3 December 1999

Science

Vol. 286 No. 5446
Pages 1805–2032 $8

Frontiers in Cell Biology

Quality Control

American Association for the Advancement of Science

The *Real* Story on
High-Fidelity DNA Polymerase

Nothing beats *PfuTurbo*® DNA polymerase†*

- Highest fidelity
- Lowest error rate
- Longer targets
- Greater yields

In side-by-side comparisons with competitor's DNA polymerase using manufacturer's recommended conditions, *PfuTurbo*® DNA polymerase consistently excels in yield, length and fidelity. The special formulation of cloned *Pfu* and a unique PCR-enhancing factor found in *PfuTurbo* DNA polymerase makes it the ideal choice for the most important research today— yours.

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

PfuTurbo® DNA Polymerase
Superior Performance with the Highest Fidelity

Circle No. 84 on Readers' Service Card

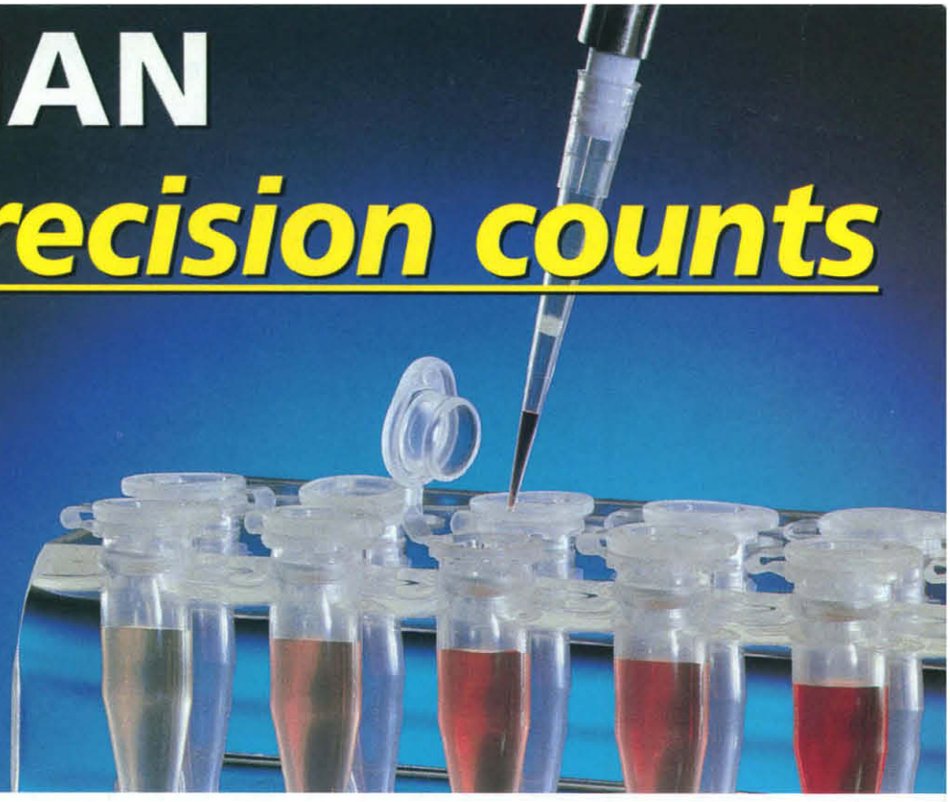
See for yourself—
www.stratagene.com/vol12_4/index.htm

***PfuTurbo*® DNA Polymerase: 100 U CATALOG # 600250**
500 U CATALOG # 600252
1000 U CATALOG # 600254

STRATAGENE®

† Purchase of these products is accompanied by a limited license to use them in the Polymerase Chain Reaction ("PCR") process for 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). These products are sold under licensing arrangements with F. Hoffmann-La Roche Ltd., Roche Molecular Systems, Inc., and The Perkin-Elmer Corporation.
* U.S. Patent No. 5,545,552 and 5,866,395 and 5,948,663 and patents pending

PIPETMAN
when *precision counts*

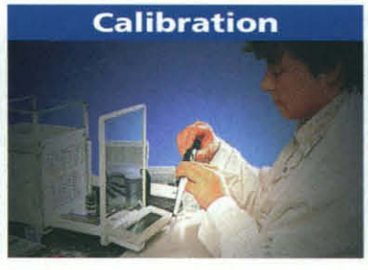


PIPETMAN® air-displacement pipettes...
the world standard for accuracy and precision

What makes the Gilson Pipetman so accurate and precise?
Robust design, quality production and... careful inspection. No batch processing at Gilson. Pipettes are individually calibrated and supplied with a performance check report. So you can be sure results conform to specifications.

Why does Pipetman last so long?
A smooth piston surface prevents leaks and costly repair. And a perfect piston requires no contaminating grease, no fastidious cleaning, no regreasing.

PIPETMAN. *Eight digitally adjustable models from 0.1 µl to 10 ml. Also available in fixed and multi-channel models.*



Pipetting systems at the service of science

GILSON®
SOLUTIONS AT WORK FOR YOU

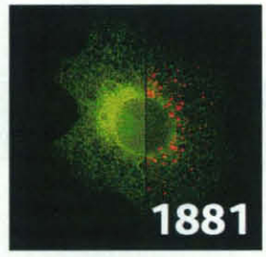
Circle No. 34 on Readers' Service Card

B.P. 45, 95400 Villiers-le-Bel, France, Tel: 33+ (0)1-34-29-50-00, Fax: 33+ (0)1-34-29-50-80, www.gilson.com

VOLUME 286 3 DECEMBER 1999 NUMBER 5446

Science

www.sciencemag.org



COVER The yellow area (left) shows a red-stained misfolded protein colocalizing with a green-stained molecular chaperone in the endoplasmic reticulum (ER) (image width, ~12 μm). After a shift from 39.5° to 32°C, the protein folds properly, passes quality control, leaves the ER, and enters vesiculotubular clusters (red spots on the right) en route to the cell surface. This special issue looks at quality control mechanisms in the cell, beginning on p. 1881. [Image: Anna Mezzacasa and Ari Helenius]

1836
The bottom line

NEWS

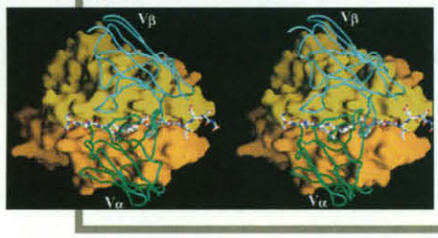
NEWS OF THE WEEK

NEWS FOCUS

RESEARCH

RESEARCH ARTICLES

REPORTS



1913
A T cell receptor–class II complex

FRONTIERS IN CELL BIOLOGY: QUALITY CONTROL

REVIEWS

DEPARTMENTS

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. 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

LETTERS

ESSAY

BOOKS *ET AL.*

PERSPECTIVES

VISIONS OF THE FUTURE: ESSAY COMPETITION

1872
A day in the life

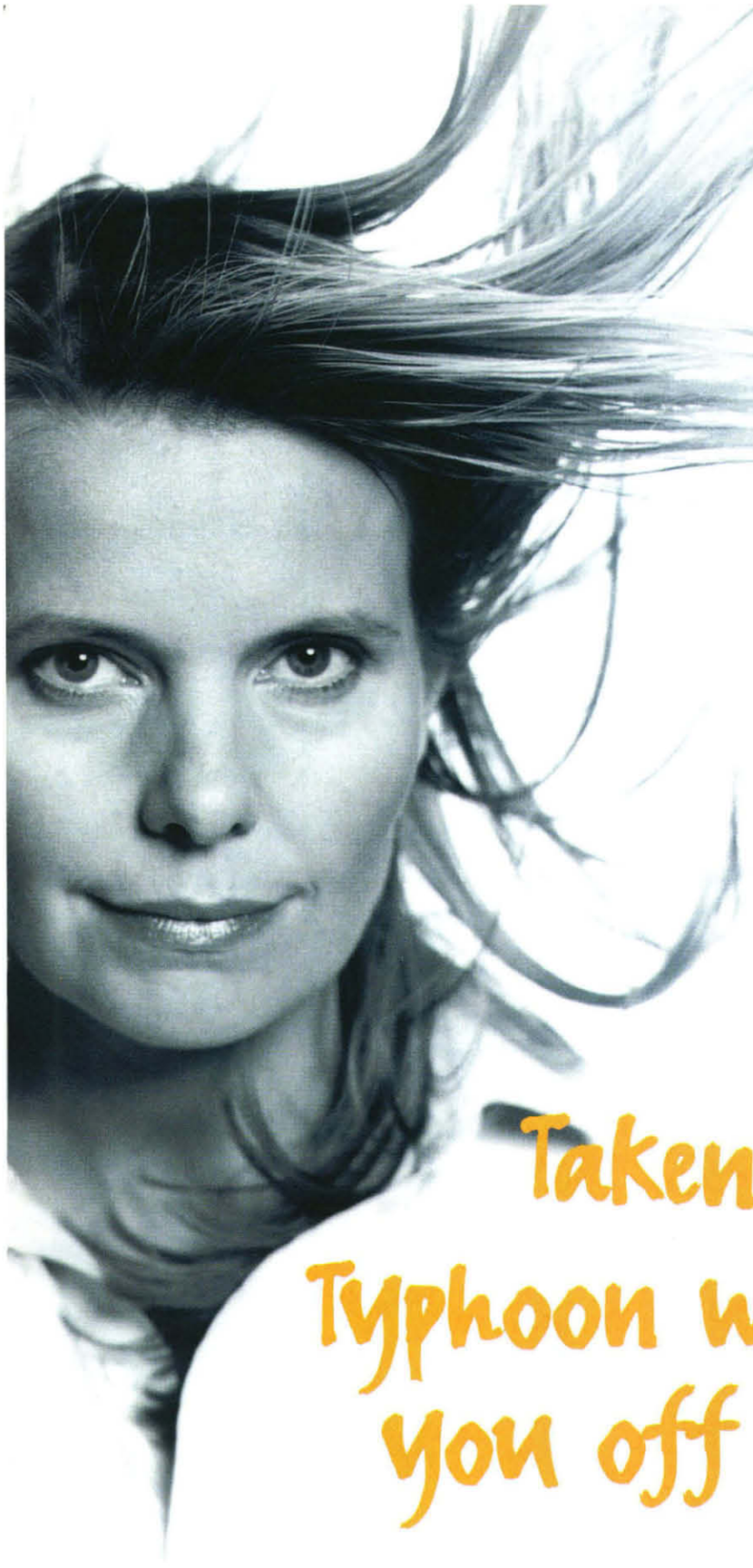
1861
The realms of reason

TECHNICAL COMMENTS

www.sciencemag.org/cgi/content/full/286/5446/1815a

1931
How quantum dots get into shape

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.



Typhoon™ offers unmatched flexibility in scanning various types of samples. Whether your needs are storage phosphor imaging, multi-colour fluorescence, chemiluminescence, or chemifluorescence, the new Typhoon scanner will cover them.

Typhoon

If you loved the versatility of Storm™, prepare to be blown away by Typhoon. With at least 20 times greater sensitivity in multiple colour fluorescence gel applications, the new Typhoon 8600 is a single, variable mode imager that offers a complete bridge between storage phosphor and fluorescence. You choose the method. But you don't have to change the protocol. For unparalleled performance and flexibility, Typhoon gives you a simpler, more effective and time-saving way of working.

Find out more at **www.apbiotech.com/Typhoon**
And prepare to be swept off your feet.

Taken by storm? Typhoon will sweep you off your feet.

molecular dynamics
part of Amersham Pharmacia Biotech

Amersham Pharmacia Biotech UK Limited,
Amersham Place, Little Chalfont,
Buckinghamshire, England HP7 9NA.

Circle No. 68 on Readers' Service Card

MultiShot™ Chemically Competent *E. coli*— For Faster High-Throughput Transformations

It's a fast-paced world. To keep up you need high-performance tools for fast results. That's the idea behind high-throughput cloning. It's also the reason we make MultiShot™ Chemically Competent *E. coli*. MultiShot™ *E. coli* are ready to use for a quick start in all of your high-throughput cloning applications.

Time-Saving Format. Each MultiShot™ *E. coli* Kit includes five 96-well plates. Each well contains 15 µl of high-efficiency, chemically competent TOP10 *E. coli*. There's no need to prepare, test, or aliquot your own competent cells. You'll be up to speed in no time.

