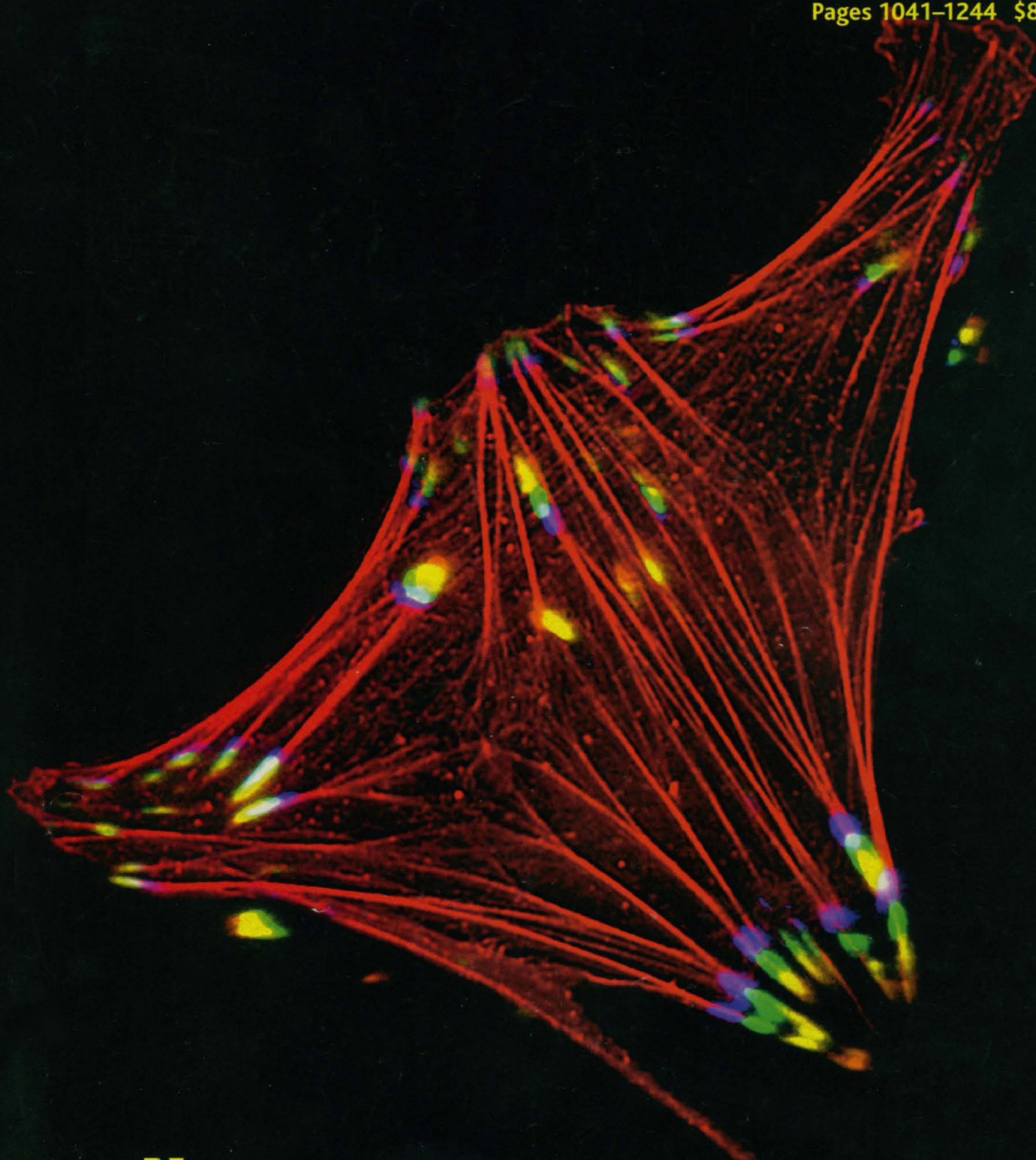


Science

5 November 1999

Vol. 286 No. 5442
Pages 1041-1244 \$8



AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

A Revolution in PCR Analysis

Sentinel™ Molecular Beacons

Molecular Beacons
Custom Synthesis Service
www.stratagene.com



Faster, Easier and More Versatile PCR Analysis

PCR analysis with Sentinel™ molecular beacons gives you true quantitative analysis while saving time and work by completely eliminating post-PCR manipulation. Use molecular beacons for both your real-time and endpoint PCR applications.

- Quantitative expression analysis
 - Qualitative endpoint analysis
 - Allele discrimination
 - Customized assays
 - High-throughput multiplexing

STRATAGENE USA and CANADA
ORDER: (800) 424-5444 x3
TECHNICAL SERVICES: 800-894-1304

STRATAGENE EUROPE
Belgium, France, Germany, The Netherlands,
Switzerland, United Kingdom
ORDER: 00800 7000 7000
TECHNICAL SERVICES: 00800 7400 7400
Austria
ORDER: 0800 312 526
TECHNICAL SERVICES: 017 956 7036

INTERNET
eMAIL: techservices@stratagene.com
WEBSITE: www.stratagene.com

Molecular Beacon products are sold under license from The Public Health Research Institute of The City of New York, Inc. for the purchaser's own internal research and development activities.

INTRODUCING Stratagene's integrated system of Sentinel™ molecular beacon products.

PCR and RT-PCR Core Reagent Kits

Detection Kits

Expression Analysis Kits

Custom Molecular Beacon Synthesis Service

FluorTracker™ Fluorescence Reader

www.stratagene.com
Circle No. 61 on Readers' Service Card



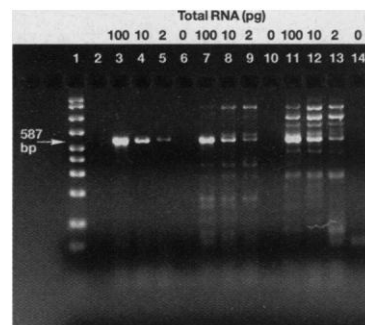


GeneAmp® Gold RNA PCR Kit

For the highest RNA PCR specificity, add Gold.

Thanks to AmpliTaq Gold® DNA Polymerase with automated chemical Hot Start, PE Biosystems brings a new level of specificity to RNA PCR. Our New GeneAmp® Gold RNA PCR Kit combines MultiScribe™ Reverse Transcriptase and AmpliTaq Gold® DNA Polymerase in an optimized one-step reaction. Together these enzymes ensure high sensitivity from very low copy numbers, as well as unparalleled flexibility and ease of use. The GeneAmp® Gold RNA PCR Kit is suitable for reverse transcription from all types of RNA sequences: mRNA, rRNA, total RNA, or viral RNA, and the subsequent cDNA amplification. You can even use it to build a cDNA library. To see the possibilities for yourself, call 650.638.5800 or go to www.pebiosystems.com.

One step. One tube. Great results.



Amplification of β -actin from total human RNA

Lanes 3, 4, 5, 6: GeneAmp® Gold RNA PCR Kit; including MultiScribe™ and AmpliTaq Gold® DNA Polymerase with automated Hot Start

Lanes 7, 8, 9, 10: RNA PCR; with MuLV and Taq DNA Polymerase, no Hot Start

Lanes 11, 12, 13, 14: RNA PCR; AMV and enzyme blend, no Hot Start

Lane 1: Size Standard

GeneAmp® Gold RNA PCR Kit

Applied Biosystems



PE Biosystems

A PE Corporation Business



PE Corporation, formerly The Perkin-Elmer Corporation, is committed to providing the world's leading technology and information for life scientists. PE Corporation consists of the PE Biosystems and Celera Genomics businesses. PE Biosystems comprises four divisions—Applied Biosystems, PE Informatics, PerSeptive Biosystems, and Tropix.

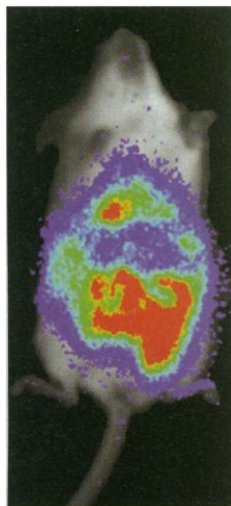
AmpliTaq Gold and GeneAmp are registered trademarks of Roche Molecular Systems, Inc. The PCR process is covered by patents owned by Roche Molecular Systems, Inc. and F. Hoffmann-La Roche Ltd. PE, PE Applied Biosystems, MultiScribe, and PE Biosystems are trademarks, and Perkin-Elmer is a registered trademark of The Perkin-Elmer Corporation. PE Applied Biosystems develops and produces its products in accordance with ISO 9000 quality system requirements. For Research Use Only. Not for use in diagnostic procedures. ©1999 PE Biosystems. Printed in the USA.

Circle No. 49 on Readers' Service Card

Science

www.sciencemag.org

COVER Combined fluorescence images of focal adhesions (multicolored patches) and microfilaments (red) in a stationary fibroblast expressing green fluorescent protein-integrin (image width, ~50 μm). Color-encoded time-lapse images of the focal adhesions (earliest, orange; latest, purple) show that focal adhesions move while remaining connected to microfilaments. Immobile focal adhesions in migrating cells may reflect the activity of a molecular clutch. [Image: A. Mikhailov and G. G. Gundersen]



1068

Less invasive
animal testing

NEWS

NEWS OF THE WEEK

- 1058 **MOLECULAR BIOLOGY: EMBL Faces Huge Bill Following Adverse Pay Dispute Ruling**
- 1059 **ANIMAL RIGHTS: Booby-Trapped Letters Sent to 87 Researchers**
- ▼1059 **BIOMATERIALS: Reverse Engineering the Ceramic Art of Algae**
1129
- ▼1061 **OCEANOGRAPHY: Has a Great River in the Sea Slowed Down?**
1132
- 1062 **AIDS: European Vaccine Effort Faces Chinese Puzzle**
- 1064 **DOE LABS: Congress Shrinks Lab Chiefs' Flexible Funds**
- 1064 **PALEONTOLOGY: Fossils Give Glimpse of Old Mother Lamprey**

1065 **PHYSICS: Gravity's Gravity Vindicates Einstein**

1067 **NANOTECHNOLOGY: Patterning Plastic With Plentiful Pillars**

NEWS FOCUS

- 1068 **ANIMAL EXPERIMENTATION: Humane Science Finds Sharper and Kinder Tools**
Toxicity Testing: The Many Arts of Persuasion
- 1071 **SOCIETY OF VERTEBRATE PALEONTOLOGY: The Stories Behind the Bones**
- 1074 **BIOMEDICAL RESEARCH: NIH Eyes Sweeping Reform of Peer Review**
What's Wrong With NIH Peer Review?
- 1076 **SCIENTIFIC MISCONDUCT: The Misconduct Case That Won't Go Away**

RESEARCH

RESEARCH ARTICLES

- 1119 **Experimental Determination of the Antiaromaticity of Cyclobutadiene**
A. A. Deniz, K. S. Peters, G. J. Snyder
- ▼1123 **Plant Diversity and Productivity Experiments in European Grasslands**
1099
A. Hector, B. Schmid, C. Beierkuhnlein, M. C. Caldeira, M. Diemer, P. G. Dimitrakopoulos, J. A. Finn, H. Freitas, P. S. Giller, J. Good, R. Harris, P. Högberg, K. Huss-Danell, J. Joshi, A. Jumpponen, C. Körner, P. W. Leadley, M. Loreau, A. Minns, C. P. H. Mulder, G. O'Donovan, S. J. Otway, J. S. Pereira, A. Prinz, D. J. Read, M. Scherer-Lorenzen, E.-D. Schulze, A.-S. D. Siamantziouras, E. M. Spehn, A. C. Terry, A. Y. Troumbis, F. I. Woodward, S. Yachi, J. H. Lawton

▼1132 **A Possible 20th-Century Slowdown of Southern Ocean Deep Water Formation**
1061
W. S. Broecker, S. Sutherland, T.-H. Peng

1135 **Fault Slip Rates in the Modern New Madrid Seismic Zone** K. Mueller, J. Champion, M. Guccione, K. Kelson

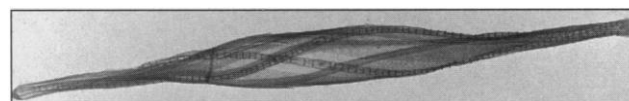
1139 **Ultrasensitive Isotope Trace Analyses with a Magneto-Optical Trap** C. Y. Chen, Y. M. Li, K. Bailey, T. P. O'Connor, L. Young, Z.-T. Lu

1141 **Similarity of the *C. elegans* Developmental Timing Protein LIN-42 to Circadian Rhythm Proteins** M. Jeon, H. F. Gardner, E. A. Miller, J. Deshler, A. E. Rougvie

1146 **An Adenosine Deaminase That Generates Inosine at the Wobble Position of tRNAs**
A. P. Gerber and W. Keller

REPORTS

- 1127 **Hydrogen Storage in Single-Walled Carbon Nanotubes at Room Temperature**
C. Liu, Y. Y. Fan, M. Liu, H. T. Cong, H. M. Cheng, M. S. Dresselhaus
- ▼1129 **Polycationic Peptides from Diatom Biosilica That Direct Silica Nanosphere Formation** N. Kröger, R. Deutzmann, M. Sumper
1059



1129

Diatom shell formation

DEPARTMENTS

NETWATCH
1047

THIS WEEK IN SCIENCE
1049

SCIENCESCOPE
1061

RANDOM SAMPLES
1079

CONTACT SCIENCE
1087

NEW PRODUCTS
1189



AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE

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 © 1999 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): \$110 (\$62 allocated to subscription). Domestic institutional subscription (51 issues): \$325; 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. Publications Mail Agreement Number 1069624. Printed in the U.S.A.

SCIENCE'S COMPASS

EDITORIAL

- 1087 **View from the East** J. G. Reich

LETTERS

- 1089 **Megascience Forum: Valuable from IUPAP's Perspective** B. Richter. **Need for Neutron Diffraction Instruments** P. Langan and B. P. Schoenborn. **The Paternity of Aspirin** H. Henderson. **Fear of Biotechnology: Hysteria or Due Caution?** J. Koch. **Corrections and Clarifications**

ESSAY

- 1093 **Of Two Minds and One Nature**
R. R. Shearer and S. J. Gould

BOOKS ET AL.

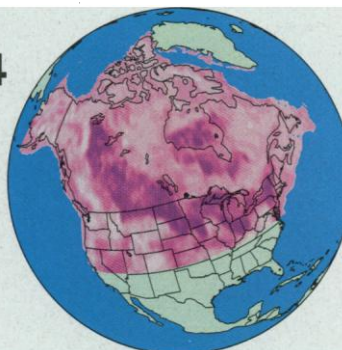
- 1095 **BIOTECHNOLOGY: *French DNA Trouble in Purgatory*** P. Rabinow, reviewed by W. Ansorge
- 1096 **MICROBIOLOGY: *Intimate Strangers Unseen Life on Earth*** reviewed by C. S. Harwood and E. P. Greenberg

PERSPECTIVES

- 1097 **MATERIALS SCIENCE: Controlling Cracks in Ceramics** W. J. Clegg

1104

Ice sheets and climate



- ▼1099 **ECOLOGY: Diversity and Production in European Grasslands** D. Tilman
1123
- ▼1100 **CANCER: Breast Cancer Genes and DNA Repair** A. R. Venkitaraman
1162
- ▼1102 **CELL BIOLOGY: Cell Migration—Movin' On**
1172 A. R. Horwitz and J. T. Parsons

REVIEW

- 1104 **CLIMATOLOGY: Northern Hemisphere Ice-Sheet Influences on Global Climate Change** P. U. Clark, R. B. Alley, D. Pollard

- 1149 **Regulation of Lineage Commitment Distinct from Positive Selection** R. Keefe, V. Dave, D. Allman, D. Wiest, D. J. Kappes
- 1153 **A Biochemical Genomics Approach for Identifying Genes by the Activity of Their Products** M. R. Martzen, S. M. McCraith, S. L. Spinelli, F. M. Torres, S. Fields, E. J. Grayhack, E. M. Phizicky
- 1155 **Nongenomic Transmission Across Generations of Maternal Behavior and Stress Responses in the Rat** D. Francis, J. Diorio, D. Liu, M. J. Meaney
- 1159 **Extensive Nuclear DNA Sequence Diversity Among Chimpanzees** H. Kaessmann, V. Wiebe, S. Pääbo
- ▼1162 **Requirement of ATM-Dependent Phosphorylation of Brca1 in the DNA Damage Response to Double-Strand Breaks** D. Cortez, Y. Wang, J. Qin, S. J. Elledge
1100
- 1166 **Control of the DNA Damage Checkpoint by Chk1 and Rad53 Protein Kinases Through Distinct Mechanisms** Y. Sanchez, J. Bachant, H. Wang, F. Hu, D. Liu, M. Tetzlaff, S. J. Elledge

- ▼1172 **Focal Adhesion Motility Revealed in Stationary Fibroblasts** L. B. Smilenov, A. Mikhailov, R. J. Pelham Jr., E. E. Marcantonio, G. G. Gundersen
1102
- 1175 **Experimental Studies of Extinction Dynamics** G. E. Belovsky, C. Mellison, C. Larson, P. A. Van Zandt
- 1178 **Chunk Versus Point Sampling: Visual Imaging in a Small Insect** E. Buschbeck, B. Ehmer, R. Hoy
- 1180 **Calmodulin Dependence of Presynaptic Metabotropic Glutamate Receptor Signaling** V. O'Connor, O. El Far, E. Bofill-Cardona, C. Nanoff, M. Freissmuth, A. Karschin, J. M. Airas, H. Betz, S. Boehm

TECHNICAL COMMENTS

- CH₃⁺ Stability and Mass Spectrometry**
G. M. Kramer. **Response** T. Oka and E. T. White; D. Marx and M. Parrinello
- www.sciencemag.org/cgi/content/full/286/5442/1051a

SCIENCE ONLINE
www.sciencemag.org

SCIENCE
THE JOURNAL
www.sciencemag.org

SCIENCE NOW
DAILY NEWS SERVICE
www.sciencenow.org

NEXT WAVE
WEEKLY CAREER UPDATES
www.nextwave.org

GRANTSNET
RESEARCH FUNDING DATABASE
www.grantsnet.org


NEUROAIDS
EXPERIMENTAL WEB SITE
www.sciencemag.org/NAIDS

SCIENCE'S STKE
SIGNAL TRANSDUCTION
KNOWLEDGE ENVIRONMENT
www.stke.org



1178
Seeing the light

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: \$8.00 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 0036-8075/83 \$4.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.



