

Science



18 May 2001

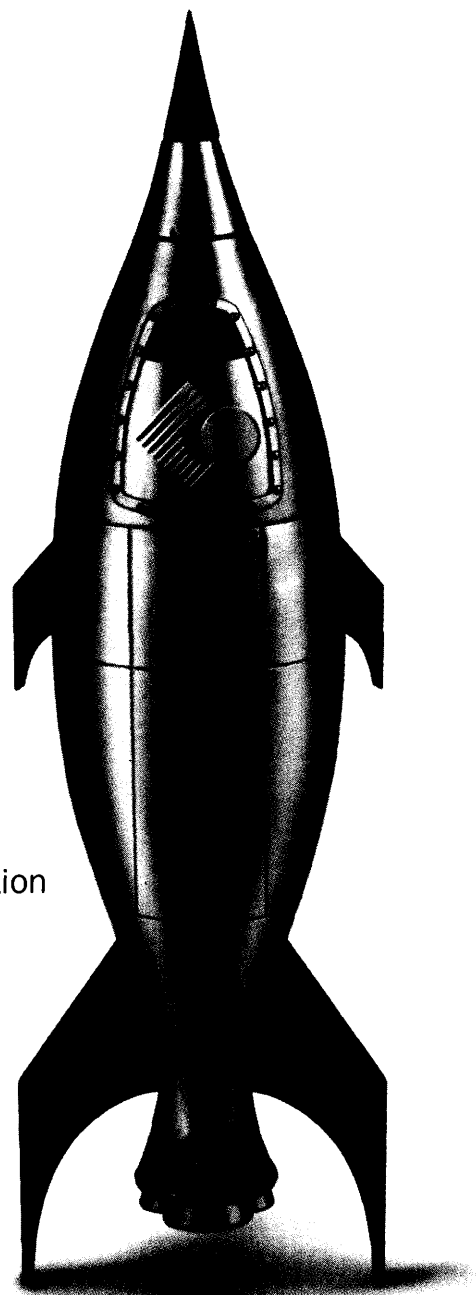
Vol. 292 No. 5520
Pages 1249–1436 \$9

Comet C/LINEAR



AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

LifeSeq® databases propel your quest for discovery with...



A stellar collection of rare and full-length gene transcripts

Out-of-this-world understanding of gene function

Mission-critical expertise, affordability and IP protection

With tens of thousands of full-length transcripts, the odds of target discovery and validation are better here than anywhere else. That's why more researchers are turning to LifeSeq® databases from Incyte. Only Incyte starts with actual gene transcripts anchored to the genome where each transcript is completed to full-length

www.incyte.com

status using proprietary molecular biology and bioinformatics capabilities. Only Incyte integrates sequence data with expression, SNP and Proteome annotation for the best understanding of gene function. Only Incyte stocks tens of millions of cDNA clones to advance your research further. And only Incyte protects you with the world's largest, fastest growing gene patent estate. So before you boldly go where no one has gone before, call or go online to explore the galaxy's most pharmaceutically relevant genomic data.

800.430.0030 (U.S.) +44 (0) 1223 454 900 (U.K.) 314.427.3222 (International)



IncyteGenomics
For Life.

Circle No. 50 on Readers' Service Card

BACTERIO MATCH™

T W O - H Y B R I D S Y S T E M

2-hybrid studies in record time!

Save time
Detect protein-protein
interactions in less time with the
BacterioMatch™ Two-Hybrid System

Fast, next-day results

Easy techniques with high efficiency
— simple bacterial transformation

Easy to detect
protein-protein interactions

Convenient dual-reporter validation

Screen larger libraries



The BacterioMatch™ two-hybrid system* is a fast and easy alternative or complement to yeast two-hybrid systems for in vivo detection of protein-protein interactions. Yeast two-hybrid screens take days just waiting for the yeast to grow. In the BacterioMatch system, all screening is done in bacteria; transformation and plating is easy and colonies grow by

the next day. Plus, detection of your protein-protein interactions is simple because positive colonies are ampicillin-resistant. To facilitate screening, the BacterioMatch system has a secondary β -galactosidase marker to validate putative protein-protein interactions.

Fast and easy, next-day results in your two-hybrid screening

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

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

European Toll-Free Numbers
ORDER: 00800 7000 7000
TECHNICAL SERVICES: 00800 7400 7400

Austria
0800 312 526
France
00800 7000 7000 or 0800-100391

INTERNET
email: techservices@stratagene.com
website: www.stratagene.com

* U.S. Patent No. 5,925,523

See www.stratagene.com
for more information.

Circle No. 26 on Readers' Service Card

BacterioMatch™ two-hybrid system cDNA library construction kit #200412
BacterioMatch™ two-hybrid system vector kit #240065
BacterioMatch™ two-hybrid system
reporter strain competent cells #200180



NEWS

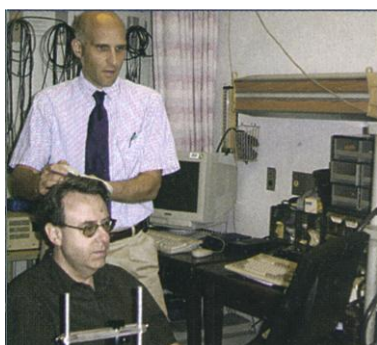
NEWS OF THE WEEK

- 1274 **INTELLECTUAL PROPERTY:** Alzheimer's Researcher in Japan Accused of Economic Espionage
- 1275 **THE POSTGENOMIC ERA:** Windfall for European Data Bank
- ▼1275 **CLIMATE CHANGE:** 17 National Academies Endorse Kyoto
 1261
- 1277 **SCIENCESCOPE**
- ▼1278 **RIBOZYMES:** Making Copies in the RNA World
 1319
- 1278 **PALEONTOLOGY:** Early Tyrannosaur Was Small But Well Armed
- 1279 **ANIMAL RESEARCH:** Charles River Labs to Care for NIH Chimps
- 1280 **RUSSIAN UNIVERSITIES:** Centers of Excellence Get Big U.S. Boost
- 1280 **GENOMICS:** New Genomes Shed Light on Complex Cells

- 1281 **VOLCANOLOGY:** Oregon's Rising, an Eruption to Follow?
- 1283 **ASTROPHYSICS:** Star-Cluster Census Shows Surprises

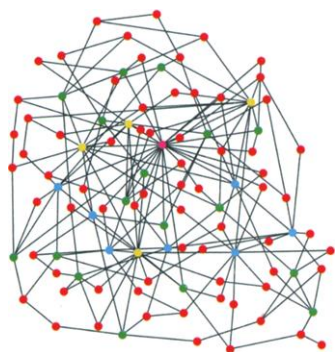
NEWS FOCUS

- 1284 **NEUROSCIENCE:** Boosting Brain Activity From the Outside In
- 1286 **SCIENCE EDUCATION:** Creationism Takes Root Where Europe, Asia Meet
- 1288 **PROFILE:** Shirley Tilghman: Princeton's Unconventional New Chief
- 1289 **INFECTIOUS DISEASES:** West Nile Researchers Get Ready for Round Three
- 1291 **MINORITY FACULTY:** New Data in Chemistry Show 'Zero' Diversity
- ▼1293 **PALEOCLIMATE:** A Variable Sun and the Maya Collapse
 1367
- 1295 **RANDOM SAMPLES**



1284

Magnetic windows into the brain



1316

Epidemiology of the Web

SCIENCE'S COMPASS

LETTERS

The Ethical Reasons for Stem Cell Research R. P. Lanza, J. B. Cibelli, M. D. West, E. Dorff, C. Tauer, R. M. Green. **Arsenic Levels Can Be "Standard" or "Safe"** G. Stöhrer. **Defining Dyslexia** W. J. M. Levelt. **Response** E. Paulesu, J.-F. Démonet, F. Fazio, S. F. Cappa, G. Cossu, C. D. Frith, U. Frith

POLICY FORUM

- 1303 **GENETIC TECHNOLOGIES:** Facing Inheritable Genetic Modifications M. S. Frankel and A. R. Chapman

BOOKS ET AL.

- 1304 **NATURAL HISTORY:** *A Different Nature The Paradoxical World of Zoos and Their Uncertain Future* D. Hancocks, reviewed by M. H. Robinson

- 1305 **ANTHROPOLOGY:** *Female "Circumcision" in Africa Culture, Controversy, and Change* B. Shell-Duncan and Y. Hernlund, Eds., and *The Female Circumcision Controversy An Anthropological Perspective* E. Gruenbaum, reviewed by C. M. Obermeyer

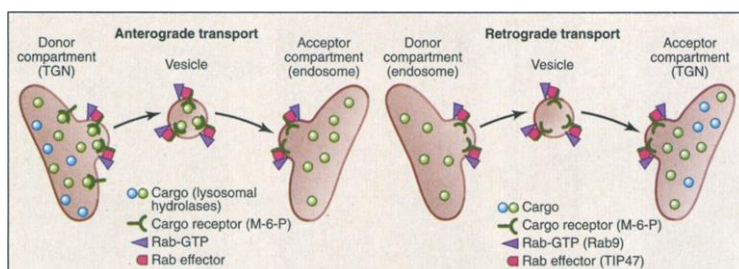
BROWSINGS

PERSPECTIVES

- ▼1307 **PLANETARY SCIENCE:** The Death of a Comet and the Birth of Our Solar System
 1326 H. Boehnhardt
- ▼1310 **MOLECULAR MEDICINE:** The Cholesterol Quartet J. L. Goldstein and M. S. Brown
 1394
- ▼1312 **MICROBIOLOGY:** How Bacteria Breathe Minerals D. K. Newman
 1360
- ▼1313 **CELL BIOLOGY:** A TIP About Rabs N. Segev
 1373
- 1315 **MOLECULAR BIOLOGY AND EVOLUTION:** Can Genes Explain Biological Complexity? E. Szathmáry, F. Jordán, C. Pál
- 1316 **EPIDEMIOLOGY:** How Viruses Spread Among Computers and People A. L. Lloyd and R. M. May

1313

Directing traffic



RESEARCH

RESEARCH ARTICLE

- ▼1319
1278 **RNA-Catalyzed RNA Polymerization: Accurate and General RNA-Templated Primer Extension** W. K. Johnston, P. J. Unrau, M. S. Lawrence, M. E. Glasner, D. P. Bartel

▼REPORTS: COMET C/LINEAR 1307

- 1326 **Water Production of Comet C/1999 S4 (LINEAR) Observed with the SWAN Instrument** J. T. T. Mäkinen, J.-L. Bertaux, M. R. Combi, E. Quémerais
- 1329 **HST and VLT Investigations of the Fragments of Comet C/1999 S4 (LINEAR)** H. A. Weaver, Z. Sekanina, I. Toth, C. E. Delahodde, O. R. Hainaut, P. L. Lamy, J. M. Bauer, M. F. A'Hearn, C. Arpigny, M. R. Combi, J. K. Davies, P. D. Feldman, M. C. Festou, R. Hook, L. Jorda, M. S. W. Keesey, C. M. Lisse, B. G. Marsden, K. J. Meech, G. P. Tozzi, R. West
- 1334 **Organic Composition of C/1999 S4 (LINEAR): A Comet Formed Near Jupiter?** M. J. Mumma, N. Dello Russo, M. A. DiSanti, K. Magee-Sauer, R. E. Novak, S. Brittain, T. Rettig, I. S. McLean, D. C. Reuter, L.-H. Xu
- 1339 **Outgassing Behavior and Composition of Comet C/1999 S4 (LINEAR) During Its Disruption** D. Bockelée-Morvan, N. Biver, R. Moreno, P. Colom, J. Crovisier, É. Gérard, F. Henry, D. C. Lis, H. Matthews, H. A. Weaver, M. Womack, M. C. Festou
- 1343 **Charge Exchange-Induced X-Ray Emission from Comet C/1999 S4 (LINEAR)** C. M. Lisse, D. J. Christian, K. Dennerl, K. J. Meech, R. Petre, H. A. Weaver, S. J. Wolk
- 1348 **Imaging and Photometry of Comet C/1999 S4 (LINEAR) Before Perihelion and After Breakup** T. L. Farnham, D. G. Schleicher, L. M. Woodney, P. V. Birch, C. A. Eberhardy, L. Levy

REPORTS

- 1354 **Microscopic Structure of the Metal-Insulator Transition in Two Dimensions** S. Ilani, A. Yacoby, D. Mahalu, H. Shtrikman
- 1357 **Controlling Chemical Turbulence by Global Delayed Feedback: Pattern Formation in Catalytic CO Oxidation on Pt(110)** M. Kim, M. Bertram, M. Pollmann, A. von Oertzen, A. S. Mikhailov, H. H. Rotermund, G. Ertl
- ▼1360
1312 **Bacterial Recognition of Mineral Surfaces: Nanoscale Interactions Between *Shewanella* and α -FeOOH** S. K. Lower, M. F. Hochella Jr., T. J. Beveridge

- 1363 **Ultrafast Source-to-Surface Movement of Melt at Island Arcs from ^{226}Ra - ^{230}Th Systematics** S. Turner, P. Evans, C. Hawkesworth

- ▼1367
1293 **Solar Forcing of Drought Frequency in the Maya Lowlands** D. A. Hodell, M. Brenner, J. H. Curtis, T. Guilderson

- 1370 **Origin and Environmental Setting of Ancient Agriculture in the Lowlands of Mesoamerica** K. O. Pope, M. E. D. Pohl, J. G. Jones, D. L. Lentz, C. von Nagy, F. J. Vega, I. R. Quitmyer

- ▼1373
1313 **Role of Rab9 GTPase in Facilitating Receptor Recruitment by TIP47** K. S. Carroll, J. Hanna, I. Simon, J. Krise, P. Barbero, S. R. Pfeffer

- 1376 **A GDP/GTP Exchange Factor Involved in Linking a Spatial Landmark to Cell Polarity** P. J. Kang, A. Sanson, B. Lee, H.-O. Park

- 1379 **Interactions of the COP9 Signalsome with the E3 Ubiquitin Ligase SCF^{TIR1} in Mediating Auxin Response** C. Schwechheimer, G. Serino, J. Callis, W. L. Crosby, S. Lyapina, R. J. Deshaies, W. M. Gray, M. Estelle, X.-W. Deng