Guaranteed Results. The high transformation efficiency of MultiShot™ *E. coli* ensures that you'll have plenty of colonies for downstream analysis. In addition, the TOP10 *E. coli* genotype is optimized for efficient cloning without restriction activity. It's the strain to use for the best results in most cloning applications.

Pick Up the Pace. Fast times call for fast methods. Accelerate your high-throughput transformations with MultiShot™ Chemically Competent *E. coli*. Don't get caught below 96. Call Invitrogen today.

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 058 344 19 80
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:
Invitrogen
1600 Faraday Avenue
Carlsbad, California 92008
Tel: 1-800-955-6288
Fax: 760-603-7201
Email: tech_service@invitrogen.com
http://www.invitrogen.com

Circle No. 77 on Readers' Service Card

DISCONTINUOUS PLUMES

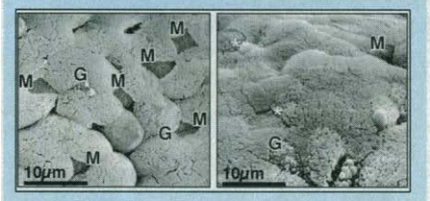
Several volcanic regions, such as Hawaii and Iceland, are associated with hot spot plumes, but their depth of origin and thus the heat sources that lead to the formation of these plumes have been debated. Two reports show how seismic tomography, which generates an image of the variations in velocity in the mantle, can be used to try to resolve plume structures. Goes *et al.* (p. 1928) have resolved a lower mantle upwelling of hot material beneath central Europe that may be broken up into smaller upper mantle plumes. Ritsema *et al.* (p. 1925) have resolved an upper mantle upwelling beneath Iceland that does not extend into the lower mantle. They have also found evidence for a tilted upwelling in the lower mantle beneath East Africa that does not connect with the upper mantle plume-like structures that have been related to the East African Rift. In a Perspective, Ritter discusses how these discontinuous plumes may be related to upper mantle structure and crustal volcanism and rifting.

SKATING ON THINNING ICE

Sea ice is a sensitive indicator of climate change—if global climate were warming, then the amount of permanent sea ice in the Arctic should decrease. Satellite measurements and surface observations have shown that at least the areal extent of Northern Hemisphere sea ice has been decreasing for almost 50 years. Two reports present new measurements and analysis of changes in Arctic sea ice (see the news story by Kerr). Johannessen *et al.* (p. 1937) measured the areal extent of the perennial Arctic sea ice pack and found that the area of multiyear ice has decreased by more than twice as much as that of total sea ice. This change in ice cover has been accompanied by a roughly coincident decrease in ice thickness, which suggests that the heat and fresh water balances of the Arctic may be changing in significant ways. Vinnikov *et al.* (p. 1934) have examined the decrease in areal extent of sea ice. They combined five separate data sets and two independent climate models to test whether these sea ice reductions can be attributed to natural climate variations. Their model results suggest that the probability of this change being caused by natural variability is less than 2% for the last 20 years and that the decreases seen should continue during the next century. They conclude that the observed decrease in Northern Hemisphere sea ice is probably a result of anthropogenically driven global warming.

B CELLS AND MUCOSAL IMMUNITY

The immune system that develops along the length of the small intestine consists of organized lymphoid tissue called Peyer's patches. Within these patches are M cells, which allow microbes to pass into the lymphoid tissue where they initiate an immune



response or gain a foothold for infection. Golovkina *et al.* (p. 1965) report that mice lacking B lymphocytes were deficient in M cells, and that M cells were restored by exposure to B cells. The resistance of mice with no B cells to infection by murine mammary tumor virus was found to be due to the deficiency of M cells rather than the direct lack of B cells. Thus, B cells not only participate in immune responses but are involved in the generation of the organs for mucosal immunity.

QUANTUM DOTS GROW UP

One way to self-assemble quantum dots or nanocrystals on a surface is through strain. When there is sufficient crystallographic mismatch between a thin film several monolayers thick and its underlying substrate, the resulting strain can be relieved by rearrangements that create quantum dots. For germanium-silicon dots, low-volume pyramids and high-volume domes form, but the origin of these two size distributions has been unclear. Ross *et al.* (p. 1931) used a low-energy electron microscopic technique to look at the evolution of the dots in real time. The dots begin as square-based pyramids, and proceed through a series of metastable transition states before maturing into multifaceted dome-shaped dots.

DID YOU GET THAT FLU SHOT?

The value of the annual flu vaccine is directly related to how well it can be determined which flu strain will actually predominate in the seasonal onslaught. Bush *et al.* (p. 1921; see the Perspective by Hillis) have analyzed the molecular evolution of flu strains through recent years and arrived at a means to predict more accurately which strain will emerge in the next flu season. Their process, which involves identification of codons under positive selection to change, successfully predicted in retrospective tests the flu strains for the last 8 years.

A CLASS DIFFERENCE IN WHERE YOU DOCK

The adaptive immune response is stimulated when peptides bound to major histocompatibility complex (MHC) molecules bind to T cells. Structures of T cell receptors (TCRs) in complex with peptide–MHC class I ligands have been determined. Now Reinherz *et al.* (p. 1913) present the structure of a TCR binding to a complex of a 16-residue peptide antigen and a murine MHC class II molecule (pMHCII). The authors propose that the angle of TCR-pMHCII docking will be restricted to a more "orthogonal" interaction than that seen in the class I "diagonal" mode, and that this difference in docking specifies the preferential binding of pMHCI and pMHCII to CD8 or CD4 coreceptors, respectively. In a Perspective, Wilson analyzes the similarities and differences between the pMHCII and pMHCI structures, and cautions that while this work is a valuable contribution, more TCR-pMHC structures are needed to understand fully the structural basis of TCR-MHC recognition.

GOING WITH THE GROUP

Spontaneous activity is seen during recording from a single neuron in the brain. Is this seemingly random firing simply "noise" that lacks any informational content or could it also represent some kind of meaningful signal? Tsodyks *et al.* (p. 1943) combined single-neuron recording with real-time optical imaging of a large surrounding cortical region and found that the firing of a cell depends on the overall activity pattern in the surrounding area. It appears that nerve cells are not really firing at random, but rather that they are participat-

CONTINUED ON PAGE 1815

ing in larger cortical activity states that seem to correspond to the functional architecture maps.

BONING UP ON STATINS

Nearly 100 million people worldwide are at risk for osteoporosis, a debilitating disease of bone loss, and this number is expected to rise as the population ages. Mundy *et al.* (p. 1946; see the news story by Vogel) show that the statins, a group of drugs commonly prescribed to lower serum cholesterol levels, also stimulate bone formation in vitro and in rodent models. This effect was associated with increased expression of bone morphogenetic protein–2, a growth factor produced by bone cells. These results raise the possibility that with optimization of dose and tissue distribution properties, the statins may have beneficial effects in the prevention and treatment of osteoporosis.

TOO MANY DOING TOO LITTLE

Familial hemophagocytic lymphohistiocytosis (FHL) is a genetic disorder that dysregulates the immune system and leads to excesses of lymphocytes, macrophages, and inflammatory cytokines. Two genetic loci have been identified and linked to the disease. Stepp *et al.* (p. 1957) identified the defective gene in the 10q21-22–linked patients as the gene coding for perforin, a protein released from cytotoxic lymphocytes to kill the target cell. This finding provides insight into the biological role of perforin as a mechanism for turning off immune responses, perhaps through the elimination of antigen presenting cells or the cytotoxic T cells themselves.

BLOCKING DEVELOPMENT OF B CELLS

Not all of the causes of genetic immunodeficiencies have been worked out. In cases in which B cells are lacking in the periphery, the Btk protein kinase signaling pathway is suspect, as it has turned out to be critical for B cell activation and development. Minegishi *et al.* (p. 1954) have characterized the defect in a patient that had normal Btk. The mutation responsible in this case was the BLNK adaptor protein, which coordinates signaling from the B cell antigen receptor by binding to various kinases, lipases, and adaptors. Pappu *et al.* (p. 1949) generated mice deficient in BLNK and report that these mice have the same defect—a block in the development of immature B cells from the pro-B to the pre-B stage that effectively prevents maturation of B cells and antibody production.

POX ENTRY PATHWAYS

The ability of chemokine receptors to act as viral receptors is best known for the case of the human immunodeficiency virus (HIV). Lalani *et al.* (p. 1968) have now identified a receptor for a very different pathogenic virus, myxoma, a rabbit pox virus. They show that 3T3 cells can be made permissive for this virus if the cells are transfected with one of a number of chemokine receptors, including CCR1, CCR5, and CXCR4. Infection could be blocked by treatment with a chemokine or specific antibody. The authors speculate that the existence of poxviruses may have led to the selection in the human population for mutant alleles of CCR5 that would later provide resistance to HIV.

TECHNICAL COMMENT SUMMARIES

Reconciling Holocene CO_2 Records

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full//286/5446/1815a

Wagner *et al.* (Reports, 18 June, p. 1971) used measurements of stomata of fossil leaves from a peat bog in the Netherlands to infer atmospheric CO_2 levels during deglaciation and the beginning of the Holocene. They concluded that changes in CO_2 levels accompanied small climatic oscillations and suggested that CO_2 levels were high [above 300 parts per million by volume (ppmv)] in the beginning of the Holocene.

Two comments critique their second interpretation in particular. Birks *et al.* comment that other fossil leaf data and ice core data "are consistent with atmospheric CO_2 levels...at ca. 260 to 280 ppmv" and question the calibration set used by Wagner *et al.* Indermühl *et al.* provide further discussion of the discrepancy with the ice core measurements of atmospheric CO_2 levels from Taylor Dome, Antarctica.

Wagner *et al.* respond that the other data from leaf stomata have low temporal resolution and may be biased by comparison of samples across latitudes, and "agree that [their] results cannot be reconciled with the ice-core records from Antarctica."

dreams made real.

Considering the pace of technology, it wouldn't hurt to change a few things. These days the faster you are on your feet, the better. The same thing goes for your business partners. That's why four of HP's most innovative business groups have become a brand new company. Introducing Agilent Technologies. You'll find the same people and the same passion. So no matter what comes next, or how fast it arrives, you're ready to roll.

Agilent Technologies
Innovating the HP Way

Agilent Technologies is a subsidiary of Hewlett-Packard Company. www.agilent.com

www.sciencemag.org
Science

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.

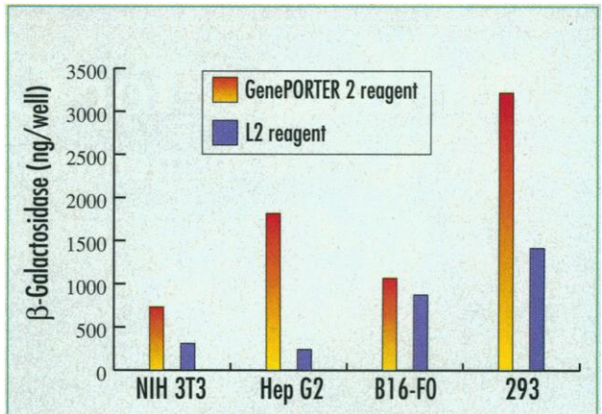
The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of 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.

Works great with or without serum

Highest levels of transfection available

Best results with hard-to-transfect cell lines

Alienated by hard-to-transfect cell lines? GenePORTER™ 2 transfection reagent has out-of-this-world results for a variety of cell lines. This new reagent yields higher efficiencies than GenePORTER reagent, even in the presence of serum. Order GenePORTER 2 reagent today and make contact with the next generation of transfection reagent.



GenePORTER 2 reagent or a competitor's transfection reagent was used to deliver the β-gal expression plasmid into cells in 24-well plates. Each manufacturer's protocol was followed. Following transfections (48 hours), a colorimetric assay was used to measure β-galactosidase.