Isn't an oligo
just an oligo?

No, not
exactly!

Use our PSF[®] or HPSF[®] purified oligos and discover the difference!

All at no extra cost...

- ❖ Purified
- ❖ Salt free
- ❖ QC'd by MALDI-TOF MS

... starting from

\$ 0.49
per purified base

More information

Germany ++49 (0)8092/8289-77

USA ++01 336-812-9995

In science you really cannot afford to rely on things which are not proven!

Circle No. 63 on Readers' Service Card



PSF[®] and HPSF[®] oligos are purified under completely salt free conditions. Unlike RP-HPLC purification, there's no extra costs and long delivery times for purified oligos. PSF[®] and HPSF[®] save you time and money.

Every one of your oligos is quality checked by MALDI-TOF MS mass spectrometric analysis, offering the most reliable quality control check for your oligos. We can include the mass certification of your oligos in the synthesis report for just (\$ 5.00).

**MWGAG
BIOTECH**

GERMANY
ANZINGER STRASSE 7
85560 EBERSBERG

USA
4170 MENDENHALL OAKS PARKWAY
SUITE 160, HIGH POINT, NC 27265

E-MAIL: info@mwgdna.com
<http://www.mwgbiotech.com>

New QIAGEN® OneStep RT-PCR Kit

Take OneStep to
simplify your RT-PCR.

The QIAGEN® OneStep RT-PCR Kit is designed for easy and sensitive one-step RT-PCR using any RNA. A unique enzyme combination and specially developed reaction buffer ensure efficient reverse transcription and PCR in one tube.

The QIAGEN OneStep RT-PCR Kit is the one kit that makes your RT-PCR:

- ◆ **Simple** — easy one-tube setup
- ◆ **Fast** — time-saving procedure
- ◆ **Sensitive** — a unique blend of two high-affinity reverse transcriptases and a hot-start PCR enzyme
- ◆ **Robust** — optimized buffer for efficient reverse transcription and amplification

QIAGEN OneStep RT-PCR Kit.
One step, one tube — the simplest RT-PCR.

Products containing HotStarTaq DNA Polymerase are sold under licensing arrangements with F. Hoffmann-La Roche Ltd, Roche Molecular Systems, Inc. and The Perkin-Elmer Corporation. The PCR process is covered by U.S. Patents 4,683,195 and 4,683,202 and foreign equivalents owned by Hoffmann-La Roche AG.
© 1999 QIAGEN, all rights reserved.

www.qiagen.com

QIAGEN: Germany USA
Tel. 02103-892240 Tel. 800-426-8157
Fax 02103-892255 Fax 800-718-2056

Australia
Tel. 03-9489-3666
Fax 03-9489-3888

Canada
Tel. 800-572-9613
Fax 800-713-5951

France
Tel. 01-60-920-930
Fax 01-60-920-925

Japan
Tel. 03-5805-7261
Fax 03-5805-7263

Switzerland
Tel. 061-319-30-31
Fax 061-319-30-33

UK
Tel. 01293-422-999
Fax 01293-422-922

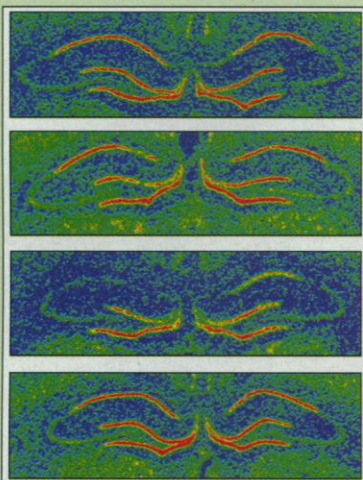
DISTRIBUTORS: Austria/Hungary/Slovenia R. u. P. MARGARITELLA Austria [01] 889 18 19 Belgium/Luxembourg Westburg b.v. 0800-1-9815 Brazil Labtrade do Brazil [11] 543 1455 or 0800 55 1321 Central & South America Labtrade Inc. USA [305] 828-3818 China Gene Company Limited [852]2896-6283 Czech Republic BIO-CONSULT spol. s.r.o. [02]4447 1239 Denmark KEBO Lab A/S 43 86 87 88 Egypt Clinlab 525 7212 Finland KEBO Lab Oy [09]804 551 Greece BioAnalytica S.A. [01]640 03 18 India Genetix [011]542 1714 or [011]515 9346 Israel BioLab Ltd. 02. 584 1111 Italy GENENCO (IMedical srl) [055] 500 1871 Korea ILS Laboratories, Inc. [02] 924-86 97 Malaysia Research Biolabs Sdn. Bhd. [03]7312099 Mexico Quimica Valonar S.A. de C.V. [5] 525 57 25 The Netherlands Westburg b.v. [033]4950094 New Zealand Biolab Scientific Ltd. [09]980 6700 or 0800 933 966 Norway KEBO Lab AS 22 90 00 00 Poland Syngen Biotech [071] 351 41 06 or 0601 70 60 07 Portugal IZASA PORTUGAL LDA [11]751 6000 Singapore Research Biolabs Pte Ltd. 445 7927 Slovak Republic BIO-CONSULT Slovakia s.r.o. [07] 50221 336 South Africa Southern Cross Biotechnology (Pty) Ltd [021] 671 5166 Spain IZASA, S.A. [93] 902.20.30.90 Sweden KEBO Lab [08] 621 34 00 Taiwan TAIGEN Bioscience Corporation [02] 2880 2913 Thailand Theera Trading Co. Ltd. [02] 412-5672 In other countries contact: QIAGEN GmbH, Germany

Circle No. 68 on Readers' Service Card



STRESS ACROSS THE GENERATIONS

Although it has been clear that parents can transmit personality traits to their children, it has not been easy to determine the extent to which such transfer occurs through genetic inheritance or through nongenomic, behavioral mechanisms. Francis *et al.* (p. 1155) have looked at generations of mice that show genetic differences in fearfulness. By cross-fostering offspring, they have shown that the environment can trigger differences in behavior and in stress-related gene expression that are passed on to the next generation.



itance or through nongenomic, behavioral mechanisms. Francis *et al.* (p. 1155) have looked at generations of mice that show genetic differences in fearfulness. By cross-fostering offspring, they have shown that the environment can trigger differences in behavior and in stress-related gene expression that are passed on to the next generation.

A DIP IN DEEP WATER?

Deep ocean circulation is driven in part by cold water from polar regions sinking and flowing underneath and mixing with the warmer ocean. This deep-ocean circulation has played a major role in large, abrupt climate changes such as deglaciations. The last major reorganization of the deep ocean's thermohaline circulation is believed to have occurred at the end of the Younger Dryas, approximately 11,500 years ago. Since then, climate and oceanic circulation apparently have been remarkably stable, but this stability may be an illusion. Broecker *et al.* (p. 1132; see the news story by Kerr) compared recent measurements of the chlorofluorocarbon tracer CFC-11 in the deep Southern Ocean with data on the distribution of carbon-14 and phosphate. They conclude that the rate at which Southern Ocean deep water has been forming during the past century is only about one-third of

that during the preceding 700 years. This result would imply that the period of unusually cold weather in Europe that lasted from about 1400 to 1900, called the Little Ice Age, may have been a mild analog of the Younger Dryas, and only one of a continuing series of such episodes that have been occurring roughly every 1500 years for the past 130,000 years.

ASSESSING ANTIAROMATICITY

The unusual reactivity and stability of benzene compared to alkenes can be attributed in simple models to resonance interactions between its three double bonds. The stabilization of cyclic unsaturated molecules, or aromatic molecules, in which $4n + 2$ electrons ($n = 0, 1, 2, \dots$) form π bonds, contrasts with the destabilization of antiaromatic molecules, cyclic species with $4n$ π -electrons. The most notable example is cyclobutadiene, which is destabilized to such an extent that its high reactivity makes measuring antiaromaticity difficult. Deniz *et al.* (p. 1119) have now used photoacoustic calorimetry to determine the enthalpy of formation of cyclobutadiene produced in a photochemical reaction. They estimated its antiaromaticity relative to a hypothetical strainless, conjugated diene reference and a reference with isolated double bonds.

BIOGENIC GLASS FORMERS

Diatoms are able to produce highly organized nanostructured silica cell walls at ambient temperatures and at high rates. The initial formation of a silica sphere is regulated by biomolecules, but their characterization has remained difficult. Kröger *et al.* (p. 1129; see the news story by Amato) show that these biomolecules—called silaffins—are polycationic peptides that contain posttranslational modifications crucial for their activity at the pH conditions relevant for biosilicification in diatoms. When silaffins were added to solutions of silicic acid, silica nanospheres were generated in a few seconds.

ROOM-TEMPERATURE HYDROGEN STORAGE IN NANOTUBES

The use of hydrogen as a clean-burning fuel is limited in part by difficulties in storing it. Carbon nanotubes of various types have shown promise as a hydrogen-storage medium but have required either cryogenic storage conditions or high-temperature desorption conditions. Liu *et al.* (p. 1127) show that wider single-wall nanotubes (mean diameters of 1.85

nanometers) are promising materials for this application. Such nanotubes, after cleaning with acid and thermally annealing, can store 4.2% by weight hydrogen at room temperature after exposure to hydrogen at 100 atmospheres.

CAUGHT IN THE TRAP

Isotopes with extremely low abundance present a difficult analytical challenge, but their measurement can prove useful. For example, krypton-81 could be used for dating ice and groundwater or in neutrino detection if more sensitive detection methods could be developed. Chen *et al.* (p. 1139) analyzed krypton gas samples that were excited into a metastable electronic state and introduced into a magneto-optical trap. Isotope analysis was performed by measuring laser-induced fluorescence. Single atoms of the rare isotopes could be detected, and abundances were determined by counting.

DIVERSITY AND PRODUCTIVITY

Satisfactory answers to major ecological questions frequently demand large-scale experiments. Hector *et al.* (p. 1123; see the Perspective by Tilman) examined the key question of the relation between biodiversity and ecosystem productivity in an experimental study at eight different locations across Europe. Different levels of grassland plant species diversity were simulated by synthesizing communities of different numbers of species. After harvesting, a consistent pattern of decreasing productivity was seen with decreasing plant diversity.

NOT JUST SITTING AROUND

Before a fibroblast cell migrates, it must modulate its adhesive contacts to an underlying substrate. These points of contact, called focal adhesions, are comprised of cell surface integrins that bind externally to the substrate and internally to the cell's actin cytoskeleton. Smilenov *et al.* (p. 1172; see the cover and the Perspective by Horwitz and Parsons) labeled focal adhesions in living cells with a fluorescent probe and observed that these contact points are motile in stationary cells. When a cell was stimulated to move, focal adhesions became stationary except at the rear of the cell. The authors propose that a clutch-like mechanism may regulate both the strength of integrin interaction with the substrate and the tension applied by associated actin filaments. A cell could switch from a nonmotile to motile state by stabilizing substrate con-

CONTINUED ON PAGE 1051



Resist the Temptation to Screen Libraries.

GeneStorm™ Expression-Ready Human Genes

Tempting or not, screening cDNA libraries is a time-consuming but necessary evil. We can help. GeneStorm™ is the only organized collection of full-length, expression-positive human genes available. Save yourself some time. Spend a few minutes screening the GeneStorm™ database before spending weeks screening a cDNA library.

The GeneStorm™ Difference.

Unlike cDNA libraries and other gene collections, GeneStorm™ Clones are actually expression-positive clones. This means you don't have to spend time cloning and testing for expression. Simply find your gene of interest in the

GeneStorm™ database and you're ready for downstream functional genomics, gene analysis, and drug discovery applications.

CATEGORY	CLONES AVAILABLE
Signal Transduction and Cell Signaling Genes	404
Oncogenes, Cancer, and Tumor Suppressor Genes	158
Adhesion Molecules and Cell Surface Antigen Genes	195
Cell Receptor Genes	198
Cytokines, Chemokines, and Growth Factor Genes	127
Apoptosis Genes	37

Thousands of Genes. The GeneStorm™ collection now contains thousands of full-length, expression-positive clones. There are many important genes in a variety of categories so you're likely to find the genes you're looking for.

Easy Access. The entire time-saving, expression-positive GeneStorm™ collection

is easily accessible on the GeneStorm™ web site. Make sure you are getting the right advice. Visit the GeneStorm™ web site today (www.invitrogen.com/genestorm) and have the clone you need tomorrow.

Circle No. 53 on Readers' Service Card

European Headquarters:

Invitrogen BV
P.O. Box 2312
9704 CH Groningen
The Netherlands
Tel: +31 (0) 50 5299 299
Fax: +31 (0) 50 5299 281
Email: tech_service@invitrogen.nl
www.invitrogen.com

International Toll Free Numbers:

Tel: 00800 5345 5345*
Fax: 00800 7890 7890*
*This number operates in all European countries excluding Finland and Sweden
Finland:
Tel: 990800 5345 5345
Fax: 990800 7890 7890
Sweden:
Tel: 009800 5345 5345
Fax: 009800 7890 7890

Distributors:

Austria 0222 889 18 19
Australia 1 800 882 555
China 010 6255 3477
Hungary 01 280 3728
India 91 80 8391453
Israel 02 584 1111
Italy 02 38 19 51
Japan 03 5684 1622

Malaysia 03 736 9198
Poland 058 341 47 26
Portugal 01 453 7085
Singapore 65 2922130
South Korea 02 3471 6500
Spain 03 450 2601
Taiwan 886 2 238 10844
Thailand 246 7243

From all other countries, call our European headquarters at +31 (0) 50 5299 299.

United States Headquarters:



1600 Faraday Avenue
Carlsbad, California 92008
Tel: 1-800-955-6288
Fax: 760-603-7201
Email: tech_service@invitrogen.com
<http://www.invitrogen.com>

THIS WEEK IN SCIENCE

CONTINUED FROM PAGE 1048

tacts and increasing its traction. Otherwise, when sitting still, focal adhesions may be in an active "idling" state, ready to engage when a cell wants to move.

LINKING BREAST CANCER AND DNA REPAIR

Failure of cell cycle checkpoint mechanisms that prevent cell division in the presence of damaged DNA can lead to an accumulation of genetic errors and can contribute to formation of cancerous cells. Cortez *et al.* (p. 1162; see the Perspective by Venkitaraman) report that two proteins that are associated with increased risk of breast cancer in humans in their mutated form actually interact with one another in cells and function in the response to DNA damage. They provide evidence that Brca1 (for breast cancer gene 1) is a substrate for ATM (for mutated in ataxia telangiectasia), a protein kinase that is activated in cells with damaged DNA. Phosphorylation of Brca1 by ATM appears to be required for proper function of Brca1 in protecting cells from DNA damage.

SEARCHING FOR ACTIVITY

Complete genomes for some organisms, such as yeast, are now available, but methods are needed to screen the possible activities of the proteins that are encoded. Martzen *et al.* (p. 1153) have combined biochemical assays with genomic arrays to create a rapid way to identify the functions of expressed proteins. Open reading frames representing more than 6000 genes were fused to a tag that facilitated affinity purification of gene products, which were then assayed to identify previously unknown proteins involved in the transfer RNA splicing pathway. This technique may shorten the process of functional identification from months or years to days.

