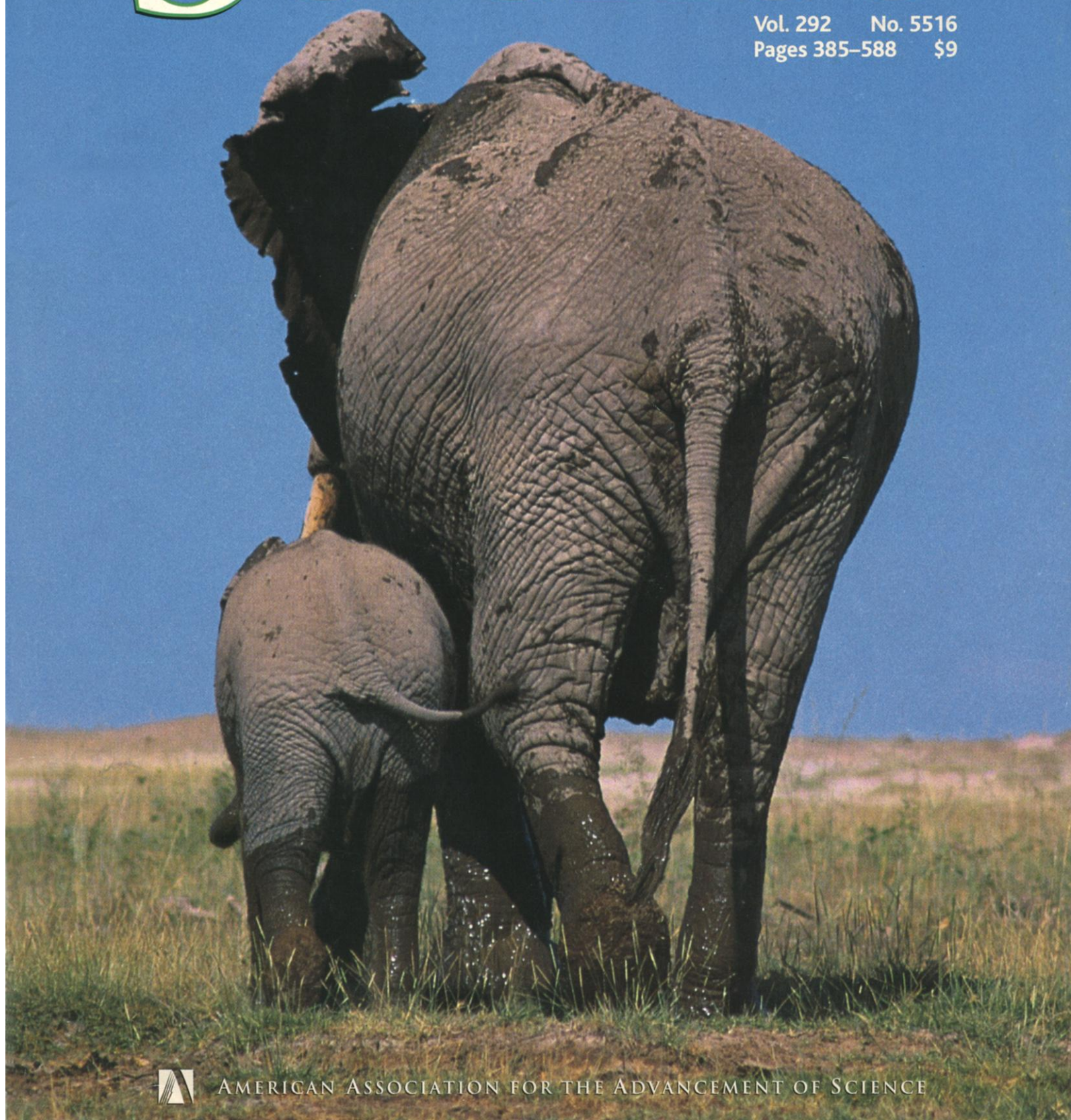


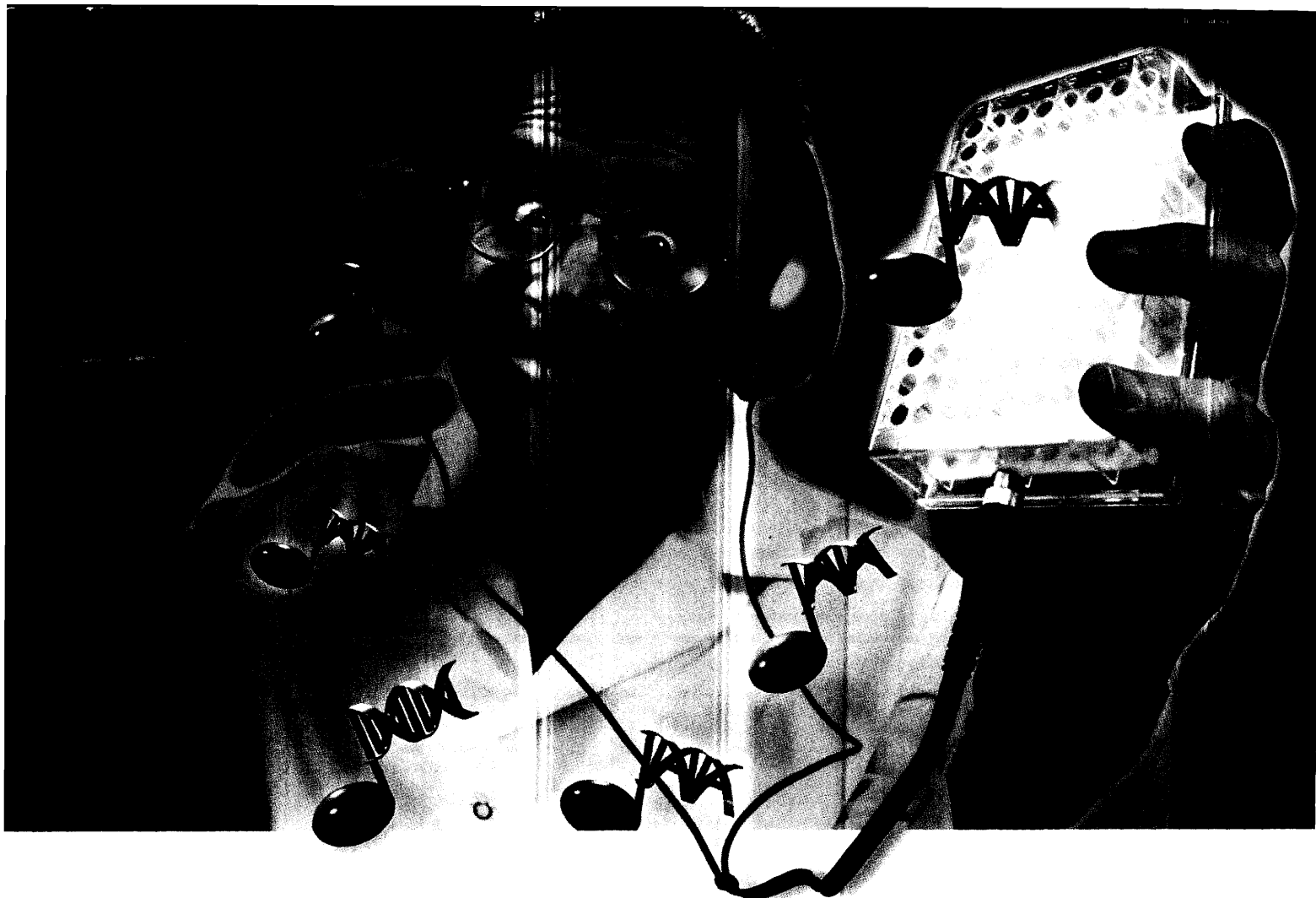
20 April 2001

Science

Vol. 292 No. 5516
Pages 385-588 \$9



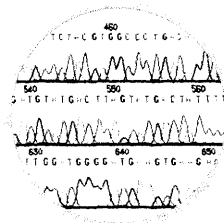
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



No alkaline lysis or cell harvesting ...that's music to your ears. Fast, easy plasmid purification with CONCERT™ 96.

For rapid, simple high-throughput DNA isolation, the CONCERT™ 96 Plasmid Purification System is music to your ears. Get purified plasmids from up to 96 samples at the same time, without all the hassles of alkaline lysis or cell harvesting.

Quick, easy protocol. Save time and labor by eliminating the numerous steps associated with cell harvesting and alkaline lysis. With CONCERT™ 96, simply load bacterial cultures directly onto the purification matrix. In just 45 minutes you'll have your plasmid.



High-quality capillary sequencing data from templates produced using CONCERT™ 96.

Superior sequencing results. Templates isolated using CONCERT™ 96 produce high-quality sequencing data and increased read lengths. That means you'll get more of the valuable information you need out of each experiment. Whether you're doing automated sequencing, PCR, restriction digests, or cloning,

CONCERT™ 96 is the system for you. *For rapid plasmid purification with superior results try CONCERT™ 96. Tune in to Invitrogen today.*



Circle No. 22 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 5288
Fax: 1 760 603 7229
Email: tech.service@invitrogen.com

European Headquarters:
Invitrogen Ltd
3 Fountain Drive
Inchinnan Business Park
Paisley PA4 9RE, 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 5411 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 11 572 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

It's Like Screening **29** Libraries in One 96-Well Plate!

Cloning Matrix™ System FOR THE HUMAN UNIVERSAL cDNA LIBRARY

The Cloning Matrix™ System for the Human Universal cDNA Library (HUCL)* allows you to screen this highly normalized library representing 29 different tissues and find your clone with only two PCR steps! First you run a set of PCR reactions from the 96-well plate of DNA pools to identify the 384-well plate that contains your clone. Your second set of PCR reactions shows you the location of your clone in the 384-well plate. That's all! It's much faster than hybridization and more accurate than RT-PCR, without radioactivity.

The easy-to-use Cloning Matrix system uses the high-quality HUCL collection of primary clones, extensively normalized to ensure that you can isolate even a rare, unknown or low-abundance gene. And, your final clone is not a PCR product but a cDNA clone that has been individually picked and cultured in your microwell plate from the original library.

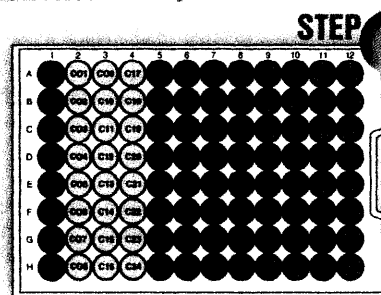
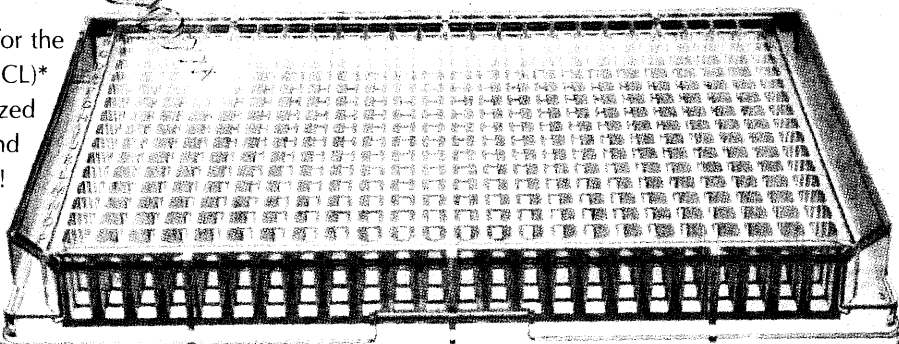
- **Same-day results**
- **Faster than hybridization**
- **More accurate than RT-PCR**
- **No radioactivity or hybridization**
- **29 different human tissues represented on one plate**
- **Average cDNA insert size of 1.7 kb with 50% full length genes**

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

* Purchase of these products includes a limited license to use these products for research purposes. For information on commercial use licenses, please contact Stratagene's Product Manager for Libraries at 800-894-1304



STEP 1

Screen the Master Plate

Run PCR reactions from the 96-well master plate to identify positive PCR results.

Identify plate containing your clone using online Cloning Matrix system software.

C001	C009	C17	S01	S09	S17	S25	S01	S09	S17	S25
C002	C10	C18	S02	S10	S18	S26	S02	S10	S18	S26
C003	C11	C19	S03	S11	S19	S27	S03	S11	S19	S27
C004	C12	C20	S04	S12	S20	S28	S04	S12	S20	S28
C005	C13	C21	S05	S13	S21	S29	S05	S13	S21	S29
C006	C14	C22	S06	S14	S22	S30	S06	S14	S22	S30
C007	C15	C23	S07	S15	S23	S31	S07	S15	S23	S31
C008	C16	C24	S08	S16	S24	S32	S08	S16	S24	S32

STEP 2

Identify Your Clone of Interest

Run a set of 40 PCR reactions from the 384-well plate to locate your clone.