GenePORTER™ 2
Transfection Reagent

75 reactions (0.75 ml) • T202007
150 reactions (1.5 ml) • T202015
750 reactions (5 x 1.5 ml) • T202075

Now available on our web site:
✓ Gene Therapy Systems, Inc. 1999 Catalog
✓ Updated list of sucessfully transfected cells

GTS
Gene Therapy Systems
"the art of innovation"

To Order: 888-428-0558
Fax: 858-623-9494
10190 Telesis Court, San Diego, CA 92121, USA
Check out the Gene Therapy Systems web site @
http://www.genetherapysystems.com

Circle No. 83 on Readers' Service Card

Gene Therapy Systems International Distributors

Australia • Astral 61-2-9540-2055 **Austria** • BIO-TRADE +43 1 889 18 19 **Benelux** • BIOzymTC BV +31 +(0)45 532 77 55 **China** • Shanghai Haojia Tech. 86-21-5453-0107 **Denmark** • KEBO Lab A/S +45 43 86 87 88 **Finland** • Kebo Lab +358 9 8045 5300 **France** • OZYME +33 1 30 85 92 92 **Germany** • PEQLAB 49-9131-691-470, Biozym +49 5152-9020 **Israel** • Biotech Appl. 972 8 928 5353 **Italy** • Duotech 39 02 331 066 30 **Japan** • Funakoshi 81-3-5684-1622, Takara +81-77-543-7231 **Korea** • Core Bio 82 2 841-7530 **Norway** • Kebo Lab A/S +47 22 90 00 00 **Sweden** • KEBO Lab +46 8 621 35 07 **South Africa** • Millinium 27 12 8034-876 **Spain** • bioNova +34 91 551 54 03 **Switzerland** • Axon Lab AG +41 56/484 80 80 **Taiwan** • PROtech 886-2-23810844 **United Kingdom** • Lifescreen Ltd 01895 453700

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:

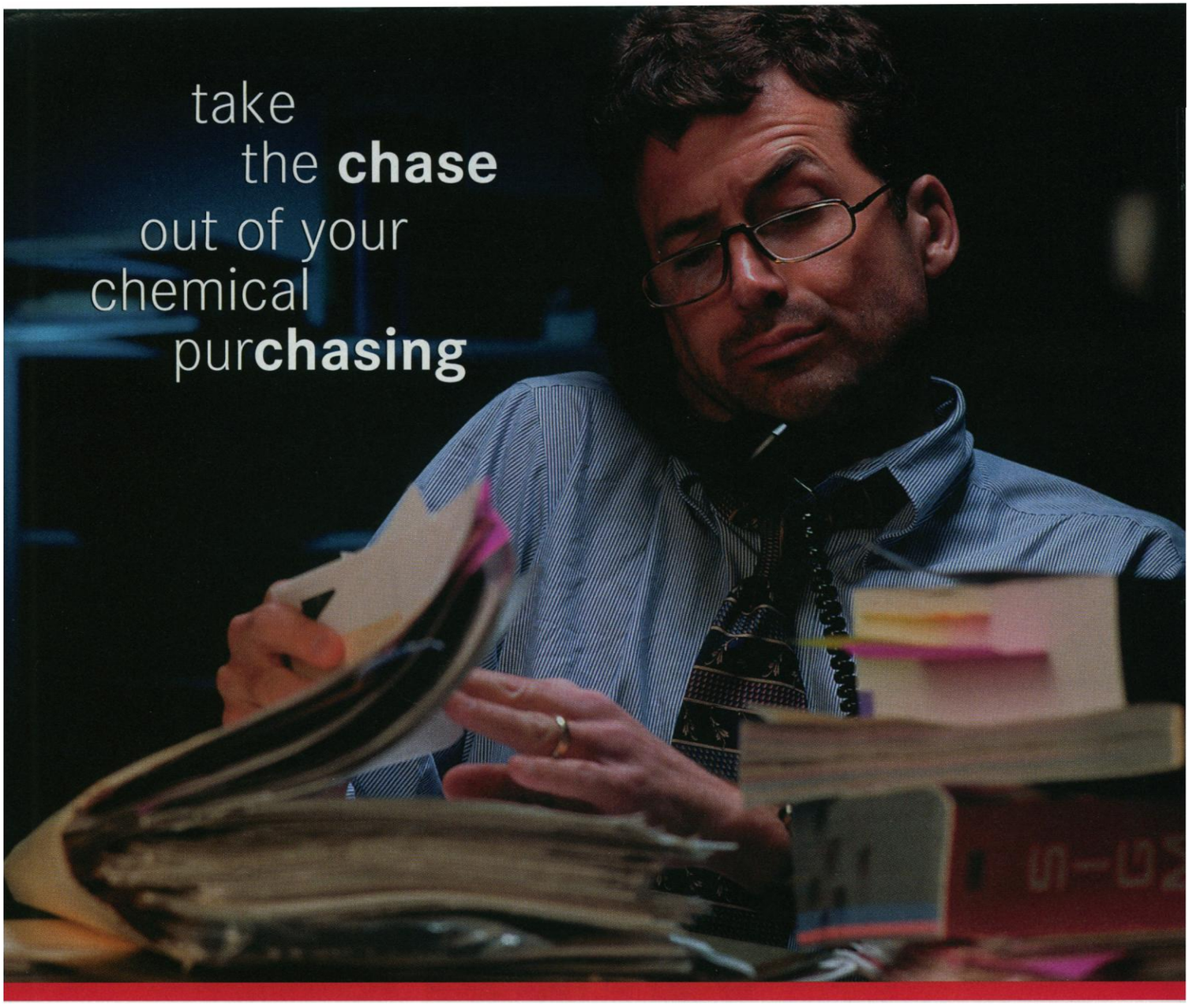
> An expanding database of reagents, instruments and equipment
> One, simple electronic order form that can be used for multiple suppliers
> A fast, easy-to-use search engine
> A "personal favorites" page for quick and easy re-ordering
> Rapid, real-time order tracking
> World-class customer service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

Circle No. 42 on Readers' Service Card

www.chemdex.com

Chemdex
Accelerating Science



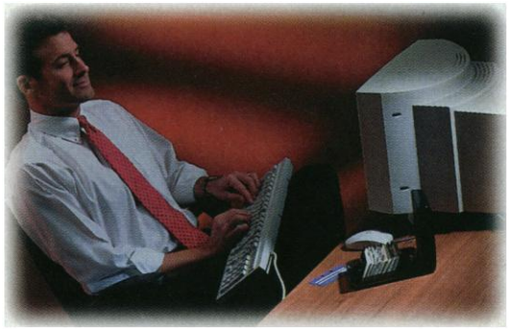
TRY OUR eCOMMERCE SOLUTION @ **www.sigma-aldrich.com**

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. 71 on Readers' Service Card

Background picture: ABI Model 377 automated fluorescent DNA cycle sequencing of pNoTA/T7™ plasmid DNA prepared by the Perfectprep method.

Perfection comes with Perfectprep®

Imagine, if you can, ultra-pure plasmid DNA which has been rapidly isolated and is now ready for transfection and sequencing: It's almost too perfect to be true! But it is both perfect and true – thanks to Eppendorf's **Perfectprep® Plasmid Kits** for plasmid DNA isolation, which give you:

- Ultra-pure plasmid DNA in next to no time
- Reproducible, high-yield results
- A spin-column format for ease of handling
- Ready-to-use plasmid DNA for manual or automated sequencing, cloning and transfection

Rapid, simple and systematic plasmid purification, adapted to suit sample throughput and the amount of DNA required, whether you want individual purification in one spin column or the simultaneous isolation of 96 plasmid samples. The Perfectprep System offers rapid, reproducible yields of plasmid DNA in a simple-to-use kit system. An extremely efficient binding matrix ensures that yields remain constantly high. The plasmid DNA obtained is ultra-pure, shows no chromosomal DNA or RNA contamination and can be used immediately after isolation for all molecular biological applications, such as automated sequencing, transformation, PCR*, blotting or clonings.

The Perfectprep Plasmid System is available in five different kit versions, including the ultra-rapid Mini-Kit, the economical XL-Kit and the high-throughput 96 Spin-Kit. Without the use of organic substances and fully compatible with Eppendorf centrifuges and rotors, these kits provide plasmid DNA which will make your colleagues green with envy.
Perfectprep from Eppendorf – perfect by name, perfect by nature.

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

The Perfectprep® System

Kit Size	Bacteria Culture (ml)	Time needed (min)	Yields High Copy Plasmid (µg)	Yields Low Copy Plasmid (µg)
Mini	1–2	25	5–30	1–3
Midi	10–75	120	50–600	10–100
Maxi	100–300	150	250–2,500	50–400
XL	400–800	150	2,000–6,000	200–1,000
96 Minispin	1–1.3	120	2–10	0.05–0.06

eppendorf® is a registered trademark.

eppendorf

In touch with life

Circle No. 14 on Readers' Service Card

Eppendorf – Netheler – Hinz GmbH · 22331 Hamburg · Germany · Life Science Application-Hotline: +49 180-3666789 · Fax +49 40-53801-556
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

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 (nested) 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 neural networks 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**

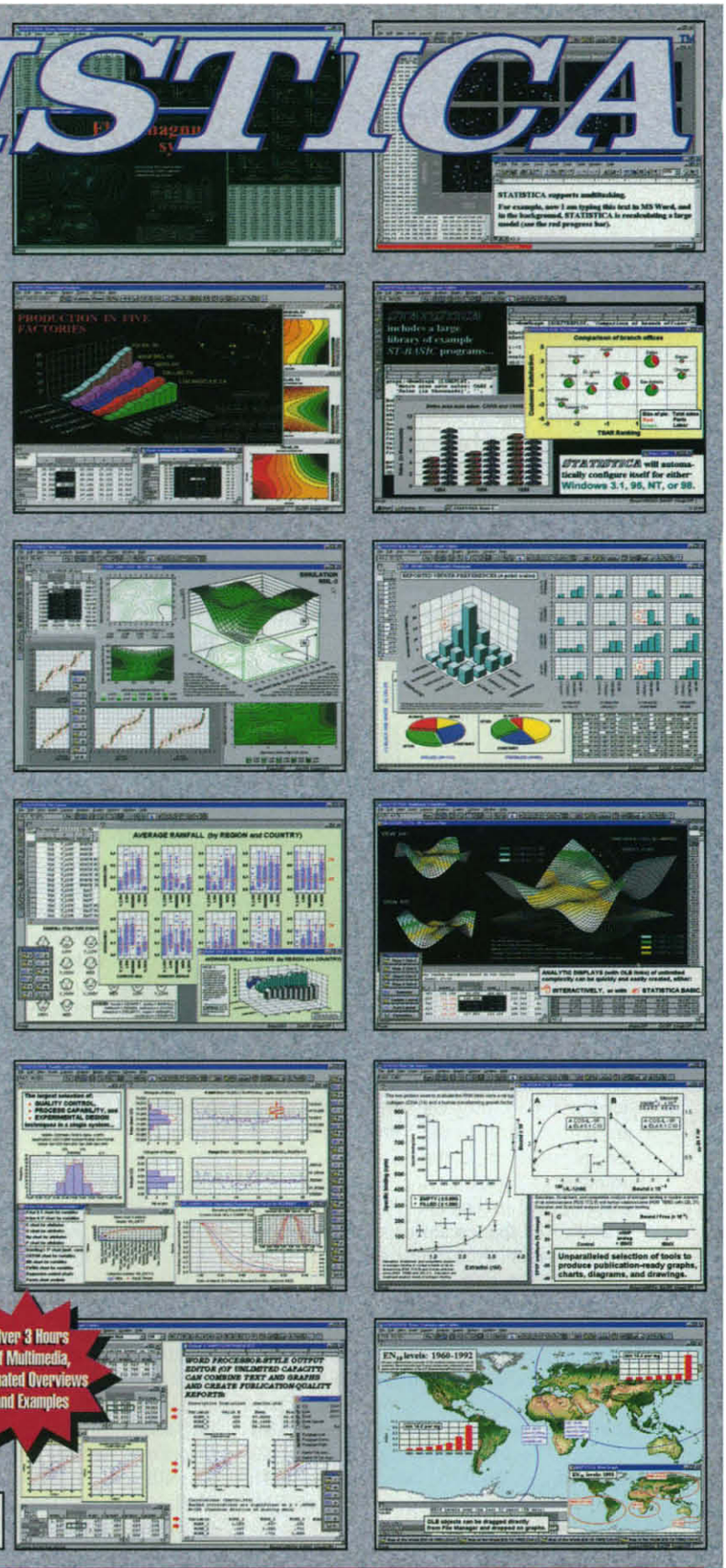
STATISTICA Industrial/SPC Solutions ■ A comprehensive selection of the most flexible, customizable tools for quality control and improvement applications (ISO 9000), single-user and enterprise, including extensive implementations of: ■ ***Quality Control Charts*** Price **$695** ■ ***Process Analysis****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

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

STATISTICA/Macintosh ■ Price **$695** ■ Quick version also available ■ Price **$395**

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. 8 on Readers' Service Card

