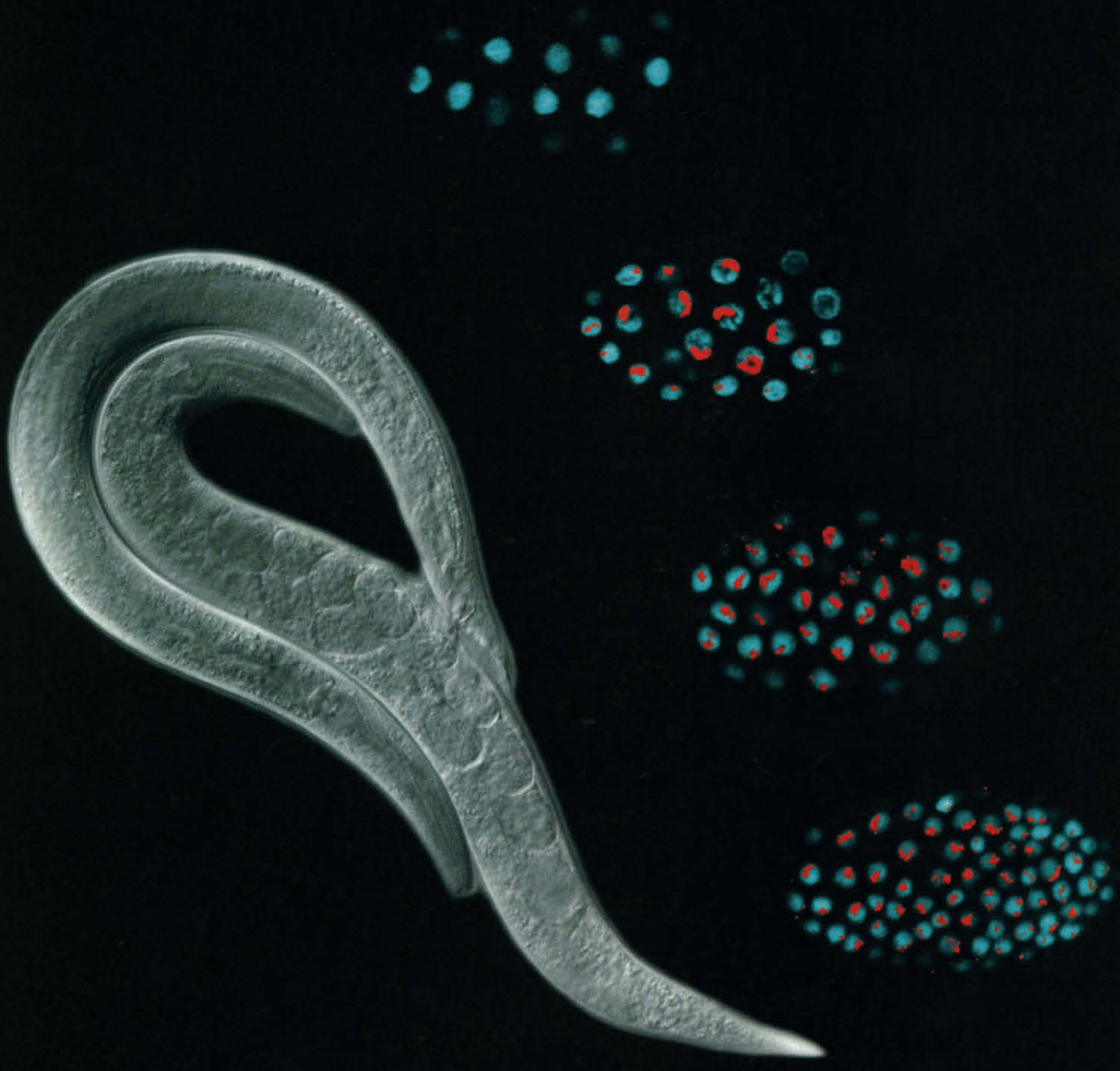
11 June 1999

Science

Vol. 284 No. 5421
Pages 1725–1880 $8

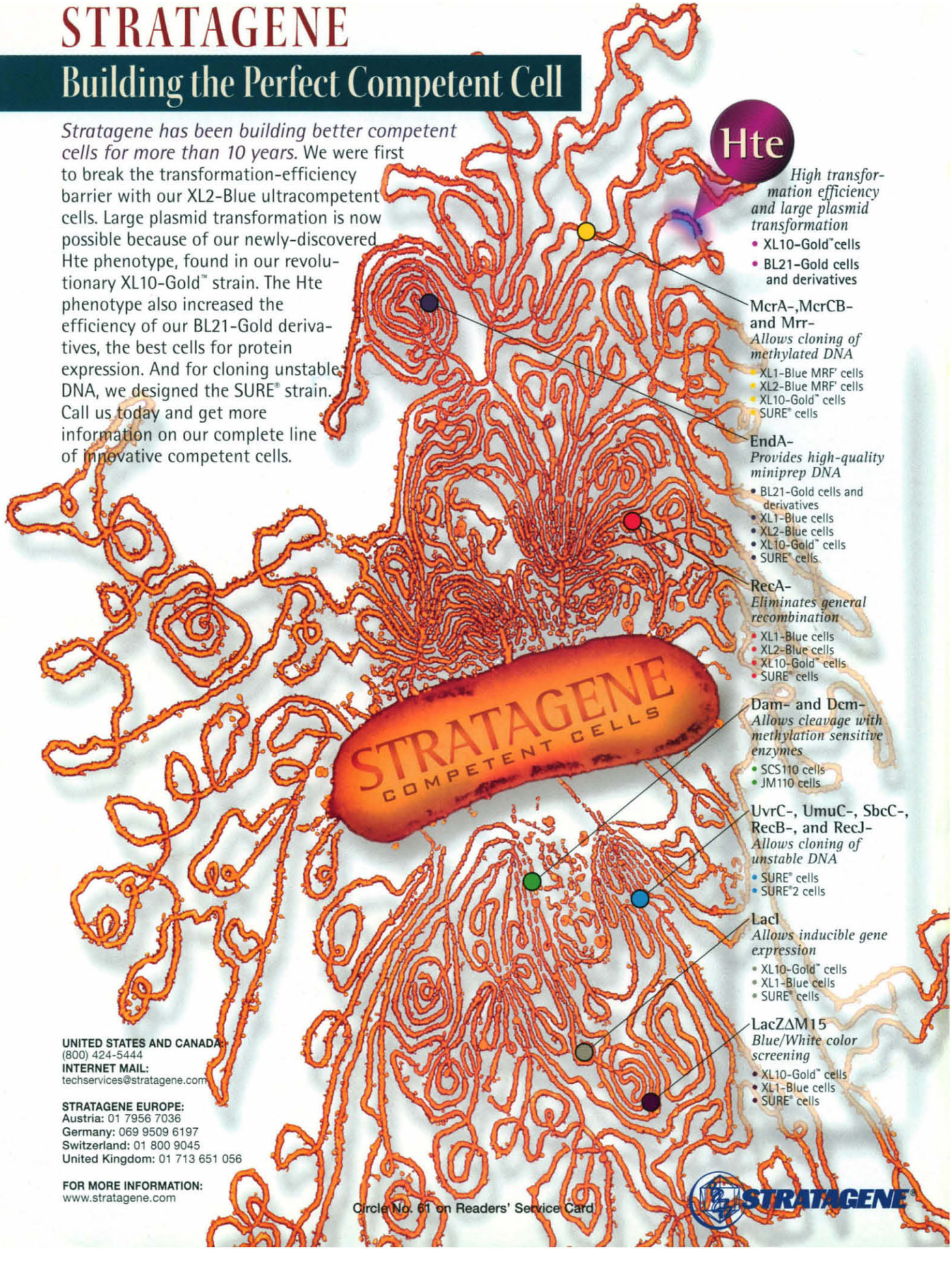


AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

STRATAGENE

Building the Perfect Competent Cell

Stratagene has been building better competent cells for more than 10 years. We were first to break the transformation-efficiency barrier with our XL2-Blue ultracompetent cells. Large plasmid transformation is now possible because of our newly-discovered Hte phenotype, found in our revolutionary XL10-Gold™ strain. The Hte phenotype also increased the efficiency of our BL21-Gold derivatives, the best cells for protein expression. And for cloning unstable DNA, we designed the SURE® strain. Call us today and get more information on our complete line of innovative competent cells.



Hte
High transformation efficiency and large plasmid transformation
- XL10-Gold™ cells
- BL21-Gold cells and derivatives

McrA-, McrCB- and Mrr-
Allows cloning of methylated DNA
- XL1-Blue MRF' cells
- XL2-Blue MRF' cells
- XL10-Gold™ cells
- SURE® cells

EndA-
Provides high-quality miniprep DNA
- BL21-Gold cells and derivatives
- XL1-Blue cells
- XL2-Blue cells
- XL10-Gold™ cells
- SURE® cells

RecA-
Eliminates general recombination
- XL1-Blue cells
- XL2-Blue cells
- XL10-Gold™ cells
- SURE® cells

Dam- and Dcm-
Allows cleavage with methylation sensitive enzymes
- SCS110 cells
- JM110 cells

UvrC-, UmuC-, SbcC-, RecB-, and RecJ-
Allows cloning of unstable DNA
- SURE® cells
- SURE®2 cells

LacI
Allows inducible gene expression
- XL10-Gold™ cells
- XL1-Blue cells
- SURE® cells

LacZΔM15
Blue/White color screening
- XL10-Gold™ cells
- XL1-Blue cells
- SURE® cells

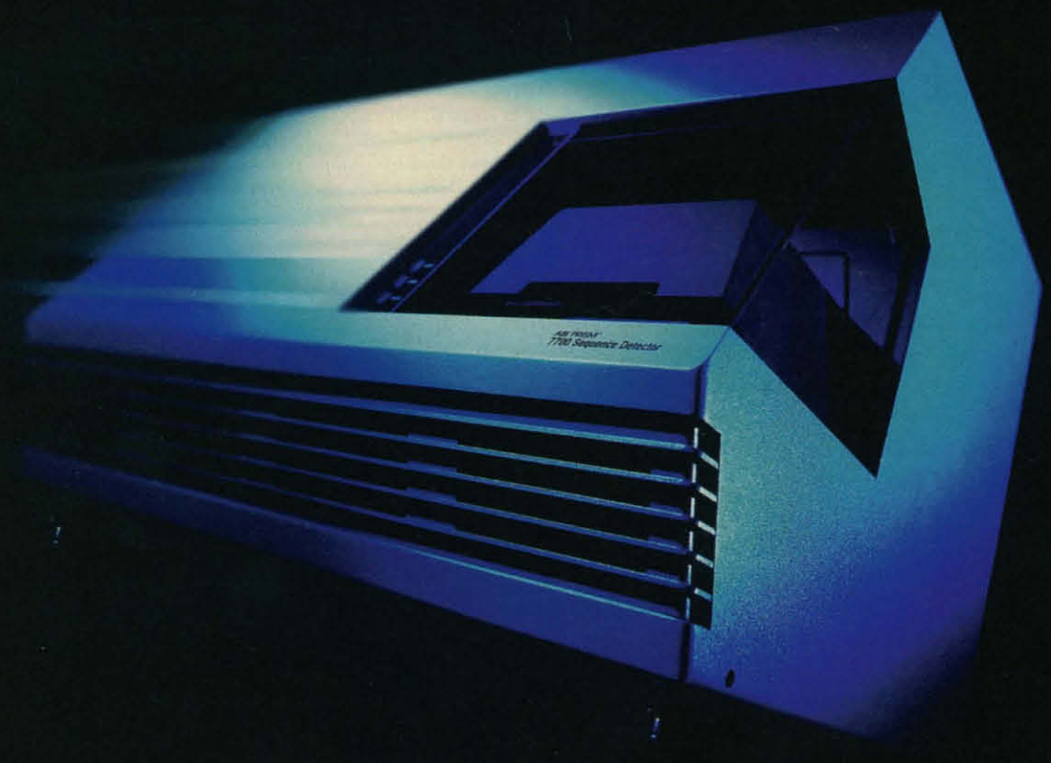
UNITED STATES AND CANADA:
(800) 424-5444
INTERNET MAIL:
techservices@stratagene.com

STRATAGENE EUROPE:
Austria: 01 7956 7036
Germany: 069 9509 6197
Switzerland: 01 800 9045
United Kingdom: 01 713 651 056

FOR MORE INFORMATION:
www.stratagene.com

Circle No. 61 on Readers' Service Card

STRATAGENE®



Think of it as a time machine.