CHIMP HISTORY

Comparative DNA sequence analysis continues to unravel the story of the evolutionary relationships of humans and the great apes. Kaessmann *et al.* (p. 1159) have generated a large database of DNA sequences from the X chromosomes of chimpanzees in order to compare the variation found in humans to that in chimps. Chimps have an evolutionary history that is more extensive and diverse than our own, which implies a greater age for the common ancestor of chimpanzee sequences compared to that for humans. Their data also show that chimps do not divide cleanly into several subspecies but that the subspecies are highly intermixed. The bonobo appears to have diverged from other chimp lineages less than 1 million years ago, much more recently than indicated by other measures.

CHUNK-PIXELATED VISION

Anyone who has purchased a personal computer will be familiar with the exponential relation between monitor size and cost. The cost arises not only from the actual display size but also from the associated hardware and processing speed needed to support the vastly increased amount of data in a larger number of pixels. Buschbeck *et al.* (p. 1178) describe a cost-effective solution implemented by a parasitic insect, one whose entire life cycle is spent within the body of the host wasp (in the case of the female) or the wasp nest (male). The eyes of these insects are organized to grab visual data in a small number of chunks, about 50 per eye, with a separate retina subserving each chunk of the visual field. This resolution may be sufficient for the insect's somewhat limited visual requirements, or it may help to concentrate limited light in a fashion reminiscent of trilobite eyes.

TECHNICAL COMMENT SUMMARIES

Protonated Methane

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/286/5442/1051a

White *et al.* (Reports, 2 Apr., p. 135) reported the infrared spectrum of CH_5^+ , and Marx and Parrinello (Perspectives, 2 Apr., p. 59) reviewed recent theoretical work which suggests that the bonds in this species are highly fluxional.

Kramer comments that previous mass spectrometry studies suggest that, in the absence of intermolecular collisions, CH_4D^+ and CD_4H^+ are not rearranging and can be described as a van der Waals complex of a methyl cation and a hydrogen molecule.

In response, Oka and White point out some difficulties in the interpretation of the mass spectrometry cited and note that a more static structure would still have a complex infrared spectrum. Marx and Parrinello have performed additional calculations on CH_4D^+ that show scrambling of the D atom, and note that complexation may "freeze" the scrambling of the H atoms.

Now Available In
GERMAN

NEW VERSION!
6.0

ORIGIN[®]

for Windows[®]

Data Analysis and Technical Graphics Software



*Origin is faster,
more flexible, and
easier-to-use!*

- **New Project Explorer:** a tool that helps navigate through the hundreds of graphs and worksheets in a project file
- **New Data Masking tool:** point and click to exclude data points from curve fitting
- **OLE2 Server,** export graphs in EPS, CGM, JPEG, TIFF, PDF, DXF, and more!
- **Open and run Excel,** drag and drop to create Origin graphs from Excel workbooks and Origin worksheets
- **Toolbar customization:** add your own toolbar buttons that run your own scripts or DLL
- **Faster redraw:** a graphics caching scheme makes it easy to manipulate complex 3D graphs

**Download
a FREE DEMO at
www.origin6.com
or call
1-800-969-7720**

"Microcal's Origin 6.0 has the most comprehensive graphing engine of this collection; it supports the most graph types, the most data types, and the most customizations."

— Dr. Barry Simon, Ph. D., Desktop Engineering Magazine, April, 1999

Microcal[™]

Microcal Software, Inc.

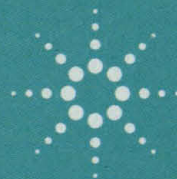
One Roundhouse Plaza
Northampton, MA 01060 USA
Tel. US & Canada: 1-800-969-7720 Int'l: 1-413-586-2013
Fax: 1-413-585-0126 Email: info@microcal.com

©1999. Origin and LabTalk are trademarks of Microcal Software, Inc. All other brand and product names are trademarks of their respective owners.

dreams made real.



Something old, something new. We are proud to announce that your HP business and technology partners for the past 60 years are now Agilent Technologies. Agilent is fully devoted to meeting the increasing demands of your business. Our vow is to be committed to innovation, uncompromising integrity, teamwork, and trust. If you're looking for a lasting relationship, look no further.



Agilent Technologies

Innovating the HP Way

Circle No. 72 on Readers' Service Card

EDITOR-IN-CHIEF
Floyd E. Bloom

EDITOR
Ellis Rubinstein

MANAGING EDITOR
Monica M. Bradford

EDITORIAL

DEPUTY MANAGING EDITORS: R. Brooks Hanson (Physical Sciences), Katrina L. Kelner (Biological Sciences); SUPERVISORY SENIOR EDITORS Linda J. Miller, Phillip D. Szufomi; SENIOR EDITORS Gilbert J. Chin, Pamela J. Hines, Barbara Jasny, Paula A. Kiberstis (Boston), L. Bryan Ray; ASSOCIATE EDITORS Lisa D. Chong, Beverly A. Purnell, Linda R. Rowan, H. Jesse Smith, Valda Vinson; EDITORIAL SUPPORT Candace Gallery, Carolyn Kyle, Elise Laffman, Patricia M. Moore, Anita Wynn; ADMINISTRATIVE SUPPORT Sylvia Kihara

SCIENCE'S COMPASS

SENIOR EDITOR/POLICY FORUM Barbara Jasny; SENIOR EDITORS/PERSPECTIVES Orla Smith, Julia Uppenbrink; ASSOCIATE BOOK REVIEW EDITOR

PUBLISHER

Richard S. Nicholson

ASSOCIATE PUBLISHER
Beth Rosner

MEMBERSHIP/CIRCULATION DIRECTOR
Michael Spinella

MEMBERSHIP/CIRCULATION

SUBSCRIPTION SERVICES: 202-326-6417; 800-731-4939

DEPUTY DIRECTOR Marlene Zendell; MEMBER SERVICES: MANAGER Michael Lung; SUPERVISOR Mary Curry; REPRESENTATIVES Laurie Baker, Pat Butler, Christine Ford, Mari Pope, Jantell Smith; MARKETING: MANAGER Scott Oser; ASSOCIATES Lauri Sirois, Deborah Stromberg; EUROPE MANAGER Jane Pennington; EXECUTIVES Ruth Jackson, Martin Paine; RESEARCH: MANAGER Renuka Chander; BUSINESS AND FINANCE: MANAGER Teresa Stirk; ASSISTANT Susan Maxim; COMPUTER SPECIALIST Charles Munson

FINANCE AND ADVERTISING

BUSINESS AND FINANCE: BUSINESS MANAGER Deborah Rivera-Wienhold; SENIOR ANALYST Randy Yi; FINANCIAL ANALYST Lisa Donovan RIGHTS AND PERMISSIONS: ASSOCIATE Emilie David; ASSISTANT Karen Lentz MARKETING: DIRECTOR John Meyers; ASSOCIATES Catherine Giordano, Allison Pritchard ELECTRONIC MEDIA: MANAGER David Gillikin; COMPUTER SPECIALIST Wendy Green; PRODUCTION ASSOCIATES Mark Croatti, Ellen McGuire, Louis Williams ADMINISTRATIVE SUPPORT Jessica Tierney

Sherman J. Suter; CONTRIBUTING EDITORS Kevin Ahern, Richard Peters, Robert Sikorski, David F. Voss; PUBLICATION ASSISTANTS Jeffrey Hearn, Elizabeth Lenox; INFORMATION SPECIALIST Janet Kegg; ASSOCIATE LETTERS EDITOR Christine M. Pearce; PUBLICATION ASSISTANT Charlene King

NEWS

NEWS EDITOR Colin Norman; FEATURES EDITOR Tim Appenzeller; DEPUTY NEWS EDITORS Elizabeth Culotta (contributing editor), Jean Marx, Jeffrey Mervis, Richard Stone; NEWS WRITERS Martin Enserink, Laura Helmuth (intern), Constance Holden, Jocelyn Kaiser, Richard A. Kerr, Andrew Lawler, David Malakoff, Eliot Marshall, Elizabeth Pennisi, Gretchen Vogel BUREAUS: BERKELEY, CA Marcia Barinaga (contributing correspondent); SAN DIEGO, CA Jon Cohen (contributing correspondent); PACIFIC NORTHWEST Robert F. Service; COPY EDITORS Linda B. Felaco, Daniel T. Helgerman; CONTRIBUTING CORRESPONDENTS Barry A. Cipra, Ann Gibbons, Robert Irion, Charles C. Mann, Anne Simon Moffat, Virginia Morell, Evelyn Strauss, Gary Taubes, Ingrid Wickelgren; ADMINISTRATIVE SUPPORT Scherraine Mack, Fannie Groom

EDITING AND PROOFREADING

EDITORIAL MANAGER Cara Tate; SENIOR COPY EDITORS Cay Butler, Harry Jach, Etta Kavanagh, Barbara P. Ordway, COPY EDITORS Jeffrey E. Cook, Jason Llewellyn, Joshua Marcy, Monique Martineau, EDITORIAL COORDINATORS Ellen E. Murphy, Beverly Shields; PUBLICATIONS ASSISTANTS Chris Filiatreau, Joi S. Granger, Gail Murphy; EDITORIAL ASSISTANT Kathy Libal

PRODUCTION

DIRECTOR James Landry; MANAGER Wendy K. Shank; ASSISTANT PRODUCTION MANAGERS, Elizabeth A. Harman (Internet), Rob Masson;

PRODUCT ADVERTISING

NATIONAL SALES MANAGER NORTHEAST AND E. CANADA Richard Teeling: 973-694-9173, FAX 973-694-9193 • MIDWEST/ SOUTHEAST Elizabeth Mosko: 773-665-1150, FAX 773-665-2129 • WEST COAST/W. CANADA Neil Boylan: 415-673-9265, FAX 415-673-9267 • MID ATLANTIC AND U.S. INSIDE SALES Christopher Breslin: 410-273-1007, FAX 410-273-1591 NEW MEDIA SALES MANAGER Chris Peterson: 410-560-3960, FAX 410 560-3961 • UK/SCANDINAVIA/France/ ITALY/BELGIUM/NETHERLANDS Andrew Davies: (44) 7-071-226-216, FAX (44) 7-071-226-233 • GERMANY/SWITZERLAND/AUSTRIA Tracey Peers: (44) 1-260-297-530, FAX (44) 1-260-271-022 JAPAN Masah Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852 • TRAFFIC MANAGER Carol Maddox; SALES ASSOCIATES Sean Gee, Sheila Myers

RECRUITMENT ADVERTISING

SALES AND PRODUCTION OPERATIONS MANAGER Terri Seiter Azie u.s.: SALES MANAGER Gabrielle Boguslawski: 718-491-1607, FAX 202-289-6742; INTERNET SALES MANAGER Beth Dwyer; SALES SUPERVISOR Daryl Anderson; SALES REPRESENTATIVES Kathleen Clark, Beth Dwyer, Christina Geiger, Bren Peters-Minnis, Kristin Westapher; ASSISTANTS Erika Bryant, Sussy Castilla, Jody Fenty, Shirley Young PRODUCTION: TRAFFIC MANAGER Jennifer Rankin; ASSOCIATE Christine Borkowski U.K./EUROPE: SALES MANAGER Debbie Cummings; SALES EXECUTIVE Sabine Lenuid; ASSISTANT Elisabeth Py: (44) 1223-326500, FAX (44) 1223-326532 AUSTRALIA/NEW ZEALAND: Keith Sandell: (61) 02-9922-2977, FAX (61) 02-9922-1100 JAPAN: Masah Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852

DEPUTY EDITORS

Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*); Thomas R. Cech (*Biological Sciences*)

BOARD OF REVIEWING EDITORS

Frederick W. Alt
Children's Hospital, Boston
Don L. Anderson
California Institute of
Technology
Michael Ashburner
University of Cambridge
Frank S. Bates
Univ. of Minnesota, Minneapolis
Stephen J. Benkovic
Pennsylvania State University
Alan Bernstein
Mount Sinai Hospital, Toronto
Michael J. Bevan
University of Washington, Seattle
Seth Blair
University of Wisconsin, Madison
David E. Bloom
Harvard School of Public Health
Piet Borst
The Netherlands Cancer Institute
Henry R. Bourne
Univ. of California, San Francisco
James J. Bull
University of Texas at Austin
Kathryn Calame
Columbia Univ. College of
Physicians & Surgeons
Dennis W. Choi
Washington Univ. School of
Medicine, St. Louis
Joanne Chory
The Salk Institute

David Clapham
Children's Hospital, Boston
Adrienne E. Clarke
University of Melbourne, Parkville
F. Fleming Crim
University of Wisconsin, Madison
Paul J. Crutzen
Max-Planck-Institut für Chemie
James E. Dahlberg
University of Wisconsin Medical
School, Madison
Robert Desimone
National Institute of Mental
Health, NIH
Hans Eklund
Swedish Univ. of Agricultural
Sciences, Uppsala
Paul T. Englund
Johns Hopkins University
School of Medicine
G. Ertl
Max-Planck-Gesellschaft
Richard G. Fairbanks
Lamont-Doherty Earth Observatory
Douglas T. Fearon
University of Cambridge
Harry A. Fozzard
The University of Chicago
Roger I. M. Glass
Centers for Disease Control
Peter N. Goodfellow
SmithKline Beecham, UK
Jack F. Greenblatt
University of Toronto

Peter Gruss
Max Planck Institute of
Biophysical Chemistry
Philip C. Hanawalt
Stanford University
Paul Harvey
University of Oxford
M. P. Hassell
Imperial College at
Silwood Park
Nobutaka Hirokawa
University of Tokyo
Tsukumo Honjo
Kyoto University
Susan D. Iversen
University of Oxford
Eric F. Johnson
The Scripps Research Institute
Hans Kende
Michigan State University
Elliott Kiehl
Harvard University
Jeffrey T. Kiehl
National Center for Atmospheric
Research, Boulder
Judith Kimble
University of Wisconsin,
Madison
Stephen M. Kosslyn
Harvard University
Michael LaBarbera
The University of Chicago
Antonio Lanzavecchia
Basel Institute for Immunology

Nicole Le Douarin
Institut d'Embryologie Cellu-
laire et Moléculaire du CNRS
Norman L. Letvin
Beth Israel Hospital, Boston
Harvey F. Lodish
Whitehead Institute for
Biomedical Research
Richard Losick
Harvard University
Seth Marder
University of Arizona
Diane Mathis
Harvard Medical School
Susan K. McConnell
Stanford University
Anthony R. Means
Duke University
Stanley Meisel
University of California, Davis
Douglas A. Melton
Harvard University
Andrew Murray
Univ. of California, San Francisco
Elizabeth G. Nabel
National Heart, Lung, and Blood
Institute, NIH
Shigetada Nakanishi
Kyoto University
Roger A. Nicoll
Univ. of California, San Francisco
Staffan Normark
Swedish Institute for Infectious
Disease Control

ASSOCIATES Patricia Riehn Berg (Internet), Vicki J. Jorgensen,
Tara L. Kelly, Jessica K. Moshell, Rebecca Thomas

ART

DESIGN DIRECTOR C. Faber Smith; ART DIRECTOR Alan T. Stone-
braker; SCIENTIFIC ILLUSTRATORS Carin Cain, Katharine Sutliff;
GRAPHICS ASSOCIATES Holly Bishop, Preston Morrighan, Darcel
Pugh; PHOTO RESEARCHER Leslie Blizard

SCIENCE INTERNATIONAL

EUROPE

EDITORIAL: SUPERVISORY SENIOR EDITOR Andrew M. Sugden; ASSO-
CIATE EDITORS Stella M. Hurlty, Ian S. Osborne, Peter Stern;
NEWS: EDITOR Daniel Clery, CORRESPONDENT Michael Hagmann;
CONTRIBUTING CORRESPONDENTS Michael Balter (Paris) Robert
Koenig (Bern); SCIENCE'S NEXT WAVE, UK EDITOR: John MacFar-
lane; EDITORIAL SUPPORT Jenny Parker, Meleena Thomas; AD-
MINISTRATIVE SUPPORT Janet Mumford, Liz Ellis

ASIA

JAPAN NEWS BUREAU: Dennis Normile (contributing correspon-
dent); CHINA REPRESENTATIVE Hao Xin; Pallava Bagla (contributing
correspondent, India)

SCINCENOW: www.sciencenow.org

EDITOR Erik Stokstad

SCIENCE'S NEXT WAVE: www.nextwave.org

MANAGING EDITOR Wendy Yee; SENIOR EDITOR Nicole Ruediger
WRITER Melissa Merti; CANADA EDITOR Charles Boulakia; AS-
SISTANT Suzanne Moore

