

Vol. 288 No. 5470 Pages 1289–1536 \$8

Nuclear Dynamics



AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

🔊 NEW ENGLAND

where science is the priority

Inc

Sometimes one step makes all the difference...



For more information on how **Impact** is meeting the needs of today's **fast-paced** biotechnology industry, visit **www.neb.com** or contact your local NEB office.

- 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 (0)69/305-23-140 Fax 0800/BIOLABX (0)69/305-23-149 email: info@de.neb.com
- New England Biolabs (UK) Ltd. Tel. (0800) 31 84 86 (01462) 420616 Fax (01462) 421057 email: info@uk.neb.com

DISTRIBUTORS: Australia (07) 5594-0299; Belgium (0800)1 9815; Brazil (011) 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

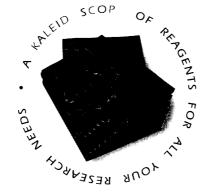


MONOCLONAL • ANTIGEN-PURIFIED POLYCLONAL • BIOTINYLATED • FLUOROCHROME-LABELED

R&D Systems is your source for antibodies to cytokines and related molecules

Offering over 1000 antibodies to:

- Cytokines
- Chemokines
- Receptors
- Developmental Factors



TAINING KIT

MEN

- Adhesion Molecules
- Matrix Metalloproteinases
- Neurotrophic Factors
- Apoptosis-related Factors
 - Look for this symbol in our 2000 Catalog for Antibodies

R&D Systems' Cell and Tissue Staining Kits are now available for detecting goat, mouse and rabbit primary antibodies utilizing three different enzymatic systems, HRP-DAB, HRP-AEC or AP-BCIP/NBT.

Antigen Retrieval Reagents are also available.

For more information about immunohistochemistry, please visit R&D Systems' website at www.rndsystems.com/cyt_cat/ihcprot.html.



Activin A in prostate cancer. Activin A labeling (red) in paraffinembedded human prostate cancer tissue was done using R&D Systems' monoclonal anti-Activin A (β_A subunit), Catalog # MAB3381. Detection was done using the anti-mouse HRP-AEC Cell and Tissue Staining Kit, Catalog # CTS003.

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

North America R&D Systems, Inc. McKinley Place NE Minneapolis, MN 55413, USA Tel: 612 379-2956 Free: 1-800-343-7475 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 529 449 Free: 0800 37 34 15 Fax: +44 (0)1235 533 420 info@mdsystems.co.uk

Germany R&D Systems GmbH Borsigstrasse 7 65205 Wiesbaden, Germany Tel: +49 (0)6122 90980 Free: 0800 909 4455 Fax: +49 (0)6122 909819 infogmbh@mdsystems.co.uk

Circle No. 58 on Readers' Service Card

Europe Free Phone Belgique/België: 0800 10 468 614 Danmark: 80 01 85 92 France: 0800 90 72 49 Nederland: 060 226607 Norge: 800 11033 Sverige: 020 79 31 49 Switzerland: 0800 55 2482



Science

www.sciencemag.org

NEWS

1311

1313

▼1314

1315

1316

1317

v1390

1396

v1399

1352

1402

1358

1436

26 MAY 2000

NEWS OF THE WEEK

1310 ASTRONOMY: Space Telescope, Teamwork Top Priority List for Next Decade

TOXICOLOGY: Dioxin Draft Sparks

BIOMEDICAL ETHICS: HHS Plans to

Overhaul Clinical Research Rules

CLIMATOLOGY: A Refuge for Life on

AIR POLLUTION: Three Asian Nations

RESEARCH ARTICLES

REPORTS

Anomalous Polarization Profiles in

Chulkov, V. M. Silkin,

P. M. Echenique, S. Crampin

1390

Pluses and

minuses of

ion pumps

Structure of the Light-Driven Chloride

Pump Halorhodopsin at 1.8 Å Resolution

M. Kolbe, H. Besir, L.-O. Essen, D. Oesterhelt

Sunspots: Possible Origin of Umbral Flashes

H. Socas-Navarro, J. Trujillo Bueno, B. Ruiz Cobo

Dimensionality Effects in the Lifetime of

Surface States J. Kliewer, R. Berndt, E. V.

First Union Contract

Controversy

Bacillus Persists

Snowball Earth

RESEARCH

Launch Joint Study

1311 CALIFORNIA: State Ready to Create

Three Research Institutes

CALIFORNIA: UC Teaching Assistants Win

MICROBIOLOGY: New Clues to How the TB

NUMBER 5470

COVER Stages of mitosis in cells of the Indian muntjak, a deer species with only a few chromosomes. This characteristic allows a clear visualization of the condensation (yellow to orange), separation (red to turquoise), and decondensation (green to yellow) of chromosomes throughout mitosis. See the Nuclear Dynamics section, starting on p. 1369. [Fluorescent micrographs: S. Hauf and J.-M. Peters]





1320 Hot labs are hot

DEPARTMENTS

NETWATCH 1295

THIS WEEK IN SCIENCE 1297

EDITORS' CHOICE 1301

CONTACT SCIENCE 1306

> SCIENCESCOPE 1313

RANDOM SAMPLES 1331

AAAS News & Notes 1442

NEW PRODUCTS 1455



NEWS FOCUS

- **1320 VIROLOGY: The Boom in Biosafety Labs** Learning the Hard Way
- 1323 PUBLIC HEALTH: Aluminum Is Put on Trial as a Vaccine Booster
- 1324 EUROPEAN SCIENCE: A Blow to Austria's Scientific Revival From Wasteland to Biomedical Wonderland Teleportation Guru Stakes Out New Ground
- 1328 MATHEMATICS: Is That Your Final Equation? Turn-of-the-Century 'Hit List' Showed the Limits of Mathematical Ambition

NUCLEAR DYNAMICS

Macromolecular Ballet

NEWS

- Interfering With Gene Expression
- Matching the Transcription Machinery to the Right DNA

VIEWPOINTS

- 1374 Gatekeepers of the Nucleus S. R. Wente
- 1377 A Sense of the End S. M. Gasser

REVIEWS

1379 Splitting the Chromosome: Cutting the Ties That Bind Sister Chromatids K. Nasmyth, J.-M. Peters, F. Uhlmann

1385 Like Attracts Like: Getting RNA Processing Together in the Nucleus J. D. Lewis and D. Tollervey

See also Report on p. 1422.

1369

1370

1372

- ▼1402 Real-Time Observation of Adsorbate
 1352 Atom Motion Above a Metal Surface
 1399 H. Petek, M. J. Weida, H. Nagano, S. Ogawa
- 1404 Electron-Induced Inversion of Helical Chirality in Copper Complexes of N,N-Dialkylmethionines S. Zahn and J.W. Canary
- 1407 Quantifying Denitrification and Its Effect on Ozone Recovery A. Tabazadeh, M. L. Santee, M. Y. Danilin, H. C. Pumphrey, P. A. Newman, P. J. Hamill, J. L. Mergenthaler



American Association for the Advancement of Science SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals Mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 2000 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): \$112 (\$62 allocated to subscription). Domestic institutional subscription (51 issues): \$340; Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$90. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. Publications Mail Agreement Number 1069624. Printed in the U.S.A.

SCIENCE'S COMPASS

EDITORIAL

Welcome Don Kennedy 1341

LETTERS

1343 NAS Report Under Scrutiny H. I. Miller. Snake Origins M. S. Y. Lee, J. D. Scanlon, M. W. Caldwell. Response H. W. Greene and D. Cundall. Immortality, Anyone? M. Phillips; H. Rojas; P. Frank. Response J. Harris. Report Clarification M. Kanzaki, M. Nagasawa, I. Kojima, C. Sato, K. Naruse, M. Sokabe, H. lida

PROFILE

1349 Donald Kennedy—The Next Editor-in-Chief of Science P. R. Ehrlich

BOOKS ET AL.

- 1350 HISTORY OF PHYSICS: In the Shadow of the Bomb Oppenheimer, Bethe, and the Moral Responsibility of the Scientist S. S. Schweber, reviewed by R. Rhodes
- 1351 CHEMISTRY: Color A Multidisciplinary Approach H. Zollinger, reviewed by T. Lazar

Postcards from the edge

1399

1402

1390

1314

1356

PERSPECTIVES

- SURFACE SCIENCE: Electron Dynamics at **v**1352 Surfaces M. Wolf and G. Ertl
- 1353 PALEOCLIMATE: 1000 Years of Climate Change R. Bradley
- 1356 **ECOLOGY: Receding Forest Edges and** Vanishing Reserves C. Gascon, G. B. Williamson, G.A.B. da Fonseca
- **v**1358 STRUCTURAL BIOLOGY: A Chloride Pump at Atomic Resolution J. L. Spudich
- 1411 Field Measurement of Slow Metamorphic Reaction Rates at Temperatures of 500° to 600°C E. F. Baxter and D. J. DePaolo
- 1414 Spatial Patterns in the Distribution of Tropical Tree Species R. Condit, P. S. Ashton, P. Baker, S. Bunyavejchewin, S. Gunatilleke, N. Gunatilleke, S. P. Hubbell, R. B. Foster, A. Itoh, J. V. LaFrankie, H. S. Lee, E. Losos, N. Manokaran, R. Sukumar, T. Yamakura
- 1418 Mechanism of ATP-Dependent Promoter **Melting by Transcription Factor IIH** T.-K. Kim, R. H. Ebright, D. Reinberg
- 1422 Structure and Function of a Human TAF₁250 **Double Bromodomain Module** R. H. Jacobson, A. G. Ladurner, D. S. King, R. Tjian
- Rapid Destruction of Human Cdc25A in 1425 Response to DNA Damage N. Mailand, J. Falck, C. Lukas, R. G. Syljuåsen, M. Welcker, J. Bartek, J. Lukas
- 1429 **Chromatin-Independent Nuclear Envelope** Assembly Induced by Ran GTPase in Xenopus Egg Extracts C. Zhang and P. R. Clarke

- 1432 Nipah Virus: A Recently Emergent Deadly Paramyxovirus K. B. Chua, W. J. Bellini, P. A. Rota, B. H. Harcourt, A. Tamin, S. K. Lam, T. G. Ksiazek, P. E. Rollin, S. R. Zaki, W.-J. Shieh, C. S. Goldsmith, D. J. Gubler, J. T. Roehrig, B. Eaton, A. R. Gould, J. Olson, H. Field, P. Daniels, A. E. Ling, C. J. Peters, L. J. Anderson, B.W.J. Mahy
- **v** 1436 Granuloma-Specific Expression of **Mycobacterium Virulence Proteins from** the Glycine-Rich PE-PGRS Family L. Ramakrishnan, N. A. Federspiel, S. Falkow
 - **Regulation of B Lymphocyte and** 1439 Macrophage Development by Graded Expression of PU.1 R. P. DeKoter and H. Singh

TECHNICAL COMMENTS

Reversibility of HIV Drug Resistance M. P. Davenport. Response S. M. Blower, H. B. Gershengorn, R. M. Grant

www.sciencemag.org/cgi/content/full/288/5470/1299a

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 photo-copy 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 \$8.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for Science is 0036-8075/83 \$8.00. Science is indexed in the Reader's Cuide to Reprindical Unexpression of the average indexed. Guide to Periodical Literature and in several specialized indexes.

SCIENCE ONLINE www.scienceonline.org

SCIENCE THE JOURNAL www.sciencemag.org

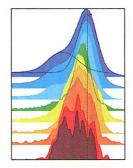
SCIENCENOW DAILY NEWS SERVICE www.sciencenow.org

NEXT WAVE RESOURCES FOR YOUNG SCIENTISTS www.nextwave.org

GRANTSNET RESEARCH FUNDING DATABASE www.grantsnet.org

NEUROAIDS EXPERIMENTAL WEB SITE www.sciencemag.org/NAIDS

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



1402 How to see an atom move

Watson and Crick unlocked the secret of DNA in 1953.