The ABI PRISM® 7700 Sequence Detection System compresses weeks of work into hours. Quantitation of nucleic acids is now faster and more automated than ever before due to the breakthrough of real-time quantitative PCR. Not only is the assay development simple and quick using our proven and well-defined assay design guidelines, but all post-PCR processing steps are eliminated by the integration of thermal cycling, detection, and data analysis. No electrophoresis. No radioactivity. This total solution delivers the highest sample throughput available, enabling thousands of reactions per week. Add our world-class service and support, and you've got a whole new way to speed up your research process. For more information, call 1.650.638.5800.

Real-time quantitative PCR. **Work toward discovery, not against time.**

ABI PRISM® 7700 Sequence Detection System

Applied Biosystems

PE Biosystems

Roche

ISO 9000

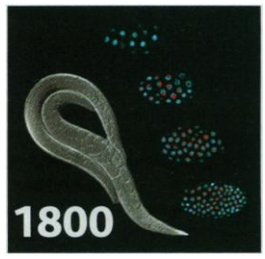
Tel: 1.800.345.5224 or 1.650.638.5800. Fax: 1.650.638.5884. www.pebiosystems.com

Circle No. 30 on Readers' Service Card

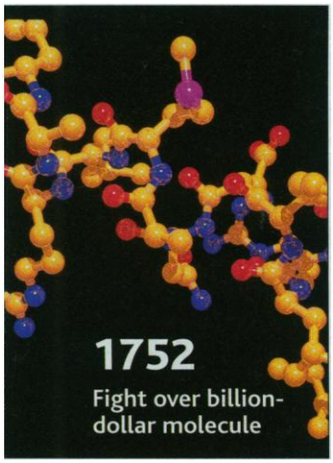
VOLUME 284 11 JUNE 1999 NUMBER 5421

Science

www.sciencemag.org



COVER In mammals, flies, and nematodes, a specialized dosage compensation complex equalizes the expression of genes on the X chromosome between 1X males and 2X females (or hermaphrodites) by modulating transcript levels. In *Caenorhabditis elegans*, SDC-2 protein (red) targets the complex along the X chromosomes of hermaphrodite embryos (~50 μm long) (DNA in blue) at about the 40-cell stage. A mating pair (~1 mm long) is on the left. [Images: H. Dawes and A. Villeneuve]



NEWS

NEWS OF THE WEEK

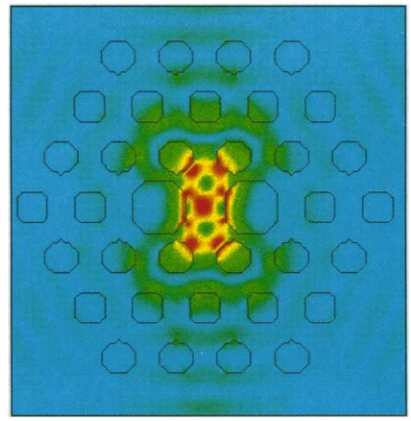
NEWS FOCUS

DEPARTMENTS

RESEARCH

RESEARCH ARTICLES

REPORTS



1819
Lasers make the spotlight

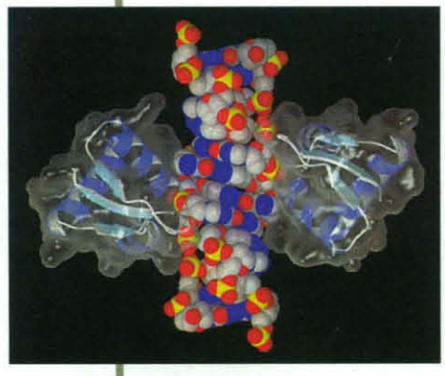
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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

1782

Tropical forests destroyed by fire



1841

Editing by hand

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.

MMC 06-99

In drug discovery, speed is everything. So: what if you could complete a whole week's sample screening in a single day?

LEADseeker programme

LEADseeker™ homogeneous imaging system is the only ultra-high throughput system that gives you a choice of radiometric, fluorimetric and luminescent chemistries and the ability to screen over 100,000 compounds in a single day. In a library of a million compounds, that could mean shortening the screening cycle by weeks. And extending your chances of being first to find suitable lead compounds.

With the LEADseeker technology transfer programme, you have everything you need to focus on screening and make your assay design as simple as possible. We'll also help you to develop your own expertise in-house.

LEADseeker is just one of the technology programmes that we can offer to help you discover, develop and deliver the results that keep you ahead in the drug discovery race.

A faster route to success? Find out more about the LEADseeker technology transfer programme at **www.apbiotech.com/LEADseeker**

Our latest contribution to drug discovery. Speed.

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

amersham pharmacia biotech

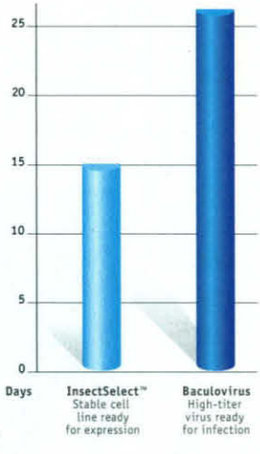
Circle No. 43 on Readers' Service Card

Just Landed–Effortless, Non-Lytic Insect Cell Expression.

A system for effortless, non-lytic insect cell expression has just landed. InsectSelect™ offers you the high protein yields of an insect system without the need for baculovirus.

Non-Lytic, Straightforward Expression. The InsectSelect™ System gives you something baculovirus expression systems can't—non-lytic, continuous expression of recombinant proteins. InsectSelect™ is a simple, straightforward system that eliminates the need for plaque purification and the production of a recombinant viral stock. In less than three weeks you can express your protein in your choice of insect cell line, and continue to produce it for months.

Zeocin™ is a trademark of CAYLA



Non-Stop Expression. The InsectSelect™ System allows continuous expression of recombinant proteins, saving you the time, effort, and expense of reinfecting cells each time you want to express your protein. In addition, there's no cell lysis and no release of protein-degrading proteases which can lower yields of sensitive proteins.

A Single Vector Has it All. The single vector in the InsectSelect™ System has it all—a powerful viral promoter for high-level expression, the Zeocin™ resistance gene for rapid production of stable cell lines, and a C-terminal fusion tag for efficient purification and detection of recombinant proteins.

Don't let effortless, non-lytic expression of your protein flutter by. Call Invitrogen today for more information about how you can catch the new InsectSelect™ System.

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:
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. 54 on Readers' Service Card

FIXING THE FOSSIL TREE

Much of the tree of evolution, and particularly the important details relating to genus and species, has been constructed by cladistics, the analysis of a variety of morphological traits of fossils. Consideration of the temporal occurrence of fossils has been problematic because there may be many gaps in the fossil record and because "living fossils" that preserve primitive traits may persist; often, the temporal data are not weighted or included in the analysis. Fox *et al.* (p. 1816) constructed a computer model of evolution of several character traits and show that inclusion of the temporal occurrences of fossils greatly improves the likelihood of capturing the correct or a reasonable phylogeny.

SMALL, COHERENT, AND BRIGHT

Smaller optical devices could lead to "all-optical" computing and also find applications in communications and in near-field (subwavelength) optics. Painter *et al.* (p. 1819) introduce a cavity laser that is only 0.03 cubic micrometer in size. Its operation combines a laser cavity, which consists of a gap between two reflectors in which the photons can build up, and a photonic crystal that has an intentionally placed defect. The defect, a single departure from the otherwise periodic array of holes etched into the material, effectively "locks" or localizes the light output to that particular point.

ASSAYING ANCIENT ATMOSPHERES

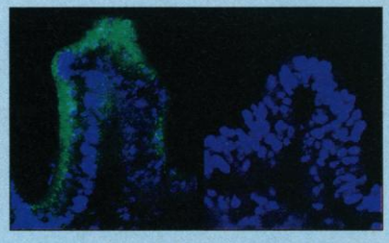
Earth's climate was warmer during the middle Eocene, possibly because atmospheric CO_2 concentrations were considerably greater than they are today or possibly because of differences in ocean circulation. Pearson and Palmer (p. 1824; see the news story by Kerr) evaluated this hypothesis by constructing a pH profile of the Eocene ocean from boron isotopes in several species of fossil plankton—ocean pH reflects the amount of CO_2 dissolved in seawater, which in turn depends on atmospheric CO_2. The data imply that atmospheric CO_2 concentrations during the middle Eocene were similar to or only slightly greater than modern values.

DIRECTING HERMAPHRODITE DEVELOPMENT

For the specification of sexual development, many organisms require the action of two different mechanisms, one that determines overt sexual characteristics (sex determination) and one that equalizes gene expression from the sex chromosomes despite the difference in sex chromosome dose (dosage compensation). Dawes *et al.* (p. 1800; see the cover and the Perspective by Kuroda and Kelley) now demonstrate that a single factor in the nematode *Caenorhabditis elegans* acts as a "switch" to direct hermaphrodite development. This factor, SDC-2, coordinately regulates both sex determination and dosage compensation by acting as a repressor of the male-specific gene *her-1* and by initiating complex formation on the X chromosome to reduce the chromosome's overall expression, respectively. The dual repression functions of SDC-2 in regulating sex determination and dosage compensation in *C. elegans* exemplifies the elaborate control mechanism necessary for such a complex developmental program.

THE CELLULAR CONNECTION IN HEARING

Hair cells in the inner ear are the crucial first link in a long chain of elements that participate in the hearing process, and the destruction of hair cells is one of the most important causes of hearing loss and deafness.



How these cells develop and differentiate during embryogenesis has been largely unknown. Bermingham *et al.* (p. 1837) now identify a proneural gene, *Math1*, that is required for the production of hair cells. This homolog of the *Drosophila* proneural gene *atonal* is expressed in developing sensory patches. In mutant mice that lacked *Math1*, no hair cells developed in the embryo.