- 1382 **Promotion of NEDD8-CUL1 Conjugate Cleavage by COP9 Signalsome** S. Lyapina, G. Cope, A. Shevchenko, G. Serino, T. Tsuge, C. Zhou, D. A. Wolf, N. Wei, A. Shevchenko, R. J. Deshaies

- 1385 **Genetic Analysis of Digestive Physiology Using Fluorescent Phospholipid Reporters** S. A. Farber, M. Pack, S.-Y. Ho, I. D. Johnson, D. Wagner, R. Dosch, M. C. Mullins, H. S. Hendrickson, E. K. Hendrickson, M. E. Halpern

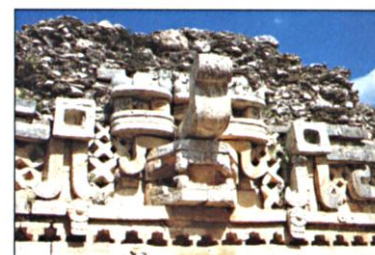
- 1389 **Differentiation of Embryonic Stem Cells to Insulin-Secreting Structures Similar to Pancreatic Islets** N. Lumelsky, O. Blondel, P. Laeng, I. Velasco, R. Ravin, R. McKay

- ▼1394
1310 **Autosomal Recessive Hypercholesterolemia Caused by Mutations in a Putative LDL Receptor Adaptor Protein** C. K. Garcia, K. Wilund, M. Arca, G. Zuliani, R. Fellini, M. Maioli, S. Calandra, S. Bertolini, F. Cossu, N. Grishin, R. Barnes, J. C. Cohen, H. H. Hobbs



COVER 1326

The destruction of comet C/1999 S4 (LINEAR). Images from the Hubble Space Telescope on 6 to 8 July (right, top to bottom) show an outburst that culminated in the ejection from the nucleus (within the white area) of a small fragment (smaller white area, bottom). On or about 22 July, the comet nucleus broke into at least 16 large fragments and debris. Images from the Lowell Observatory on 26 and 28 July and from the Perth Observatory on 2 August (left, top to bottom) show the dust from this event spreading out to form a tail. [Images: T. L. Farnham *et al.*, H. A. Weaver *et al.*, NASA]



1367

Sun and civilization

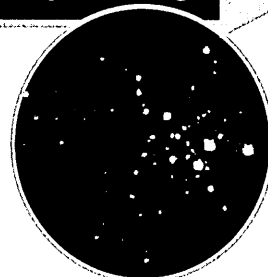
HIGHLIGHTS FROM www.sciencexpress.org



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 © 2001 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): \$115 (\$64 allocated to subscription). Domestic institutional subscription (51 issues): \$370; Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$87. 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 \$9.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for *Science* is 0036-8075/83 \$9.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.



Structure of a
globular cluster

IS YOUR SEQUENCING
ABOUT TO MOVE
forward,
OR BACK?

High quality sequencing data is critical to moving forward in your research. And as you know, the sequencing chemistry you use will directly impact data quality.

High quality sequencing data is critical to moving forward in your research. And as you know, the sequencing chemistry you use will directly impact data quality.

But did you know this: you may soon be told to change **your sequencing chemistry**. At that point, ask, "To what? Will it be as bright and as **robust**? Will I lose signal? Will I have to change my workflow to make it work? Will I **have the same easy clean up process as before**?" Ask questions, then test against **DYEnamic™ ET terminator chemistry** from Amersham Pharmacia Biotech—now available for all **ABI PRISM™** instruments.

Put DYEnamic ET Terminator Cycle Sequencing Kit to the test

DYEnamic ET chemistry has reliably sequenced billions of bases in some of the largest sequencing facilities in the world. Want to move forward in your sequencing with the proven chemistry and kits? Go to www.apbiotech.com and order a test kit at our special promotional price.

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



Circle No. 53 on Readers' Service Card

Scienceonline

www.scienceonline.org

CONTENT HIGHLIGHTS AS OF 18 MAY 2001

science magazine www.sciencemag.org

SCIENCE EXPRESS www.sciencexpress.org

High-Resolution X-ray Imaging of a Globular Cluster Core: Compact Binaries in 47Tuc J. E. Grindlay, C. Heinke, P. D. Edmonds, S. S. Murray

An x-ray survey of faint stars in a globular cluster provides information on how such clusters formed some 12 billion years ago and evolved over time.

Exponential Gain and Saturation of a Self-Amplified Spontaneous Emission Free-Electron Laser S. V. Milton *et al.*

The growth and saturation of emitted ultraviolet radiation observed from a high-quality electron beam passed through a slalom of magnets mark a step toward short-wavelength free-electron lasers.

Microbial Genes in the Human Genome: Lateral Transfer or Gene Loss? S. L. Salzberg, O. White, J. Peterson, J. A. Eisen

PERSPECTIVE: Are There Bugs in Our Genome? J. O. Andersson and C. L. Nesbø

Analysis indicates that transfer of genes from the bacterial to the human genome may be much less frequent than had been postulated.

SPECIAL FEATURES

Ecology and Evolution of Infection: A Web Supplement

A collection of classic reviews and articles supplementing last week's special issue of *Science*, as well as pointers to selected Web resources on infectious disease, can be found at www.sciencemag.org/feature/data/diseases/index.shtml.

science's stke

www.stke.org

Protocol: Targeting Silence—The Use of Site-Specific Recombination to Introduce in Vitro Methylated DNA into the Genome D. Schübeler, M. C. Lorincz, M. Groudine

A method for manipulating and studying DNA methylation in defined genomic sites.

science's next wave

www.nextwave.org

Canada: Entrepreneurs in Science—How to Turn a Need into a Business G. Chevalier
The lack of good online resources for life science job seekers and employers inspired one Canadian scientist to create her own company.

US: Biotech Buzzwords D. Jensen

If you're agonizing over alphabet soups of annoying acronyms, you're in luck: Our "Tooling Up" columnist's glossary is a gastronomic glory!

US: Mentoring for Postdocs J. Rutter

In this week's Postdoc Network, read about the NIH's efforts to bolster relationships between faculty mentors and postdoctoral fellows.

UK: Ruthless Reading P. H. Dee

If your idea of keeping on top of the literature is standing on a stack of photocopies, you need our columnist's tips for tackling your reading monsters.

GrantsNet

www.grantsnet.org
RESEARCH FUNDING DATABASE

NeuroAIDS

www.sciencemag.org/NAIDS
EXPERIMENTAL WEB SITE

ONLINE STAFF

SCIENCENOW EDITORS Laura Helmuth, Martin Enserink, Erik Stokstad

SCIENCE'S NEXT WAVE EDITORIAL: MANAGING EDITOR Crispin Taylor; EDITORS Robert Metzke (Germany), Kirstie Urquhart (UK); CONTRIBUTING EDITORS Lesley McCarney (Canada), Mark Sincell; PROJECT MANAGER Emily Klotz; WRITERS Katie Cottingham, Mona Mort; MARKETING: MARKETING MANAGERS Karen Horting (US and Canada), Hazel Crocker (Europe); PROGRAM DIRECTOR Lisa Kozlowski; MARKETING ASSOCIATE Joey D'Adamo

SCIENCE'S STKE EDITOR Bryan Ray; ASSOCIATE EDITORS Lisa Chong, Nancy Gough, John Nelson

ELECTRONIC MEDIA MANAGER David Gillikin; INTERNET PRODUCTION MANAGER Betsy Harman; ASSISTANT PRODUCTION MANAGER Wendy Stengel; SENIOR PRODUCTION ASSOCIATE Lisa Stanford; ASSOCIATES Carla Cathey, Mark Croatti, Robert Owens, Louis Williams

Daily coverage of science and science policy by Science's news team

sciencenow

www.sciencenow.org

NOW!

ADDITIONAL RESOURCE

SCIENCECAREERS.ORG

Resume/CV Database:

ScienceCareers.org is more than a place to look for a new job. It's also a place where the jobs can look for you. Post your resume/cv in our online Resume/CV Database today.

ADDITIONAL RESOURCE

AD SUPPLEMENT / 1 JUNE ISSUE

FOCUS ON CAREERS

Informatics: The successful sequencing of the human genome demanded supercomputers and software programs. This ad supplement will address some of the nontraditional jobs that this area has created. Look for it in the 1 June issue.

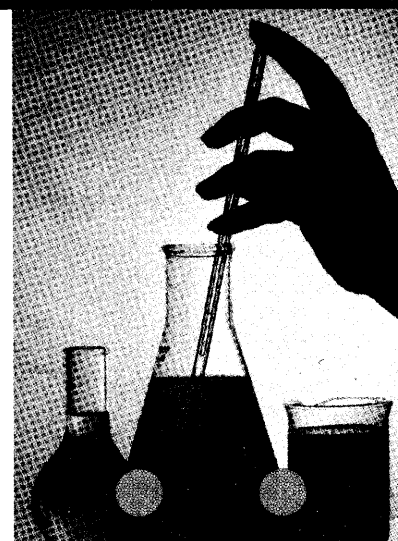
ADDITIONAL RESOURCE

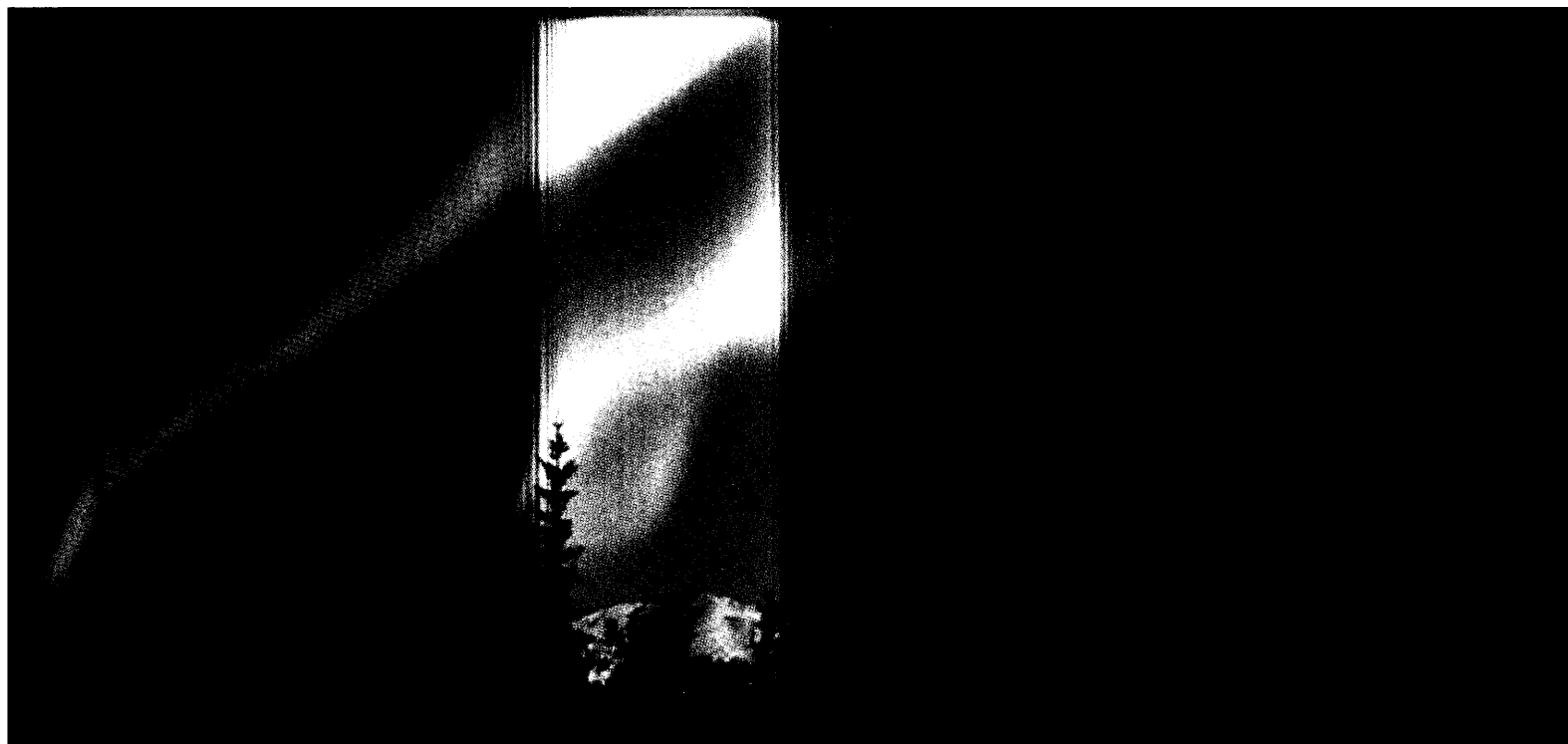
AD SUPPLEMENT / 15 JUNE ISSUE

LAB TECHNOLOGY TRENDS

Biotechnology—A Global Perspective:

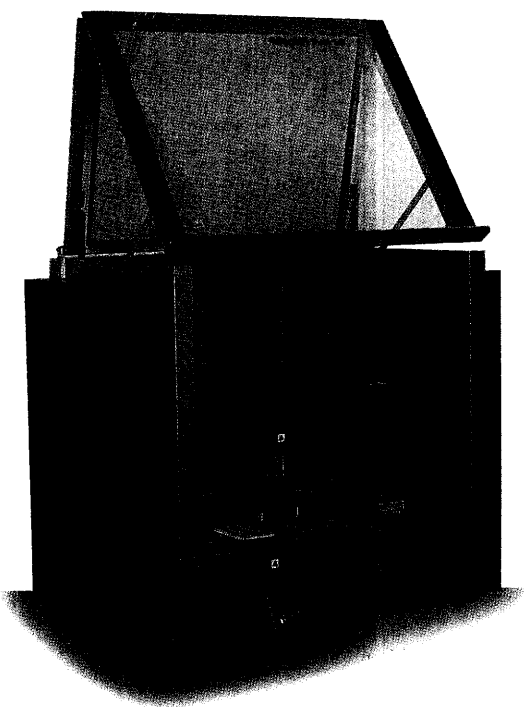
This ad supplement will discuss the tools that have allowed researchers worldwide to make significant progress in directing biotechnology to improve our lives. Look for it in the 15 June issue.





The aurora borealis is formed when the earth's magnetosphere causes charged particles from the sun to collide with atmospheric gasses, emitting light.

MagNA Pure LC: Experience Flexibility and Walk-away Precision in Template Preparation



Isolate pure, PCR-ready nucleic acids from a wide variety of sample types in less than 1 hour. Increase the precision of every pipetting step while letting MagNA Pure LC do all the work! Reaction mixes are ready for real-time PCR when you return.

