Quantitative PCR

Request your 2003-2004 Stratagene catalog today!

Go to www.stratagene.com/catalog or call 800-424-5444

Real-Time QPCR just got more affordable.

The Mx4000™ system* is now even easier to use and still the most flexible QPCR system on the market. The system is designed to support all QPCR chemistries and fluorescent dyes. Its powerful and intuitive software makes collection and analysis of high-quality data fast and convenient.

New Design!
Lower Price!

Now you can have it all.

- *Higher level of performance*
- *Improved plate handling*
- *Increased reliability, less down time*
- *Unparalleled service and support*

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

STRATAGENE EUROPE
Belgium, France, Germany, The Netherlands, Switzerland, United Kingdom
European Toll-Free Numbers
ORDER: 00800 7000 7000
TECHNICAL SERVICES: 00800 7400 7400
Austria
0800 312 526

*Patent pending. See www.stratagene.com for licensing information.

Call or visit our website for more information.

www.stratagene.com

Cutting-Edge Quantitative PCR

Mx4000™

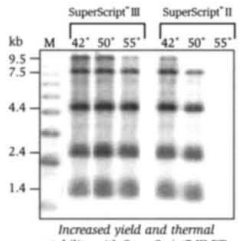
MULTIPLEX QUANTITATIVE PCR SYSTEM

STRATAGENE®

Score winning cDNA yields with SuperScript™ III RT

Researchers around the world depend on SuperScript™ for winning results. Now SuperScript™ III reverse transcriptase from Invitrogen offers improved performance to ensure your success in every RT experiment.

More cDNA. SuperScript™ III RT, engineered from SuperScript™ II, is RNase H⁻ to generate high yields of full-length cDNA. Plus, it has full activity at 50°C and an incredibly long half-life of 220 minutes. The result: even higher cDNA yields, beyond what any other RT can do.



Increased yield and thermal stability with SuperScript™ III RT.

Improved RT-PCR. SuperScript™ III is ideal for RT-PCR with a gene-specific primer. And increasing units doesn't inhibit PCR. Whether you're cloning, analyzing a single gene or expression of every gene, SuperScript™ III RT will give you overall superior performance to achieve the results you need. For more information, visit **www.invitrogen.com/superscriptIII** today.

Invitrogen™
life technologies

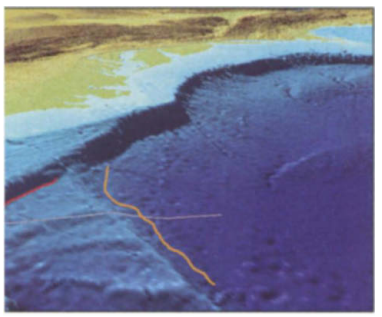
Corporate Headquarters:
Invitrogen Corporation
1600 Faraday Avenue
Carlsbad, California 92008 U.S.A.
Tel: 1 760 603 7200
Tel (Toll Free): 1 800 955 6288
Fax: 1 760 603 7229
Email: tech_service@invitrogen.com

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

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

Science

Volume 298 6 December 2002 Number 5600



1877
Finding an edge

NEWS

NEWS OF THE WEEK

NEWS FOCUS

1870
Infrared eye

SCIENCE'S COMPASS

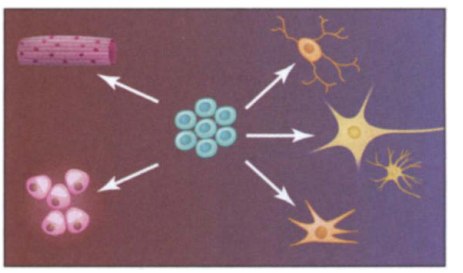
1899
Limitations of axiom-based systems

BOOKS *ET AL.*

HISTORICAL ESSAY

PERSPECTIVES

1901
An axolotl's tale of regeneration

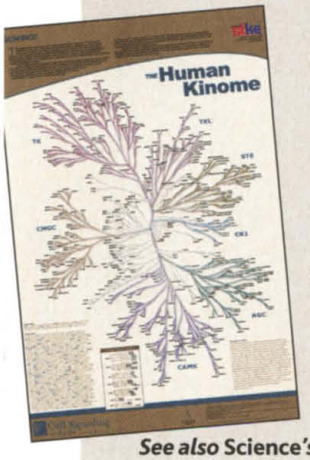


RESEARCH

BREVIA

REPORTS

THE HUMAN KINOME



VIEWPOINT

REVIEW

See also Science's *STKE* on p. 1841

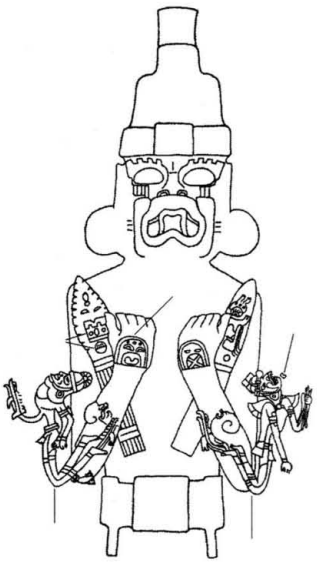
POLARITY: FROM CELL TO ORGANISM

REVIEWS

See also Science's *STKE* on p. 1841

COVER 1941

The *Caenorhabditis elegans* polarity regulator PAR-2, here tagged with green fluorescent protein, is uniformly distributed in a one-cell embryo (top left) but localizes to the posterior before the first cell division (bottom right). Mechanisms involved in the establishment and maintenance of polarity are featured in the special section in this issue. [Photo: Adrian Cuenca]

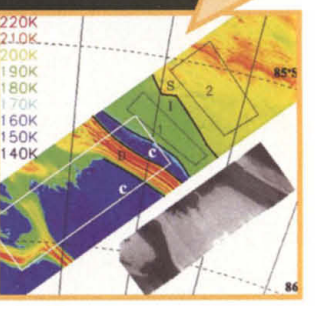


1984

First words in the New World

New on *Science* Express

Martian icy patch



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.

Domestic individual membership and subscription (51 issues): $120 ($66 allocated to subscription). Domestic institutional subscription (51 issues): $390; Foreign postage extra: Mexico, Caribbean (surface mail) $55; other countries (air assist delivery) $85. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. Publications Mail Agreement Number 1069624. **Printed in the U.S.A.**

Change of address: allow 4 weeks, giving old and new addresses and 8-digit account number. **Postmaster:** Send change of address to *Science*, P.O. Box 1811, Danbury, CT 06813–1811. **Single copy sales:** $10.00 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 $15.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for *Science* is 0036-8075/83 $15.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

At every stage in the discovery and development of new medicines, the pressure is on to get results.

You need to be able to make your processes faster, more targeted, more economical, more effective. You need integration of individual processes. You need scalability from lab to production. And you need continual innovation, so you always stay one step ahead.

Amersham Biosciences helps you do all that. We understand your needs. We understand the pressures you are under. We understand your processes.

We focus on improving individual steps. We make the overall process more efficient. We continually improve our technology and deliver new innovation. **We help you to do more.**

discover more. determine more deliver more

Amersham Biosciences

www.amershambiosciences.com

Amersham Biosciences UK Limited, Amersham Place,
Little Chalfont, Buckinghamshire, HP7 9NA
AD 21-02

Scienceonline

www.scienceonline.org

FREE access to *Science*'s STKE until 7 January 2003. Register at http://stke.sciencemag.org.

CONTENT HIGHLIGHTS AS OF 6 DECEMBER 2002

science magazine

www.sciencemag.org

SCIENCE EXPRESS

www.sciencexpress.org

Exposed Water Ice Discovered Near the South Pole of Mars T. N. Titus, H. H. Kieffer, P. R. Christensen

▼1866

Infrared radiation imaging by Mars Odyssey found exposed water ice at the south pole that provides another accessible source of water vapor for transient clouds.

Rates of Behavior and Aging Specified by Mitochondrial Function During Development A. Dillin *et al.*

Defects in the mitochondrial respiratory chain of the nematode *C. elegans* during the developmental phase (but not adulthood) result in worms with an extended life-span.

Bose-Einstein Condensation of Cesium T. Weber, J. Herbig, M. Mark, H.-C. Nägerl, R. Grimm

Bose-Einstein condensation of cesium has been achieved using a combination of optical and magnetic trapping techniques.

science's next wave

www.nextwave.org

career resources for scientists

GLOBAL: And Now for Something Completely Different . . . Edited by K. Urquhart

Each essayist in December's careers feature has a unique or unusual job—and a passion for what they do.

UK: A Funny Thing Happened on the Way to the Lab H. Pilcher

Working with children, animals, stem cells, and blokes in white coats provides plenty of material for lively stand-up comedy routines.

NETHERLANDS: School for T-Shaped People T. Jetten

An innovative Ph.D. program provides students with in-depth research knowledge and a wide disciplinary focus.

GERMANY: Broaden Your Horizons R. Bartz

A year in Texas was a boon to one participant in a U.S.–Germany exchange program.

SINGAPORE: The Ideal Ph.D. Mentor—A Student's Perspective W. T. Ling

What one student expects of her supervisor—and why.

GRANTSNET: December News K. Cottingham

Funds for NIH fellows; a postdoctoral fellowship for study in the UK; and the latest biomedical funding news.

science's sage ke

www.sageke.org

science of aging knowledge environment

NEWS SYNTHESIS: Europe Wakes Up to Aging G. Weiss

Its nations have long neglected the science of aging—but change is in the air.

NEWS FOCUS: Ageless Activist I. Chen

Paola Timiras has advocated for education about aging since the 1960s.

NOTEWORTHY THIS WEEK: Domino Effect C. Seydel

Multiple DNA-wrapping proteins might execute calorie restriction's life-extending effects in fruit flies.

science's stke

www.stke.org

signal transduction knowledge environment

KINOME

See related articles beginning on p. 1911

CONNECTIONS MAPS: Canonical Mitogen-Activated Protein Kinase Pathways R. Lapadat and G. L. Johnson

ERK1/ERK2 MAPK, JNK MAPK, and p38 MAPK pathways.

PERSPECTIVE: Hitting the Target—Emerging Technologies in the Search for Kinase Substrates B. D. Manning and L. C. Cantley

Help in the search for physiological targets of protein kinases.

PERSPECTIVE: Plasticity of the Kinomes in Monkey and Rat Tissues S. Pelech and H. Zhang

A screen of 78 mammalian kinases yields unexpected variation.

PROTOCOL: Design and Use of a Mammalian Protein-Protein Interaction Trap (MAPPIT) S. Eyckerman *et al.*

Detecting interactions and screening for novel protein partners.

POLARITY

See related articles beginning on p. 1941

PERSPECTIVE: Aurora-A in Cell Fate Control C. Gonzalez

Role for Aurora-A in asymmetric protein localization.

PERSPECTIVE: Creating Asymmetric Cell Divisions by Skewing Endocytosis Q. Shen and S. Temple

How Notch signaling is silenced in only one daughter cell by asymmetric distribution of Numb.

PERSPECTIVE: Pulsating Ion Fluxes and Growth at the Pollen Tube Tip K. R. Robinson and M. A. Messerli

Do oscillating ion fluxes direct polarized growth?