HOLDING BOTH LEFT AND RIGHT

Although DNA is usually found in a form known as B-DNA, which is a right-handed double helix—meaning that the spiraling directionality of the sugar-phosphate backbone can be mimicked by the thumb and fingers of the right hand—it does transiently adopt a left-handed form, called Z-DNA, in the wake of an actively transcribing RNA polymerase. Schwartz *et al.* (p. 1841) describe the structure of a complex between Z-DNA and the Z-DNA binding domain of an RNA editing enzyme. They find a familiar motif in DNA-protein interactions, the helix-turn-helix fold used by many proteins in binding to B-DNA. The versatility of this fold is revealed by how the second helix, which normally recognizes specific bases within the major groove when bound to right-handed B-DNA, instead makes polar contacts with the sugar-phosphate backbone of Z-DNA.

STIMULATING SYNAPSES

The underlying mechanisms of the changes in synaptic activity induced by high-frequency stimulation of neurons, such as long-term potentiation (LTP), and their implications for memory, have been controversial; two research articles address these topics (see the news story by Barinaga). The changes induced in AMPA-type glutamate receptor function during repetitive stimulation could be due to greater intrinsic activity or to their recruitment to synapses. Shi *et al.* (p. 1811) were able to count AMPA receptors in hippocampal slice cultures by tagging a subunit with green fluorescent protein. After tetanic stimulation, a large intracellular pool of AMPA receptors was redistributed into dendritic spines or clustered in dendrites. This phenomenon could be prevented by blockade of NMDA receptors in a manner analogous to synaptic potentiation. How does LTP, an electrophysiological phenomenon, relate to memory? Zamanillo *et al.* (p. 1805) show that LTP is essentially absent in mutant mice that lack an important glutamate receptor subunit. However, their spatial learning performance in the water maze test is unchanged. These findings indicate that there is a dissociation between LTP and certain forms of spatial memory. The interplay between events on the cellular and synaptic level and the behavior of the organism is more sophisticated than earlier simplistic models assumed.

VIRAL VIGILANTES

The first response by a mammal to viral infection is to produce the cell-protective type 1 interferons α and β. The major source of the interferon is not known, but natural interferon-producing cells (IPCs) are known to express CD4 and major histocompatibility complex class II proteins. Siegal *et al.* (p. 1835; see the news story by Hagmann) have now determined that these cells are the same as the recently

CONTINUED ON PAGE 1735

POSITIVE I.D. GUARANTEED.

Lining up your next big research project? If so, it's vital to be able to pick out your laboratory animal from all the others who may look alike. Otherwise, as you well know, one misidentified lab animal can spell disaster for your scientific experiment.

It's time to quit worrying, because we've created a unique ELAMS™ microchip transponder that makes animal identification a sure thing (ELAMS stands for Electronic Lab Animal Monitoring System). You can even write your own identification code onto your laboratory animal — and read it loud and clear.

With ELAMS, positive I.D. is guaranteed — in any line-up — with any cast of characters.

BMDS™

Bio Medic Data Systems, Inc.

1 Silas Road, Seaford, Delaware 19973 Toll-Free: 800-526-2637 www.bmds.com

Circle No. 52 on Readers' Service Card

CONTINUED FROM PAGE 1739

identified precursors of type 2 dendritic cells (pDC2s), which can induce a cell-mediated T helper cell response. As these cells mature, they work on various levels to quell viral attacks and they may provide an interesting therapeutic target for boosting antiviral responses.

FIRE AND ECOSYSTEMS

Fire has a well-recognized nature role in shaping ecosystems, but the impact of human activity on fire dynamics needs to be better understood (see the Perspective by Goldammer). Cochrane *et al.* (p. 1832) report that in tropical forests, fires caused accidentally by humans have become much more common. A positive feedback occurs that results in the accumulation of combustable biomass, which leads both to an increased incidence and an increased severity of re-burning. Using the location and patterns of fires and subsequent land use as a guide, the authors estimate that these accidental fires are currently responsible for more Amazon deforestation than intentional timber harvesting and agricultural clearing. Keeley *et al.* (p. 1829) analyzed fire frequency in California brushland using almost a century's worth of data. It has been widely believed that brushlands are similar to woodlands—fire suppression management is needed because fuel accumulation leads to less frequent but more catastrophic fires. In fact, no Californian brushland county appears to have suffered an increase in fire size since 1910; instead, fire frequency is positively correlated with human population density. These results have implications for other fire-prone shrublands in areas of high human population density.

PSD-95 AND NEURONAL CELL DEATH

Excessive Ca^{2+} influx causes cell death in neurons, but the underlying molecular mechanisms are not fully understood. Sattler *et al.* (p. 1835) investigated the specific link between NMDA receptor signaling and the intracellular scaffolding molecule PSD-95. They showed that PSD-95 links NMDA neurotoxicity to the production of nitric oxide (NO). Suppressing PSD-95 by antisense oligodeoxynucleotides selectively blocked Ca^{2+}-activated NO generation by NMDA receptors but not by other glutamate or Ca^{2+} channels.

TECHNICAL COMMENT SUMMARIES

Heat Content Changes in the Pacific Ocean

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/284/5421/1735a

The Acoustic Thermometry of Ocean Climate (ATOC) Consortium (Reports, 28 Aug., p. 1327) compared measurements of the heat content of the Pacific Ocean and sea surface height with results from a general circulation model. They concluded that only about half of the changes in sea level "are attributable to thermal expansion."

K. A. Kelly *et al.* comment "that the ATOC estimates [of heat content changes as made by the numerical model] are too small by a factor of two." Estimates of seasonal heat flux can be reconciled with temperature and sea-level data "after accounting for adiabatic terms, without resorting to large advective contributions."

In response, ATOC agrees "that the model may be underestimating the annual cycle of the heat flux" and states that ATOC has "no conflict with the numbers provided by Kelly *et al.*"

Regional Carbon Imbalances in the Oceans

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/284/5421/1735b

C. M. Duarte and S. Augustí (Reports, 10 July, p. 234) compiled data from many studies to model the relation between "community respiration" and "gross primary production" of ocean ecosystems. They found that, in total, the ocean "biota can act as CO_2 sinks at the global scale."

P. J. le B. Williams and D. G. Bowers comment that the apparent CO_2 deficit calculated in the report is a result of "the form of analysis." They conclude that there is insufficient evidence to suggest "that the open oceans, either as a whole or regionally, are substantially out of organic balance."

In response, Duarte and Augustí discuss choices of data sets and analysis and the challenges of making comparisons across scales and studies. They maintain that "the bulk of available empirical evidence" shows a "pattern toward heterotrophy in the oligotrophic ocean...."

Introducing GIBCO BRL® THERMOSCRIPT RT-PCR Systems.

THERMOSCRIPT™ RT-PCR Systems, employing a novel *avian* RNase H⁻ reverse transcriptase, together with the M-MLV-derived SUPERSCRIPT™ II RNase H⁻ RT family of products, offer exceptional RT-PCR performance, no matter what your need.

THERMOSCRIPT RT-PCR Systems

Higher specificity

- Synthesize cDNA from high secondary structure RNA, rare RNA, and RNA with high GC content, and improve specificity of priming.
- Superior to RNase H⁺ AMV and M-MLV RTs for cDNA synthesis at temperatures up to 70°C.

Higher sensitivity

- 100-times better sensitivity than with AMV H⁺ RT.

Higher yield and longer transcripts

- Reduced RNase H activity for increased percent of full-length cDNA and higher cDNA yield than with AMV or M-MLV RNase H⁺ RTs.
- Amplify RT-PCR targets up to 12 kb.

SUPERSCRIPT Preamplification System

Configured with SUPERSCRIPT II RNase H⁻ RT for first-strand cDNA synthesis. Use for cloning or customize with amplification enzyme of choice for PCR.

SUPERSCRIPT ONE-STEP™ RT-PCR System

Unique combination of SUPERSCRIPT II RNase H⁻ RT and *Taq* DNA Polymerase to amplify up to 3.5 kb fragments.

- Detects 5 to 10 molecules of RNA template.
- Single tube reaction for reduced pipetting and risk of contamination.

Product	Cat. No.
THERMOSCRIPT RT-PCR System for First-Strand cDNA Synthesis	11146-016
with PLATINUM® *Taq* DNA Polymerase	11146-032
with PLATINUM *Taq* DNA Polymerase High Fidelity	11146-040
SUPERSCRIPT Preamplification System	18089-011
SUPERSCRIPT ONE-STEP RT-PCR System	10928-026

U.S. Academic and Government Orders/TECH-LINE™: **(800) 828-6686**
U.S. Industrial Orders/TECH-LINE: **(800) 874-4226**
Internet Ordering and Information: **www.lifetech.com**

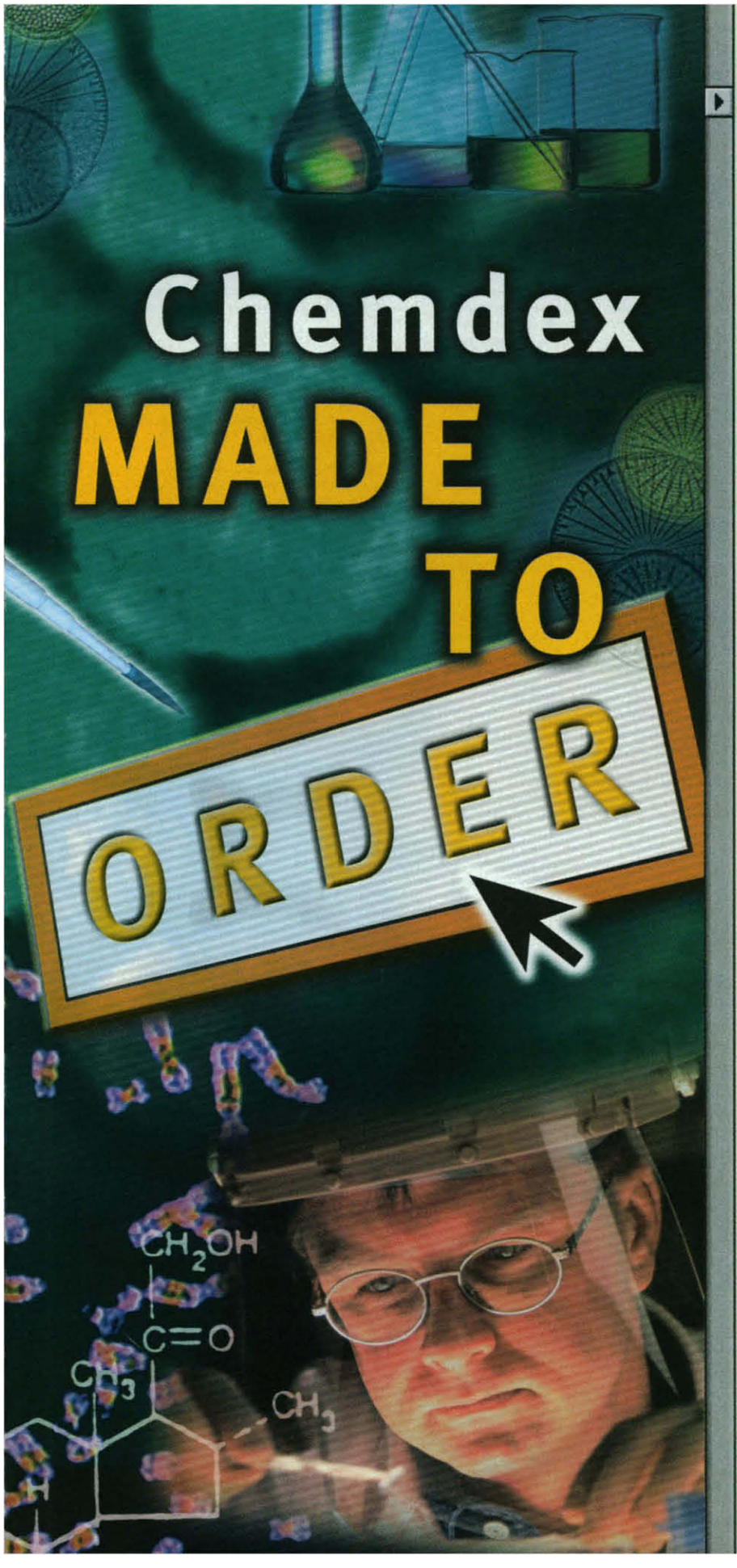
LIFE TECHNOLOGIES™

U.S. Academic & Government Fax Orders: (800) 331-2286 **U.S. Industrial Fax Orders:** (800) 352-1468
Latin America Orders: To Order/TECH-LINE: (301) 610-8709 • Fax: (301) 610-8724
Canada Orders: To Order: (800) 263-6236 • TECH-LINE: (800) 757-8257 • Fax: (800) 387-1007

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. ©1999 Life Technologies, Inc. 98-97CRE

Purchase of these products is accompanied by a limited license to use them in the Polymerase Chain Reaction (PCR) process for research and development 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. Hoffman-La Roche Ltd, Roche Molecular Systems, Inc., and The Perkin-Elmer Corporation.