Start Your Analysis

Finding your clone is easy
with the
Cloning Matrix™ System

Circle No. 39 on Readers' Service Card

For more information visit our website
www.stratagene.com

Cloning Matrix™ System for the Human Universal cDNA Library #937840



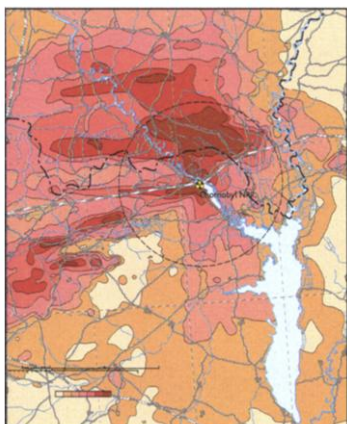
Science

Volume 292 20 April 2001

Number 5516

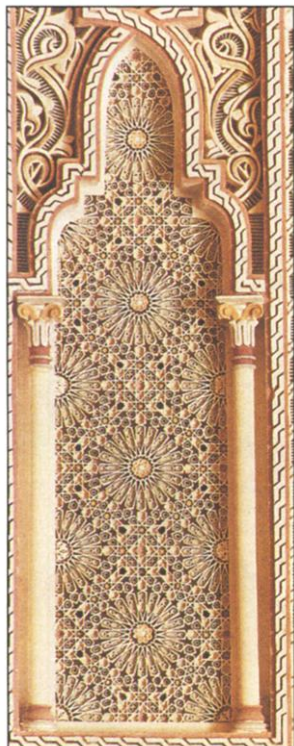
391 **SCIENCE ONLINE**
393 **THIS WEEK IN SCIENCE**
397 **EDITORIAL**
Erik Parens and Eric
Juengst
*Inadvertently Crossing the
Germ Line*

399 **EDITORS' CHOICE**
403 **NETWATCH**
406 **CONTACT SCIENCE**
515 **TECH.SIGHT/NEW PRODUCTS**
Genome Sequencing



420

15 years after the
explosion



445

Algorithmic beauty

NEWS

NEWS OF THE WEEK

- 410 **EPIDEMIOLOGY: Intensified Battle Against Foot and Mouth Appears to Pay Off**
- 411 **UNIVERSITY OF ROCHESTER: Researcher Sues After School Spent His Grant**
- 411 **X-RAY CRYSTALLOGRAPHY: Transcription Enzyme Structure Solved**
- 413 **SCIENCESCOPE**
- ▼ 414 **ECOLOGY: Birds Weigh Risk Before Protecting Their Young**
494
- 414 **MICROARRAYS: Data Standards on the Horizon**
- 415 **STEM CELLS: NIH Pulls Plug on Ethics Review**
- 416 **JAPAN: Women Academics Propose Steps to Equity**
- 416 **WORKFORCE DIVERSITY: NSF Makes the BEST of a Good Idea**

▼ 417
491

BEHAVIORAL ECOLOGY: Elephant Matriarchs Tell Friend From Foe

▼ 419
472

QUANTUM COMPUTING: Souped-Up Software Gets a Virtual Test

NEWS FOCUS

- 420 **NUCLEAR RADIATION: Living in the Shadow of Chernobyl**
Genetic Studies of Wildlife in the Hot Zone Reach Different Conclusions
Dealing With a Slumbering Hulk
Ordeals of a Dissenter
Rewards of a Volunteer
- 426 **CELL BIOLOGY: Do Centrosome Abnormalities Lead to Cancer?**
- 429 **DEVELOPMENTAL BIOLOGY: The Hottest Stem Cells Are Also the Toughest**
- 431 **RANDOM SAMPLES**

SCIENCE'S COMPASS

437 LETTERS

Proposed Research Budget a Starting Point P. G. Rogers. **Marine Iguanas Oiled in the Galápagos** M. Wikelski, L. M. Romero, H. L. Snell. **Removing CO₂ from Lake Nyos in Cameroon** M. Halbwachs and J.-C. Sabroux. **Mutation in Embryonic Stem Cells** L. Rocanova, P. Ramphal, P. Rappa III. **Response** C. B. Harley, J. S. Lebkowski, M. K. Carpenter, T. B. Okarma. **More About Duikers in Ancient Egypt** D. V. Flores

▼ 449
464
468

SIGNAL TRANSDUCTION: How Do Cells Sense Oxygen? H. Zhu and H. F. Bunn

▼ 452
461

BOSE-EINSTEIN CONDENSATION: A New Trick of the Trade M. Inguscio

▼ 453
498
501

MOLECULAR BIOLOGY: Invading the Genetic Code A. Böck

455

RETROSPECTIVE: Claude E. Shannon (1916–2001) S. W. Golomb

POLICY FORUM

- 443 **BIOMEDICINE: The NASA-NCI Collaboration on Biomolecular Sensors** D. S. Goldin, C. A. Dahl, K. L. Olsen, L. H. Ostrach, R. D. Klausner

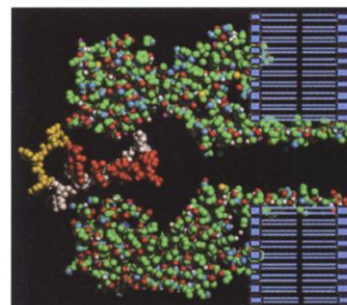
BOOKS ET AL.

- 445 **MATHEMATICS AND ART: Arabesques** *Decorative Art in Morocco* J.-M. Castéra, reviewed by G. Buck
- 446 **Nota Bene** A Last Hurrah and New Directions

PERSPECTIVES

- 447 **PHOTOSYNTHESIS: Splitting Water** G. C. Dismukes
- ▼ 448 **ECOLOGY: The Advantages of Togetherness**
504 E. Cox and J. Bonner

DNA sequencing
in nanopores **515**



RESEARCH

RESEARCH ARTICLES

- ▼ 461
452 **A Bose-Einstein Condensate of Metastable Atoms** A. Robert, O. Sirjean, A. Browaeys, J. Poupard, S. Nowak, D. Boiron, C. I. Westbrook, A. Aspect

- ▼ 464
449 468 **HIF α Targeted for VHL-Mediated Destruction by Proline Hydroxylation: Implications for O₂ Sensing** M. Ivan, K. Kondo, H. Yang, W. Kim, J. Valiando, M. Ohh, A. Salic, J. M. Asara, W. S. Lane, W. G. Kaelin Jr.

- ▼ 468
449 464 **Targeting of HIF- α to the von Hippel-Lindau Ubiquitylation Complex by O₂-Regulated Prolyl Hydroxylation** P. Jaakkola, D. R. Mole, Y.-M. Tian, M. I. Wilson, J. Gielbert, S. J. Gaskell, A. von Kriegsheim, H. F. Hebestreit, M. Mukherji, C. J. Schofield, P. H. Maxwell, C. W. Pugh, P. J. Ratcliffe

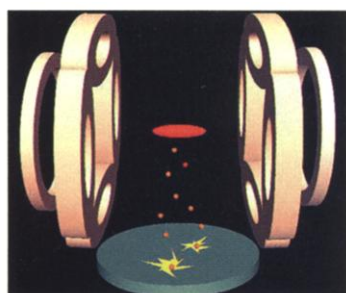
REPORTS

- ▼ 472
419 **A Quantum Adiabatic Evolution Algorithm Applied to Random Instances of an NP-Complete Problem** E. Farhi, J. Goldstone, S. Gutmann, J. Lapan, A. Lundgren, D. Preda

- 476 **Observation of Vortex Lattices in Bose-Einstein Condensates** J. R. Abo-Shaeer, C. Raman, J. M. Vogels, W. Ketterle

- 479 **Self-Assembly of Subnanometer-Diameter Single-Wall MoS₂ Nanotubes** M. Remskar, A. Mrzel, Z. Skraba, A. Jesih, M. Ceh, J. Demšar, P. Stadelmann, F. Lévy, D. Mihailovic

- 481 **Probing the Structure of Metal Cluster-Adsorbate Systems with High-Resolution Infrared Spectroscopy** K. Nauta, D. T. Moore, P. L. Stiles, R. E. Miller



461
Condensing a cloud of metastable helium

- 484 **Imaging of Small-Scale Features on 433 Eros from NEAR: Evidence for a Complex Regolith** J. Veverka, P. C. Thomas, M. Robinson, S. Murchie, C. Chapman, M. Bell, A. Harch, W. J. Merline, J. F. Bell III, B. Bussey B. Carcich, A. Cheng, B. Clark, D. Domingue, D. Dunham, R. Farquhar, M. J. Gaffey, E. Hawkins, N. Izenberg, J. Joseph, R. Kirk, H. Li, P. Lucey, M. Malin, L. McFadden, J. K. Miller, W. M. Owen Jr., C. Peterson, L. Prockter, J. Warren, D. Wellnitz, B. G. Williams, D. K. Yeomans

- 488 **Laser Altimetry of Small-Scale Features on 433 Eros from NEAR-Shoemaker** A. F. Cheng, O. Barnouin-Jha, M. T. Zuber, J. Veverka, D. E. Smith, G. A. Neumann, M. Robinson, P. Thomas, J. B. Garvin, S. Murchie, C. Chapman, L. Prockter

- ▼ 491
417 **Matriarchs As Repositories of Social Knowledge in African Elephants** K. McComb, C. Moss, S. M. Durant, L. Baker, S. Sayialel

- ▼ 494
414 **Fecundity-Survival Trade-Offs and Parental Risk-Taking in Birds** C. K. Ghalambor and T. E. Martin

- ▼ 498
453 501 **Expanding the Genetic Code of *Escherichia coli*** L. Wang, A. Brock, B. Herberich, P. G. Schultz

- ▼ 501
453 498 **Enlarging the Amino Acid Set of *Escherichia coli* by Infiltration of the Valine Coding Pathway** V. Döring, H. D. Mootz, L. A. Nangle, T. L. Hendrickson, V. de Crécy-Lagard, P. Schimmel, P. Marlière

- ▼ 504
448 **Cooperation and Competition in the Evolution of ATP-Producing Pathways** T. Pfeiffer, S. Schuster, S. Bonhoeffer

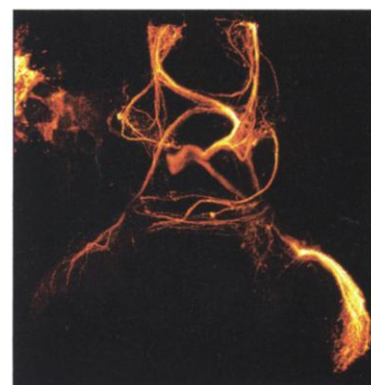
- 507 ***astray*, a Zebrafish *roundabout* Homolog Required for Retinal Axon Guidance** C. Fricke, J.-S. Lee, S. Geiger-Rudolph, F. Bonhoeffer, C.-B. Chien

- 510 **Fast Backprojections from the Motion to the Primary Visual Area Necessary for Visual Awareness** A. Pascual-Leone and V. Walsh



COVER 491

Female African elephants and their dependent offspring live in matrilineal groups led by the oldest female, or matriarch. Research reveals that group members are dependent on the matriarch for their store of social knowledge. The removal of these key individuals, often targets for illegal hunters because of their large size, could have serious consequences for the conservation of this endangered species. [Photo: K. McComb]



507
Chaos at the optic chiasm

Silent earthquake in the Pacific Northwest 391

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.



OLIGO Wherever you WANNA GO

Want to perform effective and economical oligo synthesis at either small or large-scale? Want one system for research, process development and production? Want to be assured of compliance as you go? Then you'll want ÄKTA™ oligopilot™.

The most flexible DNA/RNA synthesizer ever:

ÄKTA oligopilot

New ÄKTA oligopilot is available in two versions: one for low-scale synthesis ranges (1 - 50 μ mol), a second for larger scales (50 μ mol - 4 mmol). And a conversion kit is available to allow you to upgrade the low-scale system into the large-scale one.

Both systems employ our exceptional flow-through reactor technology, so you are assured of economical, fast and easily scalable synthesis processes. Both allow you to use up to ten different monomers and to automate the synthesis of up to seven different oligos sequentially. Both give you on-line UV and conductivity monitoring and use control software that was specifically developed for use in regulated environments. What's more, both are backed by our regulatory support IQ/OQ documentation and services, which can help save months during validation.

So now you can take your oligo wherever you want to go.

Visit www.apbiotech.com/aktaoligopilot for more information.

Or call your local representative.



Scienceonline

www.scienceonline.org

CONTENT HIGHLIGHTS AS OF 20 APRIL 2001

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

sciencenow

www.sciencenow.org

NOW!

science magazine www.sciencemag.org

SCIENCE EXPRESS www.sciencexpress.org

A Silent Slip Event on the Deeper Cascadia Subduction Interface

H. Dragert, K. Wang, T. S. James

Aseismic slip along the Cascadia subduction zone, inferred from geodetic data, may trigger a reassessment of seismic hazard in the Pacific Northwest.