ONLINE STAFF

***SCIENCE*NOW** MANAGING EDITOR Erik Stokstad; EDITOR Greg Miller

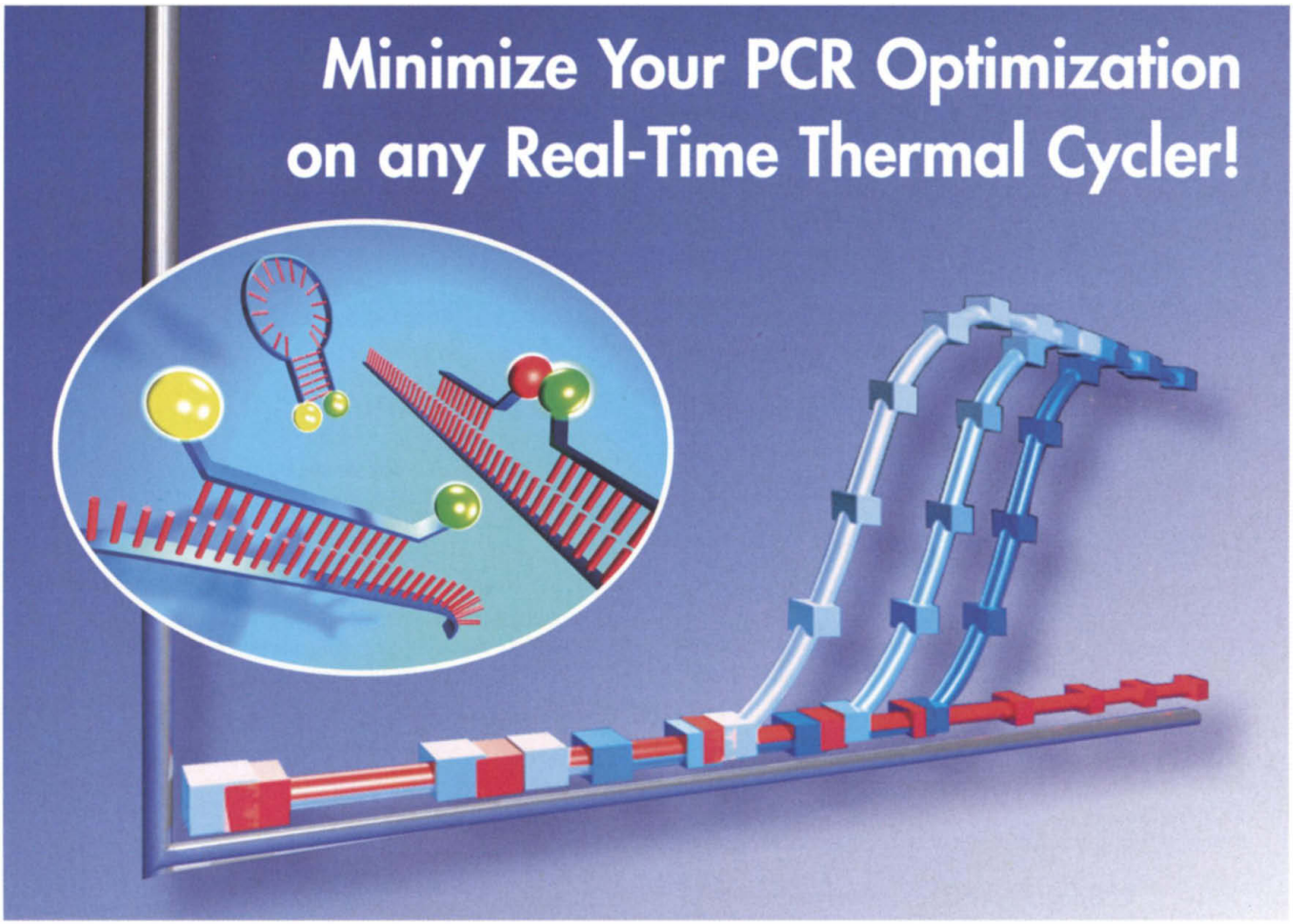
***SCIENCE*'S NEXT WAVE** EDITORIAL: EDITOR Crispin Taylor; PORTAL EDITORS Elizabeth Pain (UK), Eick von Ruschkowski (Germany), Kirstie Urquhart (Europe), Ric Weibl (US); CONTRIBUTING EDITORS Lesley McKarney (Canada), Robert Metzke (Netherlands), Jennie Wong (Singapore); PROJECT EDITORS Jim Austin, Sibrina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

AIDSCIENCE SENIOR EDITOR Roberto Fernandez-Larsson

***SCIENCE*'S STKE** EDITOR Bryan Ray; MANAGING EDITOR Nancy Gough; ASSOCIATE EDITORS Elizabeth M. Adler, Lisa Chong; PUBLICATIONS ASSISTANT Christopher Kenny

***SCIENCE*'S SAGE KE** EDITOR-IN-CHIEF George M. Martin; EDITOR Kelly LaMarco; SENIOR NEWS EDITOR Evelyn Strauss; ASSOCIATE EDITOR R. John Davenport

ELECTRONIC MEDIA MANAGER Don Hemenway; INTERNET PRODUCTION MANAGER Betsy Harman; ASSISTANT PRODUCTION MANAGER Wendy Stengel; SENIOR PRODUCTION ASSOCIATES Sheila Myers, Lisa Stanford; ASSOCIATES Carla Cathey, Eugene Moxley, Louis Williams; LEAD APPLICATIONS DEVELOPER Carl Saffell; APPLICATIONS DEVELOPER John Williams

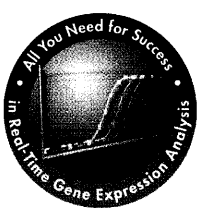


New QuantiTect™ Probe PCR and RT-PCR Kits

Quantitative real-time PCR and RT-PCR using sequence-specific probes is now easier than ever before — with the QuantiTect™ Probe PCR Kit (for PCR and two-step RT-PCR) and the QuantiTect Probe RT-PCR Kit (for one-step RT-PCR).

Both kits are designed for use with all types of probes including TaqMan® or QIAGEN® Operon® dual-labeled probes, FRET probes (such as LightCycler® hybridization probes), and Molecular Beacons.

- **Simple assay development** — no need for optimization
- **High sensitivity** — stringent built-in hot start with HotStarTaq™ DNA Polymerase



- **Easy handling** — ready-to-use master-mix format
- **Versatility** — optimized for use with all types of real-time thermal cyclers and sequence-specific probes

QIAGEN Operon is a licensed supplier of a wide variety of primers and probes for quantitative, real-time PCR with QuantiTect Probe Kits.

www.qiagen.com

QIAGEN:

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

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

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

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

Italy
Tel. 02-33430411
Fax 02-33430426

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

Switzerland
Tel. 061-319-30-31
Fax 061-319-30-33

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

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

Distributors:

Argentina Tecnolab S.A. (011) 4555 0010 **Austria/Slovenia** Merck Eurolab GmbH (01) 576 00 0 **Belgium/Luxemburg** Westburg b.v. 0800-1-9815 **Brazil** Uniscience do Brasil 011 3622 2320 **China** Gene Company Limited (852)2896-6283 **Cyprus** Scientronics Ltd (02) 765 416 **Czech Republic** BIO-CONSULT spol. s.r.o. (420) 2 417 29 792 **Denmark** Merck Eurolab A/S 43 86 87 88 **Egypt** Clinilab 52 57 212 **Finland** Merck Eurolab Oy (09)-804 551 **Greece** BioAnalytica S.A. (01)-640 03 18 **India** Genetix (011)-542 1714 or (011)-515 9346 **Israel** Westburg (Israel) Ltd. 08 6650813/4 or 1-800 20 22 20 **Korea** LRS Laboratories, Inc. (02) 924-86 97 **Malaysia** RESEARCH BIOLABS SDN. BHD. (603)-8070 3101 **Mexico** Quimica Valaner S.A. de C.V. (55) 55 25 57 25 **The Netherlands** Westburg b.v. (033)-4950094 **New Zealand** Biolab Scientific Ltd. (09) 980 6700 or 0800 933 966 **Norway** Merck Eurolab AS 22 90 00 00 **Poland** Syngen Biotech Sp.z.o.o. (071) 351 41 06 or 0601 70 60 07 **Portugal** IZASA PORTUGAL, LDA (21) 424 7312 **Singapore** Research Biolabs Pte Ltd 2731066 **Slovak Republic** BIO-CONSULT Slovakia spol. s.r.o. (02) 5022 1336 **South Africa** Southern Cross Biotechnology (Pty) Ltd (021) 671 5166 **Spain** IZASA, S.A. (93) 902.20.30.90 **Sweden** Merck Eurolab AB (08) 621 34 00 **Taiwan** TAIGEN Bioscience Corporation (02) 2880 2913 **Thailand** Theera Trading Co. Ltd. (02) 412-5672 **In other countries contact:** QIAGEN, Germany

QIAGEN

PCRQTP0220025WW

THIS WEEK IN Science

edited by Phil Szuromi

Sonochemistry in Green Solvents

Sonochemistry takes advantage of the high temperatures that can be generated in solution by the collapse of cavitation bubbles. Kuijpers *et al.* (p. 1969) show that radicals formed by cavitation can be used to induced polymerization reactions of methyl methacrylate in high-pressure liquid CO_2. High conversions result because the polymer is poorly solvated under these conditions and precipitates, thus maintaining a low-viscosity solution.

1975

How Our Planet Shapes Up

Recently, Cox and Chao (2 August, p. 831) determined that Earth's dynamic oblateness had increased sharply in 1998. Now Dickey *et al.* (p. 1975) show that the increase is related to oceanic mass redistribution caused by the Pacific Decadal Oscillation and the El Niño–Southern Oscillation and an increase in subpolar glacier melting. Once these short-term climatic effects are excluded, the longer-term decrease in oblateness caused by postglacial rebound can be refined to estimate the viscosity of the lower mantle.

And in Brevia ...

An upper bound of 20% for the contribution of the dissolved organic carbon flux to support respiration in the dark ocean has been estimated by Aristegui *et al.* (p. 1967) based on a data set they assembled.

In the Original Olmec

A written language emerged in Mesoamerica sometime in the first millenium B.C. It was used in southeastern Mexico by the Olmec, who were responsible for many of the first monuments in the New World and who developed large cities, and the language formed the basis for later Mayan writing. However, the time, location, and developers of Mesoamerican writing have been widely debated. Pohl *et al.* (p. 1984; see the news story by Stokstad) have uncovered a seal and plaque holding glyphic inscriptions from near La Venta, Mexico, an ancient Olmec center. Radiocarbon dates and associated pottery imply that these artifacts date 650 B.C. These finds imply that this region was the origin of Mesoamerican writing and the calendar system, rather than cultures in southwestern Mexico.

Heavy Bombardment Formed Martian Valleys

The surface of Mars shows evidence for at least 25 large impact events about 3.5 billion years ago and for the formation of many of the extensive river valley networks at that same time. Segura *et al.* (p. 1977; see the news story by Kerr) modeled the effects of impacts on valley network formation and found that one 500-kilometer-diameter bolide or a dozen 200-kilometer–diameter bolides could have created the 50-meter-thick global layer of water needed to form the valley networks. Impact events may have created warm and wet conditions on Mars, but only for a very short time after the heavy bombardment. Thus, habitability for life would have been limited to a brief period of comfortable quiescence.

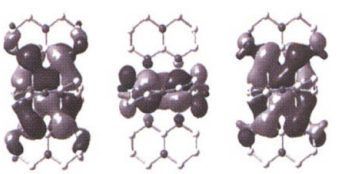
More Is Less

It is commonly assumed that plants will produce more biomass if the atmospheric CO_2 concentrations continue to rise, but CO_2 is not the only agent that effects plant growth. Shaw *et al.* (p. 1987; see the Perspective by Morgan) describe the responses of a grassland ecosystem to a suite of realistic changes in CO_2, temperature, precipitation, and nitrogen deposition, alone and in combination. The response of net primary production (NPP) to elevated CO_2 varies strikingly, depending on the status of other global-change factors. As a single factor, elevated CO_2 increases aboveground growth, but when elevated CO_2 is combined with other global changes, elevated CO_2 tends to decrease NPP.

Refuge Networks

Networks of marine reserves have been suggested as a potential way to conserve biodiversity at scales larger than single isolated reserves. However, often there is not enough information on biodiversity at medium and large scales (beyond data on species richness) to design appropriate networks. To address this problem, Sala *et al.* (p. 1991) have collected information on patterns of biodiversity, ecological processes, and connectivity in reef habitats in the Gulf of California that cover a distance of about 1000 kilometers. Using this information, as well as data on fishing pressure and socioeconomic factors, they developed an algorithm for the selection of reserves to produce a network of reserves that fulfills all conservation goals and permits coexistence with local fisheries.