Circle No. 33 on Readers' Service Card



Convenient One-Stop Shopping

Buy online at Chemdex.com

The Chemdex Marketplace is the best way to buy biological and chemical reagents online. We are adding lab supplies, instruments, and equipment to create a convenient one-stop source for all your laboratory needs.

When you purchase online with Chemdex, you can:

- Buy from the suppliers you know and trust
- Find what you need quickly with our precision search engine
- Order from multiple suppliers with one electronic order form
- Rely on world-class customer service

Visit the Chemdex Marketplace today at www.chemdex.com.

Custom Procurement Solutions

Streamline your purchasing

Chemdex procurement solutions go far beyond our Web site. Our e-commerce technology can be integrated into your company's current systems and customized to match your existing business rules.

Chemdex procurement solutions feature:

- Custom pricing and catalog views
- Electronic requisition routing and approval
- Summary billing and consolidated reporting

Let Chemdex streamline your organization's purchasing process so you can focus on what's important — research and development.

To learn more about our custom procurement solutions, call 1-888-810-4732 or e-mail enterprise@chemdex.com.

Chemdex
Accelerating Science

Chemdex Corporation
3950 Fabian Way, Palo Alto, CA 94303 • 650-813-0300

Circle No. 65 on Readers' Service Card

Science

www.sciencemag.org

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.

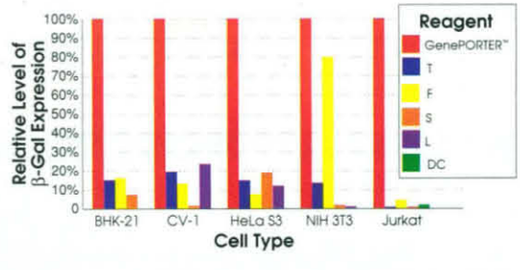
The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of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

Finally, a transfection reagent that makes you smile, every time!

Introducing

GenePORTER™ Transfection Reagent*

GenePORTER™ reagent, which incorporates direct hydrophilic conjugation (DHC) technology,* is the latest innovation from the lab of Dr. Philip Felgner, inventor of lipofection. In a variety of cell lines, GenePORTER reagent consistently delivers higher levels of transfection than any other commercially available product. This robust reagent performs in a wide range of conditions, including different ratios of plasmid and reagent. GenePORTER reagent is easy to use and does not require enhancers or special handling of cells, saving time, cost, and reagents. Order GenePORTER reagent today. The results will make you smile.



The β-gal expression plasmid was delivered into cells using GenePORTER or competitor's transfection reagents. Each manufacturers protocol was followed. A colorimetric assay was used to measure β-gal expression 48 hours after transfection.

GenePORTER™
Transfection Reagent
75 reactions (0.75 ml) • T201007
150 reactions (1.5 ml) • T201015
750 reactions (5 x 1.5 ml) • T201075

New High Expression Vectors
gWiz™* Expression Vectors
Call for a brochure or visit our web page
* Patents pending.

GTS
Gene Therapy Systems
"the art of innovation"

To Order: 888-428-0558
Fax: 619-623-9494
10190 Telesis Court, San Diego, CA 92121, USA
Check out the Gene Therapy Systems web site @
http://www.genetherapysystems.com

Gene Therapy Systems International Distributors

Australia • ASTRAL +61-2-9540-2055 **Austria** • BIO-TRADE +43 1 889 18 19 **Benelux** • BIOzym+31+(0)45 532 77 55 **Denmark, Finland, Norway, Sweden** • KEBO Lab +46 8 621 35 07 **France** • OZYME +1 30 85 92 92 **Germany** • BIOzym GmbH +49 5152-9020 **Italy** • Duotech 39 02 331 066 30 **Japan** • Funakoshi +81-3-5684-1622 **Korea** • Core Bio +82 2 841-7530 **Spain** • BioNova +34 91 551 54 03 **Switzerland** • Axon Lab AG +41 56 484 80 80 **Taiwan** • PROtech, Ltd. 886-2-23810844 **United Kingdom** • Lifescreen Ltd. +44 0 1923 241515

Circle No. 59 on Readers' Service Card

TIME MACHINE

The New **Mini-Prep 24** for Automated Plasmid Mini-Preps

The Mini-Prep 24 uses a new method of plasmid purification based on agarose gel electrophoresis and subsequent recovery by electroelution.

The Mini-Prep 24 uses premanufactured sample cassettes that come ready for direct loading of up to 2 ml of culture.

Call now to learn how the New Mini-Prep 24 can give you with quality DNA while saving you lots of time.

High Purity - sufficient for automated fluorescent and manual sequencing.
Easy Operation - begin prep with direct loading of bacteria culture - no centrifugation step saves you time.
Consistent Results - up to 6 µg of plasmid per ml.
Fast - up to 24 preps per hour, saving you time.
Quality - time and time again.

MacConnell RESEARCH

1-800-466-7949

11339 SorrentoValley Rd • San Diego, CA 92121 Phone: (619) 452-2603 Fax (619) 452-6753
www.macconnell.com

Circle No. 28 on Readers' Service Card

Illustration inspired by Art Deco poster art of the post-WWI era.

ClonCapture cDNA enrichment from a human liver library

Gene	Representation in original library (%)	Positive clones after hybridization (%)	Enrichment
Dad1	0.005	27	5.4×10^3
Tob1	0.01	15	1.5×10^3
GBP	0.0002	10	5×10^2
IAP	0.0002	9	4.5×10^4
Estrogen receptor	0.005	5	8×10^2
Bcl-x	0.005	4.5	8×10^2
RPA	0.007	3.2	5×10^2

* 75–100% of positive clones were confirmed by sequencing.

Save even more time by choosing a high-quality CLONTECH premade library. Visit our web site at libraries.clontech.com for a full listing!

The ClonCapture cDNA Selection Kit (K1056-1) can get you the clones you want in 2–3 days without library screening. All you need is a 200–600-bp probe for your target gene. ClonCapture is based on proprietary technology that utilizes the RecA protein to create and stabilize a hybrid between the probe and double-stranded plasmid DNA. These target clones are then captured on magnetic beads, allowing you to efficiently screen an enriched population for full-length clones. ClonCapture is compatible with all plasmid libraries—no need for single-strand conversions. Call and order today!

In Germany please contact CLONTECH GmbH • Tel: 06221 34170 Fax: 06221 303511
In the UK please contact CLONTECH UK Ltd. • Tel: 01256 476500 Fax: 01256 476499
In Japan please contact CLONTECH Japan Ltd. • Tel: 03 3523 9777 Fax: 03 3523 9781
In Switzerland please contact CLONTECH AG • Tel: 061 68354 50 Fax: 061 68354 52

Distributors: Australia: 61 7 3273 9100 ■ **Austria and Eastern Europe:** 43 1 3106688 ■ **Belgium/Luxembourg:** 0 800 1 9815 ■ **Brazil:** 55 11 66940539 ■ **Canada:** Now call CLONTECH direct • 800 662 2566 ■ **China:** BEIJING YUANGPING BIOTECH • 86 10 68187551; GENE CO. LTD. • 021 6428 7163; SINO-AMERICAN BIOTECH CO. • 86 21 6402 2371 ■ **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:** 603 777 2611 ■ **Mexico:** 525 281 4718 ■ **The Netherlands:** 31 33 495 00 94 ■ **Norway:** 47 22 421 520 ■ **Poland:** 49 06221 34170 ■ **Portugal:** 351 361 36 20 ■ **Scandinavia:** 46 8 728 00 65 ■ **Singapore:** 65 775 7284 ■ **South Africa:** 27 21 615166 ■ **Spain:** 34 9 1 630 0379 ■ **Taiwan:** 886 2 27202215 ■ **Thailand:** 662 530 3804 4 ■ **Turkey:** 90 216 385 8321 rev.4/7/99

CLONCAPTURE No license required!

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

(AD89771)

Circle No. 35 on Readers' Service Card

NEW ANTIBODIES

NEW ENGLAND BIOLABS

CELL SIGNALING

DNA Damage/Protein Acetylation

FOR ANALYSIS OF p53 PHOSPHORYLATION & LYSINE ACETYLATION

Acetylated-Lysine Antibody

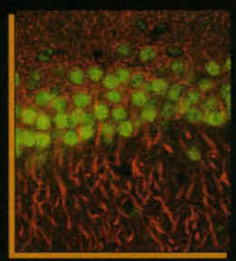
Western analysis of extracts from TSA treated COS cells using Acetylated-Lysine Antibody (A) and MAPK Antibody (B).

Increase in p53 acetylation of UV treated 293 cells detected by IP using p53 Antibody followed by Western blotting using Acetylated-Lysine (A) and p53 Antibodies (B).

Increase in Histone acetylation of NIH/3T3 cells treated with 5 mM sodium butyrate for 24 hours detected by Western blotting using Acetylated-Lysine Antibody.

Phospho-p53 (Ser15) Antibody

Western analysis of cell extracts from PC12 cells or Hela cells treated with UV using Phospho-p53 (Ser15) Antibody.



Confocal image of double immuno-staining for Phospho-p53 (Ser15) Antibody (green) and propidium iodide (red) in rat hippocampus CA1 region from tissue section of 15 minutes of transient cerebral ischemia followed by 3 hours of reperfusion. Yellow represents overlay of red and green. (Provided by Dr. Bingren Hu, Queens Medical Center, Hawaii.)

New England Biolabs maintains an active cell signaling research group and is committed to developing reagents to study growth, survival, death and cell cycle checkpoint signaling. All of our antibodies are manufactured and rigorously characterized by our own scientists with respect to specificity and sensitivity. Choose NEB when your research demands the highest quality reagents.

Visit our home page at www.neb.com for up-to-the-minute new product announcements.

