



AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE

Science

21 NOVEMBER 1997
Vol. 278 • PAGES 1369-1532

\$7.00



NEW ENGLAND BIOLABS

Molecular Biology and PCR

Summer Workshops

WHEN:

Session 1: May 31-June 13, 1998
Session 2: June 21-July 4, 1998
Session 3: July 12-July 25, 1998

WHERE:

Clark Science Center
Smith College
Northampton, MA

FACULTY:

Dr. Steven A. Williams
Dept. of Biological Sciences, Smith College,
and Molecular and Cellular Biology,
University of Massachusetts

Dr. John R. McCarrey
Dept. of Genetics, Southwest
Foundation for Biomedical Research

Dr. Barton Slatko
New England Biolabs, Inc.
DNA Sequencing Group

Dr. Alan L. Scott
Dept. of Molecular Microbiology
and Immunology
Johns Hopkins University

TO APPLY:

Please submit a recent C.V. or resume and a one page statement explaining your interest to:

Dr. Steven A. Williams
Clark Science Center
Smith College
Northampton, MA 01063

We are pleased to announce the thirteenth annual New England Biolabs Molecular Biology Summer Workshops held at Clark Science Center, Smith College, Northampton, MA, USA. Over 1,000 research scientists have attended this intensive program in the past eleven years.

INTENSIVE BENCH EXPERIENCE: This intensive, two-week course emphasizes hands-on molecular biology laboratory work. About eight hours each day will be spent working at the bench. All of the work is hands-on; there are no demonstrations.

EXPERIMENTS WILL INCLUDE: Construction and screening of genomic and cDNA libraries, PCR, RT-PCR, PCR subcloning, purification of DNA and RNA, restriction enzyme digestion, gel electrophoresis, construction of recombinant DNA molecules, cloning in plasmid and phage vectors, cloning strategies, bacterial transformation, Southern and Northern transfer and hybridization, methods for labeling DNA, DNA sequencing, etc. All of these techniques are woven into a cohesive research project carried out by each participant during the two-week session. Lectures and discussion sessions (at least three hours each day) will deal with all of the above topics and the application of these methods in molecular biology research.

INTENDED FOR BEGINNERS IN MOLECULAR BIOLOGY: No previous experience in molecular biology is required or expected. Forty-eight participants per session will be selected from a variety of disciplines and academic backgrounds. Last year's participants included principal investigators, directors of programs, postdoctoral fellows, graduate students, and research assistants. Their fields of research included medicine, biochemistry, ecology, immunology, microbiology, pharmacology, plant biology, genetics, physiology and others. They came from large universities, small colleges, medical schools, hospitals, industry, and private foundations; 75% came from the USA, and 25% from overseas. With eight instructors, the student to teacher ratio is 6 to 1.

FEE: \$3200 per participant includes lab manual, use of all equipment and supplies, and room and board (all rooms are singles). Fee includes the use of the libraries, computers, and all campus athletic facilities.

APPLICATIONS MUST BE RECEIVED BY March 10, 1998. Notification of acceptance status will be mailed by March 13, 1998. Late applications will be accepted for our wait list. Payment in full will be due by April 10, 1998. Your application should include a brief C.V. and a one page statement explaining your reasons for taking the course. Please specify the session to which you are applying (1, 2, 3) and indicate one of the other sessions as a second choice. Women and minorities are especially encouraged to apply. **For additional information, please visit our web site (<http://math.smith.edu/~sawlab/neb.html>) or contact us at (413) 247-3004.**



Circle No. 38 on Readers' Service Card

Immunoassays

guaranteed to give outstanding performance

precision ▲ accuracy ▲ sensitivity ▲ specificity

R&D Systems offers over 100 analyte-specific immunoassays. Our development and quality control are extensive to eliminate interference and to ensure that results can be duplicated from one day to the next. Immunoassay kits are available for the following:

- ▲ Cytokines
- ▲ Cytokine Receptors
- ▲ Adhesion Molecules
- ▲ Eicosanoids
- ▲ Cyclic Nucleotides
- ▲ Free Oxygen Radicals
- ▲ Clinical *In Vitro* Diagnostic (IVD)

Each R&D Systems immunoassay kit is complete.

- ▲ standard
- ▲ diluent
- ▲ substrate
- ▲ pre-coated 96 well microplate(s)
- ▲ conjugate
- with removable strips

Now Available! Chemiluminescent Immunoassays

Call for a copy of our new 1997/98 Immunoassay Catalog

FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC OR THERAPEUTIC PROCEDURES.

North America
R&D Systems, Inc.
614 McKinley Place NE
Minneapolis, MN 55413, USA
Tel: 612 379-2956
Fax: 612 379-6580
info@rndsystems.com

Europe
R&D Systems Europe Ltd.
4-10 The Quadrant, Barton Lane
Abingdon, OX14 3YS, UK
Tel: +44 (0)1235 551100
Fax: +44 (0)1235 533420
info@rndsystems.co.uk

Germany
R&D Systems GmbH
Borsigstrasse 7
65205 Wiesbaden, Germany
Tel: +49 (0)6122 90980
Fax: +49 (0)6122 909819
info@rndsystems.co.uk

Japan
Funakoshi, Co., Ltd.
9-7, 2-Chome
Hongo, Bunkyo-ku
Tokyo 113, Japan
Tel: +81-3 5684-1622
Fax: +81-3 5684-1633

International Distributors – Argentina: 54-1-942-3654. Australia: 61-2-9521-2177. Austria: 43-1-292-3527.
Chile: 56-2-264-1576. Greece: 031 322 525. Hong Kong: 852-2649-9988. Israel: 972-3-6459649. Italy: 39 2 25 75377.
Korea: 82-2-569-0781. Mexico: 525-612-0085. New Zealand: 64-9-377-3336. Spain: 34 1 535 39 60. Poland: 48 22 720 44 54.
Portugal: 01 352 87 74. South Africa: 021 981 1560. Taiwan: 886-2-368-3600. Venezuela: 58-2-239-7546.

Europe Free Phone – Belgique/België: 0800 10 468. Danmark: 80 01 85 92. France: 0800 90 72 49.
Nederland: 060 225607. Norge: 800 11033. Sverige: 020 79 31 49. Switzerland: 0800 55 2482.

Circle No. 43 on Readers' Service Card

R&D
SYSTEMS

1-800-343-7475



www.rndsystems.com



Introducing the *Drosophila* Expression System.
It's the Latest Buzz in Gene Expression Technology.

What's all the buzz about? The new *Drosophila* Expression System (DES™) from Invitrogen. It's a proven eukaryotic expression system that combines the best of mammalian and insect expression technologies to create a system that is powerful and simple to use.

SIMPLICITY

The simplicity of DES™ lies in the *Drosophila* S2 cell line. Expression of your protein in DES™ does not require lengthy virus production or labor-intensive cell growth. DES™ uses straightforward transfection methods (the same ones you use for your mammalian cell lines). S2 cells grow rapidly at 27°C without CO₂ and require minimal maintenance.

CHOICE OF EXPRESSION

DES™ offers you the choice of transient or stable expression. Choose transient expression and assay your protein two to

seven days posttransfection.

For stable expression, it is not necessary to isolate and expand clonal transfectants following selection. You can establish stable S2 cells in less than four weeks.

POWERFUL VECTORS

The DES™ expression vectors use native *Drosophila* promoters to give you high-level inducible or constitutive expression.

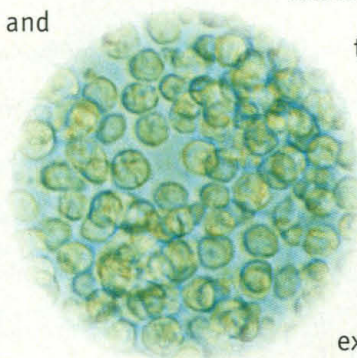
In addition, the vectors each contain a C-terminal polyhistidine and epitope tag for rapid purification and detection.

IT'S PROVEN

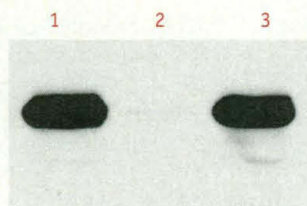
Although DES™ is new, the technology behind it has been around for years. A wide variety of proteins have been successfully expressed in S2 cells

including enzymes, receptors, and glycoproteins. With expression levels higher than most mammalian systems, DES™ can't be beat.

Want to get more information about DES™? Give the gene expression folks at Invitrogen a buzz to learn about the simple, powerful, proven *Drosophila* Expression System, or visit our website at www.invitrogen.com.



S2 Cells



Western blot of constitutive, uninduced, and induced β-gal expressed with DES™

DES™ is a patented technology of SmithKline Beecham Corporation. A sublicense from Invitrogen is required.

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

Toll Free Phone Numbers:
Belgium 0800 111 73
Denmark 800 188 67
Finland 990 31 800 5345
France 00 31 800 5345
Germany 0130 8100 43
The Netherlands 0800 022 88 48
Norway 800 113 70
Sweden 020 795 369
Switzerland 0800 551 966
United Kingdom 0800 96 61 93

Distributors:
Australia 1 800 882 555
China 010 681 526812
Czech Republic 02 5721 14 67
Hong Kong 886 2 381 0844
Hungary 01 280 3728
Israel 02 652 2102
Italy 02 38 19 51
Japan 03 5684 1616
Korea 822 569 6902

Malaysia 03 432 1357
Poland 058 31 57 22
Singapore 65 779 1919
Slovak Republic 07 3707 368
Spain 03 450 2601
Taiwan 886 2 381 0844
Thailand 66 22 467243
From all other countries, contact our European headquarters at +31 (0) 594 515 175.

