

3 May 2002

Science

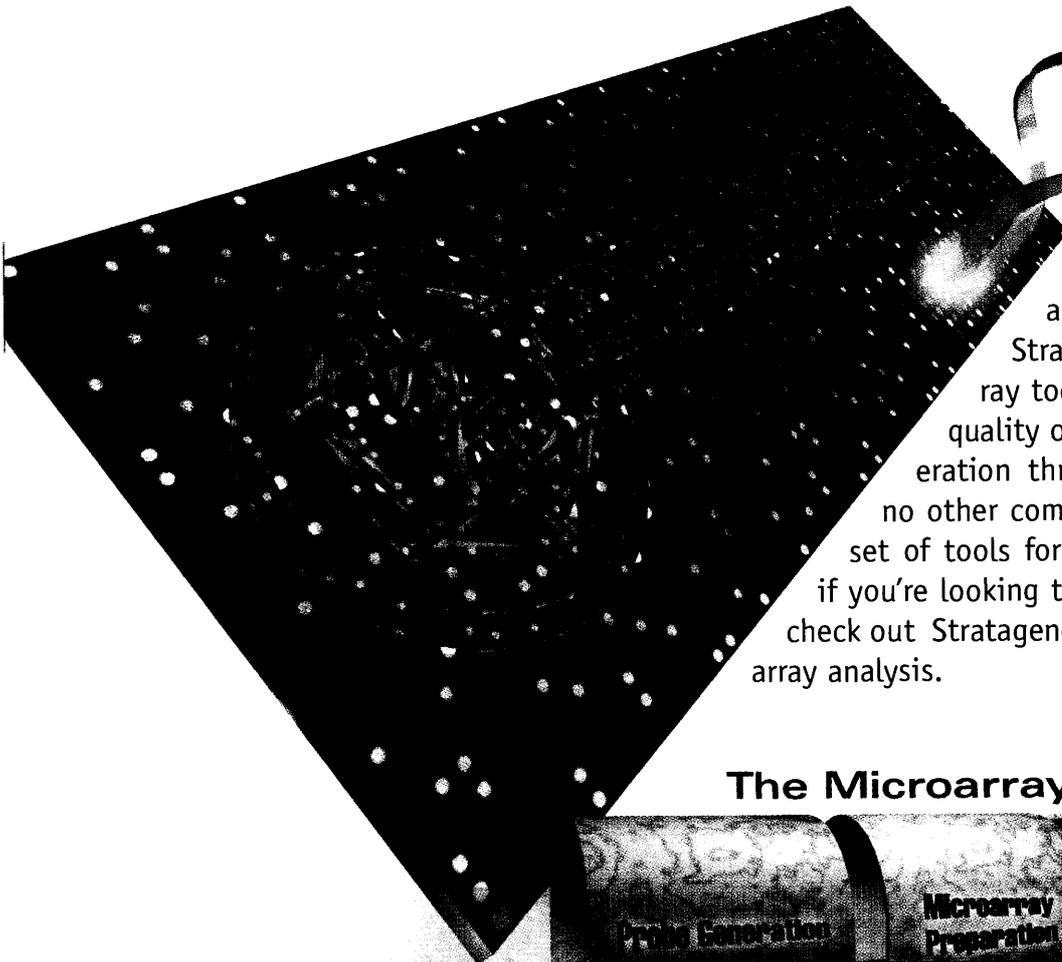
Vol. 296 No. 5569
Pages 793-968 \$9



AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

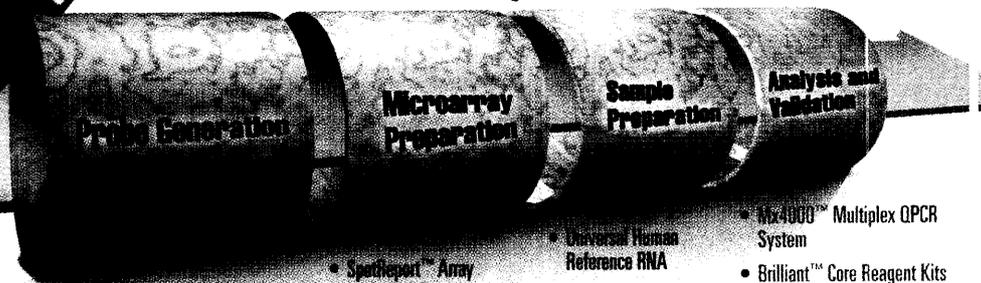
Get a Complete Solution

for microarray analysis



No matter what your needs are for gene expression analysis, Stratagene's portfolio of microarray tools allows you to maximize the quality of your results. From probe generation through analysis and validation, no other company delivers a more complete set of tools for each step of the process. So, if you're looking to obtain the best quality data, check out Stratagene's complete solution for microarray analysis.

The Microarray Process



- **YieldAce™** DNA Polymerase
- **Taq2000™** DNA Polymerase
- **QuikSpot™** PCR Products

- **SpotReport™** Array Validation System
- **Stratalinker®** UV Crosslinker

- **Universal Human Reference RNA**
- **Absolutely RNA™** Purification Kits
- **FairPlay™** Microarray Labeling Kit
- **Microarray Direct** Labeling Kit

- **Mx4000™** Multiplex QPCR System
- **Brilliant™** Core Reagent Kits

Your complete provider of microarray tools

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

STRATAGENE EUROPE
Belgium, France, Germany,
The Netherlands, Switzerland,
United Kingdom

European Toll-Free Numbers
ORDER: 00800 7000 7000
TECHNICAL SERVICES: 00800 7400 7400
Austria
0800 312 526

www.stratagene.com



Continuing to set the standard in nucleic acid markers.

For the highest quality, consistency, and reliability in nucleic acid markers, go with Invitrogen. We provide the Gibco BRL[®] DNA and RNA markers you've come to rely on for superior results.

Reach new heights. Invitrogen's selection of high-performance standards offers unsurpassed convenience and clarity. Markers ranging from 10 bp to 40 kb give you flexibility to size RNA as well as single-stranded,

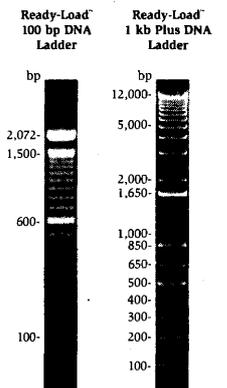
double-stranded and supercoiled DNA easily. Even increments and orientation bands remove obstacles for clear size estimations. Convenient Ready-Load[™] formats store at room temperature and eliminate time-consuming

marker preparation steps, helping you to finish your analysis in record-breaking time.

Winning combination. Partner with Invitrogen and achieve your goals with confidence. To find out more about the entire line of nucleic acid markers, call Invitrogen today or visit us at www.invitrogen.com.

Winning combination. Partner with Invitrogen and achieve your goals with confidence. To find out more about the entire line of nucleic acid markers, call Invitrogen today or visit us at www.invitrogen.com.

Ready-Load[™] Formats



Invitrogen[™]
life technologies

Corporate Headquarters:
Invitrogen Corporation
1600 Faraday Avenue
Carlsbad, California 92008 U.S.A.
Tel: 1 760 603 7200
Tel (Toll Free): 1 800 955 6288
Fax: 1 760 603 7229
Email: tech_service@invitrogen.com

European Headquarters:
Invitrogen Ltd
3 Fountain Drive
Inchinnan Business Park
Paisley PA4 9RF, UK
Tel: +44 (0) 141 814 6100
Fax: +44 (0) 141 814 6287
Email: eurotech@invitrogen.com

For an office near you go to:
www.invitrogen.com

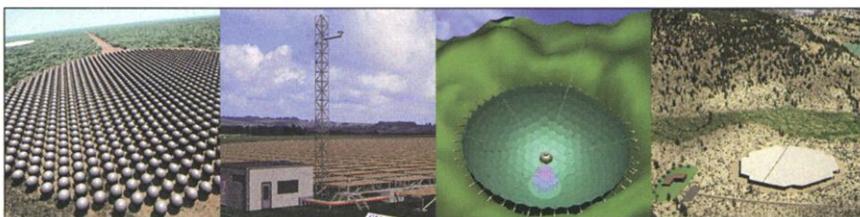
Science

Volume 296 3 May 2002

Number 5569

799 **SCIENCE ONLINE**
801 **THIS WEEK IN SCIENCE**
805 **EDITORIAL**
Jonathan Adams
Research Assessment in the UK

807 **EDITORS' CHOICE**
811 **NETWATCH**
814 **CONTACT SCIENCE**
935 **NEW PRODUCTS**



830

Candidates for the world's biggest telescope

NEWS

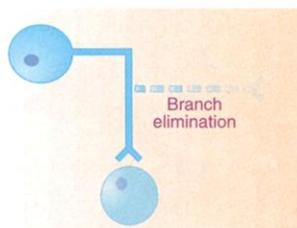
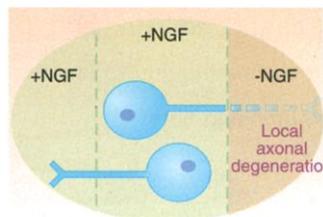
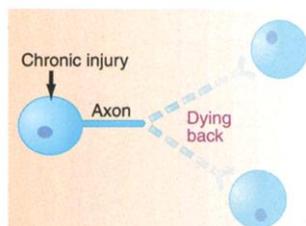
NEWS OF THE WEEK

- 820 **PEDIATRIC DRUG TRIALS: Challenge to FDA's Authority May End Up Giving It More**
- ▼821 **PALEOBOTANY: Fossil Plant Hints How First Flowers Bloomed**
899
- 821 **WEAPONS LABS: DOE Delays Hiring of Livermore Head**
- ▼823 **ALCOHOLISM RESEARCH: Stressed Mutant Mice Hit the Bottle**
931
- 823 **SCIENCE SCOPE**
- 824 **POPULATION STUDIES: U.K.'s Mass Appeal for Disease Insights**
- 824 **GENOME RESEARCH: Venter Is Back With Two New Institutes**
- ▼825 **CLIMATE CHANGE: A Single Climate Mover for Antarctica**
895
- 826 **NATIONAL SECURITY: Pentagon Proposal Worries Researchers**

- 826 **RESEARCH FUNDING: Europe Begins Work on Modest New Agency**
- 827 **PROTEOMICS: Public-Private Group Maps Out Initiatives**
- 829 **SCIENCE INDICATORS: NSF Report Paints a Global Picture**

NEWS FOCUS

- 830 **ASTRONOMY: Tuning In the Radio Sky**
Space Communication for the Video Age Seeking Peace in a Radio-Loud World
- 834 **ASSYRIA: Bringing a Long-Lost Library Back to Life**
- 835 **AMERICAN ASSOCIATION OF PHYSICAL ANTHROPOLOGISTS: Humans' Head Start: New Views of Brain Evolution**
- 838 **DRUG DELIVERY: Breaching the Membrane**
- 841 **RANDOM SAMPLES**



868

Programmed axon death

SCIENCE'S COMPASS

LETTERS

Attraction to Orange: Sexiness, Not Gluttony A. P. Jayasooriya, R. S. Weisinger, H. S. Weisinger, M. L. Mathai, A. J. Sinclair. *Response* G. F. Grether, K. A. Hughes, F. H. Rodd. **Tree-Ring Chronologies and Climate Variability** M. E. Mann and M. K. Hughes. *Response* E. R. Cook and J. Esper

HISTORICAL ESSAY

851 **PORTRAITS OF SCIENCE: Damn the Torpedoes. Full Speed Ahead!**
S. B. McGrayne

BOOKS ET AL.

853 **MATHEMATICS: *The Honors Class Hilbert's Problems and Their Solvers*** B. H. Yandell, reviewed by F. Q. Gouvêa

853 **Browsings**

854 **HUMAN BODY: *The Oxford Companion to the Body*** C. Blakemore and S. Jennett, Eds., reviewed by S. Vogel

PERSPECTIVES

- ▼855 **CELL BIOLOGY: The Different Hues of Lipid Rafts** G. van Meer
913
- ▼857 **CELL BIOLOGY: Fats, Flies, and Palmitate** A. Nohturfft and R. Losick
879
- ▼859 **SELF-ASSEMBLY: Persistence Pays Off** C. K. Ober
892
- ▼861 **PHYSICS: Superconducting Qubits—a Major Roadblock Dissolved?** A. J. Leggett
886
889
- ▼862 **MICROBIOLOGY: Subversion of Schwann Cells and the Leper's Bell** P. J. Brophy
927

REVIEWS

- 864 **EVOLUTION: Planetary Biology—Paleontological, Geological, and Molecular Histories of Life** S. A. Benner, M. D. Caraco, J. M. Thomson, E. A. Gaucher
- 868 **NEUROSCIENCE: Axonal Self-Destruction and Neurodegeneration** M. C. Raff, A. V. Whitmore, J. T. Finn

RESEARCH

BREVIA

- 873** **Female Eavesdropping on Male Song Contests in Songbirds** D. J. Mennill, L. M. Ratcliffe, P. T. Boag

RESEARCH ARTICLES

- 875** **A S_N2 Reaction That Avoids Its Deep Potential Energy Minimum** L. Sun, K. Song, W. L. Hase

- 879** **Regulation of SREBP Processing and Membrane Lipid Production by Phospholipids in *Drosophila*** I. Y. Dobrosotskaya, A. C. Seegmiller, M. S. Brown, J. L. Goldstein, R. B. Rawson



910
Network properties of protein interactions

REPORTS

- 884** **Direct Synthesis of Long Single-Walled Carbon Nanotube Strands** H. W. Zhu, C. L. Xu, D. H. Wu, B. Q. Wei, R. Vajtai, P. M. Ajayan

- 886** **Manipulating the Quantum State of an Electrical Circuit** D. Vion, A. Aassime, A. Cottet, P. Joyez, H. Pothier, C. Urbina, D. Esteve, M. H. Devoret

- 889** **Coherent Temporal Oscillations of Macroscopic Quantum States in a Josephson Junction** Y. Yu, S. Han, X. Chu, S.-I. Chu, Z. Wang

- 892** **Ordering of Quantum Dots Using Genetically Engineered Viruses** S.-W. Lee, C. Mao, C. E. Flynn, A. M. Belcher

- 895** **Interpretation of Recent Southern Hemisphere Climate Change** D. W. J. Thompson and S. Solomon

- 899** **Archaeofractaceae, a New Basal Angiosperm Family** G. Sun, Q. Ji, D. L. Dilcher, S. Zheng, K. C. Nixon, X. Wan

- 904** **Mammal Population Losses and the Extinction Crisis** G. Ceballos and P. R. Ehrlich

- 907** **Genomewide Analysis of mRNA Processing in Yeast Using Splicing-Specific Microarrays** T. A. Clark, C. W. Sugnet, M. Ares Jr.