- Walk away from manual nucleic acid preparation.
- Increase the accuracy of your quantitative PCR.
- Automate PCR reaction set-up for 96-well plates, LightCycler Capillaries, PCR strips, or tubes.
- Achieve reproducible quality and yields of pure DNA, RNA, and mRNA.

For more information on MagNA Pure LC, visit <http://biochem.roche.com/magnapure> or call us at 1-800-428-5433.



LightCycler and MagNA Pure are trademarks of a member of the Roche Group.
The technology used for the LightCycler is licensed from Idaho Technology, Inc.
© 2001 Roche Diagnostics Corporation. All rights reserved.

Roche Diagnostics Corporation
Roche Molecular Biochemicals
Indianapolis, Indiana

THIS WEEK IN Science

edited by Phil Szuromi

Death of an Uncommon Comet

Comet C/1999 S4 (LINEAR), which passed close by Earth between June and August of 2000, fragmented and "died" as it neared the Sun. Early observations indicated that the comet was depleted in carbon monoxide, methanol, and other hydrocarbons compared with other long-period comets like Hale-Bopp, which are thought to originate in the Oort cloud at the edge of the solar system. This chemical composition suggests Comet C/LINEAR may have originated from the region between Jupiter and Saturn instead. Later observations captured the unexpected fragmentation and complete disintegration of the fragments of this comet. Tidal disruption or solar sublimation are the more typical causes of cometary destruction, but in this case the fragile structure of the comet itself may be to blame. The comet also emitted high-energy x-rays, and observations clarified that x-ray production was caused by charge exchange between solar wind ions and the cometary gases. Six reports (pp. 1326–1353; see the cover and the Perspective by Boehnhardt) in a special issue on C/LINEAR discuss these observations and their implications for the origin of comets and their dynamical interactions in the solar system.

Two Phases of Confined Carriers

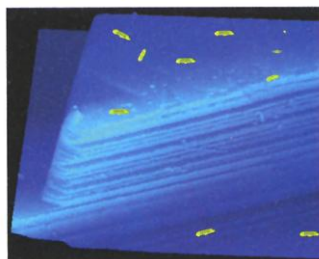
Theoretical studies have suggested that when charge carriers are confined to a two-dimensional plane, the system should be insulating. However, experiments have shown that such systems transform into a metallic phase when the density of charge carriers exceeds a certain level. Most of this experimental work has focused on macroscopic measurements, such as transport properties. Ilani *et al.* (p. 1354) used a single-electron transistor to probe the spatial structure of a two-dimensional electron gas as the carrier density was varied. A complex microscopic structure of coexisting metallic and insulating regions was found to underlie the metal-to-insulator transition.

Controlling Chemical Turbulence

Some chemical reactions couple reaction and diffusion under steady-state conditions in such a way that chemical patterns or waves are set up. For one such "oscillatory" reaction, the oxidation of CO on the (100) surface of platinum, the reaction-diffusion patterns are highly sensitive to changes and concentration, and waves can run into each other and set up chemical "turbulence" that can be imaged in the photoelectron microscope. Kim *et al.* (p. 1357) now show that by changing the intensity of global feedback control of one of the reactants, CO, not only can turbulence be suppressed, but chaotic regimes of patterns

1360 Ironing Out Minerals

When subjected to an oxygen-poor environment, dissimilatory iron-reducing bacteria (DIRM) can conserve energy for growth by using iron oxyhydroxide minerals as their terminal electron receptors, and in doing so they contribute to the biogeochemical cycle of iron. Lower *et al.* (p. 1360) used atomic force microscopy to measure the binding strength between the bacterium *Shewanella oneidensis* and the mineral goethite under aerobic and anaerobic conditions. The attractive force increased under anaerobic conditions, and modeling suggests that a 150-kilodalton iron reductase in the outer membrane of the bacteria reduces the iron present in goethite.



that form and annihilate can be generated, as well as stable cluster patterns and standing waves. Feedback control is facilitated more easily in this case than for a reaction in solution because the change in CO concentration can be made at once across the entire surface.

Too Much Sun

Extended periods of drought could have had significant impacts on primitive cultures, and drought cycles could be caused by increases in the amount of solar energy reaching Earth. However, actually demonstrating a causal connection between solar forcing and a prehistoric civilization is rather difficult.


Hodell *et al.* (p. 1367; see the news story by Kerr) have now examined sediment cores from Lake Chichancanab, in the Yucatan Peninsula of Mexico, and found evidence that the three major discontinuities in Mayan culture during the past 2500 years were correlated with long intervals of drought. These droughts were themselves correlated with a 208-year cycle of solar activity.

Older Corn

The beginnings of agriculture in the New World have been traced back to the semi-arid highlands of Mexico, where evidence for the domestication of corn and sunflower are well-preserved in dry caves. Pope *et al.* (p. 1370) have found evidence for the domestication of corn about 5100 calendar years B.C. along the more humid lowlands of Mexico. They analyzed pollen collected from soil samples and sediment cores from the San Andres site, where farmers settled along the beaches and lagoons of the Grijalva River delta on the Gulf Coast of Tabasco. Their results push the timing of corn domestication in Mesoamerica back about 1000 years and also show that farming probably started in the more accessible lowlands.

Making Good Copy in the RNA World

The RNA World hypothesis posits that a crucial step in the evolution of our predominantly DNA- and protein-based world began with self-replicating RNA molecules that fulfilled both the information storage role of DNA and the structural and enzymatic functions of proteins. A critical test for the RNA World hypothesis is the demonstration that an RNA molecule can replicate itself. Johnston *et al.* (p. 1319; see the news story by Davenport) have taken an important step in this direction. They have used "in vitro" selection to "evolve" an RNA molecule (ribozyme) that replicates short stretches of RNA with high fidelity when presented with an RNA template, primer, and nucleotides. The ribozyme has no template or primer sequence specificity and thus is functioning as a general RNA replicase.



Elevate long
PCR cloning to
new heights.

**TOPO® XL PCR Cloning turns a
long shot into a sure thing.**

The TOPO® XL PCR Cloning Kit enables high-efficiency cloning of long (3-10 kb) PCR products by combining the power of TOPO® Cloning, a positive selection mechanism, and a unique gel purification step. Now, efficient cloning of long PCR products doesn't have to be a stretch.

Effective. TOPO® Cloning uses the enzyme topoisomerase I rather than DNA ligase for faster, more successful ligations. A simple 5-minute incubation yields great results (Table 1). And the crystal violet gel purification, which works without UV light or ethidium bromide, ensures that your DNA remains intact.

Table 1 - Cloning Long PCR Products

PCR Product Size (kb)	Percent Recombinants
4.8	97%
7.0	80%
10.0	71%

PCR products were amplified, gel purified, and TOPO® Cloned.
The percent recombinants equals the number of colonies containing
an insert/the number of total colonies.

Positive selection. TOPO® XL utilizes a lethal gene that selects against non-recombinant vector, virtually eliminating background. Because only colonies with an insert can grow, you'll get your clone without wasting time screening negatives.

For cloning long PCR products, the TOPO® XL PCR Cloning Kit goes the distance. To learn more, call Invitrogen today.



Circle No. 14 on Readers' Service Card

United States Headquarters:
Invitrogen Corporation
1600 Faraday Avenue
Carlsbad, California 92008
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 (Free Phone Orders): 0800 269 210
Tel (General Enquiries): 0800 5345 5345
Fax: +44 (0) 141 814 6287
Email: eurotech@invitrogen.com

International Offices:
Argentina 54 11 4556 0844
Australia 1 800 331 627
Austria 0800 20 1087
Belgium 0800 14894
Brazil 0800 11 0575
Canada 800 263 6236
China 10 6849 2578
Denmark 80 30 17 40

France 0800 23 20 79
Germany 0800 083 0902
Hong Kong 2407 8450
India 11 577 3282
Italy 02 98 22 201
Japan 03 3663 7974
The Netherlands 0800 099 3310
New Zealand 0800 600 200
Norway 0800 5456 5456

Spain & Portugal 900 181 461
Sweden 020 26 34 52
Switzerland 0800 848 800
Taiwan 2 2651 6156
UK 0800 838 380
Other countries see our website

www.invitrogen.com

Cargo Selection Devices

The itinerary of the mannose-6-phosphate receptor, the protein that recognizes lysosomal enzymes and delivers them to their target, is quite complex in that it travels between the Golgi, the plasma membrane, and endosomes in almost any order, depending on whether it is loaded with its enzyme cargo. Carroll *et al.* (p. 1373; see the Perspective by Segev) examined the role of a cytosolic protein TIP47 in controlling this itinerary and discovered that in addition to binding the cytoplasmic tail of the receptor, TIP47 also binds to a small GTP-binding protein, Rab9. In the presence of bound Rab9, TIP47 shows increased affinity for the receptor and may thus hold the key to deciding which onward route the receptor takes.

Reversing Neddylation

Posttranslational modification of cellular proteins can play an important role in controlling intracellular processes. Modifications that can be specifically and rapidly reversed would provide a versatility in control that may be the key to normal cellular activities. Two reports, by Schwechheimer *et al.* (p. 1379) and Lyapina *et al.* (p.



1382), examine interactions between a particle known as the signalosome and the SCF ubiquitin ligases (see the 4 May news story by Marx). This system is involved in modifying proteins with the ubiquitin-like molecule, NEDD8. Together, these reports show that neddylation can be reversed, that the signalosome is involved in this NEDD8 removal, and that this mechanism appears to be important in controlling the auxin response pathway in plants. The signalosome and SCFs are widely distributed, and the system is likely to be important in controlling many intracellular signaling pathways in a variety of organisms. *X*

Landmark of Polarity

During development, organisms use preordained polarity markers to regulate and control growth in response to external signals. Even unicellular organisms such as yeast exhibit defined polarity during growth. Yeast select predictable sites in relation to previous bud-site selection decisions. Kang *et al.* (p. 1376) examined how the cell recognizes the site of previous budding decisions, either axial landmarks in haploid cells or bipolar landmarks in diploid cells, in order to control bud site selection. They found that a small guanosine triphosphate/guanosine diphosphate (GTP/GDP) exchange factor, Bud5, was crucial in the recognition of the previous bud site and in defining future bud-site selection. *X*

Directing Stem Cell Fate

Embryonic stem (ES) cells have shown the potential to develop into a wide variety of differentiated cells. One challenge has been to direct the ES cells down one particular developmental pathway. Lumelsky *et al.* (p. 1389; see the 27 April news story by Vogel) have now taken mouse ES cells and generated cells that replicate at least some of the functions of the insulin-secreting cells of the pancreas. This preliminary work suggests that ES cells might be a useful source of material to address the challenges of diabetes. *X*

Adaptor Required

More than 70% of circulating low-density lipoprotein (LDL) is removed from the blood by LDL receptor-mediated endocytosis in the liver. Patients with the rare disorder autosomal recessive hypercholesterolemia (ARH) show poor clearance of LDL from the blood and develop coronary artery disease at a young age. Garcia *et al.* (p. 1394; see the Perspective by Goldstein and Brown) identify the gene responsible for ARH and find that it encodes a previously undescribed protein with a sequence motif characteristic of adaptors, proteins that bind to the cytoplasmic tails of endocytic receptors and that are critical for receptor internalization. This newly identified protein is likely to facilitate trafficking of the LDL receptor in liver cells. *X*

RESOLVING THE RIDDLE: NUCLEOFECTION™

Movies tend to portray research scientists as people out of this world.

And, they're not far off the mark. Everyone knows that the DNA must be in the nucleus in order to work. But for decades people have been taking a more tortuous route. We have a shortcut:

Nucleofection™. The DNA is quickly transferred into the nucleus. Also of primary cells. To do this you don't have to spend a lot of money (which should interest the controllers), and Nucleofection™ is really quite simple (which should interest the scientists whose time is costly). And neither are viruses necessary (which should interest all those with a concern for safety). And if you're not employing primary cells for research you can still work ten times faster with cell lines using the Nucleofector™.

After all, it's up to you into which nuclei the DNA is being transferred. The important thing: it gets there directly. For more information click: www.amaxa.com or call +49 (0)221-99 199-400 to get in touch – directly.

Circle No. 3 on Readers' Service Card

a m a x a

gene transfer begins here.

We've bottled confidence.

GIBCO

- The brand more scientists trust
- Unparalleled technical support and advice
- Continual development of innovative products and services

GIBCO™ Cell Culture:
the standard for over 40 years.


www.invitrogen.com

GIBCO Cell Culture

Invitrogen Corporation

These products are for laboratory research use only and are not intended for human or animal diagnostic, therapeutic, or clinical uses, unless otherwise stated. ©2001 Invitrogen Corporation 01-016MS

Circle No. 19 on Readers' Service Card



Precision performance,
again and again and again.

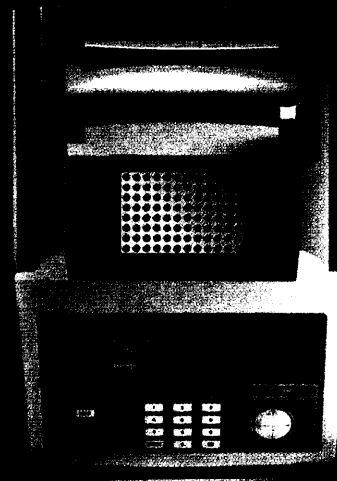
GeneAmp® PCR System 9700

PE Corporation is committed to providing the world's leading technology and information for life scientists. PE Corporation consists of the Applied Biosystems and Celeris Genomics businesses.

The GeneAmp® PCR System 9700 is an Authorized Thermal Cycler for PCR. GeneAmp is a registered trademark of Roche Molecular Systems, Inc. The PCR process is covered by patents owned by Roche Molecular Systems, Inc. and F. Hoffmann-La Roche Ltd. Applied Biosystems is a registered trademark of PE Corporation or its subsidiaries in the U.S. and certain other countries. For Research Use Only. Not for use in diagnostic procedures.
©2000 Applied Biosystems

Circle No. 13 on Readers' Service Card

Precision requires discipline—the discipline to keep working until your performance is consistent and reliable. Consider the GeneAmp® PCR System 9700, the most advanced instrument for routine, high-performance PCR. We introduced the System 9700 in 1997 and continuously release innovations to the system.