And you're still searching for the correct restriction enzyme?

Search no more. Because at www.sciquest.com, it's easy to find, and order, exactly what you need from the supplier you want. With a search function created specifically for scientists, choosing from nearly a million products has never been faster. And features like "My Favorites," which makes reordering easy, save you money through the efficiencies of e-commerce. Best of all, SciQuest.com offers you something money can't buy - more time to do what you do best. See why companies like Amersham Pharmacia Biotech, Ambion, Inc., BioWhittaker, Inc., The Dow Chemical Company and DuPont Pharmaceuticals Company have signed exclusive online agreements with SciQuest.com by visiting the site today - www.sciquest.com

International orders subject to review with individual supplier.

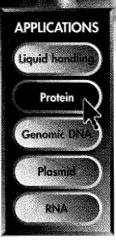


Order here. Experiment elsewhere.

Visit us at ASM, booth #933.

Image: A false color scanning tunnel micrograph of a double-stranded DNA molecule taken at the Lawrence Livermore Laboratory.

Lab automation designed for unlimited flexibility



New

BIO ROBOT 3000 — automated protein applications in 96-well format

Automated purification and assay of 6xHis-tagged proteins

The BioRobot[™] 3000 provides automated magnetocapture purification and assay for functional genomics and protein-based drug screening, diagnostics, and immunology. Optimized protocols streamline cross-contamination–free purification of up to 96 different proteins in parallel. Automated processing ensures high well-to-well reproducibility for consistent yields.

Micro-scale purification and assay of 6xHis-tagged proteins are easy using walk-away processing with Ni-NTA Magnetic Agarose Beads. Flexible programming options give you unlimited possibilities for experimental design. The Ni-NTA Superflow 96 BioRobot Kit is available for convenient medium-scale purification.

Tailor-made automation

Each BioRobot 3000 is custom designed for maximum application flexibility allowing you to design any kind of assay. The easy-to-use software provides complete documentation and standard formats for effortless data exchange. You can easily modify and expand your BioRobot 3000 whenever your application demands change.

Comprehensive application support

Our Application Specialists have experience in both molecular biology and instrumentation, and can offer help that goes beyond workstation design and installation. This unique support for application development and system expansion keeps your workstation state of the art.

Lab automation your way — from the company that understands molecular biology

Contact QIAGEN today!

Trademarks: BioRobot™ (QIAGEN); Superflow (Sterogene Bioseparations, Inc.). The BioRobot 3000 is not available in all countries; please inquire. © 2000 QIAGEN, all rights reserved

www.qiagen.com

Circle No. 50 on Readers' Service Card

 QIAGEN:
 Germany
 USA
 Australia
 Canada
 France
 Japon
 Switzerland
 UK

 Tel.
 02103.892.240
 Tel.
 800-426.8157
 Tel.
 039.489.3666
 Tel.
 800-572.9613
 Tel.
 0160-920.930
 Tel.
 035805.7261
 Tel.
 061.319.3031
 Tel.
 01293.422.999

 Fax
 02103.892.255
 Fax
 800-718-2056
 Fax
 039.489.3888
 Fax
 905.821.1327
 Fax
 0160-920.925
 Fax
 035805.7263
 Tel.
 01293.422.999

 Fax
 0150.920.925
 Fax
 035.805.7264
 Tel.
 01319.3033
 Fax
 01293.422.992

DSTRIBUTORS: Argentina Tecnolab S.A. (011) 4555 0010 Austria/Hungary/Slovenia R. u. P. MARGARITELIA Austria (01) 889 18 19 Belgium/Luxemburg Westburg b.v. 0800-1-9815 Brazil Labtrade da Brazil (11) 431 1455 or 0800 55 1321 Central & South America Labtrade inc. USA (305) 828-3818 China Gene Company Limited (85)(2896/2838 Czech Republic BIO-CONSUIT spot. sr.o. (02)/4447 1239 Denmark KEBO Lab A/S 43 86 87 88 Egypt Clinilab 525 7212 Finland KEBO Lab Cy (09)/804 551 Greece BioAndyrico S.A. (01)-640 03 18 India Genetix (01)/542 1714 or (01)/515 9346 Israel Biolab Ud. 02. 584 1111 Korea IRS Laboratories, Inc. (02) 924-86 97 Malaysia Research Biolabs Sda. Bhd. (03)/7312099 Mexico Quinico Valoner SA. 4e C.V. (5) 525 57 25 The Netherlands Westburg b.v. (033)/4930094 New Zealand Biolab Scientific Ltd (09)/980 6700 or 0800933966 Norway KEBO Lab A/S 22 90 000 Poland Syngen Biolech (071) 351 41 06 or 0601 70 60 07 Portugal IZASA PORTUGAL, IDA (1)/424 73 64 Singapore Research Biolabs Pe Lit 4.457927 Slovak Republic BIO-CONSUIT Spot. Sur.o. (03) 4.500, 0521 336 South Africa Sudhern Cross Biolechology (19)/11 (01) (71) 156 591 (71) 1424 73 64 Singapore Research Biolabs Pe Lit 4.457927 Slovak Republic BIO-CONSUIT Spot. Sur.o. (75) 0521 336 South Africa Sudhern Cross Biolechology (19)/11 (02) (71) 516 5.500 (71) 671 516 5



This Week in *Science*

edited by PHIL SZUROMI

OSCILLATING SUNSPOTS

Some sunspots show oscillations in the shape and strength of spectral lines in the chromosphere above the sunspot umbrae; these umbral flashes occur with periods of about 3 minutes. Socas-Navarro et al. (p. 1396) observed anomalous circular polarization profiles for two sunspots and developed a model that inverts for the characteristics of the spectral lines of the umbral flashes by including nonthermal emissions. From their model, they suggest that umbral flashes result from the periodic formation of a downward-flowing magnetized region, and all sunspots may have umbral flashes but that some go unseen because of a lack of spectral resolution.

POLES APART

Loss of stratospheric ozone at the poles depends on the presence of polar stratospheric clouds (PSCs) that promote formation of the "active" chlorine that catalytically destroys ozone molecules. An important step in this process is denitrification. Tabazadeh et al. (p. 1407) have evaluated satellite measurements of Antarctic stratospheric nitric acid and water vapor and introduce the concept of "PSC lifetime" to show why denitrification is more severe there than in the Arctic. This idea can be used to help explain why the Arctic has not developed an ozone hole like the one in the Antarctic and suggests that widespread Arctic ozone loss could occur if further stratospheric cooling were to accompany changes in the concentrations of greenhouse gases.

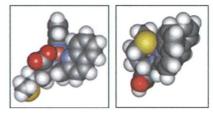
EXCITED ON THE SURFACE

Measurements of the dynamics of excited electrons on metal surfaces, which can control electronic processes and chemical reactions, must overcome the role of defects and the strong interactions with other electrons. Two reports present experimental approaches to overcoming these difficulties (see the Perspective by Wolf and Ertl). When an electron is excited and leaves behind a positively charge hole, it can roam the surface until it recombines with another electron. Various experimental and theoretical studies have given differing surface hole lifetimes. Kliewer et al. (p. 1399) used scanning probe microscopy to measure the hole lifetime on microscopic regions of the surface. Previous techniques were macroscopic in that they averaged across the surface and did not take into proper account scattering in the surface region.

When scattering in the surface is properly taken into account, the discrepancies between theory and experiment can be resolved. When atoms or molecules adsorbed on a surface are excited electronically (for example, with light of suitable wavelength) chemical reactions may occur. The associated structural changes usually occur on time scales of femtoseconds, too fast to be resolved even by ultrafast diffraction techniques. Petek et al. (p. 1402) exploit an unusually long-lived electronic state for cesium on a copper surface to study the changes in surface electronic structure with time. Their "movie," with 13.4-femtosecond frames, indicates that the cesium-copper bond is extended by 0.35 angstrom as a result of laser excitation before it relaxes back to its equilibrium position.

HELICAL INVERSION

Changes in chirality can be induced photochemically and reversibly in certain small chemical compounds. Redox-driven chirality changes have also been investigated, but with less success. Zahn and Canary (p. 1404) have synthesized copper complexes



that undergo complete and reversible helix inversion of the orientation of the two chromophores in these propeller-shaped molecules as a result of oxidation and reduction between Cu¹ and Cu¹¹. The change is driven by the reorientation of one of the chromophores caused by a change in ligand.

THE FLIP SIDE OF ION PUMPING

The membrane protein bacteriorhodopsin uses the energy from one photon of visible light to transport one proton from the interior of Halobacterium to the external medium. Halorhodopsin, also found in Halobacterium, bears about 30% sequence identity to bacteriorhodopsin but uses one photon to pump a chloride ion inward. How such a similar protein can catalyze such an apparently different reaction is now clearer as a result of the structure presented by Kolbe et al. (p. 1390; see the Perspective by Spudich). The photon-driven cis-trans isomerization of retinal serves to flip the Schiff's base and to drag the chloride ion to a site that provides access to the cytoplasmic space. Subsequent relaxation and reisomerization allow the chloride-binding site to be refilled from the external medium.

GROWING TOGETHER

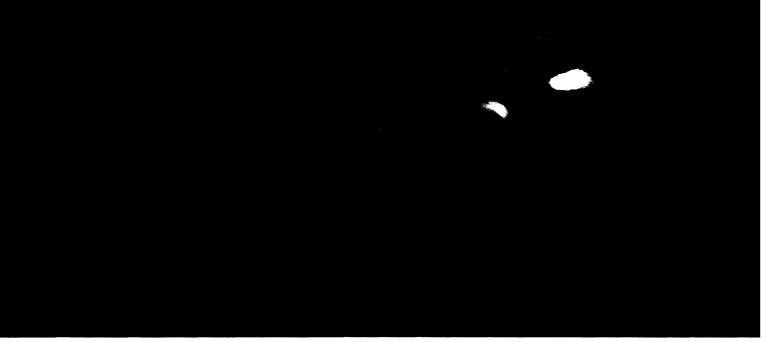
Tropical forests contain a very high diversity of tree species, but there is little baseline information that describes the population structure and dispersion of individual tree species, many of which are rare. Condit et al. (p. 1414) now present a massive survey of all stems greater than 1 centimeter in diameter, in forest plots 25 to 52 hectares in area, at six sites in Asia and Central America. This large sample of more than 1000 species shows that most tree species are aggregated and not randomly distributed or overdispersed, as many previous reports have suggested. Aggregation is maintained even among very large trees, and rare species are more aggregated than common ones. This new wealth of data paves the way for greater understanding of the factors controlling diversity in tropical forests.

GETTING A GRIP

Messenger RNAs are transcribed from their complementary gene in the DNA by the enzyme RNA polymerase II plus a host of additional transcription factors. One of these, transcription factor IIH, is a 3'-5' DNA helicase and is required for melting the double-stranded DNA at the transcription start site so that RNA polymerase, which acts only on single-stranded DNA, can gain access. Rather than acting directly on the start site to cause unwinding and melting, Kim et al. (p. 1418) show that IIH actually acts at a distance and binds to DNA 3 to 25 nucleotides downstream of the start site. From this adjacent position, the authors suggest, IIH acts as a "molecular wrench" to exert torque on the DNA helix. Separation of the DNA strands slightly upstream forms the start-site transcription bubble.