United States Headquarters:

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

Circle No. 30 on Readers' Service Card



1390
On the upswing?



1397
Development in 3D

NEWS & COMMENT

- Easing the Squeeze on R&D **1390**
NASA Faces Billion-Dollar Problem **1391**
- RaDiUS Draws a Bead on U.S. R&D **1392**
- Physicist Sues Duke Over Control of Lab **1393**
- Consensus on African Research Projects **1393**
- Laser-Fusion Hot Spot to Migrate East **1394**
- ESF Hopes to Be Voice of European Science **1395**
New Chief to Go After Industrial Funding **1395**
- Number Theorists Embark on a New Treasure Hunt **1396**
A Limited Universe of Solutions? **1396**

RESEARCH NEWS

- A Womb With a View **1397**
Information Displays Go 3D **1398**
- How Does HIV Overcome the Body's T Cell Bodyguards? **1399**
- Will Fossil From Down Under Upend Mammal Evolution? **1401**
- Clusters Point to Never-Ending Universe **1402**

- Life's Winners Keep Their Poise in Tough Times **1403**

- The Big Easy Serves Up a Feast to Visiting Neuroscientists **1404**

PERSPECTIVES

- Carbon Dioxide and Vegetation **1411**
G. D. Farquhar
- Quantum Magnetism and Its Many Avatars **1412**
S. Chakravarty
- Methane: Small Molecule, Big Impact **1413**
J. G. Ferry
- Marine Managers Look Upstream for Connections **1414**
J. C. Ogden

POLICY FORUM

- Uncertainties in Projections of Human-Caused Climate Warming **1416**
J. D. Mahlman

ARTICLE

- Colliding Beam Fusion Reactor **1419**
N. Rostoker, M. W. Binderbauer, H. J. Monkhorst

DEPARTMENTS

- THIS WEEK IN SCIENCE** **1377**
- EDITORIAL** **1381**
Poets, Painters, and the Future of Science
M. A. Emmert
- LETTERS** **1383**
Twin Studies, Heritability, and Intelligence: M. W. Feldman and S. P. Otto; S. I. Greenspan; L. J. Kamin; A. Falek and L. F. Jarvik; *Response*: G. E. McClearn, F. Ahern, B. Johansson, S. Berg, N. L. Pedersen, S. A. Petrill, R. Plomin
- SCIENCESCOPE** **1389**

- RANDOM SAMPLES** **1407**
DNA Fingerprinting Comes of Age • Blumenthal Bows Out • On the Scent of a Data Trail • UN Weighs in on Cloning
- BOOK REVIEWS** **1409**
Buffon: A Life in Natural History, reviewed by K. L. Taylor • Vignette • Browseings • Books Received
- TECH.SIGHT** **1481**
- GORDON RESEARCH CONFERENCES** **1492**

AAAS Board of Directors

Jane Lubchenco
Retiring President, Chair
Mildred S. Dresselhaus
President
M. R. C. Greenwood
President-elect

Robert D. Goldman
Alice S. Huang
Sheila Jasanoff
Simon A. Levin
Marcia C. Linn
Michael J. Novacek
Anna C. Roosevelt
Jean E. Taylor

William T. Golden
Treasurer
Richard S. Nicholson
Executive Officer

■ SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals Mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 1997 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$105 (\$58 allocated to subscription). Domestic institutional subscription (51 issues): \$260. Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$90. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. IPM #1069624. Printed in the U.S.A.

Unlike those found in normal chloroplasts, thylakoid membranes (colored red) from mutant *hcf106* (*high-chlorophyll fluorescence*) maize leaves are not subdivided into stacks. Instead, they frequently adopt a uniform whorled arrangement (here ~2 to 3 microme-

ters in diameter). The *Hcf106* gene is conserved in bacterial genomes and encodes a membrane protein that mediates protein translocation independent of the SecA translocation pathway. See page 1467. [Image: A. M. Settles, J. Barr, and R. Martienssen]



RESEARCH ARTICLE

Impact of Lower Atmospheric CO₂ on Tropical Mountain Ecosystems 1422

F. A. Street-Perrott, Y. Huang, R. A. Perrott, G. Eglinton, P. Barker, L. Ben Khelifa, D. D. Harkness, D. O. Olago

REPORTS

Evolution of Magnetic and Superconducting Fluctuations with Doping of High-T_c Superconductors 1427

G. Blumberg, M. Kang, M. V. Klein, K. Kadowaki, C. Kendziora

Nearly Singular Magnetic Fluctuation in the Normal State of a High-T_c Cuprate Superconductor 1432

G. Aepli, T. E. Mason, S. M. Hayden, H. A. Mook, J. Kulda

Direct Measurement of the Current-Phase Relation of a Superfluid ³He-B Weak Link 1435

S. Backhaus, S. V. Pereverzev, A. Loshak, J. C. Davis, R. E. Packard

A Tribosphenic Mammal from the Mesozoic of Australia 1438

T. H. Rich, P. Vickers-Rich, A. Constantine, T. F. Flannery, L. Kool, N. van Klaveren

Contribution of Stream Channel Erosion to Sediment Yield from an Urbanizing Watershed 1442

S. W. Trimble

Adatom Pairing Structures for Ge on Si(100): The Initial Stage of Island Formation 1444

X. R. Qin and M. G. Lagally

Vigorous HIV-1-Specific CD4⁺ T Cell Responses Associated with Control of Viremia 1447

E. S. Rosenberg, J. M. Billingsley, A. M. Caliendo, S. L. Boswell, P. E. Sax, S. A. Kalams, B. D. Walker

Insolation Cycles as a Major Control of Equatorial Indian Ocean Primary Production 1451

L. Beaufort, Y. Lancelot, P. Camberlin, O. Cayre, E. Vincent, F. Bassinot, L. Labeyrie

Connectivity and Management of Caribbean Coral Reefs 1454

C. M. Roberts

Crystal Structure of Methyl-Coenzyme M Reductase: The Key Enzyme of Biological Methane Formation 1457

U. Ermler, W. Grabarse, S. Shima, M. Goubeaud, R. K. Thauer

Targeting of HIV- and SIV-Infected Cells by CD4-Chemokine Receptor Pseudotypes 1462

M. J. Endres, S. Jaffer, B. Haggarty, J. D. Turner, B. J. Doranz, P. J. O'Brien, D. L. Kolson, J. A. Hoxie

Inhibition of Invasion of Epithelial Cells by Tiam1-Rac Signaling 1464

P. L. Hordijk, J. P. ten Klooster, R. A. van der Kammen, F. Michiels, L. C. J. M. Oomen, J. G. Collard

Sec-Independent Protein Translocation by the Maize Hcf106 Protein 1467

A. M. Settles, A. Yonetani, A. Baron, D. R. Bush, K. Cline, R. Martienssen

CD4-Independent Binding of SIV gp120 to Rhesus CCR5 1470

K. A. Martin, R. Wyatt, M. Farzan, H. Choe, L. Marcon, E. Desjardins, J. Robinson, J. Sodroski, C. Gerard, N. P. Gerard

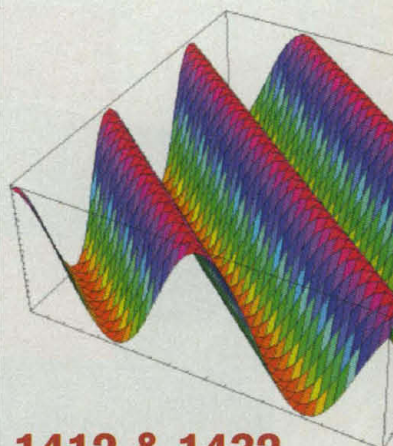
TECHNICAL COMMENTS

Shock Wave-Induced Melting in Argon by Atomistic Simulation 1474

L. S. Dubrovinsky; Response: A. B. Belonoshko

Intertropical Latitudes and Precessional and Half-Precessional Cycles 1476

A. Berger and M. F. Loutre; Response: A. McIntyre



1412 & 1432

Magnetism in superconductors



1413 & 1457

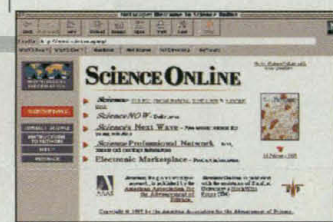
Warming to microbes

Indicates accompanying feature

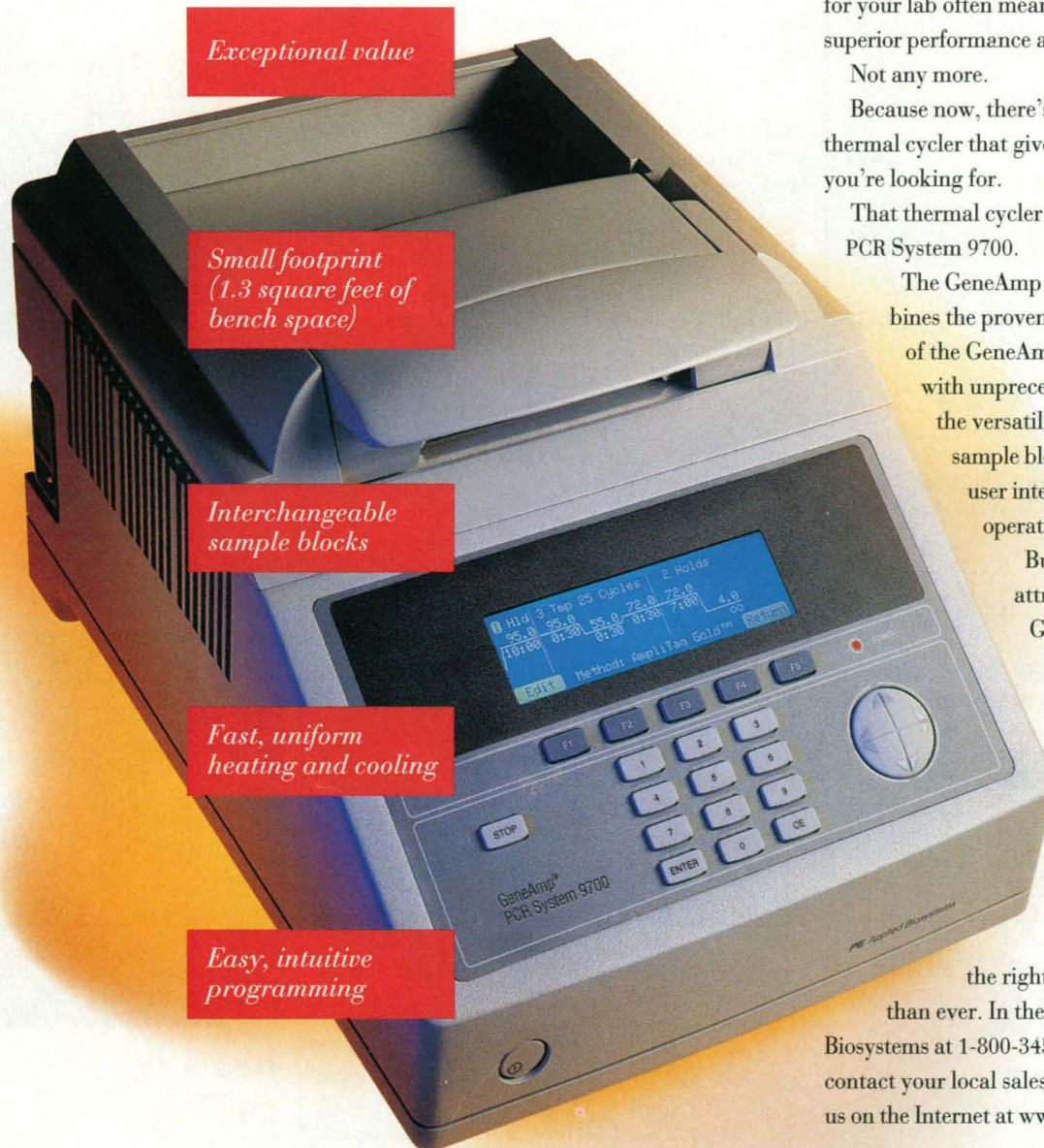
Change of address: allow 4 weeks, giving old and new addresses and 8-digit account number. **Postmaster:** Send change of address to *Science*, P.O. Box 1811, Danbury, CT 06813-1811. **Single copy sales:** \$7.00 per issue prepaid includes surface postage; bulk rates on request. **Authorization to photocopy** material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that \$4.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for *Science* is 0036-8075/93 \$4.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

On the Web

Science Online
www.sciencemag.org



Within budget. Without compromise.