The GeneAmp® PCR System 9700 is available with a gold-plated silver 96-well sample block or with an AutoLid-enabled dual 384-well sample block.

For example, today's PCR applications require precision thermal performance; even heat pumps that conform to manufacturer's specifications can vary enough to skew results. So we combined a proprietary Peltier heat pump with specially-engineered sample blocks to deliver fast thermal response and exceptional uniformity for all your PCR protocols.

Reliable results, again and again and again: it's what you've come to expect from Applied Biosystems.

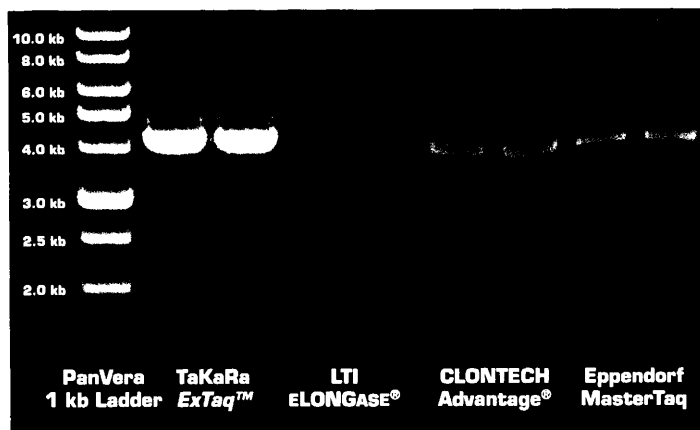
www.appliedbiosystems.com
650.638.5800

AB Applied Biosystems

 **ORDER ON-LINE**
store.appliedbiosystems.com

PCR That Works!

Takara *Ex Taq*TM
DNA Polymerase



- Excellent Sensitivity
- Robust Signal Intensity
- High Fidelity
- Longer Amplifications
- Reliable Results

PROVE IT TO YOURSELF

Call us or visit our website
for your free sample of *Ex Taq* today!

Circle No. 54 on Readers' Service Card



The Protein CompanyTM

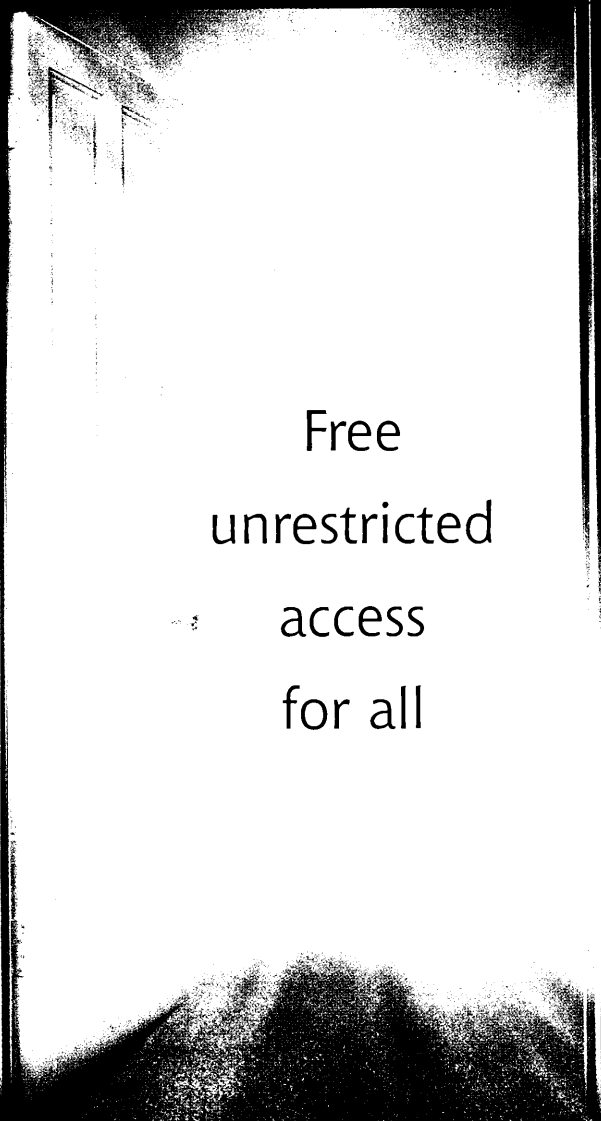
Takara PCR-related products are sold under licensing arrangements with Roche Molecular Systems and E. Hoffmann-La Roche Ltd. and The Perkin-Elmer Corporation. Purchase of these products is accompanied by a license to use them in the Polymerase Chain Reaction (PCR) process for research in conjunction with a thermal cycler whose use in the automated performance of the PCR process is covered by the up-front license fee, either by payment to Perkin-Elmer or as purchase, i.e., an authorized thermal cycler.

Ex Taq is a trademark of Takara Shuzo Co., Ltd.
"The Protein Company" is a trademark of PanVera Corporation.

PanVera Corporation • Madison WI 53711
Phone: 608.233.9450 • Fax: 608.233.3007
E-Mail: info@panvera.com

800.791.1400
In the USA and Canada

www.panvera.com
© 2001 PanVera Corporation. All rights reserved.
Lit. #L0524 Rev. 5/01



Free
unrestricted
access
for all

WELCOME

The Human Genome Project is of such fundamental importance, unrestricted access is a right, not a privilege. Everyone should have the earliest possible chance to benefit from this knowledge.

That's why Ensembl and the websites listed below offer free, unrestricted access. High-quality data. No limit to the volume you download. The most advanced analysis tools.

The door to discovery is wide open. Take a look...

Genome browsers

Ensembl

www.ensembl.org

University of California Santa Cruz

<http://genome.cse.ucsc.edu>

Genome databases

European Bioinformatics Institute

www.ebi.ac.uk

GenBank

www.ncbi.nlm.nih.gov

DNA Data Bank of Japan

www.ddbj.nig.ac.jp

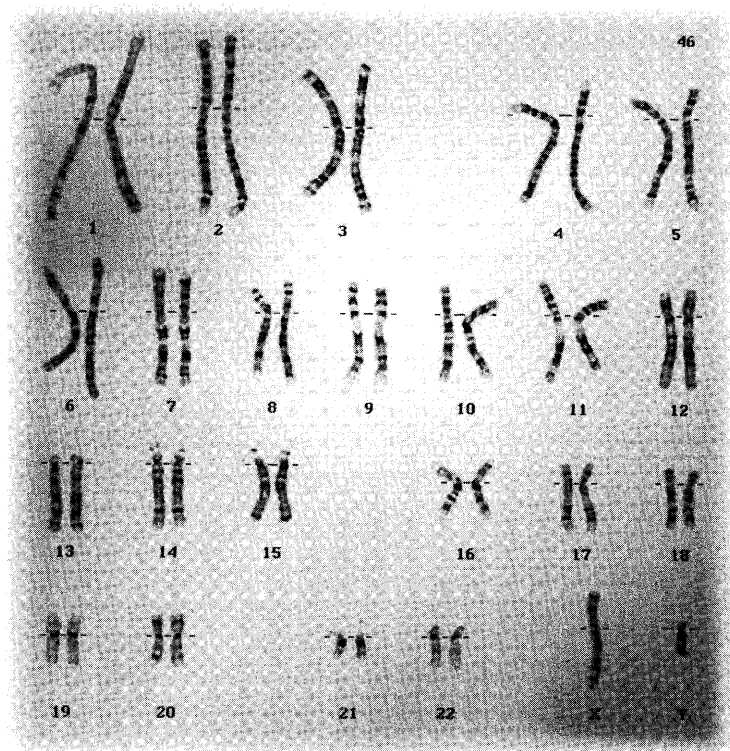
Circle No. 21 on Readers' Service Card



The Wellcome Trust

Research for a healthier world

Charity No. 210183



Until science identifies a gene for financial savvy, there's always TIAA-CREF.

Not many people are born investors. Luckily, there's a place you can turn to for financial expertise.

TIAA-CREF has been helping people in education and research meet their long-term financial goals for over 80 years. And now that experience, combined with a dedication to keeping expenses low, is available to everyone through our family of companies. Whatever your goals are, we're ready to design an investment strategy that makes sense for you.

Now it's easy to be financially savvy. Simply call us at
1 800 842-1924 or visit us online at www.tiaa-cref.org.



Ensuring the future for
those who shape it.SM

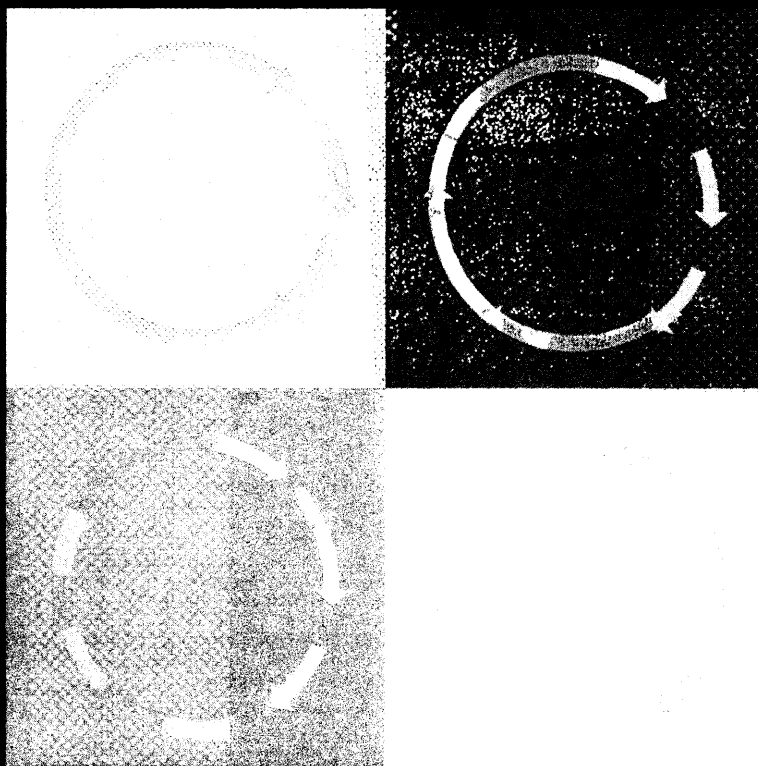
Circle No. 6 on Readers' Service Card

1 800 842-1924

www.tiaa-cref.org

For more complete information on our securities products, call 1 800 842-1924 for prospectuses. Read them carefully before you invest. • TIAA-CREF Individual and Institutional Services, Inc. and Teachers Personal Investors Services, Inc. distribute securities products. • Teachers Insurance and Annuity Association (TIAA), New York, NY and TIAA-CREF Life Insurance Co., New York, NY issue insurance and annuities. • TIAA-CREF Trust Company, FSB provides trust services. • Investment products are not FDIC insured, may lose value and are not bank guaranteed. © 2001 Teachers Insurance and Annuity Association—College Retirement Equities Fund, New York, NY 01/02

GENEOP



gene expression

GeneOp® customized gene synthesis is a powerful tool for today's most advanced biotech applications. While a staff scientist can take six months or longer to synthesize a workable gene, GeneOp customized genes can be delivered in as fast as 20 days – dramatically enhancing your efficiency and business position.

In addition, the GeneOp bioinformatics team can dramatically improve your gene expression by eliminating rare codons and utilizing optimized codons for your host organism. We can even use "hybrid" codon tables derived from multiple species to produce optimized genes for several systems simultaneously.

Visit our website or call Operon today for more information.

art of Genomics™

Circle No. 47 on Readers' Service Card

OPERON
A QIAGEN COMPANY

NORTH AMERICA 800-688-2248 dna@operon.com
EUROPE 00-800-OP-ORDERS oligo@operon.com
www.operon.com

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 NEWS EDITOR
R. Brooks Hanson Katrina L. Kerner 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), L. Bryan Ray, Linda R. Rowan; ASSOCIATE EDITORS Lisa D. Chong, Marc S. Lavine, Beverly A. Purnell, H. Jesse Smith, Valda

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; SENIOR SPECIALIST Mary Curry; COORDINATOR Jantell Stone; SPECIALISTS Laurie Baker, Pat Butler, Elizabeth Early, Katrina Smith; REPRESENTATIVE Elizabeth Haberkorn; MARKETING: MANAGER Gregory Urquhart; PRODUCTION MANAGER Lauri Sirois; ASSOCIATE Deborah Stromberg; EUROPE SENIOR EXECUTIVE Ruth Jackson; EXECUTIVE Martin Paine; RESEARCH: MANAGER Renuka Chander; BUSINESS AND FINANCE: MANAGER Teresa Ellis; ADMINISTRATIVE SUPPORT Zadia McKinnon

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-Wienhold; SENIOR ANALYST Randy Yi; FINANCIAL ANALYSTS Lisa Donovan, Jessica Tierney-Rubin; RIGHTS AND PERMISSIONS: ASSOCIATE Emilie David; ASSISTANT Karen Lentz;

Vinson; EDITOR, SCIENCE ONLINE Stewart Wills; ASSOCIATE BOOK REVIEW EDITOR Sherman J. Suter; ASSOCIATE LETTERS EDITOR Christine M. Pearce; INFORMATION SPECIALIST Janet Kegg; CONTRIBUTING EDITOR Kevin Ahern; EDITORIAL MANAGER Cara Tate; SENIOR COPY EDITORS Jeffrey E. Cook, Harry Jach, Etta Kavanagh, Barbara P. Ordway; COPY EDITORS Jason Llewellyn, Joshua Marcy, Monique Martineau, John Meade; EDITORIAL COORDINATORS Carolyn Kyle, Ellen E. Murphy, Beverly Shields; PUBLICATIONS ASSISTANTS Chris Filiatreau, Joi S. Granger, Jeffrey Hearn, Charlene King, Elise Laffman, Gail Murphy, Anita Wynn; EDITORIAL ASSISTANT Patricia M. Moore; EDITORIAL SUPPORT ASSISTANTS Osa Atoe, Christopher Kenny, Yolanda Matthews, Brian White; 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; CONTRIBUTING EDITORS Elizabeth Culotta, Polly Shulman; NEWS WRITERS Martin Enserink, Laura Helmuth, Constance Holden, Jocelyn Kaiser, Richard A. Kerr, Andrew Lawler (Boston), David Malachuk, Elizabeth Pennisi, Charles Seife, Robert F. Service (Pacific NW), Gretchen Vogel, John Davenport (intern); CONTRIBUTING CORRESPONDENTS Marcia Barinaga (Berkeley, CA), Kathryn Brown, Barry A. Cipra, Jon Cohen (San Diego, CA), Daniel Ferber, Ann Gibbons, Robert Irion, Charles C. Mann, Virginia Morell, Evelyn Strauss, Gary Taubes, David Voss, 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, Boston,