Interactive WEB site: www.statsoft.com

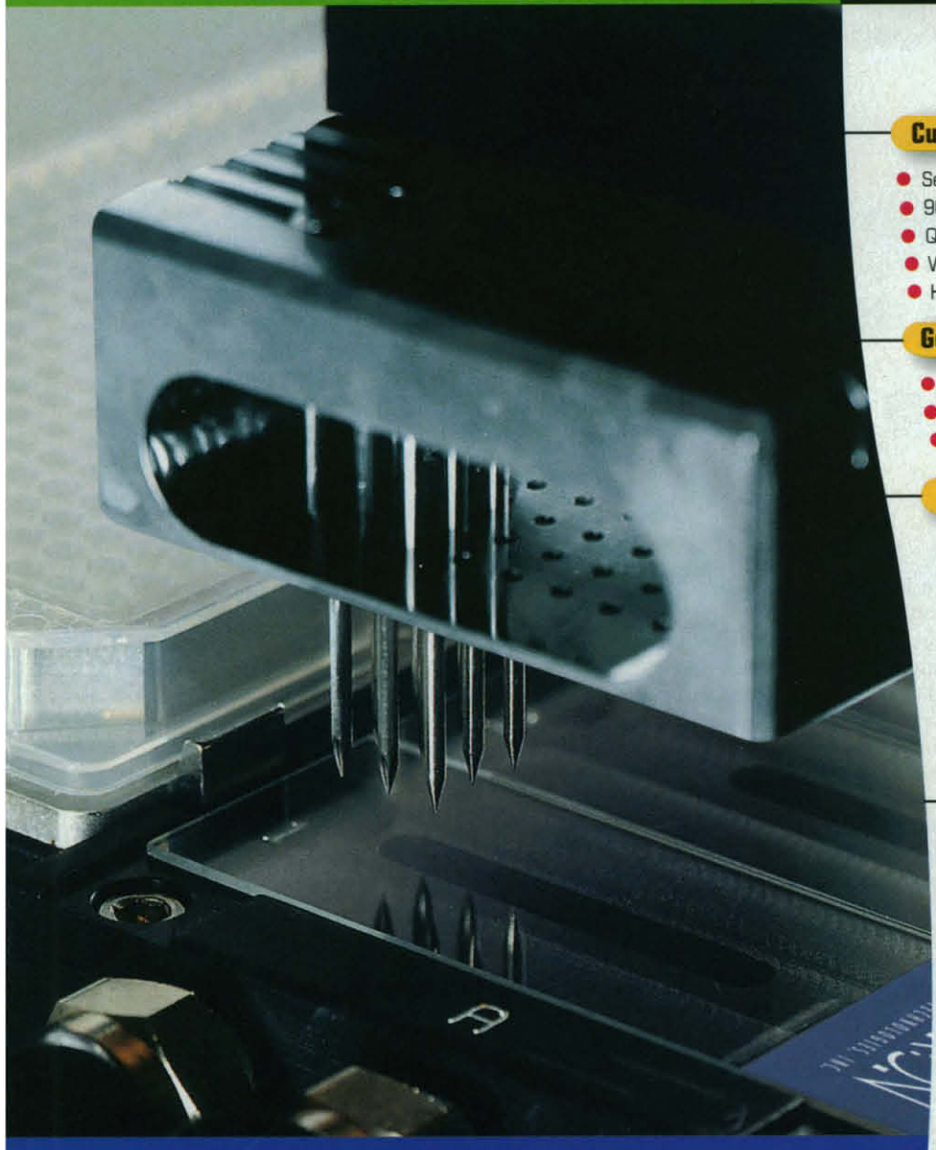
StatSoft®

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: +48-12-428-43-00, fax: +48-12-428-43-01
StatSoft Taiwan (Taipei, Taiwan R.O.C.), ph: +886-2-2346-2576, fax: +886-2-2346-2577
StatSoft Pacific Pty Ltd. (Melbourne, Australia), ph: +613-9521-4833, fax: +613-9521-4288
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 Brazil Ltda. (Sao Paulo, Brazil), ph: +55-11-441-4870, fax: +55-11-4227-4293
StatSoft Southern Africa (Pty) Ltd. (Midrand, S. Africa), ph: +27-11-254-8450, fax: +27-11-254-8451
StatSoft Ltd. (London, UK), ph: +44-1234-341226, fax: +44-1234-341622
StatSoft France (Paris, France), ph: +33-145-185-999, fax: +33-145-185-285
StatSoft Japan Inc. (Tokyo, Japan), ph: +81-3-5475-7751, fax:+81-3-5475-7752
StatSoft Italia srl (Padova, Italy), ph: +39-049-893-4654, fax: +39-049-893-2897
StatSoft Korea (Seoul, Korea), ph: +82-2-783-5875, fax: +82-2-783-5874
StatSoft Iberica (Alges, Portugal), ph: +35-21-411-3008, fax: +35-21-411-2580
StatSoft Russia (Moscow, Russia), ph: +7-095-916-8838, fax: +7-095-916-0393
StatSoft Israel (Kefar Saba, Israel), ph: +97-29-742-7791, fax: +97-29-742-7922

For the Best DNA

Operon Technologies • The DNA Company



Custom Oligonucleotide Synthesis Service

- Sephadex column purification of every oligo with purchase
- 96-well plate format for your convenience at no extra charge
- Quality large scale synthesis
- Wide variety of modifications
- HPLC and PAGE purification

GeneOp™ Custom Gene Synthesis Service

- Quick turn around
- Low prices
- Sequence accuracy is unconditionally guaranteed

Microarray Products NEW

- **Oligos** - Any desired format or modification for your arraying needs
- **Custom PCR† Service** - High quality, high yield, large scale-up available
- **OPTs™** - Sequenced-optimized, concentration-normalized PCR products
- **OpArray™** - Custom DNA arrays on glass slides

For More Information,

E-mail us at
dna@operon.com for custom synthesis products

E-mail us at
oparray@operon.com for microarray products

1000 Atlantic Avenue, Suite 108
Alameda, California 94501
Tel: 800-688-2248
Fax: 510-865-5255
Customer Service Hours are 7a.m. to 5p.m. PST

† These products are made using the Polymerase Chain Reaction ("PCR") Process which is covered by patents owned by Roche Molecular Systems, Inc. and F. Hoffmann-La Roche LTD. ("Roche"), under license from Roche. No license to use the PCR Process is conveyed expressly or by implication to the purchaser by purchase of these products.

www.operon.com

800.688.2248

Circle No. 81 on Readers' Service Card

OPERON

OPERON TECHNOLOGIES, INC.

Unlocking Secrets

the Inner of Life

Drug discovery and basic life science. Research areas that are under constant development. Buzzing with activity. Every week, brand new proteins are discovered.

In the Key of Life. By studying the role of proteins in human cells, you can gain new knowledge about life itself. About health and diseases. This involves a thorough understanding of what molecules do. And why they do it.

Key Questions. Do two molecules bind to each other? How specific is the interaction? How much? How fast? How strong?

In basic research, current studies address signal transduction, receptor-ligand binding, and immune response mechanisms. Among other things. In the pharmaceutical industry, researchers are racing to describe the functions of newly found proteins. To help them design and discover new drugs.

The Key to Success. These are difficult issues. But Biacore can provide the answers. Our high-tech instruments offer researchers unique tools to detect and monitor biomolecular interaction. This knowledge is key to success in both basic and applied R&D. It will open closed doors for you.

BIACORE

www.biacore.com

Circle No. 61 on Readers' Service Card

Digital Imaging Platform

Meet the challenges of the digital age with **Axioplan 2 imaging.** Not just a new microscope but a flexible system designed for the future – the digital imaging platform. A system that is set up and controlled by computer, with images captured and stored by computer, that communicates with other computers – truly digital from start to finish.

Combine with **AxioVision** software, with its in-built microscope control, and the new **AxioCam** ultra high resolution digital camera and you have pure synergy – microscopy and more. Make yours the future-proof choice for high resolution image capture, image processing, archiving – even tele-microscopy. The digital age is with us. Are you?

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

800.233.2343, ext. 7858
micro@zeiss.com
www.zeiss.com/micro

ZEISS

Circle No. 63 on Readers' Service Card

THE RNA COMPANY™

Make time stand still

WITH RNA*later*™

RNA*later*™ eliminates the need to immediately process or snap-freeze tissue samples for RNA isolation

•

Rapidly inactivates RNases in solid tissue samples

•

RNA is stable in tissues stored for weeks at 25°C, months at 4°C, or indefinitely at -20°C

•

Thaw and refreeze tissue samples without RNA degradation

•

No more freezing and grinding

•

Dissect and weigh tissues at room temperature

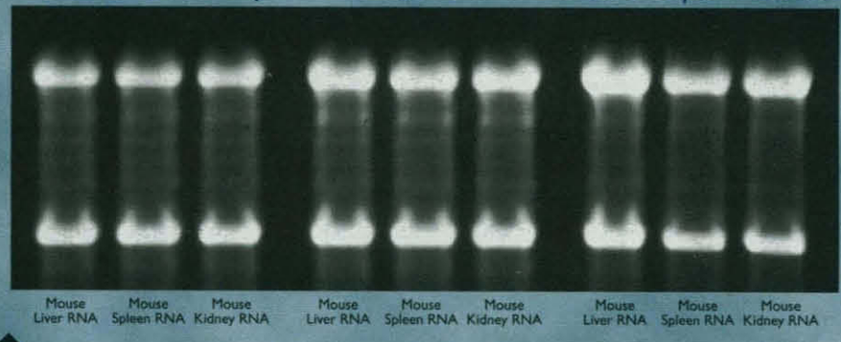
•

Perfect for field collection and clinical samples

•

Ship samples at room temperature

No more quick-freezing of samples to preserve RNA



DO YOU ISOLATE RNA FROM TISSUE?

RNA*later*™ rapidly inactivates RNases and stabilizes RNA in tissues for subsequent RNA isolation.

Ambion's novel Tissue Collection:RNA Stabilization Solution, RNA*later*™, is an aqueous, non-toxic, room temperature reagent that replaces liquid nitrogen for tissue collection prior to RNA isolation. Simply harvest tissues and submerge them in RNA*later*. Store tissues for weeks at 25°C, months at 4°C or indefinitely at -20°C without jeopardizing the quality or quantity of RNA obtained from subsequent RNA isolation. Because RNA*later* immediately inactivates RNases, RNA yield may even increase.

Once saturated in RNA*later*, tissues can be dissected and weighed at room temperature then returned to RNA*later* or placed at -80°C for archival storage. RNA in tissue remains intact after 10 freeze/thaw cycles. RNA*later* is compatible with all RNA isolation procedures tested.

Use RNA*later* and eliminate the rush of tissue harvesting, the worry of long-term tissue storage and the difficulty of freezing and grinding tissue in liquid nitrogen.

For more information, see the 1999 Ambion Product Catalog, call Technical Service, or visit the Ambion website at http://www.ambion.com/ProdInfo/rnalater.html.