Exceptional value

*Small footprint
(1.3 square feet of
bench space)*

*Interchangeable
sample blocks*

*Fast, uniform
heating and cooling*

*Easy, intuitive
programming*

The New GeneAmp® PCR System 9700

Until now, deciding on the best thermal cycler for your lab often meant choosing between superior performance and affordability.

Not any more.

Because now, there's an entirely new thermal cycler that gives you more of what you're looking for.

That thermal cycler is the GeneAmp® PCR System 9700.

The GeneAmp PCR System 9700 combines the proven quality and reliability of the GeneAmp PCR System 9600 with unprecedented performance, the versatility of interchangeable sample blocks and a graphical user interface that streamlines operation.

But perhaps the most attractive feature of the GeneAmp PCR System 9700 is that it packs all of this into one compact instrument that fits easily on your lab bench—and into your budget.

Find out how the GeneAmp PCR System 9700 makes choosing the right thermal cycler easier than ever. In the U.S., call PE Applied Biosystems at 1-800-345-5224. Outside the U.S., contact your local sales representative. Or visit us on the Internet at www.thermalcycler.com.

PE Applied Biosystems

Europe Langen, Germany Tel: 49 (0)6103 708 301 Fax: 49 (0)6103 708 310

Japan Tokyo, Japan Tel: (047) 380-8500 Fax: (047) 380-8505

Latin America Mexico City, Mexico Tel: 52-5-651-7077 Fax: 52-5-593-6223

Australia Melbourne, Australia Tel: 1 800 033 747 Fax: 61 3 9212-8502

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



The PCR process is covered by patents owned by Hoffmann-La Roche, Inc. and F. Hoffmann-La Roche Ltd. Perkin-Elmer is a registered trademark and PE Applied Biosystems, PE, and Applied Biosystems are trademarks of The Perkin-Elmer Corporation. GeneAmp is a registered trademark of Roche Molecular Systems, Inc. PE Applied Biosystems products are developed and produced under the quality requirements of ISO 9000.

Call
1-800-345-5224
to order

Circle No. 33 on Readers' Service Card

THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

At tree line

It has generally been thought that changes in temperature were primarily responsible for shifts in tree lines in the past, although some recent models have suggested that the large changes in atmospheric CO₂ levels at the end of the last glaciation also had an effect. Street-Perrott *et al.* (p. 1422; see the Perspective by Farquhar, p. 1411) analyzed carbon isotopes in fossil leaf waxes and algal biomarkers to show that the changes in atmospheric CO₂ had a significant effect on high-altitude tropical ecosystems.

Mind the pseudogap

The parent compounds of the high-temperature superconductors are antiferromagnetic insulators. Blumberg *et al.* (p. 1427) performed electronic Raman scattering studies of the superconducting bismuth cuprate compound to see how such ordering may evolve into the superconducting state. At temperatures well above the superconducting transition temperature, possible precursors to superconductivity develop, such as long-lived hole states with $d_{x^2-y^2}$ symmetry and a binding energy of 75 millielectron volts. As the temperature is decreased, greater coherence is seen in the electronic system and a pseudogap opens up in the spectrum.

Current events

The flow of currents between macroscopic quantum systems, such as superfluids or superconductors, that are weakly connected will depend on the relative quantum phase describing each condensate. Such effects, which govern superconducting tunnel junctions, are much more difficult to observe directly in superfluids such as liquid helium-3. Backhaus *et al.* (p. 1435) determined the current-phase

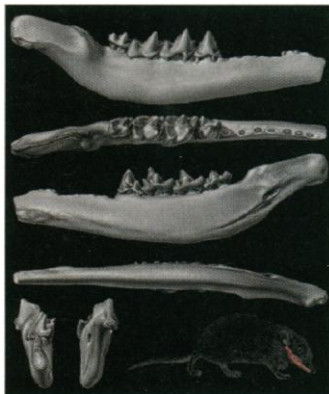
Protective immune responses to HIV

In order to rationally design a vaccine against AIDS, it will be necessary to understand the correlates of protective immunity. Rosenberg *et al.* (p. 1447; see the related news story by Balter, p. 1399) have studied individuals infected with the human immunodeficiency virus (HIV) who managed to control HIV proliferation in the absence of antiviral drug therapy. These individuals had specific proliferative responses of CD4⁺ T helper cells that resulted in the production of interferon- γ and antiviral β chemokines. Virus load was inversely related to the strength of the proliferative response to the viral protein p24.

relation directly for superfluid helium by using a membrane array of 4225 apertures to connect two reservoirs, and they observed the transition with increasing temperature from linear to sinusoidal behavior.

Repeated deliveries

Placental mammals have been thought to have dispersed from South America through Antarctica to Australia in the Cenozoic, sometime after about 60 million years ago. Rich *et al.* (p. 1438; see the news story by Wuethrich, p. 1401) have now found a jaw of an early placental mammal (or early ancestor of



one) from the Early Cretaceous in Australia, about 115 million years ago. This fossil thus implies that Australia and the southern continents were not faunally isolated from northern continents in the Cretaceous. These early placentals may have become extinct in Australia, only to be reintroduced later.

Two by two

The atomistic growth pathway from single adsorbed atoms (adatoms) of silicon or germanium adatoms to larger rows and islands is complex. Qin and Lagally (p. 1444) now provide a possible missing link between monomer absorption and the formation of two-dimensional islands. Scanning tunneling microscope images show that pre-nucleation structures, consisting of paired adatoms that are distinctly different electronically from previously characterized dimers, play a crucial role in the formation of larger rows and islands on this surface.

Coral connections

The eggs and larvae of marine organisms can be transported over great distances. Based on a detailed analysis of the surface currents and assuming a larval lifespan of 1 or 2 months, Roberts (p. 1454; see the Perspective by Ogden, p. 1414) mapped out potential "transport envelopes" that link different reef areas around the Caribbean. Such studies could help in assigning priority for preservation by identifying "upstream" supplier sites.

Dissolved partnership

Many features of the stepwise mechanism by which HIV binds to CD4 and its coreceptors are currently unclear. Binding of the HIV viral envelope protein

gp120 to T cells likely exposes a previously concealed coreceptor binding site. Although binding of HIV gp120 to the coreceptor CCR5 depends on CD4, Martin *et al.* (p. 1470) show that this is not so for the simian counterpart SIVmac239. The difference can be attributed to a one amino acid change in the CCR5 amino terminus, which may be in the region that makes direct contact with gp120. The finding of the critical role of a single amino acid rather than an entire domain may make it possible to design targeted assay systems for vaccines and therapeutics.

Making methane

Methyl-coenzyme M reductase catalyzes the formation of methane. Ermler *et al.* (p. 1457; see the Perspective by Ferry, p. 1413) present the high-resolution structure of this enzyme. It contains an unusual Ni-porphinoid cofactor that accepts the methyl group from methyl-coenzyme M and combines it with a hydrogen atom obtained from coenzyme B to yield methane and the mixed disulfide of coenzyme M-coenzyme B. A long hydrophobic channel helps to order and orient the two linearly shaped coenzymes.

Targeting cells with receptors

Traditionally, retroviral vectors have targeted cells through the cell-surface receptors. Recent studies have indicated that it is possible to reverse the process, by putting the receptor on the vector to target ligand-expressing cells. Endres *et al.* (p. 1462) show that the interaction of the envelope glycoprotein of HIV and SIV with the cellular receptor is not unidirectional; vectors containing a functional virus receptor complex can target chronically infected cells and infected macrophages.



Jump into the World of Convenient and Reliable Protease Inhibition.

Tired of time-consuming searches for the right protease inhibitor? Tired of weighing and dissolving inhibitors? Then try Boehringer Mannheim's Complete™ Protease Inhibitor Cocktail Tablets—a giant step forward in convenient protease inhibition!

Simplify protease inhibition with new Complete Tablets

To inhibit all possible serine, cysteine, and metallo-proteases, simply dissolve one Complete Protease Inhibitor Cocktail Tablet in 50 ml or 10 ml water or aqueous buffer (*e.g.*, cell-lysis buffer). Simplify protein extractions on eukaryotic cell lines, animal tissues, plants, yeast, or bacteria by eliminating the need to weigh inhibitor after inhibitor. With these convenient tablets, you can:

- deliver the same inhibitor dosage every time for greater reliability
- use a product that is non-toxic, readily soluble, and stable in solution for consistent results
- select EDTA-free tablets that will not affect the stability or function of metal-dependent proteins.

Complete Tablets	Vol. per tablet
1697 498 (20 tablets)	50 ml
1836 145 (3 x 20 tablets)	
1836 153 (25 Mini tablets)	10 ml
Complete Tablets, EDTA-free	
1873 580 (20 tablets)	50 ml
1836 170 (25 Mini tablets)	10 ml

Avoid inhibitor binding while inhibiting serine proteases with Pefabloc® SC PLUS

Recent findings indicate that the serine protease inhibitors Pefabloc SC, PMSF, and APMSF bind covalently to proteins under certain conditions. Now you can avoid this problem with Boehringer Mannheim's new Pefabloc SC PLUS (Cat. Nos. 1873 601, 1873 628). This convenient set combines Pefabloc SC with a Pefabloc SC Protector to prevent this binding—without diminishing the inhibitory effect of Pefabloc SC!

Order from our complete protease inhibitor line today!

Or, to learn more about these and our other unique products for protease inhibition, request our revised *Complete Guide for Protease Inhibition* from your Boehringer Mannheim representative.



**BOEHRINGER
MANNHEIM**



Internet <http://biochem.boehringer-mannheim.com>

Complete™ is a trademark of Boehringer Mannheim. Pefabloc® is a registered trademark of Pentapharm AG.