- 910** **Specificity and Stability in Topology of Protein Networks** S. Maslov and K. Sneppen

- 913** **Partitioning of Lipid-Modified Monomeric GFPs into Membrane Microdomains of Live Cells** D. A. Zacharias, J. D. Violin, A. C. Newton, R. Y. Tsien

- 916** **Large-Scale Transcriptional Activity in Chromosomes 21 and 22** P. Kapranov, S. E. Cawley, J. Drenkow, S. Bekiranov, R. L. Strausberg, S. P. A. Fodor, T. R. Gingeras

- 920** **Neurofibromas in NF1: Schwann Cell Origin and Role of Tumor Environment** Y. Zhu, P. Ghosh, P. Charnay, D. K. Burns, L. F. Parada

- 922** **Genomic Instability in Mice Lacking Histone H2AX** A. Celeste, S. Petersen, P. J. Romanienko, O. Fernandez-Capetillo, H. T. Chen, O. A. Sedelnikova, B. Reina-San-Martin, V. Coppola, E. Meffre, M. J. Difilippantonio, C. Redon, D. R. Pilch, A. Oлару, M. Eckhaus, R. D. Camerini-Otero, L. Tessarollo, F. Livak, K. Manova, W. M. Bonner, M. C. Nussenzweig, A. Nussenzweig

- 927** **Contact-Dependent Demyelination by *Mycobacterium leprae* in the Absence of Immune Cells** A. Rambukkana, G. Zanazzi, N. Tapinos, J. L. Salzer

- 931** **Enhanced and Delayed Stress-Induced Alcohol Drinking in Mice Lacking Functional CRH1 Receptors** I. Sillaber, G. Rammes, S. Zimmermann, B. Mahal, W. Ziegglänsberger, W. Wurst, F. Holsboer, R. Spanagel

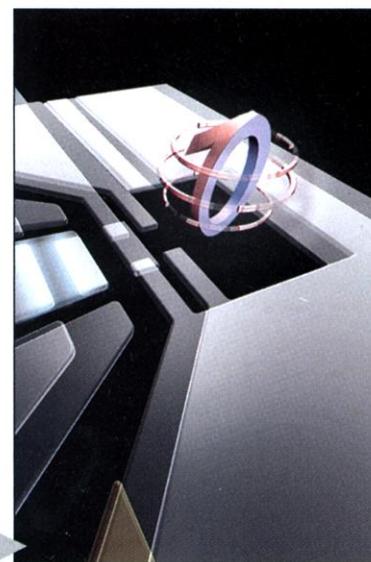


COVER 899

An early fossil flower, *Archaeofructus sinensis* sp. nov., from the lower Yixian Formation (Upper Jurassic/Lower Cretaceous), Liaoning, China. Morphological and molecular analyses suggest that *Archaeofructus* is a basal angiosperm. Thin stems, dissected leaves, and associated fruit (*Lycopersicon davidi* Sauvage) indicate that these were aquatic flowering plants. [Photo: David Dilcher, Ge Sun, Qiang Ji]

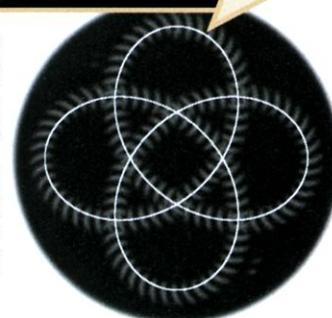
886

A macroscopic qubit with long coherence time



New on Science Express

Chemical wave guides

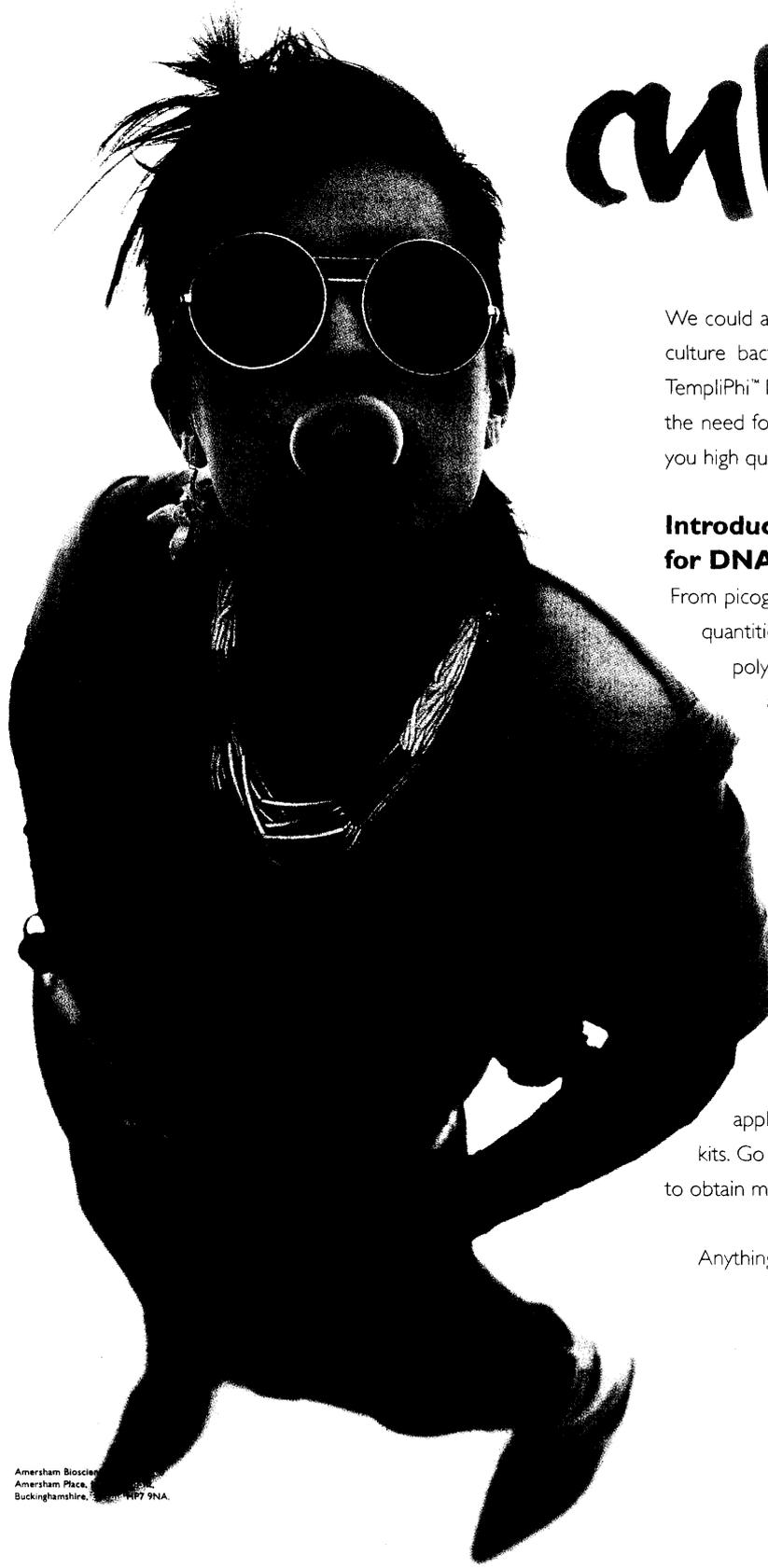


AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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 © 2002 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): \$120 (\$66 allocated to subscription). Domestic institutional subscription (51 issues): \$390; Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$85. 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.

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: \$9.00 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 \$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 Guide to Periodical Literature and in several specialized indexes.

TEMPLIPHI: THE END OF culture?



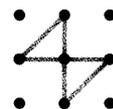
We could all do without certain aspects of culture. Like having to culture bacteria and phage for DNA sequencing. Good news: TempliPhi™ DNA Amplification Kits will save you time by eliminating the need for culture growth. They are also simple to use and give you high quality results.

Introducing the easiest solution for DNA template preparation

From picogram starting amounts, TempliPhi generates microgram quantities of template DNA utilizing bacteriophage Phi29 DNA polymerase and rolling circle amplification. This unique approach gives you high quality DNA templates in just four to six hours—with less than 20 minutes of hands-on-time. Uniform quantities of DNA are amplified in all samples, so there's no need to quantify each sample before sequencing—saving you even more time and effort. Amplified DNA can be used directly for sequencing using any chemistry and sequencing platform. Amplified DNA can also be processed by restriction enzymes and stored for future needs. What's more, it makes automation easy.

TempliPhi is easy to use, simple protocols suit all applications and is available in 100, 500 and 10,000 reaction kits. Go to www.amershambiosciences.com/templiphi to obtain more information. Put an end to culture.

Anything is possible.



Scienceonline

www.scienceonline.org

CONTENT HIGHLIGHTS AS OF 3 MAY 2002

NOW!
Daily coverage of science and science policy by Science's news team
sciencenow
www.sciencenow.org

science magazine

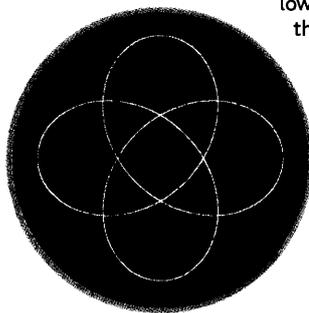
www.sciencemag.org

SCIENCE EXPRESS

www.sciencexpress.org

Design and Control of Patterns of Wave Propagation in Excitable Media T. Sakurai, E. Mihaliuk, F. Chirila, K. Showalter

Feedback control is used to control and guide chemical waves in the photosensitive Belousov-Zhabotinsky reaction.



A Natural Product That Lowers Cholesterol as an Antagonist Ligand for the FXR N. L. Urizar *et al.*

An ancient folk medicine, widely used in India to lower cholesterol, is found to mediate its beneficial effects through the bile acid receptor FXR.

Sp1 and TAFII130 Transcriptional Activity Disrupted in Early Huntington's Disease A. W. Dunah *et al.*

Mutant huntingtin interferes with transcription mediated by the transcriptional activator Sp1 and its coactivator TAFII130.

science's next wave

www.nextwave.org

career resources for scientists

GLOBAL: Science Translation

Science translators get to combine their love for science and their love for languages in a single, fascinating career.

SINGAPORE: Why Singapore? E. Liu

The former scientific director of the Division of Clinical Sciences at the National Cancer Institute writes about his reasons for moving to Singapore.

NETHERLANDS: Transitions, Part II—Switching Postdocs S. Oomes

How an MIT postdoc and a personal career advisor helped find a research group that is an excellent fit.

GERMANY: Dresden's New Max-Planck-Institute—A Rising Star in the East E. von Ruschkowski

The Max-Planck-Institute of Molecular Cellular Biology and Genetics is the newest attraction in Germany's scientific community.

CANADA: From Academia to Embassy—An Unusual Career Path P. Hicks

A career in bilateral collaborations, R&D partnerships, and strategic alliances at the Canadian Embassy is not something that most scientists would consider possible, but they do possess the skills to do it.

GRANTSNET: May News K. Cottingham

Part 3 of our series on International Research Funding; profiles of two Damon Runyon Cancer Research Foundation awardees; and the latest biomedical funding news.

KNOWLEDGE ENVIRONMENTS

science's sage ke

www.sageke.org

science of aging knowledge environment

Meeting Report—National Institute on Aging Workshop on the Comparative Biology of Aging H. Warner, R. A. Miller, J. Carrington

Exploiting differences in life-span among a drove of diverse creatures.

Playful Rejuvenation R. J. Davenport

Researchers turn to music and other diversions for inspiration.

science's stke

www.stke.org

signal transduction knowledge environment

Perspective: Death Receptor Signaling Giving Life to Ectodermal Organs I. Thesleff and M. L. Mikkola

Signaling by ectodysplasin.

Perspective: Sticky Caveats in an Otherwise Glowing Report—Oligomerizing Fluorescent Proteins and Their Use in Cell Biology D. A. Zacharias

Technical issues related to using green fluorescent proteins to study protein interactions.

Connections Map: TNF Pathway Pathway Authorities: G. Chen and D. V. Goeddel

A canonical view of apoptosis stimulated by tumor necrosis factor.

GrantsNet

www.grantsnet.org

RESEARCH FUNDING DATABASE

AIDScience

www.aidsience.com

HIV PREVENTION & VACCINE RESEARCH

Members Only!

www.AAASMember.org

AAAS ONLINE COMMUNITY

SCOPE

http://scope.educ.washington.edu

EXPLORING SCIENCE CONTROVERSIES

Functional Genomics

www.sciencegenomics.org

NEWS, RESEARCH, RESOURCES

ONLINE STAFF

SCIENCENOW EDITORS Martin Enserink, Laura Helmuth, Greg Miller, Erik Stokstad

SCIENCE'S NEXT WAVE EDITORIAL: MANAGING EDITOR Crispin Taylor; EDITORS Eick von Ruschkowski (Germany), Kirstie Urquhart (UK), Ric Weibl (US); CONTRIBUTING EDITORS Lesley McCarney (Canada), Robert Metzke (Netherlands), Jennie Wong (Singapore); PROJECT EDITORS Jim Austin, Sibrina Collins, Katie Cottingham, Laure Haak; PRODUCTION ASSOCIATE Lily Han; MARKETING: MARKETING MANAGERS Karen Horning (Global), Hazel Crocker (Europe); PROGRAM DIRECTOR Lisa Kozlowski; MARKETING ASSOCIATE Angela Walker; PROGRAM ASSOCIATES Shajuan Martin, Tammy Minor

AIDSCIENCE SENIOR EDITOR Roberto Fernandez-Larsson; ASSOCIATE EDITOR Paula Werner

SCIENCE'S STKE EDITOR Bryan Ray; MANAGING EDITOR Nancy Gough; ASSOCIATE EDITOR Lisa Chong; PUBLICATIONS ASSISTANT Christopher Kenny

SCIENCE'S SAGE KE EDITORIAL DIRECTOR Kelly LaMarco; SENIOR NEWS EDITOR Evelyn Strauss; ASSOCIATE EDITOR R. John Davenport

ELECTRONIC MEDIA MANAGER Don Hemmenway; INTERNET PRODUCTION MANAGER Betsy Hartman; ASSISTANT PRODUCTION MANAGER Wendy Stengel; SENIOR PRODUCTION ASSOCIATES Shelia Myers, Lisa Stanford; ASSOCIATES Carla Cathey, Steve Kusek, Louis Williams; LEAD APPLICATIONS DEVELOPER Carl Saffell

Amplify your Message

Do for your RNA what electricity did for the guitar.

10.17.01.dcm.v1 © Copyright 2001 - Ambion, Inc.

The new MessageAmp™ aRNA Kit

can amplify your
mRNAs 1000X

in a single reaction. This means you can get that valuable array data from your limiting RNA samples. Each step of the

MessageAmp procedure has been optimized for high efficiency and high yields, and the kit is compatible with both biotin and Cy™ dye labeling. The procedure can be completed in less than one day.

MessageAmp contains reagents for first-strand cDNA synthesis, RNase H digestion, second-strand synthesis, cDNA purification, in vitro transcription (using MEGAscript™ technology) and aRNA purification.