U.S. (800)888-8804

Canada (800)445-1161

For a complete list of distributors visit our website, http://www.ambion.com

Order Today

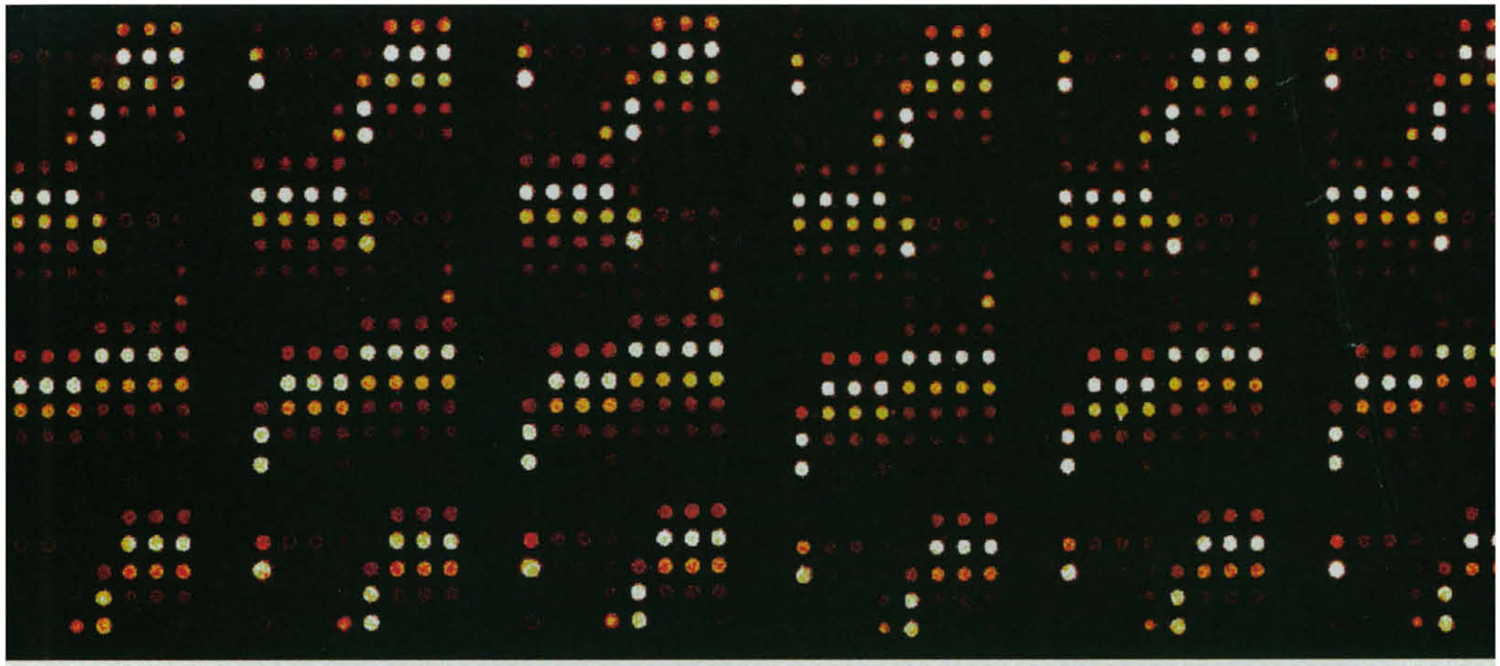
100 ml	Catalog # 7020	$ 50.00
500 ml	Catalog # 7021	$175.00

Ambion®

THE RNA COMPANY

Ambion, Inc. • 2130 Woodward St. • Austin, TX 78744-1832 • tel(512)651-0200 • fax(512)651-0201 • email: moinfo@ambion.com • www.ambion.com

Circle No. 95 on Readers' Service Card



Read it and reap

Researchers at CAMBIA use the GMS™ Microarray Analysis System to harvest rice genome information

At Australia's Center for the Application of Molecular Biology to International Agriculture (CAMBIA), work is underway to functionally characterize the rice genome and develop new technologies for rice breeding. With the help of the GMS system, the CAMBIA team is preparing BAC library arrays to physically map transposon insertions into the rice genome. They are also using GMS microarray technology to analyze mutants for changes in transcription patterns and to develop genetic marker systems for DNA fingerprinting and Molecular Marker Assisted Selection.

Beyond rice, microarray analysis has broad utility in agricultural genomics.

Imagine what you could do

Microarray analysis is revolutionizing genomics research by enabling scientists to analyze complex systems and pathways. Using proprietary high-precision fluid delivery and laser scanning digital imaging technology, the GMS Microarray Analysis System provides superior analytical performance—for use in your own lab, in experiments of your own design.

The GMS 417 Arrayer and GMS 418 Array Scanner.

For information, call 1-800-834-5244, or visit our web site at **www.geneticmicro.com.**

Array and rice images courtesy of Andrzej Kilian, Damian Jaccoud and Richard Jefferson, CAMBIA.

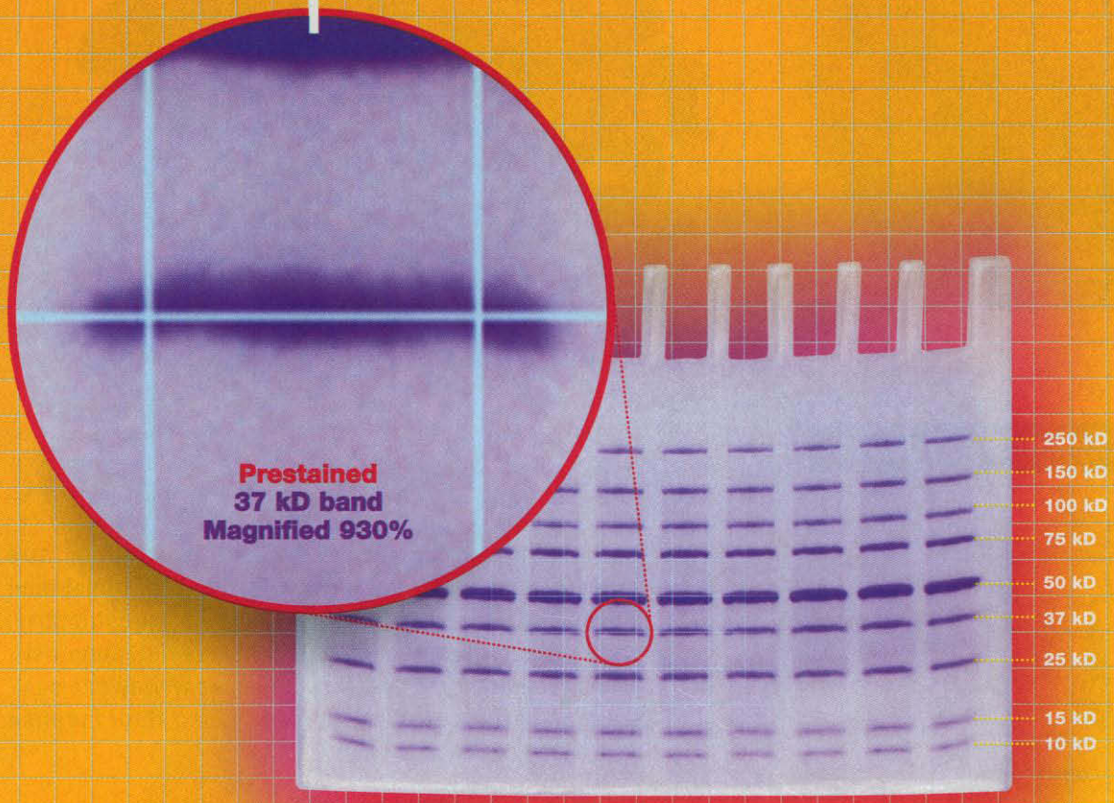
Certain arrays or microarrays and/or their methods of preparation, analysis or use may be covered by patents or other intellectual property rights held by others in certain countries. Genetic MicroSystems does not encourage or support the unauthorized or unlicensed use of any technology. Use of Genetic MicroSystems products is recommended only for technology for which the end user has a license under proprietary rights of third parties or for technology for which a license is not required.

Genetic MicroSystems™

Changing the image of DNA microarrays

Circle No. 46 on Readers' Service Card

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 ul
161-0372	Precision Protein Standards, Prestained, 50 applications (10 µl/application), 500 ul

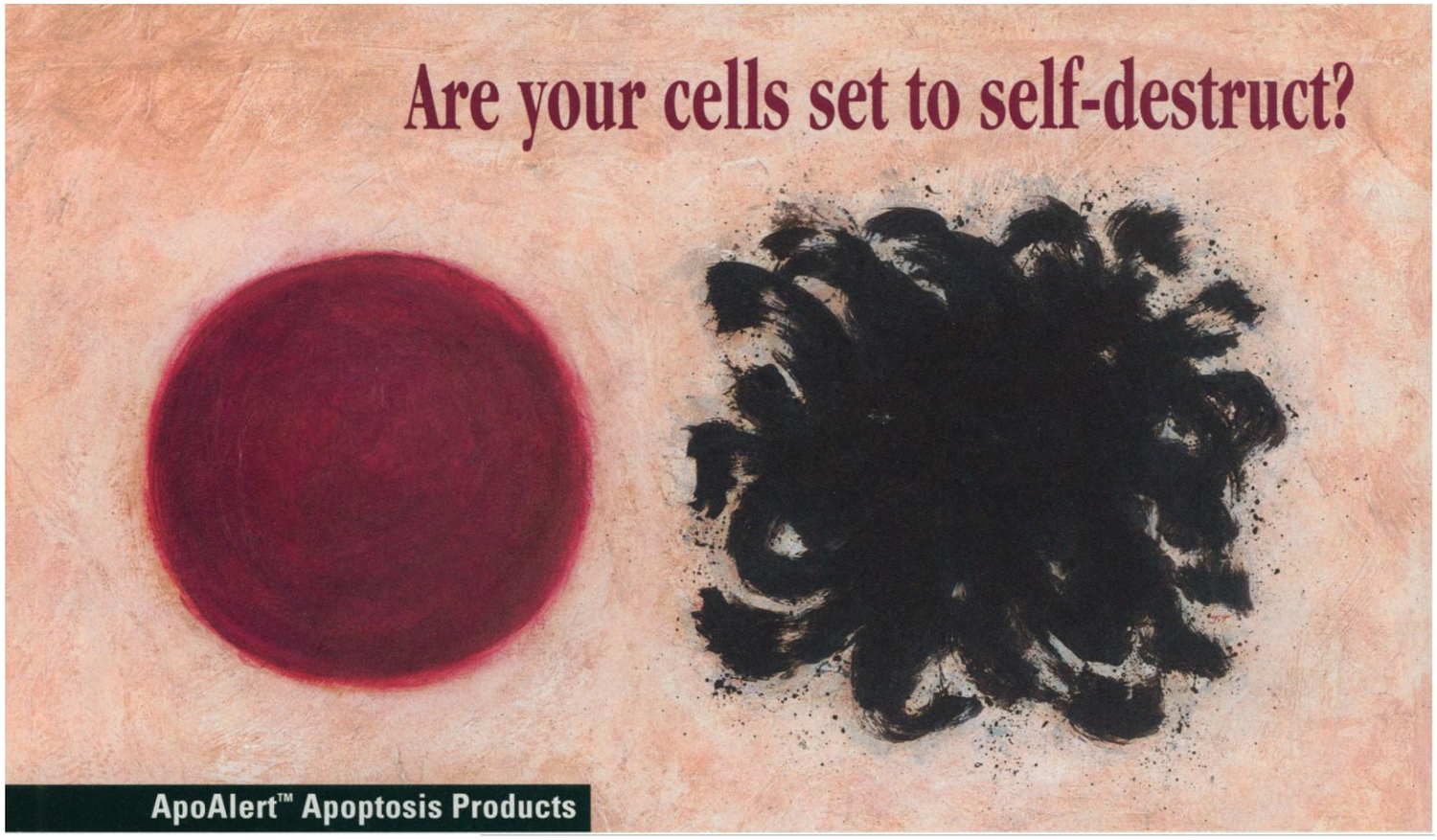
What Will You Discover Next?

Visit our Life Science web site at discover.bio-rad.com.
Call toll free at 1-800-4BIORAD (1-800-424-6723); outside the US, call (510) 741-6996.

BIO-RAD

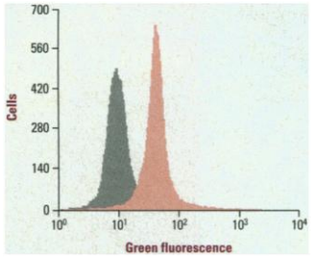
Circle No. 86 on Readers' Service Card

Are your cells set to self-destruct?

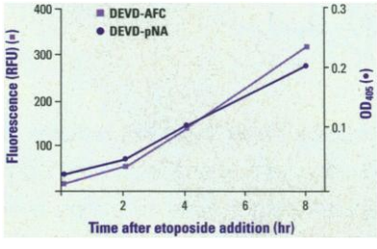


ApoAlert™ Apoptosis Products

Illustration inspired by the art of Adolph Gottlieb (1903–1974).



Detection of apoptosis by flow cytometry using the Mitochondrial Membrane Sensor Kit.



ApoAlert Caspase-3 Assay detects caspase-3 activity soon after induction of apoptosis.

CLONTECH offers a variety of products for apoptosis detection, including the new **Mitochondrial Membrane Sensor Kit** for detecting the change in mitochondrial transmembrane potential that accompanies apoptosis. The kit's fluorescent dye provides an easy way to visualize membrane potential changes using fluorescence microscopy or flow cytometry.

The **Annexin V-EGFP** and **-FITC Apoptosis Kits** recognize phosphatidylserine on the outer membrane of apoptotic cells. The **Apo 2.7/Annexin V-EGFP Kit** includes the Apo 2.7 antibody, which detects an antigen on the mitochondrial membrane of apoptotic cells. **ApoAlert Caspase-3** and **Caspase-8 Assay Kits** provide a convenient, quantitative way of detecting caspase activation.