Australia (02) 9899 7999; Austria (0222) 277 87; Belgium (02) 247 4930; Brazil 55 11 66 3565; Canada (514) 686 7050; (800) 361 2070; Chile 00 56 (2) 22 33 737; China 86 21 6416 4320; Czech Republic (0324) 45 54, 58 71-2; Denmark 49 13 82 32; Egypt +20 2 3358815/19; Finland (90) 429 2342; France 04 76 76 30 86; Germany (0621) 759 8545; Greece (01) 67 40 238; Hong Kong (852) 2485 7596; India (22) 520 2820; Indonesia 62 (21) 520 2820; Israel 972-3-6 49 31 11; Italy 02 270 96209; Japan 03 3432 3155; Malaysia 60 (03) 755 5039; Mexico (5) 227 8967, -61; Netherlands (036) 539 4911; New Zealand (09) 276 4157; Norway 22 07 65 00; Poland (22) 36 06 77-87; Portugal (01) 417 17 17; Republic of Ireland 1 800 409041; Russia (49) 621 759 8636; Singapore/Philippines 65 272 7500; South Africa (011) 886 2400; South Eastern Europe +43 (1) 277 87; South Korea 02 568 6902; Spain (93) 201 4411; Sweden (08) 404 88 00; Switzerland 0 417 99 6161; Taiwan (02) 736 7125; Thailand 66 (2) 274 0708-13; Turkey 1 349 81 76-79; United Kingdom (0800) 521 578; USA (800) 428 5433.

© 1997 Boehringer Mannheim. All Rights Reserved.

Circle No. 34 on Readers' Service Card

MEMBERSHIP/CIRCULATION

Deputy Director: Marlene Zendell
Member Services: Michael Lung, *Manager*; Mary Curry, *Supervisor*; Pat Butler, Laurie Baker, Jonathan Keeler, Sherie Jones, Jantell Smith, *Representatives*
Marketing: Dee Valencia, *Manager*; Hilary Baar, *Assistant Manager*; Lauri Sirois, *Coordinator*; Jane Pennington, *Europe Manager*; Ben Holland, *Representative*
Research: Renuka Chander, *Manager*
Business and Finance: Robert Smariga, *Manager*; Susan Maxim, *Assistant*
Computer Specialist: Charles Munson

FINANCE AND ADVERTISING

Business and Finance: Deborah Rivera-Wienhold, *Business Manager*; Randy Yi, *Senior Analyst*; Connie Dang, *Financial Analyst*
Permissions: Lincoln Richman, *Administrator*; Emilie David, *Assistant*
Marketing: John Meyers, *Manager*; Allison Pritchard, *Associate*
Electronic Media: David Gillikin, *Manager*; Wendy Green, *Computer Specialist*; Mark Croatti, Crystal Young, *Production Associates*
Assistant to Associate Publisher: Nancy Hicks

SALES

Product Advertising: Susan A. Meredith, *Advertising Sales Manager*; 503-697-5624, FAX 503-697-5619 • **East Coast/E. Canada:** Richard Teeling; 201-904-9774, FAX 201-904-9701 • **Midwest/Southeast:** Elizabeth Mosko; 773-665-1150, FAX 773-665-2129 • **West Coast/W. Canada:** Neil Boylan; 415-673-9265, FAX 415-673-9267 • **UK/Scandinavia/France/Italy/Belgium/Netherlands:** Andrew Davies; (44) 1-457-871-073, FAX (44) 1-457-877-344 • **Germany/Switzerland/Austria:** Tracey Peers; (44) 1-260-297-530, FAX (44) 1-260-271-022 • **Japan:** Mashy Yoshikawa; (81) 3-3235-5961, FAX (81) 3-3235-5852 • Carol Maddox, *Traffic Manager*; Sheila Myers, *Sales Associate*; Emilie David, *Assistant*

Recruitment Advertising: Terri Seiter Azie, *Sales and Production Operations Manager* • **U.S. Sales:** Gabrielle Boguslawski, *Sales Manager*; 718-491-1607, FAX 202-289-6742; Daryl Anderson, *Sales Supervisor*; Beth Dwyer, Bren Peters-Minnis, *Sales Representatives*; Eric Banks, Troy Benitez, *Sales Associates*; Angela Pantor, *Assistant* • Ellen McGuire, Jennifer Rankin, *Production Associate* • **U.K./Europe:** Debbie Cummings, *Sales Manager*; Sabine Lenud, *Sales Executive*; Michaela Heigl, *Assistant*; (44) 1-223-302-067, FAX (44) 1-223-576-208 • **Australia/New Zealand:** Keith Sandell; (61) 02-922-2977, FAX (61) 02-922-1100 • **Japan:** Mashy Yoshikawa; (81) 3-3235-5961, FAX (81) 3-3235-5852

SCIENCE EDITORIAL BOARD

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

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

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

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

INFORMATION RESOURCES

SUBSCRIPTION SERVICES

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

MEMBER BENEFIT CONTACTS

Credit Card: MBNA 1-800-847-7378; Car Rentals: Hertz 1-800-654-2200 CDP#343457, Dollar 1-800-800-4000 #AA1115; AAAS Travels: Betchart Expeditions 1-800-252-4910; Life Insurance: Seabury & Smith 1-800-424-9883; Other Benefits: AAAS Member Services 1-202-326-6417.

REPRINTS & PERMISSION

Reprints: Ordering/Billing/Status, 800-407-9190; Corrections, 202-326-6501 • **Permissions:** 202-326-7074, FAX 202-682-0816

INTERNET ADDRESSES

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

classified advertisements); science_advertising@aaas.org (for product advertising)

INFORMATION FOR CONTRIBUTORS

See pages 98–99 of the 3 January 1997 issue or access www.sciencemag.org/misc/con-info.shtml.

EDITORIAL & NEWS CONTACTS

North America

Address: 1200 New York Avenue, NW, Washington, DC 20005
Editorial: 202-326-6501, FAX 202-289-7562
News: 202-326-6500, FAX 202-371-9227 • **Bureaus:** **Berkeley, CA:** 510-841-1154, FAX 510-841-6339, **San Diego, CA:** 619-942-3252, FAX 619-942-4979, **Chicago, IL:** 312-360-1227, FAX 312-360-0537, **Boston, MA:** 617-566-7137, FAX 617-734-8088

Europe

Headquarters: 14 George IV Street, Cambridge, UK CB2 1HH; (44) 1223-302067, FAX (44) 1223-302068
Paris Correspondent: (33) 1-49-29-09-01, FAX (33) 1-49-29-09-00

Asia

News Bureau: Dennis Normile, (81) 3-3335-9925, FAX (81) 3-3335-4898; dnormile@twics.com
• **Japan Office:** Carl Kay, Esaka 1-chome 16-10-305, Suita-shi, Osaka-fu 564 Japan; (81) 6-387-5483, FAX (81) 6-337-6809; science@japanese.co.jp
• **China Office:** Hao Xin, (86)10-6255-9478; science@public3.bta.net.cn

BOARD OF REVIEWING EDITORS

Frederick W. Alt
Children's Hospital, Boston

Don L. Anderson
California Institute of Technology

Michael Ashburner
Univ. of Cambridge

Frank S. Bates
Univ. of Minnesota, Minneapolis

Stephen J. Benkovic
Pennsylvania State Univ.

Alan Bernstein
Mount Sinai Hospital, Toronto

Michael J. Bevan
Univ. of Washington, Seattle

Seth Blair
Univ. of Wisconsin, Madison

David E. Bloom
Harvard Institute for International Development

Piet Borst
The Netherlands Cancer Institute

Henry R. Bourne
Univ. of California, San Francisco

James J. Bull
Univ. of Texas at Austin

Kathryn Calame
Columbia Univ. College of Physicians & Surgeons

Dennis W. Choi
Washington Univ. School of Medicine, St. Louis

David Clapham
Children's Hospital, Boston

Adrienne E. Clarke
Univ. of Melbourne, Parkville

F. Fleming Crim
Univ. of Wisconsin, Madison

Paul J. Crutzen
Max-Planck-Institut für Chemie

James E. Dahlberg
Univ. of Wisconsin Medical School, Madison

Robert Desimone
National Institute of Mental Health, NIH

Paul T. Englund
Johns Hopkins Univ. School of Medicine

G. Ertl
Max-Planck-Gesellschaft

Richard G. Fairbanks
Lamont-Doherty Earth Observatory

Robert E. Fay
U.S. Bureau of the Census

Douglas T. Fearon
Univ. of Cambridge

Harry A. Fozzard
The Univ. of Chicago

Roger I. M. Glass
Centers for Disease Control

Peter N. Goodfellow
SmithKline Beecham, UK

Peter Gruss
Max Planck Institute of Biophysical Chemistry

Philip C. Hanawalt
Stanford Univ.

Paul Harvey
Univ. of Oxford

M. P. Hassell
Imperial College at Silwood Park

Nobutaka Hirokawa
Univ. of Tokyo

Tomas Hökfelt
Karolinska Institutet

Tasuku Honjo
Kyoto Univ.

Susan D. Iversen
Univ. of Oxford

Eric F. Johnson
The Scripps Research Institute

Hans Kende
Michigan State Univ.

Elliott Kiehl
Harvard Univ.

Jeffrey T. Kiehl
National Center for Atmospheric Research, Boulder

Judith Kimble
Univ. of Wisconsin, Madison

Stephen M. Kosslyn
Harvard Univ.

Michael LaBarbera
The Univ. of Chicago

Antonio Lanzavecchia
Basel Institute for Immunology

Nicole Le Douarin
Institut d'Embryologie Cellulaire et Moléculaire du CNRS

Norman L. Letvin
Beth Israel Hospital, Boston

Harvey F. Lodish
Whitehead Institute for Biomedical Research

Richard Losick
Harvard Univ.

Ruth Lynden-Bell
Queen's Univ., Belfast

Seth Marder
California Institute of Technology

Diane Mathis
Institut de Chimie Biologique, Strasbourg

Susan K. McConnell
Stanford Univ.

Anthony R. Means
Duke Univ. Medical Center

Stanley Meisel
Univ. of California, Davis

Douglas A. Melton
Harvard Univ.

Shigetada Nakanishi
Kyoto Univ.

Kim Nasmyth
Research Institute of Molecular Pathology, Vienna

Roger A. Nicoll
Univ. of California, San Francisco

Staffan Normark
Swedish Institute for Infectious Disease Control

Kiyotaka Okada
Kyoto Univ.

Bert W. O'Malley
Baylor College of Medicine

Roy R. Parker
Univ. of Arizona, Tucson

Stuart L. Pimm
The Univ. of Tennessee, Knoxville

Yeshayau Pocker
Univ. of Washington, Seattle

Ralph S. Quatrano
Univ. of North Carolina, Chapel Hill

Martin Raff
Univ. College London

Douglas C. Rees
California Institute of Technology

T. M. Rice
ETH-Hönggerberg, Zürich

David C. Rubie
Universität Bayreuth

Erkki Ruoslahti
The Burnham Institute, CA

Gottfried Schatz
Biozentrum, Basel

Jozef Schell
Max-Planck-Institut für Zuchtungsforschung

Ronald H. Schwartz
National Institute of Allergy and Infectious Diseases, NIH

Terrence J. Sejnowski
Salk Institute

Christopher R. Somerville
Carnegie Institute of Washington

Michael P. Stryker
Univ. of California, San Francisco

Cliff Tabin
Harvard Medical School

John Jen Tai
Academia Sinica, Taiwan

Tomoyuki Takahashi
Univ. of Tokyo

Masatoshi Takeichi
Kyoto Univ.