Easily Lost Electrons



The extremely low ionization energy of cesium has long been exploited in photoelectric cells. Cotton *et al.* (p. 1971) now report on a molecular solid whose ionization energy beats out cesium by a few tenths of an electron volt. This compound contains a specially ligated tungsten-tungsten quadruple bond, and it is the electron in the weakest δ bond that is emitted at such low energies. Quite unlike cesium, the molecule is relatively stable at ambient conditions and may find use as a reducing agent.

Poly(A) Tails and Spermatogeneis

A gene-regulation mechanism that operates during spermatogenesis has been identified by Kashiwabara *et al.* (p. 1999). Male mice that carry a targeted disruption of the gene for testis-specific, cytoplasmic poly(A) polymerase (TPAP) are infertile because of an arrest in spermiogenesis at the round spermatid stage. The reduced expression of a subset of haploid-specific genes demonstrates that TPAP is essential for spermiogenesis. In addition, TPAP is involved in

CREDIT: COTTON *ET AL.*

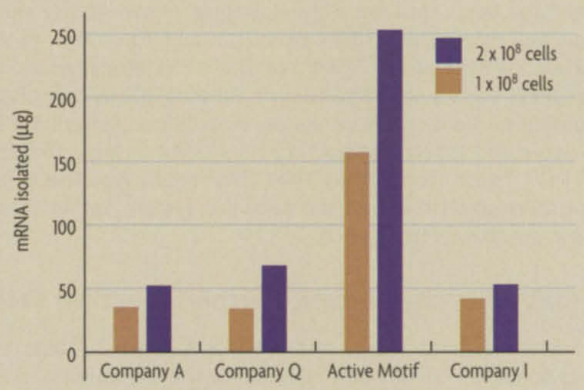
Published online in *Science* Express

CONTINUED ON PAGE 1845

Active Motif's mTRAP™ Kits isolate higher yields of mRNA than conventional methods. They utilize gripNAs™*, a novel class of negatively charged peptide nucleic acids (PNAs) that bind mRNA with a much greater affinity than oligo dT. This enables the use of binding, wash and elution conditions that greatly increase mRNA yields.

Conventional mRNA isolation methods require the use of high-ionic strength buffers, which can also preserve mRNA secondary structure. This prevents many mRNA molecules from being bound. It also stabilizes the non-specific binding and subsequent co-purification of ribosomal RNA (rRNA) and genomic DNA.

In contrast, the high affinity of gripNAs enables mTRAP Kits to use low salt conditions that eliminate secondary structure and non-specific binding. The high affinity also makes possible the isolation of mRNA molecules with short poly A tails. The result is higher yields of more representative mRNA populations, with reduced rRNA and genomic DNA contamination.



mRNA yields from 1 and 2 x 10^8 HeLa cells using Active Motif's mTRAP Maxi and three other suppliers' kits.

Active Motif offers an entire line of mTRAP Kits that optimize mRNA isolation from different sample sizes of cells, tissue or total RNA.

For higher yields of pure mRNA, grab onto mTRAP.

Visit our website: **www.activemotif.com**

North America Toll Free: 877 222 9543 Direct: 760 431 1263
Europe Toll Free: +800 222 95 430 Direct: +32 (0)2 653 0001
Japan Direct: +81 3 5684 1620

* Patent pending

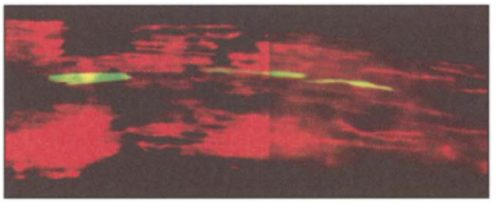
ACTIVE MOTIF

Innovative Tools for
Cell & Molecular Biology

poly(A) tail extension of particular transcription factor messenger RNAs (mRNAs) in round spermatids, and the elimination of TPAP affects nuclear transport of the TAF10 transcription factor. Hence, TPAP is critical for mRNA control during mammalian gametogenesis through posttranscriptional and posttranslational events.

Stem Cell Tails

Many recent experiments on stem cells have focused on whether their differentiative capabilities allow switching of their developmental lineages. Echeverri and Tanaka (p. 1993; see the Perspective by Stocum) now follow the fate of stem cells in the relatively normal context of a regenerating salamander tail. Using real-time, live observation of individually labeled cells, the authors find that cells labeled in the spinal cord contribute to muscle and cartilage of the regenerating tail, as well as to more neuronal cells. Although amphibians show a greater capacity to regenerate limb and tail than do mammals, these observations of amphibian cell plasticity may lead to insights into the factors that control mammalian cell plasticity.



CREDIT: ECHEVERRI AND TANAKA

Blocking Malarial Entry

The widespread resistance of human malaria parasite *Plasmodium falciparum* to the few effective antimalarial drugs has led to a search for new therapeutic targets. Greenbaum *et al.* (p. 2002) used a chemical proteomics screen to identify a cysteine protease, falcipain-1, that is essential for the parasite merozoites to invade human red blood cells. By screening chemical libraries, the authors identified inhibitors that specifically blocked only falcipain-1 activity and parasite invasion of erythrocytes, but not other cysteine proteases or other stages in the parasite life cycle.

Wnt Signaling Through Transducins

Wnts are signaling molecules with critical roles in development that act though a receptor called Frizzled. Although Frizzled proteins resemble heterotrimeric guanine nucleotide binding protein (G protein)–coupled receptors, Wnt signaling is best understood in cases where Wnts control transcription through a β-catenin–dependent signaling mechanism. Ahumada *et al.* (p. 2006) describe a different mechanism for Wnt signaling in which the rat Frizzled-2 protein appears to be coupled to the G protein transducin, better known for its central role in signaling in visual tissues that respond to light. In cultured cells, activation of transducin was required for Wnt-dependent activation of guanosine 3′,5′-monophosphate (cGMP)–dependent phosphodiesterase, as well as subsequent decreases in the intracellular concentration of cGMP and increased release of calcium from intracellular stores. Wnt signaling during zebrafish gastrulation could be inhibited when phosphodiesterase activity was reduced after application of pharmacological inhibitors.

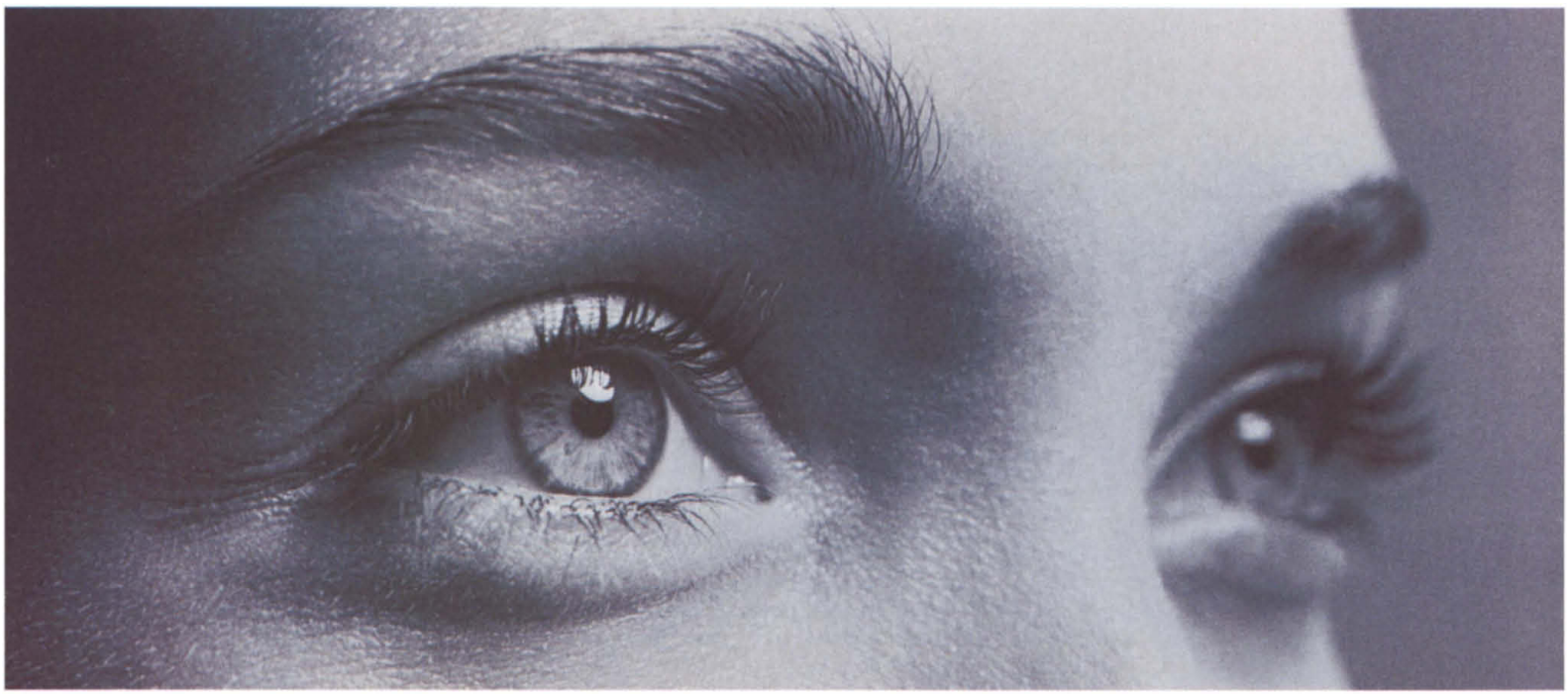
Wakeful Smells in the Morning

It is hard to sleep late when your household is up and about at the crack of dawn. Such social influences are seen in other animals, but how are these signals communicated? Levine *et al.* (p. 2010) have examined mixed *Drosophila* populations of wild-type (rhythmic) and short-period (arrhythmic) fly populations and found that arrhythmic flies destabilize the rhythms of wild-type flies. The information seems to be communicated by chemosensory cues—flies that lack the ability to sense chemical signals ignored their neighbors' activity.

Where Baby Talk Ends Up

How do we learn to understand speech? Dehaene-Lambertz *et al.* (p. 2013) have begun to explore the cerebral origins of language acquisition in humans by adapting the technique of functional magnetic resonance imaging for use on 3-month-old infants. They find evidence for activity in brain regions known to subserve language processing in adults, predominantly on the left side, in response to speech.

Full-Length Genes...



...Look No Further

VAST COLLECTION

Over 10,000 human full-length clones, many of which encode novel proteins whose functions have yet to be defined, are available and can be searched through our Web site. Additional clones may be obtained by special request.

READY-TO-EXPRESS

All clones are in a mammalian expression vector, ready for transfection into eukaryotic cells, and may also be used for direct expression *in vitro* in a coupled transcription-translation system.