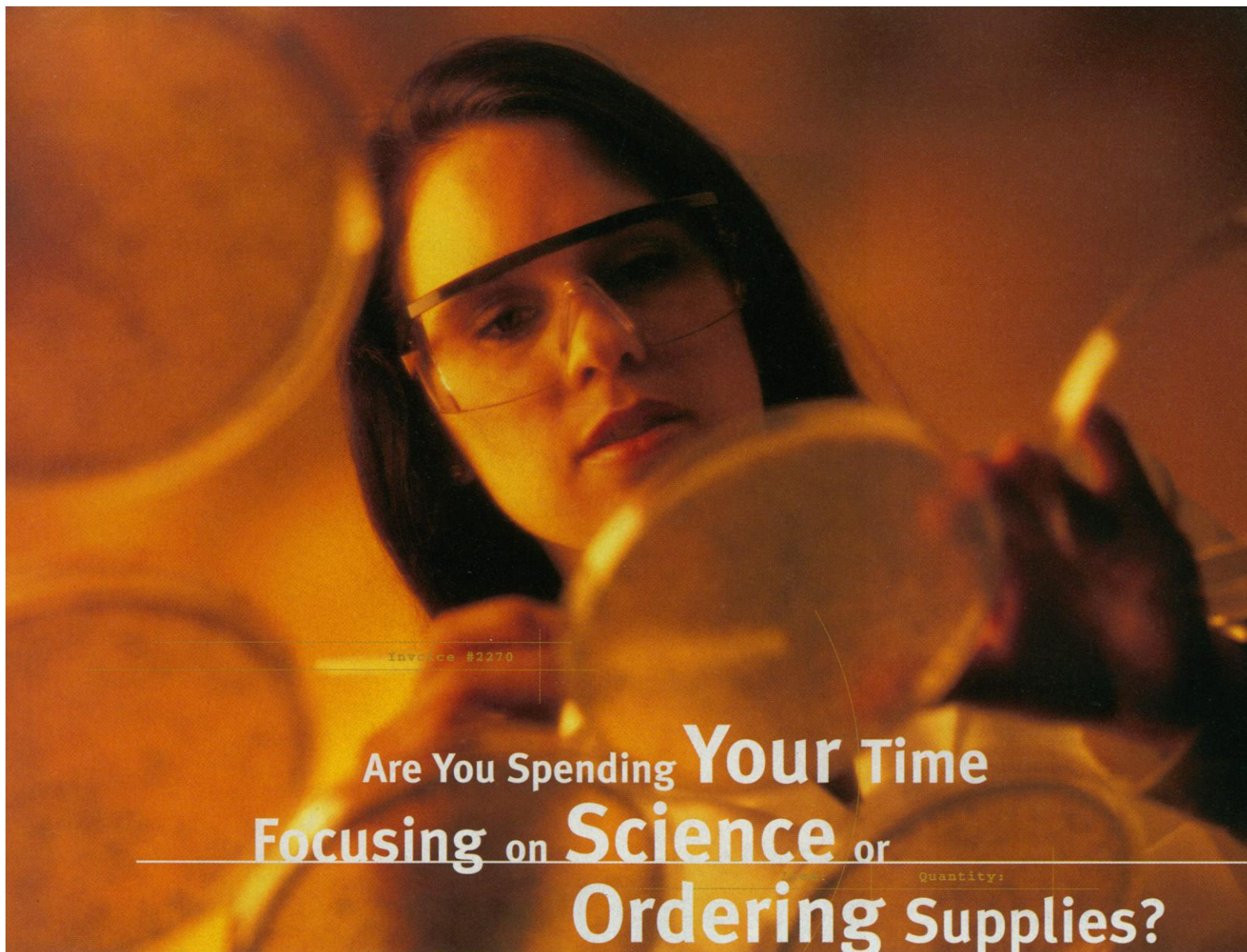
AAAS BOARD OF DIRECTORS

RETIRING PRESIDENT, CHAIR M. R. C. Greenwood
PRESIDENT Stephen Jay Gould
PRESIDENT-ELECT Mary Lowe Good
TREASURER William T. Golden
EXECUTIVE OFFICER Richard S. Nicholson

Lewis M. Branscomb; Robert D. Goldman; Alice S. Huang;
Sheila Jasanoff; Sally Gregory Kohlstedt; Marcia C. Linn;
Neena B. Schwartz; David E. Shaw

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.



Chemdex™ — Your One-Stop Shop for Life Science Supplies

The hours you spend ordering lab supplies cut into your day, distracting you from your research. You have more important things to do than search through dozens of catalogs for the product you need or track the status of your order.

Chemdex offers a faster, easier way to order lab supplies with an online marketplace that contains hundreds of thousands of products from the suppliers you know and trust. When you buy through Chemdex, you get:

- > An expanding database of reagents, instruments and equipment
- > One, simple electronic order form that can be used for multiple suppliers
- > A fast, easy-to-use search engine
- > A "personal favorites" page for quick and easy re-ordering
- > Rapid, real-time order tracking
- > World-class customer service and support

Make Chemdex your one-stop shop for laboratory supplies. Go to www.chemdex.com. You'll spend less time placing orders, and more time focusing on science.

© 1999 Chemdex Corporation. Chemdex is a trademark of Chemdex Corporation.

Circle No. 31 on Readers' Service Card

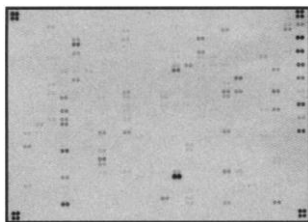


www.chemdex.com



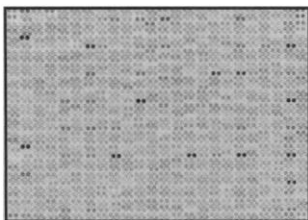
Chemdex
Accelerating Science

RELATED PRODUCTS



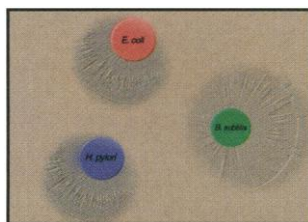
Panorama™ Human Cytokine Gene Arrays

375 genes encoding human cytokines, chemokines, interleukins, growth factors, receptors and more, spotted in duplicate on nylon membranes.



Panorama™ *E. coli* Gene Arrays

4,290 PCR-amplified open reading frames representing all *E. coli* protein coding sequences, arrayed in duplicate on nylon hybridization membranes.



Microbial ORFmers

PCR primer pairs designed to amplify each open reading frame (ORF) in *E. coli* and *B. subtilis* from the start codon to the stop codon. *H. pylori* primer pairs are designed to amplify most of the ORF with an average length of ~1 kb.

SIGMA
GENOSYS

Sigma-Genosys, The Woodlands, Texas
Phone: 877-260-0763 or 281-363-3693
ginformation@sial.com

Cambridge, U.K.:
Phone (+44)(0)1223 839000
genosys@genosys.co.uk

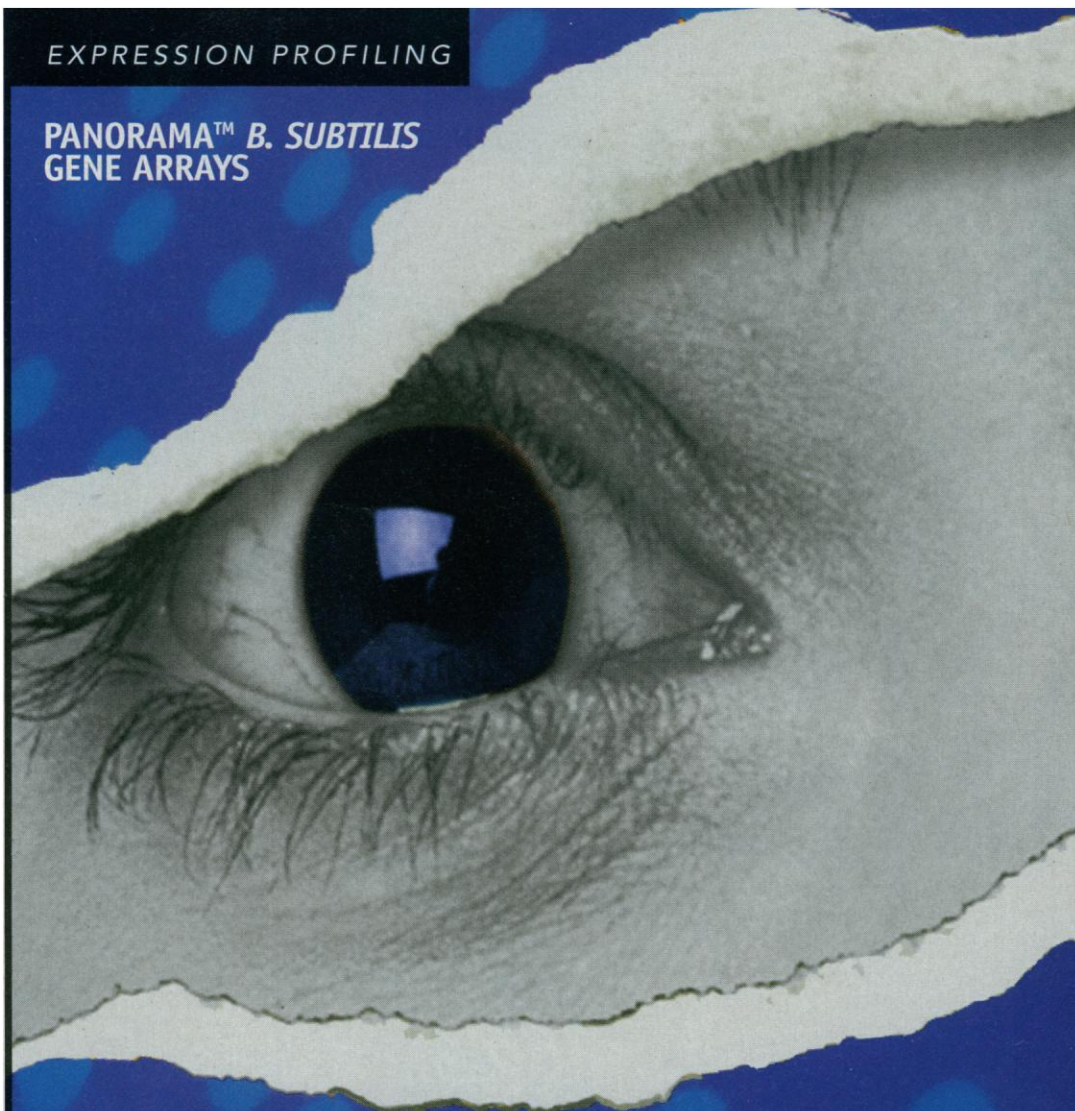
Hokkaido, Japan:
Phone: 81 133 73 5005
genosys@genosys.co.jp
www.genosys.com

Australia:
Phone: 61 2 9841 0555
Sigmaa@ibm.net

Circle No. 41 on Readers' Service Card

EXPRESSION PROFILING

PANORAMA™ *B. SUBTILIS* GENE ARRAYS



Focus on the Entire *B. subtilis* Genome

No Special Equipment Necessary.

Our Panorama *B. subtilis* Gene Arrays let you monitor differential expression of all the *B. subtilis* genes simultaneously and cost-effectively. Standard radiolabeling and hybridization techniques make whole genome expression profiling possible in virtually any molecular biology laboratory.

- 4,107 PCR amplified ORFs representing the entire *B. subtilis* genome, spotted in duplicate on nylon membranes
- Allows for analysis of *B. subtilis* gene arrays by phosphorimaging or autoradiography
- Analysis tools and information links for all *B. subtilis* genes included

Zeiss Introduces the LSM 5 PASCAL

High-Performance Confocal Microscopy Priced for the Personal Everyday User.



The new **LSM 5 PASCAL** is a compact system specifically designed to provide individual users and small workgroups unrivaled operating convenience, resolution and flexibility.

All moving components are computer-controlled for easy, error-free set-up and instant, automatic resets.

The **LSM 5 PASCAL** delivers resolution that approaches the limits of physics, with image

sizes to 2,048 x 2,048 pixels and scan fields of unrivaled size along with maximum linearity.

Other features that make the **LSM 5 PASCAL** unique in its class include 12-bit resolution per channel, high scan speeds, high sensitivity detectors and short specimen-to-detector light paths.

Available in six versions, the Zeiss **LSM 5 PASCAL** operates on a Windows NT 4.0 platform and offers one or two confocal

channels, as well as offering combinations of lasers in the blue and green spectrum.

The **LSM 5 PASCAL** is designed to be easily fitted to motorized versions of five popular Zeiss research microscopes, and can be converted from upright to inverted style in minutes.

Bring high-end confocal microscopy to your lab. Call **800.233.2343, ext. 7857** for your nearest Zeiss representative.

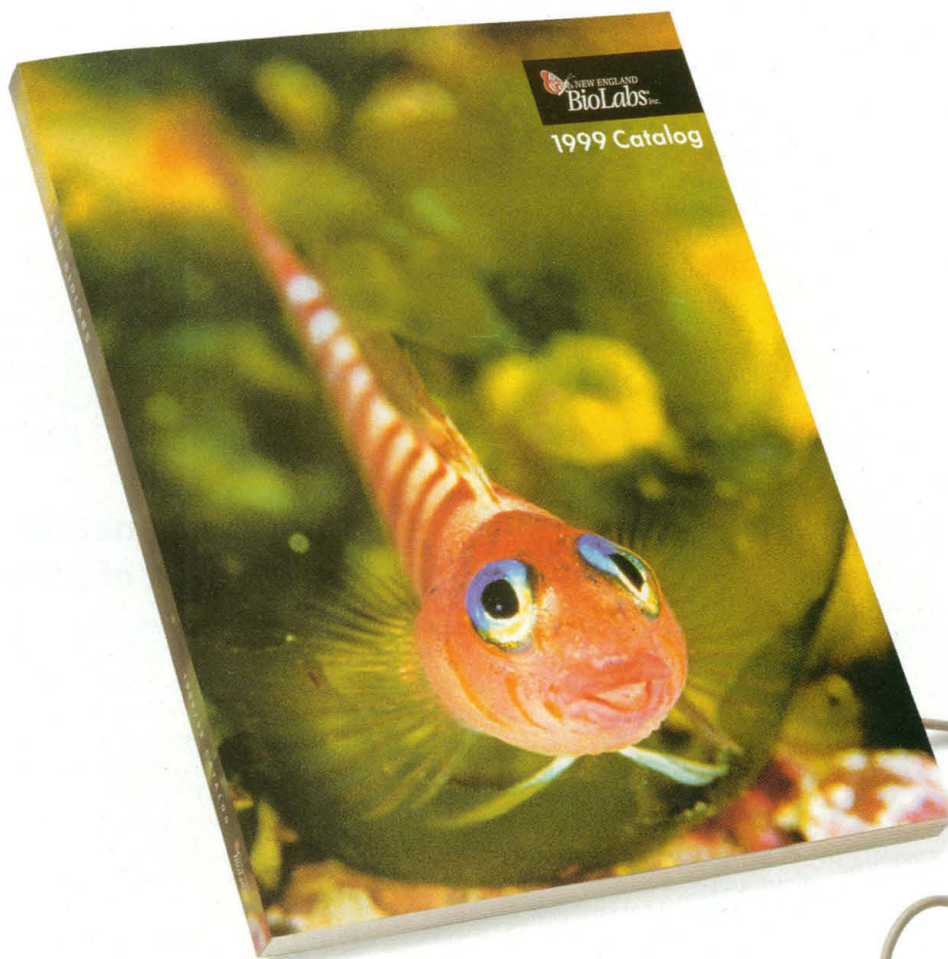
Carl Zeiss, Inc.
Microscopy & Imaging Systems
One Zeiss Drive
Thornwood, NY 10594

800.233.2343, ext. 7857
micro@zeiss.com
www.zeiss.com/micro
Circle No. 66 on Readers' Service Card

ZEISS

Need enzymes?

NEW
ENGLAND
BIOLABS



Order on-line at www.neb.com

Products you trust.

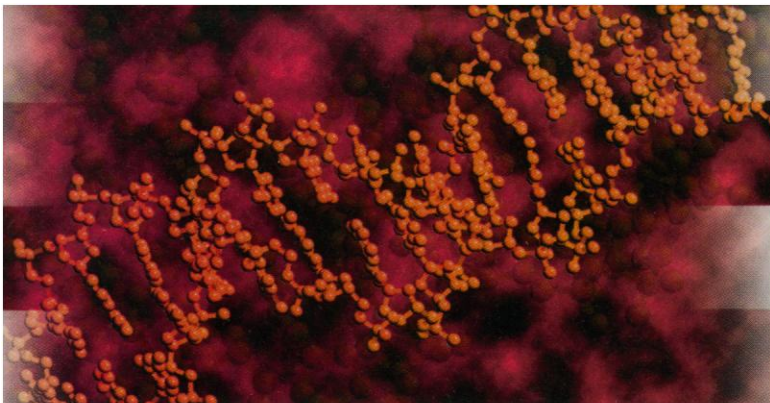
Technical information you need.

Anytime.