Keiji Tanaka
RIKEN Institute

David Tilman
Univ. of Minnesota, St. Paul

Robert T. N. Tjian
Univ. of California, Berkeley

Yoshinori Tokura
Univ. of Tokyo

Derek van der Kooy
Univ. of Toronto

Geerat J. Vermeij
Univ. of California, Davis

Bert Vogelstein
Johns Hopkins Oncology Center

Gerhard Wegner
Max-Planck-Institut für Polymerforschung

Arthur Weiss
Univ. of California, San Francisco

Robin A. Weiss
The Institute of Cancer Research, London

Zena Werb
Univ. of California, San Francisco

George M. Whitesides
Harvard Univ.

Martin Zatz
National Institute of Mental Health, NIH

**SIGMA FBS.
SOURCED ONLY
IN THE U.S.A.**

You can't be too certain of your sources. That's why we collect and process our fetal bovine serum exclusively in the US. We offer complete traceability and documentation — assuring researchers control over their serum sources and minimizing the risk from possible contamination with exotic viral agents such as BSE.

Our Complete Control Program focuses on all aspects of the serum process to assure complete customer confidence with Sigma FBS. All material sold by Sigma in the US is collected at USDA-inspected abattoirs.

**WHEN IT
COMES TO
FBS SOURCES,**



**WE KNOW OUR
BOUNDARIES.**

Our raw FBS is sourced only from qualified vendors, passing stringent on-site audits by our sourcing audit team.

We require certificates of origin from vendors from which fetal blood is sourced, as well as lot traceability to the original USDA-inspected plant where the blood was collected. Additionally, all samples are evaluated in our own facilities before processing as a final Sigma product.

It all results in a fetal bovine serum you can use with full confidence — proving we not only know our boundaries, we stay well within them. For ordering or information, call 1-800-325-3010 or 314-771-5750.



Circle No. 24 on Readers' Service Card

Get Peak Performance from your *Taq* DNA Polymerase

*Taq2000*TM DNA polymerase^{*} is a highly purified, recombinant *Taq* DNA polymerase that provides superior yield and specificity for all *Taq*-based PCR applications.

***Taq2000* DNA Polymerase**

- Most highly purified *Taq* polymerase available
- Virtually eliminates background artifacts
- Ideal for extreme PCR conditions
- Minimizes smearing in long PCR

Circle No. 40 on Readers' Service Card



UNITED STATES:
Stratagene Cloning Systems
(800) 424-5444
INTERNET MAIL:
techservices@stratagene.com

AUSTRALIA: (02) 9417 7866
AUSTRIA: (0222) 3 68 99 51
BRAZIL: 11 5561-1771
CANADA: (800) 424-5444
DENMARK: 86 10 10 55
FRANCE: (01) 34 60 24 24
GERMANY: (0130) 84 09 11
HONG KONG: 578-5839
INDIA: 3325677
ISRAEL: 03-5761520
ITALY: 02-58.01.34.09
JAPAN: (Funakoshi) (03)5684-1622
(Toyobo) (03)3680-4819
KOREA: (02)-556-0311
MALAYSIA: 3-7031888
NETHERLANDS: 033 495 00 94
NEW ZEALAND: 9 443-5957
NORWAY: 22 20 01 37
PORTUGAL: 01-441 06 84
SINGAPORE: 2730898
SPAIN: 1 729 03 33
SWEDEN: (8) 6800845
SWITZERLAND: (061) 6 93 05 40
THAILAND: (662) 308-0611
UNITED KINGDOM: 0800 585370

OTHER COUNTRIES CALL
STRATAGENE USA: (619) 535-5400



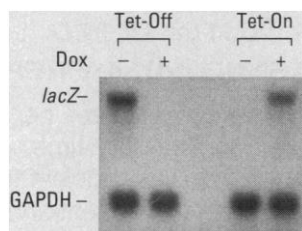
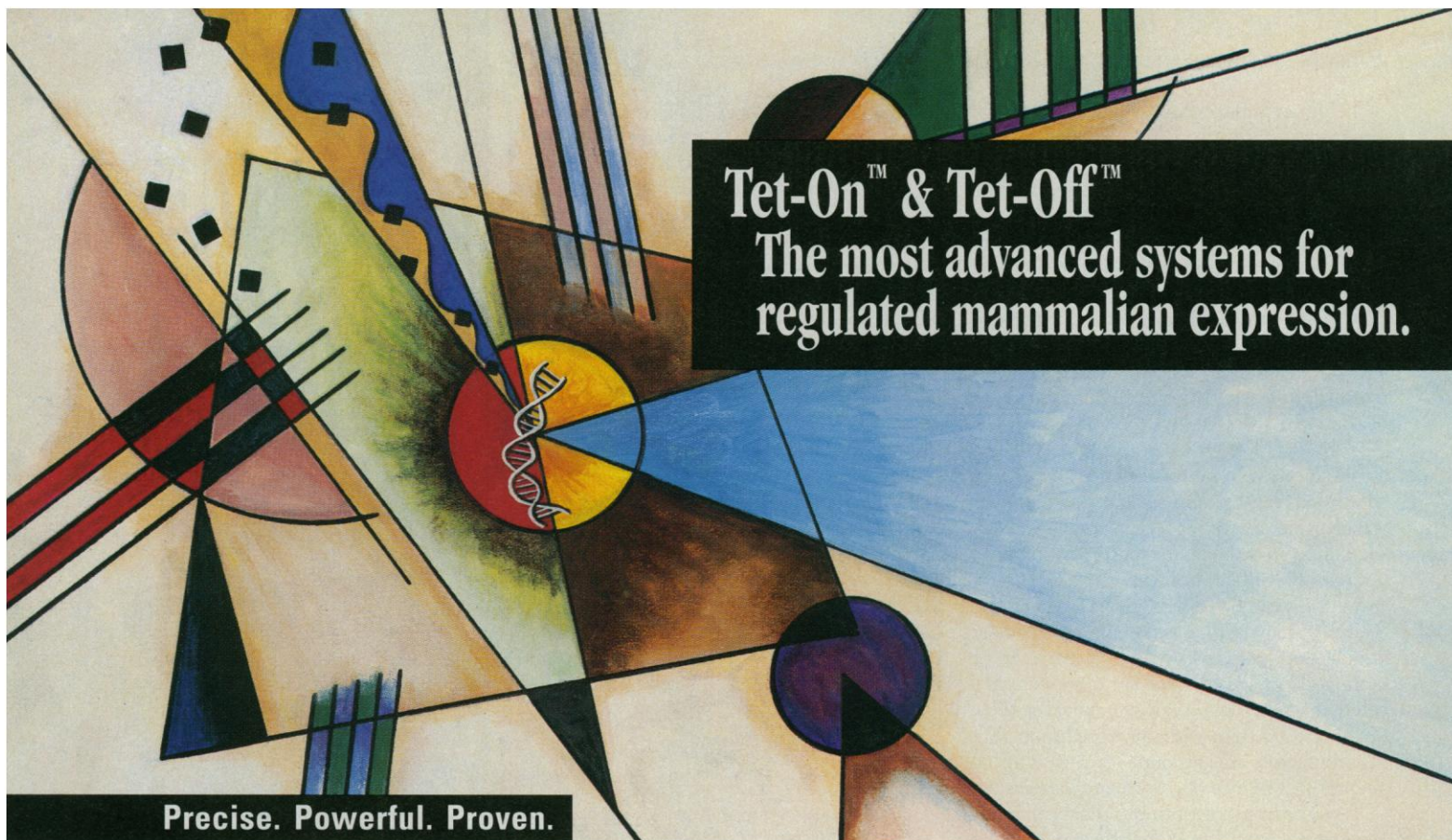
PCR amplifications were performed using Stratagene's *Taq2000* DNA polymerase or competitor's cloned *Taq* DNA polymerase. The PCR extension times were 4 minutes, 8 minutes and 12 minutes for a 1.9-kb amplicon of transgenic mouse genomic target DNA.

***Taq2000*TM DNA Polymerase...For Peak PCR Performance**

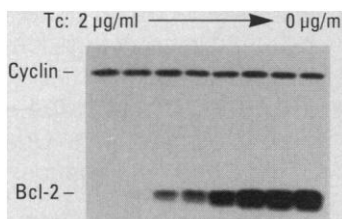
*Taq2000*TM DNA Polymerase
100U CATALOG #600195
500U CATALOG #600196
1000U CATALOG #600197



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



Tet Systems offer inducible on/off control of gene expression. Northern analysis of RNA from HeLa Tet-Off and Tet-On cell lines stably expressing the *lacZ* gene under Tet regulation. Cells were cultured in \pm 1 μ g/ml doxycycline (Dox), a tetracycline derivative.



Tet Systems provide precise control of inducible expression. HeLa S3 Tet-Off Cells stably expressing pTet-Off and pTRE-Bcl-2 were grown in decreasing amounts of tetracycline (Tc). Western analysis indicates 100-fold range of controlled induction of Bcl-2.

In Germany please contact CLONTECH GmbH • Tel: 06221 34170 Fax: 06221 303511

In the U.K. please contact CLONTECH U.K. Ltd. • Tel: 01256 476500 Fax: 01256 476499 (effective 1/1/98)

Australia: 61 2 9417 7866 ■ Austria and Eastern Europe: 43 1 889 1819 ■ Belgium/Luxembourg: 0 800 1 9815
 ■ Canada: Now call CLONTECH direct • 800 662 2566 ■ China: BEIJING YUANGPING BIOTECH • 86 10 68187551; GENE CO. LTD. • 86 21 64748700; HW SCIENCE & TECHNOLOGY DEVELOPMENT CO. LTD. • 86 22 26647265; SINO-AMERICAN BIOTECH CO. • 86 37 94322501; WATSON BIOMEDICALS, INC. • 86 21 65572386
 ■ Czech Republic: 42 19 65214 ■ Egypt: 202 349 8311 ■ France: 33134 602424 ■ Germany: CLONTECH GmbH • 49 6221 34170 ■ Greece: 30 1 483 1190 ■ Hong Kong: 852 2646 6101 ■ India: 091 11 54 21714 ■ Israel: 972 4 9960595 ■ Italy: 39 2 6127621 ■ Japan: 81 6 348 3786 ■ Korea: 82 2 556 0311 ■ Malaysia: 603 777 2608 ■ Mexico: 525 519 3463 ■ The Netherlands: 31 33 495 00 94 ■ Scandinavia: 46 8 749 5940 ■ Singapore: 65 775 7284 ■ Spain/Portugal: 34 1 630 0379 ■ Switzerland: 41 61 272 3924 ■ Taiwan: 886 2 7202215 ■ Thailand: 662 530 3805 ■ Turkey: 90 216 385 8321 ■ United Kingdom: CLONTECH U.K. Ltd. (effective 1/1/98) • 01256 476500 rev. 10/97

Notice to Purchaser

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

Tet-On/Tet-Off Gene Expression Systems

(#K1621-1 & #K1620-1) for mammalian cells offer tight regulation without compromising high-level expression at full induction for clear, convincing results. Winner of the R&D 100 Award for outstanding technological achievement, Tet is the system of choice for both cell culture and transgenic applications. The most advanced systems come from CLONTECH.