REVERSE TRANSCRIBED

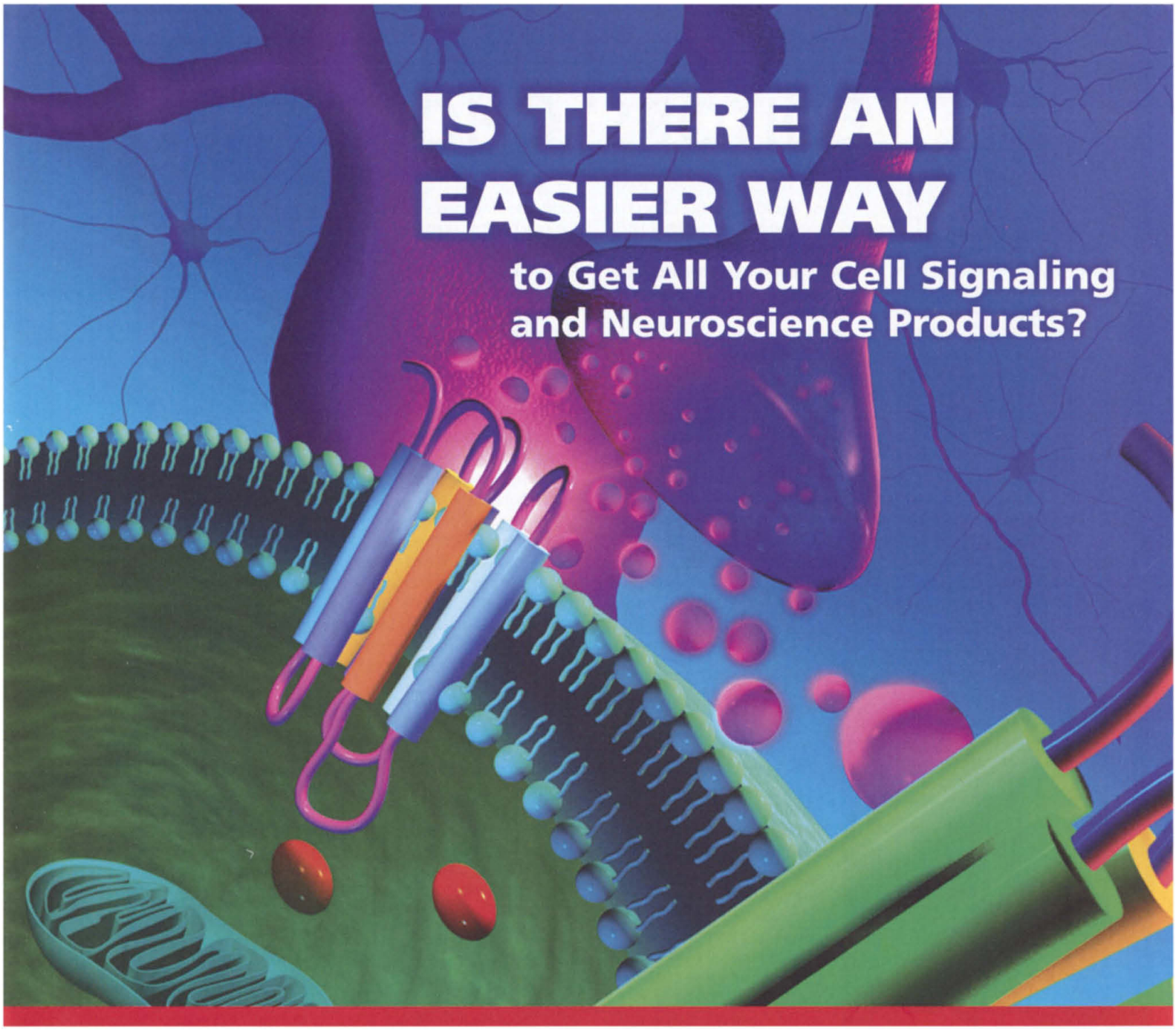
All clones were isolated from our high-quality, reverse transcriptase-generated cDNA libraries. In order to avoid mutations, the cDNA inserts were never subjected to PCR amplification.

EASY TO SEARCH

Clones may be searched by nucleotide sequence, NCBI NM/XM accession number, words in gene description or, more importantly, the presence of specific protein domains.

ORIGENE TECHNOLOGIES, INC.

Visit us at www.origene.com or call us at 301-340-3188



Yes! Sigma-RBI

Why search around for cell signaling and neuroscience products? Sigma-RBI has them all — from standard biochemical reagents to the latest cutting-edge research products, including key signal transduction enzymes, phosphospecific antibodies, novel receptor ligands, selective enzyme inhibitors and much, much more.

Sigma-RBI is committed to bringing you the widest array of new, exciting and innovative research products.

With over 5,000 cell signaling and neuroscience products to select from, Sigma-RBI provides the right research tools right when you need them.

Plus, all products are available in one easy-to-use catalog conveniently arranged by scientific areas of interest — with over 600 new products added every year.

All products are backed by our world-renowned customer service and technical support, and can be researched using our award winning Web site.

Subscribe now to receive our new product updates and our newest Cell Signaling & Neuroscience Catalog by calling 1-800-282-1298 and requesting literature code (079), or visit our Web site at **sigma-aldrich.com/cellsignaling**.

availability, ordering & tracking
sigma-aldrich.com
scientific tools, products & information

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

SIGMA® RBI®

Your Vision - Our Mission

- Observe 0.6 micron-size structures at a resolution of 840 Lp/mm.
- Save 80 % of the time it normally takes to presort, read out, characterize and analyze.
- Zoom with ease from 7.1x to 115x with motorized zooming and conveniently read the current magnification on a display.
- Automatically measure and save measurement data on a PC.

Make Your Visions a Reality:
Leica MZ16 & MZ16 A High-tech Stereomicroscopy

Leica Microsystems (Switzerland) Ltd
Business Unit SM
Max Schmidheiny-Strasse 201
CH-9435 Heerbrugg (Switzerland)

Telephone +41 71 726 33 33
Fax +41 71 726 33 99
www.leica-microsystems.com
www.stereomicroscopy.com

Leica
MICROSYSTEMS

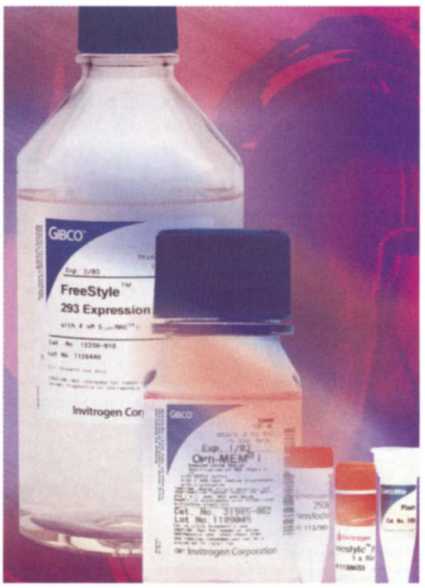
New GIBCO™ FreeStyle™ 293 Expression Medium

Optimize Suspension Growth of 293 Cells in a Serum-Free Medium

Transfect 293 cells in suspension with new, serum-free GIBCO™ FreeStyle™ 293 Expression Medium.

- Enables efficient transfection and promotes optimal growth
- Significantly reduces protein-competitive components
- Provides cleaner preparations and scalable, reproducible results
- Available in economical casepacks

This new medium is also included in the new Invitrogen FreeStyle™ 293 Expression System, which contains transfection reagent and preadapted FreeStyle™ 293F cells that work together to simplify and streamline protein production.



New Advanced D-MEM and MEM

When You Reduce FBS Supplementation, You Reduce Variables

Now you can reduce Fetal Bovine Serum supplementation from 50 to 80%, depending on the cell line, with no loss in cell growth or function and no change in cell morphology.

New GIBCO™ Advanced D-MEM and MEM are enhanced basal formulations that help you control variability. You'll save money and time qualifying new serum lots, since lessening the percentage of serum increases the lifetime of your serum stock.

- Reduces serum supplementation up to 80% with no loss of performance
- Requires no cell adaptation
- Decreases variability from lot-to-lot changes of serum
- Extends life of serum lot

Animal Sera

GIBCO™ Sera Set the Global Standard

When it comes to selecting a supplier of sera, quality is everything. We offer a wide selection of high-quality GIBCO™ products, including Fetal Bovine Serum, Newborn Calf Serum, Bovine Serum, Horse Serum, Goat Serum, and other sera for special applications, all sourced from countries that meet the strict importation requirements of the USDA.

- Manufactured in compliance with the FDA's Quality System Regulation (cGMP) and ISO-9001 guidelines
- Extensively documented, including raw materials traceable to their source
- Produced to our stringent standards, in procedures and processes validated to ensure quality and reproducibility
- Certificates of Suitability available upon request

www.invitrogen.com/gibco

www.sciencemag.org

Science

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**
EXECUTIVE EDITOR **Monica M. Bradford**
DEPUTY EDITORS **R. Brooks Hanson** **Katrina L. Kelner**
NEWS EDITOR **Colin Norman**

EDITORIAL/COMPASS SUPERVISORY SENIOR EDITORS Barbara Jasny, Guy Riddihough, Phillip D. Szuromi; SENIOR EDITOR/PERSPECTIVES Orla Smith; SENIOR EDITORS Gilbert J. Chin, Pamela J. Hines, Paula A. Kiberstis (Boston), Beverly A. Purnell, L. Bryan Ray, Linda R. Rowan; ASSOCIATE EDITORS Lisa D. Chong, Marc S. Lavine, H. Jesse Smith, Valda Vinson; ONLINE EDITOR Stewart Wills; ASSOCIATE ONLINE EDITOR Tara S. Marathe; ASSOCIATE BOOK REVIEW EDITOR Sherman J. Suter; ASSOCIATE LETTERS EDITOR Etta Kavanagh; INFORMATION SPECIALIST Janet Kegg; CONTRIBUTING EDITOR Kevin Ahern; EDITORIAL MANAGER Cara Tate; SENIOR COPY EDITORS Jeffrey E. Cook, Harry Jach, Monique Martineau, Barbara P. Ordway; COPY EDITORS Cynthia Howe, Jennifer Sills, Trista Wagoner; EDITORIAL COORDINATORS Carolyn Kyle, Ellen E. Murphy, Beverly Shields; PUBLICATION ASSISTANTS Chris Filiatreau, Joi S. Granger, Jeffrey Hearn, Elise Laffman, Scott Miller, Gail Murphy, Brian White, Anita Wynn; EDITORIAL ASSISTANTS Lisa Johnson, Dorothy Matthews, Yolanda Matthews, Patricia M. Moore, Tunisia L. Riley; EXECUTIVE ASSISTANT Sylvia S. Kihara; ADMINISTRATIVE SUPPORT Patricia F. Fisher

science_editors@aaas.org (for general editorial queries)
science_letters@aaas.org (for letters to the editor)
science_reviews@aaas.org (for returning manuscript reviews)
science_bookrevs@aaas.org (for book review queries)

NEWS SENIOR CORRESPONDENTS Eliot Marshall, Jean Marx; DEPUTY NEWS EDITORS Robert Coontz, Jeffrey Mervis, Leslie Roberts; ASSOCIATE NEWS EDITOR Laura Helmuth; CONTRIBUTING EDITORS Elizabeth Culotta, Polly Shulman; NEWS WRITERS Jennifer Couzin, Martin Enserink, Constance Holden, Jocelyn Kaiser, Richard A. Kerr, Andrew Lawler (Boston), David Malakoff, Elizabeth Pennisi, Charles Seife, Robert F. Service (Pacific NW), Erik Stokstad, Erica Goldman (intern); CONTRIBUTING CORRESPONDENTS Marcia Barinaga (Berkeley, CA), Kathryn Brown, Barry A. Cipra, Jon Cohen (San Diego, CA), Daniel Ferber, Ann Gibbons, Robert Irion, Mitch Leslie (NetWatch), Charles C. Mann, Virginia Morell, Evelyn Strauss, Gary Taubes, David Voss, Ingrid Wickelgren; COPY EDITORS Laura Atwood, Linda B. Felaco, Daniel T. Helgerman; ADMINISTRATIVE SUPPORT Scherraine Mack, Fannie Groom; 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: 503-963-1940

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

PREFLIGHT OPERATIONS DIRECTOR David M. Tompkins; MANAGER Marcus Spiegler

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

***SCIENCE* INTERNATIONAL**

EUROPE (science@science-int.co.uk) EDITORIAL: INTERNATIONAL MANAGING EDITOR Andrew M. Sugden; SENIOR EDITOR/PERSPECTIVES Julia Fahrenkamp-Uppenbrink; SENIOR EDITORS Caroline Ash, Stella M. Hurtley, Ian S. Osborne, Peter Stern; ASSOCIATE EDITOR Stephen J. Simpson; EDITORIAL SUPPORT Cheryl Sharp, Emma Westgate; ADMINISTRATIVE SUPPORT Janet Mumford, Jill White, Lara Crowe, Mark Chadwick; NEWS: EUROPEAN NEWS EDITOR Richard Stone; DEPUTY NEWS EDITOR Daniel Clery; CORRESPONDENT Gretchen Vogel (Berlin: (49) 30-2809-3902, FAX (49) 30-2809-8365); CONTRIBUTING CORRESPONDENT Michael Balter (Paris: (33) 1-49-29-09-01, FAX (33) 1-49-29-09-00), Philipp Weis (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)