Acetylated-Lysine Antibody	#9441
New Phospho-specific Antibodies	
Akt (T308)	#9275
ATF-2 (T69/71)	#9225
GSK-3α/β (S21/9)	#9331
p38 MAPK (T180/Y182)	#9211
p44/42 MAPK monoclonal (T202/Y204)	#9106
SAPK/JNK monoclonal (T183/Y185)	#9255
Phospho-MAPK Antibody Sampler	#9910
p53 (S15)	#9284
p53 (S392)	#9281
p70 S6 Kinase (T389)	#9205
p90RSK (S381)	#9341
PKCβ (S660)	#9371
PKCδ (T505)	#9374
Stat5 (Y694)	#9351
Stat6 (Y641)	#9361
Tyk2 (Y1054/1055)	#9321

NOW AVAILABLE

General Phospho-specific Antibodies

Phospho-Threonine-Proline monoclonal	#9391
Phospho-Tyrosine monoclonal	#9411

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

- **New England Biolabs Inc.** 32 Tozer Road, Beverly, MA 01915 USA 1-800-NEB-LABS Tel. (978) 927-5054 Fax (978) 921-1350 email: info@neb.com
- **New England Biolabs Ltd., Canada** Tel. (800) 387-1095 (905) 672-3370 Fax (905) 672-3414 email: info@ca.neb.com
- **New England Biolabs GmbH, Germany** Tel. 0800/BIOLABS (06196) 3031 Fax 0800/BIOLABX (06196) 83639 email: info@de.neb.com
- **New England Biolabs (UK) Ltd.** Tel. (0800) 31 84 86 (01462) 420616 Fax (01462) 421057 email: info@uk.neb.com

NEW ENGLAND BioLabs Inc.

CELL SIGNALING

DISTRIBUTORS: Australia (07) 5594-0299; Belgium (0800)1 9815; Brazil (011) 366-3565; Denmark (39) 56 20 00; Finland (9) 584-121; France (1) 34 60 24 24; Greece (01) 5226547; Hong Kong 2649-9988; India (542) 311473; Israel (03) 9229013; Italy (02) 381951; Japan (03) 5820-9408; Korea (02) 556-0311; Netherlands (033) 495 00 94; New Zealand 0800 807809; Norway 22 09 15 00; Singapore 4457927; Spain (03) 902 20 30 90; Sweden (08) 30 60 10; Switzerland (061) 486 80 80; Taiwan (02) 28802913

Circle No. 44 on Readers' Service Card

CHECK OUT THE BIOCOAT® ADVANTAGES!

There's never been a better time to try BIOCOAT® Cellware! Now available with Collagen I, Gelatin, Poly-D-Lysine or Poly-L-Lysine — in a variety of tissue culture vessels! Researchers can now spend more of their valuable time *performing* experiments instead of preparing for them. Get the BIOCOAT advantages...now at a price you can afford!

WIDE SELECTION

BIOCOAT Cellware is offered in a wide assortment of tissue culture vessels — from FALCON® clear polystyrene Multiwell™ plates to a variety of dishes and flasks. Also available are FALCON® 96-well and 384-well assay plates in solid white opaque and black and white opaque with clear bottoms.

CUSTOM PRODUCTS

Looking for a special coating or vessel? We can 'Custom Coat' to meet your individual needs. Please contact our Technical Services Department for details.

For More Information, Visit Our Web Site...
www.bd.com/labware

FALCON®
BIOCOAT®
CELL ENVIRONMENTS

✓ Ready-To-Use Convenience

Save labor and increase productivity by spending more of your valuable time performing experiments instead of preparing for them.

✓ Reliable Performance

Improve cell attachment and increase proliferation rates for a variety of normal and transformed cells.

✓ Room Temperature Stability

Too little space in your cold room is no longer a problem! Our proprietary formulation and manufacturing techniques result in products that are stable at room temperature.

✓ Quality Assurance Testing

Products are thoroughly tested and guaranteed to perform as claimed so you can use them with complete confidence.

✓ Lot-To-Lot Consistency

Highly controlled production environment and validated manufacturing procedures assure product uniformity and cell culture performance.

✓ Affordable Pricing

Our automated production facility and improved packaging have enabled us to achieve significant cost savings—savings we have passed on to our customers by substantially reducing list prices!

Order BIOCOAT® products from your authorized distributor or call us directly at 1-800-343-2035.

BECTON DICKINSON

Becton Dickinson Labware
Two Oak Park • Bedford, MA 01730 USA
Fax:(800) 743-6200 • e-mail: mail@bdl.bd.com

Circle No. 22 on Readers' Service Card

QUALITY

SERVICE

RELIABILITY

NOW

QUALITY

SERVICE

RELIABILITY

INNOVATION

mannheim boehringer

Roche

Boehringer Mannheim Biochemicals has become Roche Molecular Biochemicals

What's in a name? If the name happens to be Boehringer Mannheim, the answer is excellence. For more than 50 years, researchers worldwide have looked to us for superior product quality, outstanding customer service, and corporate reliability. Even though our name is now changing, you can continue to rely on the same products, people, and promise of excellence you always have, plus something new.

By joining forces with Roche, we can now offer you the benefits of one of the health care industry's largest investments in pharmaceutical and diagnostic research and development. Roche's commitment to innovation, paired with our quality and reliability, is already resulting in new, better solutions for your lab. Look for them on our website, from our people, in our 1999 catalog, or wherever you see our new name, Roche Molecular Biochemicals.

Circle No. 46 on Readers' Service Card

We recognize academic excellence.

1998 PFIZER SUMMER UNDERGRADUATE RESEARCH FELLOWSHIP AWARDEES

SYNTHETIC ORGANIC CHEMISTRY

Awardee	*School*	*Mentor*
Elizabeth M. Ruel	Boston College	Scott J. Miller
Tara Winstanley	Boston College	Lawrence T. Scott
Ryan M. Spoering	Colorado State University	Louis S. Hegedus
Joann M. Um	Columbia University	Koji Nakanishi
Benjamin S. Edelson	Harvard University	E.J. Corey
Christine G. Espino	Harvard University	Eric N. Jacobsen
Jennifer M. Vance	UC, Irvine	Larry E. Overman
Krista M. Entrop	University of Maryland	Jeffery T. Davis
David E. White	University of Michigan	Masato Koreeda
Jason C. Wong	MIT	Rick L. Danheiser
Shane J. Degen	University of Minnesota	Richard P. Hsung
Robert J. McDonald	University of Minnesota	Thomas R. Hoye
Steven L. Kuklish	University of Nebraska	David Berkowitz
Michael N. Weaver	North Carolina State	David A. Shultz
Eileen Farahay	Ohio State University	Yen-Ho Chu
Michael T. Rudd	Purdue University	P.V. Ramachandran
Liam C. Palmer	University of South Carolina	James M. Tour
Anna Chiu	Stanford University	Paul A. Wender
Jason C. Link	Texas A&M University	Gyula Vigh
Mohammed Ghonim, Jr	UCLA	Christopher S. Foote
Jason Klovning	University of Wisconsin	Steven D. Burke

MOLECULAR BIOLOGY

Awardee	*School*	*Mentor*
Josephine H. Haduong	Amherst College	Caroline Goutte
Shelley Saber	Brandeis University	Leslie Griffith
Banumathi Kuppusami	William and Mary	Margaret S. Saha
Valorie T. Ryan	Florida Institute of Technology	Alan C. Leonard
Kevin N. Sheth	Johns Hopkins University	Solomon H. Snyder
Christopher Baugh	Johns Hopkins University	Joel F. Schildbach
Melody Hou	Northwestern University	Amy C. Rosenzweig
Megan Bergkessel	Penn State University	Joseph C. Reese
Ryan P. McCarthy	Purdue University	Klaus M. Herrmann
Christian T. Carson	University of Colorado	Brian Parr
Charay D. Jennings	University of Maryland	Lasse Lindahl
Mikal-Anne Waters	University of Utah	Michael McIntosh
Jessica Gross	University of Wisconsin	Jo Handelsman
Jason W. Griffith	Vanderbilt University	Ellen Fanning
Marielle Yohe	Wesleyan University	Ishita Mukerji

PHARMACY

Awardee	*School*	*Mentor*
Travis Worst	Ohio Northern University	Jon E. Sprague
Ya Xi Wang	St. John's University	Chandra S. Chaurasia
Lucy Lee	University of Maryland	Emmeline Edwards
Allison J. Doyle	University of Wisconsin	William S. Mellon

CHEMISTRY

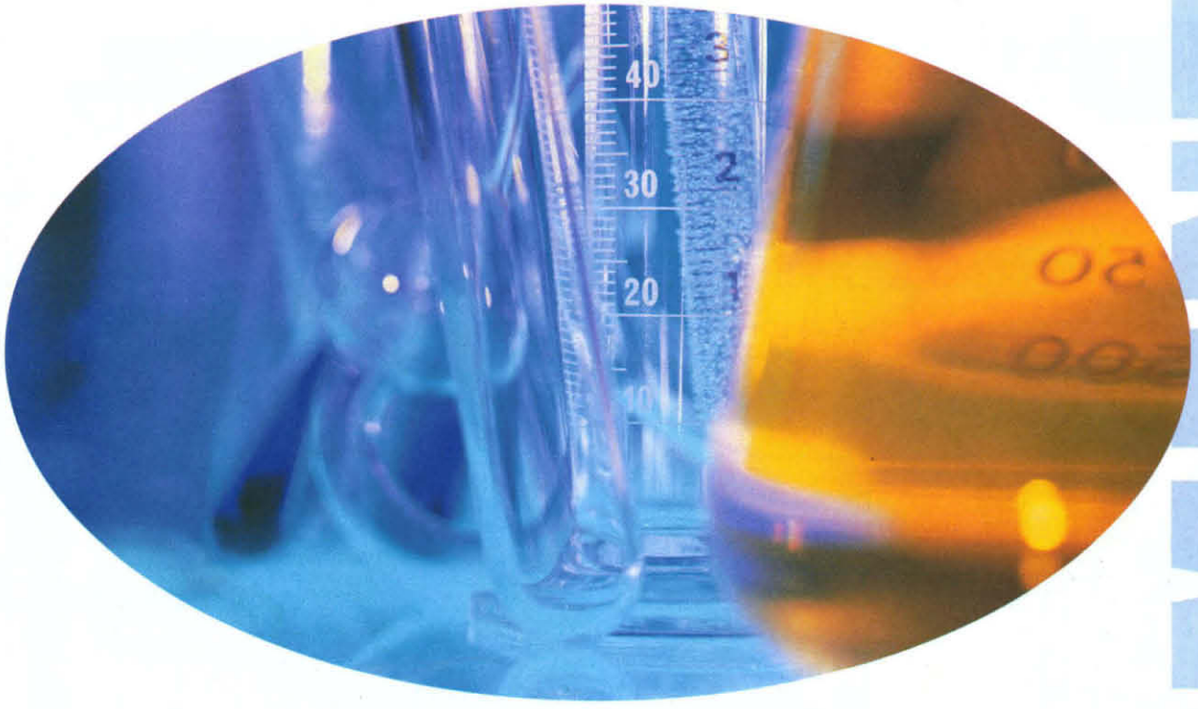
Awardee	*School*	*Mentor*
Christopher Colapietro	Bates College	Rachel N. Austin
Christina M. Marchetti	Bowdoin College	Ellen E. Burns
Cheryl L. Morse	Bucknell University	Gretchen M. Rehberg
E. Joseph Nemanick	Carleton College	Steven Drew
Anne R. Smith	Holy Cross	Timothy P. Curran
Carrie S. Callis	William and Mary	Christopher J. Abelt
Clay S. Bennett	Connecticut College	Bruce R. Branchini
Kari K. Cox	Furman University	Moses Lee
Kevin Paulisse	Hope College	William F. Polik
John Northrop	Johns Hopkins University	Gary H. Posner
Sharon Simpson	Juniata College	I. David Reingold
Peter L. Steinberg	Middlebury College	Jeffrey H. Byers
Suazette Reid	Morgan State University	Yousef Hijji
Kerry Murphy	Providence College	Sheila M. Adamus
Annemarie Gallo	Saint Joseph's University	Mark A. Forman
Maria T. Batista	Stevens Institute of Technology	Ajay K. Bose
Jennifer E. Chick	Union College	James C. Adrian, Jr.
Lisa LeBlanc	University of Connecticut	Amy Howell
Susannah R. Hindes	UMASS, Dartmouth	Gerald B. Hammond
Jason P. Burke	University of Vermont	Martin E. Kuehne
Christine M. Micheel	Washington University	William E. Buhro
Cheryl K. Eddins	Worcester Polytechnic Institute	James W. Pavlik