MARKETING: DIRECTOR John Meyers; RECRUITMENT MARKETING MANAGER Allison Pritchard; ASSOCIATES Mary Ellen Crowley, Amanda Donathen; ELECTRONIC MEDIA: MANAGER David Gillikin; INTERNET PRODUCTION MANAGER Elizabeth Hartman; ASSISTANT PRODUCTION MANAGER Wendy Stengel; SENIOR PRODUCTION ASSOCIATE Lisa Stanford; PRODUCTION ASSOCIATES Carla Cathey, Mark Croatti, Robert Owens, Louis Williams; ADMINISTRATIVE SUPPORT Joyce Scott

PRODUCT ADVERTISING (science_advertising@aaas.org) NATIONAL SALES MANAGER Richard Teeling: 973-694-9173, FAX 973-694-9193 • NORTH-EAST AND E. CANADA Elizabeth Pointek: 978-969-1542, FAX 413-480-0008 • MIDWEST Rick Bongiovanni: 330-405-7080, FAX 330-405-7081 • WEST COAST/W. CANADA Neil Boylan: 415-673-9265, FAX 415-673-9267 • MID-ATLANTIC AND SOUTHEAST Sales Christopher Breslin: 443-512-0330, FAX 443-512-0331 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) 1-782-752-530, FAX (44) 1-782-752-531 JAPAN Mashy Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852 • TRAFFIC MANAGER Carol Maddox; TRAFFIC ASSOCIATE Halimah S. Whitby; SENIOR SALES ASSOCIATE Sheila Myers

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, Jody Fenty, Christina Geiger, Bren Peters-Minnis; ASSISTANTS Sussy Castilla, Ermet Tesfaye; ASSOCIATES Christine Hall, Dawn Bruno, Dina Freeman; PUBLICATIONS AS-

MA: 617-542-5098, 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 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; ILLUSTRATORS Cameron Slayden, Katharine Sutliff; ASSOCIATES Holly Bishop, Joshua Moglia, Debra J. Morgeneegg, Preston Morrighan; 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. Hurtle; ASSOCIATE EDITORS Ian S. Osborne, Stephen J. Simpson, Peter Stern; EDITORIAL SUPPORT Jenny Parker, Sarah Parker; ADMINISTRATIVE SUPPORT Janet Mumford, Liz Ellis, Viv Hogarth; NEWS: EUROPEAN NEWS EDITOR Richard Stone, CORRESPONDENT Michael Balter (Paris: (33) 1-49-29-09-01, FAX (33) 1-49-29-09-00); CONTRIBUTING CORRESPONDENT Robert Koenig (Bern); John Pickrell (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@public1.bta.net.cn; INDIA Pallava Bagla (contributing correspondent (91) 11-271-2719; pbagla@ndb.vsnl.net.in)

SISTANTS Robert Buck, Jane Vaughn; U.K./EUROPE: SALES MANAGER Debbie Cummings; PROMOTIONS COORDINATOR Richard Walters; INTERNET SALES EXECUTIVE Tracy Holmes; SALES EXECUTIVE Bonnie Price Lofton; 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 Mary L. Good; PRESIDENT Peter H. Raven; PRESIDENT-ELECT Floyd E. Bloom; TREASURER David E. Shaw; EXECUTIVE OFFICER Richard S. Nicholson; BOARD LEWIS M. Branscomb; Nina V. Fedoroff; Karen A. Holbrook; Sally Gregory Kohlstedt; Richard A. Messervy; Robert C. Richardson; Neena B. Schwartz; 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 relating 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.

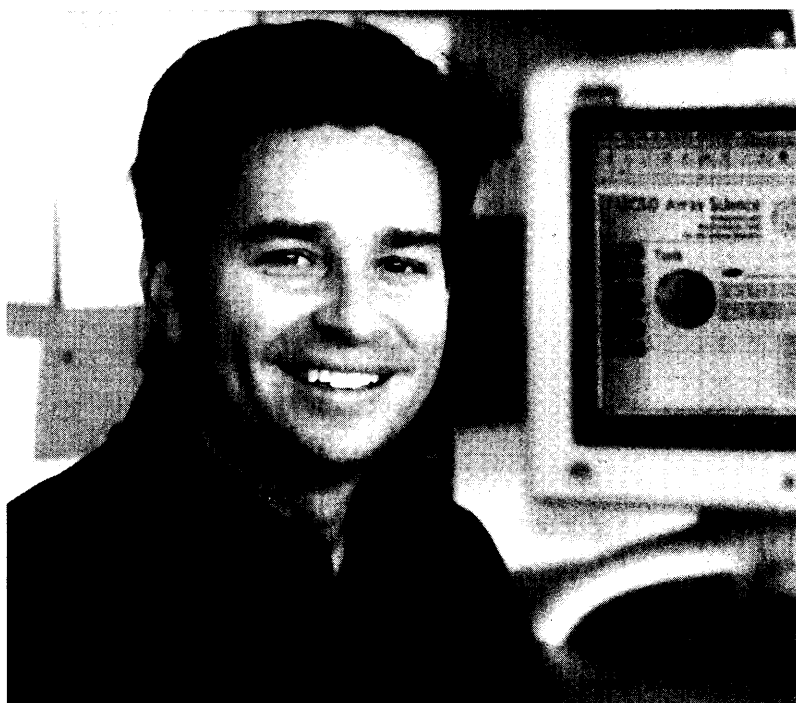
INFORMATION FOR CONTRIBUTORS

See pages 145 and 146 of the 5 January 2001 issue or access www.sciencemag.org/misc/con-info.shtml

BOARD OF REVIEWING EDITORS

Frederick W. Alt <i>Children's Hospital, Boston</i>	Ton Bisseling <i>Washington University</i>	Dennis W. Choi <i>Washington Univ. School of Medicine, St. Louis</i>	Chris D. Frith <i>Univ. of Chicago</i>	Michael LaBarbera <i>Univ. of Chicago</i>	Michele Parrinello <i>Max Planck Institute for Solid State Research, Stuttgart</i>	Tomoyuki Takahashi <i>Univ. of Tokyo</i>
Edouard Bard <i>Univ. d'Aix-Marseille III</i>	Seth S. Blair <i>Univ. of Wisconsin</i>	Joanne Chory <i>The Salk Institute</i>	Don Ganem <i>Univ. of California, San Francisco</i>	Angus I. Lamond <i>Univ. of Dundee</i>	Linda Partridge <i>Univ. College London</i>	Marc Tessier-Lavigne <i>Univ. of California, San Francisco</i>
Frank S. Bates <i>Univ. of Minnesota</i>	Mark Boguski <i>NCBI, NIH</i>	David Clapham <i>Children's Hospital, Boston</i>	James Gimzewski <i>Univ. of California, LA</i>	Antonio Lanzavecchia <i>Inst. of Res. in Biomedicine, Bellinzona, Switzerland</i>	Suzanne Pfeffer <i>Stanford Univ. School of Medicine</i>	Joan S. Valentine <i>Univ. of California, LA</i>
Ray H. Baughman <i>Honeywell International</i>	Henry R. Bourne <i>Univ. of California, San Francisco</i>	Jonathan D. Cohen <i>Princeton Univ.</i>	Alex Halliday <i>ETH Zentrum, Zürich</i>	Anthony J. Leggett <i>Univ. of Illinois, Urbana- Champaign</i>	Stuart L. Pimm <i>Columbia Univ.</i>	Michiël van der Klis <i>Astronomical Inst. of Amsterdam</i>
Stephen J. Benkovic <i>Pennsylvania St. Univ.</i>	Lewis M. Branscomb <i>Kennedy School, Harvard Univ.</i>	Daniel G. Colley <i>Centers for Disease Control</i>	Paul Harvey <i>Univ. of Oxford</i>	Norman L. Letvin <i>Beth Israel Deaconess Medical Center, Boston</i>	Danny Reinberg <i>Univ. of Medicine and Dentistry-New Jersey</i>	Derek van der Kooy <i>Univ. of Toronto</i>
Michael J. Bevan <i>Univ. of Washington</i>	Joseph A. Burns <i>Cornell Univ.</i>	F. Fleming Crim <i>Univ. of Wisconsin</i>	Martin Heimann <i>Max Planck Institute of Biogeochemistry, Jena</i>	Beth Israel Deaconess <i>Medical Center, Boston</i>	Janet Rossant <i>Univ. of Toronto</i>	Bert Vogelstein <i>Johns Hopkins</i>
SENIOR EDITORIAL BOARD						
John I. Brauman, Chair, <i>Stanford Univ.</i>	Philip H. Abelson, <i>AAAS</i>	Julian Downward <i>Imperial Cancer Research Fund</i>	Tasuku Honjo <i>Kyoto Univ.</i>	Richard Losick <i>Harvard Univ.</i>	Erkki Ruoslahti <i>The Burnham Institute</i>	Arthur Weiss <i>Univ. of California, San Francisco</i>
Joseph L. Goldstein, <i>Univ. of Texas Southwestern Med. Ctr.</i>	Richard Losick, <i>Harvard Univ.</i>	Hans Eklund <i>Swedish Univ. of Agricultural Sciences</i>	Evelyn L. Hu <i>Univ. of California, Santa Barbara</i>	Raul Madariaga <i>Ecole Normale Supérieure, Paris</i>	David G. Russell <i>Cornell Univ.</i>	Zena Werb <i>Univ. of California, San Francisco</i>
Robert May, <i>Univ. of Oxford</i>	Marcia McNutt, <i>Monterey Bay Aquarium Research Inst.</i>	Gerhard Ertl <i>Fritz-Haber-Institut, Berlin</i>	Herbert Jäckle <i>Max Planck Institute for Biophysical Chemistry, Göttingen</i>	George M. Martin <i>Univ. of Washington</i>	Terrence J. Sejnowski <i>The Salk Institute</i>	R. Sanders Williams <i>Univ. of Texas Southwestern Med. Ctr.</i>
Vera C. Rubin, <i>Carnegie Institution of Washington</i>	Christopher R. Somerville, <i>Carnegie Institution of Washington, Stanford</i>	Paul G. Falkowski <i>Rutgers Univ.</i>	Meyer B. Jackson <i>Univ. of Wisconsin Medical School</i>	Diane Mathis <i>Harvard Medical School</i>	Manfred Sigrist <i>ETH Hönggerberg, Zürich</i>	Ian A. Wilson <i>The Scripps Res. Inst.</i>
Yoshinori Tokura, <i>Univ. of Tokyo</i>	Gerhard Wegner, <i>Max Planck Inst. of Polymer Research, Mainz</i>	Douglas T. Fearon <i>Univ. of Cambridge</i>	Bernhard Keimer <i>Max Planck Inst. for Solid State Research, Stuttgart</i>	Andrew Murray <i>Harvard Univ.</i>	Susan Solomon <i>NOAA</i>	Richard A. Young <i>The Whitehead Inst.</i>
BOOK REVIEW BOARD						
David Bloom, <i>Harvard Univ.</i>	Michael S. Gazzaniga, <i>Dartmouth College</i>	Jeffrey S. Flier <i>Harvard Medical School</i>	Christian Körner <i>Botanisches Institut, Basel</i>	Elizabeth G. Nabel <i>NHLBI, NIH</i>	Edward I. Stiefel <i>ExxonMobil Research and Engineering</i>	Martin Zatz <i>NIMH, NIH</i>
Richard Schweder, <i>Univ. of Chicago</i>	Robert Solow, <i>Massachusetts Inst. of Technology</i>	Richard Fortey <i>The Natural History Museum, London</i>	Anne Krueger <i>Stanford Univ.</i>	Shigekazu Nagata <i>Osaka Univ. Medical School</i>	Cliff Tabin <i>Harvard Medical School</i>	Walter Ziegler-Schäfer <i>Max Planck Institute of Psychiatry, Munich</i>
David Voss, <i>Science</i>	Ed Wasserman, <i>DuPont</i>	Yves Frégnac <i>Unité de Neurosciences Intégratives et Computa- tionnelles, CNRS, Gif-sur-Yvette</i>		Roy R. Parker <i>Univ. of Arizona</i>		Maria Zuber <i>Massachusetts Inst. of Technology</i>

Finally, Efficient Intracellular Protein Delivery!



We have used the BioPORTER reagent to study the molecular mechanism of apoptosis and we are planning on using it to investigate host/pathogen relationships. BioPORTER reagent is a new and powerful tool in the functional genomics arsenal.

-Jacques Corbeil

Veterans Medical Research Foundation
Virology and Infectious Diseases Sections
UCSD

Thanks to the BioPORTER reagent, we are quickly getting into a very exciting phase of apoptosis research.

-John C. Reed

Burnham Institute.

BioPORTER™ Protein Delivery Reagent

- **Direct delivery of proteins, peptides, and various macromolecules into cells**
- **Fast and efficient**
- **Easy to use and stable**

BioPORTER protein delivery reagent is the first and only lipid-based protein delivery system that effectively translocates macromolecules into living cells.* BioPORTER makes proteins or peptides directly available to cellular processes without the need for transcription and translation. BioPORTER reagent interacts non-covalently with the protein or peptide of choice and forms a protective vehicle for immediate delivery into cells.

Now your protein or peptide can be directly available for a variety of studies like intercellular signaling pathways, cell cycle regulation, control of apoptosis, study of oncogenesis and transcription regulation. Call GTS today to speed up your functional protein studies with the BioPORTER protein delivery reagent.

* US and worldwide patents pending

BioPORTER™ Protein Delivery Reagent

24 reactions

Catalog # BP502401



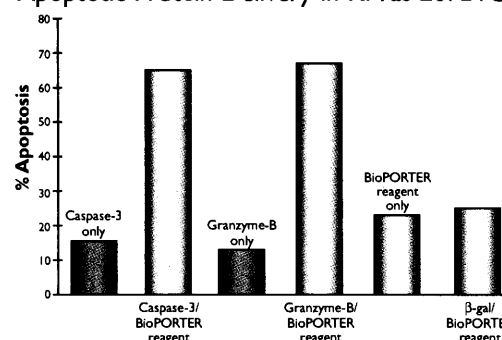
To Order: 888-428-0558

Fax: 858-623-9494

10190 Telesis Court, San Diego, CA 92121, USA

For more information and a list of distributors visit the Gene Therapy Systems web site @ <http://www.genetherapysystems.com>

Apoptotic Protein Delivery in Ki-ras 267B1 Cells



Granzyme B (450 ng), Caspase-3 (3.3 ng) or β-galactosidase (2 μg) were added to Ki-Ras 267 cells (prostate cancer) with or without BioPORTER reagent. 24 hours after protein delivery, cells were directly analyzed for apoptosis by flow cytometry using an Annexin V-FITC assay kit.