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

EXECUTIVE PUBLISHER **Alan I. Leshner**
PUBLISHER **Beth Rosner**

FULFILLMENT & MEMBERSHIP SERVICES (membership@aaas.org) DIRECTOR Marlene Zendell; MEMBER SERVICES: MANAGER Michael Lung; SENIOR SPECIALIST Mary Curry; COORDINATOR Jantell Stone; SPECIALISTS Laurie Baker, Pat Butler, Elizabeth Early, Kristina Mazzocchi; MARKETING: DIRECTOR SITE LICENSE SALES Tom Ryan; PRODUCTION MANAGER Lauri Sirois; SENIOR ASSOCIATE Deborah Stromberg; INTERNATIONAL MARKETING MANAGER Wendy Sturley; INTERNATIONAL MARKETING EXECUTIVE Emilie Stott; RESEARCH MANAGER Renuka Chander

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

REPRINTS Ordering/Billing/Status 800-635-7171; Corrections 202-326-6501

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

BUSINESS OPERATIONS AND ADMINISTRATION DIRECTOR 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; DIRECTOR OF INTERNATIONAL MARKETING AND RECRUITMENT ADVERTISING Deborah Harris; INTERNATIONAL SUBSCRIPTIONS MARKETING MANAGER Wendy Sturley; RECRUITMENT MARKETING MANAGER Allison Pritchard; ASSOCIATES Mary Ellen Crowley, Amanda Donathen; ELECTRONIC MEDIA: MANAGER Don Hemenway; INTERNET PRODUCTION MANAGER Lizabeth Harman; ASSISTANT PRODUCTION MANAGER Wendy Stengel; SENIOR PRODUCTION ASSOCIATES Sheila Myers, Lisa Stanford; PRODUCTION ASSOCIATES Carla Cathey, Eugene Moxley, Louis Williams; LEAD APPLICATIONS DEVELOPER Carl Saffell; DEVELOPER John Williams

PRODUCT ADVERTISING (science_ advertising@aaas.org) NORTHEAST AND E. CANADA Elizabeth Wardell: 860-668-9025, FAX 413-480-0008 • MIDWEST Rick Bongiovanni: 330-405-7080, FAX 330-405-7081 • WEST COAST/W. CANADA B. Neil Boylan: 415-458-1630, FAX 415-458-1631 • MID-ATLANTIC AND SOUTHEAST SALES Christopher Breslin: 443-512-0330, FAX 443-512-0331 • UK/SCANDINAVIA/FRANCE/ITALY/BELGIUM/NETHERLANDS Andrew Davies: 44 (0)1-782-750-111, FAX 44 (0)1-782-751-999 • GERMANY/SWITZERLAND/AUSTRIA Tracey Peers: (44) 1-782-752-530, FAX (44) 1-782-752-531 JAPAN Mashy Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852 ISRAEL Jessica Nachlas 001 972-3-5449123 • TRAFFIC MANAGER Carol Maddox; SALES COORDINATOR Deiandra Underwood

RECRUITMENT ADVERTISING (science_classifieds@aaas.org); PRODUCTION MANAGER Jennifer Rankin; ASSISTANT PRODUCTION MANAGER Deborah Tompkins; U.S.: SALES MANAGER Gabrielle Boguslawski: 718-491-1607, FAX 202-289-6742; WEST COAST SALES MANAGER Kristine von Zedlitz; EAST COAST SALES MANAGER Jill Steinberg; INTERNET SALES MANAGER Beth Dwyer; ASSISTANT SALES MANAGER Daryl Anderson; SENIOR SALES COORDINATOR Erika Bryant; SALES COORDINATORS Rohan Edmonson, Caroline Gallina, Shirley Young; SALES REPRESENTATIVES Kathleen Clark, Sussy Castilla, Joyce Scott, Bren Peters-Minnis; ASSOCIATES Christine Hall, Amy Hardcastle; PUBLICATIONS ASSISTANTS Robert Buck, Jane Vaughn; INTERNATIONAL SALES EXECUTIVES Anna McBryde, Richard Walters; INTERNATIONAL SALES ASSISTANT Claire Last; INTERNATIONAL RECRUITMENT ADVERTISING MANAGER Tracy Holmes; JAPAN: Mashy Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852

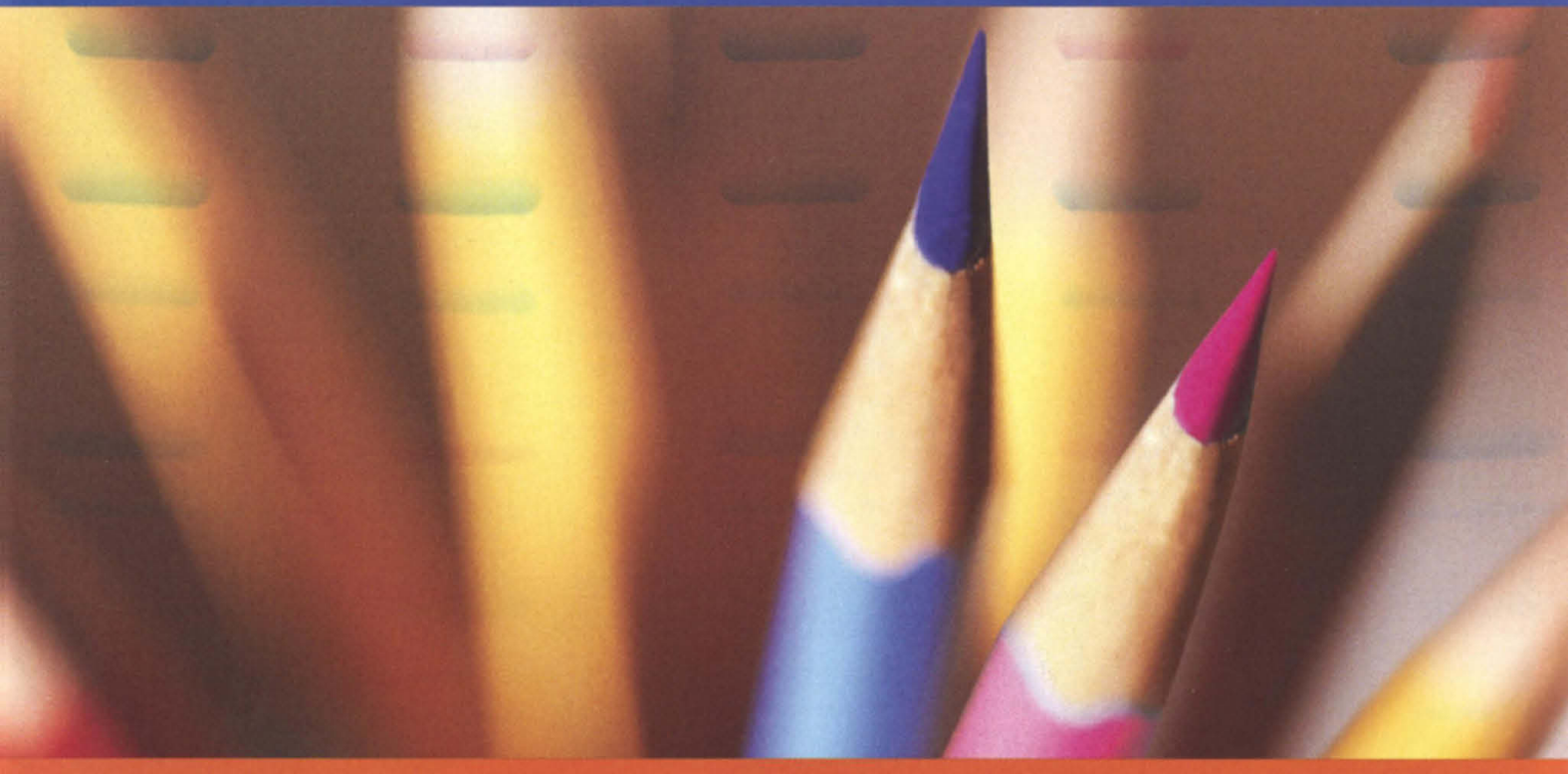
AAAS BOARD OF DIRECTORS RETIRING PRESIDENT, CHAIR Peter H. Raven; PRESIDENT Floyd E. Bloom; PRESIDENT-ELECT Mary Ellen Avery; TREASURER David E. Shaw; CHIEF EXECUTIVE OFFICER Alan I. Leshner; BOARD Lewis M. Branscomb; John E. Burris; Nina V. Fedoroff; Karen A. Holbrook; Richard A. Meserve; Norine E.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

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

AAAS was founded in 1848 and incorporated in 1874. Its mission is to advance science and innovation throughout the world for the benefit of all people. The goals of the association are to: foster communication among scientists, engineers and the public; enhance international cooperation in science and its applications; promote the responsible conduct and use of science and technology; foster education in science and technology for everyone; enhance the science and technology workforce and infrastructure; increase public understanding and appreciation of science and technology; and strengthen support for the science and technology enterprise.

Advancing science • Serving society

Precision Plus Protein™ Standards



The Sharpest Standards in the Box

Now with dual color and more reference bands, protein standards have never looked better.

Precision Plus Protein™ standards in dual color, all blue, and unstained formulations offer:

- The sharpest bands available
- A band migration pattern that never changes, whether you're staining or blotting
- Incredibly precise molecular weights on gels and blots ($r^2 = 0.998$)
- Instant orientation with reference bands at 25, 50, and 75 kD
- A ready-to-use, load-and-go format

For more information on Precision Plus Protein standards, contact your Bio-Rad representative or visit us at **www.bio-rad.com/precisionplus/**

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

BIO-RAD

READER AND ADVERTISER RESOURCES

Free access to www.stke.org: Registered users of *Science* Online will have free, full-text access to *Science's* Signal Transduction Knowledge Environment through 7 January. Register today at **www.sciencemag.org**

Science Careers:

SCIENCECAREERS.ORG

Job Alerts

Keeping up with the job market is critical in any field, and Science Careers can make it easy. Sign up for Job Alerts and receive job listings by e-mail.

Sign up today at www.sciencecareers.org.

FOCUS ON CAREERS

AD SUPPLEMENT ARCHIVES

Looking for a past *Science* Careers ad supplement? You can access all of the 2002 Focus on Careers supplements online at ScienceCareers.org.

Click on Advice and Perspectives to find the online archive.

Product News:

LAB TECHNOLOGY TRENDS

SPECIAL AD SECTION IN THIS ISSUE

Cell Biology

This ad section discusses recent progress made in the field of cell biology and covers the methods, tools, and techniques that allow researchers to piece together the complex inner workings of the living cell.

Look for it on page 2027.

WWW.SCIENCEPRODUCTLINK.ORG

***Science* Product Link**

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

Find it all at www.scienceproductlink.org.

AAAS Members

AAASMEMBER.ORG

***Science* Express**

AAAS Members can read *Science* articles online before they are printed! Updated weekly, papers are posted to *Science* Express within 10– 14 days of acceptance, several weeks before they are published in print. Visit www.scienceexpress.org today!