**order
on-line**
www.neb.com

 NEW ENGLAND
BioLabs[®] Inc.
where science is the priority

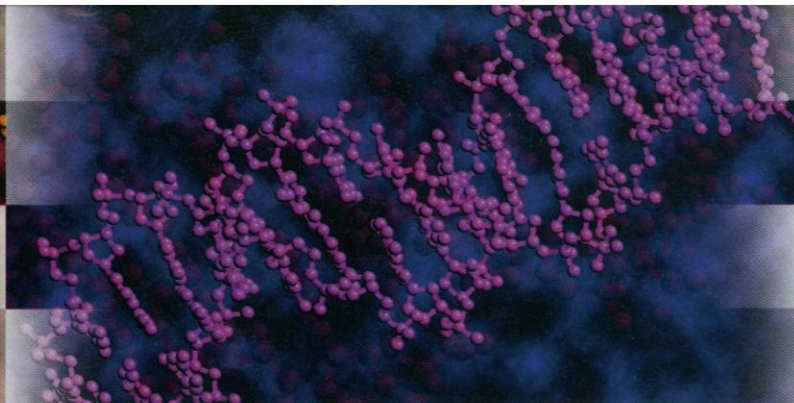
Circle No. 56 on Readers' Service Card



Amplify your success!

Mastercycler® Family

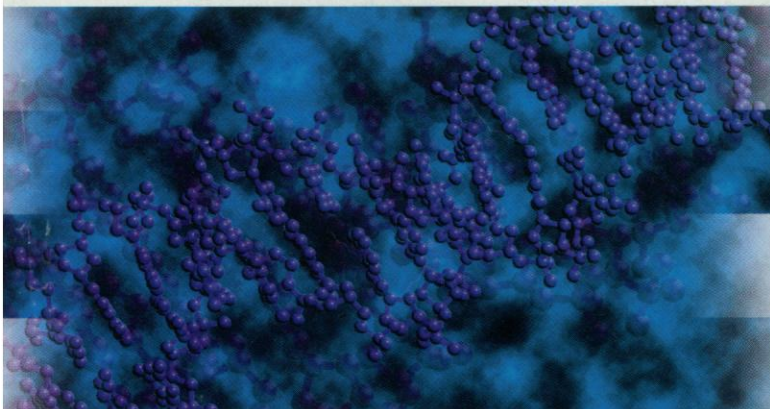
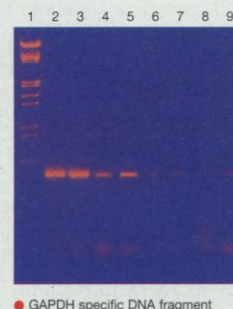
- Mastercycler gradient – the gradient cyclizer which set the standard, optimizes your PCR* in one run
- Mastercycler – the specialist for your everyday routines
- Mastercycler personal – small, fast and flexible



Amplify your success!

PCR Reagents

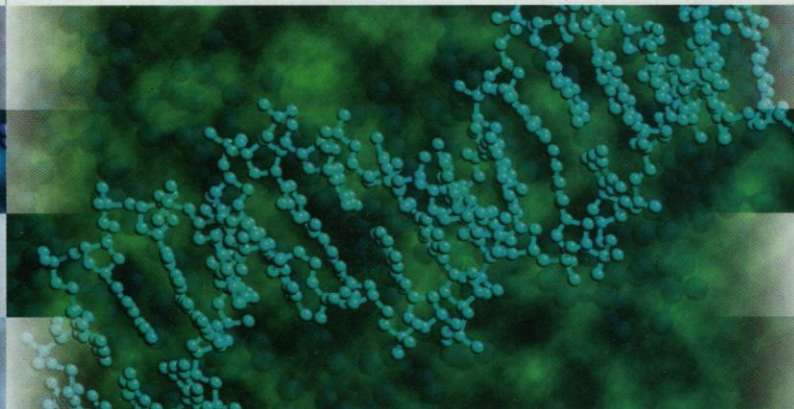
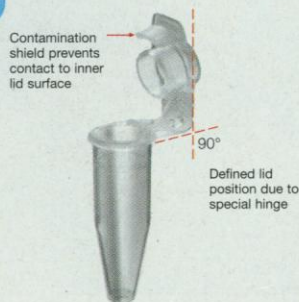
- Taq DNA Polymerase (for all common PCR protocols)
- MasterTaq Kit (for your sophisticated protocols)
- dNTP Set (Set of four separate deoxynucleotides)
- dNTP Mix (ready-to-use mix of four deoxynucleotides)



Amplify your success!

PCR Consumables

- Strips and single tubes (0.2 and 0.5 ml)
- Plates (96 wells and 384 wells)
- *In situ* frames
- Work trays, frames and racks
- Various sealing options
- Heat sealer



Amplify your success!

Customer Support

- Application specialists – experienced molecular biologists provide practical, individual support
- Telephone Hotline – rapid assistance from scientific experts

Life Science Application
Hotline: +49 180-3 666 789



eppendorf® is a registered trademark.

*PCR (Polymerase Chain Reaction) is protected by patent held by Hoffmann-La Roche.

eppendorf

In touch with life

Circle No. 11 on Readers' Service Card

Eppendorf – Netheler – Hinz GmbH · 22331 Hamburg · Germany · Phone +49 40-538 01-0 · Fax +49 40-538 01-556

e-mail: eppendorf@eppendorf.com · eppendorf home page: <http://www.eppendorf.com>

Eppendorf Scientific, Inc. · One Cantiague Road · Westbury, NY 11590-0207 · Phone 800-421-9988 or 516-876-6800 · Fax 516-876-8599

e-mail: eppendorf@eppendorfsi.com · website: www.eppendorfsi.com



STATISTICA '99

STATISTICA (automatically configures itself for Windows 98/NT) ■ A complete data analysis system with thousands of graphs integrated with all procedures ■ DDE, OLE client/server, customizable AutoTask toolbars ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques; multi-way tables/banners; nonparametrics; distribution fitting; regression; general nonlinear estimation; logit/probit; general ANCOVA/MANCOVA; GLM and Generalized LM; partial least squares analysis; variance components; discriminant; log-linear; correspondence; cluster, confirmatory/exploratory factor analysis; multidimensional scaling; classification trees; canonical correlation; item analysis/reliability; survival analysis; time series modeling/forecasting; structural equation modeling; Monte Carlo simulations; and much more ■ On-line comprehensive introductions/overviews, over 3 hours of multimedia step-by-step examples ■ Stats Advisor expert system ■ Workbooks with AutoOpen documents ■ Extensive data management facilities (fast spreadsheet of unlimited capacity with 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 ■ Batch command language, editable macros, "turn-key" automation ■ Open Architecture: custom-designed procedures can be added to toolbars ■ All output displayed in *Scrollsheets*™ (customizable, presentation-quality tables with instant 2D/3D/multiple graphs) or word processor-style (unlimited) editor with text and graphs ■ Extremely large analysis designs (e.g., correlations up to 32,000x32,000) ■ Megafile Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited file size; extended/quadruple precision; unmatched speed ■ Exchanges data/graphs with other applications via DDE, OLE, or extensive file import/export facilities (including ODBC access to virtually all databases and mainframe files) ■ Internet/HTML support ■ Hundreds of types of graphs ■ Facilities to custom-design new graph types and add them to menus or toolbars ■ Advanced drawing tools (e.g., editing of complex objects in 32x zoom mode), compound OLE documents, Multiple-Graph AutoLayout Wizard, page layout control; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of 3D displays ■ Large selection of tools for graphical exploration: animated brushing, fitting/smoothing, spectral planes, projections, layered compressions ■ Price **\$1095**

Quick STATISTICA ■ A subset of *STATISTICA*; a selection of basic statistics and the full graphics capabilities of *STATISTICA* ■ Price **\$495**

STATISTICA Neural Networks (interfaces with but does not require *STATISTICA*) ■ The most comprehensive and user friendly NN application on the market ■ Unique Intelligent Problem Solver (IPS) network wizard ■ Endless array of statistics, charting options, network architectures and training algorithms ■ Price **\$795**

STATISTICA Power Analysis (interfaces with but does not require *STATISTICA*) ■ A comprehensive, extremely precise, and user-friendly research tool for analyzing all aspects of statistical power and sample size calculation ■ Price **\$495**

STATISTICA Industrial/SPC Solutions ■ A comprehensive selection of the most flexible, customizable tools for quality control and improvement applications (ISO 9000), including extensive implementations of: ■ **Quality Control Charts** Price **\$695** ■ **Process Analysis** Price **\$495** ■ **Design of Experiments** Price **\$495**

*These add-on products require *STATISTICA*, *Quick STATISTICA*, or *QC Charts*.

STATISTICA/Macintosh ■ Quick version also available ■ Price **\$695**

STATISTICA Enterprise Versions: SEWSS (SPC) and SENS ■ Data warehouse integration, extensive groupware functionality.

Overseas prices 25% higher. Domestic sh/h \$12; 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 in 1993.

Circle No. 6 on Readers' Service Card



StatSoft

Interactive WEB site:
www.statsoft.com

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

StatSoft GmbH (Hamburg, Germany), ph: +49-40-468866-0, fax: +49-40-468866-77

StatSoft Polska Sp. z o.o. (Krakow, Poland), ph: +48-0601-414151, fax: +48-012-4225100

StatSoft Pacific Pty Ltd. (Melbourne, Australia), ph: +613-9521-4833, fax: +613-9521-4288

StatSoft Brazil Ltda. (Sao Paulo, Brazil), ph: +55-11-441-4870, fax: +55-11-4227-4293

StatSoft Scandinavia AB (Uppsala, Sweden), ph: +46-18-21-00-45, fax: +46-18-21-00-39

StatSoft Benelux (Groningen, Netherlands), ph: +31-50-526-7310, fax: +31-50-527-7665

StatSoft Portugal Lda. (Alges, Portugal), ph: +35-01-411-2580, fax: +35-01-411-2580

StatSoft Southern Africa (Pty) Ltd. (Midrand, S. Africa), ph: +27-11-651-5311, fax: +27-11-651-5296

STATISTICA and StatSoft are trademarks of StatSoft, Inc.

StatSoft France (Paris, France), ph: +33-01-45-185-999, fax: +33-01-45-185-285

StatSoft Italia srl (Padova, Italy), ph: +39-49-893-4654, fax: +39-49-893-2897

StatSoft Taiwan (Taipei, Taiwan), ph: +886-2-2579-8592, fax: +886-2-2579-8075

StatSoft Ltd. (London, UK), ph: +44-1234-341226, fax: +44-1234-341622

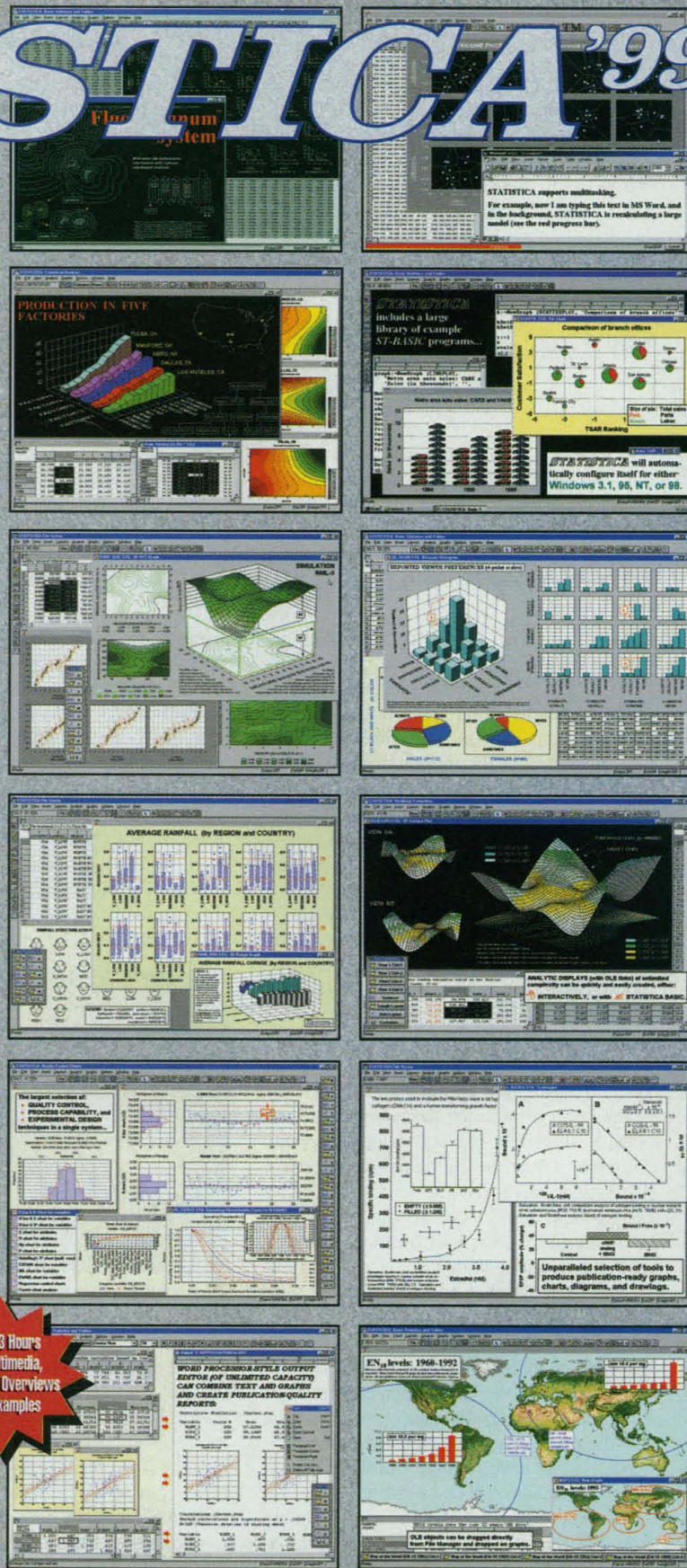
StatSoft Korea (Seoul, Korea), ph: +82-2-783-5875, fax: +82-2-783-5874

StatSoft Japan Inc. (Tokyo, Japan), ph: +81-3-5475-7751, fax: +81-3-5475-7752

StatSoft Russia (Moscow, Russia), ph: +7-95-916-8838, fax: +7-95-916-0393

StatSoft Espana, ph: +35-01-411-3107, fax: +35-01-411-2580

Over 3 Hours
of Multimedia,
Animated Overviews
and Examples





Bison americanus

Going to extremes for RT-PCR results?

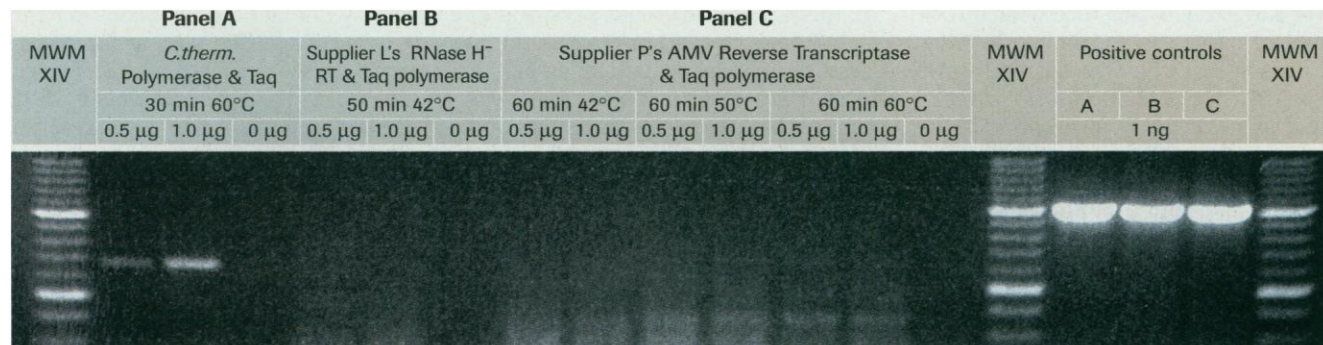
If your RT-PCR results are leaving you cold, warm up to ***C.therm.* Polymerase** from Roche Molecular Biochemicals. Maximize transcription efficiency at 60-70°C, where RNA secondary structure is minimized and *C.therm.*'s activity is optimized:

- Achieve sensitive results—even from GC-rich templates.
- Obtain a specific product from large quantities of non-specific RNA.

Satisfy your burning curiosity

Perform one-step reactions with our convenient ***C.therm.* Polymerase One-Step RT-PCR System** (Cat. Nos. 2 016 338, 2 016 346). Or for two-step

RT-PCR flexibility, combine our ***C.therm.* Polymerase** (2 016 311) with your own DNA polymerase. For more information, contact your local Roche Molecular Biochemicals representative or visit <http://biochem.roche.com>



Comparison of *C.therm.* Polymerase, Supplier L's RNase H⁻ Reverse Transcriptase, and Supplier P's AMV Reverse Transcriptase for RT-PCR. (Template: Total RNA isolated from K562 cell line; Primer: TGFβ; Target: 650 bp product; 1.5 M betaine to dissolve secondary structure; Positive Controls: 1 ng of a 997 bp β-actin fragment from mouse).