For more information about the MessageAmp Kit visit:
www.ambion.com/messageamp

Cy™ is a trademark of Amersham Pharmacia Biotech

Ambion®

THE RNA COMPANY®
2130 Woodward • Austin, TX 78744

US: 800-888-8804 CANADA: 800-445-1161
tel:(512)651-0200 • fax:(512)651-0201 • email: moinfo@ambion.com
For a complete list of distributors visit <http://www.ambion.com>

THIS WEEK IN Science

edited by Phil Szuromi

Centimeter Nanotubes

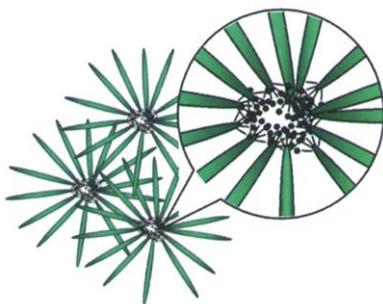
The fabrication of single-walled carbon nanotubes is still somewhat of an art form, and processes that either create the nanotubes at a much faster rate or of much greater length or purity is still needed. Zhu *et al.* (p. 884) use an improved floating catalyst method to create centimeter-long single-walled nanotube ropes that are significantly longer than those obtained from either chemical vapor deposition or laser-ablation methods.

Macroscopic Quantum Systems

Quantum-mechanical effects, such as discrete energy levels and the superposition of energy states, which are normally associated with systems no bigger than the atomic scale, can in fact be observed in certain macroscopic systems. Vion *et al.* (p. 886) and Yu *et al.* (p. 889) present results on the formation of two-level macroscopic quantum systems with superconducting tunnel junctions and show that interference effects between the two states can be observed. The realization of such large-scale quantum systems in more readily manipulated macroscopic systems may prove useful in quantum computation (see the Perspective by Leggett).

Phage Forge Nanoparticle Films

A nanofabrication method is presented that not only forms nanoparticles but also organizes them. Lee *et al.* (p. 892; see the Perspective by Ober) genetically engineered a coat protein of M13 bacteriophage with a specificity for the surfaces of ZnS nanoparticles. The bacteriophage, being long rigid structures, can form liquid-crystalline phases in solution, and thus the attached nanoparticles can assemble into ordered layered structures.



Antarctic Cooling and Ozone Losses

Despite an overall global warming trend, temperatures over large parts in the interior of Antarctica have exhibited a small but distinct cooling trend during the past several decades. Thompson and Solomon (p. 895; see the news story by Kerr) present evidence that high-latitude Southern Hemisphere circulation changes during the past few decades re-

875 Avoiding the Obvious

Chemists usually view elementary chemical reactions as proceeding in a statistical fashion—energy is rapidly redistributed between vibrational and rotational modes, and deep energy minima that lie along the various possible reaction pathways tend to act as a “trap” and dominate product formation. Sun *et al.* (p. 875) present results for dynamical simulations of a nucleophilic substitution reaction, $\text{OH}^- + \text{CH}_3\text{F} \rightarrow \text{CH}_3\text{OH} + \text{F}^-$, which show that despite the presence of a deep minimum in the potential energy surface, more than 90% of the simulation trajectories make their way to products. Product formation appears to occur on a much faster time scale than the competing statistical energy redistribution.

And in Brevia ...

Interactive song playback and microsatellite paternity analysis were used by Mennill *et al.* (p. 873) to test the hypothesis that female songbirds eavesdrop on male territorial song contests in order to make reproductive decisions.

molecular and phylogenetic analysis, is one of the basal angiosperms and provides important information about the origin of reproductive organs in flowering plants.

Making Sense of Many Lipids

Homeostatic mechanisms maintain the lipid composition of biological membranes. In mammalian cells, the sterol response element-binding proteins are transcription factors that regulate cellular levels of cholesterol and fatty acids in a signaling and feedback mechanism that responds to these very lipids. Dobrosotskaya *et al.* (p. 879; see the Perspective by Nohturfft and Losick) report that this pathway is conserved in flies but also responds to and regulates synthesis of cellular phospholipids, a major membrane lipid.

The Splice of Life

Although 30 to 50% of human genes produce alternatively spliced transcripts, a much lower percentage is found in yeast. Clark *et al.* (p. 907) developed a microarray-based system to gain a global view of yeast splicing regulation. The authors examine pre-messenger RNA and messenger RNA levels of all yeast intron-containing genes in response to mutation of splicing-related genes to see what happens to splicing, both globally and at the level of individual transcripts. Cluster analysis indicates which introns behave similarly under certain circumstances and which genes affect splicing in similar ways. This method can be applied to more complex genomes for informative expression profiling of those systems.

Protein Raft Trips

Attention has been focused on lipid rafts—microdomains of the plasma membrane enriched in sphingolipid and cholesterol—in part be-

fect a systematic trend in regional atmospheric circulation. Trends in tropospheric circulation trends can be traced to the recent cooling of the lower stratosphere caused by photochemical ozone losses.

Old Family of Flowers

Fossil specimens of a new family, Archaeofractaceae, of herbaceous, aquatic plants from the Upper Jurassic to Late Cretaceous Yixian Formation of western Liaoning, China have been characterized by Sun *et al.* (p. 899; see the cover and the news story by Stokstad). The family consists of a single genus, *Archaeofractus*, with two species, *Archaeofractus liaoningensis* and *Archaeofractus sinensis*. This family, based on

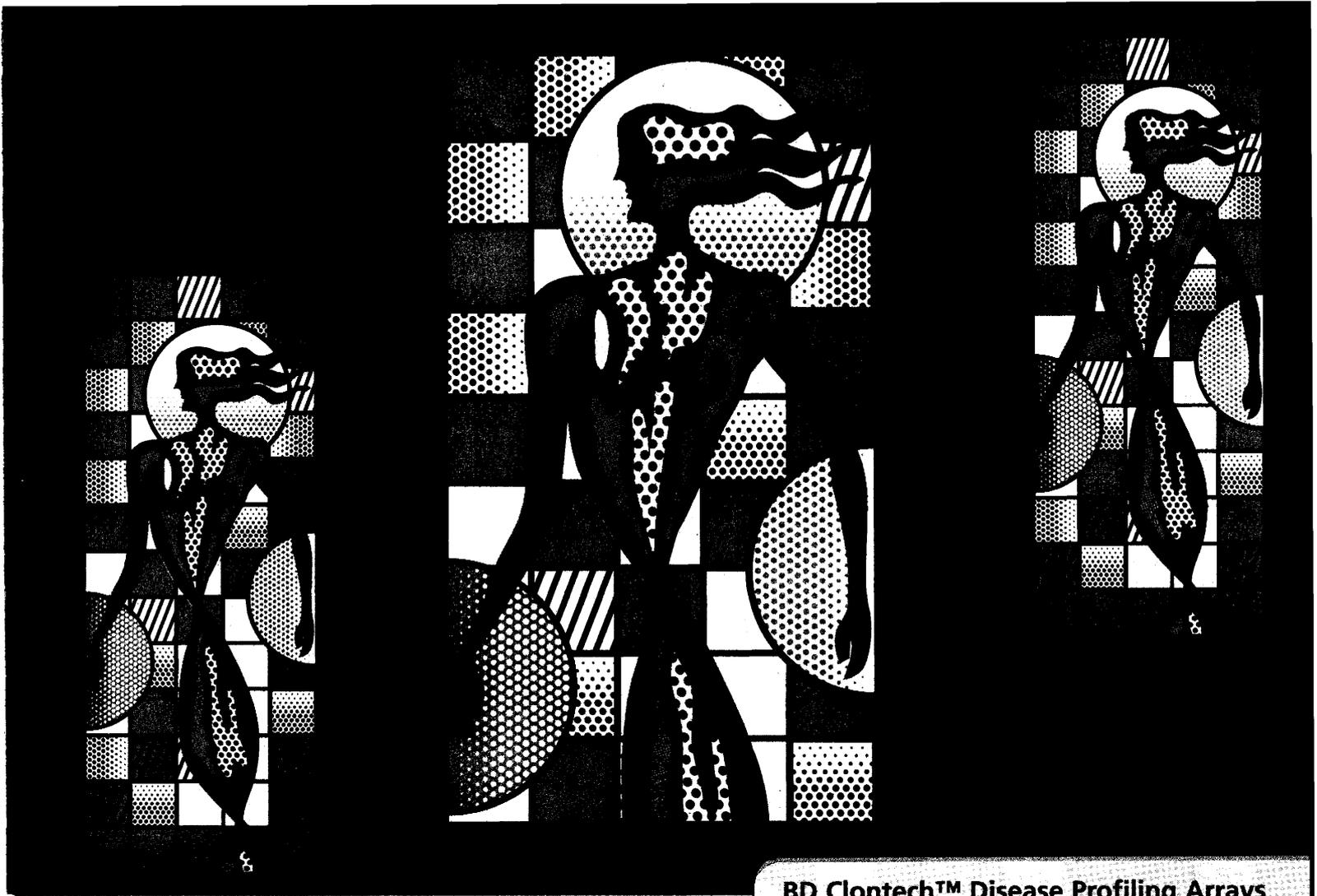


Illustration inspired by the art of Roy Lichtenstein (1923–1997).

BD Clontech™ Disease Profiling Arrays

Sample Collection Simplified

BD Clontech™ Disease Profiling Arrays simplify your efforts to profile gene expression across hundreds of individually collected patient samples.

Disease Profiling Arrays are now available to study Cancer, Blood, and Autoimmune Diseases.

These new arrays are derived from a comprehensive library of patient samples. The Cancer Profiling Array features matched tumor and normal samples from over 200 patients spanning 13 different types of Cancer. Our new Blood and Autoimmune Disease Profiling Arrays each allow you to study gene expression in blood fractions from five disease types.

Take advantage of our tissue collection. Prove results from cDNA expression arrays. Link a gene of interest to other disease types.

Disease Profiling Arrays. It's simple.

BD Biosciences Clontech

www.bdbiosciences.com

United States Canada Europe Japan Asia Pacific Latin America/Caribbean

877.232.8995 888.259.0187 32.53.720.211 81.24.593.5405 65.6861.0633 55.11.5185.9995

For country-specific contact information, visit www.bdbiosciences.com/how_to_order/

For Research Use Only. Not for use in diagnostic or therapeutic procedures. Not for resale.

BD, BD Logo and all other trademarks are the property of Becton, Dickinson and Company. ©2002 BD AD23009

BD Biosciences

Clontech

Discovery Labware

Immunocytometry Systems

Pharmingen

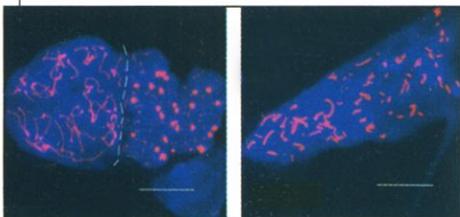


cause many proteins that take part in signaling across the plasma membrane are preferentially located in these structures. Zacharias *et al.* (p. 913; see the Perspective by van Meer) studied targeting of proteins to lipid rafts by monitoring fluorescence resonance energy transfer (FRET) between mutants of cyan fluorescent protein (mCFP) and yellow fluorescent protein molecules (mYFP) that had been engineered to prevent the normal dimerization of these proteins. FRET was detected between a fusion protein of CFP with caveolin, which is known to localize to rafts, and YFP that was acylated on its amino terminus. Prenyl modification of YFP, however, did not target the protein to rafts. Thus, lipid modification of proteins can regulate localization, and hence the function, of various proteins in lipid rafts.

Schwann Cells and Nerve Disorders

The glial cells of the peripheral nervous system, the Schwann cells, play important supporting roles, such as producing myelin, but their generation appears to facilitate two important nervous system disorders. Neurofibromatosis type 1 (NF1) is an inherited disorder characterized by the development of multiple benign tumors in the nervous system (neurofibromas) that occasionally progress to malignancy. Affected individuals have germline mutations in one allele of the tumor suppressor gene *NF1*, and their tumors show loss of expression of the other allele. Neurofibromas contain a complex mixture of cell types and it has been unclear which of these cells gives rise to the tumors. Using a sophisticated mouse model in which *NF1* expression can be selectively ablated in specific cell types, Zhu *et al.* (p. 884) show that the tumors arise specifically from Schwann cell precursors. Interestingly, however, tumor development was greatly accelerated when the surrounding non-neoplastic cells carried only one functional allele of *NF1*, illustrating the importance of tumor-host interactions in tumorigenesis. The causative agent of leprosy, *Mycobacterium leprae*, prefers to infect Schwann cells, and the resulting demyelination of nerve fibers leads to a progressive loss of sensation. It has been assumed that the nerve damage was mediated indirectly by the host's immune responses against the bacteria, but Rambukkana *et al.* (p. 927; see the Perspective by Brophy) show that the *M. leprae* directly causes demyelination via a contact-mediated mechanism. Nerve injury stimulates compensatory Schwann cell proliferation, and in this way *M. leprae* generates more habitable cells to occupy.

Not Keeping Up with Repairs



Replication of DNA or DNA damage processes can result in double-strand breaks, which in turn may lead to chromosomal translocation and an increased risk of malignancy. Celeste *et al.* (p. 922) tested the role of the DNA repair-associated protein, H2AX, in maintaining genomic stability. Cells from H2AX-deficient mice displayed several genetic abnormalities, including elevated sensitivity

to irradiation-induced damage, chromosomal breakage, and an increased incidence of translocations. Male H2AX^{-/-} mice were infertile due to defective spermatogenesis that resulted from failure of synapsis and meiotic arrest. T and B cell development was also diminished, and B cells displayed defects in switch recombination. Recruitment of DNA repair enzymes was severely affected in the absence of H2AX, confirming a central role for this protein in coordinating the response to DNA damage. ✂

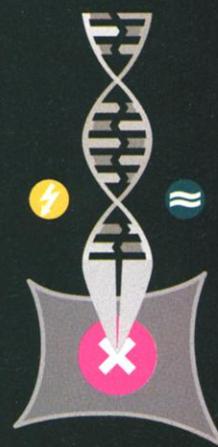
Tackling the Link Between Stress and Alcohol

The chances to develop alcoholism throughout one's life are determined by a genetic predisposition and an individual's reaction to lifetime events, such as stress. The corticotropin-releasing hormone (CRH) system regulates endocrine responses to stress and mediates stress-related behavior. To better understand the molecular and cellular mechanism underlying stress-induced alcohol drinking Sillaber *et al.* (p. 931; see the news story by Holden) created knockout mice lacking CRH1 receptors. *Crrh1*^{-/-} mice did not differ from wild-type mice in their basal alcohol intake and preference. However, after repeated stress episodes, the knockout mice gradually increased their alcohol consumption and kept it elevated for the rest of their life. This change in drinking behavior was accompanied by enhanced protein levels of the NR2B subunit of the N-methyl-D-aspartate receptor.

CREDIT: CELESTE ET AL.

Introducing our new invention: The time machine!

(What would you call it, when you can optimize any cell line in just two weeks?)