A GDP/GTP Exchange Factor Involved in Linking a Spatial Landmark to Cell Polarity

P. J. Kang, A. Sanson, B. Lee, H.-O. Park

A signaling protein, Bud5, is found to be crucial for yeast cells in linking polarity markers in the membrane to the selection of new bud sites.

Structural Basis of Transcription: RNA Polymerase II at 2.8 Å Resolution P. Cramer, D. A. Bushnell, R. D. Kornberg

Structural Basis of Transcription: An RNA Polymerase II Elongation Complex at 3.3 Å Resolution A. L. Gnatt, P. Cramer, J. Fu, D. A. Bushnell, R. D. Kornberg

411 High-resolution structures of yeast RNA polymerase II—both in its inactive state and in the act of transcription—provide insight into how the enzyme transcribes DNA into messenger RNA.

science's stke

www.stke.org

Perspective: A New Role for Protein Methylation—Switching Partners at the Phosphatase Ball M. Mumby

A posttranslational modification that regulates signal transduction.

science's next wave

www.nextwave.org

Canada: Picking Stocks—Other Helpful Sites C. Boulakia

In this month's "Personal Finances for Scientists" column, we visit several Web sites that just might help you pick a winning stock.

Canada: Peer Review for Novices L. McKarney

How graduate students and postdocs can benefit from the journal peer review process.

US: Behavioral Style: Understanding Communication Styles Can Advance Your Relationships—and Your Career Prospects, Part 2 D. Jensen

Mix two different behavioral styles together and a reaction occurs—that's the science of interpersonal chemistry.

US: Butting Heads—Conflict Resolution for Postdocs, Part 2 A. Agrawal

The ombudsman: a resource that can help postdocs and other members of the research community deal with conflict at an informal stage.

UK: Absent with Leave P. H. Dee

Research going nowhere? Then run away! A visit to another lab to learn a new technique can widen your horizons and get your project moving again.

GrantsNet
www.grantsnet.org
RESEARCH FUNDING DATABASE

NeuroAIDS
www.sciencemag.org/NAIDS
EXPERIMENTAL WEB SITE

ONLINE STAFF

SCIENCE NOW 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 McKarney (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 Hartman; ASSISTANT PRODUCTION MANAGER Wendy Stengel; SENIOR PRODUCTION ASSOCIATE Lisa Stanford; ASSOCIATES Carla Cathey, Mark Croatti, Robert Owens, Louis Williams

ADDITIONAL RESOURCE

SCIENCECAREERS.ORG

Job Alerts e-mails: Specify the criteria of the type of job you're looking for, then let Job Alerts do the looking. Once a week, when the job postings are updated, you'll receive an e-mail with all of the job postings that meet your criteria.

ADDITIONAL RESOURCE

AD SUPPLEMENT / IN THIS ISSUE

SPECIAL FEATURE

Careers & Events in Drug Discovery:

This ad supplement examines the types of career opportunities in drug discovery and outlines the skills needed for these jobs. Look for it on page 527.

LAB TECHNOLOGY TRENDS

AD SUPPLEMENT / 4 MAY ISSUE

LAB TECHNOLOGY TRENDS

Technologies in DNA Chips and Microarrays, Part 1: This ad supplement

takes an in-depth look at this leading-edge area that allowed researchers to complete a working draft of the human genome in remarkably short time. Look for it in the 4 May issue.





Sprint into PCR.

CLONTECH Sprint™ Advantage™ 2 PCR

Illustration inspired by the art of Pablo Picasso (1882–1973).

- 96-well PCR in a fraction of the time
- High sensitivity, fidelity & yields for all PCR applications
- Worry-free, room temperature storage
- Flexible format—plates separate into four sets of 24 wells
- No Mg²⁺ optimization—a clear Advantage

High-throughput PCR has just gotten easier...and faster! The new **CLONTECH Sprint™ Advantage™ 2 HT Plate** (#K1950-1) provides our most robust polymerase mix, Advantage™ 2, in a revolutionary 96-well format. Each well of the plate contains a complete lyophilized master mix of TITANIUM™ Taq, TaqStart™ Antibody, a proofreading enzyme, an optimized buffer, and dNTPs. Simply add your diluted primers and DNA, resuspend, and go directly to PCR! Since their introduction, our Advantage Polymerase Mixes have given you all the advantages of high fidelity, sensitivity, and yield. Now the CLONTECH Sprint HT Plate format gives you those same advantages in a fraction of the time. With such time-consuming applications as high-throughput cloning, long and accurate PCR, RACE, cDNA library construction, and preparative PCR, can you afford to wait any longer?

Circle No. 38 on Readers' Service Card

Austria: BD CLONTECH Austria • Tel: 01 310 6688 Fax: 01 310 7744
Germany & East Europe: BD CLONTECH Germany • Tel: 06221 3417 0 Fax: 06221 303511
Japan: CLONTECH Japan Laboratories Ltd. • Tel: 03 5324 9609 Fax: 03 5324 9636
Switzerland: BD CLONTECH Switzerland • Tel: 061 48522 84 Fax: 061 48522 86
United Kingdom: BD CLONTECH UK • Tel: 01256 476500 Fax: 01256 476499

BD Offices/Distributors: Australia: 02 8875 7000 ■ Belgium/Luxembourg: 053 720 550 ■ Brazil: 11 66940539
Canada: Now call CLONTECH direct • 800 662 2566 ■ Chile: 02209 6770 ■ China: 10 6418 1608
Czech Republic: 019 7265214 ■ Denmark: 434 345 66 ■ Egypt: 349 8311 ■ Finland: 09 8870 780 ■ France: 01 34 602424
Greece: 01 51 53882 ■ Hong Kong: 02575 8668 ■ Hungary: 01 280 3728 ■ India: 91 124 6383566 to 77
Israel: 04 9960595 ■ Italy: 02 48 24 01 ■ Korea: 02 3404 3770 ■ Malaysia: 03 757 1323 ■ Mexico: 525 281 4718
The Netherlands: 020 582 94 20 ■ Norway: 46 018 77 55 110 ■ Philippines: 63 2 807 6073 ■ Poland: 49 6221 3417 0
Portugal: 121 361 3620 ■ Singapore: 0860 1475 ■ South Africa: 021 671 5166 ■ Spain: 91 848 8185
Sweden: 08 77 55 110 ■ Taiwan: 02 2722 5660 ■ Thailand: 662 643 1371 ■ Turkey: 0216 385 8321 rev. 01/16/01

CLONTECH

N O W Y O U C A N .

1020 East Meadow Circle, Palo Alto, California 94303 USA
Tel: 800-662-2566 (CLON) 650-424-8222 • Fax: 800-424-1350 650-424-1088
E-mail: products@clontech.com orders@clontech.com • Internet: www.clontech.com

© 2001, CLONTECH Laboratories, Inc.

(AD13485)

THIS WEEK IN Science

edited by Phil Szuromi

Eros: A Beaten Asteroid

The NEAR-Shoemaker spacecraft has mapped the asteroid 433 Eros for about 1 year. In October 2000, the spacecraft completed a close-approach to the asteroid surface and obtained images with a resolution of 1 to 5 meters with the multispectral imager (Veverka *et al.*, p. 484) and collected complimentary topographic details with the laser range-finder (Cheng *et al.*, p. 488). The fine-scale observations include meter-sized blocks, degraded craters, smooth, flat-floored craters, a lack of small craters, and evidence for linear fractures. These features suggest that Eros has a complex regolith produced by multiple impact events in which the size and strength of the impactors varied to produce its heterogeneous surface character.

An Excited Bose-Einstein Condensate

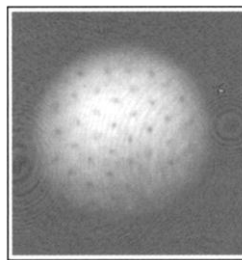
The formation of a Bose-Einstein condensation (BEC), whether as a liquid in the case of helium (He) or as weakly interacting, dilute atomic gases (seen for H, Li, Na, and Rb), dissipates energy during cooling. This process would seem to require that the atoms come together in their lowest energy or ground state, but Robert *et al.* (p. 461; see the Perspective by Inguscio and the 23 March news story by Voss) now show that a cloud of metastable helium atoms, excited some 20 electron volts in energy into the 2^3S_1 triplet spin state, can be coaxed into forming a BEC. In their experiment, a magnetic field spin-polarizes the atoms in cloud and forces out any atoms with the opposite spin. With the spins all pointing the same direction, inelastic collisions that would otherwise destroy the delicate condensate are suppressed. They have also implemented a single-atom detection scheme with a multi-channel plate that represents a large step on the road to quantum atom optics. This work may open a route to forming a dilute-gas BEC of ground-state He. ✕

Quantum Solutions to Difficult Problems

There are certain problems, for example, factoring or searching for the shortest route connecting several points (the traveling salesman problem), that classically appear to grow exponentially in computational time with the number of digits (in factoring) or points that can be tried (in a search). So far, classical algorithms for solving the wide range of related "NP-complete" problems that could yield answers in polynomial time have remained elusive. From simulations, Farhi *et al.* (p. 472; see the news story by Anderson) show that quantum computers may be more effective

476 Stable Vortex Lattices in Bose-Einstein Condensates

In macroscopic quantum systems, the application of an external parameter—a magnetic field in the case of superconductors, or an induced rotation in the case of superfluids—results in the formation of vortices. These vortices penetrate the system and dissipate energy, and they also possess quantized units of angular momentum. Abo-Shaeer *et al.*, p. 476 (see the 23 March news story by Voss) now show that large, ordered arrays of vortices can be formed and observed in a rotating Bose-Einstein condensate. The vortices are much more stable than had been predicted and may prove a useful testing ground of vortices in superfluids. ✕



at solving such problems. At least for the number of qubits they could simulate on their classical computer, they show that the adiabatic evolution of their quantum computer would yield a result to some examples of NP-complete problems in polynomial time.

Adsorption on Very Small Clusters

Small metal clusters have been characterized through a number of spectroscopic methods, but there is still great interest in the details of how these clusters react with small molecules. Nauta *et al.* (p. 481) have made complex-

es between magnesium atoms and small clusters (two and three atoms) and HCN in liquid helium droplets. In this environment, high-resolution infrared laser spectroscopy of the C-H vibrational band reveals rotational state information that allows much structural information to be deduced. A qualitative change in the adsorbate-metal cluster bonding occurs between the Mg_2 -NCH and Mg_3 -NCH complexes that is reflected in a change in Mg-N bond length.

How Cells Sense Oxygen

Mammalian cells are exquisitely sensitive to changes in oxygen concentration. When oxygen becomes limiting (hypoxia), the cells increase the transcription of genes that enhance oxygen delivery or that facilitate metabolic adjustment to reduced oxygen availability. This adaptive response is mediated by hypoxia-inducible factor (HIF), which is stable under hypoxic conditions but is degraded in the presence of oxygen by a ubiquitin ligase containing the von Hippel-Lindau (VHL) tumor suppressor protein. Ivan *et al.* (p. 464) and Jaakkola *et al.* (p. 468) have found that VHL binds to a specific domain of the HIF-1 subunit only when a conserved proline in that domain is hydroxylated (see the Perspective by Zhu and Bunn). The enzymes that catalyze prolyl hydroxylation require oxygen as a substrate, which suggests that this protein modification plays a key role in cellular oxygen sensing. This discovery could open up new therapeutic possibilities for the many diseases in which hypoxia plays a crucial role, including cancer, ischemic heart disease, hypertension, and stroke. ✕

Big Mama Knows Best

African elephants live in matrilineal family groups that range over large areas and that frequently interact with other similar groups. McComb *et al.* (p. 491; see the cover and news story by Pennisi) show that the oldest female, or matriarch, acts as a repository for the group's social knowledge. Multiple playback experiments



CAYMAN CHEMICAL....HELPING MAKE RESEARCH POSSIBLE

COX-1/COX-2

Chemiluminescent Inhibitor Screening Assay
Selective Inhibitors
COX Activity Assay
Recombinant Human COX-2

Immunoassays

PGE₂
8-Isoprostane
cAMP & cGMP
LTB₄
TXB₂
Histamine

Nitric Oxide

NO₂/NO₃ Assay Kits
Colorimetric & Fluorometric
sGC Antibody
NO Donors
NOS Enzymes & Antibodies

Neurochemistry

CGRP EIA Kit
CB₁ & CB₂ Receptor Antibodies
Anandamides
Prion Protein Antibodies

Obesity

15-deoxy $\Delta^{12,14}$ PGJ₂
PPAR γ Polyclonal Antibody
Leptin EIA Kit



1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

1-888.364.9897

Phone 734.971.3335

Fax 734.971.3420

For more information on these and
our entire product line, visit us at
www.caymanchemical.com/science

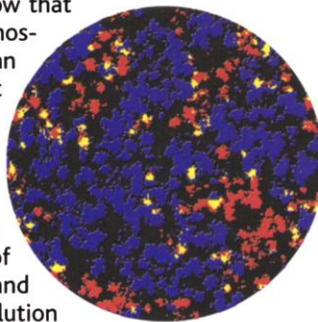
Circle No. 45 on Readers' Service Card

were performed during a period of 9 years to test vocal discriminatory abilities. Families with older matriarchs were better than those with young matriarchs at distinguishing the contact calls of other groups well or poorly known to them. These superior abilities appear to correlate with greater reproductive success on families with older matriarchs and suggest that age and experience may influence reproductive success through its effects on the acquisition of social knowledge. However, older elephants have the larger tusks prized by hunters and poachers; thus, whole populations may be affected by the removal of a few key individuals.