Panel A: *C.therm.* Polymerase & Taq polymerase for 30 min at 60°C

Panel B: Supplier L's RNase H⁻ Reverse Transcriptase & Taq polymerase for 50 min at 42°C

Panel C: Supplier P's AMV Reverse Transcriptase & Taq polymerase for 60 min at various temperatures.



Roche Diagnostics GmbH
Roche Molecular Biochemicals
Mannheim, Germany

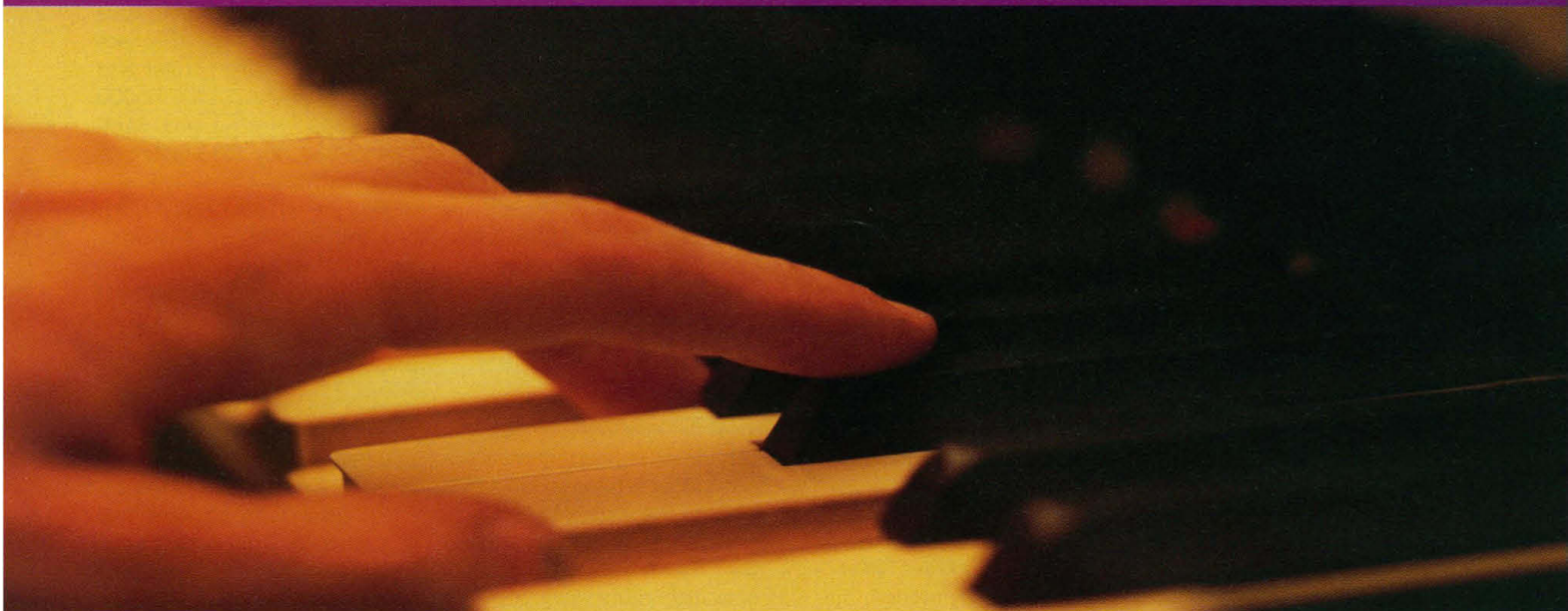
Internet: <http://biochem.roche.com>

These products are accompanied by a limited license to use them in the Polymerase Chain Reaction (PCR) process for life science research in conjunction with a thermal cycler whose use in the automated performance of the PCR process is covered by the up-front license fee, either by payment to Perkin-Elmer or as purchased, i.e., an authorized thermal cycler.

Argentina 54 1 951-0023-6, 54 1 952-6081-3, 54 1 954-5555 (FAX) 54 1 952-7589; Australia (02) 9899 7999; Austria (01) 277 870; Baltic States (FAX) 49 621 759 4068; Belgium (02) 247 4930; Brazil +55 (11) 66 3565; Canada (450) 686 7050; (800) 361 2070; Chile 0 56 (2) 375 2000 (Central); China 86 21 6427 5586; Czech Republic (0324) 45 54, 58 71-2; Denmark 49 13 82 32; Egypt 0020 3619947 (Scientific Office) 0020 2 360 9000 (Distrib. Bagneid); Finland (09) 429 2342; France 04 76 76 30 86; Germany (0621) 759 8568; Greece (01) 67 40 238; Hong Kong (852) 2485 7596; India (22) 4314653; Indonesia 62 (21) 2523820, Ext. 755; Iran 0098 21 208 2266 (Teb Technology) 0098 21 878 5656 (Tuba Nigen); Republic of Ireland (800) 40 90 41; Israel +972 6 6380569 (FAX) 972 6 6389591; Italy 039 247 4109-4181; Japan 03 5443 5284; Kenya 00254 2 744 677; Kuwait 4832600-01, -02, -03; Malaysia 60 (03) 755 5039; Mexico (5) 227 8967, -61; Netherlands (036) 539 4911; New Zealand (09) 276 4157; Nigeria +234 1 521767; Norway 22 07 65 00; Philippines (65) 27 27 500; Poland (22) 374235; Portugal (01) 417 17 17; Russia (49) 621 759 8636; Saudi Arabia 00966 1 4010333; Singapore 65 27 27 500; South Africa (011) 886 2400; South Eastern Europe (FAX) 49 621 759 4068; South Korea (02) 3471-6500; Spain (93) 201 4411; Sweden (08) 404 8800; Switzerland 0 4177 99 6161; Taiwan (02) 736 7125; Thailand 66 (2) 274 0708-13; United Kingdom 0800 100 99 98; USA (800) 428 5433
©1999 Roche Diagnostics GmbH. All rights reserved.

Circle No. 42 on Readers' Service Card

A Winning Performance.



SORVALL®



Save time and space with the Discovery™ M150 personal micro-ultracentrifuge.

Shorter total run times, a space-saving design and an easy to use operator interface: it all adds up to a winning performance from the Discovery™ M150 personal micro-ultracentrifuge.

- Speeds to 150,000 rpm and low rotor k factors mean faster, more efficient separations
- Compact and personal *without* occupying valuable lab bench space
- 13 different rotors, with volumes to 81 ml
- Simple run-parameter entry

Find out more about the Discovery™ M150 and the full range of Discovery™ Series ultracentrifuges by contacting Kendro Laboratory Products today.

Circle No. 64 on Readers' Service Card

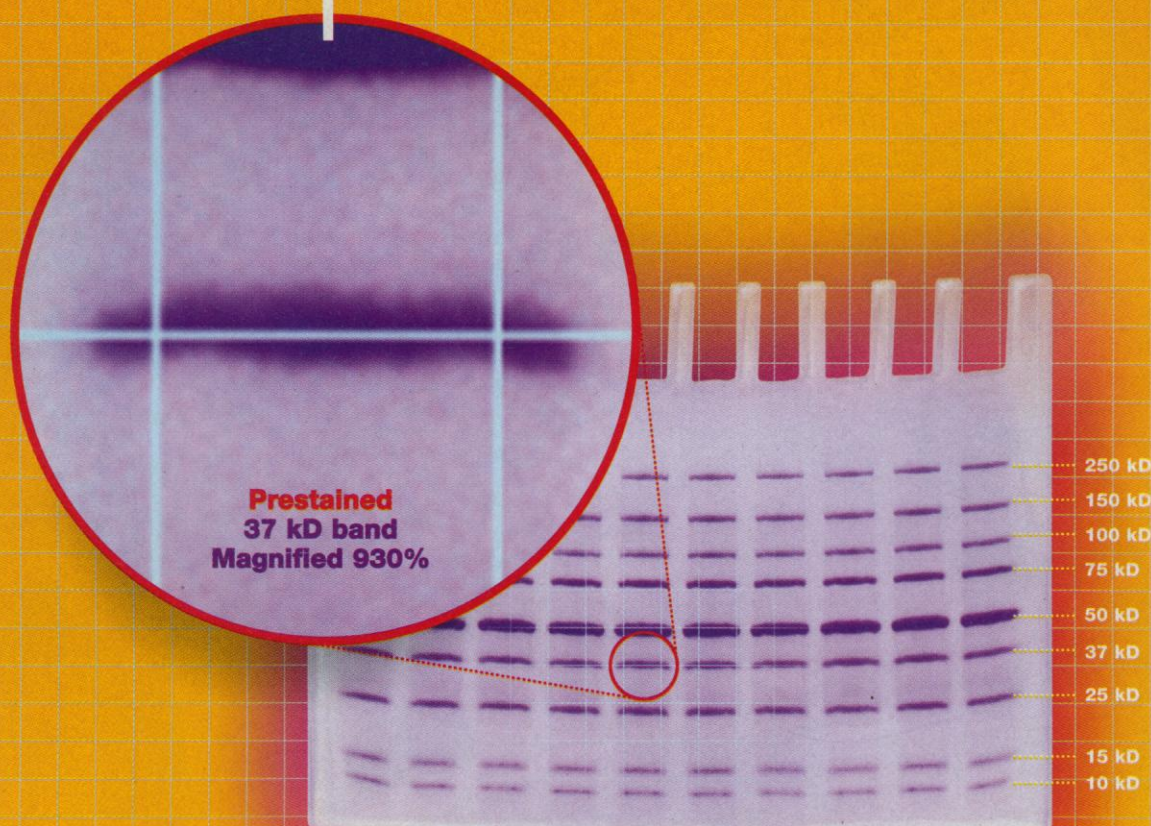
 **Kendro**
Laboratory Products

A worldwide company
formed by the merger of
Heraeus Instruments
and Sorvall.

Offices worldwide: In the US, call 1-800-522-SPIN, Fax 203-270-2210.
In Europe, 49 (6181) 35-300, Fax 49 (6181) 35-59 44.
In Asia Pacific, 203-270-2080, Fax 203-270-2210.
Or contact your local Kendro Laboratory Products Representative.

www.kendro.com

incredibly precise



new Precision Protein Standards™

New Ready-to-Use Prestained and Unstained Standards That Migrate to Their True Molecular Weight.

Engineered from the ground up and highly purified to yield bands of unrivaled clarity and sharpness. Precision Protein Standards migrate to their true molecular weight, so you get reliable molecular weight determinations every time, without lot-to-lot variability, even prestained! See us at precision.bio-rad.com for additional information.

Order Today and Try Them Now!

Catalog #	Description
161-0362	Precision Protein Standards, Unstained, 150 applications (10 µl/application), 1500 µl
161-0372	Precision Protein Standards, Prestained, 50 applications (10 µl/application), 500 µl

What Will You Discover Next?

Circle No. 57 on Readers' Service Card

Visit our Life Science web site at discover.bio-rad.com.

Call toll free at 1-800-4BIORAD (1-800-424-6723); outside the US, call (510) 741-6996.

BIO-RAD

The scientific world is making a dramatic discovery...



Find, compare, purchase, track and manage
your laboratory supplies with one easy solution.

Circle No. 52 on Readers' Service Card



The Internet Source for Scientific Products

www.sciquest.com / 800-233-1121 / email: questions@sciquest.com

©1999 SciQuest.com, Inc. All rights reserved. SciQuest is a registered trademark of SciQuest.com, Inc. Netscape and the Netscape N are registered trademarks of Netscape Communications Corporation in the U.S.A. and other countries. IBM and the e-business logo are registered trademarks of IBM Corporation.

Introducing



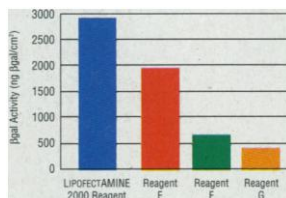
The transfection reagent for the next millennium.

LIPOFECTAMINE™ 2000 Reagent offers the highest transfection efficiencies and expression levels for the widest variety of cell lines.

LIPOFECTAMINE 2000 Reagent provides:

Highest Transfection Efficiencies and Activities

- Excellent for transient and stable transfections in a variety of cell lines
- Works well for both adherent and suspension cell types
- Unsurpassed performance in the presence or absence of serum
- Ideal for cells commonly used for protein expression (293, CHO and COS, shown above left to right)



Comparison of β -Galactosidase activity in CHO-S cells transfected with pCMV-SPORT- β gal DNA, LIPOFECTAMINE 2000 Reagent, and several other commercially available transfection reagents.

Rapid, Easy-to-Use Protocol

- Simplified steps for easy automation
- Ideal for high throughput applications

LIPOFECTAMINE 2000 Reagent is part of our full line of GIBCO BRL® transfection reagents, media, selective antibiotics, cell lines, and DNA purification systems for eukaryotic gene expression.

Contact TECH-LINE,™ TECH-ONLINE,™ or your Life Technologies representative for more information on the *transfection reagents of choice* for the next millennium.

Product	Size	Cat No.
LIPOFECTAMINE 2000 Reagent	11668-019	1.5 ml
	11668-027	0.75 ml

LIFE TECHNOLOGIES™

Essential Technologies for the Science of Life™

Internet Ordering and Information: www.lifetech.com

U.S. Academic Orders/TECH-LINE: (800) 828-6686

U.S. Government Orders/TECH-LINE: (888) 584-8929

U.S. Industrial Orders/TECH-LINE: (800) 874-4226

Latin America Orders/TECH-LINE: (301) 610-8709 Canada Orders: (800) 263-6236

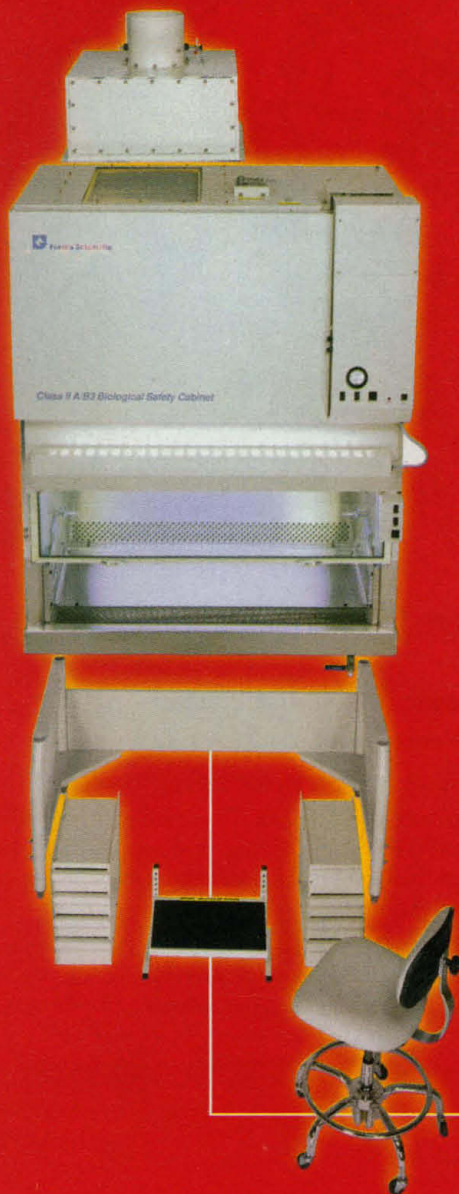
Circle No. 30 on Readers' Service Card

These products are for laboratory research use only and are not intended for human or animal diagnostic, therapeutic, or other clinical uses, unless otherwise stated. Quantities subject to change without notice. ©1999 Life Technologies, Inc. 99-078CRE

FORMA[®] BIOSAFETY CABINETS

MAXIMUM PROTECTION

OPTIONAL ENHANCEMENTS



BENCHTOPS, CONSOLES, AND A FULL ARRAY OF ACCESSORIES

Our Forma Biological Safety Cabinets and accessories were designed for maximum safety, convenience and comfort.



Benchtop and console models shield you, your product, and your environment from invasive pathogens. Exclusive vortex channels (U.S. Patent #5,295,902) on Forma Class II, Type A/B3 Biological Safety Cabinets provide extra protection by creating high velocity air in the cabinet corners.

A full line of accessories, including a crank-up stand, drawers, ADA control panel, exhaust transitions, UV lights, armrests, chairs, footrest, etc. for 4 ft. and 6 ft. cabinets let you tailor your work area for maximum comfort, convenience, and organization.

Contact our Forma Scientific Division for additional information.