Call 800-662-2566 (CLON) or contact your local representative.

Circle No. 32 on Readers' Service Card



CLONTECH
NOW YOU CAN.

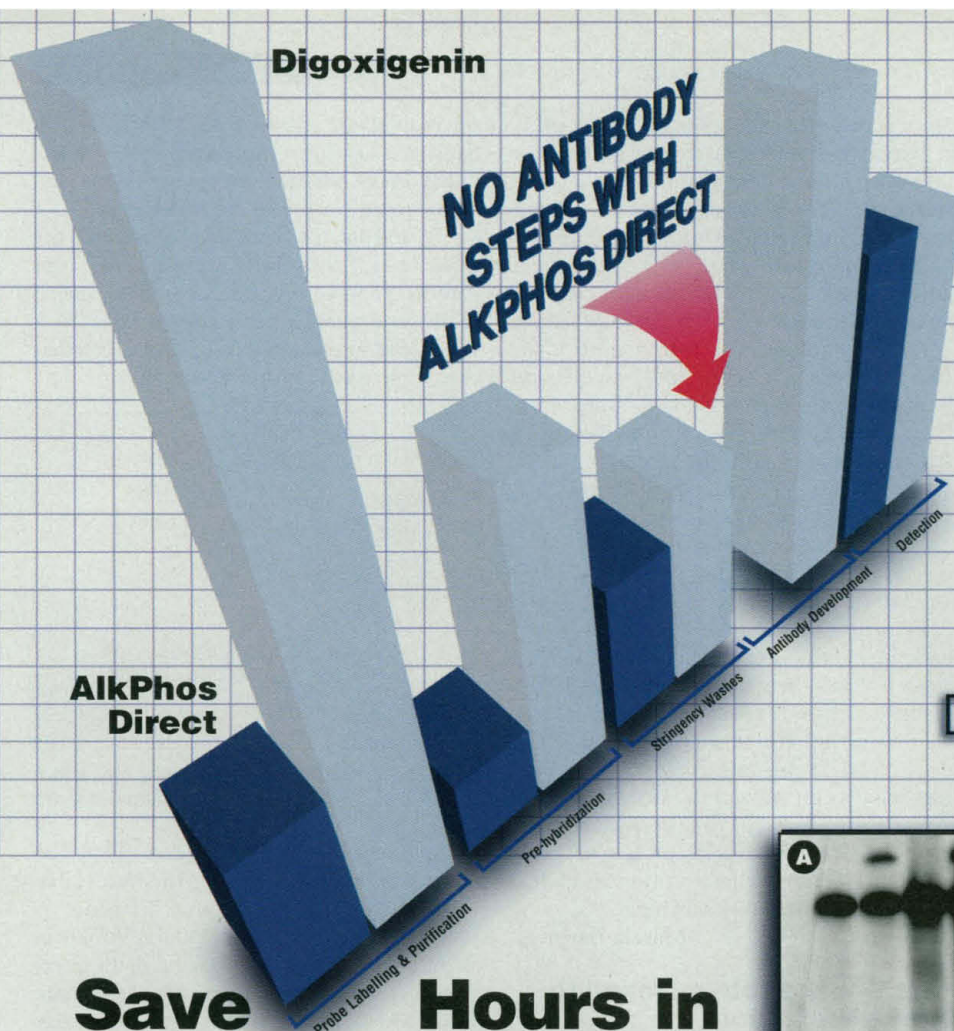
1020 East Meadow Circle, Palo Alto, California 94303 USA

Tel: 800-662-2566 (CLON) 650-424-8222 • Fax: 800-424-1350 650-424-1064

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

© 1997, CLONTECH Laboratories, Inc.

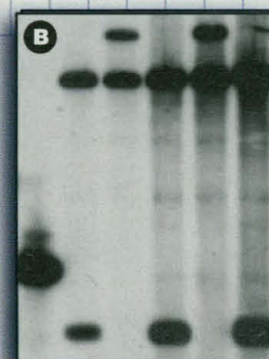
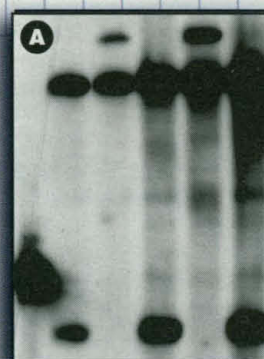
(AD76791)



AlkPhos **DIRECT** Labelling and Detection Systems

Save Hours in Non-Radioactive Southern Blotting

By eliminating the need for post-hybridization antibody steps, you can now achieve digoxigenin-quality results in much less time, with the new AlkPhos Direct™ chemiluminescent labelling and detection system. A complete and user friendly system, utilizing a novel thermostable alkaline phosphatase, AlkPhos Direct can be used for all high sensitivity applications using either DNA or RNA probes.



Southern blot, Cosmid DNA digested with *NotI* and *Eco RI*, probed with a 1.1kb probe labelled with AlkPhos Direct (A) and digoxigenin (B) (courtesy of Janet Bartels, Yale University).

- Total time saving of 2-3 hours
- Sensitivity of 0.06pg (in Southern blots) with CDP-Star™
- Hybridization stringency with temperatures up to 75°C
- No antibody development

Amersham LIFE SCIENCE

FOR MORE INFORMATION, CONTACT YOUR LOCAL OFFICE

<http://www.amersham.co.uk/life>

<http://www.amersham.com/life>

EUROPE +44 (0)1494 544550

USA 1 800 323 9750

JAPAN (03) 59 92 2828

Amersham Life Science Ltd, Amersham Place, Little Chalfont, Buckinghamshire, HP7 9NA England. All goods and services are sold subject to the terms and conditions of sale of the company within the Amersham group which supplies them. A copy of these terms and conditions is available on request. CDP-Star is protected under one or more of US patents 5,326,882 and 4,931,569.

MALX

Circle No. 26 on Readers' Service Card

SCIENCE AS YOU'VE NEVER SEEN IT BEFORE...CAMBRIDGE

PHYSICAL SCIENCES

Why Things Are the Way They Are

B. S. Chandrasekhar

This fascinating book explains why the materials we can see and touch behave as they do. The author explains how it is possible to understand the basic properties of matter, and translates the technical jargon of physics into a language that can be understood by anyone with an interest in science who wants to know why the world around us behaves in the way that it does.

1997 264 pp.
45660-6 Paperback \$24.95

Is the Universe Open or Closed?

The Density of Matter in the Universe

Peter Coles and George F.R. Ellis

This controversial book examines one of the most fundamental questions of modern cosmology: how much matter is there in the Universe? The authors address this debate and point out the most likely avenues for determining the actual density of Universe matter in both visible and invisible forms by pulling together evidence from all available sources.

Cambridge Lecture Notes in Physics 7

1997 251 pp.
56689-4 Paperback \$32.95

Nuclear Magnetic Resonance and Relaxation

Brian Cowan

This book provides an introduction to the general principles of nuclear magnetic resonance and relaxation, concentrating on simple models and their application.

1997 457 pp.
30393-1 Hardback \$95.00

Stability of Microstructure in Metallic Systems

Second Edition

J. W. Martin, R. D. Doherty, and B. Cantor

The second edition of this textbook, popular among students and faculty alike, investigates the various causes of thermodynamic instability in metallic microstructures. The entire text has been updated in this new edition, including a completely new chapter on highly metastable alloys.

Cambridge Solid State Science Series

1997 442 pp.
41160-2 Hardback \$110.00
42316-3 Paperback \$44.95

Dissections

Plane and Fancy

Greg N. Frederickson

The author explains solution methods carefully, assuming only a basic knowledge of high school geometry, then poses puzzles to solve. He introduces those who have worked on these problems, traveling from the palace school of tenth-century Baghdad to the mathematical puzzle columns in turn-of-the-century newspapers.

1997 320 pp.
57197-9 Hardback \$34.95

Classical Mechanics

Transformations, Flows, Integrable and Chaotic Dynamics

Joseph L. McCauley

This is the first book to describe the subject in the context of the language and methods of modern nonlinear dynamics. It introduces flows in phase space and transformations early and illustrates their applications throughout the text. The standard integrable problems of elementary physics are analyzed from the standpoint of flows, transformations, and integrability.

1997 487 pp.
48132-5 Hardback \$90.00
57882-5 Paperback \$39.95

HISTORY OF SCIENCE

Rebels within the Ranks

Psychologists' Critique of Scientific Authority and Democratic Realities in New Deal America

Katherine Pandora

This book examines the work of social and personality psychologists who, in the 1930s, criticized the increasingly restrictive vision of scientific life being promoted by neobehaviorist social scientists. This critique has been overlooked by historians who have concentrated on the rise of neobehaviorism, rather than the challenges advanced by Gordon Allport, Gardner Murphy, and Lois Barclay Murphy.

Cambridge Studies in the History of Psychology

1997 272 pp.
58358-6 Hardback \$9.95

Public Health and Social Justice in the Age of Chadwick

Britain, 1800-1854

Christopher Hamlin

The 1830s and 1840s are the formative years of modern public health in Britain, when Edwin Chadwick conceived his vision of public health through public works. This book offers modern public health professionals elements of a forgotten professional heritage that might be useful in responding to the bewildering range of health problems we now confront.

Cambridge Studies in the History of Medicine

1997 368 pp.
58363-2 Hardback \$64.95

AURA and its U.S. National Observatories

Frank K. Edmondson

The subject of this history is the science and politics of the establishment, funding, construction and operation of two important American observatories, the Kitt Peak National Observatory (KPNO) and the Cerro Tololo Inter-American Observatory (CTIO) by the Association of Universities for Research in Astronomy (AURA).

1997 385 pp.
55345-8 Hardback \$80.00

BIOLOGICAL SCIENCES

Biodiversity Dynamics and Conservation

The Freshwater Fish of Tropical Africa

Christian Lévêque

This comprehensive book brings together a wealth of information on the fish of tropical African systems, and discusses how these systems evolved, what holds them together, and what is tearing them apart.

1997 451 pp.
57033-6 Hardback \$84.95

The Sea Surface and Global Change

Peter S. Liss and Robert A. Duce, Editors

This book offers the first comprehensive review of the surface microlayer in a decade. The authors address the potential global marine impacts at the air-sea interface due to large-scale atmospheric ozone depletion and industrial pollution.