Use the Nucleofactor™ technology:

- to transfect a wide range of different primary cells and hard-to-transfect cell lines
- non-virally
- with highest efficiencies, e.g. up to 90 %
- transfect even non-dividing cells as the DNA is directly transported into the nucleus with the unique combination of electrical parameters and cell-type specific solutions

Improve your results.

+49 (0)221 99199-400

www.amaxa.com

*Nucleofactor™ is a trademark of amaxa

a m a x a
gene transfer begins here

BioSource leads the way in MAP Kinase Network Exploration!

BioSource phosphoELISA™ Advantages

- Quantitative
- ~10x more sensitive than Western blotting
- Kits contain all reagents needed
- 96-wells, 80 results, 4 hours
- No IP, no gel
- Fully optimized
- Normalize results with Total Protein ELISA

New! phosphoELISA™ kits*: ERK 1/2, p38 MAPK

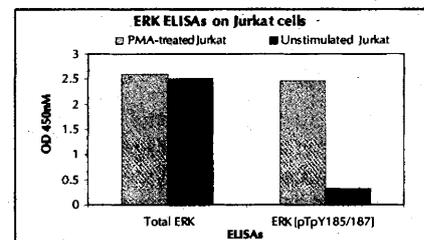
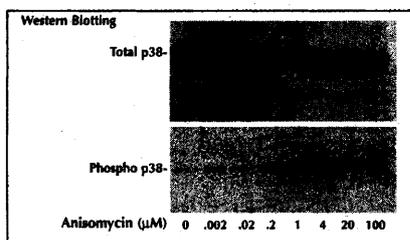
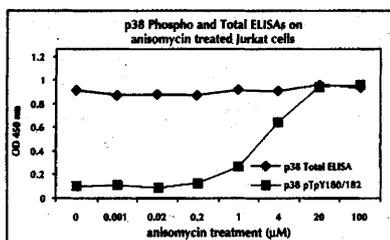
phosphoELISAs™
 ERK1/2 [pTpY185/187]
 p38 MAPK [pTpY180/182]
 EGFR [pY1068]
 EGFR [pY1173]
 Rb [pT821]
 Tau [pS199]
 Tau [pS214]
 Tau [pS396]

Total Protein ELISAs
 ERK1/2
 p38 MAPK
 EGFR
 Rb
 Tau



*Patent Pending
 New products available monthly,
 visit www.biosource.com for a complete product menu.

Solid Performance. Solid Results.



Cell lysates from Jurkat cells treated with various concentrations of anisomycin were tested with Total p38 MAPK ELISA (Cat.#KHO0061), phospho p38 MAPK ELISA (Cat.#KHO0071) and Western blotting. The data show excellent correlation between ELISA and Western blotting.

Specificity of ERK1/2 [pTpY185/187] phosphoELISA™ (Cat.#KHO0091) and Total ERK1/2 ELISA (Cat.#KHO0081).

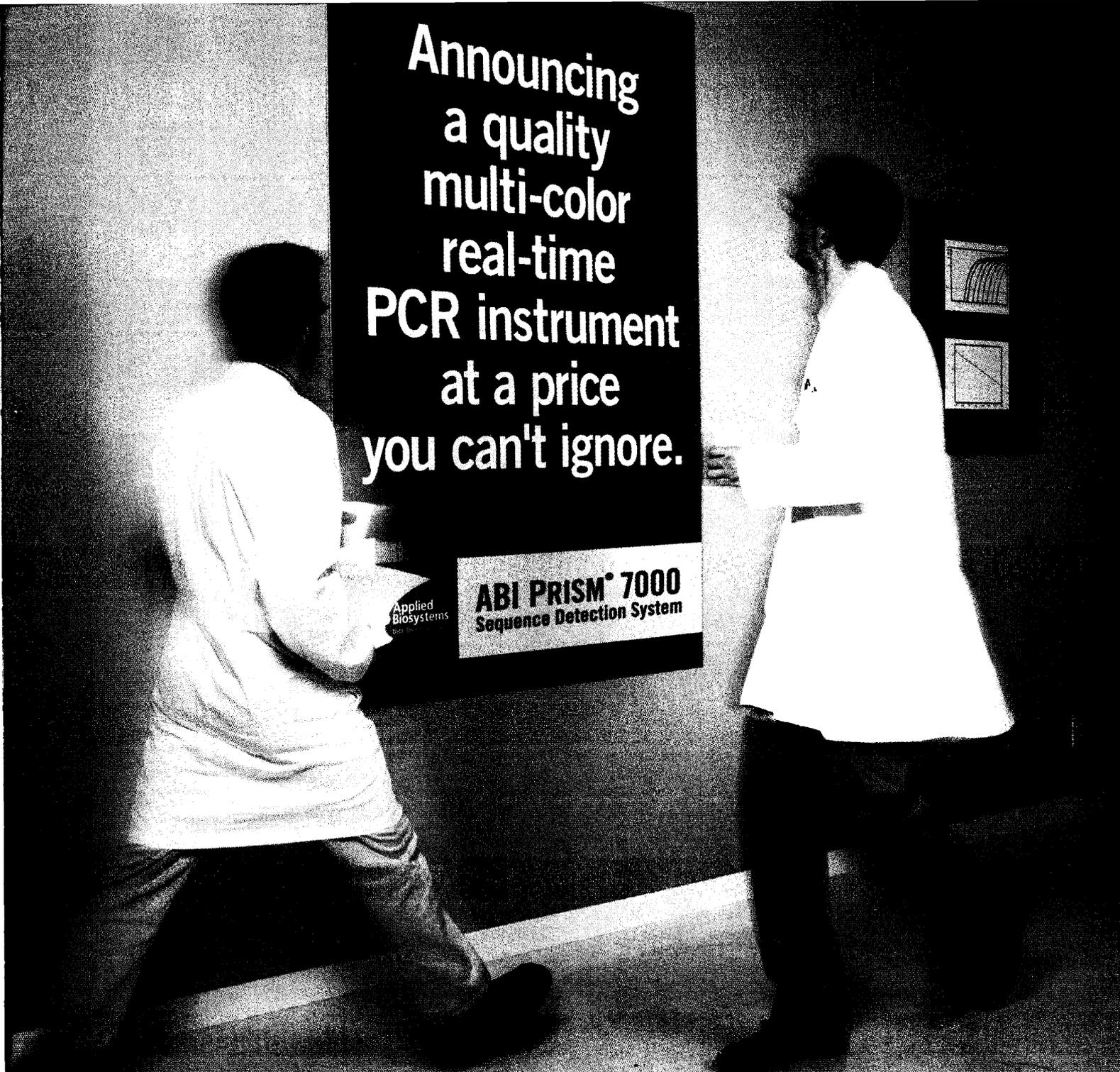
SCPS4/02 For research use only.

BioSource USA
 800.242.0607

BioSource Europe
 +32.67.88.99.99

www.biosource.com





Announcing
a quality
multi-color
real-time
PCR instrument
at a price
you can't ignore.

Applied
Biosystems

ABI PRISM® 7000
Sequence Detection System

Life is full of pleasant surprises.

Think quality, multi-color, real-time PCR has to be expensive? Think again. For less than you ever imagined possible, the new ABI PRISM® 7000 Sequence Detection System gives you exceptional multi-color performance in a convenient space-saving design. Assay development guidelines that include the use of Primer Express® software, as well as a dedicated line of reagents and disposables, ensure your success. Looks like your need for quality data is being met head on.

Want to know more about the ABI PRISM® 7000 Sequence Detection System?
Call 1.650.638.5800, or visit www.appliedbiosystems.com/7000.

AB Applied Biosystems
Data. Decision. Discovery.

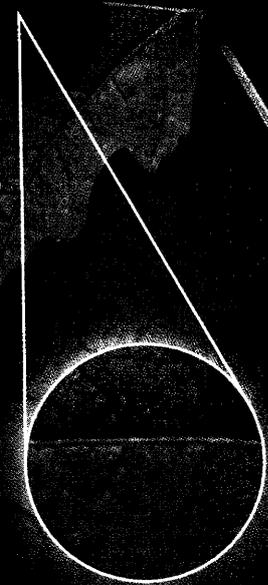
Applied Biosystems is committed to providing the world's leading technology and information for life scientists. Applied Biosystems consists of the Applied Biosystems and Celeris Genomics businesses. Practice of the patented polymerase chain reaction (PCR) process requires a license. The ABI PRISM® 7000 Sequence Detection System is an Authorized Thermal Cycler for PCR and may be used with PCR licenses available from Applied Biosystems. Its use with Authorized Reagents also provides a limited PCR license in accordance with label rights accompanying such reagents. Purchase of this instrument does not convey any right to practice the 5' nuclease assay or any of the real-time methods covered by patents owned by Roche or Applied Biosystems. Applied Biosystems, ABI PRISM and its design, and Primer Express are registered trademarks and AB (Design) and Applied are trademarks of Applied Biosystems or its subsidiaries in the US and certain other countries. For research use only. Not for use in diagnostic procedures. © 2002 Applied Biosystems. All rights reserved.

Leaf Tissue to PCR in Under 15 Minutes

Extract-N-Amp™ for Plants

- No Freezing or Grinding
- Increased Throughput
- Increased Specificity

Visit sigma-aldrich.com/XNAPs for more information.



The **Extract-N-Amp Plant PCR Kits** contain reagents to rapidly extract genomic DNA from plant leaves and amplify targets of interest by PCR. This novel extraction system eliminates the need for freezing, mechanical disruption, organic extraction, centrifugation, column purification, filtration or alcohol precipitation. The kit also includes a PCR reaction mix, especially formulated for amplification directly from extract.

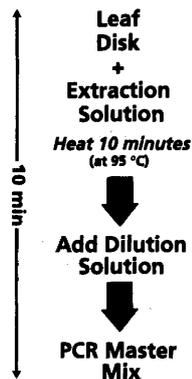
Features & Benefits:

- **Fast:** 15 minute prep allows greater speed and throughput
- **Convenient:** Simple procedure with no special equipment required
- **Specific:** Hot Start antibody for highly specific PCR amplification of genomic DNA
- **Flexible:** Tested on a wide variety of plant types

ORDERING INFORMATION

Product Code	Description	Size
XNAP2	Extract-N-Amp Plant PCR Kit	100 extractions/100 amplifications
XNAP	REExtract-N-Amp Plant PCR Kit (contains REDTag)	100 extractions/100 amplifications

Inquire for bulk and high-throughput custom needs.



- Virginia Creeper
 - Honeysuckle
 - Cottonaster
 - Flax
 - Benjaminia
 - Cannabis sativa
 - negative control



Extract-N-Amp Plant PCR Kit with 5 different plant specimens. Genomic DNA was extracted from 0.5 cm leaf disks that were cut using standard paper punch. DNA was extracted using the Extract-N-Amp Plant PCR Kit in less than 15 minutes. All samples were then amplified using the specially formulated Hot Start PCR mix. The products were generated from a 30-cycle duplex reaction containing primers specific to plant chloroplast (upper band) and primers specific for *Cannabis sativa* DNA (lower band).
 Data provided by Andy Hopwood, Forensic Science Service, Birmingham, England.

**Contact Sigma for more information on
Extract-N-Amp for Plants at sigma-aldrich.com/XNAPs**

availability, ordering & tracking

sigma-aldrich.com

scientific tools, products & information

LEADERSHIP IN LIFE SCIENCE, HIGH TECHNOLOGY AND SERVICE
 SIGMA-ALDRICH CORPORATION • BOX 14508 • ST. LOUIS • MISSOURI 63178 • USA



Purchase of these products is accompanied by a limited license to use them in the Polymerase Chain Reaction (PCR) process in conjunction with a thermal cycler whose use in the automated performance of the PCR process is covered by the up-front license fee, either by payment to Perkin-Elmer or as purchased, i.e., an authorized thermal cycler. These products are sold under licensing arrangements with F. Hoffmann-LaRoche Ltd., Roche Molecular System, Inc. and the Perkin-Elmer Corporation. Extract-N-Amp and REExtract-N-Amp are trademarks of Sigma-Aldrich Biotechnology, Inc.

The product is covered by one or more of the following U.S. patents: 5,801,155; 6,084,102; 6,317,896; 6,038,787; 5,722,591; 5,795,838 and pending applications. For research use only.

WISH YOU HAD OPTIONS FOR REAL-TIME PCR?



MGB-Eclipse™ Real-time PCR Probes. Now you can select any instrumentation system for your studies. How? MGB-Eclipse™ Real-time PCR Probes use open chemistries. And by combining Epoch's Minor Groove Binder (MGB) and our novel Eclipse™ Quencher, the MGB-Eclipse™ Probes generate dramatically improved signal-to-noise ratios. Use the complimentary MGB-Eclipse™ Design Software to select optimal probe and primer sequences at record speeds.

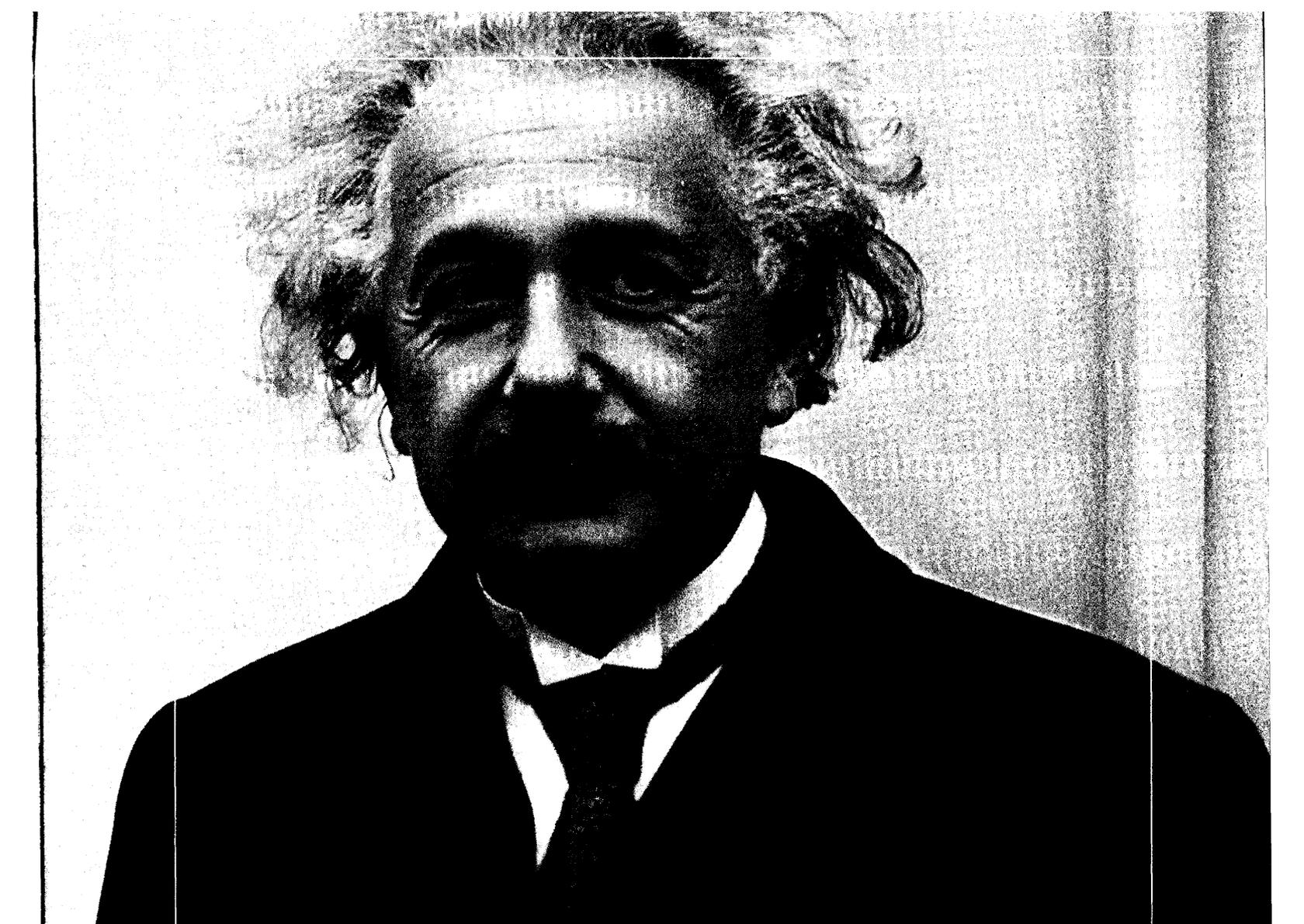
Available in pre-made and custom-designed systems, it's a better way to get answers to your probing questions.