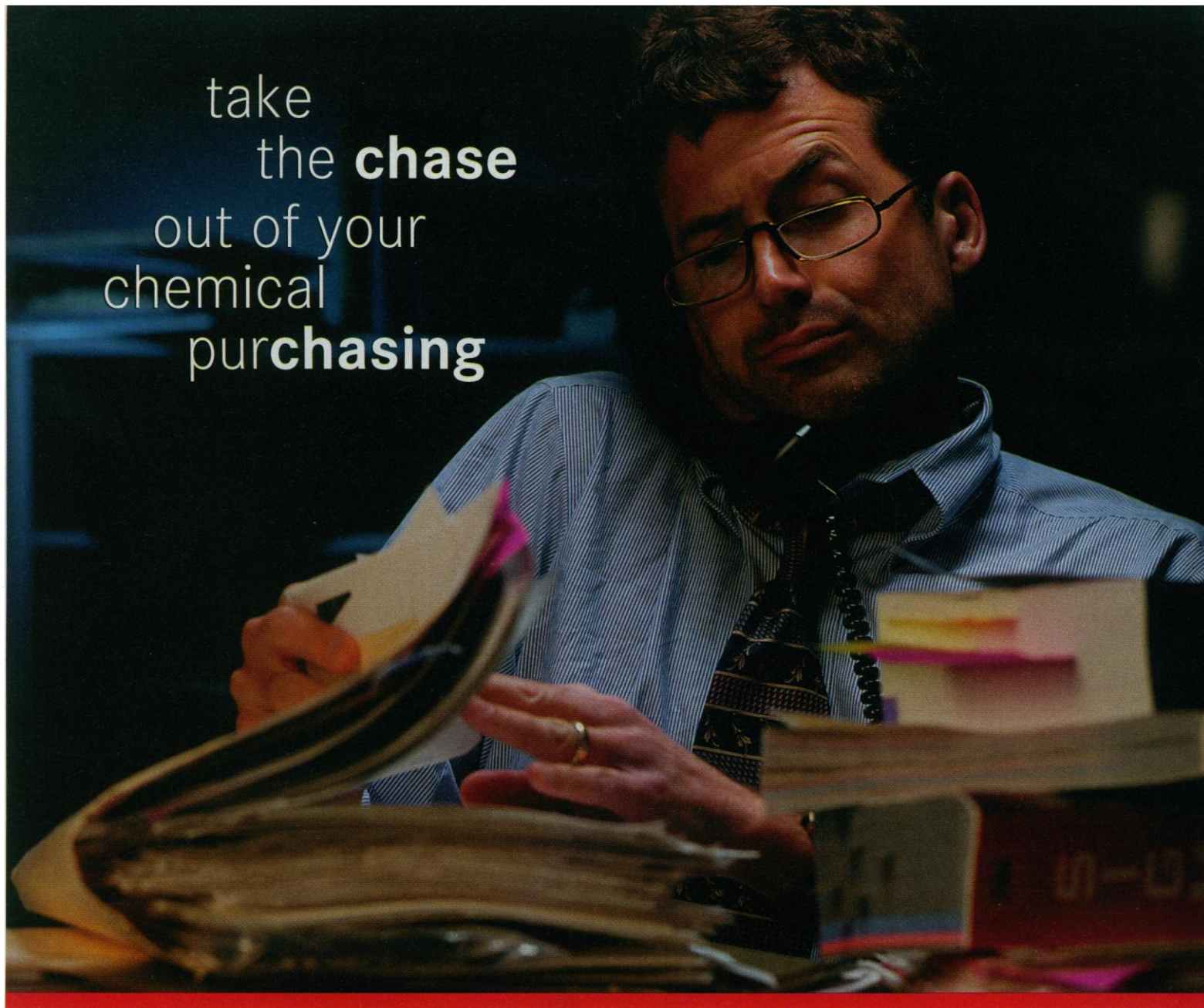


IN THE COMPANY OF SCIENTISTS[™]

Circle No. 43 on Readers' Service Card

Forma Scientific Division • P.O. Box 649 • Marietta, OH 45750 • 1.740.373.4763
USA and Canada 1.800.848.3080 • Fax 1.740.373.6770 • www.forma.com
International Distributors Worldwide • An ISO 9001 Company

take
the **chase**
out of your
chemical
purchasing



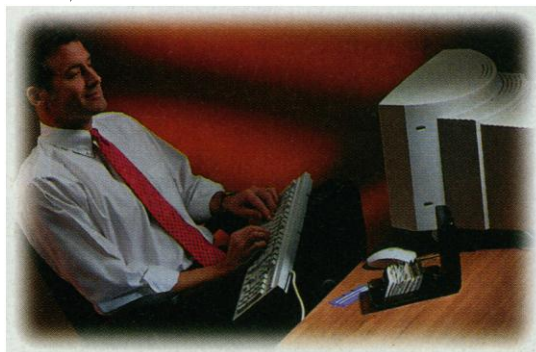
TRY OUR eCOMMERCE SOLUTION @ www.sigma-aldrich.com

EASY ON-LINE ORDERING

The Sigma-Aldrich PipeLine™ eCommerce system offers simple, on-line access to over 200,000 products from the Sigma-Aldrich brands: Sigma, Aldrich, Fluka, Supelco and Riedel-de Haën. Now you can place multi-brand orders for biochemicals, chemicals, equipment and laboratory supplies from all of our brands in a single transaction.

FIND WHAT YOU NEED FAST

With eight different ways to search, including product name, product number, CAS number, molecular formula and structure, pinpointing products is a snap.



*Stop the chase and log on today.
It will make your job easier.
www.sigma-aldrich.com*

A TOTAL INFORMATION RESOURCE

Because we are a manufacturer, we offer not only quality products but the technical knowledge and support to back them up.

- Over 90,000 on-line MSDS's
- Over 2 million on-line Certificates of Analysis
- Thousands of data sheets and technical bulletins



SIGMA-ALDRICH

3050 Spruce Street, St. Louis, MO 63103 • 800-521-8956 or 314-771-5765
Circle No. 50 on Readers' Service Card

DNA QUANTITATION

Specificity by Nature Sensitivity by Promega

Introducing the DNAQuant™ DNA Quantitation System

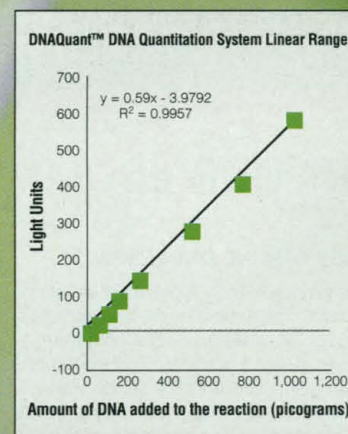
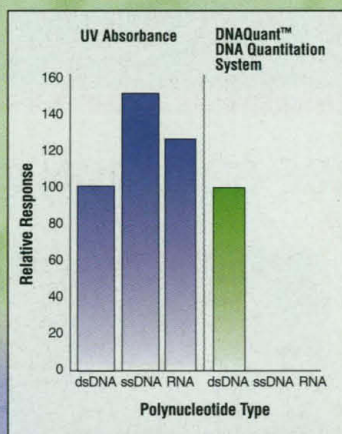
The luciferase-based assay is designed for the sensitive and specific detection of picogram amounts of linear dsDNA and PCR fragments.

Sensitivity: More sensitive than spectrophotometry or gel analysis.

Linearity: Detects DNA in the range of 20-1,000pg.

Specificity: Quantitates linear dsDNA.

Robust: Not affected by many of the common contaminants in DNA preps.



For more information on the DNAQuant™^(a) System, please visit www.promega.com/ena/datasheets/K4000/

DNAQuant™ is a trademark of Promega Corporation.
^(a) Patent Pending.



Promega Corporation • 2800 Woods Hollow Road • Madison, WI 53711-5399 USA • Telephone 608-274-4330 • Fax 608-277-2601
©1999 Promega Corporation. All Rights Reserved.
Prices and specifications subject to change without prior notice.

Printed in USA 09/99.
8105A_AD_EA



Promega

Precision Design... for Life
www.promega.com

Circle No. 33 on Readers' Service Card

Now available
online through
your institution

Ask your
institute to
register at ►

www.current-opinion.com

for **no-obligation**
trial access until
March 1st 2000

REMEMBER – personal
free access closes on
December 31st...

*...unless you subscribe
in print, or your
institute registers!*









**CURRENT
OPINION**
www.current-opinion.com

**CURRENT
OPINION**

online
www.current-opinion.com



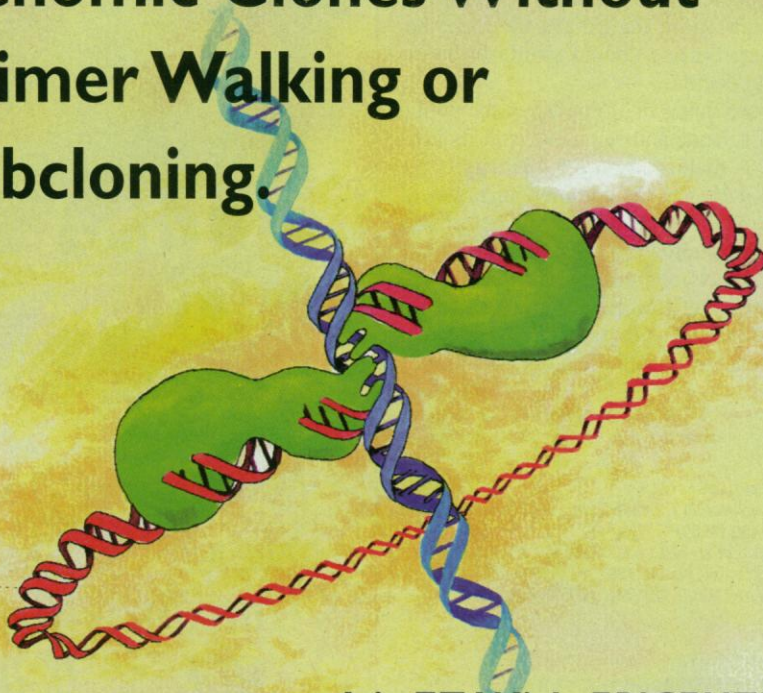
Your science signposted – by Current Opinion Journals in:

- | | | |
|--|---|--|
|  Biotechnology |  Cell Biology |  Chemical Biology |
|  Genetics & Development |  Immunology |  Microbiology |
|  Neurobiology |  Plant Biology |  Structural Biology |

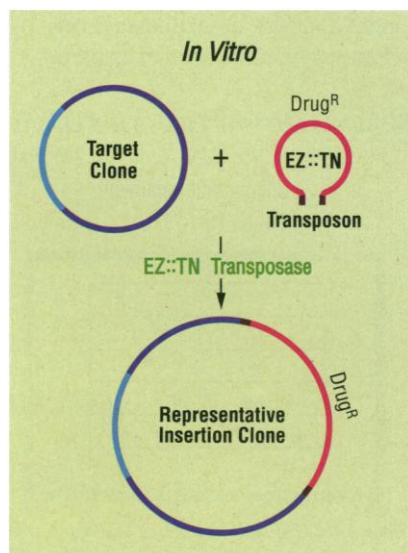


®

Now, Accelerate Complete Sequencing of cDNA and Genomic Clones Without Primer Walking or Subcloning.



... It's EZ With EPICENTRE's
EZ::TN™ Insertion System!



Here's How It Works.

Simply incubate your target DNA in any vector with an EZ::TN Transposon and the EZ::TN Transposase provided in the kit for 1-2 h. Then stop the reaction, transform competent *E. coli* cells with an aliquot of the reaction mixture, and plate on media that select for the vector containing the target DNA and for the antibiotic resistance encoded by the EZ::TN Transposon used. A single reaction will generate a population of up to millions of DNA sequencing template clones, each with a randomly-inserted EZ::TN Transposon. Then, rapidly determine the complete sequence of the target by using the primers in the kit to sequence bidirectionally from the primer-binding sites on the EZ::TN Transposon.

The EZ::TN Insertion System:

– **Yields More Insertions Than Any Other System - About 10^6 Per μg With A 6-Kb Plasmid Target.** A single standard reaction generates more than enough insertion clones for complete sequencing, even with large target sizes or limited quantities of target DNA. No CsCl purification of target DNA is needed.

– **Generates Insertions That Are More Random Than Other Systems.** This permits you to close all sequencing gaps.

– **Uses The Simple Cloned Single-Polypeptide EZ::TN Transposase and Simple EZ::TN Transposons.** The only requirement for EZ::TN Transposon DNA is that it be flanked by specific 19-basepair sequences recognized by the EZ::TN Transposase. Other systems require a complicated transposase enzyme consisting of multiple polypeptides and transposons with larger recognition sequences. A simple system means better results and fewer problems. You can use an EZ::TN Transposon provided in the kit, design a custom transposon, or choose from a growing variety of EZ::TN Transposons with different drug-resistance markers and other features available from Epicentre.

– **Has Many Uses Besides Sequencing.** The unique properties of the EZ::TN Insertion System enable experiments using artificial transposons with different selectable or screenable markers, priming sites, promoter regions, or a variety of structural genes, control elements, or other sequences. You can also use artificial transposons to generate mutations or gene “knockouts”.

To learn more about the **EZ::TN INSERTION SYSTEM**, contact **EPICENTRE** or visit our **WEBSITE** at: www.epicentre.com/transposomics.htm

**CALL ABOUT
A LIMITED-TIME
INTRODUCTORY PRICE!**



EPICENTRE®

...when you need to be sure of the quality

800-284-8474 (USA only)

tel: 608-258-3080

fax: 608-258-3088

www.epicentre.com

techhelp@epicentre.com

Outside of the U.S. contact the distributor in your country, or call 608-258-3080 or fax 608-258-3088. ARGENTINA/URUGUAY: 54-1-822-6164, AUSTRALIA: (02)9540-2055, AUSTRIA: 0222-74040-190, BENELUX: 045-532-7755, BRAZIL: 021-592-6642, CANADA: 800-661-6431, FINLAND: 3-6822-758, FRANCE: 1-30-46-39-00, GERMANY: 5152-9020, HONG KONG/CHINA: 852-2-896-6283, INDIA: 0091-11-463-6224 or 91-11-686-8795, ISRAEL: 02-5335599, ITALY: 02-891391, JAPAN: 03-3545-5720 or 06-441-5103, KOREA: 82-2-924-8697, MEXICO: 8-371-60-50, NEW ZEALAND: 9-443-1284, POLAND: 48-58-3457646, SINGAPORE: 779-3388, SOUTH AFRICA: 011-792-3428, SPAIN: 34-3-4502601, SWEDEN: 46-8-625-18-50, SWITZERLAND: 056-624-0100, TAIWAN: 886-2-932-1528, TURKEY: 312-435-0775, UNITED KINGDOM: 1223-366500

EZ::TN Insertion Kits and related products are covered by patents issued and pending in the USA and other countries. Purchase of these products is accompanied by a limited non-exclusive license for the purchaser to use the purchased product(s) solely for life science research. No license for any other field of use or immunity under any patent covering any other use is either granted or implied by the sale of the product. Information on licenses to use a product for uses other than life science research may be obtained by contacting the Intellectual Property Manager at Epicentre Technologies. EZ::TN, TN-MAX, Transposome and Transposomics are trademarks of Epicentre Technologies. Copyright Epicentre Technologies, 1999.

Circle No. 60 on Readers' Service Card

Introducing the New Rat Pak.

Now There Are Even More Reasons to Choose Endogen for Rat Cytokine ELISAs

The newest full line of rat cytokine ELISA kits delivers more performance, reliability, and flexibility.

Top Performance

Report Accurate Data

Validated for specific measurement of rat cytokines

Measure Hard-to-Find Cytokines

Achievable low-end detection

Detect Low and Elevated Levels

Accuracy across the assay range

Reliability

Consistency Time After Time

Optimal results throughout shelf life

Confidence in Results

Published expected values; full performance testing

Endogen's Rat Cytokine ELISAs

IL-1 α

IL-1 β

COMING SOON!

IL-2

NEW

IL-4

NEW

IL-6

NEW

IL-10

NEW

IFN γ

NEW

MCP-1

TNF α

Also available in convenient 5-Pak™ and 10-Pak™ bulk kits

Flexibility

More Sample Choices

Validation includes Serum, CCM, Plasma, and Homogenates

More Results per Sample

Small sample size

Save Time and Money

Relevant assay ranges – less dilutions and retests

Select the Plates Needed

Single and bulk kits available

Call us at 800.487.4885 or contact your local Endogen distributor.

Mention this ad when placing your order and receive a new Endogen Rat Pad!*



ENDOGEN

30 Commerce Way, Woburn, MA 01801-1059 USA Tel: 781.937.0890 Fax: 781.937.0891

www.endogen.com

Circle No. 69 on Readers' Service Card

*One per customer. While supplies last.
©1999 Endogen, Inc. 5-Pak and 10-Pak are trademarks of Endogen Inc.
For research use only. Not for use in diagnostic procedures.