1997 535 pp.
56273-2 Hardback \$95.00

Available in bookstores or from

CAMBRIDGE UNIVERSITY PRESS

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

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

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

MasterCard/VISA accepted.

Prices subject to change.

AAAS | SCOPE

O N L I N E

SCOPE ONLINE provides you

with all the information

you need about the 1998

AAAS Meeting to be held

February 12-17, 1998 at the

Pennsylvania Convention

Center in Philadelphia.



WWW.AAAS.ORG/MEETINGS/SCOPE/INDEX.HTM

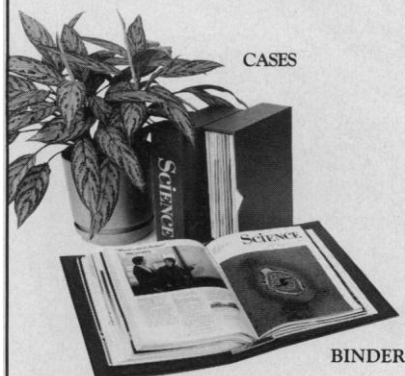
Visit AAAS Scope Online today, and you can...

- Complete the Advance Registration Form online and save up to \$50 off the on-site registration fee.
- Download the housing form and other important hotel information.
- Get information about the 16 tracks and the 150 general sessions. Highlights include: The Changing Environment of Science, Discovering Biological Diversity, Education into the Next Century, Global Change/Earth Systems Science, Industry, Technology, Engineering, Public Health and Medicine, and much more.
- Find out about the latest information on the two comprehensive seminars taking place at the meeting: The Genome Seminar (co-sponsored by Science and the Institute for Genomic Research (TIGR) and the Forum for School Science Seminar.
- Get late breaking news on hot sessions, confirmed speakers, and other updates about the program from the Program Director.
- Explore Philadelphia with hot links to exciting web sites in the "City of Brotherly Love", find out how to get discount airline rates to Philadelphia, see a listing of Exhibitors, Sponsors, and much more.
- Get current updates on the AAAS 150th Anniversary Celebration activities.



AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE

SAVE YOUR COPIES OF SCIENCE



These custom-made, imprinted cases and binders are ideal for protecting your valuable *Science* copies from damage. Each binder or case holds one volume of *Science*, or 13 weekly issues—order four binders or cases to hold a complete year of issues. Constructed from reinforced board and covered with durable, leather-like red material and stamped in gold, the cases are V-notched for easy access; binders have a special spring mechanism to hold individual rods which easily snap in.

Quantity	Cases	Binders
One	\$ 8.95	\$11.25
Three	\$24.95	\$31.85
Six	\$45.95	\$60.75

SCIENCE

Jesse Jones Industries, Dept. 95-SCE
499 East Erie Avenue
Philadelphia, PA 19134

Enclosed is \$_____ for
Cases: _____ Binders. Add 1.50 per
case/binder for postage & handling.
Outside USA \$3.50 per case/binder
(US funds only). PA residents add 7%
sales tax.

Print
Name _____

Address _____
No P.O. Box Numbers Please

City _____

State/Zip _____

CHARGE ORDERS (Minimum \$15): Am
Ex, Visa, MC, DC accepted. Send card
name, #, Exp. date.

CALL TOLL FREE 7 days, 24 hours
1-800-825-6690

Outside the US call 215-425-6600

Allow 4-6 weeks for delivery

SATISFACTION GUARANTEED

Think of us as your research foundation.

When you're probing or recording at the single-cell level, there's no room for error, or vibration.

Our patented Gimbal Piston® Air Isolator System effectively eliminates both vertical and horizontal floor vibration. When it's combined with our unique, highly damped, stainless steel laminate tops or steel honeycomb, spillproof CleanTop®, you are assured of unequalled performance.

That's why leading researchers worldwide specify TMC vibration isolation systems: laboratory tables, optical tables, table-top



and floor platforms. Each component of these precision systems is designed to assure the most effective vibration protection possible for your most critical applications.

For support you can count on, move up to TMC vibration isolation systems. Contact our Technical Sales Group today.

TMC

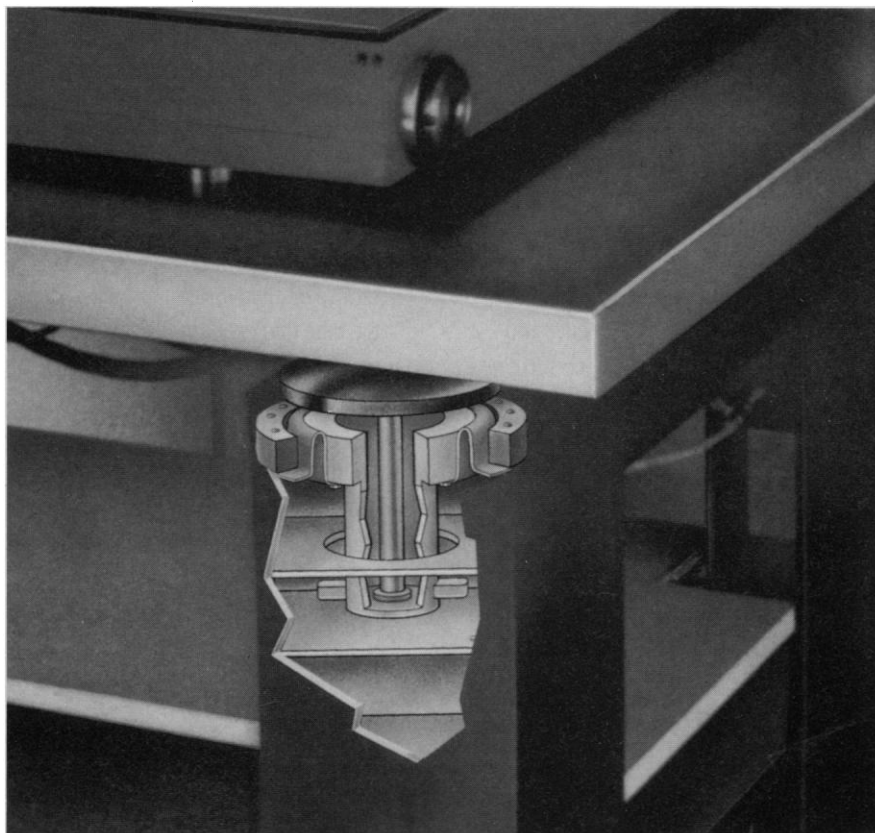
Technical Manufacturing Corporation

15 Centennial Drive • Peabody, MA 01960, USA

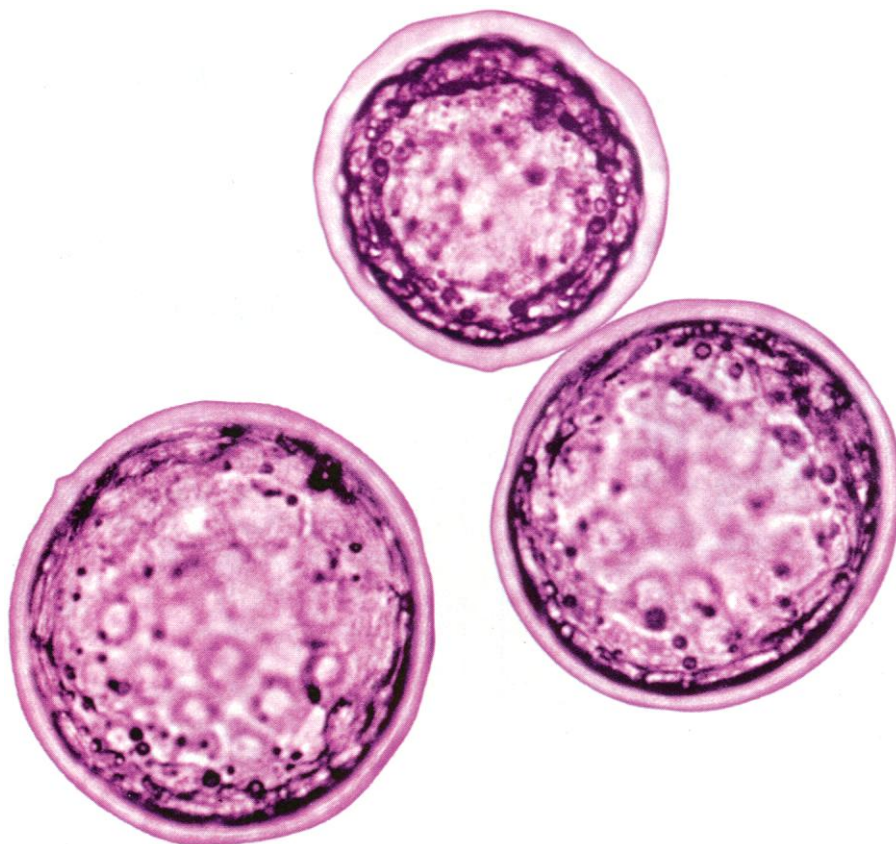
Tel: 978-532-6330 • 800-542-9725 • Fax: 978-531-8682

e-mail: sales@techmfg.com

Vibration Solutions



Circle No. 12 on Readers' Service Card



BEEGGXACT.

THE MOST COMPLETE LINE OF NON-TOXIC MOUSE EMBRYO TRANSFER PRODUCTS.

Sigma offers more than 20 products — enzymes, hormones, media and medium supplements — pre-screened for use in the *in vitro* manipulation and maintenance of preimplantation mouse embryos. This broadly-based product line features M2 and M16 media in liquid and powdered form, plus embryo-tested water, mineral oil and other reagents — all created to the highest standards.

Because these products are screened for toxicity in a working

mouse embryo system, you are spared the time and expense of reagent testing. Our product screening requires that at least 80% of the embryos reach blastocyst stage. Not only do our Mouse Embryo Transfer products save time and money, they protect your valuable transgenic embryos and experimental results.

The quality you expect from Sigma. The assurance you require. You could say we've been very *eggxacting* with our Mouse Embryo Transfer products. And, you'd be right.