RECOGNIZING MORE THAN DNA SEQUENCES

The multiprotein complex TFIID has sequence-specific DNA binding activity and mediates regulation of transcription. The CONTINUED ON PAGE 1299



Malachite Kingfisher

Migrate to the Purest dNTPs Available!

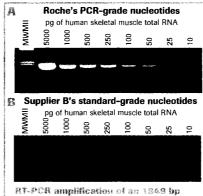
Increase sensitivity and performance

Obtain significantly better PCR results, without reoptimization or increased reaction cost.

- Multiple Use the purest dNTPs available.
- MELIminate inhibitors (e.g., tetra- and pyrophosphates, stabilizers, RNases, DNases, and nicking activity) in synthesis reactions.

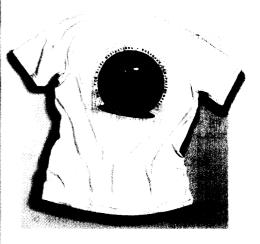
Experience better sensitivity from synthesis reactions

Try a free sample today! Obtain a free sample of PCR-Grade Nucleotides** by registering at http://biochem.roche.com/ usa/promo.htm



iragment of the human dystrophin gene. Varying amounts of human skeletal muscle total RNA were incubated with 1 µl Titan RT-PCR System[†] enzyme mix, followed by an RT-step, 35 cycles of PCR, and analysis on a 1.0% agarose gel. The experiment using Roche's PCR-Grade Nucleotides (A) produced an RT-PCR product from 10 pg of human skeletal muscle total RNA. At least 100 pg of RNA was required to produce similar results using Supplier P's standardgrade nucleotides (B).

Receive a free T-shirt with the purchase of one 1000 reaction pack size of PCR Nucleotide Mix.** Call 800 262 1640 to place your order!



Product	Cat. No.	Pack Size	Price (S)
PCR Nucleotide Mix, PCR-Gradett	C 1 814 362	1000 reactions	311.00
		and a Large T-shirt	
	D 1 814 362	1000 reactions and	311.00
		an Extra-large T-shirt	
	1 581 295	100 reactions	56.00
Set of Deoxy-Nucleotides, PCR-Grade ⁺⁺	1 969 064	4 x 25 µmol	184.00
dATP, PCR-Grade ⁺⁺	1 934 511	25 µmol*	52.00
dCTP, PCR-Grade ⁺⁺	1 934 520	25 µmol*	52.00
dGTP, PCR-Grade ⁺⁺	1 934 538	25 µmol*	52.00
dTTP, PCR-Grade ⁺⁺	1 934 546	25 µmol*	52.00
dUTP, PCR-Grade ⁺⁺	1 934 554	25 µmol*	52.00

* also available in 125 µmol pack size

** Offers valid through June 30, 2000, only in the U.S. Void where prohibited by institutional policy.

¹ Purchase of this product is accompanied by a limited license to use it in the Polymerase Chain Reaction (PCR) process for life science research in conjunction with a thermal cycler whose use in the automated performance of the PCR process is covered by the up-front license fee, either by payment to the Applied Biosystems or as purchased, i.e., an authorized thermal cycler.
¹¹ The PCR process is covered by patents owned by Roche Molecular Systems and F. Hoffmann-La Roche Ltd. Use of the PCR process requires a license. This product does not convey a license to use the PCR process. Titan is a registered trademark of a member of the Roche Group



Roche Diagnostics Corporation Roche Molecular Biochemicals Indianapolis, IN 46250

THIS WEEK IN SCIENCE

CONTINUED FROM PAGE 125

largest subunit of TFIID, TAF_{II}250, has activities that give it a potential role in chromatin targeting or remodeling. Jacobson et al. (p. 1422; see the news story by Pennisi) present the crystal structure at 2.1 angstroms of the double bromodomain from human TAF₁₁250. The structure reveals two four-helix bundles, each of which contains a hydrophobic central pocket that is likely to bind acetyllysine. Comparison of binding affinities for mono-, di-, or multiply-acetylated histone H4 peptides showed that binding was tightest for two acetyllysines separated by seven residues, a separation consistent with the distance of 25 angstroms between the binding pockets. The structure also displays localized patches of positive and negative charge that could be involved in nucleic acid and histone binding. Thus, the authors propose that the double bromodomains may recognize diacetylated H4 tails and target TFIID to specific chromatin-bound promoters.

PROFILE OF A KILLER

The Nipah virus, which was responsible for an outbreak of encephalitis that caused the deaths of 105 people in Singapore and Malaysia, has now been characterized by Chua *et al.* (p. 1432). The virus was classified as a member of the *Paramyxoviridae* family by electron microscopic analyses of the nucleocapsid structure and replication, as well as by serologic and sequence criteria. Epidemiological evidence had indicated that the infections occurred in people who came in contact with pigs and the virus was found in pig respiratory tracts. The authors suggest that Nipah virus and the recently discovered Hendra virus form part of a new genus; these viruses are unusual in the number of species that they can infect and potentially kill.

MICROBACTERIAL VIRULENCE GENES

Some mycobacteria are responsible for severe and persistent human disease. Mycobacterium marinum, a close relative of the tuberculosis (TB)-causing species, infects a range of ectotherms and can cause disease to the cooler extremities of humans. Ramakrishnan et al. (p. 1436; see the news story by Wickelgren) have used differential fluorescence induction to show that in living organisms (leopard frogs infected with M. marinum), the pathogen expresses a specific set of genes during chronic infection within granulomas and that a particular subset of these genes are essential for the organism to subvert and parasitize cells of the host's immune system. Although known to exist, these genes had not previously been ascribed any function. Moreover, the same genes in M. tuberculosis can now be targeted against TB.

TO B CELL, OR NOT TO B CELL

The transcription factor PU.1 is essential in B cell and macrophage development and proliferation. DeKoter and Singh (p. 1439) show that the level of expression of PU.1 can control which cell fate will result. At low levels, PU.1 protein caused precursor cells to differentiate into B lymphocytes (the cells involved in producing antibodies), whereas at high levels of PU.1 the same cells differentiated into macrophages (the cells that engulf invading organisms).

TECHNICAL COMMENT SUMMARIES

Reversibility of HIV Drug Resistance

The full text of these comments can be seen at www.sciencemag.org/cgi/content/full/288/5470/1299a

To predict the effectiveness of antiretroviral therapy (ART) in preventing human immunodeficiency virus (HIV) infections in the San Francisco gay community, Blower *et al.* (Reports, 28 Jan., p. 650) developed a mathematical model that encompassed the effects of ART, potential increases in risky behavior, and the rate of emergence of drug resistance. Davenport comments that, because the model assumes that "patients with drug-resistant virus who cease treatment...will revert to being drug sensitive...within a short period," few patients in the model remained drug resistant and untreated. "Because this group is expected both to have a high death rate...and to exert an influence on the spread of resistant virus," says Davenport, "their absence is significant." Blower *et al.* respond that their intention was to develop a "first, simple model to provide general insights," and that more refined future models will address such variables as re-treatment failure rates. Meanwhile, note Blower *et al.*, the timedependent sensitivity analyses even for the simple model "revealed that neither a very high rate of acquired (or reacquired) resistance...nor a very high reversion rate...significantly affected the two main outcome variables of interest." We Promise.

Whatever the length, whatever the sequence, the FailSafe^{TT} PCR System will faithfully amplify your template every time.

At EPICENTRE, we're scientists like you and we usually don't take advertising slogans seriously. But this time we're making an exception. Our new FailSafe PCR System is a very different product; it is truly a much better way to amplify your DNA.

First, it's a high fidelity system that makes many fewer mistakes than regular Taq. It's also a long PCR system — we've been able to amplify greater than 20 kb and believe we can go much farther. It's a "tough template" system. It will amplify the highest GC DNA you can find. And finally, it has our patented PCR Enhancement Technology, which makes it extremely reproducible from reaction to reaction. So you can see why this time we broke our own prohibition against using grandiose marketing claims.

We believe that if you use this enzyme system you will never have a bad PCR reaction, no matter what your template.

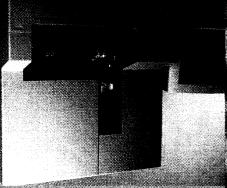
That's why we signed this ad, and that's our promise to you.



more of what you need. 3100 Genetic Analyzer to give you Main9 18A ent begoleveb eW

-lis lo ised-bre , and-best of allsistieue jueudeli pue dui puenbes more throughput capacity, more Genetic Analyzer gives you ODIC ent , sertamento "warred IBA With 16 capillaries and proven

emit ejom



The 3100 Genetic Analyzer is a fully automated. capillary electrophoreace system for mid- to high-throughput leboratores.

tot anti bebnettenu jelqitium nur lilw mersys ent inni ent insis bris , enewrice entruptes, reidmesotue ent. track. Just place your samples in there are no gels to pour, load, or vith the 3100 Genetic Analyzer,

short es of qu

Genetic Analyzer has to offer 0015 ant printyneve to epsinevbe network that can help you take full inoqqua nemoteup a bne (villidailen smetayaoi8 beilqqA betaet-emit ritiw You'll also get more peace of mind

Discover how much more you can do.

(800) 34e-e554 0016/moo.smstsysoldag.www

smateveoia 35

A PE Corporation Business

Sixteen capillaries, endless possibilities. aucing the ABI PRISM® 3100 Genetic Analyzer.

BROW

Your research may now proceed.

192VIBINA Ditense 0015 Maing 18A

Applied Biosystems

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

is e ho hieq is se , tot.l ,t Ind Hitschi, Ltd., as well as ion of its subsidiaries in the U.S. and certain other countries. For Research Use Uniy, Not for use it s she legistered trademarks of HF Col

The Order

www.sigma-aldrich.com

"Okay, all 25 are in stock. They'll ship today. Deliver tomorrow. Here's your total cost."

The Information

"Oh yeah, and just click here and it will print off the MSDS too."

What You Need...And What You Need To Know

Ordering from Sigma-Aldrich has never been easier with PipeLine^e, our convenient, on-line procurement system.

With PipeLine[®], you have instant access to over 200,000 products and can order from all brands (Sigma, Aldrich, Fluka, Supelco, and Riedel-de Haën) in a single transaction. Plus, because we are a manufacturer, we provide the technical information and support you won't find elsewhere.

www.sigma-aldrich.com

The information you give us is encrypted using the Secure Socket Layer (SSL) protocol, so you can rest assured that all transactions are private and secure.

To make on-line ordering even simpler, we have recently added :

- On-Line Product Availability
- On-Line Order Status
- Total Delivered Price

These new features allow you to see "real time" inventory and to track the status of every order you place (phone, fax or web).

Best of all, you have millions of product documents at your fingertips including: MSDS's, certificates of analysis, structures and structure searching, application notes, data sheets and much more.

Log on today it will make your job easier.



DISCOVER THE CHEMISTRY BETWEEN US SIGMA-ALDRICH • BOX 14508 • ST. LOUIS • MISSOURI 63178 • USA

Circle No. 60 on Readers' Service Card

Your J Future is Online

Where science professionals click. Just go to www.sciencecareers.org and use the premier scientific web site dedicated to helping scientists find top quality jobs in the life sciences industry.

It's easy, and free. Whether it's job postings from top pharmaceutical and biotechnology organizations, a Resume/CV database, our Job Alerts service, or career advice you need, sciencecareers.org. can help you discover your future.