Trade Shows & Conferences

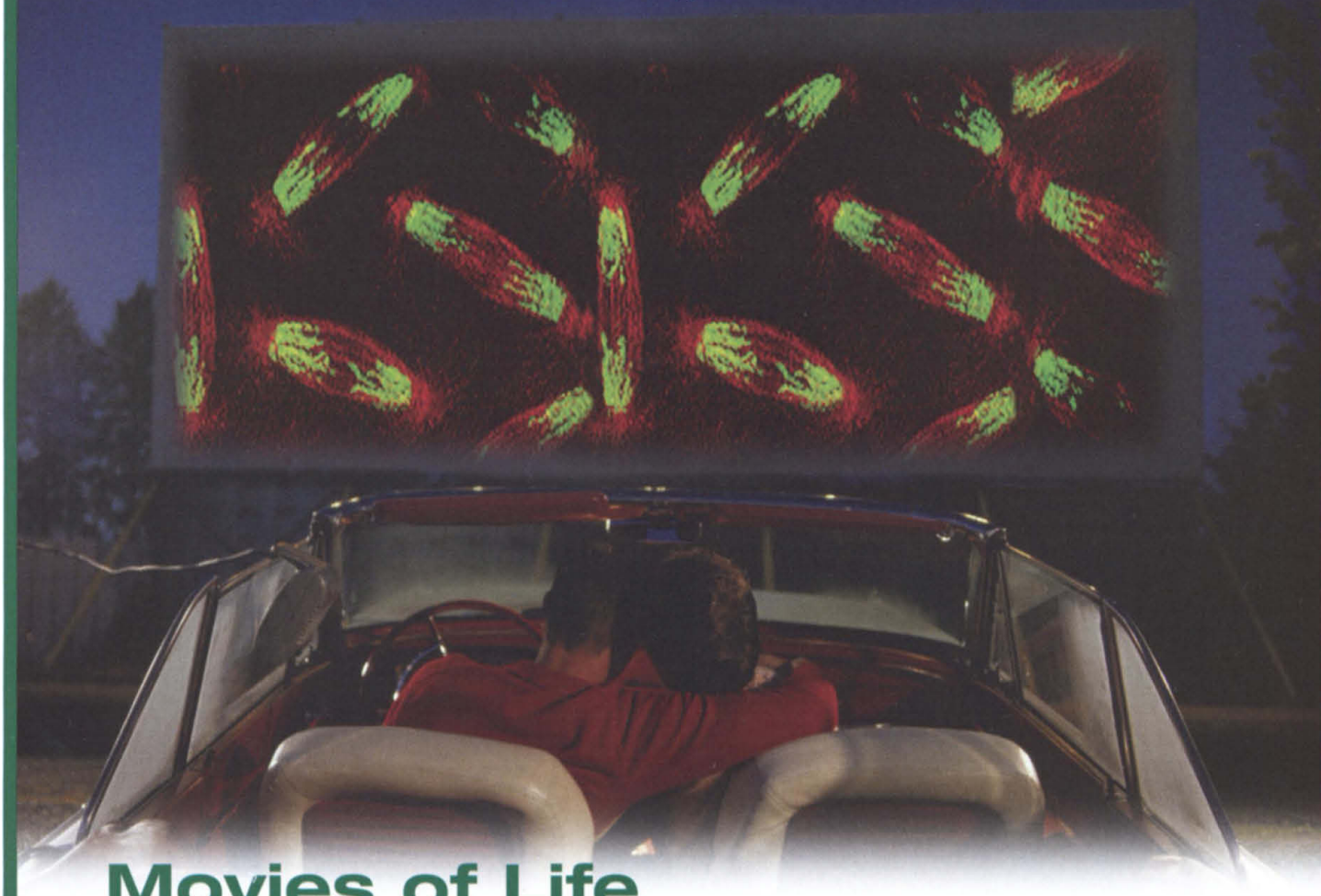
LOOK FOR *SCIENCE'S* 2003 EVENTS CALENDAR, TO BE PUBLISHED IN THE 13 DECEMBER ISSUE OF *SCIENCE*. FIND OUT MORE AT WWW.SCIENCEMEETINGS.ORG.

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

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

Drug Discovery | Research | Clinical Screening

Confocal Microscopy



Movies of Life

See the whole story, in color from start to finish, with the latest Ultra*VIEW*™ Confocal Live Cell Imager, from PerkinElmer Life Sciences.

This innovative multi-point confocal laser scanning microscope lets you capture and view multi-color, multi-dimensional confocal images of living cells in real-time.

With the Ultra*VIEW* Live Cell Imager (LCI), you'll:

- **Collect more data**—*NEW* five-line laser system allows you to use a wider range of fluorescent proteins and dyes in multi-labeling, multi-dimensional experiments, such as CFP, YFP, GFP, and dsRed2.
- **Capture more cellular action**—True, real-time image acquisition collects data faster.
- **Watch cellular processes longer**—The Ultra*VIEW* LCI allows prolonged exposure of living samples to laser light with reduced photobleaching and phototoxicity.
- **See what's happening more clearly**—State-of-the-art design provides ultra-clear high-resolution confocal images.

Now showing on www.liveCELLimaging.com: the latest of our Live Cell Movies and more information about Ultra*VIEW* LCI.

PerkinElmer™ life sciences.

www.liveCELLimaging.com

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

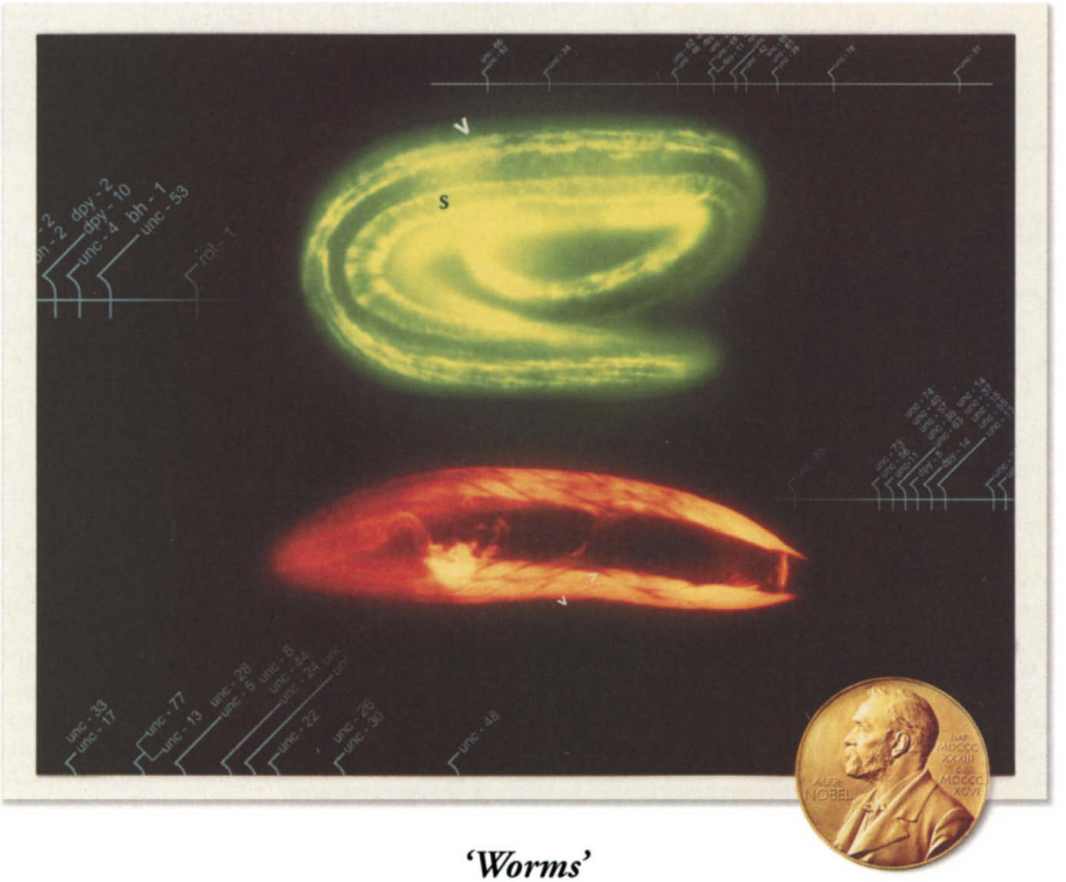
European Headquarters: PerkinElmer Life Sciences, Imperiastraat 8, B-1930 Zaventem Belgium

Image kindly donated by Dr. David Sharp, Department of Physiology and Biophysics, Albert Einstein College of Medicine, Bronx, NY, USA.

P11505

www.liveCELLimaging.com

'Worms'
Sydney Brenner, age 3



'Worms'

2002 Nobel Laureate Sydney Brenner, age 75

It just goes to show that passion grows with age.

Wit and "savage intelligence" characterise Dr Sydney Brenner, whose relationship with the worm started 40 years ago. The insightful Brenner pioneered work on the genetics and development of the humble nematode *Caenorhabditis elegans*. Dr J Sulston and Dr R Horvitz were among the scientists who later joined Dr Brenner's lab. Now all three share the 2002 Nobel Prize in Physiology or Medicine: for research work on the nematode that has "shed new light on the pathogenesis of many diseases".

Among his many notable discoveries, Dr Brenner established the existence of messenger RNA and demonstrated how the order of amino acids in proteins is determined. Dr Brenner also led a genomics group at Singapore's Institute of Molecular and Cell Biology in elucidating the Fugu genome, providing an important key to understanding the complex human genome.

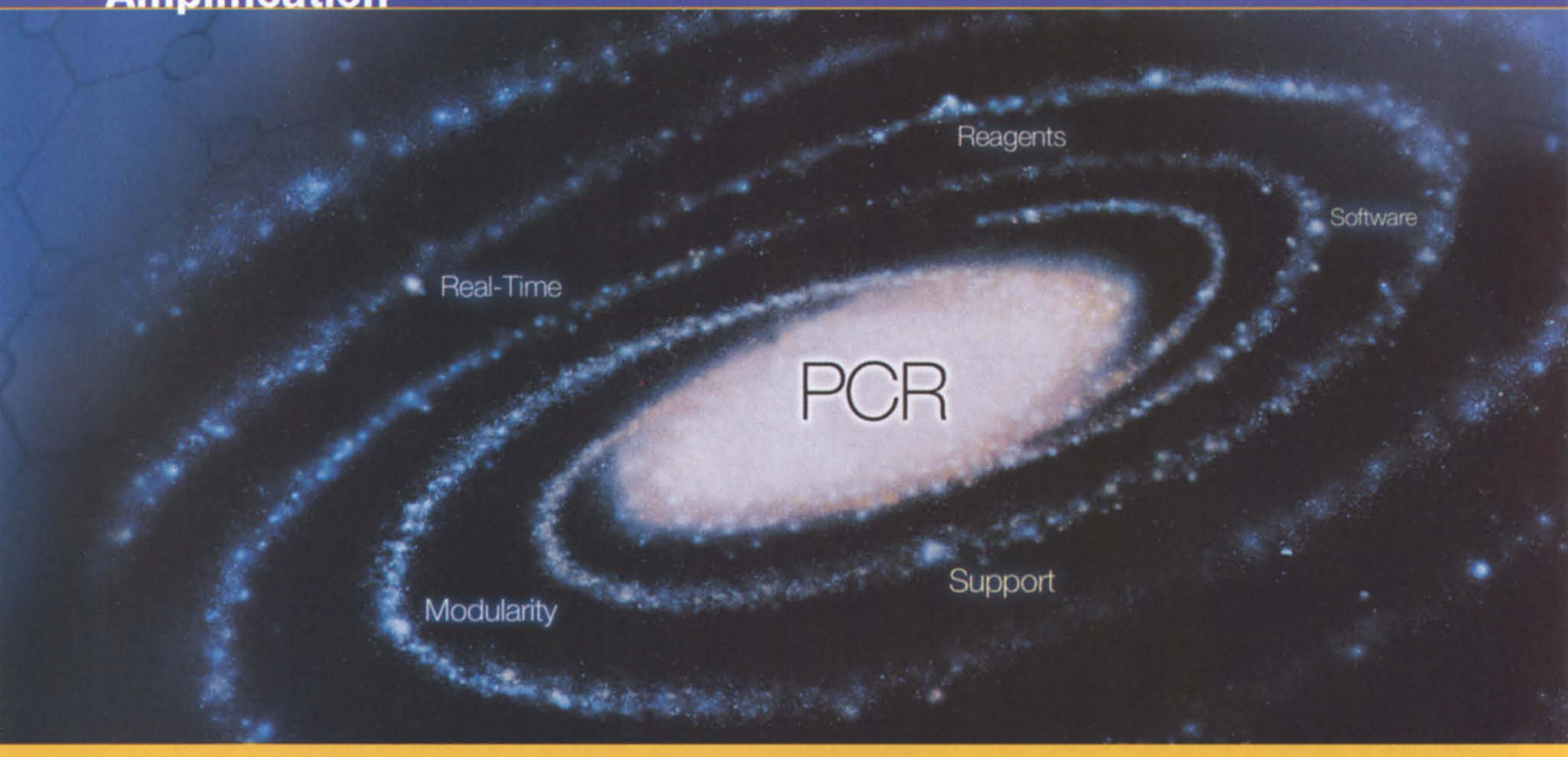
For over two decades, Dr Brenner played an active role in Singapore's biomedical sciences field. He now sits on the Board of Singapore's Agency for Science, Technology and Research (A*STAR) and is the Co-Chairman of the Biomedical Sciences International Advisory Council. He plays a key role in A*STAR's research councils.