For more information, speak to one of our Technical Service representatives. Call toll free at 800-848-7791, or collect at 314-771-5765, Ext. 3950.
E-mail: sigma-techserv@sial.com

SIGMA[®]

BIOCHEMICALS AND REAGENTS
FOR LIFE SCIENCE RESEARCH

P.O. Box 14508

St. Louis, MO 63178 USA

Visit us on the Internet: <http://www.sigma-sial.com>

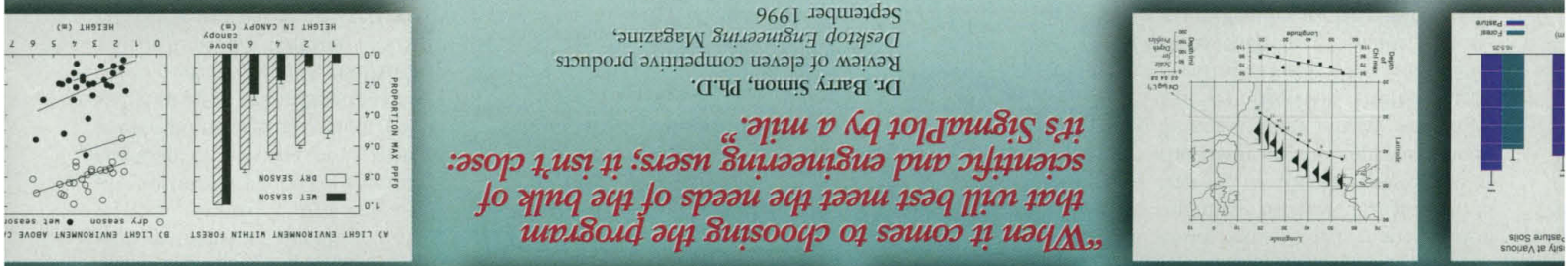
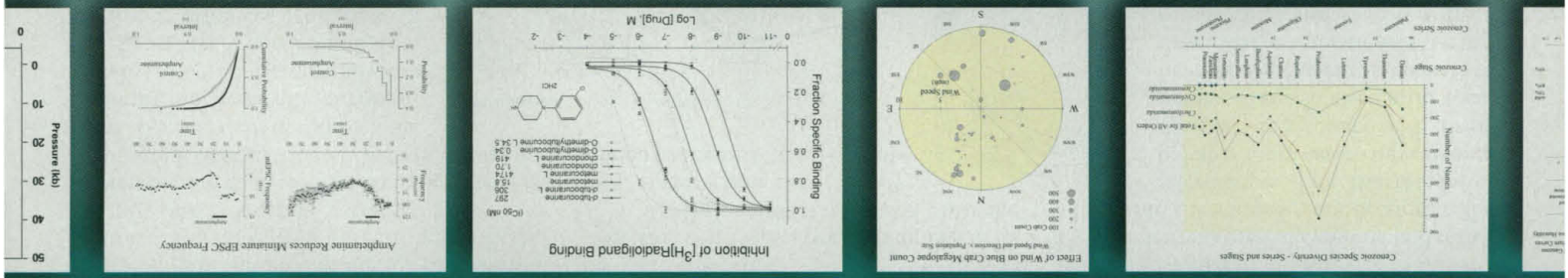
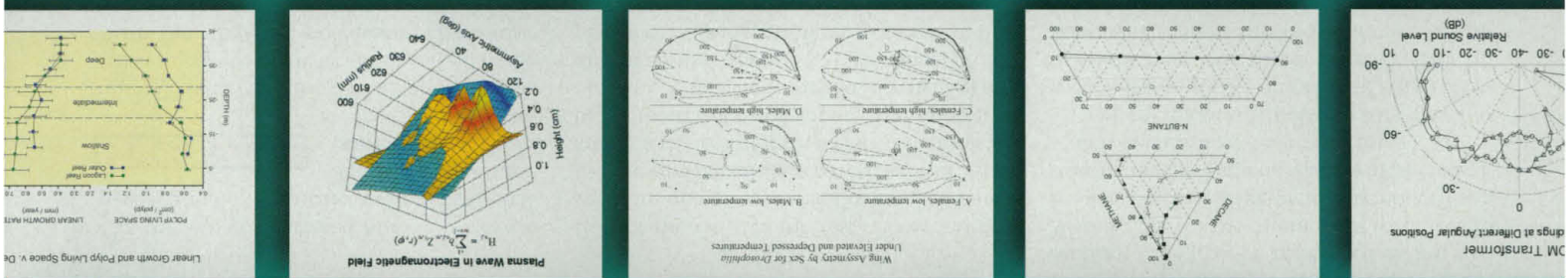
A Member of the Sigma-Aldrich Family

Germany: 0130 5155 • France: 05 21 14 08 • UK: 0800 373731 • Italy: 1678 27018 • Belgium/Netherlands: 0800 14747/06 022 9088 • USA/Canada: 800 325 3010

Circle No. 25 on Readers' Service Card

Exact Graphs for Exact Science

NEW!
SIGMAPLOT
4.0



"When it comes to choosing the program that will best meet the needs of the bulk of scientific and engineering users, it isn't close: it's SigmaPlot by a mile."

Dr. Barry Simon, Ph.D.
Review of eleven competitive products
Desktop Engineering Magazine,
September 1996

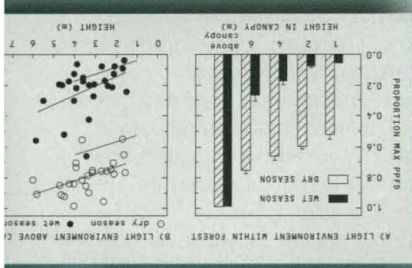
You've spent months gathering and analyzing data. Now you need to show off your work—clearly and precisely. Sure, you can use a spreadsheet or a data analysis program to make a graph. Many scientists have tried this route. Then they saw that they could not create the exact graph that best represented their data. Scientists like you designed the solution: SigmaPlot.

DESIGNED WITH THE FLEXIBILITY YOU NEED

Customize every detail to create the exact SigmaPlot graph you want. Just a few mouse clicks is all it takes to see one of over 100 curve fits added to your graph using the new SigmaPlot 4.0 Regression Wizard. Choose the error bar direction for every data point. Lay out multiple graphs on a page to see the trends in your data. All this and more with amazing ease.

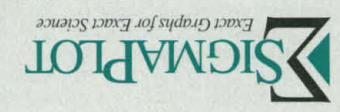
THE PROOF IS IN THE PLOTTING

Over 100,000 of your colleagues have already seen how SigmaPlot can help them create compelling graphs—like the ones shown here. Researchers, Technicians, Professors, and Engineers have all come to rely on SigmaPlot when they need exact graphs for exact science.



Call today at 1-800-345-4740

Circle No. 42 on Readers' Service Card



TSA™ IS THE DIFFERENCE

See Clearly.

Now you can enhance both chromogenic and fluorescent signals up to 1000 times with Renaissance® Tyramide Signal Amplification (TSA), a powerful new technology from NEN™ Life Science Products. TSA is easily integrated into standard immunohistochemistry (IHC) or in situ hybridization (ISH) protocols, providing Horseradish Peroxidase (HRP) is present in the system.

Fig. 1. Multicolor detection using TSA-Direct.
Courtesy of Kevin Roth, M.D., Washington University
School of Medicine, St. Louis, Missouri.

Fig. 1.

How does it work?

This technology uses HRP to catalyze the deposition of biotinyl or fluorescent tyramide onto tissue-section or cell-preparation surfaces that were previously blocked with protein. This reaction is quick (less than 10 minutes) and results in the deposition of numerous biotin or fluorochrome labels.

These labels can then be detected directly or indirectly by standard techniques. The deposition occurs right at the enzyme site, resulting in minimal loss of resolution. This easy-to-use signal amplification technique may be applied to both IHC and ISH.

Fig. 2

a. Standard fluorescent detection.

b. TSA-Enhanced fluorescent detection.

c. Standard chromogenic ISH.

d. TSA-Enhanced chromogenic ISH.

Enhance signal up to 1000-fold.

Figs. 2 a-b. Fluorescent detection of chromosome centromere probes in metaphase spreads.
Figs. 2 c-d. In situ chromogenic detection of oxytocin in rat brain tissue sections.

Care to Jump?

Call today to learn more about TSA and our complete line of Renaissance labeling and detection products for nucleic acids and proteins. To order call your local NEN office.

© NEN™ Life Science Products, 1997.

TSA is a registered trademark of NEN™ Life Science Products. Renaissance products are manufactured under an ISO 9002 Quality System registered by UL.

Circle No. 35 on Readers' Service Card

Fig. 3

a. Anti-EBA dilution is 1:25.

b. Anti-EBV dilution is 1:25,000. Enhanced by TSA.

Figs. 3 a-b. IHC of EBV antigen in Hodgkin's Lymphoma of mixed cellularity.
Courtesy of R. Von Wasielewski and S. Gignac, Pathologisches Institut de
Medizinischen Hochschule, Hannover, Germany.

Reduce use of valuable reagents.

The use of TSA allows you to conserve your precious antibodies while maintaining the same level of sensitivity.

Fluorescent or chromogenic, it's your choice.

TSA-Direct deposits numerous fluorochromes that can be directly visualized immediately after amplification. TSA-Direct kits are available in a variety of colors: Fluorescein (Green), Tetramethylrhodamine (Red), and Coumarin (Blue).

TSA-Indirect deposits numerous biotins which are then detected by streptavidin conjugated to an enzyme (followed by chromogenic detection) or a fluorochrome (for fluorescent detection).

NEN™ Life Science Products

Boston, MA 02118-2512 USA
1-800-551-2121 • 617-482-9595
Fax: 617-482-1380
Web: <http://www.nenlifesci.com>

Products available worldwide.
Consult the NEN home page for your
local sales office or distributor.
<http://www.nenlifesci.com>

**We've caused
a million
separations.**

FILTRON® Brand

has been a leader in bioseparations for over 10 years. Now available from Pall Gelman Sciences, Filtron brand products containing Omega™ PES ultrafiltration membranes combine high flow rates and low non-specific protein and nucleic acid binding for maximum sample recoveries. From microlitre volumes to process-scale production, count on centrifugal, stirred cell, and tangential flow devices with Omega membrane.



**But we'll help you
hold it all together.**

For the best technical support in the business, call your local Pall Gelman Sciences office. We'll give you our undivided attention.

PALL GelmanSciences

Australia Tel: 2-94282333 • France Tel: 1-64615252 • Germany Tel: 61-546-0220
Italy Tel: 2-69006109 • Japan Tel: 3-3844-5411 • United Kingdom Tel: 1604-704704
United States Tel: 1-800-521-1520 (U.S. only) or 313-665-0651 • www.gelman.com
© Pall Corporation, 1997

SEE THE FUTURE...

SCIENCE'S Tech.Sight

NEW FROM SCIENCE!

Tech.Sight provides detailed insight on leading-edge technology and techniques from the experts, including:

- ★ **Tech View:** Detailed technology reviews from the experts
- ★ **Tech Sightings:** Summaries of new techniques and technologies
- ★ **Tech.Sight Online:** Full-text version of the print material and enhanced online features

UPCOMING TOPICS

Tech.Sight publishes every third Friday of each month and offers readers a chance to see the future of science. Upcoming topics include:

17 OCT: Structure-activity relationships by nuclear magnetic resonance—its impact and use, along with combinatorial chemistry and pharmacokinetics, on rational drug design
Space reservation deadline: 26 September

21 NOV: Single Cell Laser Microdissection
Space reservation deadline: 29 October

19 DEC: Animal Models for AIDS Research
Space reservation deadline: 26 November

SCIENCE
www.sciencemag.org