What Parents Will Do for Children

Understanding why species differ in their parental care tactics has been a central goal for evolutionary ecologists studying life history evolution. Ghalambor and Martin (p. 494; see the news story by Pennisi) test the prediction that life-history differences between bird species result in differences in how parents resolve the trade-off between feeding their young and reducing the predation risk to their offspring and to themselves. In a survey of nearly 200 bird species, they show that clutch size is negatively correlated with adult survival. They also manipulated predation risk to phylogenetically paired species in North and South America and show that parents with smaller clutch sizes and greater chances of survival are less willing to place themselves at risk than those with large clutch sizes.

More Efficient in Groups

Competition between organisms that share a common glucose resource leads to an evolutionary dilemma analogous to the "tragedy of the commons"—overexploitation of a common resource. Pfeiffer *et al.* (p. 504; see the Perspective by Cox and Bonner) present simulation models and a range of examples to show that organisms using pathways that produce adenosine triphosphate (ATP) with high rate but low yield (anaerobic) can outcompete those that produce ATP with low rate but high yield (aerobic). This situation leads to an inefficient use of a vital resource. They also suggest that the evolution of respiratory sugar metabolism required cooperation between cells, which suggests that an energetic bonus was reaped when the transition was made from single cells to multicellularity. This study is an example of how concepts derived from whole-organism ecology and evolution can apply to a very different sphere—the evolution of biochemical pathways. 

The Protein Code Turns 21

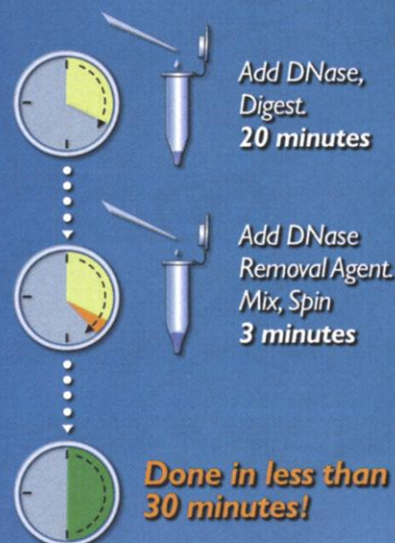
All organisms construct proteins from the same set of 20 amino acids (the only known variants being formyl-methionine and selenocysteine, although many amino acids can be modified after their incorporation into polypeptide chains). Is it possible to extend the set of 20 amino acids in vivo to include new chemical functionalities in proteins? Two papers report success toward this goal in *Escherichia coli* (see the Perspective by Böck). Using genetics, Döring *et al.* (p. 501) identified mutations in the editing function of valyl-tRNA synthetase that result in high levels of incorporation of the nonnatural amino acid aminobutyrate. Wang *et al.* (p. 498) used a combination of genetics and molecular biology to add an orthogonal tyrosyl tRNA-tyrosyl tRNA synthetase pair with altered substrate specificity so that they could incorporate *O*-methyl-L-tyrosine at high fidelity.

Sharing the Roundabout

The midline of the fruit fly and the zebrafish share more than just topology. Fricke *et al.* (p. 507) show that zebrafish use a receptor encoded by the gene *astray* for guiding axons from the developing eyes to the brain, crossing the midline on their way to form the optic chiasma. The *astray* receptor is similar to the receptor encoded by the gene *roundabout* that is responsible for guidance of growing axons across the midline in *Drosophila*. Chimeras made by exchanging eyes of mutant and wild-type zebrafish demonstrated that the relevant site of expression of *astray* is in the eye.

CREDIT: T. PFEIFFER ET AL.

Get
**DNA-free
RNA** *Fast and Easy*
with Ambion's DNA-free™



DNase digestion, inactivation,
and removal in less than
30 minutes

Novel DNase removal agent
means no extraction, heating,
or precipitation

Compatible with all
RNA isolation techniques

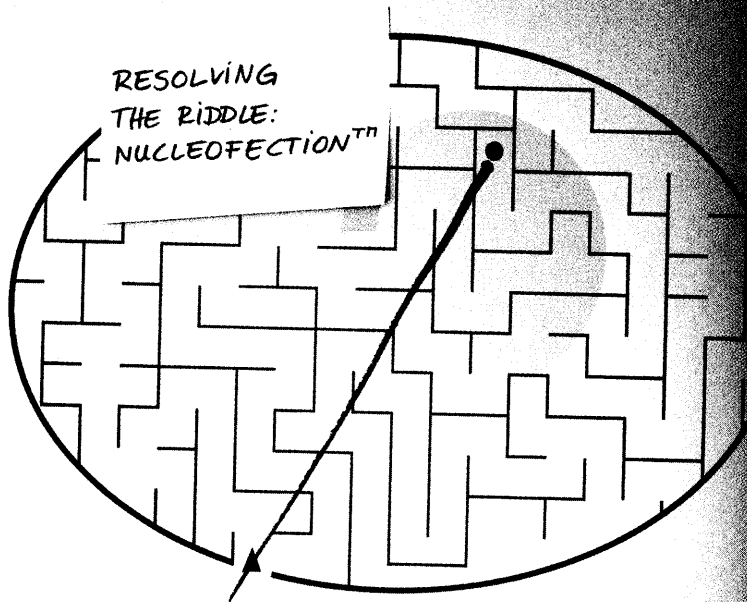
Ambion®
THE RNA COMPANY®

2130 WOODWARD ST. AUSTIN, TX 78744
tel (512) 651-0200 • fax (512) 651-0201
email: moinfo@ambion.com

www.ambion.com

Circle No. 75 on Readers' Service

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)221-3 99 34-0 to get in touch – directly.

Circle No. 12 on Readers' Service Card

a m a x a

gene transfer begins here.

And if you still want to work with cell
go ahead and do so. But up to 10 times faster.



diabetes gene classified:
discovery **Applied**

AB Applied Biosystems
Data. Decision. Discovery.

Type 2 diabetes, also called adult-onset or non-insulin-dependent diabetes, affects more than 15 million Americans. Although there is no single gene that can explain the risk of diabetes, scientists using DNA analysis systems from Applied Biosystems have recently pinpointed a gene that plays a key role in this complex disease.

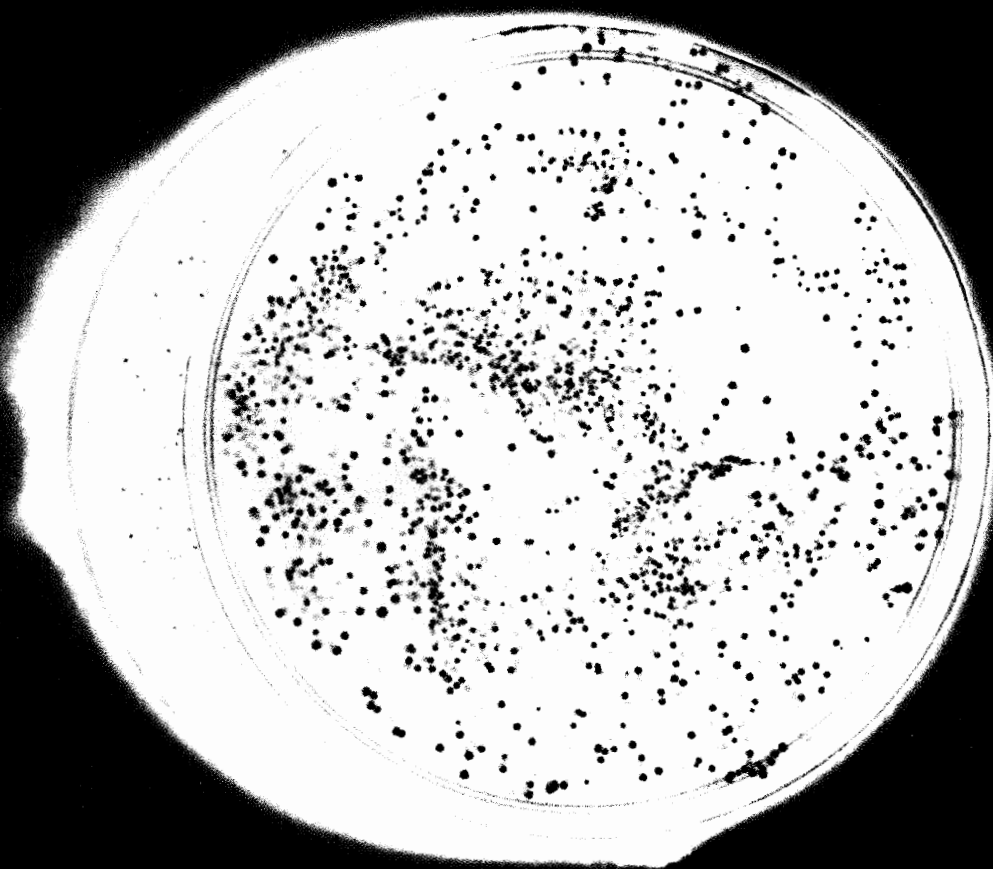
Meet the new Applied Biosystems. As a \$1.4 billion company serving 40,000 scientists in over 150 countries, we bring more than just the broadest range of technologies to genetics research, protein analysis, high-throughput screening, and bioinformatics challenges. We also bring optimism.

www.appliedbiosystems.com

Applied Biosystems, Inc. and its subsidiaries are providing the world's leading technology and information for life scientists. Applera Corporation consists of the Applied Biosystems and Genomic Sciences divisions. Applied Biosystems is a registered trademark and AB (Design) is a trademark of Applera Corporation or its subsidiaries in the US and certain other countries. © 2000 Applied Biosystems, Inc. All rights reserved.

Circle No. 15 on Readers' Service Card

Witness the eclipse of all other gene insertion detection methods.



(No special eyewear required.)

New S-Gal™ from Sigma-Aldrich produces the clearest contrast between *lac*⁺ and *lac*⁻ colonies.

S-Gal, our patented water-soluble, autoclavable chromogenic substrate for β -galactosidase, produces a much greater contrast between *lac*⁺ and *lac*⁻ colonies than does X-gal. And our S-Gal/LB Agar Blend (complete with IPTG) eliminates the problems associated with X-gal. No preparing stock solutions of X-gal in dimethyl formamide or dimethyl sulfoxide, and no waiting for the media to cool before adding the substrate.

Just add water to S-Gal/LB Agar Blend, autoclave and pour your plates. It's that easy.

For a free 500 ml sample of S-Gal/LB Agar Blend (Product Code: C 4478), contact your local Sigma-Aldrich sales representative or register online at www.sigma-aldrich.com/s-gal through May 31, 2001. S-Gal is a trademark of Sigma-Aldrich Corporation.

www.sigma-aldrich.com

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

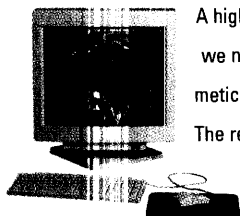


SIGMA-ALDRICH

Circle No. 27 on Readers' Service Card



True Innovation is the Hallmark for Today's Imaging Needs



A high quality microscope image is only as precise as the optical system that produces it. At Leica Microsystems, we not only concentrate on designing true technological innovations based on our customers' input, we also pay meticulous attention to accurately translating these innovations during the manufacture of our microscope systems.

The result? The highest quality, most accurate images possible. For biology, medicine and industry look to Leica

Microsystems for all your imaging needs. **Leica Microsystems, Like You've Never Seen Before!**

Leica Microsystems Wetzlar GmbH
Ernst-Leitz-Straße
D-35578 Wetzlar (Germany)

Tel. +49 (0) 64 41 29 - 0
Fax +49 (0) 64 41 29 - 25 99
www.leica-microsystems.com

Circle No. 74 on Readers' Service Card

Leica
MICROSYSTEMS

Thomas Edison didn't invent electricity. He just put it to work.



Likewise, we at Molecular Mining didn't invent data mining, but we can harness it for you in unique and powerful ways. From our GeneLinker™ gene-expression analysis software to our custom collaborations, you'll have the tools of discovery at your disposal – data exploration, advanced inference, even ***prediction*** of complex gene networks.

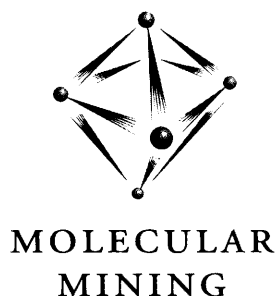
In short, Molecular Mining puts your data to work.

Algorithmic excellence. Unsurpassed gene network expertise. These are the factors that distinguish Molecular Mining from the others. They're also the factors that will speed you toward discovery.