Now available:
Enough titles to trigger some effector functions.

ISBN: 0122270754



List price \$250.00/ Our price \$175.00
You save \$75.00

List price \$95.00 / Our price \$66.50
You save \$28.50



ISBN: 0124005608

ISBN: 0122886607



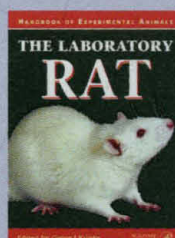
List price \$69.95 / Our price \$48.96
You save \$20.99

ISBN: 012643140X



List price \$99.95 / Our price \$69.97
You save \$29.98

ISBN: 012426400X



List price \$189.95 / Our price \$132.96
You save \$56.99

ISBN: 0126392900



List price \$49.95 / Our price \$34.96
You save \$14.99

ANNOUNCING THE NEW PROFESSIONAL & TECHNICAL STORE AT AMAZON.COM

What does Amazon.com know about science? Enough to know that you need the latest science books, and you need them fast. And at our new Professional & Technical store, that's exactly what you'll get. Thousands of scientific titles, plus expert and peer book reviews. Not to mention everyday savings of up to 30%. It's something we call synthesis. And it's something you'll find at www.amazon.com/professional.

EARTH'S BIGGEST SELECTION JUST GOT BIGGER.
books video dvd music auctions e-cards toys electronics



B a s i c
e n z y m e s
f r o m t h e
c o m p a n y
t h a t

n e v e r f o r g o t
t h e b a s i c s .

The basic elements of your research – modifying enzymes, ultrapure biochemicals and reagents – have always been the basics of our business. So while many companies are pursuing multiple technologies, we are continuing to concentrate on one goal – to supply you with consistently pure, superior quality enzymes, biochemicals and convenience reagents. USB also gives you a level of service that is becoming rare in this business. Our customer service and technical support representatives know our products and your needs. Superior products. Superb service. Just two of the reasons why more researchers and large-scale manufacturers are turning to USB. To learn more, visit us at www.usbweb.com. Or call 1.800.321.9322. USB. When you start with better raw materials, you finish with better results.

For your authorized USB distributor outside the United States, contact your local Amersham Pharmacia Biotech office.

Circle No. 44 on Readers' Service Card

©1999 USB Corporation

USB Corporation
26111 Miles Road
Cleveland, OH 44128
1.800.321.9322
www.usbweb.com



Rediscover the chemistry™

PNAS Evo-Devo Special Feature

Call for papers in evolution and developmental biology

Submit your original research paper in any area of evo-devo for publication in the first PNAS special feature on developmental biology, which is scheduled to appear in the spring of 2000. We guarantee:

- Fast, rigorous peer review
- Page and color charges are waived

Submission deadline: January 8, 2000

If your paper is selected for publication, you'll join this distinguished panel contributing Perspective articles for the special feature:

Simon Conway Morris—*Cambrian explosion*

Billie Swalla—*Chordate origins*

Peter Holland—*Vertebrate innovations*

John Gerhart—*Abrupt changes in body plan (axis inversion)*

André Adoutte—*Animal systematics*

Nipam Patel—*Evolution and development in insects*

Marty Shankland—*Annelids*

Michael Akam—*Crustaceans*

Eric Davidson—*Regulatory evolution of animal body plans*

Contact

Submission of papers for the evolution and developmental biology special feature or inquiries about submission should be sent, as soon as possible, to Guy Riddihough:

Email: griddiho@nas.edu; Web: www.pnas.org; Phone: 1-202-334-1370; Fax: 1-202-334-2738

PNAS, 2101 Constitution Av NW, Washington DC 20418, USA

PNAS

Proceedings of the National Academy of Sciences
of the United States of America

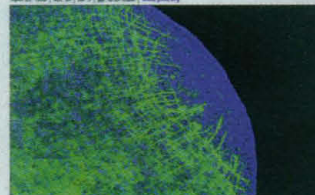
August 3, 1999 | vol. 96 | no. 16 | pp. 8880-9048 | www.pnas.org



PNAS

Proceedings of the National Academy of Sciences
of the United States of America

April 25, 1999 | vol. 96 | no. 16 | pp. 8752-9026 | www.pnas.org



Overlapping gene expression in the placenta
Phenotypic plasticity in cell division
Color vision, olfactory and cognitive
Cytoskeletal dynamics in cell migration
Mapping the human genome to the brain
Special advertising features

PNAS

Circle No. 46 on Readers' Service Card

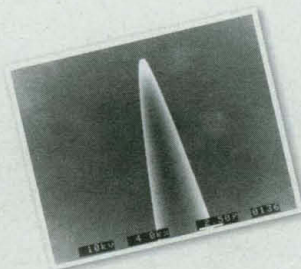
The Tool for Exploring the Microworld



The P-2000

Micropipette Puller rapidly and consistently produces micropipettes for cell physiology, nanoelectrospray, scanning microscopy and other innovative technologies. Pre-programmed to make quartz probes with tip diameters from nanometers to micrometers.

Call or write us today for more information.



Actual 1 um quartz capillary tip fabricated with the P-2000.

From the world leader in micropipette technology.



SUTTER INSTRUMENT COMPANY
51 DIGITAL DRIVE • NOVATO CALIFORNIA • 94949 • PHONE: (415) 883-0128
FAX: (415) 883-0572 • EMAIL: INFO@SUTTER.COM • WEB: WWW.SUTTER.COM

Circle No. 28 on Readers' Service Card

Chart the right course for your career.



Steer to these coordinates...
www.scienceonline.org

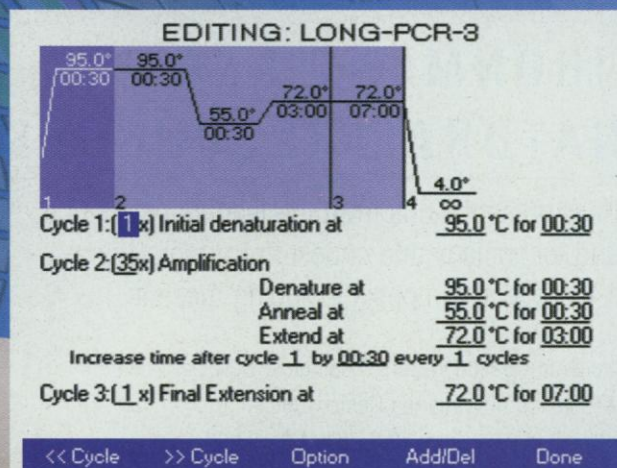
Science Professional Network can help you navigate through the myriad career options with its fast, **searchable jobs database** and other useful career information.

Science
Professional Network
www.scienceonline.org
Click on *Science Careers*

amplify your PCR^{*} expectations

The iCycler[™] Thermal Cycler
Excels at Performance,
Reliability and Ease-of-Use.

The iCycler features the most intuitive interface, including comprehensive informational screens, validation reports and a graphical textual display of a protocol on one screen.



- Effortless interface
- Directly upgradeable for Real Time PCR
- Rapid and reliable cycling
- Interchangeable sample blocks
- Out of the box and running in just minutes

Practice of the patented polymerase chain reaction (PCR) process requires a license. The iCycler includes a licensed thermal cycler and may be used with PCR licenses available from the Perkin-Elmer Corp. Its use with authorized reagents also provides a limited PCR license in accordance with the label rights accompanying such reagents. Some applications may require licenses from other parties.

What Will You Discover Next?

Visit our Life Science web site at discover.bio-rad.com.
Call toll free at 1-800-4BIORAD (1-800-424-6723); outside the U.S., call (510) 741-6996.
Circle No. 58 on Readers' Service Card

BIO-RAD

2000 AAAS ANNUAL MEETING AND SCIENCE INNOVATION EXPOSITION

FEBRUARY 17-22, 2000 WASHINGTON, DC

"The nation's premier scientific gathering" (C&E News, 1999)

ENVIRONMENT AND NATURAL RESOURCES

Hear presentations from the leaders of science
and technology and choose from more than
140 special symposia including these in...

- Alien Species in Coastal Waters: Ecological & Social Costs?
- The Art & Science of Wetlands Restoration
- Food or Stressed Environments in the Asia-Pacific
- Climate Change and Human Health
- Population Growth & Environmental Sustainability
- World Food Security: Challenges to Science & Society
- Frontiers in Hurricane Climate Research
- Studying the Effects of Urban Sprawl from Space
- Consequences of Climate Variability & Change for the U.S.
- Understanding the Human Dimensions of Global Change
- Restoring Ecosystems Impacted by Fisheries
- Climate Variability on the Millennial Timescale

Among those invited to speak are:

- | | |
|---|---|
| - Judith Weis, Rutgers Univ | - Theodore Hullar, Cornell Univ |
| - Mary Barber, ESA | - M.S. Swaminathan, M.S.
Swaminathan Res Fdn |
| - Daniel Simberloff, Univ of TN | - William Clark, Harvard Univ |
| - David Pimentel, Cornell Univ | - Kai Lee, Williams Coll |
| - Per Pinstrup-Andersen, IFPRI | - Joel Cohen, Rockefeller Univ |
| - Rattan Lal, OH State | - Gus Speth, Yale Univ |
| - Susan McCouch, Cornell Univ | - Jerry Melilo, MBL |
| - Lester Brown, World Watch Inst | - Stephen Schneider,
Stanford Univ |
| - Bruce Alberts, NAS | - William Nordhaus, Yale Univ |
| - Donald Duwick,
Pioneer-Hybrid Intl | - Francesca Grifo,
Amer Mus Nat Hist |
| - Rita Colwell, NSF | - And hundreds more! |
| - Richard Sawyer, NC State | |

Science
in an
**UNCERTAIN
MILLENNIUM**

Register now on the web at special advanced rates!

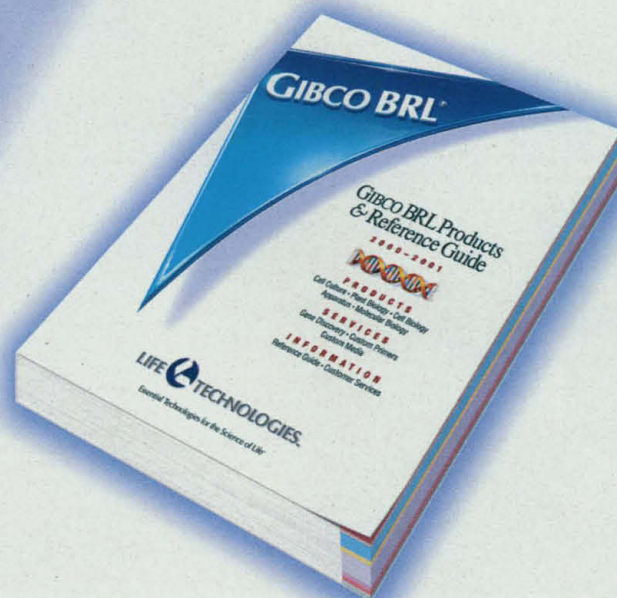
202-326-6450 | confinfo@aaas.org | www.aaas.org/meetings

The AAAS Meeting – Take another look!

Circle No. 45 on Readers' Service Card

© American Association for the Advancement of Science

GIBCO BRL®



We've Got Just What You're Looking For

New 2000-2001 Catalogue

Our comprehensive GIBCO BRL® Products & Reference Guide is *the* resource on Life Technologies' products and services. We have the technologies essential for your work.

Request your free copy of the Catalogue on the web at www.lifetech.com/cat2000 or call today.

Internet Ordering: www.lifetech.com

U.S. Academic Orders/TECH-LINESM: (800) 828-6686

U.S. Government Orders/TECH-LINE: (888) 584-8929

U.S. Industrial Orders/TECH-LINE: (800) 874-4226

U.S. Academic Fax Orders: (800) 331-2286

U.S. Government Fax Orders: (888) 584-8930

U.S. Industrial Fax Orders: (800) 352-1468

Latin America Orders: To Order/TECH-LINE: (301) 840-4027 • Fax: (301) 258-8238

Canada Orders: To Order: (800) 263-6236 • TECH-LINE: (800) 757-8257 • Fax: (800) 387-1007

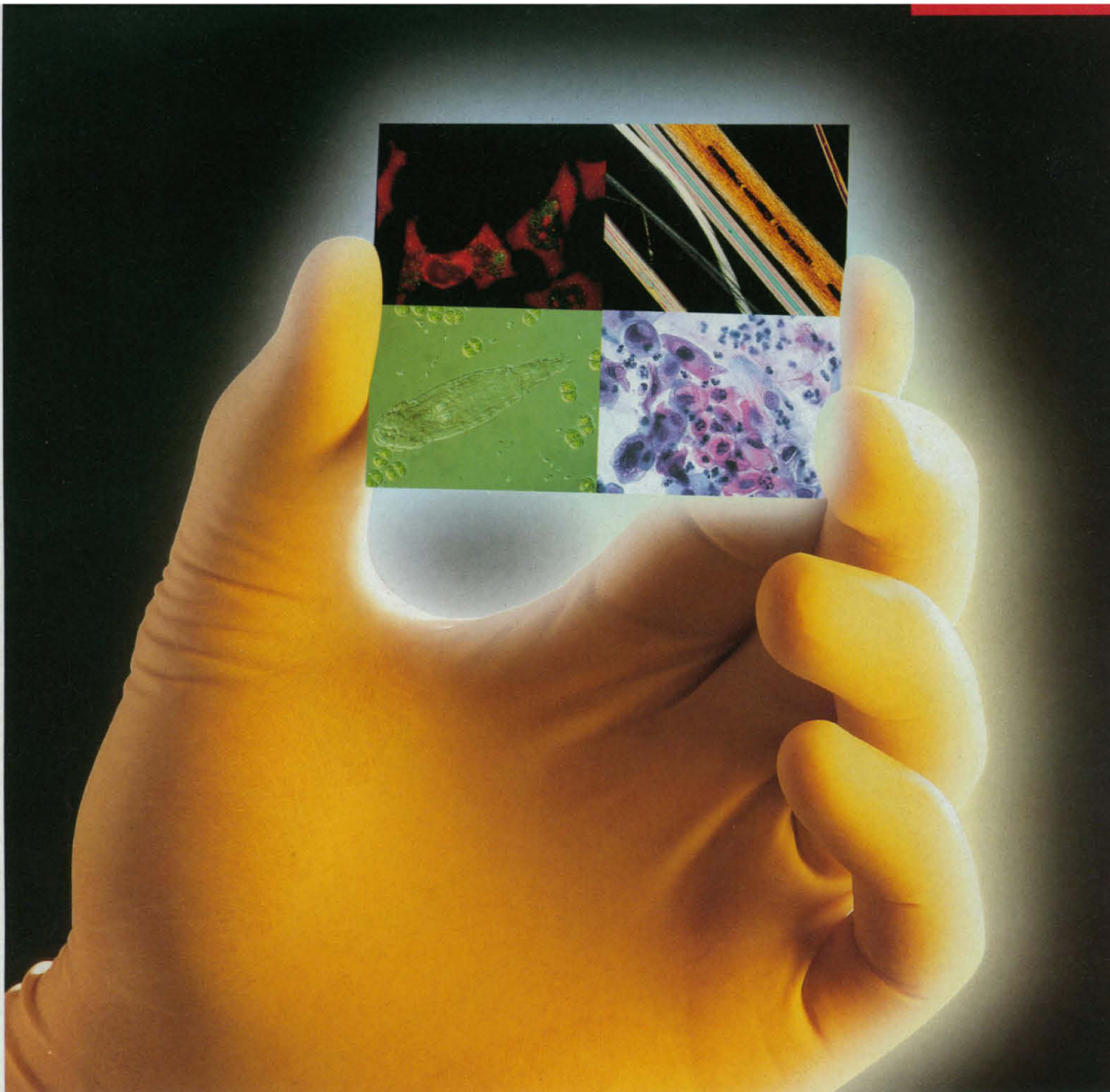
LIFE TECHNOLOGIES®

Essential Technologies for the Science of Life™

These products are for laboratory research use only and are not intended for human or animal diagnostic, therapeutic, or other clinical uses, unless otherwise stated. All referenced trademarks are the property of their respective owners.

©1999 Life Technologies, Inc. 99-151

Circle No. 65 on Readers' Service Card



Leica.

An Eye for Discovery

Image 4.98 Life Science e.

The demand for innovative system solutions in life sciences is growing all the time. Leica can provide you with just the solution you need. So why not benefit from the experience of an international technology group? Sales organizations in over 20 countries guarantee optimum support and service. Leica offers a wide range of products for life science applications to suit all requirements from routine to research.

Leica Microsystems Holdings GmbH
Ernst-Leitz-Straße
D-35530 Wetzlar (Germany)

Phone +49 (0) 64 41 29 - 0
Fax +49 (0) 64 41 22 - 25 99
www.leica.com

Circle No. 21 on Readers' Service Card

Leica