BIOCHEMISTRY

Awardee	*School*	*Mentor*
Steven M. Truscott	Brigham Young University	Gerald D. Watt
Lindsay Windham	Texas A&M University	David P. Giedroc
Liana Lamont	University of Illinois	George Ordal
Emily J. Tan	University of Kentucky	Kevin D. Sarge
Michael S. Werkema	University of Michigan	Alexander J. Ninfa
Jennifer McElhenny	University of Virginia	Ronald P. Taylor
Jennifer M. Wright	Worcester Polytechnic Institute	Kristin K. Wobbe

BIOLOGY

Awardee	*School*	*Mentor*
Michal Eisenberg	Barnard College	John I. Glendinning
Jay Bikoff	Brown University	Eric A. Hendrickson
Hannah Blitzblau	Brown University	Susan A. Gerbi
Charles R. Tessier	Clark University	Thomas J. Leonard
Tarun Bhalla	Drew University	David M. Miyamoto
Robyn Tornabene	Hofstra University	Joanne M. Willey
Brian R. Chapados	SUNY, Fredonia	Laurie F. Caslake
Regan E. Gealy	University of Pittsburgh	Stephen T. Kilpatrick
Charu P. Vepari	Worcester Polytechnic Institute	Pamela J. Weathers



ACHIEVEMENT

We're Pfizer. Each summer, we provide undergraduate research fellowships which allow students to conduct independent research on their own campuses, under the guidance of their faculty mentor. Each year, colleges and universities throughout the U.S. nominate outstanding undergraduates. Fellowships are awarded on the merits of the students' research proposals, academic records, faculty recommendations and their passion for laboratory science. It is our belief that, for many, this Pfizer program provides students with an important opportunity to reap the many benefits accrued by engaging in research in a stimulating laboratory environment. We congratulate the following 1998 Pfizer Summer Undergraduate Research Fellowship Awardees.

"Scientific research drives discovery of novel therapeutants. Pfizer is proud to support scientific excellence and, in particular, to recognize promising young scientists of the future."

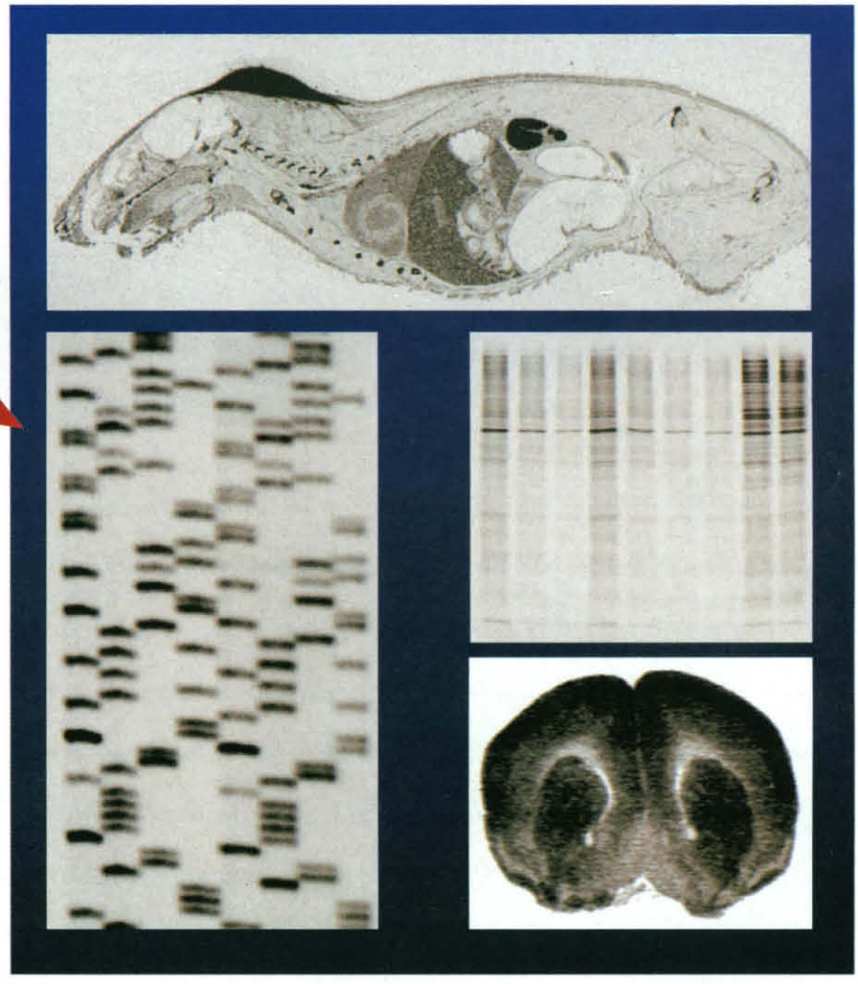
John F. Niblack, Ph.D.
Executive Vice President, Pfizer Inc

Pfizer 150

Life is our life's work.

www.pfizer.com

Highest Performance, Lowest Price



$14,987* USD

Cyclone Storage Phosphor System

The Cyclone™ utilizes a state-of-the-art confocal optical design in a helical scanning system. This unique design optimizes efficiency of detection, resolution and sensitivity with a long linear dynamic range. This compact system enables the Cyclone to take advantage of the best phosphor screens and to get the highest performance for every sample.

- 42 micron pixel resolution
- Up to 10 to 100 times faster than film
- Choice of 11 phosphor screens to suit any application
- Cyclone fits your lab and your budget

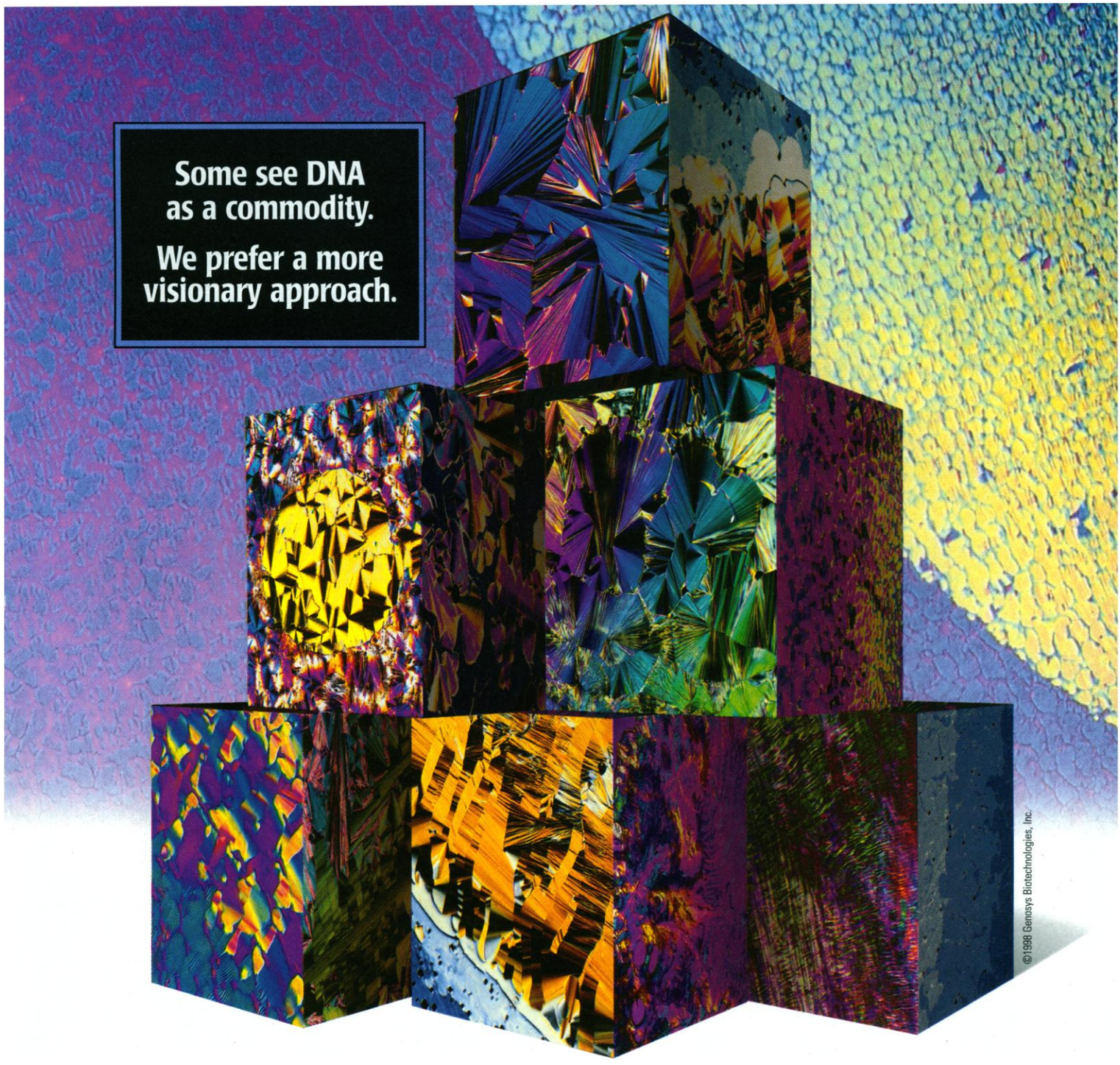
Contact Packard today for more information about the new Cyclone Storage Phosphor System.

*Prices will vary outside the U.S.A. due to exchange rates, freight, duties, and local service.

Packard
A Packard BioScience Company

Packard Instrument Company
800 Research Parkway
Meriden, CT 06450 U.S.A.
Tel: 203-238-2351
Toll Free: 1-800-323-1891
FAX: 203-639-2172
Web Site: http://www.packardinst.com
Email: webmaster@packardinst.com

Packard International Offices:
Australia 03-9543-4266 or 1 800 335 638;
Austria 43-1-2702504; **Belgium** 32(0)2/481.85.30;
Canada 1-800-387-9559; **Central Europe** 43 456 2230 015;
Denmark 45-43909023 or 45-43907151;
France (33) 1 46.86.27.75; **Germany** (49) 6103 385-151;
Italy 39-2-33910796; **Netherlands** 31-50-549 1296;
Russia 7-095-259-9632; **Switzerland** (01) 481 69 44;
United Kingdom 44 (0)118 9844981



Call us idealistic, but we think your next custom oligo should be a thing of beauty.