Mr. Edison once said that there's no substitute for hard work. Of course, there's no law that says you can't work ***smarter***, too.



www.molecularmining.com



T H E P O W E R O F P R E D I C T I O N

Circle No. 16 on Readers' Service Card



Bioinformatics

designed with you in mind...

- analyze DNA and protein sequences
- search and integrate databases
- analyze gene expression data
- cluster and assemble ESTs
- annotate genome databases
- etc.

Biomax provides teams of highly experienced bioinformatics specialists able to quickly identify management and analysis requirements and deliver tailored, user-friendly solutions.

No matter what the task, outsourcing with Biomax will result in more efficient, sophisticated and economical bioinformatics tools and solutions.



Tel.: + + 49 (0)89/895574-50
www.biomax.de

Circle No. 31 on Readers' Service Card

Biomax Informatics AG
Lochamer Str. 11
82152 Martinsried
Germany

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. Szurmi; 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 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 Filatreau, 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, 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 Malakoff, 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. Helgeman; ADMINISTRATIVE SUPPORT Scherraine Mack, Fannie Groom; BUREAUS:

Berkeley, CA: 510-652-0302, FAX 510-652-1867, Boston, 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; ASSOCIATES Rebecca Doshi, Vicki J. Jorgensen, Tara L. Kelly, Jessica K. Moshell
ART DESIGN DIRECTOR C. Faber Smith; **ART DIRECTOR** Alan T. Stonebraker; **ASSOCIATE ART DIRECTOR** Stephanie D. Halvorsen; **ILLUSTRATORS** Cameron Slayden, Katharine Sutliff; **ASSOCIATES** Holly Bishop, Joshua Moglia, Debra J. Morgenege, Preston Morrighan; **PHOTO RESEARCHER** Leslie Lizard

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. Hurlley; 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@public3.bta.net.cn; INDIA Pallava Bagla (contributing correspondent (91) 11-271-2896; pbagla@ndb.vsnl.net.in)

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; REPRESENTATIVES Elizabeth Early, Elizabeth Haberkorn, Katrina Smith; MARKETING ASSOCIATES Lauri Sirois, Deborah Stromberg; EUROPE SENIOR EXECUTIVE Ruth Jackson; EXECUTIVE Martin Paine; RESEARCH MANAGER Renuka Chander; BUSINESS AND FINANCE MANAGER Teresa Ellis; ADMINISTRATIVE SUPPORT Zadia McKinnon; COMPUTER SPECIALIST Charles Munson

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

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

MEMBER BENEFITS For Credit Card: MBNA 1-800-847-7378; Car Rentals: Hertz 1-800-654-2200 CDP#343457, Dollar 1-800-800-4000 #AA11115; 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; ASSOCIATES Mary Ellen

Crowley, Amanda Donathen, Allison Pritchard ELECTRONIC MEDIA MANAGER David Gillikin; INTERNET PRODUCTION MANAGER Lizbeth Harman; 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. Whitty; SENIOR SALES ASSOCIATE Sheila Myers

RECRUITMENT ADVERTISING (science_classifieds@aaas.org); PRODUCTION MANAGER Jennifer Rankin 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, Emmet Tesfaye; ASSOCIATES Christine Hall, Dawn Bruno, Dina Freeman; PUBLICATIONS ASSISTANTS Robert Buck, Jane Vaughn; UK/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. Meserve; 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 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 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
*Children's Hospital,
Boston*
Edouard Bard
Univ. d'Aix-Marseille III
Frank S. Bates
Univ. of Minnesota
Ray H. Baughman
Honeywell International
Stephen J. Benkovic
Pennsylvania St. Univ.
Michael J. Bevan
Univ. of Washington

Ton Bisseling
Wageningen University
Seth S. Blair
Univ. of Wisconsin
Mark Boguski
NCBI, NIH
Henry R. Bourne
*Univ. of California,
San Francisco*
Lewis M. Branscomb
Kennedy School, Harvard Univ.
Joseph A. Burns
Cornell Univ.

Dennis W. Choi
*Washington Univ. School
of Medicine, St. Louis*
Joanne Chory
The Salk Institute
David Clapham
Children's Hospital, Boston
Jonathan D. Cohen
Princeton Univ.
Daniel G. Colley
Centers for Disease Control
F. Fleming Crim
Univ. of Wisconsin
Robert Desimone
NIMH, NIH
Julian Downward
Imperial Cancer Research Fund
Hans Eklund
*Swedish Univ. of
Agricultural Sciences*
Gerhard Ertl
Fritz-Haber-Institut, Berlin
Paul G. Falkowski
Rutgers Univ.
Douglas T. Fearon
Univ. of Cambridge
Jeffrey S. Flier
Harvard Medical School
Richard Fortey
*The Natural History
Museum, London*
Yves Frégnac
*Unité de Neurosciences
Intégratives et Computation-
nelles, CNRS, Gif-sur-Yvette*

Chris D. Frith
Univ. College London
Don Ganem
Univ. of California, SF
James Gimzewski
Univ. of California, LA
Alex Halliday
ETH Zentrum, Zürich
Paul Harvey
Univ. of Oxford
Michael P. Hassell
*Imperial College at
Silwood Park*
Martin Heimann
*Max Planck Institute
of Biogeochemistry, Jena*
Tsukuru Honjo
Kyoto Univ.
Evelyn L. Hu
*Univ. of California,
Santa Barbara*
Herbert Jackle
*Max Planck Institute for
Biophysical Chemistry,
Göttingen*
Meyer B. Jackson
*Univ. of Wisconsin
Medical School*
Bernhard Keimer
*Max Planck Inst. for
Solid State Research,
Stuttgart*
Christian Körner
*Botanisches Institut,
Basel*

Anne Krueger
Stanford Univ.
Michael LaBarbera
Univ. of Chicago
Angus I. Lamond
Univ. of Dundee
Antonio Lanzavecchia
*Inst. of Res. in
Biomedicine, Bellinzona,
Switzerland*
Anthony J. Leggett
*Univ. of Illinois, Urbana-
Champaign*
Norman L. Letvin
*Beth Israel Deaconess
Medical Center, Boston*
Richard Losick
Harvard Univ.
Raul Madariaga
*École Normale
Supérieure, Paris*
George M. Martin
Univ. of Washington
Diane Mathis
Harvard Medical School
Andrew Murray
Harvard Univ.
Elizabeth G. Nabel
NHLBI, NIH
Shigekazu Nagata
*Osaka Univ. Medical
School*
Roger Nicoll
*Univ. of California
San Francisco*

Roy R. Parker
Univ. of Arizona
Michele Parrinello
*Max Planck Institute for
Solid State Research, Stuttgart*
Linda Partridge
Univ. College London
Suzanne Pfeffer
*Stanford Univ. School of
Medicine*
Stuart L. Pimm
Columbia Univ.
Danny Reinberg
*Univ. of Medicine and
Dentistry-New Jersey*
Janet Rossant
Univ. of Toronto
Erkki Ruoslahti
The Burnham Institute
David G. Russell
Cornell Univ.
Terrence J. Sejnowski
The Salk Institute
Manfred Siggert
ETH Hönggerberg, Zürich
Susan Solomon
NOAA
Christopher R. Somerville
*Carnegie Institution of
Washington, Stanford*
Will J. Stewart
*Marconi Caswell,
Towcester*
Edward I. Stiefel
*ExxonMobil Research
and Engineering*

Cliff Tabin
Harvard Medical School
Tomoyuki Takahashi
Univ. of Tokyo
Marc Tessier-Lavigne
*Univ. of California,
San Francisco*
Joan S. Valentine
Univ. of California, LA
Michiel van der Klis
*Astronomical Inst. of
Amsterdam*
Derek van der Kooy
Univ. of Toronto
Bert Vogelstein
Johns Hopkins
Arthur Weiss
Univ. of California, SF
Zena Werb
Univ. of California, SF
R. Sanders Williams
*Univ. of Texas
Southwestern Med. Ctr.*
Ian A. Wilson
The Scripps Res. Inst.
Richard A. Young
The Whitehead Inst.
Martin Zatz
NIMH, NIH
Walter Ziegglansberger
*Max Planck Institute
of Psychiatry, Munich*
Maria Zuber
*Massachusetts Inst.
of Technology*

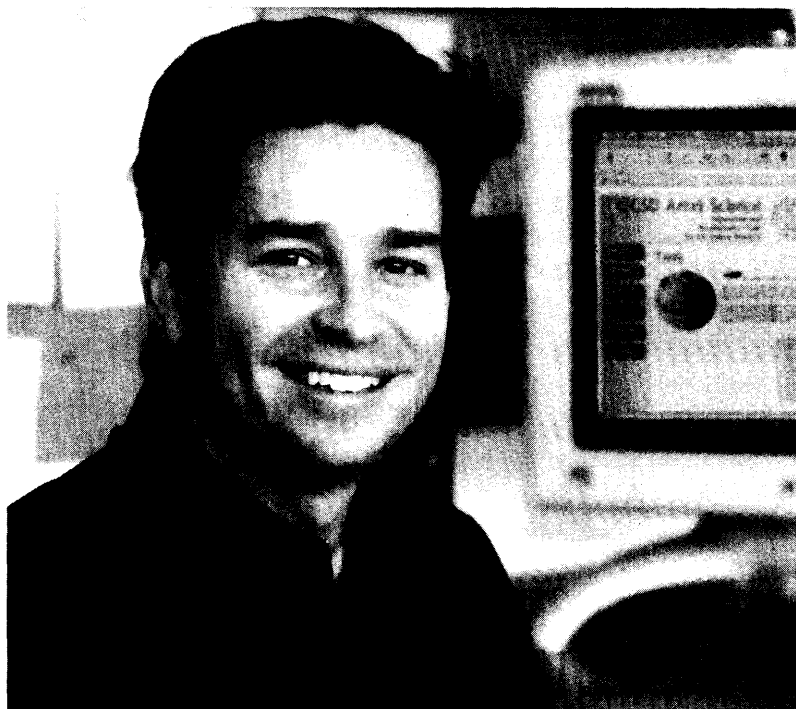
SENIOR EDITORIAL BOARD

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.*
Michael S. Gazzaniga, *Dartmouth College*
Richard Schweder, *Univ. of Chicago*
Robert Solow, *Massachusetts Inst. of Technology*
David Voss, *Science*
Ed Wasserman, *DuPont*
Lewis Wolpert, *Univ. College, London*

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

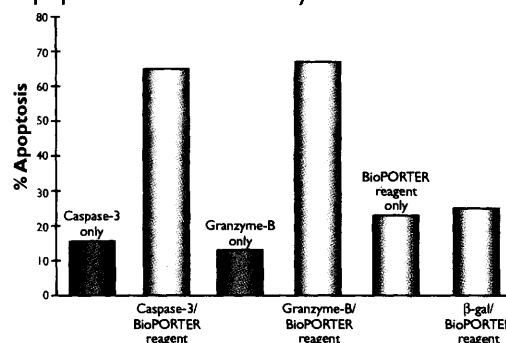
To Order: 888-428-0558

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>

GTS
Gene Therapy Systems
"innovations in gene therapy"

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.

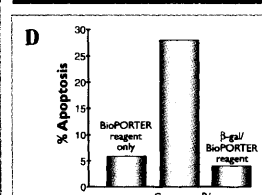
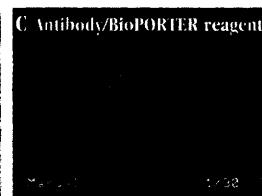


Fig. B/C FITC-Antibody or β-gal Delivery Into Mouse Fibroblasts
FITC-labeled antibody (2 μg) or β-gal (0.5 μg) were delivered with 2.5 μl of BioPORTER reagent into NIH/3T3 cells grown on coverslips in serum free conditions. Cells were examined 4 hours after protein delivery.

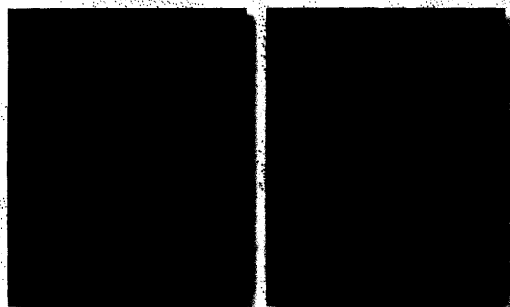
Fig. D Functional Granzyme-B Delivery Into Jurkat Cells
Granzyme-B (450 ng) or β-gal (1 μg) were delivered into cells growing in serum-free medium. 24 hours after protein delivery, cells were directly analyzed for apoptosis by flow cytometry using Annexin V-FITC.

It's likely your expression arrays
have been producing false data.

It's now likely they'll never
do it again.

3DNA
Submicro™ Expression
Array Detection Kit

**Differential Array Pattern without Primer
(Labeling of Genomic Contamination)**



3DNA Submicro Direct Incorporation

*Human heart vs. human placenta,
4 µg per channel total RNA for 3DNA Submicro labeling,
20 µg per channel total RNA for direct incorporation.*

Your arrays are showing great differentials.
But are they real, or just an artifact of
genomic contamination?