For sales and information call 800-562-5544 or visit www.epochbio.com



EPOCH
BIOSCIENCES

We listen.



Albert Einstein figured out that time and space are relative.

And he knew that nothing could move faster than the speed of light. But when it came to things like money, he **never wasted time thinking** about it. That's where we came in, the people with over 80 years' experience managing portfolios for the world's sharpest minds. Today we could offer Professor Einstein, one of our earliest participants, an even bigger universe to pick from.

Log on for ideas, advice, and results. TIAA-CREF.org or call 1.800.842.2776



*Managing money for people
with other things to think about.™*

RETIREMENT

INSURANCE

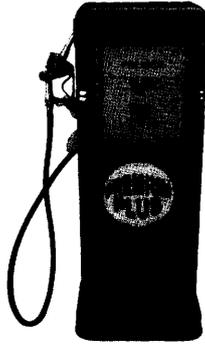
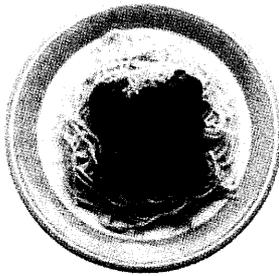
MUTUAL FUNDS

COLLEGE SAVINGS

TRUSTS

INVESTMENT MANAGEMENT

Albert Einstein became a participant in 1933. TIAA-CREF Individual and Institutional Services, Inc., and Teachers Personal Investors Services, Inc., distribute securities products. © 2001 Teachers Insurance and Annuity Association—College Retirement Equities Fund (TIAA-CREF), New York, NY. Albert Einstein™ licensed by the Hebrew University of Jerusalem, represented by the Roger Richman Agency, Inc., www.albert-einstein.net



Performance Enhancers

Power your cell culture system with the right nourishment.

Now you can minimize adaptation time, improve control, increase yield and simplify scale-up with the most trusted name in cell culture.

No matter what your cell type.

Hybridomas. CHO cells. HEK (293) cells. Insect cells. Neurons. Blood and bone marrow cells. Keratinocytes. ES cells. Hepatocytes. Endothelial cells. Mammalian cells for virus production.

You name it. We can make a serum-free, protein-free or chemically-defined GIBCO™ medium optimized for its culture.

What's more, we make it in a format to suit your system: dry powder, 1X liquid, concentrates, and new Advanced Granulation Technology™.

Use GIBCO™ specialty and serum-free nutrient media.

And pump up performance.

www.invitrogen.com



Better Cell Culture Through Innovation

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 **Donald Kennedy**
EDITOR **Ellis Rubinstein**
MANAGING EDITOR **Monica M. Bradford**

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

EDITORIAL/COMPASS SUPERVISORY SENIOR EDITORS Barbara Jasny, Guy Riddiough, Phillip D. Szuroni; SENIOR EDITOR/PERSPECTIVES Orla Smith; SENIOR EDITORS Gilbert J. Chin, Pamela J. Hines, Paula A. Kiberstis (Boston), Beverly A. Purnell, L. Bryan Ray, Linda R. Rowan; ASSOCIATE EDITORS Lisa D. Chong, Marc S. Lavine, H. Jesse Smith, Valda Vinson;

PUBLISHER **Alan I. Leshner**
ASSOCIATE PUBLISHER **Beth Rosner**
MEMBERSHIP/CIRCULATION DIR. **Michael Spinella**

MEMBERSHIP/CIRCULATION (membership@aaas.org) DEPUTY DIRECTOR Marlene Zandell; MEMBER SERVICES MANAGER Michael Lung; SENIOR SPECIALIST Mary Curry, coordinator Jantell Stone; SPECIALISTS Laurie Baker, Pat Butler, Elizabeth Early, Katrina Smith; MARKETING MANAGER Gregory Urquhart; PRODUCTION MANAGER Lauri Sirois; SENIOR ASSOCIATE Deborah Stromberg; INTERNATIONAL MARKETING MANAGER Ruth Hall; SENIOR EXECUTIVE Martin Paine; RESEARCH MANAGER Renuka Chander; BUSINESS AND FINANCE MANAGER Teressa Ellis; ADMINISTRATIVE SUPPORT Zadia McKinnon; COMPUTER SPECIALIST John Williams

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 800-635-7171; 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-Wienhold; SENIOR ANALYST Randy Yi; FINANCIAL ANALYSTS Lisa Donovan, Jessica Tierney-Rubin; RIGHTS AND PERMISSIONS: ASSOCIATE Emilie David; ASSISTANT Karen Lentz; MARKETING DIRECTOR John Meyers; RECRUITMENT MARKETING MANAGER

EDITOR, SCIENCE ONLINE Stewart Willis; ASSOCIATE BOOK REVIEW EDITOR Sherman J. Suter; ASSOCIATE LETTERS EDITOR Etta Kavanagh; INFORMATION SPECIALIST Janet Kegg; CONTRIBUTING EDITOR Kevin Ahern; EDITORIAL MANAGER Cara Tate; SENIOR COPY EDITORS Jeffrey E. Cook, Harry Jach, Barbara P. Ordway; COPY EDITORS Lauren Beben, Monique Martineau, Trista Wagoner; EDITORIAL COORDINATORS Carolyn Kyle, Ellen E. Murphy, Beverly Shields; PUBLICATION ASSISTANTS Chris Filatreau, Joi S. Granger, Jeffrey Hearn, Elise Laffman, Scott Miller, Gail Murphy, Brian White, Anita Wynn; EDITORIAL ASSISTANTS Lisa Johnson, Yolanda Matthews, Patricia M. Moore, Tunisia L. Riley; EXECUTIVE ASSISTANT Sylvia S. Kihara; ADMINISTRATIVE SUPPORT Patricia F. Fisher

science_editors@aaas.org (for general editorial 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)

NEWS SENIOR CORRESPONDENTS Eliot Marshall, Jean Marx; DEPUTY NEWS EDITORS Robert Coontz, Jeffrey Mervis, Leslie Roberts; ASSOCIATE NEWS EDITOR Laura Helmuth; CONTRIBUTING EDITORS Elizabeth Culotta, Polly Shulman; NEWS WRITERS Jennifer Couzin, Martin Enserink, Constance Holden, Jocelyn Kaiser, Richard A. Kerr, Andrew Lawler (Boston), David Malakoff, Elizabeth Pennisi, Charles Seife, Robert F. Service (Pacific NW), Erik Stokstad, Katie Greene (intern); CONTRIBUTING CORRESPONDENTS Marcia Barinaga (Berkeley, CA), Kathryn Brown, Barry A. Cipra, Jon Cohen (San Diego, CA), Daniel Ferber, Ann Gibbons, Robert Iron, Mitch Leslie (NetWatch), Charles C. Mann, Virginia Morell, Evelyn Strauss, Gary Taubes, David Voss, Ingrid Wickelgren; COPY EDITORS Laura Atwood, Linda B. Felaco, Daniel T. Helgerman; ADMINISTRATIVE SUPPORT Scherraine Mack, Fannie Groom; BUREAU: Berkeley, CA: 510-652-0302, FAX 510-652-1867, Boston,

Allison Pritchard; ASSOCIATES Mary Ellen Crowley, Amanda Donathen; ELECTRONIC MEDIA MANAGER Don Hertenway; INTERNET PRODUCTION MANAGER Lizbeth Hartman; ASSISTANT PRODUCTION MANAGER Wendy Stengel; SENIOR PRODUCTION ASSOCIATES Sheila Myers, Lisa Stanford; PRODUCTION ASSOCIATES Carla Cathey, Steve Kusek, Louis Williams; LEAD APPLICATIONS DEVELOPER Carl Saffell; ADMINISTRATIVE SUPPORT Joyce Scott

PRODUCT ADVERTISING (science_advertising@aaas.org) NATIONAL SALES MANAGER Richard Teeling; 973-694-9173, FAX 973-694-9193 • NORTHEAST AND E. CANADA Elizabeth Pointek; 860-612-0306, FAX 413-480-0008 • MIDWEST Rick Bongiovanni; 330-405-7080, FAX 330-405-7081 • WEST COAST/W. CANADA B. Neil Boylan; 415-458-1630, FAX 415-458-1631 • MID-ATLANTIC AND SOUTHEAST SALES Christopher Breslin; 443-512-0330, FAX 443-512-0331 • UK/SCANDINAVIA/France/ITALY/BELGIUM/NETHERLANDS Andrew Davies; 44 (0)1-782-750-111, FAX 44 (0)1-782-751-999 • GERMANY/SWITZERLAND/AUSTRIA Tracey Peers; (44) 1-782-752-530, FAX (44) 1-782-752-531 JAPAN Mashu Yoshikawa; (81) 3-3235-5961, FAX (81) 3-3235-5852 ISRAEL Jessica Nachlas 001 972-3-5449123 • TRAFFIC MANAGER Carol Maddox; SALES COORDINATOR Deandra Underwood

RECRUITMENT ADVERTISING (science_classifieds@aaas.org); PRODUCTION MANAGER Jennifer Rankin; ASSISTANT PRODUCTION MANAGER Deborah Tompkins; U.S. SALES MANAGER Gabrielle Boguslawski; 718-491-1607, FAX 202-289-6742; WEST COAST SALES MANAGER Kristine von Zedlitz; EAST COAST SALES MANAGER Jill Steinberg; INTERNET SALES MANAGER Beth Dwyer; ASSISTANT SALES MANAGER Daryl Anderson; SENIOR SALES COORDINATOR Erika Bryant; SALES COORDINATORS Rohan Edmonson, Caroline Gallina, Shirley Young; SALES REPRESENTATIVES Kathleen Clark, Sussy Castilla, Christina Geiger, Bren Peters-Minnis; ASSISTANTS Emnet Tesfaye, Timothy Hawk; ASSOCIATES Christine Hall, Dina Freeman, Greta

MA: 617-542-5098, San Diego, CA: 760-942-3252, FAX 760-942-4979, Pacific Northwest: 503-963-1940

PRODUCTION DIRECTOR James Landry; MANAGER Wendy K. Shank; ASSISTANT PRODUCTION MANAGER Rebecca Doshi; ASSOCIATES Vicki J. Jorgensen, Tara L. Kelly, Jessica K. Moshell, Amanda K. Skelton

PREFLIGHT OPERATIONS DIRECTOR David M. Tompkins

ART DESIGN DIRECTOR C. Faber Smith; ART DIRECTOR Alan T. Stonebraker; ASSOCIATE ART DIRECTOR Joshua Moglia; ILLUSTRATORS Cameron Slayden, Katharine Sutliff; ASSOCIATES Holly Bishop, Debra J. Morgeneegg, Preston Morrighan; Julie White PHOTO RESEARCHER Leslie Blizard

SCIENCE INTERNATIONAL

EUROPE (science@science-int.co.uk) EDITORIAL SUPERVISORY SENIOR EDITOR Andrew M. Sugden; SENIOR EDITOR/PERSPECTIVES Julia Uppenbrink; SENIOR EDITORS Caroline Ash, Stella M. Hurtleley; ASSOCIATE EDITORS Ian S. Osborne, Stephen J. Simpson, Peter Stern; EDITORIAL SUPPORT Jenny Parker; ADMINISTRATIVE SUPPORT Janet Mumford, Lara Crowe, Mark Chadwick; NEWS EUROPEAN NEWS EDITOR Richard Stone; DEPUTY NEWS EDITOR Daniel Clerj; CORRESPONDENTS Michael Balter (Paris: (33) 1-49-29-09-01, FAX (33) 1-49-29-09-00), Gretchen Vogel (Berlin: (49) 30-2809-3902, FAX (49) 30-2809-8365) Adam Bostanci (intern)

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) 10-6307-4439 or 6307-3676, FAX (86) 10-6307-4358; science@public3.bta.net.cn; INDIA Pallava Bagla (contributing correspondent (91) 11-271-2896; pbagla@ndb.vsnl.net.in)

Springett; PUBLICATIONS ASSISTANTS Robert Buck, Jane Vaughn; U.K./EUROPE SALES MANAGER Debbie Harris; PROMOTIONS COORDINATOR Richard Walters; INTERNET SALES EXECUTIVE Tracy Holmes; AUSTRALIA/NEW ZEALAND: Keith Sandell (61) 02-9922-2977, FAX (61) 02-9922-1100 JAPAN: Mashu Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852

AAAS BOARD OF DIRECTORS RETIRING PRESIDENT, CHAIR Peter H. Raven; PRESIDENT Floyd E. Bloom; PRESIDENT-ELECT Mary Ellen Avery; TREASURER David E. Shaw; CHIEF EXECUTIVE OFFICER Alan I. Leshner; BOARD LEWIS M. Branscomb; John E. Burris; Nina V. Fedoroff; Karen A. Holbrook; Richard A. Meserve; Norine E. Noonan; Robert C. Richardson; Lydia Villa-Komaroff

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 FOR CONTRIBUTORS

See pages 163 and 164 of the 5 April 2002 issue or access www.sciencemag.org/feature/contribinfo/home.shtml