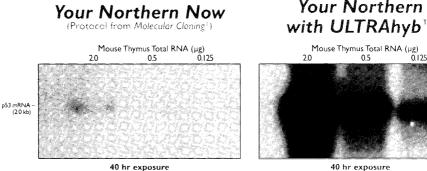
THE RNA COMPANY

Improve your

Up to 100X increase in DNA probe sensitivity; 20X increase in **RNA** probe sensitivity

> **Rare messages** now detectable in Northerns

Ideal for Northerns, Southerns, dot/slot blots and microarrays



Duplicate Northern blots were prepared using mouse thymus total RNA and hybridized with a DNA probe to p53 at a concentration of 1 x 10⁶ cpm probe/ml hybridization solution. Incubation and washing conditions were as per protocol for each solution. Both hybridizations were incubated overnight. Blots were exposed to film for 40 hours

1. Molecular Cloning: A Laboratory Manual, 1989. Sambrook, J. Fritsch, E.F., Maniatis, T. Cold Spring Harbor Laboratory Press

The answer may be as simple as changing your hyb solution.

Do you get weak signal or no signal at all from your Northern blots? A simple overnight hybridization with ULTRAhyb can increase the signal of rare messages up to 100X; so, you can avoid switching to a more complicated technique, such as poly(A) RNA isolation or RT-PCR.

ULTRAhyb works with RNA or DNA probes labeled isotopically or nonisotopically and in any blot hybridization protocol. And ULTRAhyb is not just for Northerns - similar increases in signal are seen in Southerns, dot/slot blots, and gene arrays.

For instant information about ULTRAhyb, email ultra@ambion.com. Call Ambion today to order ULTRAhyb (Catalog #8670, 125 ml, \$80.00).

For a complete list of distributors visit our website, http://www.ambion.com U.S. (800)888-8804 Canada (800)445-1161



Ambion, Inc. • 2130 Woodward St. • Austin, TX 78744-1832 • tel(512)651-0200 • fax(512)651-0201 • email: moinfo@ambion.com • www.ambion.com Circle No. 35 on Readers' Service Card

Your Northern with ULTRAhyb[™]

NOW



www.sciencemag.org cience

1200 New York Avenue, NW Washington, DC 20005 Editorial: 202-326-6550, FAX 202-289-7562 News: 202-326-6500. FAX 202-371-9227 Permissions: 202-326-7074 FAX 202-682-0816 Subscriptions: 800-731-4939 or 202-326-6417, FAX 202-842-1065

Bateman House, 82-88 Hills Road Cambridge, UK CB2 1LQ (44) 1223-326500, FAX (44) 1223-326501

EDITOR-IN-CHIEF	Floyd E. Bloom
EDITOR	Ellis Rubinstein
MANAGING EDITOR	Monica M. Bradford
	NEWS EDITOR

DEPUTY MANAGING EDITORS R. Brooks Hanson Katrina L. Kelner Colin Norman

EDITORIAL/COMPASS SUPERVISORY SENIOR EDITORS Barbara Jasny, GUV Riddihough, Phillip D. Szuromi; SENIOR EDITOR/PERSPECTIVES Orla Smith; SE-NIOR EDITORS Gilbert J. Chin, Pamela J. Hines, Paula A. Kiberstis (Boston), L Bryan Ray; Associate EDITORS Lisa D. Chong, Beverly A. Purnell, Linda R. Rowan, H. Jesse Smith, Valda Vinson; Associate BOOK REVIEW EDITOR Sherman J. Suter; Associate LETTERS EDITOR Christine M. Pearce; Associate to/web editor Stewart Wills; Information specialist

PUBLISHER Richard S. Nicholson ASSOCIATE PUBLISHER Beth Rosner MEMBERSHIP/CIRCULATION DIR. Michael Spinella

MEMBERSHIP/CIRCULATION (membership@aaas.org) DEPUTY DIRECTOR Marlene Zendell; MEMBER SERVICES: MANAGER Michael Lung; SUPERVISOR Mary Curry; REPRESENTATIVES Laurie Baker, Pat Butler, Elizabeth Early, Jantell Smith; MARKETING: MANAGER Scott Oser; Associates Lauri Sirois, Deborah Stromberg; EUROPE MANAGER lane Pennington; EXECU-TIVES Ruth Jackson, Martin Paine; RESEARCH: MANAGER RENUKA Chander; BUSINESS AND FINANCE: MANAGER TERESSA Ellis; COMPUTER SPECIALIST Charles Munson

SUBSCRIPTION SERVICES For change of address, missing issues, new orders and renewals, and payment questions: 800-731-4939 or 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

REPRINTS Ordering/Billing/Status 800-407-9190; Corrections 202-326-6501

MEMBER BENEFITS For 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

FINANCE AND ADVERTISING BUSINESS MANAGER Deborah Rivera-Wierihold; SENIOR ANALYST RANDY YI; FINANCIAL ANALYST LISA DONOVAN RIGHTS AND PER-

lanet Kegg; contributing Editors Kevin Ahern, David F. Voss; Editorial MANAGER Cara Tate; SENIOR COPY EDITORS Cay Butler, Harry Jach, Etta Kavanagh, Barbara P. Ordway, COPY EDITORS Jeffrey E. Cook, Jason Llewellyn, Joshua Marcy, Monique Martineau; EDITORIAL COORDINATORS Carolyn Kyle, Ellen E. Murphy, Beverly Shields; publications assistants Chris Filiatreau, Joi S. Granger, Jeffrey Heam, Charlene King; Elizabeth Lenox, Gail Murphy; EDITORIAL ASSISTANTS Elise Laffman, Kathy Libal, Anita Wynn: EDITORIAL SUPPORT ASSISTANTS Osa Atoe, Patricia M. Moore, Brian White, Karen Yuan ADMINISTRATIVE SUPPORT Sylvia S. Kihara EXECUTIVE ASSISTANT: Patricia E. Fisher

science_editors@aaas.org science letters@aaas.org science_reviews@aaas.org science_bookrevs@aaas.org (for book review queries)

(for general editorial queries) (for letters to the editor) (for returning manuscript reviews)

NEWS SENIOR CORRESPONDENTS Eliot Marshall, Jean Marx: DEPUTY NEWS Formes Robert Coonty Jeffrey Mervis Leslie Roberts, Richard Stone CONTRIBUTING EDITORS Elizabeth Culotta, Polly Shulman; NEWS WRITERS Martin Enserink, Laura Helmuth, Constance Holden, Jocelyn Kaiser, Richard A. Kerr, Andrew Lawler, David Malakoff, Elizabeth Pennisi, Charles Seife, Robert F. Service (Pacific NW), Gretchen Vogel, H. Adrian Cho (intern); CONTRIBUTING CORRESPONDENTS Marcia Barinaga (Berkeley, CA), Barry A. Cipra, Jon Cohen (San Diego, CA), Ann Gibbons, Robert Irion, Charles C. Mann, Anne Simon Moffat, Virginia Morell, Evelyn Strauss, Gary Taubes, Ingrid Wickelgren; copy EDITORS Linda B. Felaco, Daniel T. Helgerman; ADMINISTRATIVE SUPPORT Scherraine Mack, Fannie Groom; BUREAUS: Berkeley, CA: 510-652-0302, FAX 510-652-1867, San Diego, CA: 760-942-3252, FAX 760-942-4979, Pacific Northwest: 541-342-6290

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

MISSIONS: ASSOCIATE Emilie David; ASSISTANT Karen Lentz Marketing: Direc-TOR John Meyers; Associates Amanda Donathen, Allison Pritchard Elec-NIC MEDIA: MANAGER David Gillikin; PRODUCTION ASSOCIATES Mark Croatti, Robert Owens, Louis Williams administrative support lessica Tierney

PRODUCT ADVERTISING (science_ advertising@aaas.org) NATIONAL SALES MANAGER NORTHEAST AND E. CANADA Richard Teeling: 973-694-9173, FAX 973-694-9193 · MIDWEST/ SOUTHEAST Elizabeth Mosko: 773-665-1150 FAX 773-665-2129 · West Coast/W. Canada Neil Boylan: 415-673-9265, FAX 415-673-9267 . MID-ATLANTIC AND U.S. INside sales Christopher Breslin: 410-273-1007, FAX 410-273-1591 NEW MEDIA SALES MANAGER Chris Peterson: 410-560-3960, FAX 410 560-3961 • UK/SCANDINAVIA/FRANCE/ITALY/BELGIUM/NETHERLANDS Andrew Davies: (44) 7-071-226-216, FAX (44) 7-071-226-233 · GERMANY/SWITZERLAND/AUSTRIA Tracey Peers: (44) 1-260-297-530, FAX (44) 1-260-271-022 JAPAN Mashy Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852 · TRAFFIC MANAGER Carol Maddox; TRAFFIC ASSO CIATE Halimah S. Whitby; SENIOR SALES ASSOCIATE Sheila Myers

RECRUITMENT ADVERTISING (science_classifieds@aaas.org); pro-DUCTION MANAGER JENNIFER Rankin U.S.: SALES MANAGER Gabrielle Boguslawski: 718-491-1607, FAX 202-289-6742; west coast sales manag-ER Kristine von Zedlitz: Internet sales manager Beth Dwver: Assistant SALES MANAGER DATY! Anderson: SENIOR SALES COORDINATOR Erika Bryant; SALES COORDINATOR Caroline Gallina; SALES REPRESENTATIVES Kathleen Clark, Jody Fenty, Christina Geiger, Bren Peters-Minnis; Assistants Sussy Castilla, Shirley Young; Associates Christine Borkowski, Dawn Bruno: publications assistants Robert Buck, Jane Vaughn; U.K./EUROPE: SALES MANAGER Debbie Cummings; PROMOTIONS COORDINATOR Richard Walters sales executive Sabine Lenud; Assistant Elisabeth Py: (44) 1223Masson; Associates Patricia Riehn Berg (Internet), Vicki J. Jorgensen, Tara L. Kelly, Jessica K. Moshell, Rebecca Tho

ART DESIGN DIRECTOR C. Faber Smith: ART DIRECTOR Alan T. Stonebraker: associate art director Stephanie D. Halvorson: illustrators Carin Cain, Katharine Sutliff: Associates Holly Bishop, Debra I, Morgenegg, Preston Morrighan; PHOTO RESEARCHER Leslie Blizard

SCIENCE INTERNATIONAL

EUROPE (science@science-int.co.uk) EDITORIAL SUPERVISORY SENIOR EDI-TOR Andrew M. Sugden: SENIOR EDITOR/PERSPECTIVES Julia Uppenbrink: ASSOCIATE EDITORS Caroline Ash, Stella M. Hurtley, Ian S. Osborne, Peter Stern; EDITORIAL SUPPORT Jenny Parker; ADMINISTRATIVE SUPPORT Janet Mumford, Liz Ellis; NEWS: CORRESPONDENT Michael Hagmann; CON TRIBUTING CORRESPONDENTS Michael Balter (Paris: (33) 1-49-29-09-01, FAX (33) 1-49-29-09-00); Robert Koenig (Bern)

ASIA Japan Office: Asca Corporation, Eiko Ishioka, Fusako Tamura, 1-8-13, Hirano-cho, Chuo-ku, Osaka-shi, Osaka, 541-0046 Japan; (81) 6-6202-6272, FAX (81) 6-6202-6271; asca@os.gulf.or.jp JAPAN NEWS BUREAU: Dennis Normile (contributing correspondent, (81) 3-3335-9925, FAX (81) 3-3335-4898; dnormile@twics.com); CHINA REPRESENTATIVE Hao Xin, (86) 10-6255-9478; science@public3. bta.net.cn; INDIA Pallava Bagla (contributing correspondent (91) 11-271-2896; pbagla@ndb.vsnl.net.in)

SCIENCENOW (www.sciencenow.org) EDITOR Erik Stokstad

SCIENCE'S NEXT WAVE (WWW.nextwave.org) EDITORIAL: MANAGING EDITOR Crispin Taylor: SENIOR EDITOR Nicole Ruediger: EDITORS Robert Metzke (Bonn), Kirstie Urguhart (UK); contrubuting EDITORS Charles Boulakia (Canada), Mark Sincell; wRITERS Melissa Mertl, Vid Mohan-Ram; MARKET-ING: MARKETING MANAGERS Karen Horting (US and Canada), Hazel Crocker (Europe); PROGRAM DIRECTOR Emily Klotz; ASSOCIATE Peter Cherukun

326500, FAX (44) 1223-326532 AUSTRALIA/NEW ZEALAND: Keith Sandell: (61) 02-9922-2977, FAX (61) 02-9922-1100 JAPAN: Mashy Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852

AAAS BOARD OF DIRECTORS RETIRING PRESIDENT, CHAIR Stephen Jay Gould; PRESIDENT Mary Lowe Good; PRESIDENT-ELECT Peter H. Raven; TREASURER William T. Golden: EXECUTIVE OFFICER Richard S. Nicholson: BOARD Lewis M. Branscomb: Nina V. Fedoroff: Robert D. Goldman: Alice S. Huang; Sally Gregory Kohlstedt; Robert C. Richardson; Neena B. Schwartz; David E. Shaw

Published by the American Association for the Advancement of Science (AAAS), Science serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in Science—including editori-als, 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 found ed 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 sci-ence in the promotion of human welfare, to advance education in science, and to increase public understanding and appreciation of the im-portance and promise of the methods of science in human progress.