The problem begins with using total RNA and conventional dye incorporation labeling methods for gene expression arrays.

Total RNA typically contains some genomic DNA contamination. Unfortunately, the RT enzyme used to generate the cDNA will label the genomic DNA along with the RNA.

As a result, labeling your sample with any method that incorporates labeled nucleotides can produce false data. This can take the form of false positives, when the genomic DNA labels differentially and creates the appearance of differential expression. As well as false negatives, when a strong but balanced signal from the genomic DNA masks a weak, but real, differential.

Clearly, this is a very big problem.

Fortunately, we've found a very big solution: Genisphere's new 3DNA Submicro labeling system is immune to data corruption caused by genomic contamination.

With the Submicro system, the labels are loaded on to our proprietary 3DNA nucleic acid dendrimer, not into the cDNA. So genomic contamination, even if present in your sample, can't generate a signal. You can be assured that what you see is gene expression and nothing else.

See additional data on the effect
of genomic contamination at:
www.genisphere.com/genomic

Genisphere Inc. 14 Philips Parkway Montvale, NJ 07645
Tel 877.888.3DNA 201.651.3100
Fax 877.FAX.3DNA 201.651.3116

Genisphere, 3DNA and Submicro are trademarks of Datascope Corp.

Genisphere
A DATASCOPE COMPANY

Circle No. 3 on Readers' Service Card



Human Genome Sciences

Number One in Genomic Medicine

- Four genomic drugs in human tests
(Cancer, Immunodeficiency, Wound Healing)
- Protein and antibody drugs
- Manufacturing and clinical trials capability
- Powerful partnerships

The Healing
Power of
Knowledge

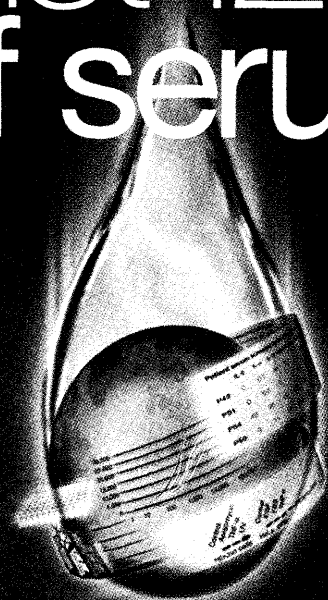
Circle No. 36 on Readers' Service Card

Human Genome Sciences, Inc. (NASDAQ: HGS)
9410 Key West Avenue, Rockville, Maryland 20850-3338, Phone: (301) 309-8504, Fax: (301) 309-8512

www.hgsi.com

See our employment ad in the Recruitment section.

run up to 100 different ELISAs in just 12 μ l of of serum



Speed Drug Discovery with the First Ever **Quantitative** Protein Array System.

Introducing the Bio-Plex™ protein array system — a world of information from a single drop. Here's a complete, easy-to-use system that lets you quantitate up to 100 different proteins and peptides simultaneously in a single microtiter well. You'll save up to 100-fold on time, labor, and those precious rare samples. Mix and match from a broad selection of bead-based assays to create your

own "liquid protein chip" or let Bio-Rad customize one for you. The Bio-Plex system features a fluorescent reader, data analysis software, validation tools, and optimized assay kits from a single source — seamlessly integrated to ensure accurate and reproducible assay results. Contact your local Bio-Rad representative or visit us on the Web at www.bio-rad.com/bioplexsystem/.

What Will You Discover Next?

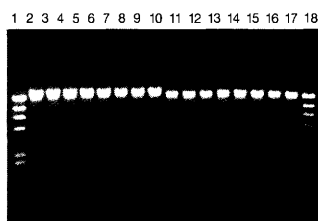
Visit us on the Web at discover.bio-rad.com. Call toll free at 1-800-4BIORAD (1-800-424-6723); outside the US, contact your local sales office.

Circle No. 52 on Readers' Service Card

BIO-RAD

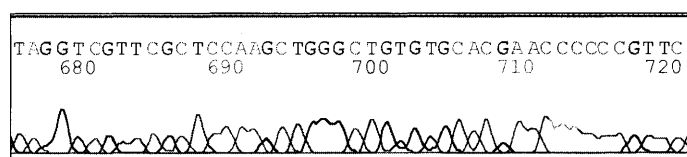
Perfect gDNA from Blood

- 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

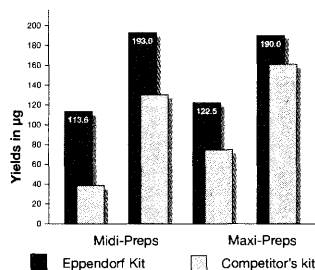


● Part of an ABI Model 3700 automated fluorescent DNA cycle sequencing of pUC19 prepared by the Perfectprep Plasmid 96 Vac, Direct Bind method. Phred Q > 20 = 701.

- 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. 6 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 Cantiague 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

Test results *not quite* what you were expecting?



Next time use BioSource!

Signal Transduction Antibodies

(Phosphorylation Site-Specific)

Antibody targets and
number of site-specific antibodies

Akt/PKB	2	JAK1	1
Bad	2	JAK2	1
CB1	1	JNK	1
cdc2	1	p38	1
c-Raf	1	p53	1
Cyclin E	1	Paxillin	1
EGF-R	7	PKR	2
elF-2 α	1	PLC γ -1	1
EIF4E	1	Pyk2	1
ERK1/2	1	Rb	1
ERK5	1	RON	1
FAK	1	Src	1
GSK-3 β	1	STAT1	1
I κ B- α	1	STAT3	1
Insulin-R	2	Syndecan-4	1
Integrin β -3	1	Tau	14
IRS-1	1		

Why settle for less?

- Affinity purified – both negative and positive selection
- Specificity tested by peptide competition and / or mutant analysis
- Lot-to-lot consistency
- Rigorously tested in multiple applications and cell lines
- Sample and bulk pricing
- All products are created and manufactured by BioSource

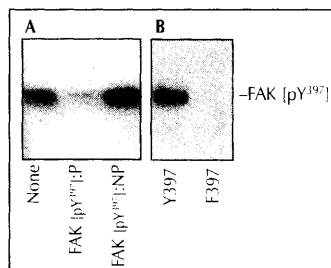


Figure A: FAK pY³⁹⁷ PSSA analysis illustrating that only the phosphopeptide blocks the Western signal.

Figure B: FAK pY³⁹⁷ PSSA analysis illustrating the absence of a Western signal with the FAK (Tyr \rightarrow Phe(F³⁹⁷)) mutant.

Testimonial from the field...

"When testing at the same concentrations, the signal for your antibody was similar to the competitors; with your background being 3-4 fold less. I would like to request a quote for 50 mg of the dual-p-JNK antibody. And if you have the stock, a quote for 100 mg of the antibody."

Pharmaceutical Researcher



Circle No. 15 on Readers' Service Card

biosource.com

BioSource USA 800.242.0607

BioSource Europe +32.67.88.99.00









NEW
ENGLAND
BIOLABS

MAPPING THE HUMAN GENOME

ADVANCED BY A DIVERSE RANGE OF

8-BASE CUTTERS

FROM NEW ENGLAND BIOLABS

ENZYME	SEQUENCE	%GC	CAT. #
 <i>Asc I</i>	GG/CGCGCC	100%	R0558
 <i>Fse I</i>	GGCCGG/CC	100%	R0588
 <i>Not I</i>	GC/GGCCGC	100%	R0189
 <i>SgrA I</i>	CPu/CCGGPyG	100-75%	R0603
 <i>Sfi I</i>	GGCCN4/NGGCC	100-60%	R0123
<i>Sbf I</i>	CCTGCA/GG	75%	V0101
 <i>Pme I</i>	GTTT/AAAC	25%	R0560
 <i>Pac I</i>	TTAAT/TAA	0%	R0547
 <i>Swa I</i>	ATTT/AAAT	0%	R0604

 Recombinant

New England Biolabs provides researchers with the largest selection of recognition sequences for genome mapping projects. Our recombinant 8-base cutters offer exceptional purity, less lot-to-lot variation and unmatched value.

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 email: info@neb.com
- **New England Biolabs Ltd., Canada** Tel. (800) 387-1095 (905) 672-3370 Fax (905) 672-3414 email: info@ca.neb.com
- **New England Biolabs GmbH, Germany** Tel. 0800/BIOLABS (0)69/305-23-140 Fax 0800/BIOLABX (0)69/305-23-149 email: info@de.neb.com
- **New England Biolabs (UK) Ltd.** Tel. (0800) 31 84 86 (01462) 420616 Fax (01462) 421057 email: info@uk.neb.com

DISTRIBUTORS: Argentina (11) 4816-0820; Australia (07) 5594-0299; Belgium (0800) 1 9815; Brazil (011) 3666-3565; China 21-6495-1899; Czech Rep. 0800 124683; Denmark (39) 56 20 00; Finland (9) 584-121; France (1) 34 60 24 24; Greece (01) 5226547; Hong Kong 2649-9988; India (542) 366473; Israel (08) 9366066; Italy (02) 381951; Japan (03) 5820-9408; Korea (02) 556-0311; Mexico (5) 678 1931; Netherlands (033) 495 00 94; New Zealand 0800 807809; Norway 23 17 60 00; Singapore 4457927; Spain (93) 401.01.73; Sweden (08) 30 60 10; Switzerland (061) 486 80 80; Taiwan (02) 28802913; Venezuela (2) 265-3386

Circle No. 43 on Readers' Service Card

 **NEW ENGLAND
BioLabs[®] Inc.**
where science is the priority



A flexible New Solution

For gene expression analysis

www.agilent.com/chem/dna

1-800-227-9770, Select
Option 1, Program 3985

In Europe call +49 7243 602 543 or
e-mail bioanalyzer_europe@agilent.com

Now you can design microarrays around experiments, rather than adapting research around microarrays. Agilent provides a complete system for fast, flexible gene expression analysis—probe design services, in-situ oligonucleotide and cDNA microarrays, reagents, protocols, automated scanner, and Rosetta Resolver™ expression data analysis system. So you can go where your research leads you.

Dreams made real.



Agilent Technologies

Innovating the HP Way

©2001, Agilent Technologies Inc. Ago-4220WW
Resolver is a trademark of Rosetta Inpharmatics, Inc.

Circle No. 19 on Readers' Service Card

Single Nucleotide Polymorphisms

Finally you can detect SNPs
with total confidence.



2,700,000 known SNPs today. Millions more tomorrow.
Is your lab ready?

Yes, your lab will be prepared with the new **AcycloPrime™-FP SNP Detection System** from PerkinElmer Life Sciences. The first fluorescence polarization-based SNP reagent system, AcycloPrime reagents are complemented by our Victor² V fluorescence polarization reader, a state-of-the-art multi-use fluorescence detection instrument. Finally, detecting all known SNPs – today and tomorrow – is easy, quick and accurate.

- **How easy?** As a homogenous assay, there are no washing or separation steps.
- **How fast?** The optional Victor² V auto dispenser eliminates hand-pipetting. Plus, 40 plates – each with 384 wells – can be stacked at once.
- **How accurate?** With our new AcycloTerminators™ there's no guesswork. So you can detect SNPs with confidence the first time.



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

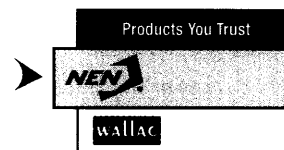
For country-specific locations, visit our web site.

Special introductory offer – expires June 30, 2001

To celebrate the introduction of our new SNP instrumentation and reagent system, we're offering substantial savings on the Victor² V through June 30, 2001.

For more information, contact PerkinElmer Life Sciences at (800) 551-2121 (U.S.) or +32 2 717 7924 (Europe).

Or visit www.perkinelmer.com/lifesciences



PURIFYING PROTEINS?

Carpe Protein!

New Seize™ X Immunoprecipitation Kit sinks its teeth into the protein you want, delivers it clean, then goes back for more!

Seize™ X Technology is the first to chemically glue the antibody to the bead. There's no antibody contamination and antibody/bead combos are reusable. With no antibody in your final purified protein solution, you get clean results on your SDS-PAGE analysis. And since the antibody stays bound to the beads, you can reuse it, saving you lots of time and money.

The **Seize™ X** Immunoprecipitation Kit sinks its teeth into the protein you want, delivers it clean, then goes back for more! ***Carpe Protein!***

To find out more about the **Seize™ X IP Kit**, call **1-800-874-3723** or visit **www.piercenet.com**

Seize™ X Technology is available in Protein A, Protein G, Yeast, Mammalian and Bacterial Immunoprecipitation Kits.

www.piercenet.com

For more information, visit the Pierce web site at **www.piercenet.com** or call **800-874-3723**.

Outside the United States, visit our web site or call **815-968-0747** to locate your local distributor or Perbio branch office.