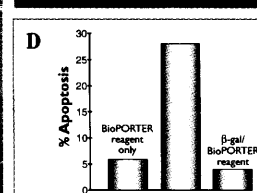
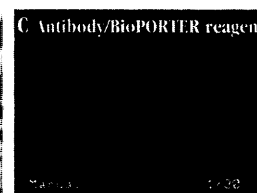


Fig. B/C FITC-Antibody or β-gal Delivery Into Mouse Fibroblasts
FITC-labeled antibody (2 μg) or β-gal (0.5 μg) were delivered with 2.5 μl of BioPORTER reagent into NIH/3T3 cells grown on coverslips in serum free conditions. Cells were examined 4 hours after protein delivery.

Fig. D Functional Granzyme-B Delivery Into Jurkat Cells
Granzyme-B (450 ng) or β-gal (1 μg) were delivered into cells growing in serum-free medium. 24 hours after protein delivery, cells were directly analyzed for apoptosis by flow cytometry using Annexin V-FITC.

MILLIPORE

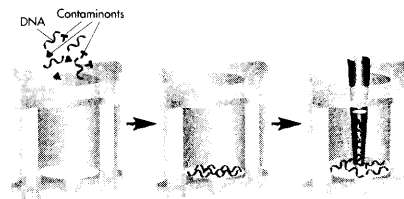


pure improvement

Introducing Montage™ Genomics Kits.

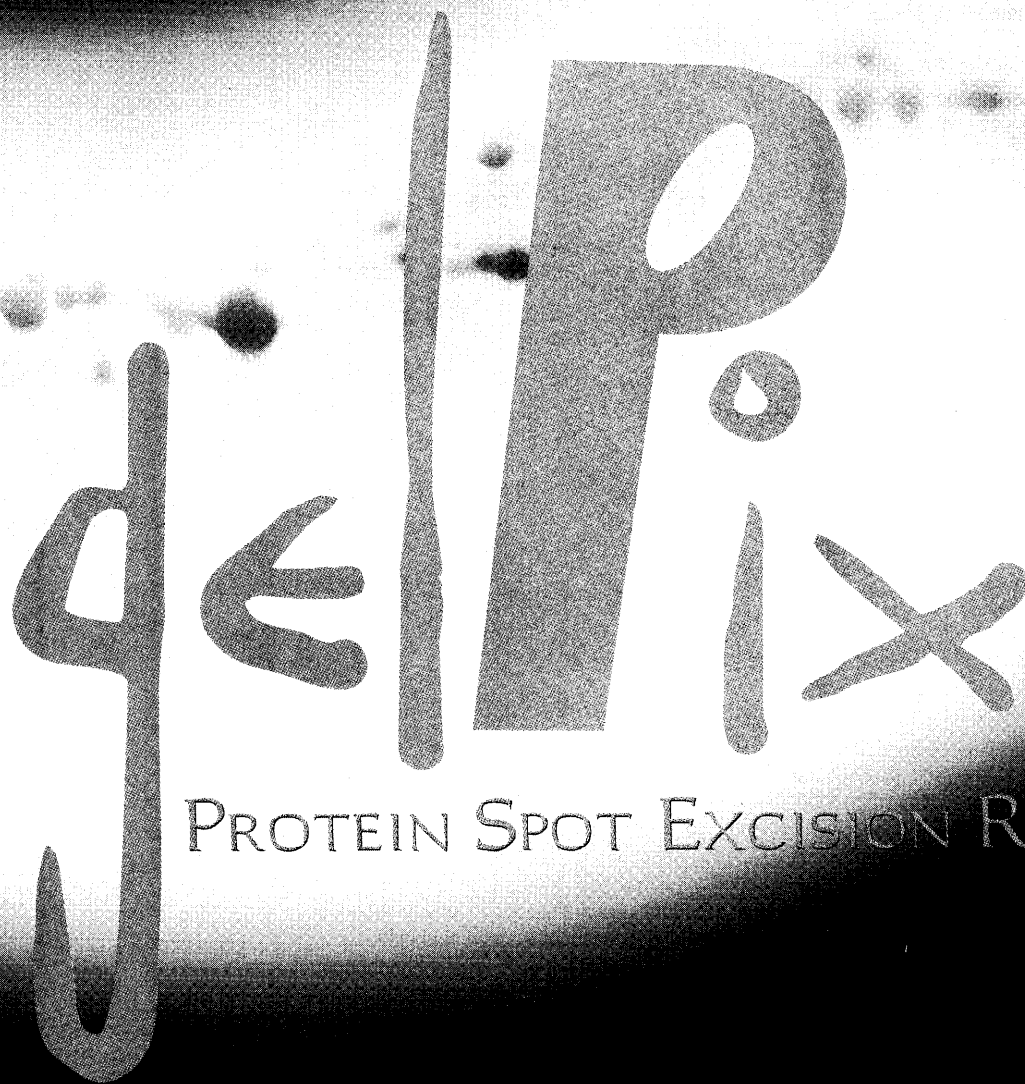
No binding. No eluting. No kidding.

New Montage PCR Cleanup and Plasmid Miniprep Kits deliver the high reproducibility and high recovery you're looking for — only faster. Our membrane-based, automation-friendly protocols save you steps, and time, with every sample. No centrifugation, no precipitation, and no solvents. You'll save money, too, with a significant price advantage compared to bind-wash-elute kits. How much faster and easier are Montage protocols than what you're using now? It won't cost a thing to find out. Visit www.millipore.com/montage or call us at 1-800-MILLIPORE to qualify for a free trial kit. In Europe, fax +33.3.88.38.91.95; in Japan, call 0120-63-3358.



Simply load, filter and recover.
Montage makes it quick and easy.

GENETIX AUTOMATED PROTEOMICS



Circle No. 2 on Readers' Service Card

www.genetixgroup.com

UK: +44 (0) 1425 624600

Fax: +44 (0) 1425 624700

US: +1-877 436 3849

Genetix Ltd, Queensway, New Milton, BH25 5NN, UK

GENETIX

The Fastest Way to Pure, Concentrated DNA after Enzymatic Reactions!

Restriction Enzymes

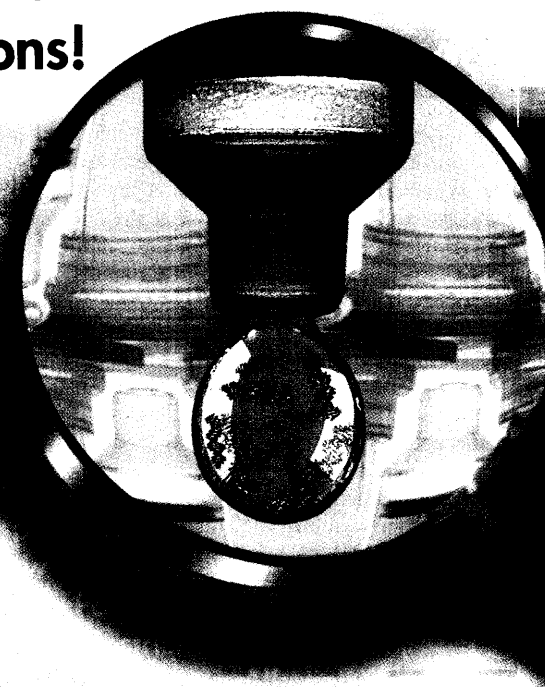
Ligase

Kinase

Reverse Transcriptase

ddp

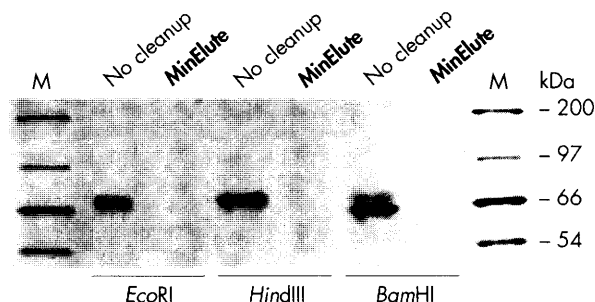
ALL YOUR ENZYME REACTIONS



New MinElute™ Reaction Cleanup Kits

- ◆ A breakthrough solution for DNA cleanup from all enzymatic reactions — complete removal of enzymes, salts, and oligomers
- ◆ Minimal elution volumes — just 10 µl Tris buffer or water
- ◆ High speed — purification in only 6 minutes
- ◆ High and reproducible DNA recovery — 80% of 70 bp to 4 kb fragments

Complete Removal of Enzymes



SDS-PAGE analysis of samples before (**No cleanup**) and after (**MinElute**) processing with the MinElute Reaction Cleanup Kit. Proteins were visualized by silver staining. **M**: protein markers.

To purify DNA in high concentrations from enzymatic reactions, order your MinElute Reaction Cleanup Kit today!

Trademarks: QIAGEN®, MinElute™ (QIAGEN). © 2001 QIAGEN, all rights reserved.

www.qiagen.com

Circle No. 22 on Readers' Service Card

QIAGEN:

Australia
Tel. 03-9489-3666
Fax 03-9489-3888

Canada
Tel. 800-572-9613
Fax 800-713-5951

France
Tel. 01-60-920-930
Fax 01-60-920-925

Germany
Tel. 02103-29-12400
Fax 02103-29-22022

Italy
Tel. 02-33430411
Fax 02-33430426

Japan
Tel. 03-5547-0811
Fax 03-5547-0818

Switzerland
Tel. 061-319-3031
Fax 061-319-3033

UK
Tel. 01293-422-999
Fax 01293-422-922

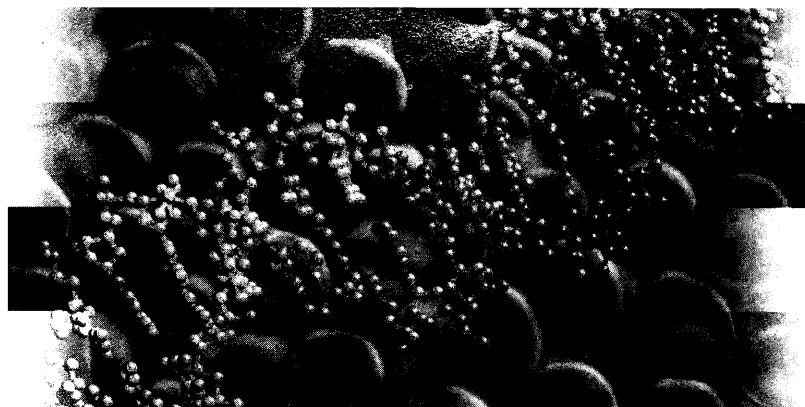
USA
Tel. 800-426-8157
Fax 800-718-2056

Distributors:

Argentina Tecnolab S.A. (011) 4555 0010 **Austria/Hungary/Slovenia** R. u. P. MARGARITELLA Austria (01) 889 18 19 **Belgium/Luxembourg** Westburg b.v. 0800-1-9815 **Brazil** Uniscience da Brasil 011 3622 2320 **China** Gene Company Limited (852) 2896-6283 **Cyprus** Scientronics Ltd (02) 765 416 **Czech Republic** BIOCONSULT spol. s.r.o. (02) 4447 1239 **Denmark** Merck Eurlab A/S 43 86 87 88 **Egypt** Clinilab 525 7212 **Finland** Merck Eurlab Oy (09) 804 551 **Greece** BioAnalytica S.A. (01)-640 03 18 **India** Genetix (011)-542 1714 or (011)-515 9346 **Israel** Westburg (Israel) Ltd. 08 66 50 813 or 1-800 20 22 20 **Korea** RS Laboratories, Inc. (02) 924-86 97 **Malaysia** Research Biolabs Sdn. Bhd. (03)-7312099 **Mexico** Quimica Volante S.A. de C.V. (5) 525 57 25 **The Netherlands** Westburg b.v. (033)-4950094 **New Zealand** Biolab Scientific Ltd. (09) 980 6700 or 0800 933 966 **Norway** Merck Eurlab AS 22 90 00 00 **Poland** Syngen Biotech Sp.z.o.o. (071) 351 41 06 or 0601 70 60 07 **Portugal** IZASA PORTUGAL, LDA (1)-424 73 64 **Singapore** Research Biolabs Pte Ltd 2731066 **Slovak Republic** BIOCONSULT Slovakia spol. s.r.o. (07) 50221 336 **South Africa** Southern Cross Biotechnology (Pty) Ltd (021) 671 5166 **Spain** IZASA, S.A. (93) 902.20.30.90 **Sweden** Merck Eurlab AB (08) 621 34 00 **Taiwan** TAIGEN Bioscience Corporation (02) 2880 2913 **Thailand** Theera Trading Co. Ltd. (02) 412-5672 **In other countries contact:** QIAGEN, Germany

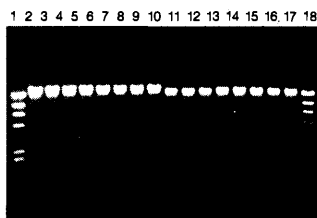


MERCK032001SWW

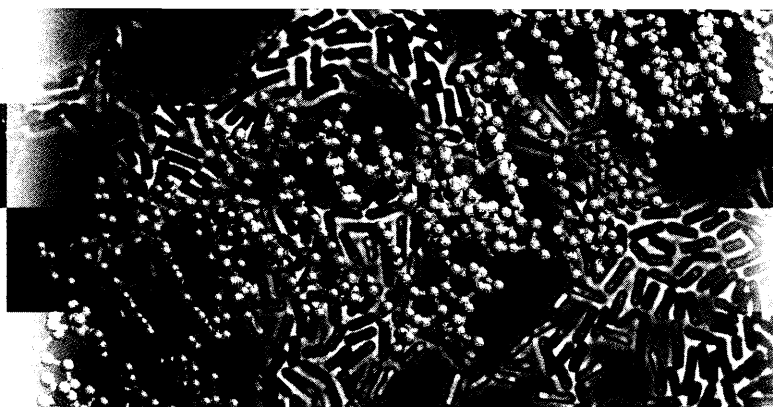


Perfect gDNA from Blood

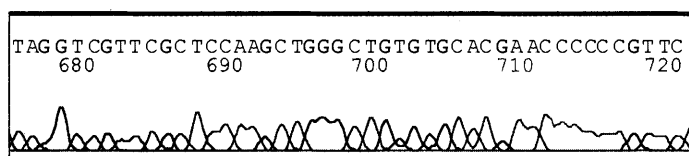
- Ultra-pure genomic DNA
- Extremely high-molecular weight DNA, with no degradation
- Suitable for long range PCR (up to 24 Kb)
- Consistent high yields
- Rapid, easy handling
- Wide range of applications, also for animal blood