INFORMATION FOR CONTRIBUTORS

See pages 147 and 148 of the 7 January 2000 issue or access www.sciencemag.org/misc/con-info.shtml

DEPUTY EDITORS: Philip H. Abelson (Engineering and Applied Sciences); John I. Brauman (Physical Sciences) **BOARD OF REVIEWING EDITORS**

Suzanne Pfeffer Yoshinori Tokura Frederick W. Alt Dennis W. Choi Douglas T. Fearon Evelyn L. Hu Susan K. McConnell Univ. of Tokyo Children's Hospital, Washington Univ. School Univ. of Cambridge Univ. of California, Stanford Univ. Stanford Univ. School of Boston of Medicine. St. Louis Santa Barbara Raul Madariaga École Normale Medicine loan S. Valentine Jeffrey S. Flier Univ. of California, Los Joanne Chory Eric F. Johnson Stuart L. Pimm Edouard Bard vard Medical School Univ. d'Aix-Marseille III The Salk Institute The Scripps Res. Inst. Supérieure, Paris Angeles Richard Fortey The Natural History Columbia Univ Michiel van der Klis George M. Martin Frank S. Bates Hans Kende David C. Rubie David Clapham Univ. of Minnesota Michigan State Univ. Univ. of Washington Universität Bayreuth Astronomical Inst. of Children's Hospital. Museum, London Amsterdam Marc Kirschner Harvard Medical School Ray H. Baughman Boston Diane Mathis Erkki Ruoslahti Harry A. Fozzard Derek van der Koov Honeywell International Harvard Medical School The Burnham Institute Jonathan D. Cohen Univ. of Chicago Univ. of Toronto Elliott Kieff Anthony R. Means Stephen J. Benkovic Princeton Univ. Ronald H. Schwartz Bert Vogelstein Johns Hopkins Chris D. Frith Harvard Medical School Duke Univ. Medical Center NIAID, NIH Pennsylvania State Daniel G. Colley Univ. College London Christian Körner Douglas A. Melton Univ. Terrence J. Sejnowski Centers for Disease Control Arthur Weiss Botanisches Institut. James Gimzewski Michael J. Bevan Univ. of Washington Harvard Univ. Univ. of California, San The Salk Institute F. Fleming Crim IBM Research, Ruschlikon, Basel Andrew Murray Switzerland Manfred Sigrist Francisco Univ. of Wisconsin Univ. of California, San Anne Krueger Seth S. Blair Kyoto Univ. Zena Werb Jack F. Greenblatt lames E. Dahlberg Stanford Univ. Francisco Univ. of Wisconsin Univ. of California, San Susan Solomon Michael LaBarbera Univ. of Wisconsin Univ. of Toronto Elizabeth G. Nabel Francisco George M. Whitesides Mark Boguski National Oceanic and Philip C. Hanawalt Univ. of Chicago Medical School NHLBI. NIH NCBI. NIH Atmospheric Adm. Stanford Univ Antonio Lanzavecchia Shigekazu Nagata Robert Desimone Harvard Univ Henry R. Bourne Christopher R. Somerville Paul Harvey Univ. of Oxford Inst. of Res. in Biomedicine NIMH. NIH Osaka Univ. Medical School lan A. Wilson Univ. of California Bellinzona, Switzerland Carnegie Institute of Roger Nicoll The Scripps Res. Inst. San Francisco Hans Eklund Washington, Stanford Michael P. Hassell Anthony J. Leggett Univ. of Illinois, Urbana Iniv. of California, San James J. Bull Univ. of Texas Swedish Univ. of Agricultural Sciences Martin Zatz Imperial College at Will I. Stewart Francisco NIMH, NIH Marconi Caswell, Silwood Park Champaign Staffan Normark Gerhard Ertl Walter Ziegigänsberger Max-Planck-Institute for Psychiatry, Munich at Austin Martin Heimann Norman L. Letvin Towcester Swedish Institute for Fritz-Haber-Institut, Berlin loseph A. Burns Cliff Tabin Max-Planck-Institute for Reth Israel Deaconess Infectious Disease Control Cornell Univ. Paul G. Falkowski Biogeochemistry, Jena Medical Center, Boston Harvard Medical School Maria Zuber Michele Parrinello Kathryn Calame Rutgers Univ. Tomovuki Takahashi Tasuku Honio **Richard Losick** Massachusetts Inst. Max-Planck-Inst, for Solid Columbia Univ. College of Gary Felsenfeld NIDDKD, NIH Univ. of Tokyo Kyoto Univ Harvard Univ. State Research, Stuttgart of Technology Physicians and Surgeons

Are You Spending YOUT Time Cousing on Science or Orcering Supplies?

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

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

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

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

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

© 2000 Ventro Corporation. Chemdex is a registered trademark of Ventro Corporation. Circle No. 9 on Readers' Service Card



www.chemdex.com



Examine life completely with Nikon microscopes for live cell microscopy.

From mouse hippocampal tissue to embryogenesis research, Nikon helps with all your live cell imaging needs. The Eclipse E600FN™ upright and Eclipse TE200/300[™] inverted models give you superior CFI60[™] optics, rock solid stability and a spacious working area. See how they run for yourself. Call **1-800-52-NIKON ext. 367**

www.nikonusa.com

Nikon live cell microscopes. See how they run.

likoj



2000 Nikon Ind

No.3



Circle No. 36 on Readers' Service Card

Redefining Infinity

0			\bigcirc		٢													8		Ċ	¢		ŝ	\mathbb{O}
1				C:	E			Ô					Ċ			Ċ	\odot							
Ô									\bigcirc	20													٢	
													٢											
								Ô				ø	ø											
							٢			۲	1			100							\bigcirc	\mathfrak{C}		
Č.						٢					8		6	٢										
							٢																	
									٢			Ð	8		Ø									
										િ	¢		ŵ	$\ell_{co}^{p_1}$										
																								Č.
11. 																								
8															۲									
63																								
	100	100	87 S																					

The best thing since glass slides | OpArrays®

OpArrays® are Operon's highly optimized, made-to-order arrays that offer researchers unsurpassed performance every time. Our T_m-normalized microarrays are carefully designed to maximize specificity yet yield excellent sensitivity. Operon is also pleased to introduce a series of stock microarrays that target major functional areas within the human genome.

@ @ @ @ @ @ Currently Available

Apoptosis Human Collage (version 1) Yeast Collage (version 1)

Available by July 1, 2000

Cancer Stress

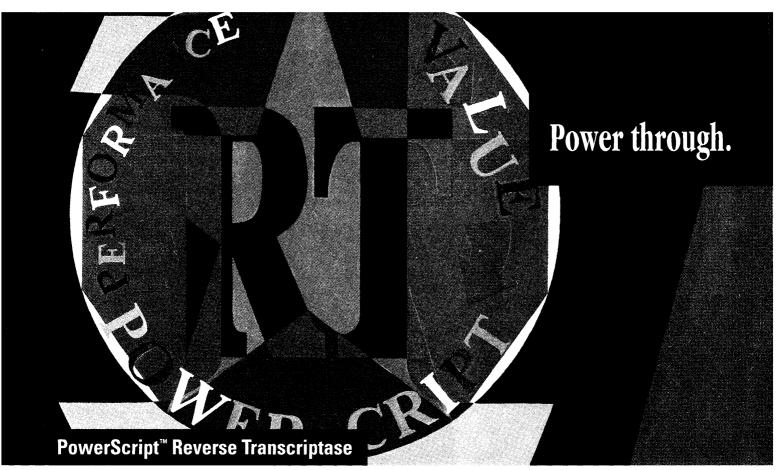
Prices start at \$100.00 per slide Restrictions apply

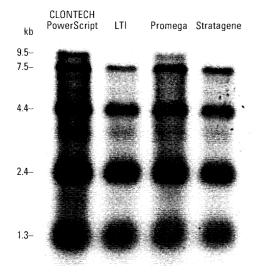
Circle No. 27 on Readers' Service Card of Genomics ${}^{{}^{\rm M}}$



(800) 688-2248 dna@operon.com www.operon.com

the art o





Superior first strand cDNA synthesis from PowerScript[™] RT. A poly A⁺ RNA ladder was incubated with equivalent amounts of different RNase H⁻ RTs using the conditions suggested by each manufacturer. PowerScript generated large amounts of the 9.5 kb fragment.

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

Distributors: Australia: 61 7 3273 9100 = Belgium/Luxembourg: 32 53 720 641 = Brazil: 55 11 66940539 = Canada: Now call CLONTECH direct = 800 662 2566 = Chile: 56 2 09 6770 = China: 021 642 7163 = Czech Republic: 420 19 7265214 = Denmark: 45 43 43 45 66 = Egypt: 202 749 8311 = Finland: 358 9 8870 780 = France: 33134 60242 # Greece: 3015 15382 = Hong Kong: 852 2646 6101 = Hungary: 36 1280 3728 = Indrá: 911 Hols2110 = Israel: 972 4 9960595 = Italy: 39 55 5 001871 = Korea: 82 2 556 0311 = Malaysia: 603 787 72611 = Mexico: 552 281 4718 = The Netherlands: 31 20 582 42 0 = Norway: 47 22 421 520 = Philippines: 63 2 807 6073 = Poland: 49 621 3170 = Portugal: 351 361 20 = Singapore: 65 0298 4347 = South Africa: 271 671 5166 = Spain: 34 9 1 630 0378 = Sweden: 46 8 77 55 110 = Taiwan: 886 2 27202215 = Thailand: 662 530 3804 4 = Turkey: 90 216 385 8321 rev 5/400 Illustration inspired by the art of Robert Indiana.

Get the power of longer cDNAs for less money with **PowerScript™ Reverse Transcriptase** (RT). PowerScript is a point mutant of the Moloney murine leukemia virus RT that lacks RNase H activity but retains wild-type polymerase ability—this means that you get higher yields of longer full-length cDNA. PowerScript is cleaner than other commercially available RTs. In fact, we guarantee it to be free of DNase and RNase. And it costs less, making PowerScript RT the most economical choice for cDNA library construction, RT-PCR, labeling probes, or any application requiring efficient reverse transcription.

Call and order today!