PIERCE
a brand of **PERBIO**

Circle No. 44 on Readers' Service Card



3747 N. Meridian Rd. • PO Box 117 • Rockford, IL 61105 U.S.A. • Tel: 815-968-0747 or 800-874-3723 • Fax: 815-968-7316
Belgium: Tel 32 53 83 44 04 • France: Tel 0 800 50 82 15 • UK: Tel 44 1829 771 744 • Germany: Tel 49 228 9125 650 • The Netherlands: Tel 31 76 50 31 880
Technical Assistance E-mail: TA@piercenet.com • Customer Assistance E-mail: CS@piercenet.com • Internet: www.piercenet.com

© Pierce Chemical Company, 2001. Printed in the U.S.A. a Perbio Science Company

Primus HT Dualblock

The Hottest Twins in town
Intelligent networking in PCR

PrimusHT

**MWG AG
BIOTECH**



GENOMIC INSTRUMENTS

The new Primus Dualblock. Hot twins for simultaneous PCR. Networking of all your PCR machines, central and easy icon-based programming with Primus HT software and individual folders for each user. The GLP report is your logbook that records every cycle automatically for each run. Optional pager function for info about end of program. Easy upgrading, exchangeable blocks (384/96 well format), motorized lid, HTR Peltier technology for fastest heating/cooling rates and optimal results. Patented HPL (High Pressure Lid) technology for 100% evaporation prevention. Easy integration in automated PCR solutions. Contact us and let's discuss your next PCR project. www.mwg-biotech.com

**MWG AG
BIOTECH**

meeting life's challenges

Circle No. 5 on Readers' Service Card

Practice of the patented polymerase chain reaction (PCR) process requires a license. The MWG-BIOTECH AG Thermal Cycler is an Authorized Thermal Cycler and may be used with PCR licences available from the Perkin-Elmer Corporation. Its use with Authorized Reagents also provides a limited PCR license in accordance with the label rights accompanying such reagents.

Regulate



www.ariad.com/regulationkits



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.

Circle No. 17 on Readers' Service Card

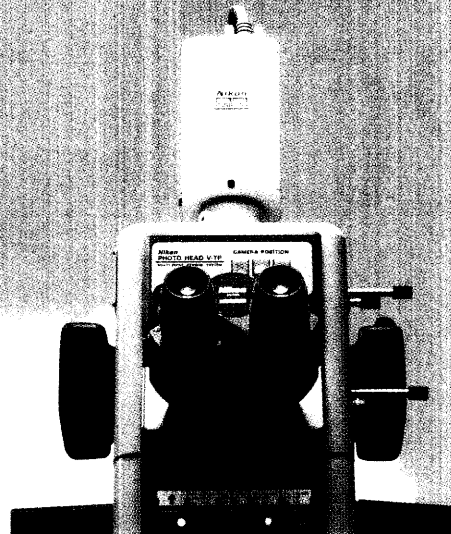
Wait until you see what 12 million pixels of capture resolution gets you. The DXM1200, designed exclusively for photomicrography, provides ultra high fidelity color reproduction and resolution virtually equal to film.

In addition, the DXM1200 comes complete with Nikon's highly intuitive ACT-1™ software with:

- 12 frames per second data transfer for faster image capture than you ever thought possible.
- Image archiving and retrieval that's faster and simpler than ever before.

To find out more about the surprisingly affordable DXM1200 digital camera, call **1-800-52-NIKON ext. 380**.

For complete tutorials of the ACT-1 software and a gallery of DXM1200 images, visit MicroscopyU at our newly designed website **www.nikonusa.com**



NOW YOU'RE TALKING HIGH RESOLUTION

GET LARGER, MORE VIVID MICROSCOPY IMAGES FROM NIKON'S DXM1200 ULTRA-HIGH RESOLUTION DIGITAL CAMERA.



2001 Tyler Prize

Jared M. Diamond, Ph.D.

University of California, Los Angeles

Thomas E. Lovejoy, Ph.D.

Smithsonian Institution & The World Bank



The Tyler Prize Medallion

Tyler Prize

The Tyler Prize was established in 1973 by the late John and Alice Tyler as an international award honoring achievements in environmental science, energy and medical discoveries of worldwide importance conferring great benefit on humanity. The Tyler Prize consists of a cash award of \$200,000 and the Tyler Prize gold medallion.

The Tyler Prize Executive Committee announces the award of the Tyler Prize for Environmental Achievement to Jared M. Diamond, Ph.D. of the University of California, Los Angeles, and Thomas E. Lovejoy, Ph.D., of the Smithsonian Institution and the World Bank. Drs. Diamond and Lovejoy are recognized for their pioneering roles in conceiving, testing, and demonstrating the theories that today guide the practice of Conservation Biology.

Dr. Diamond, a professor of physiology at the UCLA School of Medicine, conducted ecological studies of bird diversity in New Guinea that enabled him to formulate theories explaining forces structuring communities in nature. His work has led to the recognition of a sub-field of community ecology based on "assembly rules", competition and community dynamics. His theories on area requirements for species led to the theoretical justification of large natural areas. He has significantly contributed to the understanding of ecology by non-ecologists through his regular column in the journal *Nature*, articles in *Discover* magazine and two books—*The Third Chimpanzee*, and *Guns, Germs and Steel* for which he was awarded the Pulitzer Prize for nonfiction in 1998. Dr. Diamond was awarded the National Medal of Science in 1999.

Dr. Lovejoy, chief biodiversity advisor to the president of the World Bank, on detail from the Smithsonian Institution is a tropical biologist who has worked in the Amazon basin of Brazil since 1965. He is credited with coining the term biological diversity, now shortened to biodiversity, and with Diamond, helped create the field of conservation biology. His research vision led to the adoption of conservation measures in the Amazon. For 14 years, he led the World Wildlife Fund-U.S. In senior advisory positions in the Reagan, Bush and Clinton administrations, and with international organizations, he injected sound science into public policy. Beginning in 1987, he held important environmental positions with the Smithsonian Institution and moved on loan to the World Bank in 1998.

For additional information contact Dr. Linda Duguay, Executive Director, The Tyler Prize
Phone (213) 740-9760, Fax (213) 740-1313, Email tylerprz@usc.edu
Home Page www.tylerprize.usc.edu

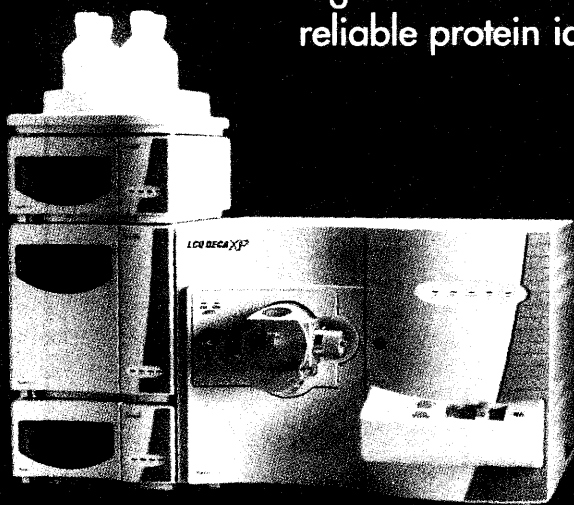
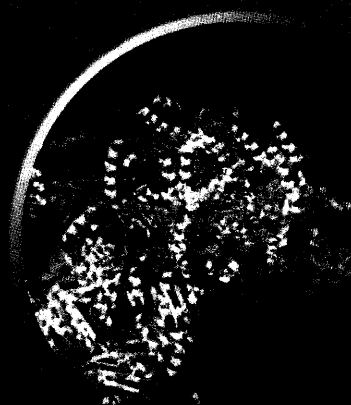
The Tyler Prize is administered by the University of Southern California

Circle No. 29 on Readers' Service Card

INTRODUCING THE
LCQTM DECA XP

ULTRA-SENSITIVE ION TRAP MASS SPECTROMETER

- **An order of magnitude improvement** in sensitivity for the identification of low abundance proteins
- New nanospray source allows for the analysis of peptides at attomole levels
- Dynamic ExclusionTM and MSⁿ enable measurements of coeluting compounds in complex mixtures, yielding more complete peptide sequence information
- SurveyorTM LC System provides automated on-line separation
 - TurboSEQUEST[®] software, with patented cross-correlation algorithm and database manager, allows accurate and reliable protein identification



For more information on the LCQ Deca XP,
e-mail: LCQDecaXP@thermofinnigan.com

Circle No. 40 For Literature
Circle No. 41 to Have A Sales Rep Call

www.thermofinnigan.com

Thermo Finnigan

A Thermo Electron business

Target: Anxiety response

Focus on gene function

DeltaBase™ is the world's largest searchable database on *in vivo* mammalian gene function. Information in DeltaBase is generated using large-scale mouse gene knockout technology and standardized phenotypic analysis protocols. More than 20,000 data points are collected on hundreds of disease-relevant genes every year.

Featured here is just one of those genes.

Phenotypes at your fingertips

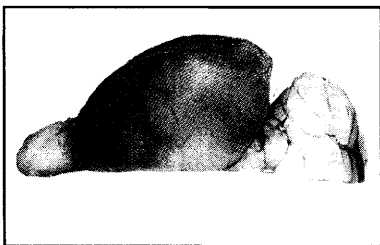
Through a browser-enabled interface, DeltaBase subscribers can quickly review and compare phenotypic data, images and analysis summaries from genes belonging to gene families that have demonstrated a high degree of success as drug targets. This information can be used to identify valid targets and to support decisions about therapeutic value. In addition, animal models for all targets in DeltaBase are made available to subscribers for further study.

Discover the power of DeltaBase

For more information on DeltaBase, visit www.deltagen.com and register for the online demo.

Phenotypic analysis

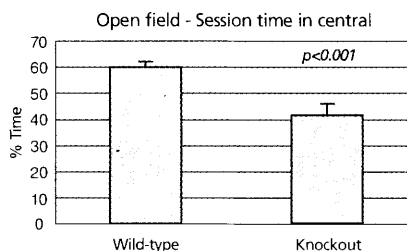
Gene: Orphan G protein-coupled receptor



The lacZ reporter gene present in the knockout construct allows for the analysis of gene expression. In mutant mice, lacZ expression is detectable in the cortex region of the brain, as shown in this whole-mount image.



Within the brain, lacZ is highly expressed throughout the cortex, hippocampus and amygdala. In normal animals, the hippocampus is essential for spatial processing and some types of exploratory behavior, while the amygdala is important for fear and anxiety behaviors.



The homozygous mutants spent less time in the central region in the open field test, indicating a higher level of anxiety compared to their wild-type siblings.

With this information, researchers can make informed decisions about which new gene targets to advance into small molecule screening programs. DeltaBase offers the possibility of faster drug discovery and improved overall efficiency in the drug development process.

Deltagen

Deltagen and DeltaBase are trademarks of Deltagen, Inc.
© 2001 Deltagen, Inc. All rights reserved.

Circle No. 20 on Readers' Service Card

DeltaBase™

Take the lead

TaKaRa

Rapid New Gene Discovery in Functional Genomics with Combinatorial Microarrays

TaKaRa Provides Customized Microarrays that Combine Conventional DNA Microarray Technology with Lynx's Innovative Cloning on Micro-beads.

Unique Custom Microarray Services Only from TaKaRa Utilizing Next-Generation Technologies

A comparative sample set of tissues or cells is all that is required for customized DNA microarrays.

Using MEGACLONE™, innovative micro-beads technology, essentially all of the sample DNA molecules are captured and cloned on millions of micro-beads.

MEGASORT™, or "fluid" micro-array based on micro-beads, delivers focused sets of differentially expressed genes and targets of your research interest including both known and unknown.

Discrete spots of cDNA arrays are laid onto solid glass slides by "pin and ring" spotting arrays and custom designed to rapidly advance discovery and development of genetic functions.

* MEGACLONE™ and MEGASORT™ are licensed from LYNX.

* References:

1) Nat. Biotechnol. **18**, 630-634 (2000)

2) Proc. Natl. Acad. Sci. USA **97**, 1665-1670 (2000)

For More Information on these and other comprehensive services, Contact us at bio-sm@takara.co.jp

High-Quality Pre-Spotted Microarray CHIPS for Expression Profiling with Reliability and Reproducibility

One slide contains well-characterized and known genes from specific pathways or relevant groups with positive and negative controls for normalization.

IntelliGene™ DNA Microarray Series*

IntelliGene™ Human Cancer CHIP

IntelliGene™ Human Cytokine CHIP

IntelliGene™ Human DNA CHIP for endocrine disruption study

IntelliGene™ Human CHIP 1K Set I

IntelliGene™ Mouse CHIP Set I

IntelliGene™ CyanoCHIP

IntelliGene™ Arabidopsis CHIP I

IntelliGene™ *E. coli* CHIP

IntelliGene™ TestARRAY

* TaKaRa's IntelliGene™ DNA Microarray Series are licensed from Affymetrix.

Visit our website for more details including Gene Lists.