BOARD OF REVIEWING EDITORS

Frederick W. Alt <i>Children's Hospital, Boston</i>	Lewis M. Branscomb <i>NIMH, NIH</i>	Robert Desimone <i>NIMH, NIH</i>	Paul Harvey <i>Univ. of Oxford</i>	Raul Madariaga <i>École Normale Supérieure, Paris</i>	Stuart L. Pimm <i>Columbia Univ.</i>	Tomoyuki Takahashi <i>Univ. of Tokyo</i>
Frank S. Bates <i>Univ. of Minnesota</i>	Joseph A. Burns <i>Cornell Univ.</i>	Julian Downard <i>Imperial Cancer Research Fund</i>	Martin Heimann <i>Max Planck Inst., Jena</i>	Rick Maizels <i>Univ. of Edinburgh</i>	Philippe Poulin <i>CNRS</i>	Marc Tessier-Lavigne <i>Stanford Univ.</i>
Ray H. Baughman <i>Univ. of Texas, Dallas</i>	Joanne Chory <i>The Salk Institute</i>	Denis Duboule <i>Univ. of Geneva</i>	Tasuku Honjo <i>Kyoto Univ.</i>	George M. Martin <i>Univ. of Washington</i>	Danny Reinberg <i>Univ. of Medicine and Dentistry-New Jersey</i>	Joan S. Valentine <i>Univ. of California, LA</i>
Stephen J. Benkovic <i>Pennsylvania St. Univ.</i>	David Clapham <i>Children's Hospital, Boston</i>	Richard Ellis <i>California Inst. of Technology</i>	Evelyn L. Hu <i>Univ. of California, SB</i>	Diane Mathis <i>Harvard Medical School</i>	Janet Rossant <i>Univ. of Toronto</i>	Michiel van der Klis <i>Astronomical Inst. of Amsterdam</i>
Michael J. Bevan <i>Univ. of Washington</i>	J. M. Claverie <i>CNRS, Marseille</i>	John Eppig <i>The Jackson Labs</i>	Herbert Jackle <i>Max Planck Institute for Biophysical Chemistry</i>	Andrew Murray <i>Harvard Univ.</i>	David G. Russell <i>Cornell Univ.</i>	Derek van der Kooy <i>Univ. of Toronto</i>
Ton Bisseling <i>Wageningen Univ.</i>	Jonathan D. Cohen <i>Princeton Univ.</i>	John Eppig <i>The Jackson Labs</i>	Meyer B. Jackson <i>Univ. of Wisconsin Med. School</i>	Elizabeth G. Nabel <i>NHLBI, NIH</i>	Philippe Sansonetti <i>Institut Pasteur</i>	Bert Vogelstein <i>Johns Hopkins</i>
Henry R. Bourne <i>Univ. of California, SF</i>	F. Fleming Crim <i>Univ. of Wisconsin</i>	Gerhard Ertl <i>Fritz-Haber-Institut, Berlin</i>	Stephen Jackson <i>Univ. of Cambridge</i>	Naoto Nagaosa <i>Univ. of Tokyo</i>	Dan Schrag <i>Harvard Univ.</i>	Christopher A. Walsh <i>Harvard Medical School</i>
		Paul G. Falkowski <i>Rutgers Univ.</i>	Bernhard Keimer <i>Max Planck Inst., Stuttgart</i>	Shigakazu Nagata <i>Osaka Univ. Medical School</i>	Georg Schulz <i>Albert-Ludwigs-Universität Freiburg</i>	Christopher T. Walsh <i>Harvard Medical School</i>
		Douglas T. Fearon <i>Univ. of Cambridge</i>	Christian Körner <i>Botanisches Institut, Basel</i>	Alexandra Navrotsky <i>Univ. of California, Davis</i>	Terrence J. Sejnowski <i>The Salk Institute</i>	Julia R. Weertman <i>Northwestern Univ.</i>
		Tom Fenchel <i>Univ. of Copenhagen</i>	Alan B. Krueger <i>Princeton Univ.</i>	James Nelson <i>Stanford Univ. School of Medicine</i>	Kazuo Shinozaki <i>RIKEN</i>	Arthur Weiss <i>Univ. of California, SF</i>
		Jeffrey S. Flier <i>Harvard Medical School</i>	Michael LaBarbara <i>Univ. of Chicago</i>	Roger Nicoll <i>Univ. of California, SF</i>	Susan Solomon <i>NOAA</i>	R. Sanders Williams <i>Duke University</i>
		Richard Fortey <i>The Natural History Museum, London</i>	Angus I. Lamond <i>Univ. of Dundee</i>	Malcolm Parker <i>Imperial College</i>	Christopher R. Somerville <i>Carnegie Institution of Washington, Stanford</i>	Ian A. Wilson <i>The Scripps Res. Inst.</i>
		Yves Frégnac <i>CNRS, Gif-sur-Yvette</i>	Antonio Lanzavecchia <i>Inst. of Res. in Biomedicine</i>	Roy R. Parker <i>Univ. of Arizona</i>	Will J. Stewart <i>Marconi Caswell, Towcester</i>	Richard A. Young <i>The Whitehead Inst.</i>
		Chris D. Frith <i>Univ. College London</i>	Anthony J. Leggett <i>Univ. of Illinois, Urbana-Champaign</i>	Michele Parrinello <i>Centro Svizzero di Calcolo Scientifico</i>	Edward I. Stiefel <i>Princeton</i>	Martin Zatz <i>NIMH, NIH</i>
		Don Ganem <i>Univ. of California, SF</i>	Norman L. Letvin <i>Beth Israel Deaconess Medical Center, Boston</i>	Linda Partridge <i>Univ. College London</i>	Bruce Stillman <i>Cold Spring Harbor Lab.</i>	Walter Ziegglängsberger <i>Max Planck Inst., Munich</i>
		James Gimzewski <i>Univ. of California, LA</i>	Richard Losick <i>Harvard Univ.</i>	Suzanne Pfeffer <i>Stanford School of Medicine</i>	Thomas Stocker <i>Univ. of Bern</i>	Huda Zoghbi <i>Baylor College of Medicine</i>
		Alex Halliday <i>ETH Zentrum, Zürich</i>				Maria Zuber <i>MIT</i>

SENIOR EDITORIAL BOARD

John I. Brauman, Chair, *Stanford Univ.*
Philip H. Abelson, *AAAS*
Joseph L. Goldstein, *Univ. of Texas Southwestern Med. Ctr.*
Richard Losick, *Harvard Univ.*
Robert May, *Univ. of Oxford*
Marcia McNutt, *Monterey Bay Aquarium Research Inst.*
Vera C. Rubin, *Carnegie Institution of Washington*
Christopher R. Somerville, *Carnegie Institution of Washington, Stanford*
Yoshinori Tokura, *Univ. of Tokyo*
Gerhard Wegner, *Max Planck Inst. of Polymer Research, Mainz*

BOOK REVIEW BOARD

David Bloom, *Harvard Univ.*
Londa Schiebinger, *Pennsylvania State Univ.*
Richard Shweder, *Univ. of Chicago*
Robert Solow, *MIT*
David Voss, *Science*
Ed Wasserman, *DuPont*
Lewin Wolpert, *Univ. College, London*

Microplate Analysis

5

ways to improve your reading

Increase speed and productivity with Bio-Rad microplate readers

Whether you're into classic readings, fast-moving kinetics, or the latest luminescence applications, Bio-Rad offers a choice of five top-selling microplate readers to meet your needs and your budget. From one to hundreds of samples a day, single- to 1,536-well plates, and manual or automated robotic loading, Bio-Rad has the system you're looking for. All systems feature accurate, linear performance with high sensitivity, broad dynamic range, state-of-the-art software, and a full range of accessories and reagents for added convenience and flexibility. To read more, visit discover.bio-rad.com or contact your local Bio-Rad representative.

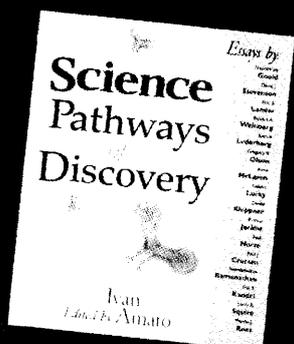
Model	Absorbance	Luminescence	Spectral Range
Model 680 microplate reader	•		400–750 nm
Benchmark™ microplate reader	•		340–800 nm
Benchmark Plus™ microplate spectrophotometer	•		340–800 nm
Ultramark™ microplate system	•		250–750 nm
Lumijam™ microplate luminescence and absorbance system	•	•	405–690 nm

Visit us on the Web at discover.bio-rad.com.
Call toll free at 1-800-4BIORAD (1-800-424-6723);
outside the US, contact your local sales office.

BIO-RAD

Just published!

Pathways of Discovery



In *Science Pathways of Discovery*, some of the sharpest scientific minds of our time reveal what science has in store by examining the histories of a dozen crucial areas of scientific inquiry. Originally published as a year-long series in *Science*, this awe-inspiring compendium features brilliant and provocative contributions from:

- ▶ **Stephen Jay Gould** on the "science wars"
- ▶ **David J. Stevenson** on planetary science
- ▶ **Eric S. Lander** and **Robert A. Weinberg** on genomics
- ▶ **Joshua Lederberg** on the history of infectious disease
- ▶ **Gregory B. Olson** on materials science
- ▶ **Anne McLaren** on cloning
- ▶ **Robert Lucky** on science communication
- ▶ **Daniel Kleppner** and **Roman Jackiw** on quantum physics
- ▶ **Paul Nurse** on biological cell theory
- ▶ **Paul J. Crutzen** and **Veerabhadran Ramanathan** on atmospheric sciences
- ▶ **Eric R. Kandel** and **Larry R. Squire** on neuroscience
- ▶ **Martin J. Rees** on the biography of the universe

Published by
John Wiley and Sons, Inc.

 **WILEY**
Independent Thinkers
wiley.com

Order online at the AAAS Bookstore,
www1.fatbrain.com/aaas,
and receive a 25% discount

READER AND ADVERTISER RESOURCES

Science Careers:

SCIENCECAREERS.ORG

Job Alerts

Receive weekly e-mails with the job postings that meet your criteria. Simply select the discipline, keywords, location, position type, and organization type that you're interested in, and let *Science Careers* do the rest.

FOCUS ON CAREERS

AD SUPPLEMENT IN THE 24 MAY ISSUE

Careers in Biotechnology & Pharmaceuticals

Biotechnology firms and pharmaceutical companies recruit scientists to oversee such issues as drug development, production, clinical trials, regulatory affairs, and patent protection.

Look for it in the
24 May issue.

Product News:

LAB TECHNOLOGY TRENDS

SPECIAL AD SECTION IN THE 10 MAY ISSUE

DNA and Biochips II: Ready-to-use microarrays

This section will cover the many ready-to-use microarray products available today. It will also discuss recent advances and highlight new products for this area of research.

Look for it in the 10 May issue.

WWW.SCIENCEPRODUCTLINK.ORG



Science Product Link

Science's online reader service system helps you find information on products advertised in the pages of *Science*. Search by product category, company name, keyword, or page number.

Find it all at
www.scienceproductlink.org.

Trade Shows & Conferences

LOOK FOR COPIES OF THE 31 MAY ISSUE OF *SCIENCE* AT THESE
UPCOMING TRADE SHOWS AND CONFERENCES:

**BIO 2002 (BIOTECHNOLOGY
INDUSTRY ORGANIZATION)**
9-13 June, Toronto, Ontario, Canada

**SECOND MESSENGERS AND
PROTEIN PHOSPHORYLATION**
9-14 June, Meriden, NH (GRC)

GRC-Gordon Research Conferences

For *Science* sales representatives' contact information, please see the previous page.



Science is published by The American Association for the Advancement of Science.
To subscribe to *Science* and become a member of the AAAS, go to www.aaas.org.

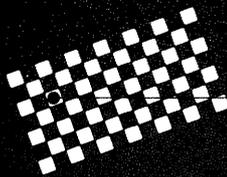
Drug Discovery

Research

Clinical Screening

Image FlashPlate

Means Go!



Introducing the New Image FlashPlate®

Higher Throughput. Less Hassle.

Ready for an easier, more effective way to increase throughput while maintaining the integrity of your results? The solution has arrived: the new Image FlashPlate from PerkinElmer Life Sciences. Unlike other plates, the Image FlashPlate is coated with a scintillant which emits in the red region, allowing detection with a range of imaging readers. The result? More flexibility, lower costs, and superior screening results.

Easier by Far!

The Image FlashPlate is easy to setup and use. Because it's beadless, you'll save steps—and time—on each plate. You'll also avoid clumping problems, and see a dramatic decrease in reagent usage and cost.

What's on Your Plate?

The new Image FlashPlate is a next-generation tool you can use to achieve more accurate readings and higher throughput performance. Drive superior screening results—in a flash!

Learn More

Call 1-800-551-2121 or visit
www.perkinelmer.com/imageflashplate



PerkinElmer™
life sciences.

World Headquarters: PerkinElmer Life Sciences, Inc., 549 Albany Street, Boston, MA 02118-2512 USA (800) 551-2121

European Headquarters: PerkinElmer Life Sciences, Inc., Imperiastraat 8 BE-1930 Zaventem Belgium

FlashPlate is a registered trademark of PerkinElmer Life Sciences under U.S. patent #5,496,502 and foreign equivalents.

© 2002 PerkinElmer Life Sciences, Inc.

www.perkinelmer.com/lifesciences

WINNING SCIENTISTS

COME FROM THE **coolest** PLACES

Raised north of the Arctic circle, near Sweden's famous Icehotel, Åsa Apelqvist was the regional winner of the 2001 Amersham Biosciences & Science Prize for Europe.

No matter where you come from, a journey of a thousand miles begins with a single step. So if you are embarking on the journey that is the study of science, here's your chance to gain international acclaim for yourself and your school. If you completed your Ph.D. in molecular biology* during 2001, describe your work in a 1,000 word essay. Then enter it into the 2002 Amersham Biosciences & Science Prize for young scientists.

Your essay will be reviewed by a panel of distinguished scientists, who'll select one grand prize winner and up to seven other winners. The grand prize winner will get his or her essay published in *Science*, receive US\$25,000, and win a trip to the awards ceremony. Your essay may be submitted in English, French, German, Spanish, Japanese or Chinese (Mandarin). The closing date for entries is July 15, 2002.

Go to www.amershamscienceprize.org to obtain the mandatory entry form. And take your step. Jamie H. Cate did and won the regional prize for North America in 1998. What's more, he recently won a prize for the best paper published in *Science*—"Crystal Structure of the Ribosome at 5.5 Å Resolution" *Science*, **292**: 883-896 (2001).

* For the purpose of this prize, molecular biology is defined as "that part of biology which attempts to interpret biological events in terms of the physico-chemical properties of molecules in a cell" (McGraw-Hill Dictionary of Scientific and Technical Terms, 4th Edition).

AMERSHAM BIOSCIENCES
& SCIENCE

Prize
FOR YOUNG
SCIENTISTS

Science

 Amersham
Biosciences



OSTEOPOROSIS

HIGH BLOOD PRESSURE

GLAUCOMA

SCHIZOPHRENIA

CANCER

DIABETES

ALZHEIMER'S

Medicine for your Medicare patients? Novartis has an offer to make them feel better.