CLONTECH NOWYOUCAN

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 • Internet: www.clontech.com © 2000, CLONTECH Laboratories, Inc. (AD03403)



Background picture: ABI Model 377 automated fluorescent DNA cycle sequencing of pNoTA/T7TM plasmid DNA prepared by the Perfectprep method

Perfection comes with Perfectprep®

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

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

Rapid, simple and systematic plasmid purification, adapted to suit sample throughput and the amount of DNA required, whether you want individual purification in one spin column or the simultaneous isolation of 96 plasmid samples. The Perfectprep System offers rapid, reproducible yields of plasmid DNA in a simple-to-use kit system. An extremely efficient binding matrix ensures that yields remain constantly high. The plasmid DNA obtained is ultra-pure, shows no chromosomal DNA or RNA contamination and can be used immediately after isolation for all molecular biological applications, such as automated sequencing, transformation, PCR*, blotting or clonings. The Perfectprep Plasmid System is available in five different kit versions, including the ultra-rapid Mini-Kit, the economical XL-Kit and the high-throughput 96 Spin-Kit. Without the use of organic substances and fully compatible with Eppendorf centrifuges and rotors, these kits provide plasmid DNA which will make your colleagues green with envy.

Perfectprep from Eppendorf - perfect by name, perfect by nature.

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

The Perfectprep® System

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

Circle No. 13 on Readers' Service Card

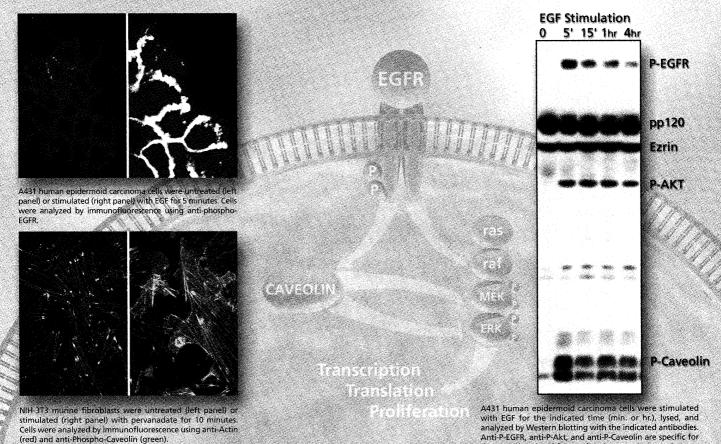


Eppendorf – Netheler – Hinz GmbH · 22331 Hamburg · Germany · Life Science Application-Hotline: +49 180-3666789 · Fax +49 40-5 38 01-556 e-mail: eppendorf@eppendorf.com · eppendorf home page: http://www.eppendorf.com

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

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

BD PharMingen • **BD** Transduction Laboratories



analyzed by Western blotting with the indicated antibodies. Anti P-EGFR, anti-P-Akt, and anti-P-Caveolin are specific for the phosphorylated forms of their respective proteins

New Phospho-Specific Antibodies and Reagents for Analysis of Signaling Pathways

Phosphorylated proteins play key roles in regulating apoptosis, cytoskeletal rearrangement, the cell cycle and transcription. BD Transduction Laboratories and BD PharMingen, leaders in cell signaling research, now provide Akt, Caveolin and EGFR antibodies to expand our portfolio of phospho-specific antibodies.

We also provide a variety of purified enzymes, inhibitors and substrates to further evaluate components of signaling pathways. These include protein kinases for *in vitro* kinase assays, caspases for apoptotic pathways, and cathepsins for inflammatory processes.

Phospho-specifi	ic Antibodies include:
Caveolin	Phosphotyrosine
Akt	PY20
EGFR	PY54
Rb	RC20
Paxillin*	PY69
ERK1/2*	
Stat5*	
Stat6*	

Ras/MAP Kinase Antibodies include: ERK 1, 2 or 3 MEK 1, 2 or 5 Map Kinase Sampler Kit MEKK1 p38 MAPK INKK1 MST 1 or 3

Purified Enzymes, Substrates, & Inhibitors include:

Inzymes	Inhibitors & Substrates
PKC · · ·	Caspase 1, 3, 6, 8 & 9
YKA	Cathepsin B, L, & K
Caspase 3, 6,	8 & 9

* Phospho-specific Antibodies coming soon

BD Biosciences www.bdbiosciences.com

Biometric Imaging	Immunocytometry Systems	Microbiology Systems	Transduction Laboratories
Clontech	Labware	PharMingen	

For information on related reagents or to request our new BD Transduction Laboratories 2000 Catalog, please call Customer Service at 877.232.8995



For research use only. Not for use in diagnostic or therapeutic procedures.

Yes! I actually found a BETTER way to isolate mRNA!



Why change?

cause current methods...

do not bind to mRNA with high secondary structure
do not differentiate between RNA and DNA
do not hybridize to mRNA with short poly A tails
do not allow for DNase treatment of the sample
top-purify large amounts of ribosomal RNA

More representative mRNA population

- Reduced DNA contamination
- Hybridizes to mRNAs with shorter poly A tails
- Allow for DNase treatment during preparation
- Less ribosomal RNA contamination

a botter way to isolate mRNA mVADER

mVADER[™] uses invasive clamping phosphono PNA (Peptide Nucleic Acid) technology to isolate mRNA from cells or tissue.

mVADER technology allows PNA/poly A mRNA triplexes to form independent of secondary structure between the poly A tail and 5' U rich regions. Furthermore, short poly A tailed messages are more efficiently captured with mVADER, thus ensuring a more representative mRNA population. mVADER technology in conjunction with our proprietary lysis solution allows for isolation of superior quality mRNA.

Use mVADER kits to isolate mRNA for cDNA arrays, libraries and RT-PCR. Available in three formats: maxi, midi and a 96-well format. *patent pending

For more information, visit our website: www.activemotif.com

ACTIVE

Or call: North America 877.222.9543 • Europe +800.222.95430 • Japan 03.5684.1622

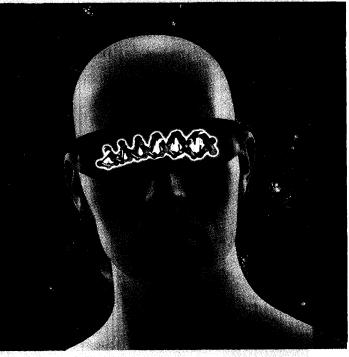
Molecular Biology Tools for Gene Discovery

Circle No. 56 on Readers' Service Card

TIF



Low-Cost, Comprehensive, Fast Sequence Analysis Via Internet







Now you can get inexpensive, immediate access to a huge collection of sequence processing applications and databases. All you need is a computer with an up-to-date browser, an Internet connection, and some data. At <u>www.BioNavigator.com</u>, you'll find capabilities that rival those found in the world's largest genome research centers. Free account setup, free BLAST, and low-cost, per-use pricing for everything else make BioNavigator a bargain, courtesy of the Internet.

AutoProtocols – Stop Repeating the Past

BioNavigator automatically records everything you do with each set of data in a "history view", which you can save as a re-usable AutoProtocol. Now, instead of spending hours at the keyboard doing the same old thing every time you have a new batch of data, just pick one of your AutoProtocols, click "GO," and get your result. History view also provides a complete audit trail for your sample.

More Choices and Opportunities

Dozens of sequence analysis software and database developers are taking advantage of BioNavigator's low-cost global access and ease-of-use by adding their works to the service. As a result, you now have access to an ever-increasing range of analysis methods and databases. BioNavigator already does everything from basic similarity searches to 3D molecular modeling. DNA, protein, motif, and EST databases are built-in.

Everything is Clearer

BioNavigator is easy-to-use, and has extensive help so you can set up and finish your own studies with confidence. BioNavigator's user-friendly interface gives you point-and-click access to familiar – and specialized – sequence analysis methods. Complete descriptions, explanations of the effects of parameter settings, and references to published literature sources accompany each method.

Get A Free Glimpse of the Future

Complete your fast, FREE registration on <u>www.BioNavigator.com</u> and get all of the following for FREE:

- All BLAST searches
- Automated weekly BLAST with email notification
- Private storage space on the BioNavigator server
- · Professional data security and daily backups

Try It for FREE at <u>www.BioNavigator.com</u>

Simple Internet accessibility, ease-of-use, breadth of applications, and no-brainer pricing make BioNavigator a welcome addition to research labs of the future. Register for FREE at www.BioNavigator.com

6900 Koll Center Parkway, Suite 401 • Pleasanton, CA 94566 • Telephone: (925) 426-9966 • Freecall: (877) EBIOINFO • Freefax: (888) 588-7446 • Email: info@ebioinformatics.com Copyright © 2000 eBioinformatics, Inc. All rights reserved. BioNavigator and eBioinformatics are trademarks of eBioinformatics, Inc. All other trademarks and registered trademarks are property of their respective holders.

Normal Human Cells for Cardiovascular Research

Smooth Muscle Cells Endothelial Cells Optimized Media

> visit **www.cascadebio.com** for detailed information on all of our products

800-778-4770 Tel: (503)292-9521 Email:info@cascadebio.com

Circle No. 12 on Readers' Service Card

Cascade Biologics, Inc. The Intelligent Choice



A year ago, we reorganized as an independent business, and in that time, we've seen a great deal of loyalty from our customers. We want to thank you for sticking with us. And for helping us maintain our leading role as a supplier of ultrapure biochemicals, convenience reagents, modifying enzymes and manual sequencing reagents. To show our appreciation, we invite you to take \$20 off your next order or receive 1000 United Airlines Reward Miles[®] Just reference quote number 20A-1070. Who says loyalty doesn't pay?

USB Corporation 26111 Miles Road Cleveland, OH 44128 800.321.9322 www.usbweb.com



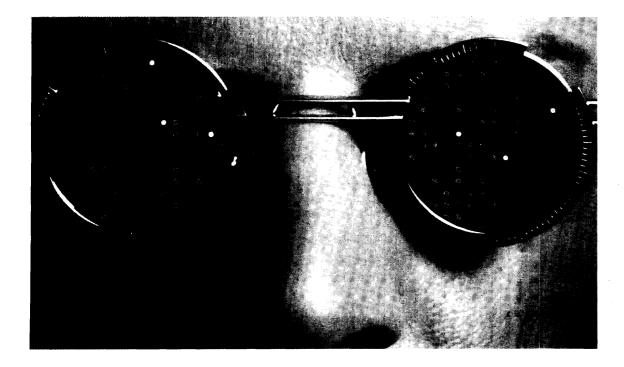
MILEAGEPLUS. United Airlines Reward Miles^{*} This offer is good until June 30, 2000 on orders of at least \$200 in the USA only. One time purchase only. This offer is also open to first time customers. United Altilnes and Mileage Plus are registered trademarks of United Airlines. Inc. Miles accrude and wards issued are in accordance with the terms and conditions of the United Mileage Plus program. United, its subsidiaries, affiliates and agents are not responsible for any products and services associated with this offer. Other terms and conditions apply

©2000 USB Corporation. The phrase "Rediscover the Chemistry" is a trademark of USB Corporation. USB and USB logo design are registered trademarks of USB Corporation.

Circle No. 44 on Readers' Service Card



Discover A Clear Array of Possibilities. ExpressChip[™] DNA Microarrays from Mergen.



If you need to simultaneously analyze over one thousand gene expressions, there's no better choice than ExpressChip™DNA Microarrays from Mergen. Each ExpressChip kit contains two duplicate glass slides pre-spotted with oligonucleotides, and reagents for probe hybridization and signal amplification.

Simple, Flexible and Affordable.