(www.takara.co.jp/bio/) or

(www.takara.co.jp/english/bio_e/products/pro10.htm)

TaKaRa

TAKARA SHUZO CO., LTD.

BIOMEDICAL GROUP

Otsu, Shiga, Japan
Phone: +81 77-543-7247 Fax: +81 77-543-9254

Korea
BOHAN (TaKaRa-Korea) Biomedical Inc.

Phone: (02) 577-2002 Fax: (02) 577-3691

China

TaKaRa Biotechnology (Dalian) Co., Ltd.

Phone: (0411) 763-2792 Fax: (0411) 761-9946

Europe

TaKaRa Biomedical Europe S.A.

Phone: +33 1 41 47 23 70 Fax: +33 1 41 47 23 71

DISTRIBUTORS

USA and the Americas

PanVera Corporation

Phone: 800 791 1400 Fax: 608 233 3007

E-mail: info@panvera.com

USA

Fisher Scientific

Phone: 800 766 7000 Fax: 800 926 1166

Europe

BioWhittaker Europe

Austria: 0800 201 538 Belgium: +32 87 321 611

France: 0800 911 981 Germany: 0800 182 5287

Netherlands: 0800 022 4525 Switzerland: 0800 838 620

UK: +44 118 979 5234

Taiwan

Cheng Chin Trading Co., Ltd.

Phone: +886 2 2331 3111 Fax: +886 2 2382 2197

Cold Spring Biotechnology Co., Ltd.

Phone: +886 2 2695 9990 Fax: +886 2 2695 9963

Homepage: http://www.takara.co.jp/english/bio_e/ E-mail: bio-sm@takara.co.jp

RETIREMENT

INSURANCE

MUTUAL FUNDS

TRUST SERVICES

TUITION FINANCING



How much damage could little things like fees and expenses do to my annuity?

Try \$70,000¹ worth. Over 20 years, that's how much would be eaten away by the average fees and expenses charged for a \$100,000 variable annuity. Which is precisely why you should think about an annuity from TIAA-CREF Life Insurance Company.²

Our expenses are among the lowest in the industry.³ And, we don't saddle you with loads, surrender charges or commissions.

So more of your money will be working for you. Hungry for more information?

Call us at 1 800 842-1924 or visit www.tiaa-cref.org/pas to learn more about our range of variable annuity investment choices. And stop high fees and expenses from chomping away at your nest egg.



Ensuring the future for those who shape it.SM

Circle No. 10 on Readers' Service Card

1 800 842-1924 dept: NJA

www.tiaa-cref.org/pas

For more complete information, including charges and expenses, on TIAA-CREF Life's Personal Annuity SelectSM variable annuity or other securities products, call 1 800 842-1924 for prospectuses. Read them carefully before you invest. 1. This assumes \$100,000 is invested for 20 years in an annuity with an 8% average return and an expense charge of 2.13%, which is the average variable annuity expense charge according to Morningstar, Inc.'s tracking of 8,391 variable annuity subaccounts, as of 9/30/00. 2. The deferred annuity contracts issued by TIAA-CREF Life Insurance Co., New York, NY, are available subject to state approval. Before transferring, check with your current provider to see if you will incur surrender charges. 3. This claim is based on our current expenses which range from 0.37% to 0.59% vs. the average variable annuity expense charge of 2.13%, as referenced in footnote 1. Our expenses reflect that a portion of the investment advisory fee and certain separate charges have been waived. This advisory fee waiver is contractual and will remain in effect until April 1, 2003. The maximum total annual expense charges without waivers range from 1.50% to 1.73%. • 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 01/03

Spend
tomorrow
afternoon
getting
to know
your oligos



instead
of
waiting
for
them
to arrive.



SameDay Oligo Service

Your oligos. Our priority.

Order your custom primers via the web
by 12:00pm CST today and your order
will be shipped priority overnight and in
your hands tomorrow morning.



SameDay Qualifications:

25 nmole scale, 15-30 bases,
unmodified, maximum of 25 oligos
per order. Available anywhere
within the continental U.S.

IDT
INTEGRATED **DNA**
TECHNOLOGIES, INC.

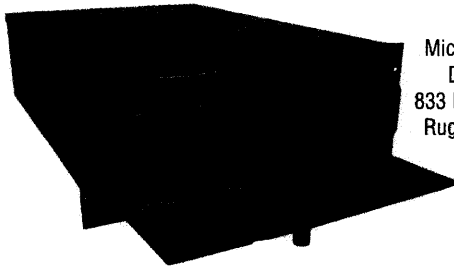
www.idtdna.com
800-328-2661

Circle No. 47 on Readers' Service Card

Genomic Research Leaders Choose Microway® Scalable Clusters

Eos Biotechnology, Marine Biological Laboratory, Millennium Pharmaceuticals, Mount Sinai Medical School, NIH, Pfizer, and Rockefeller University All Choose Microway Custom Clusters and Workstations for Reliability, Superior Technical Support and Great Pricing.

- **Microway Dual Alpha Rackmounts and Towers** For maximum performance choose the Alpha based 1U CS20, 4U UP2000+ or 4U 264DP - 833 MHz/DDR Cache
- **Dual Pentium III and Pentium 4 Clusters**
- **Myrinet, Gigabit Ethernet or Dolphin Wulffit High Speed Low Latency Interconnects**
- **RAID and Fibre Channel Storage Solutions**



Microway® Screamer™
Dual Alpha UP2000+
833 MHz, 4MB Cache in
RuggedRack™ Chassis
with Redundant
Power Supply

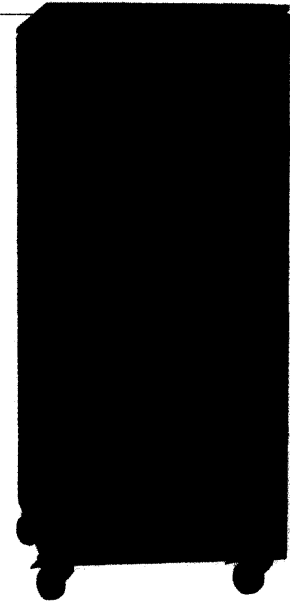
Microway Designs Cost-Effective, Custom Linux and UNIX Workstations and Beowulf Clusters for Genomic Research... That WORK!

Microway has been serving the scientific computing community since 1982, when our pioneering software made it possible to use an 8087 in the IBM-PC. In 1987 we created the world's first PC parallel processing systems. Since then, our QuadPuter™ architecture has migrated from Transputers to i860s and finally to Alphas in 1995. Over the past five years, we have engineered and delivered over 300 clusters that utilized PVM or MPI running on Tru64 UNIX or Linux. As a software developer and hardware manufacturer, we know the value of extensive testing and validation. We are experts at configuring and validating the low latency interconnects we employ in our clusters. Our technical support is legendary — the systems we sell arrive at your site and WORK! Los Alamos chose Microway to maintain and upgrade its 144 node Alpha Avalon Cluster because of our reputation. Examples of large clusters which we have sold include 400+ nodes at the University of Wisconsin and 200+ nodes at Rockefeller University. Microway is API Networks' Top North American Channel Partner.



Microway offers five different Alpha packaging options — 4U RuggedRack™, 3U, full tower, QuadPuter and 1U. Our 264DP features two 21264's with up to 4 GB of memory in our custom 4U RuggedRack, which features front accessible redundant power supplies and hard disks. We also offer a dual Alpha UP2000+ running at 833MHz with 2GB of memory in all five options. Our QuadPuter chassis holds 4 processors and up to 4GB memory. The 1U CS20 dual Alpha is the highest density, computational platform available.

Microway custom configures **Linux, NT and UNIX workstations, clusters and servers** plus state of the art **RAID** systems. If you need a quality product that is fine tuned and built to last, from a company that will be around to support you for years to come, **Microway is The Number One Choice.**



"Most Powerful, Highest Density Computational Platform On the Planet"

Microway Scalable 25 Node 50 Processor Cluster Using CS20 Dual 833 MHz Alphas and Myrinet Interconnect Yielding Peak Throughput of 82.5 Gigaflaps.

"I have ordered numerous Alpha and Intel-based servers and workstations from Microway running both Tru64 UNIX and Linux. We have been very happy with both the performance and great value of Microway's products. The major UNIX vendors don't come close to Microway in this regard, and we have also found that Microway provides better value than other Linux hardware vendors. I have also used Microway's tech support and was pleased with their response. We've been using their systems for over a year and have had only a couple of minor incidents which were dealt with promptly."

— David Kristofferson, Ph.D., MBA,
Director of Information Systems, Eos Biotechnology, Inc.

Find out why over 75% of Microway's sales come from repeat customers. Please call 508-746-7341 for a technical salesperson who speaks your language!

Visit us at www.microway.com

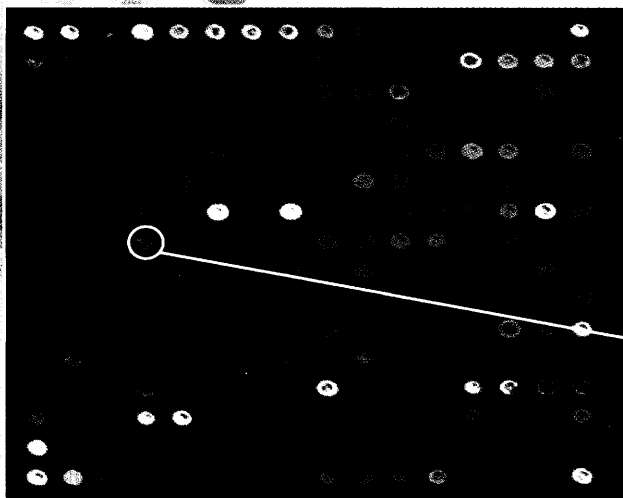
Circle No. 46 on Readers' Service Card

Microway
Technology you can count on™

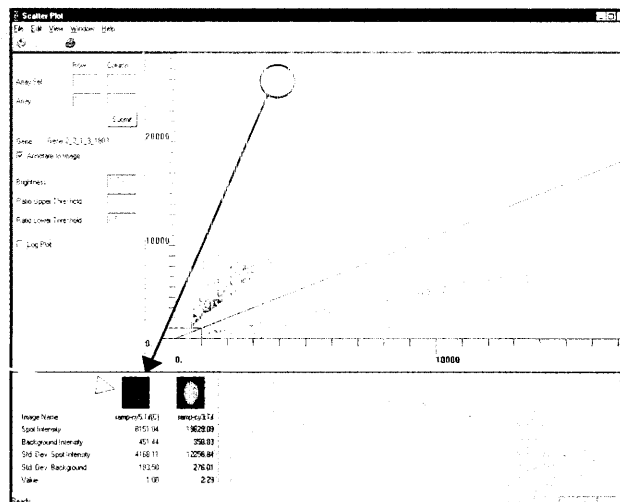
Research Park Box 79, Kingston, MA 02364 • 508-746-7341 • info@microway.com



WOULD YOU WANT TO MISS THIS GENE?



Courtesy of: Mike Wilson and Gary Schoolnick of Stanford University



QuantArray[®] Scatter Plot graphical results display

- State-of-the-art confocal scanning.
- Real Pixel resolution of 5 μ m.
- Sequential imaging of up to 5 colors.
- Adjustable laser power and PMT settings allow for optimum sensitivity

- Flexibility of spot analysis.
- Powerful algorithms that optimize signal to noise.
- Robust, automated spot quantitation.

Are the tools you are using in your microarray experiments causing you to miss important data points because of poor image acquisition or cumbersome data analysis? ScanArray[®] and QuantArray[®] products provide the highest quality image capture through a reliable confocal scanning instrument with true 5 μ m resolution. Reliable gene expression and SNP experiments require high precision imaging and powerful analytical algorithms to ensure that each spot on a microarray contributes maximum information to an accurate data set. ScanArray[®] images are composed of unfiltered raw data to ensure the most accurate analysis available. QuantArray[®] provides unique, accurate spot-finding and ratio-generating features that ensure that each analyzed microarray spot on the image provides the maximum and comprehensive data.



39 Manning Road
Billerica, MA 01821 USA
Tel: 978-439-5511 • Toll Free: 888-323-9681
Fax: 978-663-8917 • E-mail: array@packardbioscience.com

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



www.packardbiochip.com

Circle No. 8 on Readers' Service Card

Defining Sequence Analysis

Lasergene (lā-zər-jēn) *n.* 1. easy-to-use sequence analysis software

2. comprehensive software suite with integrated BLAST and Entrez Searching

3. analysis tools—contig assembly, gene discovery, primer design, alignment, restriction mapping, protein structure

4. software for Win and Mac computers

Try a Demo-
www.dnastar.com

DNA*
DNASTAR

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

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

DNA*
DNASTAR

Circle No. 51 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.laborweb.com/GeneGuide

See us at:
HGM 2001 APRIL 19-22
EDINBURGH, SCOTLAND, BOOTH 40
or contact us at +972-3-765-8585



compugen

www.cgen.com

Circle No. 30 on Readers' Service Card