● Yields obtained using the Eppendorf Perfect gDNA Blood Kit and from a competing product. 200 µl fresh human whole blood, 5 µl eluate volume applied.
 Lanes 1 and 18: λ Hind III Marker
 Lanes 2 to 9: Eppendorf gDNA Blood Kit
 Lanes 10 to 17: Competing kit

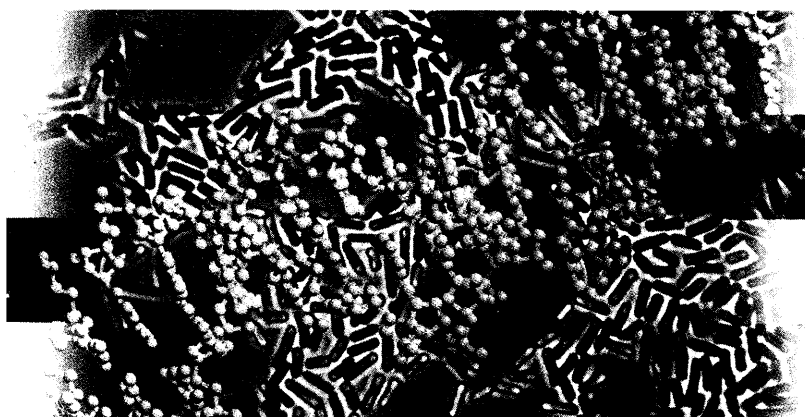


Perfectprep Plasmid 96 Vac Direct Bind



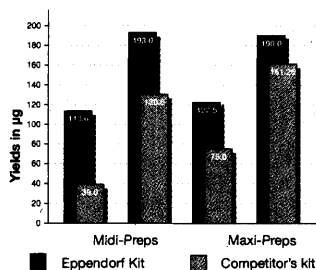
● Part of an ABI Model 3700 automated fluorescent DNA cycle sequencing of pUC19 prepared by the Perfectprep Plasmid 96 Vac, Direct Bind method. Phred Q > 20 = 701.

- Ultra-pure plasmid DNA in 96-well format
- Long read lengths with low error rate in sequencing reactions
- Reproducible high yields
- Very consistent elution volumes
- Rapid, easy handling: 96 samples in 30 minutes



Perfectprep® Plasmid

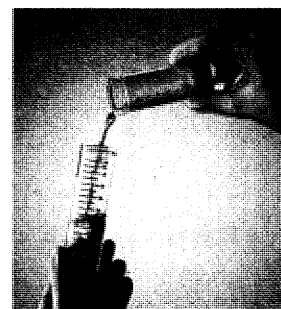
- Ultra-pure plasmid DNA in next to no time
- Consistent high yields
- Outstanding results in sensitive downstream applications (e.g. sequencing, cloning, transfection)
- Easy to handle
- Culture sizes from 1 ml to 800 ml



● Yields obtained using the Perfectprep Kit and a competitor's kit from different bacteria strains with high-copy and low-copy plasmids

Phase Lock Gel®

- Unique barrier simplifies the phenol/chloroform extraction
- Up to 30 % higher nucleic acid yields
- Simple pipetting or decanting of the aqueous DNA solution
- Reduced periods of contact with phenol vapors



eppendorf® is a registered trademark.

Application Hotline:
+49 180-366 67 89

eppendorf

In touch with life

Circle No. 5 on Readers' Service Card

Eppendorf AG · 22331 Hamburg · Germany · Phone +49 40-538 01-0 · Fax +49 40-538 01-556 · e-mail: eppendorf@eppendorf.com · Internet: www.eppendorf.com

Brinkmann Instruments, Inc. · One Cantlague Rd. · Westbury, NY 11590-0207 · Phone 800-645-3050 or 516-334-7500 · Fax 516-334-7506

e-mail: info@brinkmann.com · Internet: www.brinkmann.com

Instant Access

Your key to scholarly literature



Reference Manager[®] is the feature-rich writer's tool that saves you time organizing and preparing references for publication of your research. Now *Reference Manager* 9.5 gives you the key for two-way access between bibliographic management and the valuable literature search tools found in ISI[®] *eSource*[™] and ISI *Web of Science*[®]. Just use the new "Search ISI" tool to link, search and export references into *Reference Manager* with a single click. That way you'll spend more time researching and writing—and less time locating and importing references.

In addition to using the new "Search ISI" feature, you can search PubMed and Internet libraries worldwide to create databases instantly.

You will find citing and formatting manuscripts is a simple matter of point-and-click. Furthermore, the *Reference Manager* network edition is ideal for supporting research teams.



FREE Trial

Open the door to two-way access between scholarly literature and reference management. Download a Free Trial of *Reference Manager* 9.5 today at www.refman.com.

"It is highly recommended for anyone needing a powerful reference tool."
—*Science*, June 16, 2000

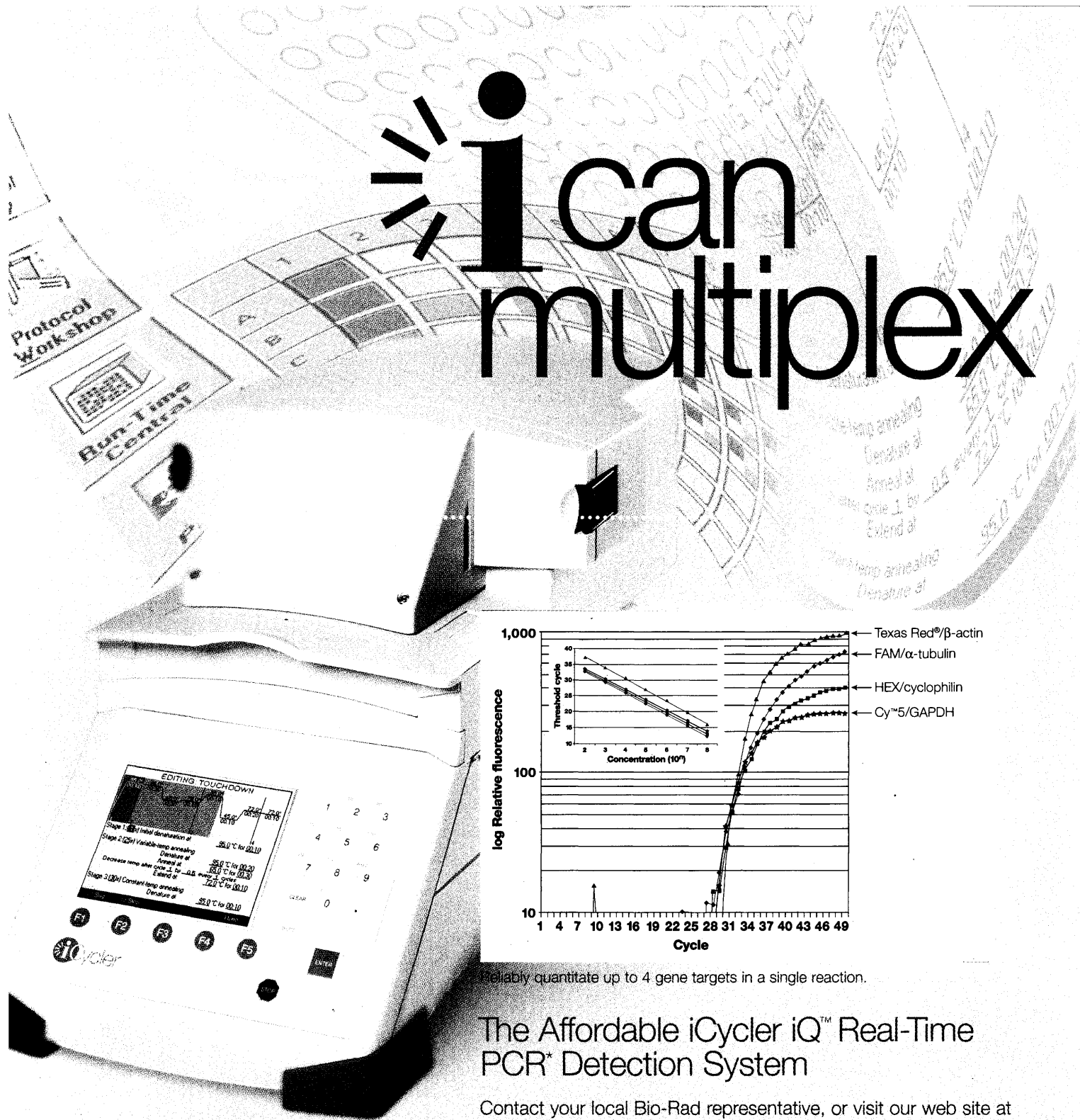
ISI RESEARCHSOFT

THOMSON SCIENTIFIC

Phone: 800-554-3049 • 510-559-8592 • Fax: 510-559-8683 • E-mail: info@refman.com • Web: www.refman.com

Circle No. 23 on Readers' Service Card

i can multiplex



Reliably quantitate up to 4 gene targets in a single reaction.

The Affordable iCycler iQ™ Real-Time PCR* Detection System

Contact your local Bio-Rad representative, or visit our web site at www.bio-rad.com/iCycler for more information.

*Practice of the patented polymerase chain reaction (PCR) process requires a license. The iCycler system includes a licensed thermal cycler and may be used with PCR licenses available from PE Corporation. Its use with authorized reagents also provides a limited PCR license in accordance with the label rights accompanying such reagents. Some applications may require licenses from other parties.

Cy is a trademark of Amersham Pharmacia International PLC. Texas Red is a trademark of Molecular Probes, Inc.

What Will You Discover Next?

Visit our Life Science web site at discover.bio-rad.com.

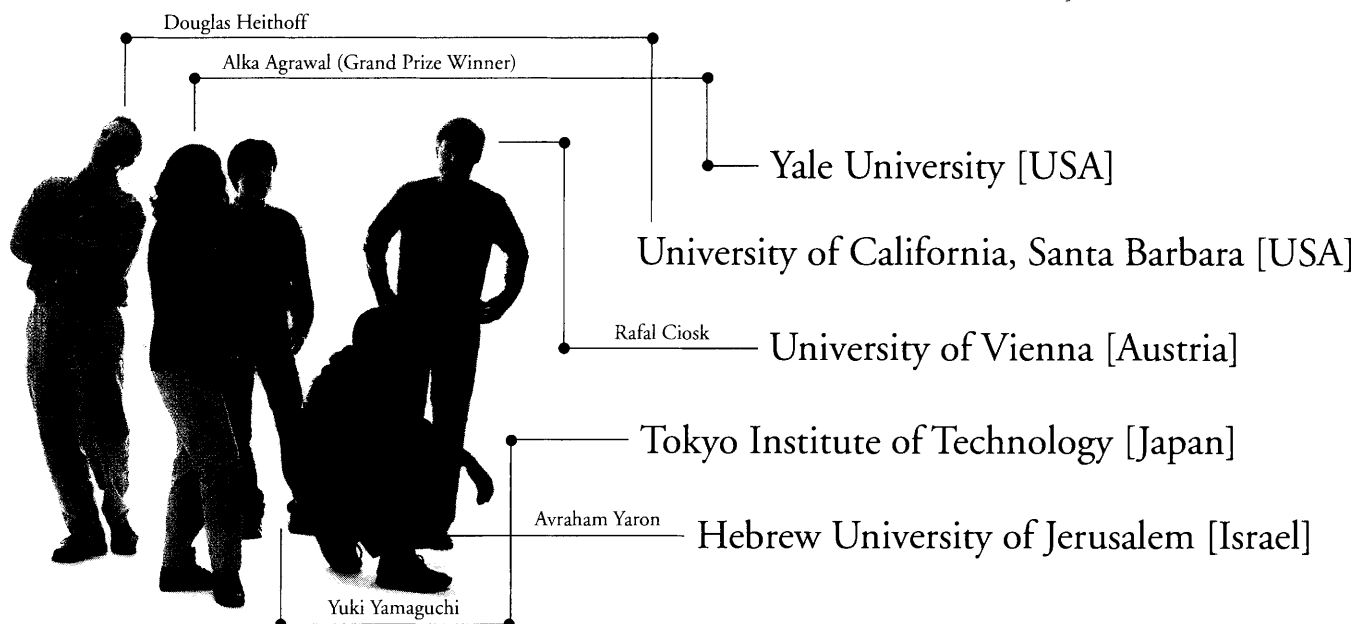
Call toll free at 1-800-4BIORAD (1-800-424-6723); outside the US, contact your local sales office.

BIO-RAD

Circle No.17 on Readers' Service Card

Award-winning

research completed at:



(PUT YOUR SCHOOL ON NEXT YEAR'S LIST.)

Did you complete your Ph.D. in molecular biology* in 2000? If so, then here's a chance to gain international acclaim for yourself and the research being conducted at your school. Just describe your work in a 1,000-word essay. Then submit the essay for entry into the 2001 Amersham Pharmacia Biotech & *Science* Prize.

The essay will be reviewed by a panel of distinguished scientists, who will then 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
- win a trip to attend the award ceremony

AMERSHAM PHARMACIA
BIOTECH & SCIENCE
Prize
FOR YOUNG
SCIENTISTS

All other winners will receive US\$5,000 and a trip to the award ceremony. Your essay may be submitted in English, French, German, Spanish, Japanese or Chinese (Mandarin). The closing date for entries is July 16, 2001. The Prize has existed since 1995 and is offered as a means to motivate students in the hope that they will continue their scientific research efforts.

Put your work (and face) in *Science*. Go to www.apbscienceprize.org where you can read the full details as well as submit your entry form. Or use the contact details (left) to find out more.