Singapore congratulates its Distinguished Friend and Scientific Advisor Dr Sydney Brenner for his Nobel Prize and his relentless pursuit of new knowledge.

NUS National University of Singapore

Agency for Science, Technology and Research SINGAPORE

EDB SINGAPORE



Systems Integration

Discover Bio-Rad's range of solutions for all your amplification needs.

iCycler Flexibility

- Intuitive interface
- Interchangeable reaction modules
- Upgrade to real-time PCR (96-well)

iCycler Reaction Module Options

- 96-, 60-, 384-, and dual 48-well formats
- Innovative gradient design (96-well)

Amplification Tools

- Hot start *Taq* polymerase
- Core PCR reagents
- PCR tubes and plates
- Unsurpassed customer service

iCycler™ thermal cycler with dual 48-well reaction module

iTaq™ DNA polymerase

96-well reaction module

384-well reaction module

60-well reaction module

The polymerase chain reaction (PCR) process is covered by patents owned by Hoffman-LaRoche. Use of the PCR process requires a license.

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

BIO-RAD

The multi-talent for transfection and cell fusion

One **Multiporator®** for multiple applications!
Electroporation of eukaryotic cells, bacteria and other microorganisms, as well as electrofusion of cells – the Eppendorf Multiporator offers it all. Together with perfectly adapted buffers, high-precision cuvettes and chambers, and up-to-date protocols it is the ideal tool for successful experiments.

Easy and reproducible cell fusion!

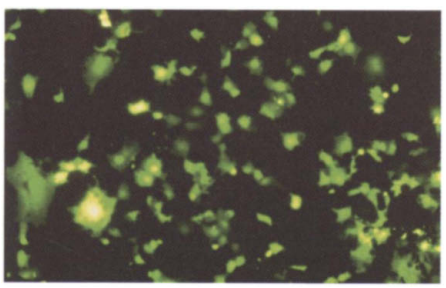
- Sophisticated Helix chamber for efficient electrofusion
- Microfusion chamber enables viewing and fast optimization of fusion parameters
- Flexibility with accessories for connection of external electrodes

Please visit us
December 14–18, 2002 · Booth 1330
American Society for Cell Biology (ASCB)
Moscone Convention Center · San Francisco, CA

Outstanding transfection rates!

- Optimal electroporation buffer system boosts transfection efficiency
- Soft PulseTM technology minimizes damage to cells
- Electronically-regulated pulse* discharge ensures reproducible results

*US patent 6008038



- HeLa cells transfected by the Multiporator

Application Hotline:
+49 180-3 66 67 89

eppendorf

In touch with life

your local distributor: www.eppendorf.com/worldwide

Eppendorf AG · 22331 Hamburg · Germany · Phone: +49 180 366 67 89 · E-Mail: eppendorf@eppendorf.com · Internet: www.eppendorf.com
Brinkmann Instruments, Inc. · Westbury, N.Y. 11590-0207 · USA · Phone: 800-645-3050 · E-Mail: info@brinkmann.com · Internet: www.brinkmann.com

The ORFeome BioCharter™

The future isn't created by chance. It's the mirror of our imagination. Yet for the future to emerge as we picture it, the abstract must crystallize into the concrete, the vision transformed into action. In the life sciences the challenge is especially great. The rapid pace of discovery feeds on itself, demanding constant innovation.

Learn how your organization can join the leading pharmaceutical and biotechnology companies to create the ORFeome BioCharter™.

United States: 760 603 7262 (direct) 800 955 6288 (toll free)
Europe: +49 721 6189100 Japan: 03 3663 8692 www.invitrogen.com/biocharter

1600 Faraday Avenue • Carlsbad, CA 92008 • Toll Free 800 955 6288 • Fax 760 602 6500

Invitrogen™
life technologies

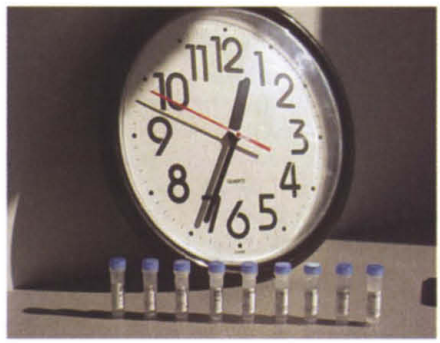
IDT SameDay Oligos. Available Only From IDT.

only $.60/base

SameDay Specifications

- 25-nmole scale
- 15-45 bases
- unmodified
- 2-OD guarantee
  (sufficient for > 250 PCR reactions)
- deprotected & desalted
- available only within the continental U.S.

SAMEDAY OLIGO SERVICE

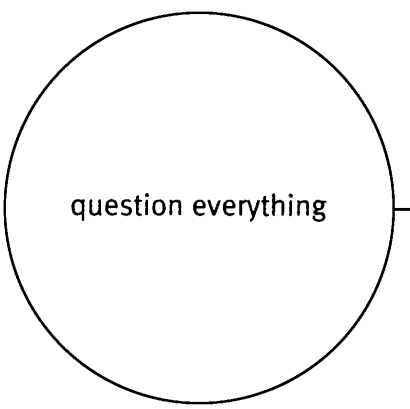


Order via the Web by 1:00 P.M. CST today and receive the oligos the next business morning.

www.idtdna.com

IDT
INTEGRATED DNA TECHNOLOGIES, INC.

1710 Commercial Park Coralville, IA 52241 USA 800.328.2661 fax 319.626.8444



You were born curious.

You were the last person to ask your parents a question before you went to bed. And the first to question the teacher.

You do not accept what is.

Rather, you ask, "what could be?"

You push society forward.

At Thermo Electron, our job is to assist you.

As the world's leading maker of high-tech instruments used in laboratories and manufacturing environments, our mission is to enable you.

No matter what kind of challenge you face, you'll find we have everything you need to analyze, detect, measure, and control.

Because long before there is a breakthrough, there is a question.

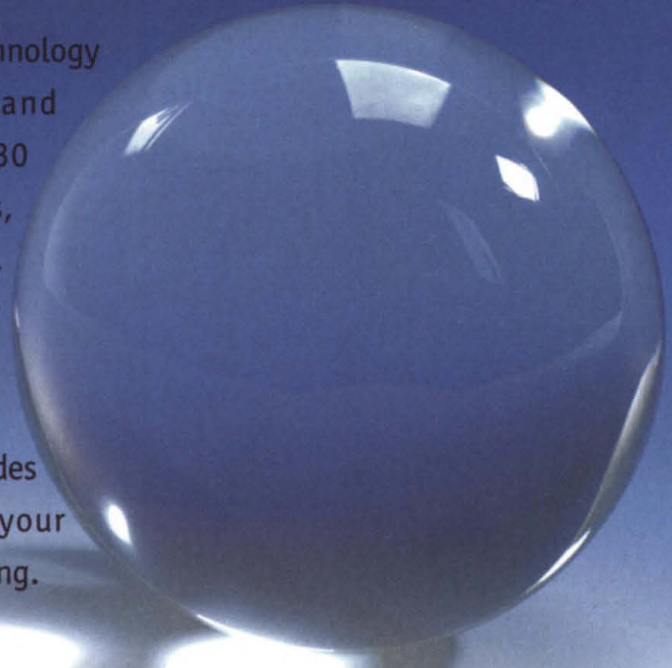
Visit www.thermo.com

Analyze • Detect • Measure • Control

Thermo
ELECTRON CORPORATION

Sphere of Influence

Our pioneering microsphere technology has influenced science and engineering for more than 30 years. Particle size analysis, pharmaceutical manufacturing, nanotechnology, immunoassay and flow cytometry are but a few of the fields our science has impacted. Let us apply our decades of technical leadership to your particle research and engineering.



Duke Scientific Corporation

Your Trusted Partner in Particle Science

1-800-334-3883 • www.dukescientific.com • 2463 Faber Place • Palo Alto, California 94303

Pfizer Inc seeks submissions for 2003 Viagra Research Grants program

Annual campaign calls for proposals to expand the medical usage of Viagra

Pfizer Inc created the Viagra Research Grants program to offer investigators an outlet to submit new and innovative research proposals that can expand the use of Viagra (sildenafil citrate) in clinical practice and extend its scientific knowledge throughout the global medical community.

We are inviting investigators worldwide to deliver proposals that outline original and scientifically valid basic science, preclinical or clinical research projects that use Viagra.

All projects should yield results that would first merit submission as abstracts to scientific meetings and, subsequently, publication in peer-reviewed journals.

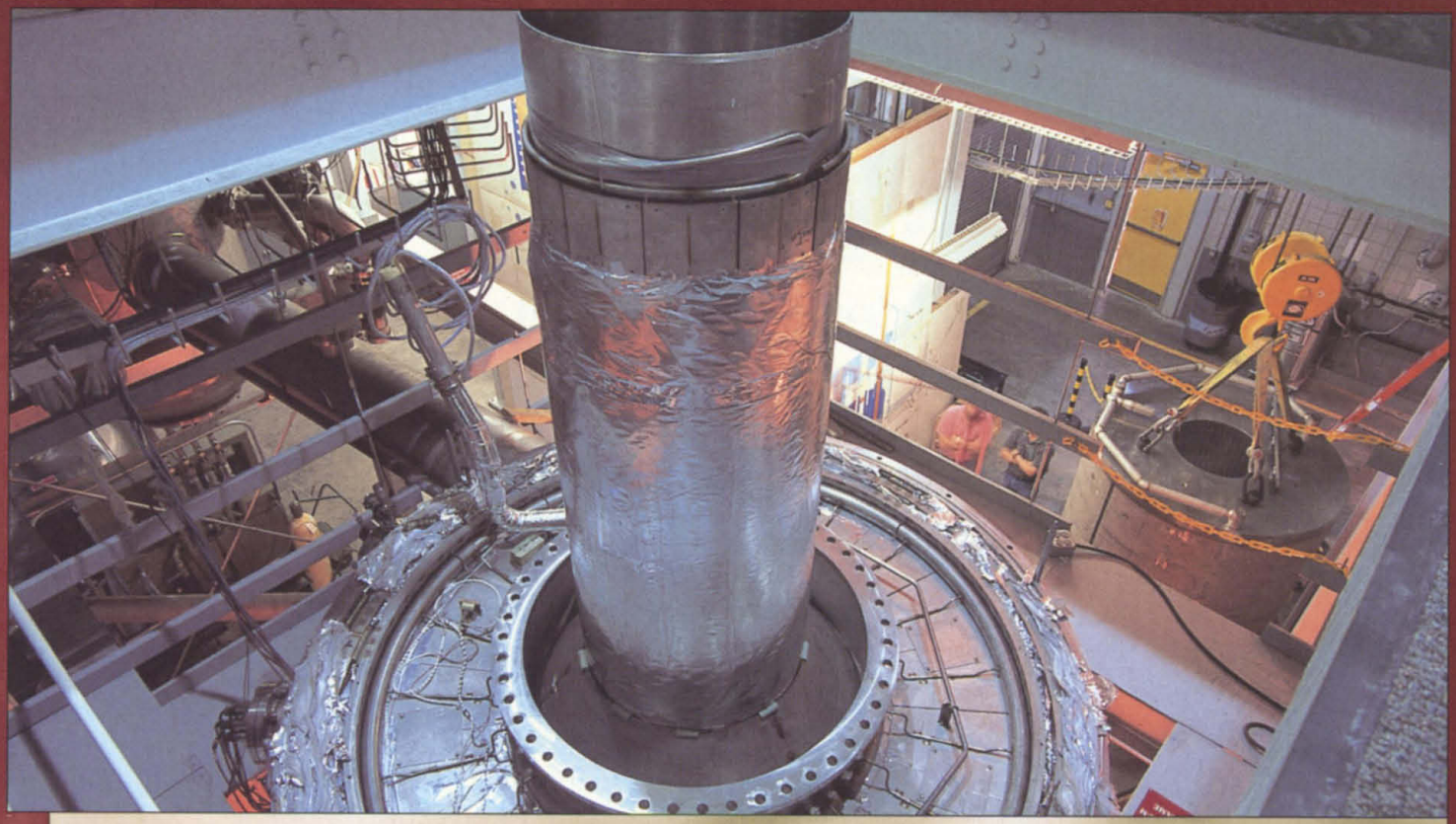
Dedicated to Discovering Novel Research Applications

Viagra Research Grants proposals must be received by January 15, 2003. An independent, multidisciplinary, international Grant Review Committee will judge proposals based on their originality, scientific merit and feasibility.