To detect nuclear events in apoptosis, use the sensitive **ApoAlert LM-PCR Ladder Assay Kit** or the versatile **ApoAlert DNA Fragmentation Assay Kit.**

Call and order today!

Germany & East Europe: CLONTECH GmbH • Tel: 06221 34170 Fax: 06221 303511
United Kingdom: CLONTECH UK Ltd. • Tel: 01256 476500 Fax: 01256 476499
Japan: CLONTECH Japan Ltd. • Tel: 03 3523 9777 Fax: 03 3523 9781
Switzerland: CLONTECH AG • Tel: 061 68354 50 Fax: 061 68354 52
Austria: CLONTECH GmbH • Tel: 01 310 6688 Fax: 01 310 7744

Distributors: Australia: 61 7 3273 9100 ■ **Belgium/Luxembourg:** 0 800 1 9815 ■ **Brazil:** 55 11 66940539 ■ **Canada:** Now call CLONTECH direct • 800 662 2566 ■ **Chile:** 56 2 209 6770 ■ **China:** BEIJING YUANGPING BIOTECH • 86 10 68187551; GENE CO. LTD. • 021 6428 7163; GENETIMES TECHNOLOGY • 86 21 6404 1358 ■ **Czech Republic:** 420 19 7265214 ■ **Egypt:** 202 349 8311 ■ **Finland:** 358 9708 596 19 ■ **France:** 33134 602424 ■ **Greece:** 301 51 53882 ■ **Hong Kong:** 852 2646 6101 ■ **Hungary:** 36 1 280 3728 ■ **India:** 91 11 54 21714 ■ **Israel:** 972 4 9960595 ■ **Italy:** 39 55 5 001871 ■ **Korea:** 82 2 556 0311 ■ **Malaysia:** 603 787 72611 ■ **Mexico:** 525 281 4718 ■ **The Netherlands:** 31 33 495 00 94 ■ **Norway:** 47 22 421 520 ■ **Poland:** 49 6221 34170 ■ **Portugal:** 351 361 36 20 ■ **Scandinavia:** 46 8 728 00 65 ■ **Singapore:** 65 775 7284 ■ **South Africa:** 27 21 671 5166 ■ **Spain:** 34 9 1 630 0379 ■ **Taiwan:** 886 2 27202215 ■ **Thailand:** 662 530 3804 4 ■ **Turkey:** 90 216 385 8321 rev. 11/9/99

CLONTECH
NOW YOU CAN.

1020 East Meadow Circle, Palo Alto, California 94303 USA
Tel: 800-662-2566 (CLON) 650-424-8222 • Fax: 800-424-1350 650-424-1088
E-mail: products@clontech.com orders@clontech.com • Internet: www.clontech.com
 (AD97176)

Circle No. 85 on Readers' Service Card

Trust proven and reliable EndoFree™ Plasmid Kits

QIAGEN® EndoFree™ Plasmid Kits are proven by thousands of researchers to perform for both in vitro and in vivo gene transfer applications. Trust QIAGEN technology to give you the endotoxin-free purity you need for:

- ✔ **Superior reproducibility**
- ✔ **Reduced cytotoxicity**
- ✔ **Increased efficiency**
- ✔ **Control of variables**

Prove it for yourself.

Order your EndoFree Plasmid Kit today!

Circle No. 76 on Readers' Service Card

www.qiagen.com

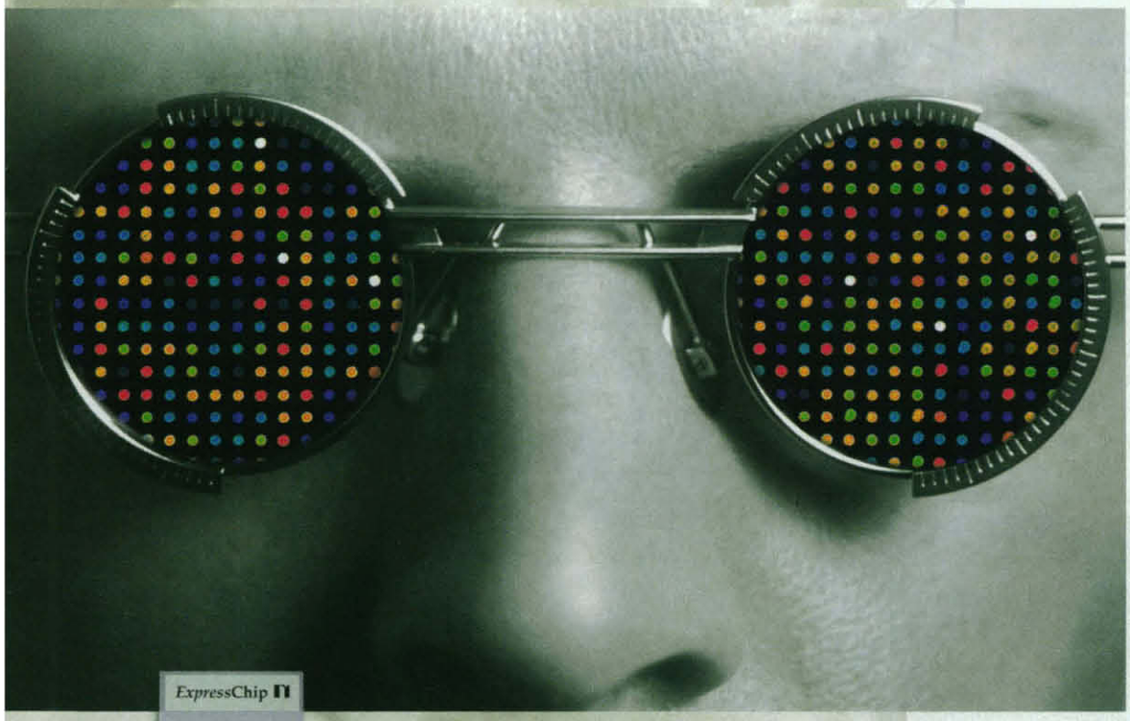
QIAGEN: Germany	USA	Australia	Canada	France	Japan	Switzerland	UK
Tel. 02103-892-240	Tel. 800-426-8157	Tel. 03-9489-3666	Tel. 800-572-9613	Tel. 01-60-920-930	Tel. 03-5805-7261	Tel. 061-319-30-31	Tel. 01293-422-999
Fax 02103-892-255	Fax 800-718-2056	Fax 03-9489-3888	Fax 800-713-5951	Fax 01-60-920-925	Fax 03-5805-7263	Fax 061-319-30-33	Fax 01293-422-922

DISTRIBUTORS: Austria/Hungary/Slovenia R. u. P. MARGARITELLA Austria (01) 889 18 19 **Belgium/Luxemburg** 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** Clinilab 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 (MMedical srl) (055) 500 1871 **Korea** LRS Laboratories, Inc.(02) 924-86 97 **Malaysia** Research Biolabs Sdn. Bhd. (03)-7312099 **Mexico** Quimica Valaner 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 (1)-424 73 64 **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

QIAGEN

PLSENDO1199SW

Discover A Clear Array Of Possibilities. Introducing ExpressChip™ From Mergen.



New and powerful tools to accelerate research and drug discovery into the next millennium. Introducing the ExpressChip DNA Microarray System from Mergen. Leading edge products and services designed to serve the exacting needs of life scientists working in pharmaceutical research, academia and biotechnology.

The ExpressChip System, developed to profile the differential expression of thousands of genes simultaneously, offers high detection sensitivity with consistent, reliable, and cost effective results. In an easy-to-use format, the ExpressChip System provides the speed and flexibility to fully complement your research needs. Choose from our standard systems pre-spotted with DNA sequences functionally important for cell growth and disease development. Or, customize your own ExpressChip System. All ExpressChip systems are backed with a variety of expert services including probe preparation, hybridization and detection, scanning and data processing—all designed to continuously keep you up-and-running.

The ExpressChip DNA Microarray System from Mergen. Discover an endless array of new possibilities.To reserve your ExpressChip System or to learn more, visit us on the web at www.mergen-ltd.com, or call toll-free at 1-877-4MERGEN (463-7436).

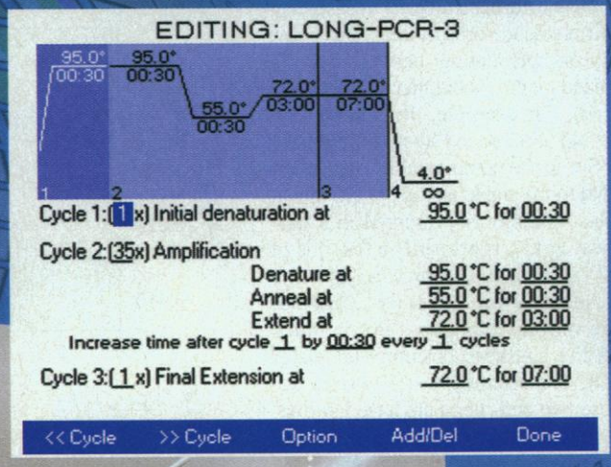
Circle No. 48 on Readers' Service Card

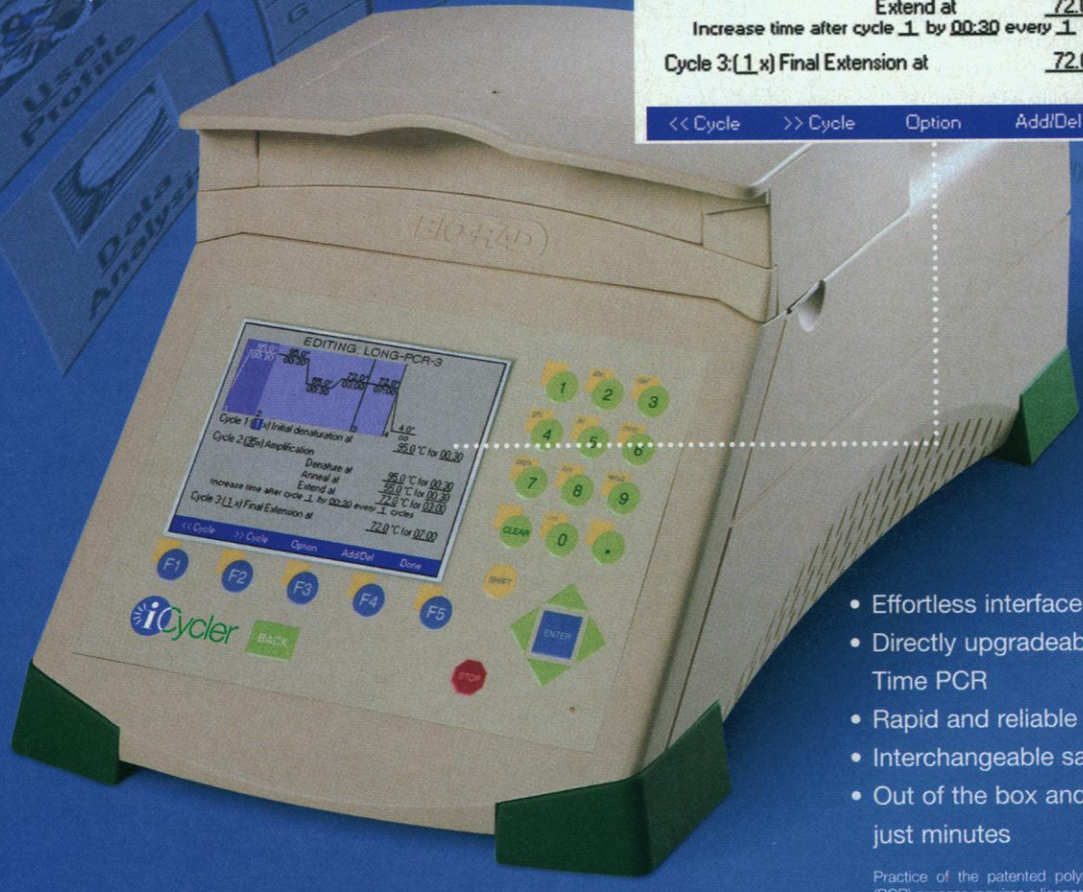
MERGEN LTD.

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. 89 on Readers' Service Card

BIO-RAD

GIBCO BRL Products and Services
for Cell Culture.

LIFE TECHNOLOGIES™

More Technical Information
www.lifetech.com

Producer of GIBCO BRL® Products

U.S. Academic and Government Orders/TECH-LINE™: **(800) 828-6686**
U.S. Industrial Orders/TECH-LINE: **(800) 874-4226**

Circle No. 43 on Readers' Service Card

When it comes to high-throughput, there are custom oligos, and there are customized custom oligos.