Young Scientist Prize Selection Committee
Science
1200 New York Avenue, NW
Room 1049B
Washington, DC 20005
USA

Young Scientist Prize Selection Committee
Science International
Bateman House
82-88 Hills Road
Cambridge, CB2 1LQ
UNITED KINGDOM

* 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).

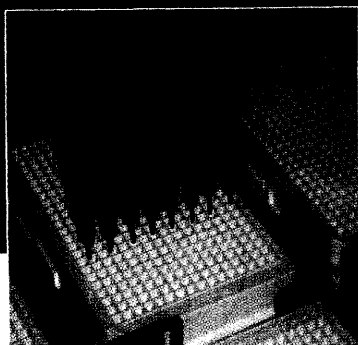
Science


amersham pharmacia biotech

Packard BioScience introduces eight new reasons for better liquid handling



MultiPROBE® II HT



**Packard's
eight tip robotic liquid handling
system offers...**

More Speed

- 8 independent liquid handling channels

More Flexibility

- Choice of deck size and capacity
- Choice of sampling probes including unique VersaTip®, capable of using disposable or fixed tips at any point in the assay
- WinPREP® applications software, easy-to-use graphical interface
- Compatible with vials, tubes, 96- and 384-well microplate and reagent reservoirs

More Applications

- High throughput screening
- Reformatting of screening hits
- Solid Phase Extraction
- Nucleic acid preparation

Please call, or visit our web site for more information on flexible liquid handling.



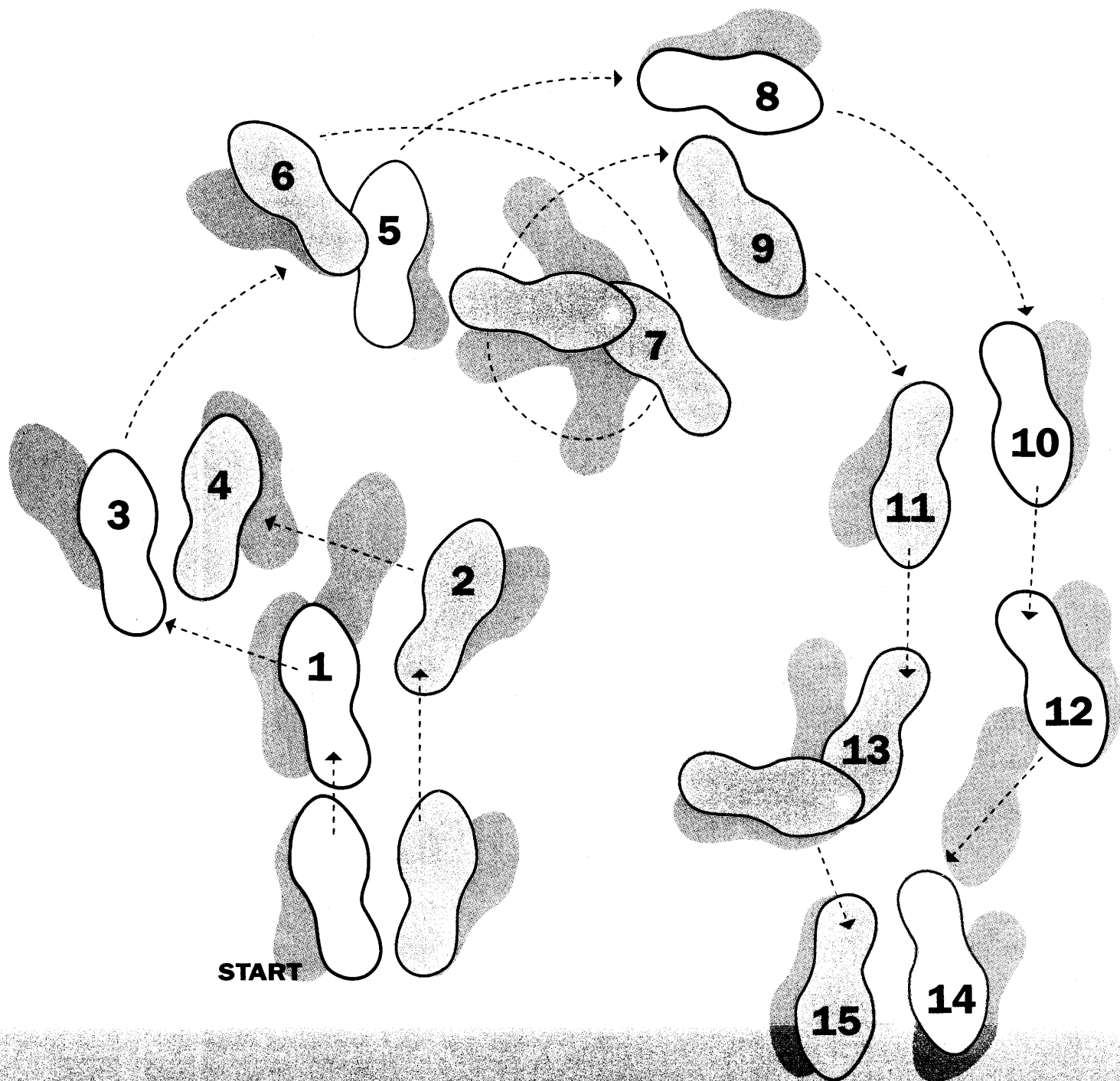
Packard BioScience Company
800 Research Parkway
Meriden, CT 06450 U.S.A.
Tel: 203-639-2598 Toll Free: 1-800-323-1891

For international offices visit our Web Site or contact the
Packard BioScience U.S.A. office.

M4446 (M3720-03)

www.packardbioscience.com

Circle No. 20 on Readers' Service Card



Apoptosis detection without getting tangled up in too many steps.

Promega's CaspACE[™] FITC-VAD-FMK In Situ Marker simplifies apoptosis determination... just add, wash, read. Fewer steps means your experiment works the first time, and every time.

Get 50% off a sample size now!

Go to www.promega.com/cellsig/vad1 for product and ordering details. It's just one of the many solutions Promega offers for apoptosis.

PROMEGA CORPORATION • www.promega.com

Made in the U.S. and other countries. Promega and the Promega logo are trademarks of Promega Corporation. ©2001 Promega Corporation. B2015-AD-CH

Circle No. 12 on Readers' Service Card



TENS OF THOUSANDS OF PREDICTED GENES

MORE THAN 150,000 TRANSCRIPTS AND PROTEINS

ONE COMPREHENSIVE EASY TO USE RESOURCE

Gencarta™

LEADS the way

Now that the draft of the human genome is complete, you need Gencarta to accelerate your post-genomic research. Gencarta turns expressed and genomic data into meaningful information. This comprehensive database — residing at your site and accessed by flexible query tools — includes novel splice variants, predicted proteins, a vast amount of high quality information and modeling of biological phenomena. LEADS™ advanced algorithms, augmented with strong lab validation, transform Gencarta into an accurate map of the Genome, Transcriptome and Proteome. So when novel knowledge and time to discovery count, Gencarta leads the way.

Evaluate Gencarta through a GeneGuide report at www.labonweb.com/GeneGuide

See us at:
AMERICAN SOCIETY OF GENE THERAPY
MAY 31-JUNE 2, SEATTLE, BOOTH 405
or contact us at (408) 730-2678

 **compugen**
www.cgen.com

Circle No. 9 on Readers' Service Card



The new Pan[®] E. coli Array.

Read the mysteries of life.

GENOMIC DISCOVERY

The new Pan[®] E. coli Array. Get microarrays that really work. 4289 gene specific oligonucleotide probes represent the complete *Escherichia coli* (K12) genome. Powerful interaction between proprietary bioinformatics and microarray technology guarantees 100% accuracy of data. Each oligonucleotide probe undergoes BLAST analysis to avoid cross reactivity. All probes are synthesized in unbeatable HPSF[®] quality and identity checked by MALDI-TOF mass spectrometry. Standardized quality control of all arrays by SYBR[®] Green I staining and random hybridization. Pan[®] Arrays are officially licenced by Affymetrix, Inc. Why not contact us to discuss your next DNA microarray project. www.mwg-biotech.com

**MWGAG
BIOTECH**

meeting life's challenges

Circle No. 4 on Readers' Service Card



At Toronto's Hospital for Sick Children, lovingly known as Sick Kids, genetic science leaves the lab and enters the real world: a world where some children are running out of time. Using high-performance data management, computing and visualization solutions designed by SGI, life scientists move quickly through mountains of genomic data to discover possible cures—and create hope. Dr. A. Jamie Cuticchia, head of bioinformatics at Sick Kids, stresses, "The identification and cure of genetic diseases is essential to the Sick Kids mission. Without supercomputer capabilities, our scientists would spend hours waiting." SGI gives research hospitals the power to find more answers, more quickly. And stay ahead. To learn more about SGI™ solutions, or for information on our services, consulting and support, visit our Web site.

www.sgi.com/ahead

sgi™
One step ahead

© 2001 Silicon Graphics, Inc. All rights reserved. Silicon Graphics is a registered trademark, and SGI, the SGI logo and One step ahead are trademarks, of Silicon Graphics, Inc.

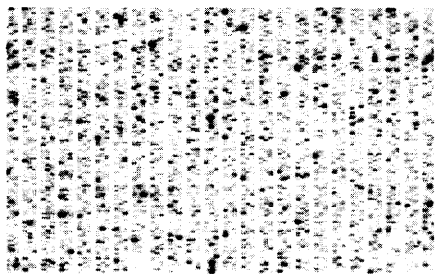
Circle No. 10 on Readers' Service Card



Plastic—A whole new world of array technology.

Atlas™ Plastic Human 8K Microarray

Illustration inspired by the art of Juan Gris (1887–1929) & Piet Mondrian (1872–1944).



Expression profiling of diabetic human skeletal muscle using the Atlas™ Plastic Human 8K Microarray. 10 µg of total RNA from diabetic human skeletal muscle tissue was isolated and labeled with ³²P using the Atlas™ Pure Total RNA Labeling System (#K1038-1). The probe was hybridized to the Atlas Plastic Human Array according to the User Manual.

If you are considering using plastic microarray technology, try our new Atlas™ Plastic Microarray Trial Kit (#K1845-1), which includes a plastic microarray spotted with long oligos representing 100 well-characterized human genes.

For more information, go to atlas.clontech.com.

Now you can screen all named human genes in a single experiment. The Atlas™ Plastic Human 8K Microarray (#7905-1) contains sequences from more than 8,300 named genes printed in duplicate on our new plastic support surface. Like our glass microarrays, we print our plastic microarrays with thoroughly tested long oligonucleotides (~80 bases) so that each spot's identity is confirmed. In addition, we have calibrated each microarray using calibration standards for the most accurate cross-lot comparisons.

Plastic provides many of the benefits of both our nylon and glass arrays, with some powerful new ones. Like glass, plastic arrays are nonporous, which greatly decreases nonspecific background. Like nylon arrays, these films require no special equipment for imaging (just a standard phosphorimager), and can be stripped and reprobed. As an added bonus, the rigid plastic retains its shape upon stripping and reprobing, which allows quick and easy template alignment for high-throughput image analysis.

Call and order today!

BD Biosciences

Clontech
Discovery Labware
Immunocytometry Systems
Pharmingen



BD Biosciences Clontech

Visit www.clontech.com or call (800) 622-2566 (CLON) to order



**The
BioImaging
Leader**

**Named
BEST
COMMERCIAL
SOFTWARE
by Cell Biologists***

* Survey of attendees at
the American Society for
Cell Biology Annual
meeting December 2000

Software and Systems for:

- 6-D Imaging
- Brightness Measurements
- Colocalization
- Fluorescence Recovery After Photobleaching (FRAP)
- Fluorescence Resonance Energy Transfer (FRET)
- Gene Chips & Microarrays
- Immunofluorescence
- Live/Dead Assays
- Green Fluorescent Protein
- Intracellular Calcium, pH & Magnesium
- Motion Analysis
- Morphometry
- Ratio Imaging
- Time Lapse And Many More...

Working
to Improve
Your
Image




UNIVERSAL IMAGING CORPORATION
Downingtown, PA USA 19335
sales@universal-imaging.com
1-610-873-5610
Contact us for a new free brochure


www.universal-imaging.com

Circle No. 7 on Readers' Service Card

**Discounted Scientific and
Technical Titles for Members
at the AAAS Bookstore**

Update your library at:
www1.fatbrain.com/AAAS



fatbrain.com 

A Barnes & Noble.com Company

**AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE**

© 2001 Fatbrain.com, Inc. Fatbrain.com and the
Fatbrain.com logo are trademarks of Fatbrain.com

 Cambridge Healthtech Institute's

**Beyond
Genome
2001**

June 17-22, 2001 • The Fairmont Hotel • San Francisco, CA

Tenth Annual

Bioinformatics and Genome Research

June 17-19, 2001

Topics to be covered:

Algorithms for Mining Gene Expression Data
Gene Prediction Methods
Using Bioinformatics to Find Useful Proteins
Identification of Regulatory Pathways

Third Annual

In Silico Biology

June 19-20, 2001

Topics to be covered:

Networks
Cells and Systems Modeling
Target Prioritization and Drug Development

Fifth Annual

Proteomics

June 21-22, 2001

Topics to be covered:

Protein-Protein Interactions
Protein Identification and Quantification
Protein Function and Annotation
Applications

Beyond Genome is a five-and-a-half day event covering a number of computational tools used in the analysis and correlation of genomic data. Over the past ten years, this event has grown from a single conference offering, into one of the most respected multiconference events in the industry. The first two days are dedicated to Bioinformatics and Genome Research, focusing on the computational advances necessary to comprehend the vast amount of information gathered through the Human Genome Project. Next, the In Silico Biology conference explores computational tools in development that translate raw data into workable models or simulations, providing guidance for target selection. The final portion of this event concentrates on Proteomics, offering in-depth coverage of the high-throughput protein expression analysis and characterization field, as well as its impact on diagnostic and therapeutic product development. Researchers and executives interested in discovering how these computational methods will help them make sense of genomic data should clear their schedules to attend CHI's Beyond Genome 2001.

For conference information or to register online log on
to: www.beyondgenome.com.

**Genome 2002
Tri-Conference**

Save the date for Cambridge Healthtech Institute's

Genome Tri-Conference 2002!

February 23-March 1, 2002

Santa Clara Convention Center

Santa Clara, California

www.genometriconference.com