- Choose among human, mouse, rat, or custom ExpressChip kits
- Use low amount of total RNA as starting material
- · Process slides with your choice of laser scanners and image analysis software
- · Customized services available

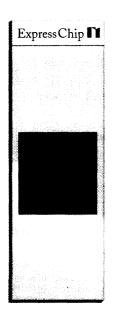
High Quality.

- · Off-chip oligo synthesis for high coupling efficiency and optimized quality control
- Sequences individually tested for cross-homologies in GenBank database
- · Superb spot geometry and uniform density
- Hybridization without cover slip for clear images across the array with minimal artifacts

Differential Expression Results You Can Trust.

- · High specificity and sensitivity
- · Linearity over large dynamic range

Get started today with ExpressChip[™] DNA Microarrays from Mergen and discover an endless array of possibilities. Visit us on the web at www.mergen-Itd.com, or call us toll-free at 1-877-4MERGEN (463-7436). Circle No. 63 on Readers' Service Card



Life Technologies creates a breakthrough!



GATEWAY[™] Cloning Technology

Now you can reach your destination more quickly and simply than ever before with a universal cloning system that provides a rapid and highly efficient route to protein expression, functional analysis and cloning/subcloning of DNA segments.

Enter the future.

GATEWAY[™] Cloning Technology has been developed by Life Technologies in response to your growing need for faster, better ways to clone and express DNA sequences.

Whether your goal is to study a few genes in depth or multiple genes in a high-throughput manner, GIBCO BRL[®] products with GATEWAY Technology will accelerate the pace of your research.



Find out how to use this breakthrough to your best advantage. Contact us online or by phone and we'll rush you our comprehensive guide.

Go farther and do more.

- Accelerate cloning experiments.
- Transfer DNA segments into multiple vectors in parallel.
- Reduce screening. Typically >99% of resulting colonies are desired clones.

Restriction Endenuclease Digestion and Lightion

CDNA Libri

Pelymerase Chain Reaction

- **Retain** reading frame and directionality.
- Eliminate further downstream processing.
- Convert your favorite vector to make it GATEWAY Technology-compatible.
- Enjoy unprecedented flexibility. Generate N-terminal or C-terminal proteins or express as native proteins.
- Save time. Perform rapid, directional cloning and expression of PCR products in parallel.

Connect with GATEWAY Cloning Technology at www.lifetech.com/gateway.



These products are for laboratory research use only and are not intended for human or animal diagnostic, therapeutic or clinical uses, unless otherwise stated. This product is the subject of U.S. patent 5,888,732. Limited label licenses apply.

Essential Technologies for the Science of Life

US Academic Orders/TECH-LINESM: (800) 828-6686 • US Government Orders/TECH-LINE: (888) 584-8929 • US Industrial Orders/TECH-LINE: (800) 874-4226 • Latin America: (301) 610-8709 Australia: 1800-331-627, aumail@lifetech.com • Austria: 0800 20 1087 • Belgium: 09 232 06 40 • Canada: 800-757-8257 • Denmark: 80 30 17 40 • France: 0800 23 20 79 Germany: 0130 83 09 02 • Hong Kong: (852) 2407-8450, techltp@glink.net.hk • Italy: 02 98 22 201 • Japan: 03 3663 8241, lti@gol.com • The Netherlands: 0800 099 3310 New Zealand: 0800-600-200, nzmail@lifetech.com • Spain/Portugal: 900 181 461 • Sweden: 020 26 34 52 • Switzerland: 0800 848 800 • United Kingdom: 0800 269 210 © 2000 Life Technologies, Inc. 00-007MS

The genetic revolution

meets the industrial revolution.

The scale of your research has grown exponentially, and now so has the power of your research equipment. With the complete SDS solution from PE Blosystems. you can accelerate your gene. expression research to maximum throughout. The ABL Prisk# 6700 Automated Nucleic Acid Workstation and ABI PASM[®] 7700 Sequence Detection. System share a hardware: software and database architecture The 6700 workstation uses a robotic sample processor to automatically purity nucleic





acids from complex biological samples and to prepare analysis assays. The 7700 system performs real-time. detection of PCR using an integrated thermal cycler. precision optics, real-time sequence detection software. and TaoMan[®] Reagents for the fluorogenic 5 nuclease assay. Together, these instruments create a complete SDS solution. bringing fully automated PCR to your high-throughout analysis. Industrialized gene expression -only from PE Biosystems www.pebiosystems.com (650) 638-5800

PE Biosystems

ABI PRISM 6700 Automated Nucleic Acid Workstation and 7700 Sequence Detection System

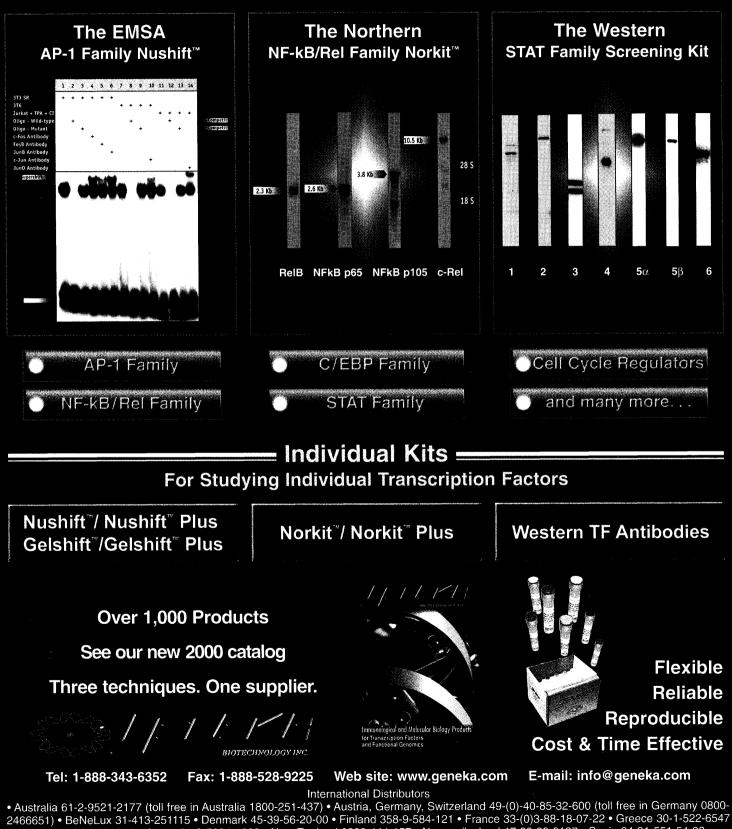
Applied Biosystems

PE Concentral, temeric The Petition Eliner Corporation, is committed to providing the world's leading technology and information for life scientists. PE Computition consists of the PE Block steme and Celena Genomics taxinesses. PE Block bins comprises four divisions – Applied Block stems. PE Informatics, Persegive Block stems, and Tippic

3.4.7 Provess 62 (5.2.4 close reasons as served by some by from blackers (some) is a style (in the set of the problem of the served of the

Kits for Transcription Factors

= Family Kits = For Screening Transcription Factor Family Members



• Italy 39-(0)2-381951 • Japan 81-3-5684-1620 • New Zealand 0800-444-157 • Norway/Iceland 47-22-20-0137 • Spain 34-91-551-54-03 • Sweden 46-8-30-60-10 • Taiwan 886-2-233-18111 • U.K./Ireland 44-(0)-1223-316855

Circle No. 52 on Readers' Service Card



The future of the science is in yo

Agilent Technologies introduces the first generation of the "Lab-on-a-Chip." Developed in collaboration with Caliper Technologies, the revolutionary Agilent 2100 bioanalyzer system automates nucleic acid analysis. Now sample handling, separation and detection all take place within a microchip.

The system offers rapid analysis, reduced sample consumption, and enhanced reproducibility for life scientists working with PCR products, restriction enzyme digests, RNA preps, and other types of nucleic acid samples. With standardized assay protocols, digital results, and powerful data analysis tools, the Agilent 2100 bioanalyzer promises to improve your lab's productivity.

To grasp the benefits of an integrated Lab-on-a-Chip system, contact Agilent today. Let LabChip* technology add a whole new dimension to your work.



Agilent Technologies Innovating the HP Way

www.agilent.com/chem/labonachip 1-800-227-9770.Ext.3391

Be First - Go BioSource!

Cutting Edge Products

ELISA KitsHumanMonkeyRatHGF, MIP-4, MIP-5IL-4IL-12Aβ [1-40]*, [1-42]** Colorimetric & Eluorimetric Kits Available

Phosphorylation and Cleavage Site-Specific Antibodies

Src, FAK, Pyk2, Paxillin, PLC-γ1, Tau, PARP, Caspase-9, β-Amyloid (Aβ)

BioSource offers the industry's most extensive animal model selection: Human, Mouse, Rat, Monkey and Swine

ELISA Kits, mRNA Kits, Antibodies, Recombinant Proteins and Primers for Signal Transduction, Cytokines, Chemokines, Growth Factors, β-Amyloid and other Neuroscience markers

Now Order Direct in the UK! Tel: 0 800 169 1547

BioSource International, Inc. 1 - 8 0 0 - 2 4 2 - 0 6 0 7



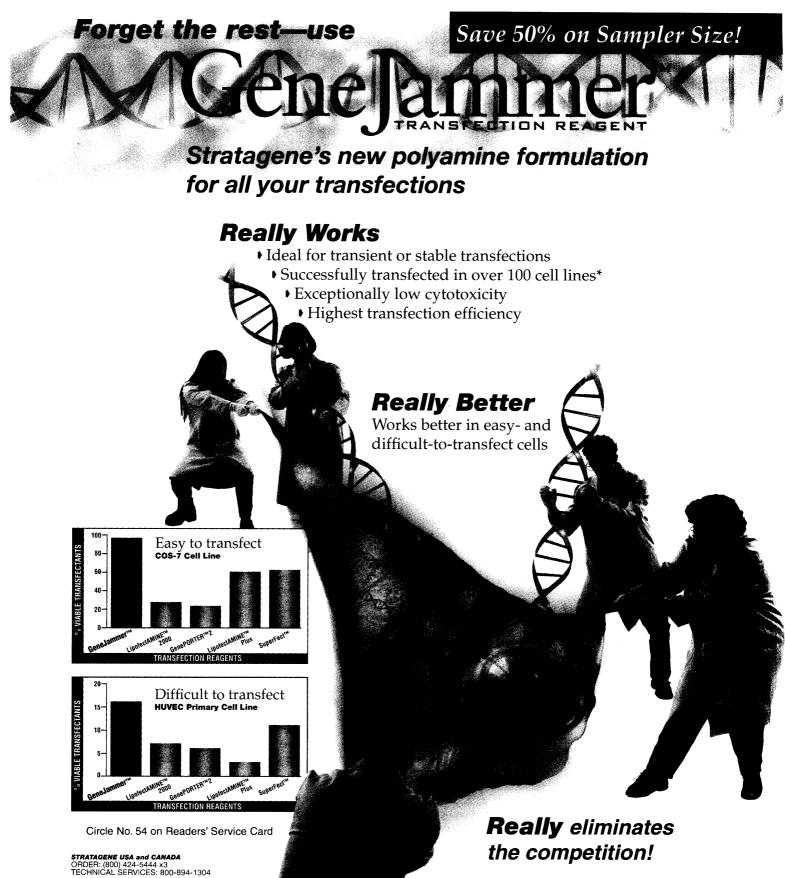
Fax: (805)987-3385

For research use only

e-mail:tech.support@biosource.com

BioSource Europe, S.A. Tel: +32-67 88 99 00 • BioSource Deutschland, GmbH Tel: 0 800 100 85 74 BioSource Netherlands, B.V. Tel: +31-76-501 4824 • BioSource United Kingdom, Ltd. Tel: 0 800 169 1547