Your lab is unique. Shouldn't your high-throughput service be?

We think so. That's why our competitive pricing and synthesis capacity allow you to order any number of custom oligos for your genome project. Choose from 96-well plates, 384-well plates, and cluster tubes customized to your specifications and delivered in 3-5 days.

What's more, no one's quality control surpasses ours. Every oligo is verified by PAGE analysis, and every batch is performance-tested by PCR and mass spec. You'll also enjoy our personal, friendly service and easy ordering. All at surprisingly affordable prices!

So call today for details on our revolutionary custom high-throughput oligo synthesis. You'll find that at Sigma-Genosys, we focus on you, so you can focus on your research.

SIGMA
GENOSYS

Toll Free: 877-260-0764 • www.genosys.com • Email: info@genosys.com

Circle No. 87 on Readers' Service Card

Stay up-to-date on the past, present, and future of science!

24 HOURS A DAY, 7 DAYS A WEEK

past

Access the *Science* archives
Read summaries, abstracts, or full-text articles from back issues of *Science*, as far back as October, 1995.

Search for the specific science news and information you want
Quickly and easily search for past or current articles by keyword, author, article title, or *Science* issue. Instantly hyperlink from articles in *Science* to citations in Medline and the ISI Citation Index, with links to full-text articles in 200 scientific journals.

scienceonline.org

present

Keep up-to-date on new scientific research
From any computer, access the current issue of *Science* on the day of publication. Plus, the online version contains an authors' index, select policy forums, special essays, and supplementary materials (articles, resources, graphics) not found in print.

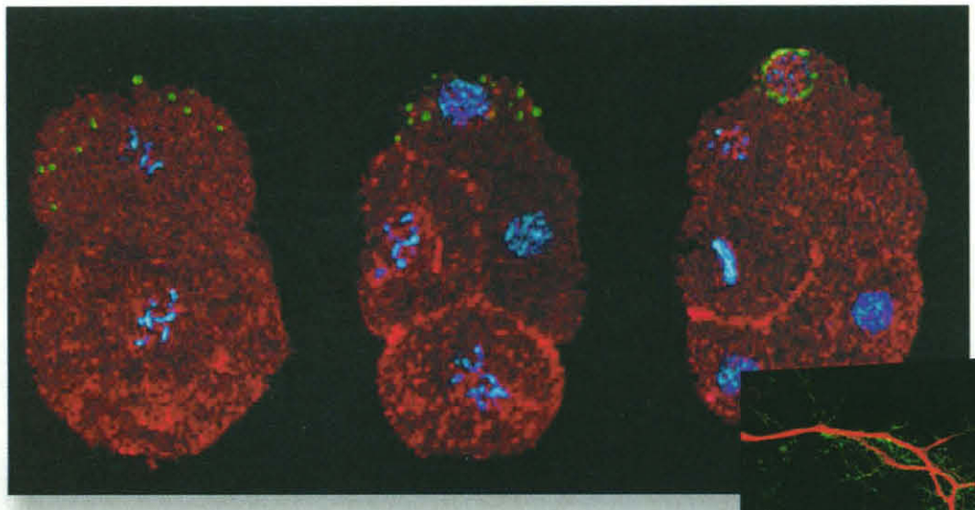
Daily news briefings
Access *Science*NOW's easy-to-read, daily updates of the hottest scientific, medical, and technological news. Plus, read concise overviews of exciting new research in *Science*'s Compass.

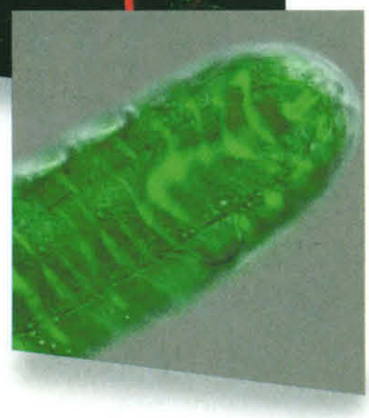
Go shopping
Explore current catalogs, brochures, technical applications sheets and new product information from the world's leading science manufacturers and suppliers.

future

Look for a new career
Prepare for your future with *Science*'s NextWave—look for a job, receive career advice, review salary surveys, and more. Plus, sign up for job alerts and we'll notify you via email when jobs open up within criteria you've selected.

Save your valuable time—we'll do the work for you
Don't worry about searching for articles on developing topics in science. We'll let you know when the news comes in. *Science Online* provides personalized email alerting services for online subscribers. Sign up for CiteTrack Personal Alerts, and we'll notify you whenever new content in a participating journal is published that matches criteria based on the topics, authors, and articles you choose.





The importance of defining objectives.

Whatever your advanced imaging objectives, advanced CFI60™ optics can handle them.

When your requirements involve spectral wavelength imaging from the IR to the UV, the secret to great images is the improved signal-to-noise performance designed into Nikon's CFI60 objectives.

You'll find over 80 CFI60 objectives including those needed for techniques such as multi-photon/confocal, detection of GFP expression, DIC, phase contrast, fluorescence and deconvolution-restoration microscopy.

For a demonstration of how important it is to define your research objectives with CFI60, call **1-800-52-NIKON, ext. 362.** Or visit us at **www.nikonusa.com**

CFI60

ECLIPSE

Fig. 1 - Specimen: *C. elegans*; 3-photon excitation technique on Nikon Diaphot with 60X Plan Apo Oil objective. Provided by J. White, Univ. of Madison, WI and Bio-Rad.

Fig. 2 - Specimen: *Manduca sexta* pupa thoracic neurons; immunocytochemical technique on Nikon PCM2000 Confocal with 20X Plan Apo objective. Provided by P. Jansma, Univ. of Arizona.

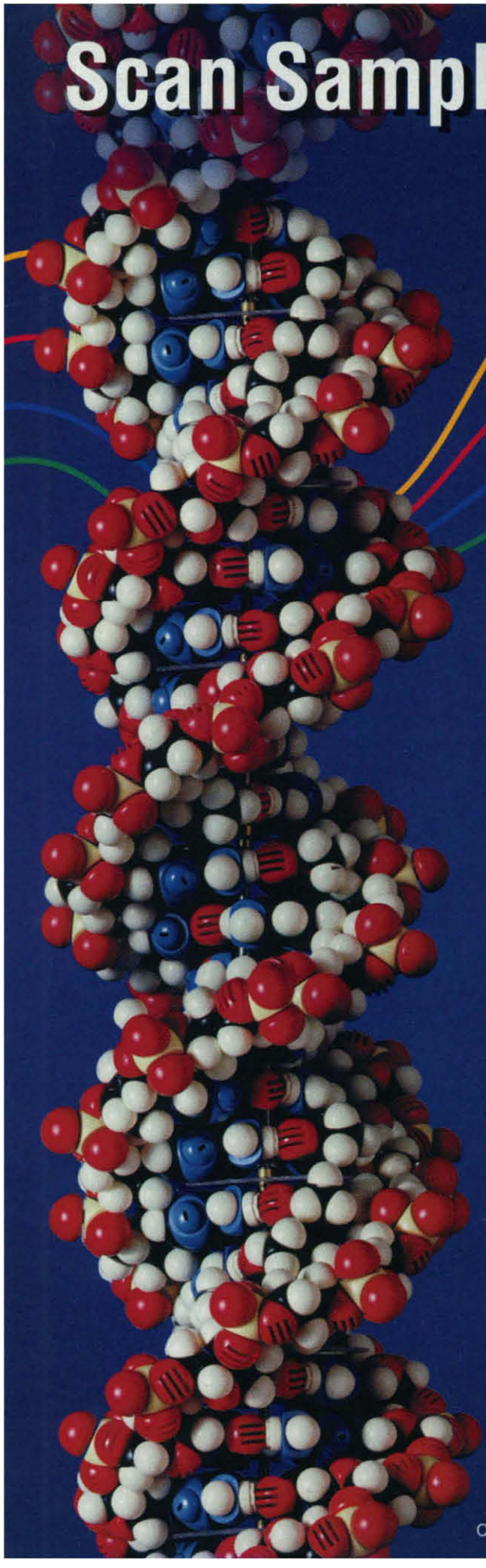
Fig. 3 - Specimen: Drosophila embryos; time lapse GFP technique on Nikon TE300 with 10X Plan Fluor objective and simple PCI software. Provided by B. Burnip, Compix Inc. and B. Sanson, Univ. of Cambridge, UK.

Nikon

Redefining Infinity

Circle No. 75 on Readers' Service Card

Scan Samples as Small as 1µL



Gene Spec I

A Breakthrough in DNA/RNA Measurement

Gene Spec™ I can analyze samples of only 1 to 50 µL accurately and reliably. Absorbance, 260/280 nm ratio, concentration, purity, and protein concentration are all determined instantly.

To learn more about the benefits, call 1-800-624-6176 or visit us at www.hitachi-soft.com/gs

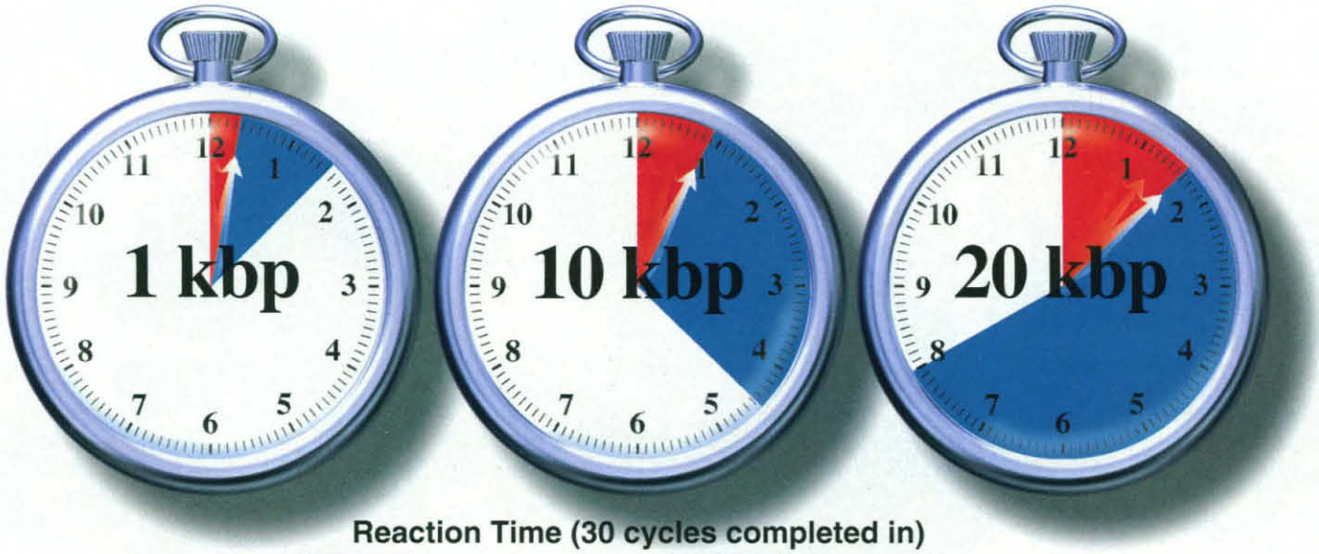
HITACHI
Genetic Systems
Hitachi Software Engineering Co., Ltd.

Circle No. 67 on Readers' Service Card

TaKaRa Z-Taq™

Today's Research for Tomorrow's Revolution

The Fastest DNA Polymerase Ever



Reaction Time (30 cycles completed in)

TaKaRa Z-Taq™ Conventional *Taq*

Speed Comparison in Amplifying *E. coli* Genomic DNA (100 ng/50 µl PCR)

TaKaRa Z-Taq™ (R006A: 200 U, R006B: 200 U x 4)

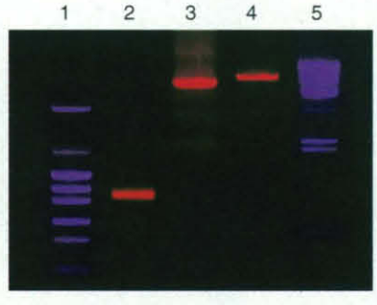
- Offers Unmatched PCR Productivity by any other enzyme at **Five times Faster Speed** with Excellent Processivity and Higher Sensitivity.