Here's how we see it. Whether you need a couple of probes or primers, or a couple of thousand, you'll want impeccable quality and assured performance. That's why every Genosys oligo comes with its own certificate of Quality Assurance that includes a digitized PAGE analysis, quantitated yield, melting temperature and MW.

1-800-853-3385
www.genosys.com

Of course, selection is important, too. So if your taste in oligos goes beyond plain vanilla primers, you'll be happy to know that our "standard flavors" include 6-FAM, HEX, TET, biotin, phosphorylation, fluorescein, amine labeling, Texas red and rhodamine. And if you're looking for S-oligos, 96-well plates, or even whole genes, look no further.

24-hour shipment? Routine for standard primers. Easy e-mail, web or fax ordering? Whichever you prefer. Knowledgeable, friendly tech support? Included free with every oligo.

Want to share the vision? Call today to discuss your DNA requirements. For a really transcendental experience, let us handle your next order.

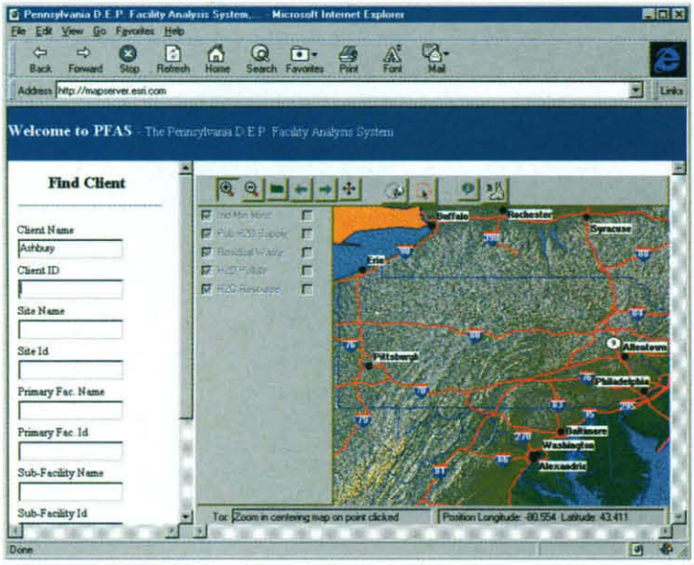
DNA micrographs are courtesy of Michael W. Davidson, director of the Optical Microscopy Division of the National High Magnetic Field Laboratory, a joint venture of The Florida State University, the University of Florida, and Los Alamos National Laboratory.

Circle No. 66 on Readers' Service Card

GENOSYS

Genosys Biotechnologies, Inc., The Woodlands, Texas, Phone: (281) 363-3693, E-Mail: info@genosys.com
Cambridge, U.K., Phone: (+44) (0)1223 839000, E-Mail: genosys@genosys.co.uk
Hokkaido, Japan, Phone: 81 133 73 5005, E-Mail: genosys@genosys.co.jp

Receiving Geographical Information Instantly and Effectively...No Matter Where.



Disseminating environmental information effectively to scientists, policy makers, and the public is critical for protecting our environment. Providing information on environmental conditions in its proper geographical context over the Internet allows this to occur. Geographic information system (GIS) is the tool for data inventory, environmental modeling, and analysis. GIS is also the tool for decision support across the Internet.

ESRI, the world leader in GIS, has facilitated the reinvention of environmental information. ESRI's Spatial Database Engine™ (SDE™) allows you to store, manage and integrate spatial data, while ESRI's Internet Map Server (IMS) lets you serve dynamic maps over the Internet. These tools help you improve environmental protection, while reducing your bottom line. More importantly, GIS has enabled better environmental information to reach the stakeholders in the community. Call us today to find out more.

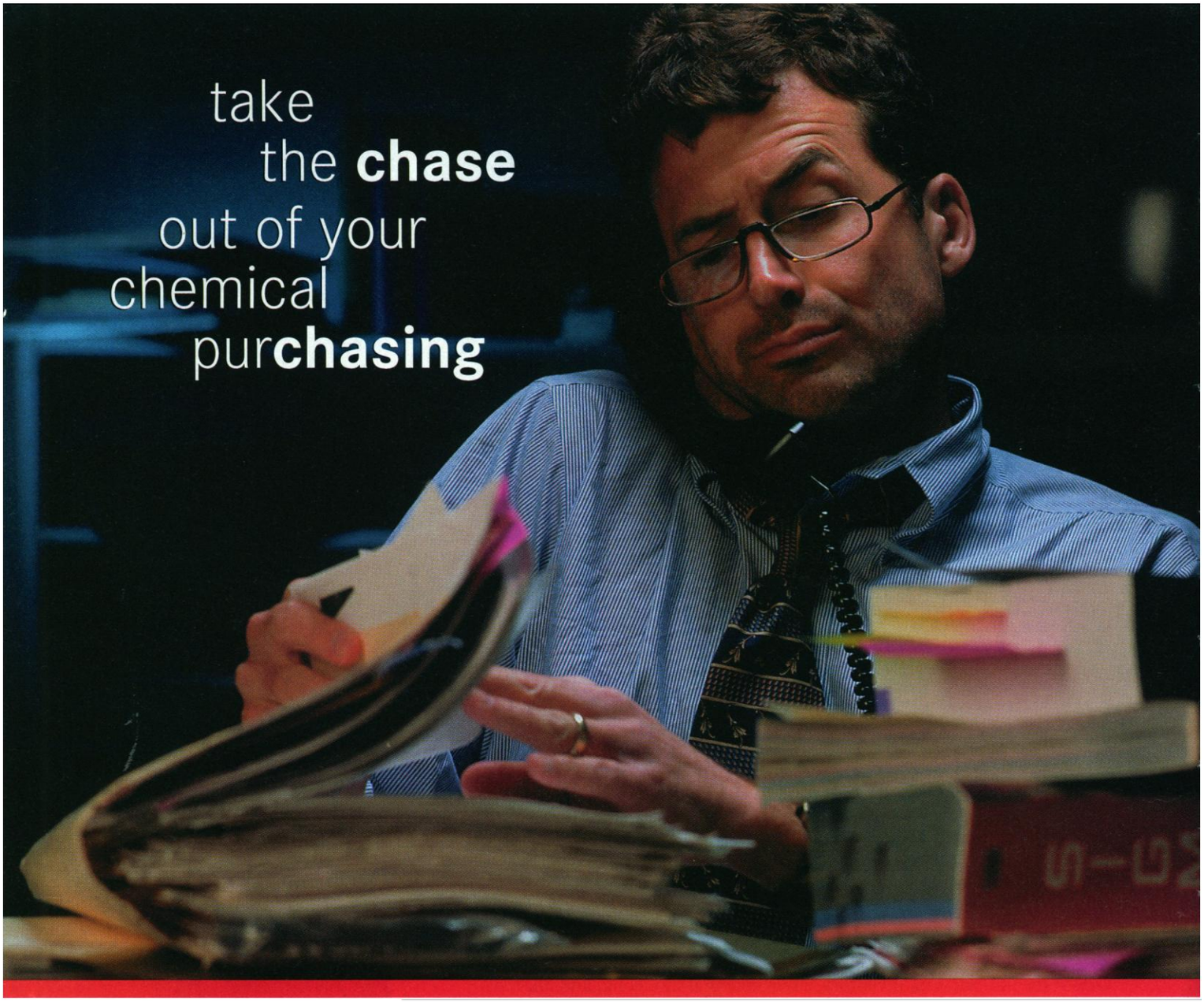
1-888-333-2943

www.esri.com/environment

E-mail: **info@esri.com**

ESRI

Circle No. 25 on Readers' Service Card



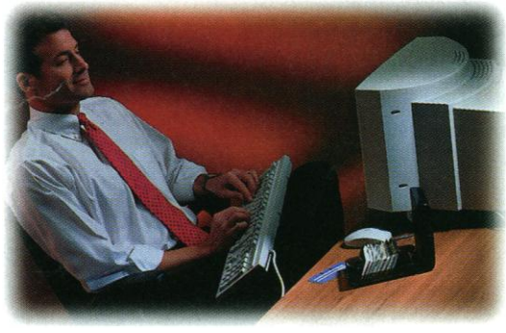
TRY OUR eCOMMERCE SOLUTION @ **www.sigma-aldrich.com**

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

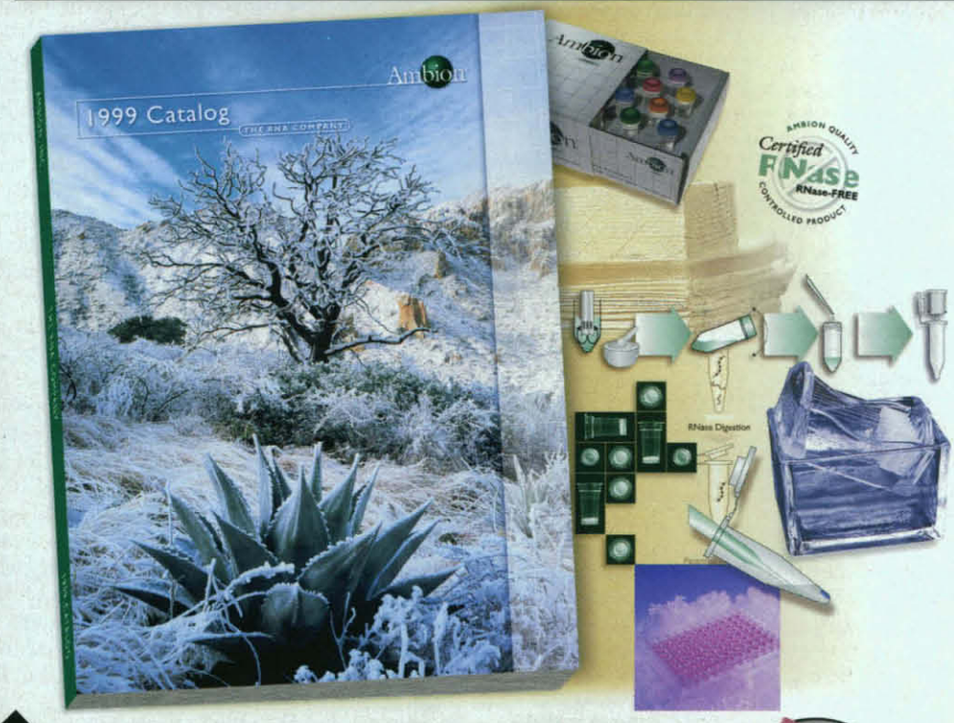
3050 Spruce Street, St. Louis, MO 63103 • 800-521-8956 or 314-771-5765

Circle No. 34 on Readers' Service Card

MORE THAN 97 NEW WAYS TO STUDY

RNA Better, Faster, Easier.

Choose from the best selection of leading edge products and kits optimized for solving the unique challenges of RNA analysis. In the new 1999 Catalog, you will discover more than 97 new products to help you optimize isolation for higher yields, increase the sensitivity of detection assays and quantitate RNA better, faster and easier.