Australia +61 7 3352 6100 * Austral +431801 04 250 * Canada 514 733-1900 * Chile 56 2 209 6770 * Denmark +45.86/10.10.55 * Egypt +202/348.0997 * Finland +358/3 682 2758 * France +33.1/42.53.14.53 Greece +30 1 52 81 900 * Hungary +36 1/395 90 48 * India +91/80 634 6520 * Israel +972/3.934 99 22 * Italy +39 02 26 28 91 * Japan +81-3-5645-2751 * Mexico +525/519 3463 * New Zealand +64.9/573.0770 Norway +47/22 200 137 * Poland +48 228356278 * South Africa +27.11/792.6790 * Spain +34, 93 404 55 02 * Sweden +46.8/625.1850 * Switzerland +041/41-420.96.36 * Taiwan 886 2 2790/ 7902 * Turkey +90 (312) 432 4130 Circle No. 49 on Readers' Service Card



STRATAGENE EUROPE Belgium, Germany, The Netherlands, Switzerland, United Kingdom ORDER: 00800 7000 7000 TECHNICAL SERVICES: 00800 7400 7400 Austria 017 956 7036 France 00800 7000 7000 or 0800-100391 INTERNET email: techservices@stratagene.com

website: www.stratagene.com

See www.stratagene.com for a current list of uccessfully transfected cells





BIOXWHITTAKER





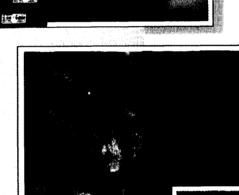
Clonetics; Normal Human Endothelial Cell Systems Provide Unsurpassed Quality and Performance

Safety and Security

- Relevant, in-Vitro Models
- Non-Transformed, Non-Immortalized Cell Strains
- Low Serum Media
- Quality Control Tested as a Cell Culture System (Cells and Medium)
- Guaranteed Performance
- Standardized Manufacturing
- Certified ISO 9001 Quality Management System Company
 - Technical Support
 - Detailed Instruction Packet
 - Creating Innovative Cell Systems Since 1986

The Tool for Research Applications

- Barrier Models
- Inflamation and Adhesion Molecule Relationships
 - Drug Discovery
 - Cardiovascular Research
 - Angiogenesis
 - Cancer Research
 - Cell Signaling
 - Apoptosis Research
 - Metastatic Research





For Technical Information: US & Canada (800) 852-5663 All other locations: (301) 898-7025 ext. 2492

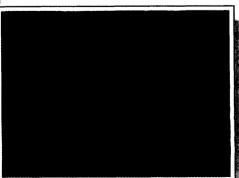
TO PLACE AN ORDER CALL: (800) 344-6618 FAX: (301) 845-1008 E-MAIL: cs@biowhittaker.com Internet: www.biowhittaker.com, or www.clonetics.com



Endothelial Cell Types

- Dermal, Lung, Microvascular
- Aortic, Coronary, Pulmonary, Iliac Artery
- Umbilical Vein
- As Proliferating or Cryopreserved Formats

©1999 BioWhittaker, Inc., A Cambrex Company. All rights reserved. Circle No. 39 on Readers' Service Card



Every scientist can use an extra research assistant

we'll give you a whole team

DoubleTwist.com Agents

Perform Comprehensive Sequence Analysis

Retrieve Assembled ESTs

Identify Protein Domains

Retrieve and Analyze Human Genome

Monitor for Identical ESTs

Monitor for Identical cDNAs

Monitor for Similar cDNAs

Monitor for Similar Proteins, Search EST Database

Monitor for Similar Proteins

Monitor DoubleTwist Human Genome Database

Monitor for Identical Genomic DNA

Monitor for DNA Patents

Monitor for Protein Patents

... and more on the way.

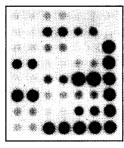
A special breed of research inquiry At your command

- Automated agents that search and monitor public and proprietary databases
- Continuous updates per your specifications
- A reporter of news and studies relevant to your research
- A purchasing agent to move your experiment forward

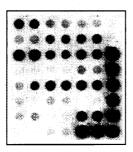


Circle No. 22 on Readers' Service Card

CENE EXPRESSION CARRAY CICCE (GEArray) SYSTEM



32 p



Chemiluminescence

Cell-cycle Apoptosis Signal Transduction Cancer

Pathway Analysis

Stress/Toxicity

PathwayFinder

Cytokines & Immuno-inflammation

Simple 3 step protocol Use of total RNA ³²P or chemiluminescence detection No special equipment

Pathway-specific Sensitive Accurate Economical



www.superarray.com Circle No. 34 on Readers' Service Card

GEArray Kit \$249

Customized Array \$19/gene

You did your homework. That's why George can still sing lullabies.

Unlocking the key to disease is a rewarding vocation with far reaching repercussions.

Maybe you haven't won the Nobel Prize. (Yet.) But your work does make a big difference in someone's life, somewhere. And that's something you can't forget. Neither do we. PerkinElmer Life Sciences (formerly known as EG&G Wallac) believes in



the value of what our customers do. The search for new medicines has always motivated us to provide

complete systems solutions for drug discovery — such as our TriLux, ViewLux,[™] and VICTOR²[™] systems and the most supportive service you'll find... always, and as soon as you need it. Because we like helping you make humanity a little healthier.









9238 Gaither Road, Gaithersburg, MD 20877 USA • P.O. Box 10, Fin-20101, Turku, Finland • 1-800-638-6692 • www.perkinelmer.com



MOLECULES that will become MEDICINES™

At ArQule, we unite innovative thinking with proprietary, patented technologies to design and produce molecules that will become the medicines of tomorrow. We improve the efficiency and effectiveness of the drug discovery process by offering accelerated lead optimization services, novel, diverse screening libraries, and access to our high-throughput parallel synthesis platform through technology licensing agreements. Contact us today and see how ArQule can make an impact on your drug discovery process.

- Lead Optimization
- Screening Libraries
- ▼ Technology Transfer
- ▼ Collaborative Drug Discovery

For more information, visit our website at www.arqule.com or contact John M. Sorvillo, PhD at 781-994-0527 or jsorvillo@arqule.com

ArQuie, Inc. 19 Presidential Way Woburn, MA 01801 www.arquie.com

ONE STEP CLOSER



Among all living things, the human body is blessed with particularly sophisticated—but virtually mysterious—mechanisms. Unlocking these enigmas is an extraordinary task but

an imperative one, for it could

tionary new drugs. At Takeda,

experts is progressing ever



lead to the discovery of revolu-

our team of dedicated research

closer toward such discoveries.



Head Office: 1-1, Doshomachi 4-chome, Chuo-ku, Osaka 540-8645, Japan Tokyo Head Office: 12-10, Nihonbashi 2-chome, Chuo-ku, Tokyo 103-8668, Japan

Circle No. 6 on Readers' Service Card

Extra! Extra!

Extra early, that is, as in PNAS Early, Edition!

Get a jump on the competition see studies weeks before they appear in print.

Authors! Your paper can appear online just 5 weeks after acceptance

Browse the ANAS Online collection from 1990 onward.

See what's new in the world's most cited multidisciplinary journal—www.pnas.org

For subscription and submission information, visit



urcle No. 28 on Readers' Serv

Proceedings of the National Academy of Sciences www.pnas.org

08

Microarray Systems for the Millennium

From the leader in microarray analysis comes a variety of microarray systems to meet your needs in the new millennium.

ScanArray® 5000 Powerful 4 laser system

ScanArray[®] 4000 Now with 3 laser wavelengths





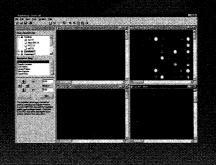
New ScanArray[®] Lite Affordable 2 laser system





QuantArray[®] Analysis Software Integrated image analysis

silumonics





- Upgradable
- * 5 µm resolution
- Compatible with most spotters and biochips
- Accomodates a variety of fluorophores



AutoLoader & Barcode Systems High throughput and automated systems

GSI Lumonics., Life Science Products 39 Manning Road, Billerica, Massachusetts 01821 Tel: 978-439-5511 Fax: 978-663-0044 Email: array@gsilumonics.com Web: www.gsilumonics.com/lifescience.htm ScanArray and QuantArray are trademarks of GSI Lumonics, Inc. Circle No. 1 on Readers' Service Card

They're all winners. But there's only one \$25,000 Victor.



Victorious Victor Velculescu (centre) and fellow prize winners.



Will it be your turn to emulate Victor Velculescu's success this year?

Entering the annual Amersham Pharmacia Biotech & *Science* Prize couldn't be easier. If you completed your Ph.D. in molecular biology during 1999, describe your work in a 1,000-word essay and submit it. The Prize is one of the most prestigious international awards of its kind for young scientists. It can help achieve a lot for those who enter by putting bright new scientific talent in the spotlight, bringing international acclaim to them and their universities, and earning winners and runners-up a handy cash prize (first prize is worth \$25,000, with up to seven additional prizes of \$5,000). The winning entry will also be published in *Science* magazine.

Will you be the Victor in 2000?

Full details and entry forms can be found at **www.apbscienceprize.org** or call/e-mail using the contact details below.





The Award Committee Amersham Pharmacia Biotech & Science Prize for Young Scientists Enquiries from Europe – Tel: +44 1223 326500, Fax: +44 1223 326501. Email: science@science-int.co.uk Enquiries from USA and all other regions – Tel: +1 202 326 6513, Fax: +1 202 289 7562. Email: pfisher@aaas.org

APOPTOSIS RESEARCH PRODUCTS

CASPASES Enzymes: Caspase- 1, 2, 3, 6, 7, 8, 9 & 10 Assay Kits: Caspase- 1, 3 & 8 Substrates & Inhibitors Antibodies

APOPTOSIS INDUCERS / INHIBITORS Human & Mouse TRAIL Triptolide Ceramides Z-VAD- FMK Bongkrekic Acid

PARP Purified Enzyme PARP Cleavage Detection Kit Automodified PARP Standard Poly(ADP-ribose) Monoclonal & Polyclonal Antibodies

Circle No. 7 on Readers' Service Card Call: 800-942-0430 Fax: 610-941-9252 Visit: www.biomol.com E-mail: info@biomol.com BIOMOL Research Laboratories, Inc. 5100 Campus Drive Plymouth Meeting, PA 19462-1123 USA

Biomolecoles for Research Success



Simply the Best Sequence Analysis Software

Lasergene99¹¹ is easy to use so you can get to work immediately. Sophisticated so you obtain accurate results. Comprehensive so you only need one suite. And Lasergene99¹¹ gives you the power you need on the Windows and Macintosh computers you already own. Choose any or all of these Lasergene99¹¹ sequence analysis functions:

- Gene Discovery and annotation using the GeneMark™ gene finder.
- Contig Assembly with the world's most accurate consensus caller
- Protein Secondary Structure prediction and annotation
- Sequence Alignment for DNA and protein sequences
- Primer Design to create oligos that work
- Restriction Map creation and display.

Every system includes integrated BLAST searching. And every system is backed by DNASTAR's expert technical support. Join the ranks of discerning researchers in over 50 countries and customize your own Lasergene system today.

DNASTAR, Inc. 1228 S. Park St., Madison, WI 53715 USA www.dnastar.com Phone: 608+258+7420 FAX: 608+258+7439 e-mail: info@dnastar.com

GATC GmbH, Fritz-Arnold-Str. 23, D-78467 Konstanz, Germany Phone: 49•7531•81600 FAX: 49•7531•816081 e-mail: sales@gatc.de



Circle No. 59 on Readers' Service Card

2000歳

tre & Internet Journal