Amplification Length Achieved	
Human genomic DNA	17.5 kbp and longer
E. coli genomic DNA	20 kbp and longer
λ DNA	20 kbp and longer

- *TaKaRa Z-Taq*™ provides High-throughput to enable multiple runs of sample processing on a single cycler* each day. *Applicable to any thermal cycler currently in use
- Highly Efficient and Cost-effective PCR processes will accelerate genetics applications in every related field.

Amplification of *E. coli* Genomic DNA (100 ng/50 µl PCR) with *TaKaRa Z-Taq*™

on the TaKaRa PCR Thermal Cycler PERSONAL by performing 30 cycles: Using 5 sec-denaturation time at 98° C, extension times are 2 sec, 70 sec and 150 sec at 68° C, respectively for 1 kbp, 10 kbp and 20 kbp.



Lane (5 µl applied for the Electrophoresis)

1. pHY marker
2. 1 kbp
3. 10 kbp
4. 20 kbp
5. λ-*Hin*d III marker

Purchase of the *Takara Z-Taq* is accompanied by a limited license to use it in the Polymerase Chain Reaction (PCR) process for 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 purchase, i.e., an authorized thermal cycler.

TaKaRa
TAKARA SHUZO CO.,LTD.
BIOMEDICAL GROUP
Otsu, Shiga, Japan
Phone:+81 77-543-7247 Fax:+81 77-543-9254

Korea
BOHAN (TaKaRa-Korea) Biomedical Inc.
Phone: (02) 577-2002 Fax: (02) 577-3691
Europe
TaKaRa Biomedical Europe S.A.
Phone: +33 1 41 47 01 14 Fax: +33 1 47 92 18 80

DISTRIBUTORS

USA and the Americas
PanVera Corporation
Toll Free: 800-791-1400
Fax: 608-233-3007
E-mail : info@panvera.com

Europe
BioWhittaker Europe
Phone: +32(0)8732 1611
Fax: +32(0)8735 1967

Taiwan
Cold Spring Biotechnology Co.,Ltd.
Phone: +886 2-695-9990
Fax: +886 2-695-9963

Taiwan
Cheng Chin Trading Co.,Ltd.
Phone: +886 2-331-3111
Fax: +886 2-382-2197

Homepage: http://www.takara.co.jp/english/bio_e/ E-mail: bio-sm@takara.co.jp

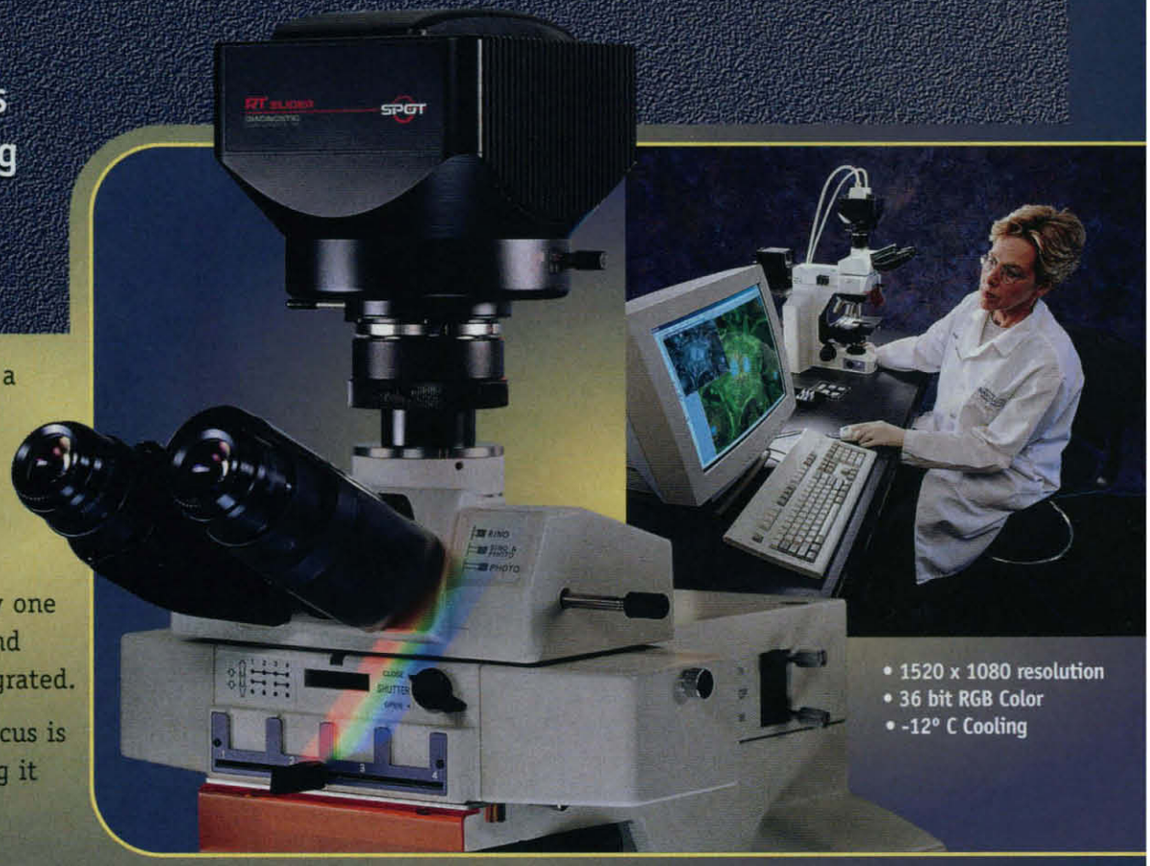
Circle No. 17 on Readers' Service Card

RT

Real Time Viewing

Getting your work done is what it's all about.

Solving problems with your imaging system is not.



- 1520 x 1080 resolution
- 36 bit RGB Color
- -12° C Cooling

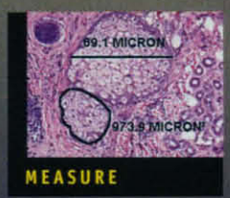
You don't want to spend a lot of time battling hardware and software issues. When you buy a SPOT RT digital camera you get an imaging environment designed by one company, with camera and software seamlessly integrated.

With the SPOT RT, the focus is on your work and getting it done, not on managing the camera.


REAL TIME VIEWING

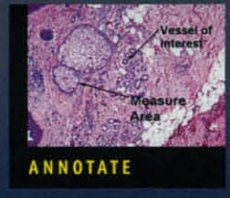

CAPTURE


ENHANCE



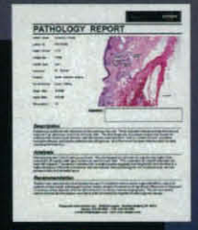
MEASURE

CALIBRATION MARK



ANNOTATE


ARCHIVE



REPORT

Great Images,

Real Time Viewing,

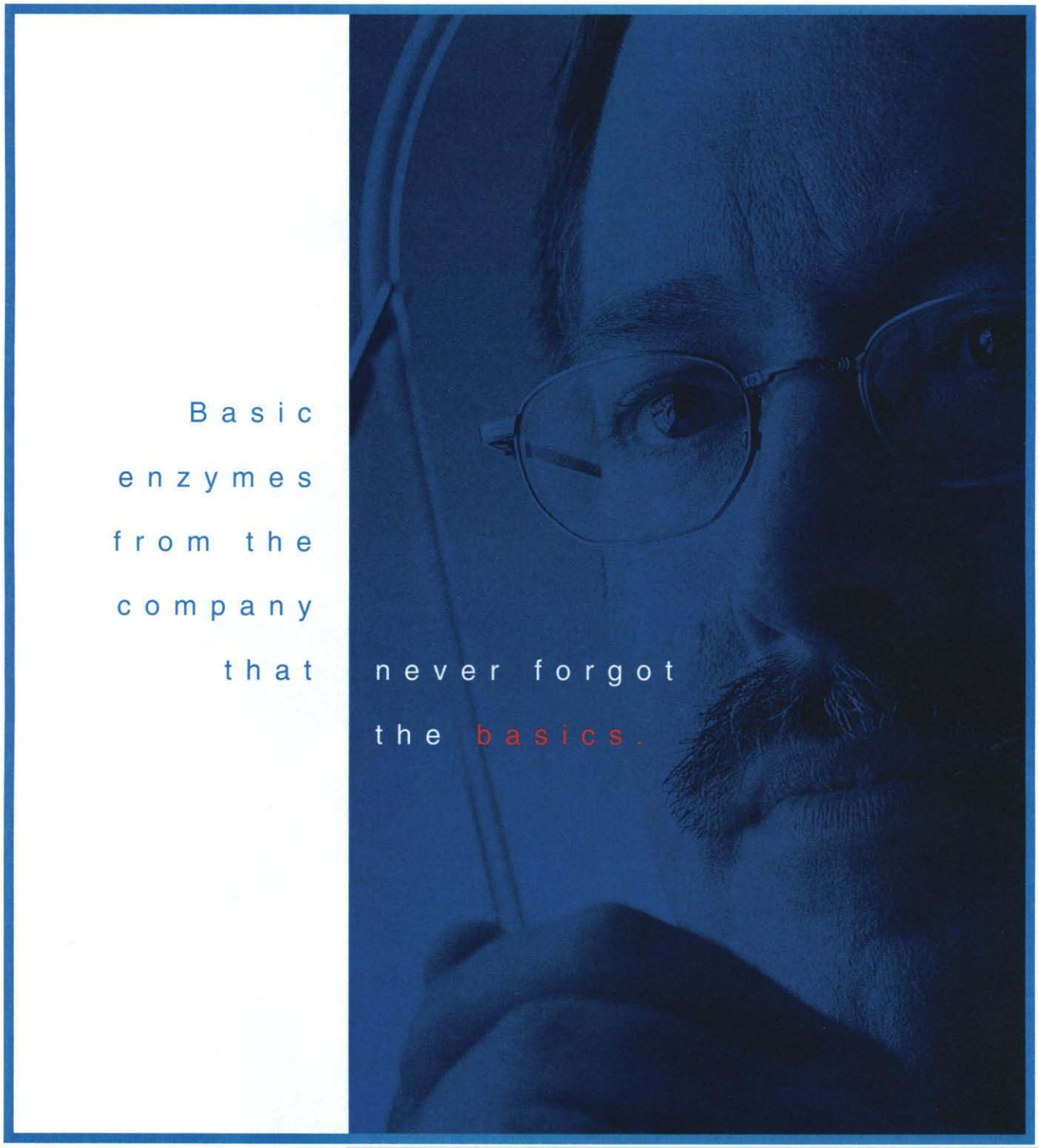
Comprehensive Software,

A Complete Working Environment.

SPOT DIAGNOSTIC instruments, inc.

Circle No. 27 on Readers' Service Card

PHONE: 810.731.6000 • FAX: 810.731.6469 • e-mail: info@diaginc.com • www.diaginc.com



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.

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

usb®

Rediscover the chemistry™

Circle No. 54 on Readers' Service Card

When you need the ability to see more, you need the precision of Fujifilm Science Imaging Systems.

FUJIFILM

I&I – Imaging & Information

Science Imaging Systems

Japan Tel: +81-3-3406-2201 • Fax: +81-3-3406-2158 • Europe Tel: +49-211-5089-174 • Fax: +49-211-5089-139

U.S.A Tel: +1-203-353-0300 • Fax: +1-203-327-6485 (1-800-431-1850 ext. 3649 in the U.S.)

http://home.fujifilm.com/info/products/science/index.html • www.fujimed.com

TÜV PRODUCT SERVICE Quality system certified to ISO 9001

Circle No. 81 on Readers' Service Card

DNA PURIFICATION

Precision Design... for Success

Introducing...
Wizard® SV 96 Plasmid DNA Purification Systems

...designed for Ease of Use, Purity, Speed and Versatility.

- Unique vacuum manifold design eliminates waste handling
- 96 plasmid purifications in less than 60 minutes
- Novel 96 well plate design prevents spraying during sample processing
- Designed for use in both manual and automated formats
- Guaranteed for automated fluorescent sequencing

Visit the Promega Plasmid Zone at www.promega.com/fpo for comprehensive information on the new Wizard® SV 96 Plasmid DNA Purification Systems[a], including:

- Protocols
- Articles
- Applications
- Online Ordering

[a] Patent Pending.
Wizard is a trademark of Promega Corporation and is registered with the U.S. Patent and Trademark Office.

Promega Corporation • 2800 Woods Hollow Road • Madison, WI 53711-5399 USA • Telephone 608-274-4330 • Fax 608-277-2601

Printed in USA 09/99
8338C_AD_PU

Promega
Precision Design... *for Life*
www•promega•com

Circle No. 58 on Readers' Service Card