In November 2001, Novartis was one of the first pharmaceutical companies to launch a prescription discount card offering valuable savings to Medicare enrolled patients lacking prescription drug coverage. Today, Novartis is a founding partner of the Together Rx, L.L.C., a new alliance of seven major pharmaceutical companies offering patients valuable savings on more than 160 medicines through one easy-to-use, completely free Rx savings card – the Together Rx™ card.

Novartis is proud to offer meaningful savings to a broad range of patients in need through its comprehensive and flexible prescription savings plan. In addition, Novartis continues to offer free medicines on a short-term basis to qualifying patients through its physician based Patient Assistance Program.

Enhanced Savings on Novartis Prescription Drugs

SINGLES up to \$18,000/yr*	COUPLES up to \$24,000/yr*	\$12 /prescription
\$18,001 - \$28,000/yr*	\$24,001 - \$38,000/yr*	25-40% off**

*Alaska: \$35,000 singles/\$48,000 couples; Hawaii: \$33,000 singles/\$44,000 couples.

**Consumer savings may vary on select Novartis products. Savings and product listing are subject to change. Consumers can anticipate obtaining savings of approximately 25 to 40 percent, depending on the pharmacy's customary pricing for the specific medication.

Patients Can Enroll Now

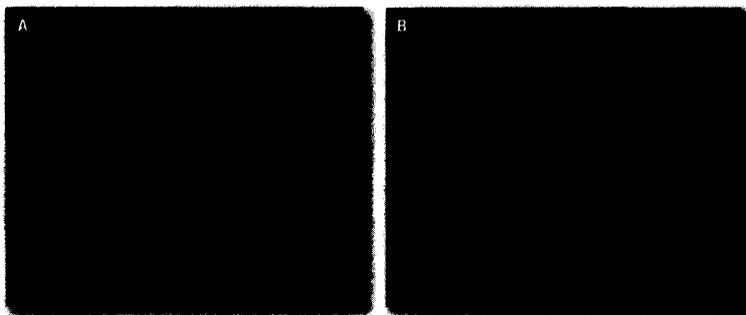
Together Rx™ Card
available JUNE 2002
www.Together-Rx.com
1-800-865-7211

Novartis Patient Assistance Program
available through
physicians' offices



Think what's possible.

Savor the silence.



RNAi in *C. elegans*

Fluorescence microscopy of a *C. elegans* adult female with a transgenic GFP reporter gene (green) highly expressed in the pharynx (A). Double-stranded RNA corresponding to the GFP coding region was produced using the HiScribe RNAi Transcription Kit and injected into the syncytial gonad of transgenic adult worms. RNAi is demonstrated by the reduction of GFP expression in the progeny (B).

INTRODUCING THE

HiScribe™ RNAi Transcription Kit

RNA interference (RNAi) is a powerful tool for post-transcriptional gene silencing. Our new HiScribe RNAi Transcription Kit uses cloning vectors with opposing T7 promoters and a single polymerase for high-yield synthesis of double-stranded RNA.

Advantages:

- High-yield (up to 1 mg/ml)
- Double-stranded RNA produced in a single reaction
- Compatible with RNAi protocols in *C. elegans*, *Drosophila* and tissue culture

Ordering Information:

#E2000S Synthesis of up to 2 mg RNA

Kit includes: cloning vectors, primer, polymerase, control template

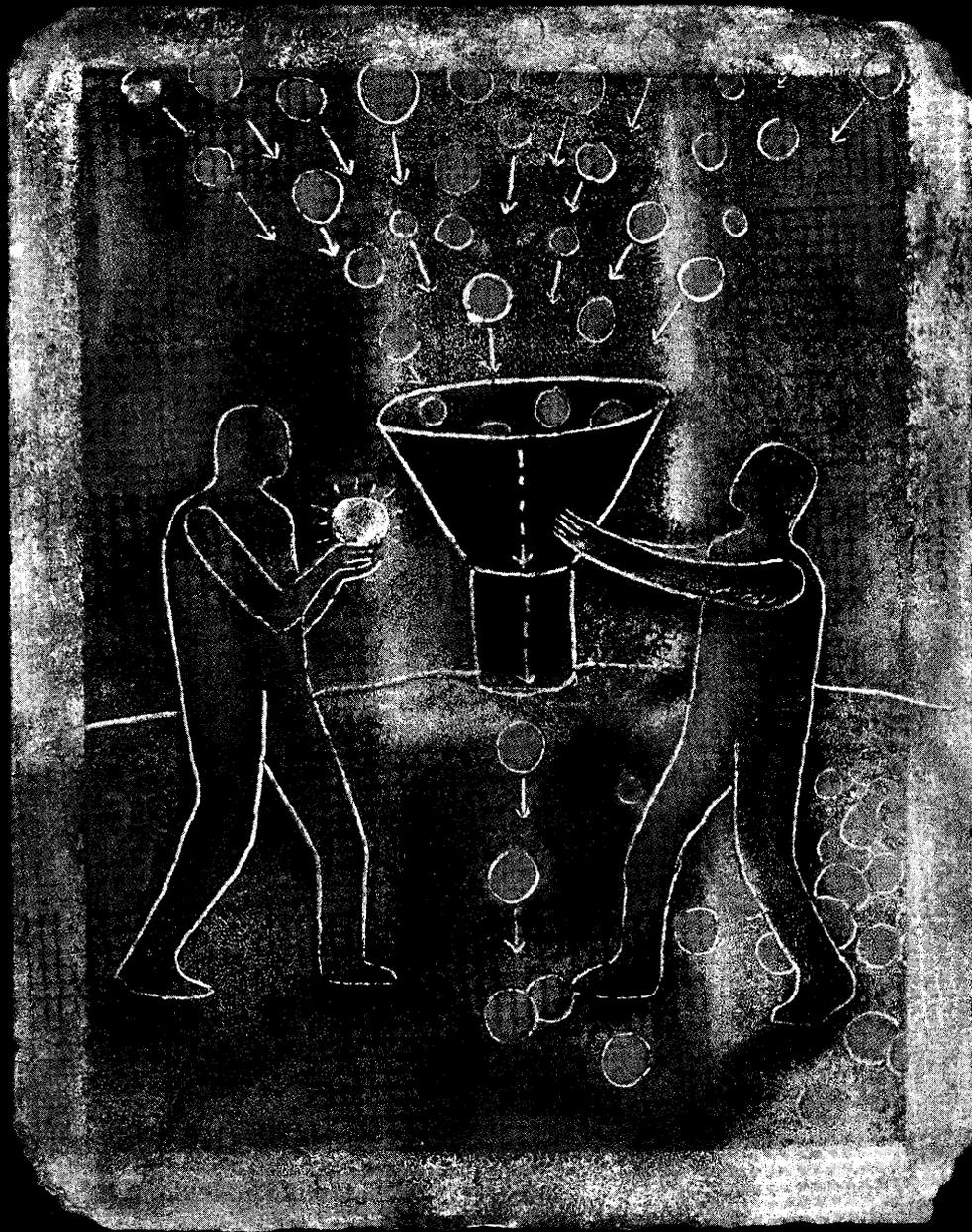
PRODUCTS YOU TRUST. TECHNICAL INFORMATION YOU NEED. www.neb.com

- New England Biolabs Inc. 32 Tozer Road, Beverly, MA 01915 USA 1-800-NEB-LABS Tel. (978) 927-5054 Fax (978) 921-1350 info@neb.com
- Canada Tel. (800) 387-1095 info@ca.neb.com ■ Germany Tel. 0800/246 5227 info@de.neb.com ■ UK Tel. (0800) 31 84 86 info@uk.neb.com.



DISTRIBUTORS: Argentina (11) 4816-0820; Australia (07) 5594-0299; Belgium (0800)1 9815; Brazil (11) 3622 2320; China 21-6495-1899; Czech Rep. 0800 124683; Denmark (39) 56 20 00; Finland (9) 584-121; France (01) 34 60 24 24; Greece (01) 5226547; Hong Kong 2649-9988; India (044) 220 0068; Israel (3) 9021330; Italy (02) 381951; Japan (03) 5820-9408; Korea (02) 556-0311; Mexico (5) 525 5725; Netherlands (033) 495 00 94; Norway 23 17 60 00; Singapore 4457927; Spain (93) 401.02.10; Sweden (08) 30 60 10; Switzerland (061) 486 80 80; Taiwan (02) 28802913

Validate

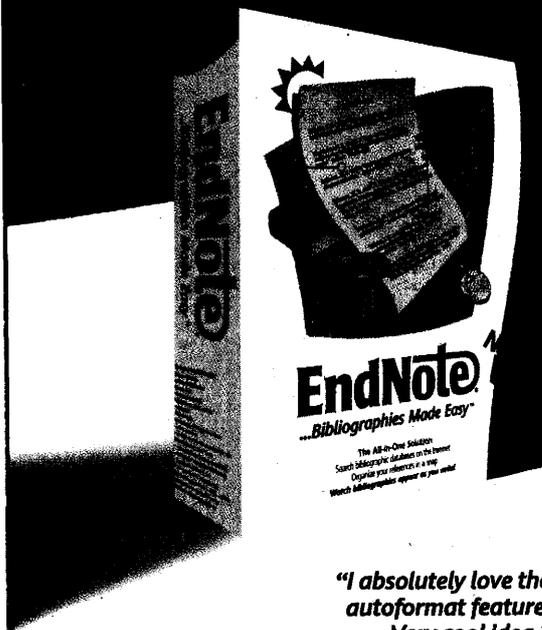


www.ariad.com/regulation

ARIAD's benchmark technologies are used by hundreds of university and government labs in genomics and proteomics research. ARIAD's small-molecule compounds, suitable for *in vivo* use, enable dose-dependent regulation of signal transduction, gene expression and protein secretion. ARIAD Regulation Kits are available at the ARIAD website, without cost to academic investigators and through ARIAD's licensing program to others.

ARIAD

The *easy* bibliography writer



**"I absolutely love the
autoformat feature.
Very cool idea."**

—Adam Summers,
University of California, Berkeley

**"Cite While You Write is the
crown jewel of EndNote"**

—Alistair Campbell,
Lincoln University, New Zealand

**The #1
Bibliographic Program
More than 300,000
users worldwide!**

Watch bibliographies appear as you write!

EndNote 5 achieves a new level of integration with Microsoft Word®, making it the easy bibliography writer. With it you can locate and insert citations without leaving Word. EndNote 5's new instant formatting creates your bibliography as you write—no waiting, no guessing, no extra steps. And EndNote knows the bibliographic rules for over 700 styles, so you save time and increase accuracy!

Publish your papers faster!

Writing today is a collaborative effort among co-authors, editors and publishers. EndNote 5 helps you collaborate with its new traveling library. Manuscripts contain a hidden traveling library with complete reference data for all citations. When you're ready to send your paper to colleagues, the references travel with it.

When your manuscript is complete, use EndNote 5 to create a publication-ready document in one step!

Access more content with EndNote 5!

Most of your research today is done online. Through EndNote 5's easy interface, you can connect to over 280 online sources including subscription resources such as the ISI® *Web of Science*®, Ovid and SilverPlatter, as well as PubMed and hundreds of other public databases. Imagine the time you'll save looking for references to journals, books and other materials with your EndNote 5 personal library. And, you'll never have to re-type a reference!

It's easy to see why over 300,000 researchers, writers and students use EndNote as their easy bibliography writer. Visit www.endnote.com and download a **free** demo today for Windows or Macintosh.

EndNote ^{New}
5
...Bibliographies Made Easy™

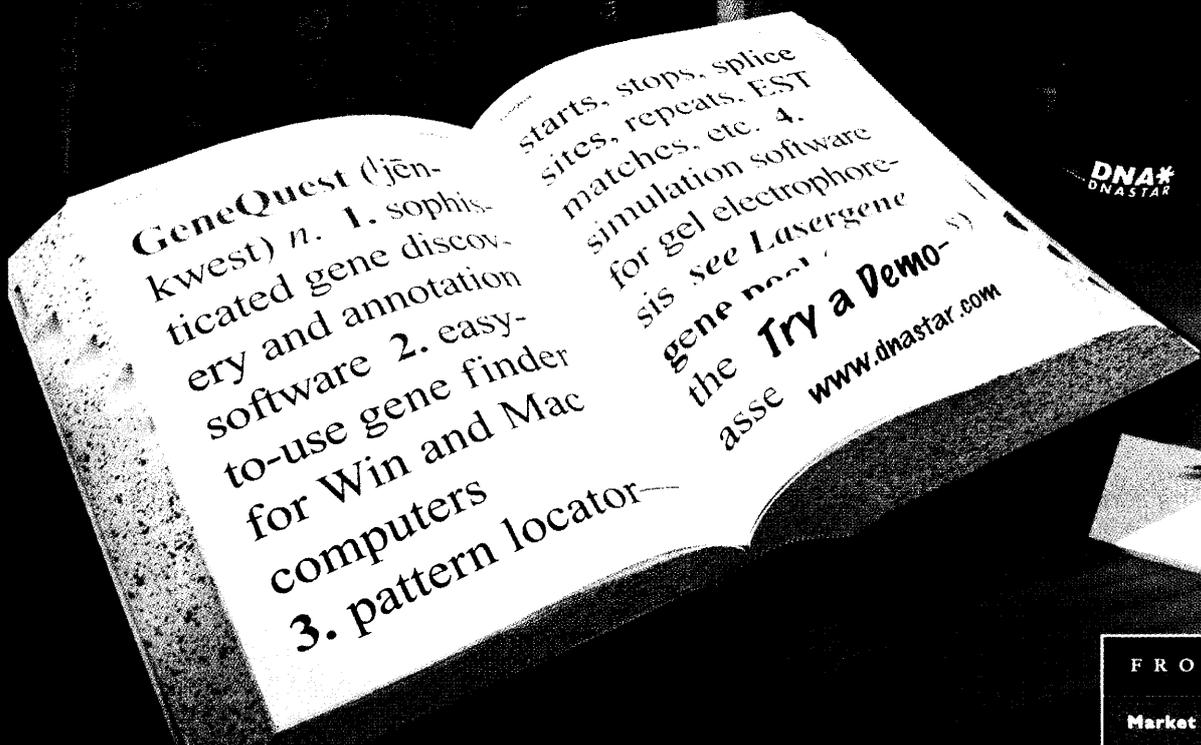
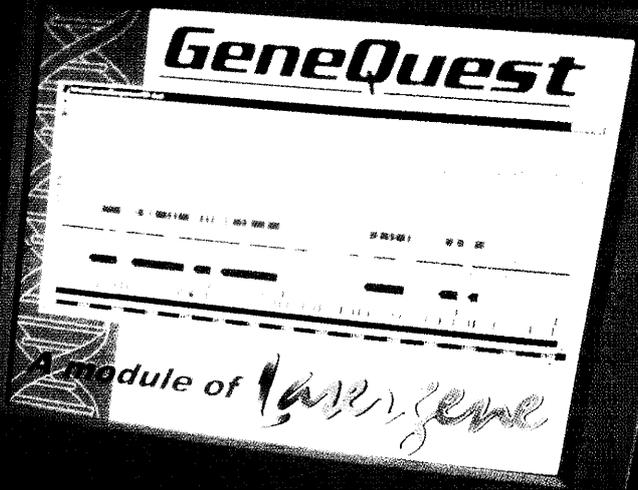
ISI RESEARCHSOFT
THOMSON SCIENTIFIC

Phone: 760-438-5526
Fax: 760-438-5573
E-Mail: info@isiresearchsoft.com
www.endnote.com



Defining Gene Discovery

Customer Service Award Winner



DNA*
DNASTAR

FROST & SULLIVAN
Market Engineering Award Recipient
Customer Service Leadership 2001

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

GATC Biotech AG, Jakob-Stadler-Platz 7, 78467 Konstanz, Germany www.gatc-biotech.com
Tel: +49 (0) 7531 81 60 0 Fax: +49 (0) 7531 81 60 81 e-mail: bioinformatics@gatc-biotech.com

DNA*
DNASTAR, Inc



or

www.sciencecareers.org

If you're in the life sciences, don't get hung up trying to get your resume noticed. Go to ScienceCareers.org. Every week you'll find hundreds of job postings, employer profiles, a resume/CV database and an e-mail alert service that will bring jobs directly to you and take your career to a higher level. With ScienceCareers.org your next job hunt won't be a wash.