ISOLATE, DETECT, QUANTITATE

Do you isolate, detect or quantitate RNA? Then you need the innovative products from Ambion, The RNA Company.

New in the 1999 Catalog

- NEW ADVANCES IN RNA ISOLATION THAT OPTIMIZE YIELDS
- TOOLS TO IMPROVE RT-PCR QUANTITATION AND USE RELATIVE RT-PCR IN A NEW WAY
- A REVOLUTIONARY METHOD TO PERFORM IN SITU HYBRIDIZATIONS
- NEW WAYS TO IMPROVE YIELDS IN TRANSCRIPTION:TRANSLATION REACTIONS

GET INFORMATION NOW VIA EMAIL ON THE BEST NEW PRODUCTS OF 1999:

To immediately receive descriptions, catalog numbers and prices on the hottest new products and to request your 1999 Catalog, email your postal mailing address to 99cataloginfo@ambion.com

Catalogs may also be requested by phone, fax or the reader service number below.

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

U.S. (800)888-8804
Canada (800)445-1161

Ambion®
THE RNA COMPANY™

Circle No. 67 on Readers' Service Card

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

HUMAN FRONTIER SCIENCE PROGRAM (HFSP)

Bureaux Europe, 20 place des Halles, 67080 STRASBOURG Cedex, FRANCE
Tel: 33 (0)3 88 21 51 21 Fax: 33 (0)3 88 32 88 97 E-mail: info@hfsp.org
Web site: http://www.hfsp.org

CALL FOR APPLICATIONS FOR 2000 AWARD YEAR
(Deadline for receipt of applications is 1 September 1999)

The aim of the Human Frontier Science Program (HFSP) is to promote, through international collaboration, basic research to elucidate the complex mechanisms of living organisms, including man. Applications are solicited for the support of research grants, fellowships and workshops in the areas set out below.

RESEARCH AREAS OF THE HFSP
Basic Research for the Elucidation of

(B) Brain Functions

1. Elementary Processes
2. Perception & Cognition
3. Movement & Behavior
4. Memory & Learning
5. Language & Thinking

(M) Biological Functions through Molecular Level Approaches

1. Expression of Genetic Information
2. Morphogenesis
3. Molecular Recognition & Responses
4. Energy Conversion

TYPES OF SUPPORT

The program will only support research that **transcends national boundaries**. Thus, **research grants** will be awarded for programs that involve collaboration between teams in different countries; **fellowships** are available to young post-doctoral scientists who wish to work in a different country; **international workshops** are organized in Strasbourg.

RESEARCH GRANTS Grants for basic research (up to 3 years) carried out jointly by research teams in different countries. The principal applicant must be from one of the eligible countries*.

FELLOWSHIPS **Long Term** (1- 2 years) and **Short-Term** (up to 3 months) Fellowships for researchers early in their careers and from the eligible countries* who wish to do post-doctoral research in foreign countries, or for researchers from outside the eligible countries who wish to do research in one of the eligible countries*.

WORKSHOPS International workshops can be organized by researchers from the eligible countries*.

***Current eligible countries are Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, Luxembourg, the Netherlands, Portugal, the Republic of Ireland, Spain, Sweden, Switzerland, the United Kingdom and the United States.**

RESEARCH GRANTS AND LONG-TERM FELLOWSHIPS : APPLICATION DEADLINE IS 1 SEPTEMBER 1999

(awards to be announced in April 2000)

Applications for **Short-Term Fellowships** and **Workshops** can be submitted **throughout the year**

Scientists interested in organizing a workshop should contact the Secretariat about possible dates

Guidebooks and application forms will be available in mid-April 1999 and may be obtained upon written request by addressing the form below to the HFSP or by E-mail. Applications using previous year's forms are not accepted. You can retrieve copies of our guidebooks and application forms from our World Wide Web site at **http://www.hfsp.org**

Surname _____ *First name* _____

Institution _____

Postal Address _____

_____

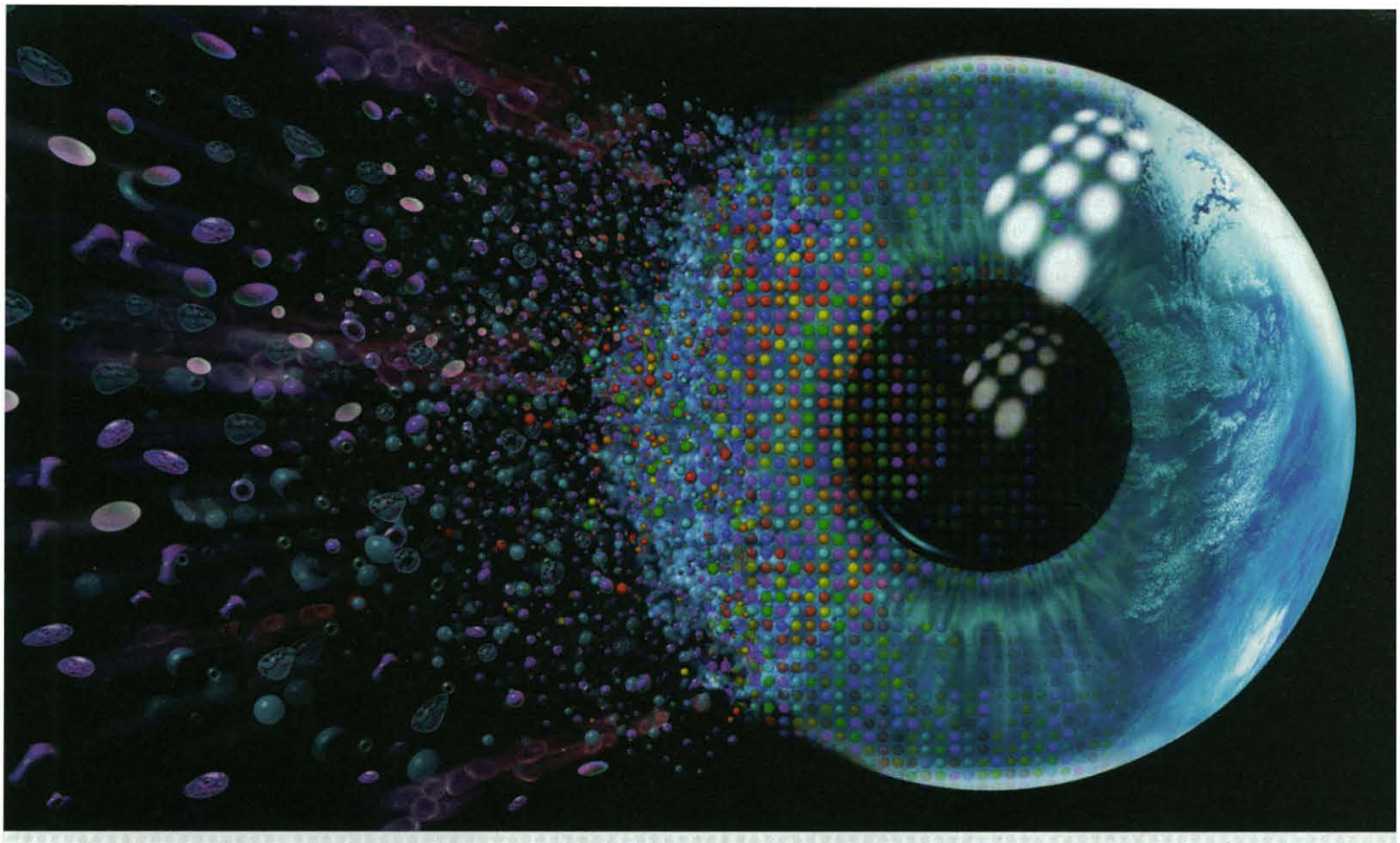
☐ **Research Grant**

☐ **Long-Term Fellowship**

☐ **Short-Term Fellowship**

☐ **Workshop**

(please check the relevant box(es)



DNA microarrays are revolutionizing genomic research and drug discovery. And Genetic MicroSystems is revolutionizing DNA microarrays. Using proprietary fluid transfer and digital laser imaging technology, we have developed a new generation of systems that enable you to create and utilize custom DNA microarrays for relatively low cost—in your laboratory and for your applications. Our systems are extremely flexible, with an open architecture that provides immediate access to this powerful research tool.

Changing the image of DNA microarrays

Imagine what you can do. For information, visit us on the Web at www.geneticmicro.com. To reserve your microarray system, call 781-932-9333. And open up an array of new possibilities.

Genetic MicroSystems™

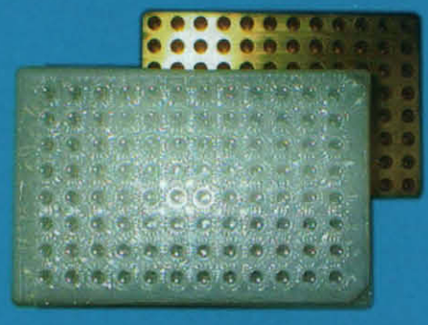
Circle No. 23 on Readers' Service Card

We are the technology leader!

Introducing the new T1 Thermocycler

- unbeatable temperature homogeneity
- fastest Peltier cycler available
- unsurpassed ease of programming

- microplate sealing in the instrument



tomorrow is today

Whatman Biometra®

Biometra GmbH · phone +49-(0)551/50 68 6-0 · fax +49-(0)551/50 68 6-66
e-mail: info@biometra.co.uk · Web site: www.biometra.com

Circle No. 26 on Readers' Service Card

AT1108205399e

Your electroporator should not be a variable.

The Gene Pulser® II Continues to be the Most Reproducible Electroporator...Period.

For efficient transfection, there are enough variables without your electroporator being one of them. The Gene Pulser II has the unique ability to test and recalibrate its capacitors. This ensures that you get the least amount of variation for reproducible performance today and in years down the road. Sample resistance is tested *before* the pulse, which prevents arcing that could ruin your results. Why repeat experiments? Use your time better with the Gene Pulser II — the only system you can fully trust. For more information, contact your local Bio-Rad representative or visit our website at **discover.bio-rad.com**.

BIO-RAD **Bio-Rad Laboratories**

Life Science Group

Website *www.bio-rad.com* ***U.S.*** *(800) 4BIORAD* ***Australia*** *02 9914 2800* ***Austria*** *(01)-877 89 01* ***Belgium*** *09-385 55 11* ***Canada*** *(905) 712-2771* ***China*** *86-10-62051850/51* ***Denmark*** *45 39 17 99 47* ***Finland*** *358 (0)9 804 2200* ***France*** *01 43 90 46 90* ***Germany*** *089 318 84-0* ***Hong Kong*** *852-2789-3300* ***India*** *(91-11) 461-0103* ***Israel*** *03 951 4127* ***Italy*** *39-02-216091* ***Japan*** *03-5811-6270* ***Korea*** *82-2-3473-4460* ***Latin America*** *305-894-5950* ***Mexico*** *514-2210* ***The Netherlands*** *0318-540666* ***New Zealand*** *64-9-4152280* ***Norway*** *22-74-18-70* ***Russia*** *7 095 979 98 00* ***Singapore*** *65-2729877* ***Spain*** *34-91-661-7085* ***Sweden*** *46 (0)8-55 51 27 00* ***Switzerland*** *01-809 55 55* ***United Kingdom*** *0800-181134*

Sig 031799

Circle No. 36 on Readers' Service Card