 AAAS

Science @
CAREERS 

www.sciencecareers.org

THE CELL CULTURE COMMITMENT

**The products
you need today.**

**The results
you want
tomorrow.**

- Quality media available for shipment today
- Exceptional performance and consistent results
- Expert advice from R & D specialists – customizable formulations

We're committed to the highest standard of cell culture support. Now and into the future.

Why settle for inconsistent quality and service or back-ordered product?

We're here for your long-term needs, providing the high quality media you need – when you need it. Because when your research starts with the strongest possible foundation, your results are solid – **every single time.**

*Call 1-800-718-4328 for a Competitive Quote on cell culture products, today.
Visit our Web site at sigma-aldrich.com/commitment_sci.*

availability, ordering & tracking

sigma-aldrich.com

scientific tools, products & information

LEADERSHIP IN LIFE SCIENCE, HIGH TECHNOLOGY AND SERVICE

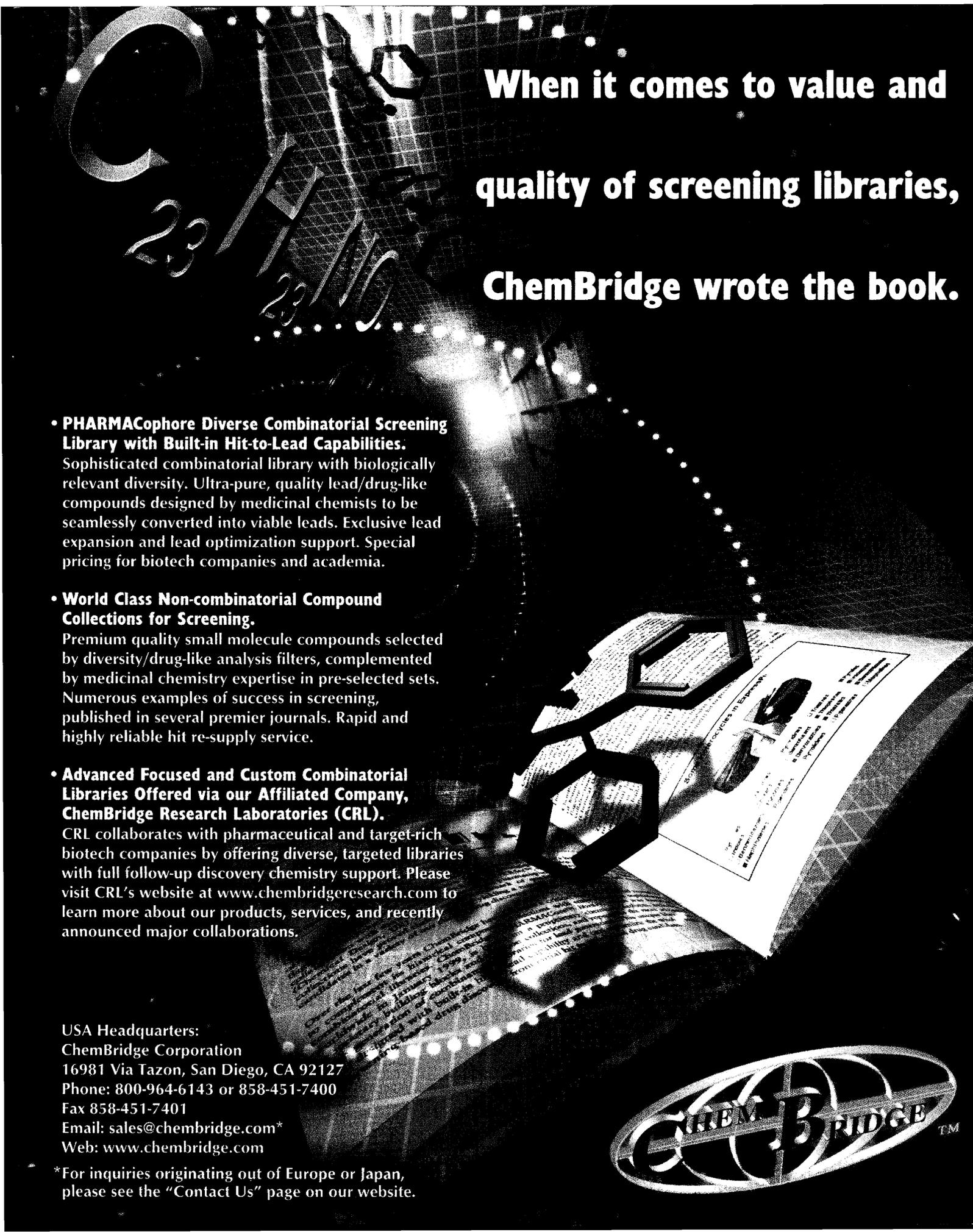
SIGMA-ALDRICH CORPORATION • BOX 14508 • ST. LOUIS • MISSOURI 63178 • USA



The new \$55 million R & D Center keeps Sigma-Aldrich on the leading edge of cell culture.



SIGMA-ALDRICH



**When it comes to value and
quality of screening libraries,
ChemBridge wrote the book.**

- **PHARMACophore Diverse Combinatorial Screening Library with Built-in Hit-to-Lead Capabilities.**

Sophisticated combinatorial library with biologically relevant diversity. Ultra-pure, quality lead/drug-like compounds designed by medicinal chemists to be seamlessly converted into viable leads. Exclusive lead expansion and lead optimization support. Special pricing for biotech companies and academia.

- **World Class Non-combinatorial Compound Collections for Screening.**

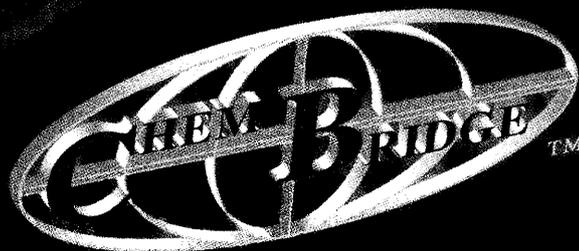
Premium quality small molecule compounds selected by diversity/drug-like analysis filters, complemented by medicinal chemistry expertise in pre-selected sets. Numerous examples of success in screening, published in several premier journals. Rapid and highly reliable hit re-supply service.

- **Advanced Focused and Custom Combinatorial Libraries Offered via our Affiliated Company, ChemBridge Research Laboratories (CRL).**

CRL collaborates with pharmaceutical and target-rich biotech companies by offering diverse, targeted libraries with full follow-up discovery chemistry support. Please visit CRL's website at www.chembridgeresearch.com to learn more about our products, services, and recently announced major collaborations.

USA Headquarters:
ChemBridge Corporation
16981 Via Tazon, San Diego, CA 92127
Phone: 800-964-6143 or 858-451-7400
Fax 858-451-7401
Email: sales@chembridge.com*
Web: www.chembridge.com

*For inquiries originating out of Europe or Japan, please see the "Contact Us" page on our website.





We've got everything
you'd expect for PCR.
And one thing you
wouldn't.

From **USB Taq** to nucleotides, binding proteins, and Tested User Friendly™ (TUF) enzymes, we've got everything you'd expect for PCR.* But here's one thing you might not: **ExoSAP-IT**®, a revolutionary clean-up tool that eliminates dNTPs and primers fast – with no columns and no sample loss. At USB, we test and re-test all our tools for PCR to ensure they work reliably the first time, every time. We know you'd expect nothing less.



800.321.9322 | www.usbweb.com



usb
Fueling Innovation™

©2002 USB Corporation. USB, the logo design and ExoSAP-IT are registered trademarks of USB Corporation. The phrases 'Fueling Innovation,' and 'Tested User Friendly' are trademarks of USB Corporation. *The Polymerase Chain Reaction (PCR) is covered by patents owned by Roche Molecular Systems and F. Hoffman-La Roche Ltd.



**Apo-ONE™. Finally, an apoptosis assay
you don't have to babysit.**

Designed for walkaway convenience with automated systems, the new Apo-ONE™ Homogeneous Caspase-3/7 Assay delivers the same simplicity to investigators analyzing one sample at a time. The add-mix-read protocol allows you to spend less time fussing over your experiments and more time taking care of what really matters.

Get your trial size kit for 50% off

An assay so easy it looks after itself. Visit www.promega.com/apoptosis for product and ordering information.

PROMEGA CORPORATION • www.promega.com

U.S. introductory pricing is \$26 plus shipping. Orders with a value of \$250 net are shipped free of charge to U.S. customers. Please contact your local Promega Branch Offices and Distributors for country specific pricing information and freight charges. Valid in U.S. and participating branch offices and distributors. Limited time offer. Product may be covered by pending or issued patents.

©2002 Promega Corporation 9730B-AD-CR



Promega

We've developed innovative pharmaceuticals for the treatment of allergies.

***So that everyone
can have pleasant feelings
about nature.***



For most of us, enjoying nature is wonderful. But millions of people around the world experience nature very differently. They suffer from allergies. At Aventis, one of the world's leading pharmaceutical companies, we already offer doctors highly effective treatments for patients with allergies. We also are developing other new, innovative pharmaceuticals in a number of therapeutic areas by utilizing our in-depth know-how, and the possibilities offered by new technologies.

More life.

Novartis is giving women with cancer more days to love, to work, to live...each year.

For Michelle, what a difference each day makes.



Michelle's cancer had been in remission for years, but suddenly it reappeared more advanced and deadlier than ever. Michelle's doctor confirmed her fears, and didn't give her long to live. Fortunately, that prognosis isn't coming true. Today, we see a new Michelle, one with new life, energy and purpose. She's even gone back to school to begin a career as a radiology technician, specializing in cancer testing. And Michelle loves commuting to class – with the top down in her newly purchased convertible. Novartis is proud to be the innovative force that's bringing new optimism and hope to patients and their families. No one can promise what the future holds for cancer patients, but today Michelle is holding her own, planning her future and enjoying life.

Think what's possible.

“When my cancer came back, they told me I didn't have long to live. Thanks to Novartis, I have my life back and I'm moving ahead.”

— Michelle Henderson



NOVARTIS

www.novartis.com

Tools to take you as far as your vision.™

You have the vision. Affymetrix has the tools, designed with experience and thoughtful science to add value to your research. Our GeneChip® expression arrays enable you to explore a comprehensive set of genes from the public domain, or any specific subset of interest to you. In addition, we offer a complete and integrated system to give you the freedom to do in new ways what you do best – practice good science. And with powerful online informatics resources and custom array programs, our tools are more flexible and affordable than ever. There has never been a better time to turn your vision into biologically meaningful results. Call us or visit our website and move your research forward. Affymetrix. The Way Ahead™.



The Way Ahead™



www.affymetrix.com
1-888-DNA-CHIP (362-2447)
Europe: +44 (0) 1628 552550

© 2002 Affymetrix, Inc. All rights reserved. Affymetrix, the Affymetrix logo and GeneChip are registered trademarks of Affymetrix, Inc. CustomExpress and NetAffx are trademarks of Affymetrix, Inc. Products may be covered by one or more of the following patents and/or sold under licenses from Oxford Gene Technology: U.S. Patent Nos. 5,445,934; 5,744,306; 6,261,776; 6,291,183; 5,700,637; and 5,945,334; and EP 619 321; 373 203 and other U.S. or foreign patents. For research use only. Not for use in diagnostic procedures.

Congratulations to Dr. William Willis

First Winner of the Purdue Pharma Prize for Pain Research

The first Purdue Pharma Prize for Pain Research has been awarded to William D. Willis, Jr., MD, PhD. This \$50,000 prize is awarded bi-annually by the Purdue Pharma Fund to recognize outstanding contributions to pain research.

Dr. Willis was selected on the basis of his pioneering research into the mechanisms of acute and chronic pain. The author of more than 350 peer-reviewed publications and presentations, his work on the neuroanatomy, physiology, and neurochemistry of pain has been critical to the development and direction of research in this field. A past president of both the American Pain Society and the Society for Neuroscience, Dr. Willis is currently Chairman of the Department of Anatomy and Neuroscience at the University of Texas, Galveston.

The selection committee for the 2002 prize included **Dr. Norman Bowery**, University of Birmingham, England; **Dr. Frank Porreca**, University of Arizona; **Dr. Gary Bennett**, McGill University, Montreal; **Dr. Anthony Dickenson**, University College, London, England; and **Dr. Ken Hargreaves**, University of Texas.

For more information about the Purdue Pharma Prize for Pain Research, please visit www.purduepharma.com.



Enter the New World

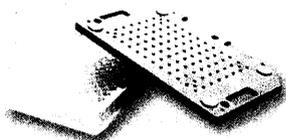
Welcome to the new world.
A world where genotyping
studies can be conducted with
speed, sample throughput,
and scale never before possible.
At a lower cost than you ever
imagined. Large studies that
once took years can now be
completed in months or
even days.

With a throughput level of
1,000,000 calls per day,
Illumina's SNP genotyping
service leverages our
proprietary BeadArray™
technology. The BeadArray
platform will be available as a
product later this year, but
you can access its remarkable
benefits now through our new
genotyping service.

Illumina's service operation
integrates a high degree of
automation with advanced LIMS
to manage linkage analyses,
fine chromosomal mapping,
candidate gene and large
association studies.

So expand your expectations.
Readjust your planning
calendar. And join us in the
new world of genotyping.

Learn more by calling us at
1.800.809.4566 or visiting
www.illumina.com/1snp



*Illumina's 96-bundle Sentrix™
Array allows parallel processing
of over 150,000 SNPs.*

Introducing
Illumina's SNP
Genotyping
Service

illumina
making sense out of life

© 2002 Illumina, Inc. BeadArray, Sentrix and Illumina are trademarks of Illumina, Inc.
Pub. No. 070-2001-002A