For program details or to submit an application, visit www.viagragrants.com, or contact the Viagra Research Grants program administrator:

Mary Beth Woodin
MBK Associates, LLC
Tel: USA +1.212.625.3311
Email: mwoodin@mbkny.com

Submission of a proposal under the Viagra Research Grants program is not made in confidence, and shall not create or be conditioned on any obligation or restriction on the part of Pfizer Inc with regard to its use.



WHEN YOU HAVE A 34-TON MAGNET,

YOU ATTRACT SOME OF THE BRIGHTEST RESEARCH MINDS IN THE WORLD.

Each year, hundreds of scientists worldwide are drawn to the National High Magnetic Field Laboratory at Florida State University. Magnetic fields one million times stronger than the Earth's allow them to push magnet-related technologies to frontiers never before envisioned. The lab is home to Nobel Laureate J. Robert Schrieffer, the physicist whose theory of superconductivity is a classic; National Academy of Sciences member Zach Fisk, expert in condensed-matter physics; and Jack Crow, experimental physicist and Magnet Lab director. These scientists are ensuring that the United States will maintain world leadership in science and technology. Perhaps the only things more powerful than our magnet are the ideas it inspires.

Professor J. Robert Schrieffer, above, Nobel Laureate in Physics

Professor Zachary Fisk, above, Member of the National Academy of Sciences

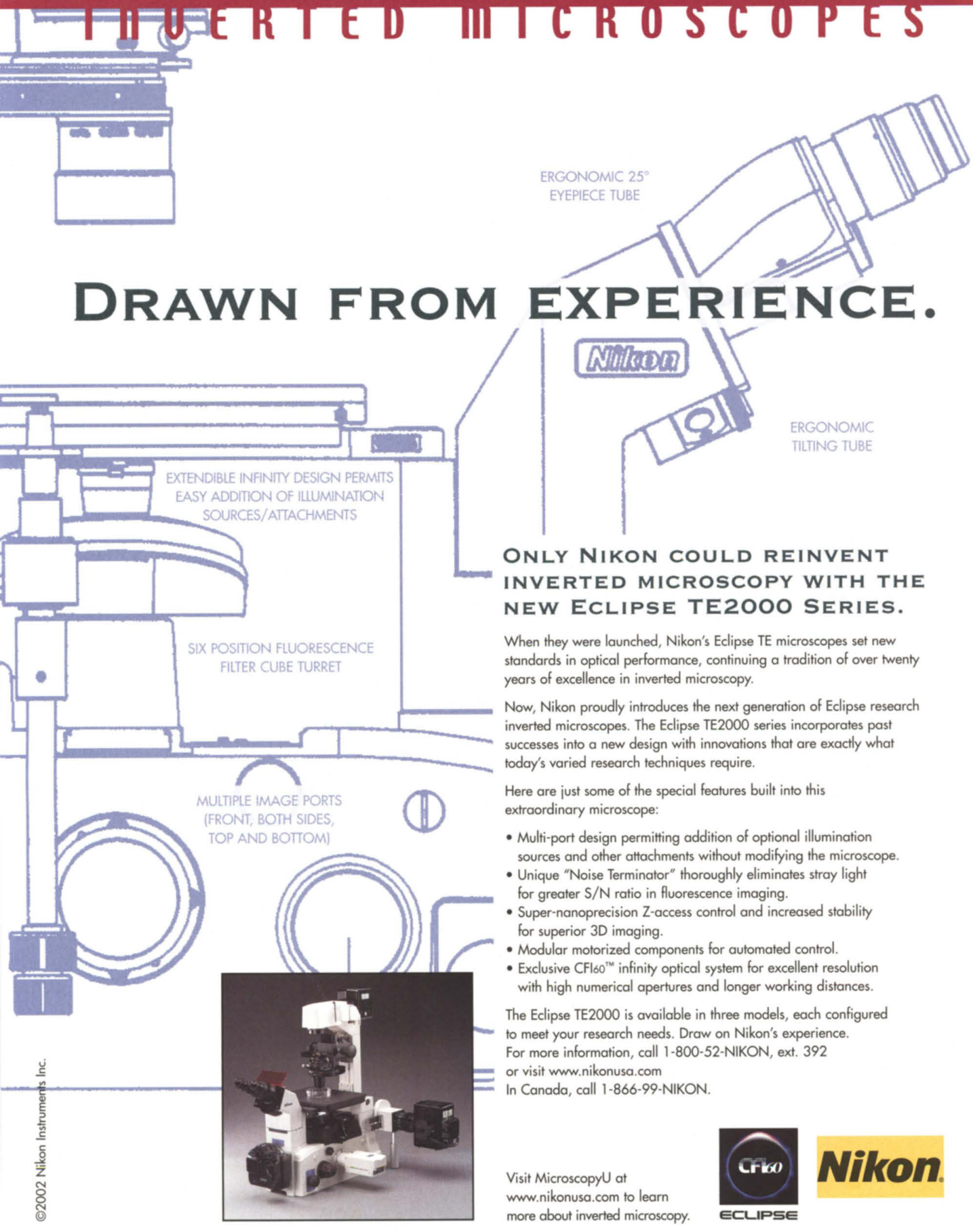
Professor Jack Crow, below, Director of FSU's National High Magnetic Field Laboratory

FLORIDA STATE UNIVERSITY

IDEAS THAT MOVE

http://attraction.fsu.edu

INVERTED MICROSCOPES



DRAWN FROM EXPERIENCE.

ONLY NIKON COULD REINVENT INVERTED MICROSCOPY WITH THE NEW ECLIPSE TE2000 SERIES.

When they were launched, Nikon's Eclipse TE microscopes set new standards in optical performance, continuing a tradition of over twenty years of excellence in inverted microscopy.

Now, Nikon proudly introduces the next generation of Eclipse research inverted microscopes. The Eclipse TE2000 series incorporates past successes into a new design with innovations that are exactly what today's varied research techniques require.

Here are just some of the special features built into this extraordinary microscope:

- Multi-port design permitting addition of optional illumination sources and other attachments without modifying the microscope.
- Unique "Noise Terminator" thoroughly eliminates stray light for greater S/N ratio in fluorescence imaging.
- Super-nanoprecision Z-access control and increased stability for superior 3D imaging.
- Modular motorized components for automated control.
- Exclusive CFI60™ infinity optical system for excellent resolution with high numerical apertures and longer working distances.

The Eclipse TE2000 is available in three models, each configured to meet your research needs. Draw on Nikon's experience.
For more information, call 1-800-52-NIKON, ext. 392
or visit www.nikonusa.com
In Canada, call 1-866-99-NIKON.

Visit MicroscopyU at
www.nikonusa.com to learn
more about inverted microscopy.

CFI60
ECLIPSE

Nikon

Cross A New Threshold In Multi-Color Analysis.

Introducing
Cytomics™ FC 500 Series Flow Cytometry Systems.

INDUSTRIAL DESIGN 2002 Silver Award — Strategic Directions International

Now you can step into the future of flow cytometry research with the most advanced technologies available today.

- Five-color analysis from a single laser has never been easier
- Single or dual lasers deliver maximum flexibility
- Single beam path eliminates need for time-delay calculations associated with spacially-separated beams
- Advanced Digital Compensation (ADC) simplifies multicolor analysis
- Automated application set-up enhances ease of use and saves time
- 20-bit real-time or listmode compensation provides flexible data manipulation

To learn more, ask your Beckman Coulter representative about the Cytomics FC 500 Series or visit us at www.beckmancoulter.com/cytomics— and open a new door to discovery.

BECKMAN COULTER™

www.beckmancoulter.com/cytomics

Innovate. SIMPLIFY. Automate.

DRUG DISCOVERY

You Discover Things That Improve Lives. We've Got A Few To Improve Yours.

Enjoy The Precision, Flexibility And Performance Of Our Complete Line Of HTS Solutions.

Whether you're performing assays in microplates, diluting compounds, replicating plates or executing other high throughput applications, Apogent Discoveries has the products, services and support to make your life easier.

Having united three world leaders in the life sciences field—BioRobotics, Matrix Technologies and Robbins Scientific—we have created a single source for the most complete range of drug discovery solutions. Our innovative line includes everything from entry-level workstations to microarray technologies, patented disposables to sophisticated microplate-processing instruments. All backed by a responsive, highly skilled global sales and service organization.

For more information, visit us at www.apogentdiscoveries.com or call, toll-free, (866) 229-9770. Either way, your life may never be the same again.

Apogent Discoveries
fluid thinking.

www.apogentdiscoveries.com

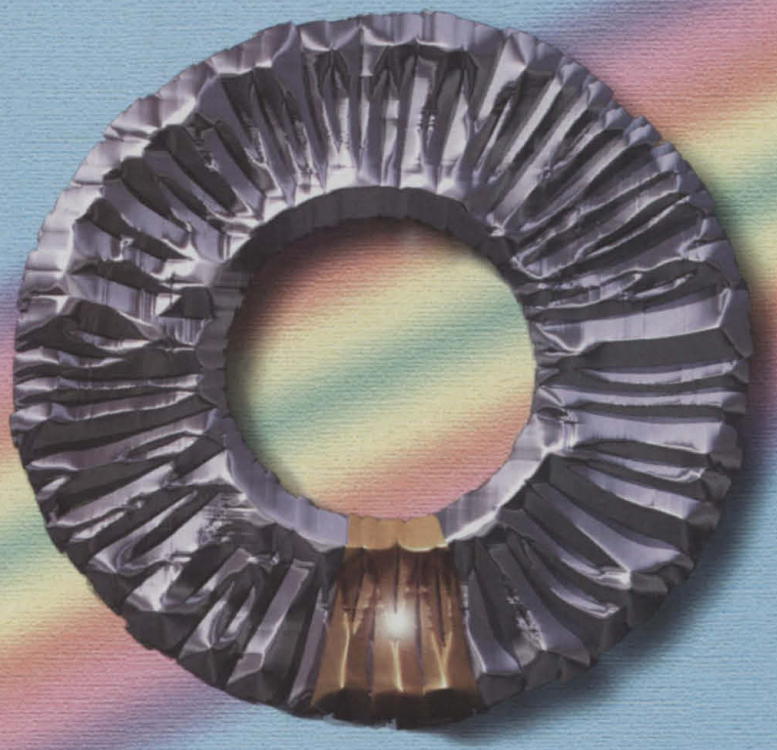
LIQUID HANDLING

ARRAYING TECHNOLOGY

HIGH THROUGHPUT SCREENING CONSUMABLES

MOLECULAR BIOLOGY

U.S. Headquarters: (866) 229 9770 Fax: (603) 595 0106 European Headquarters: +44 (0)161 486 2110 Fax: +44 (0)161 488 4560 German Office: +49 (0)6081 981878 Fax: +49 (0)6081 981959



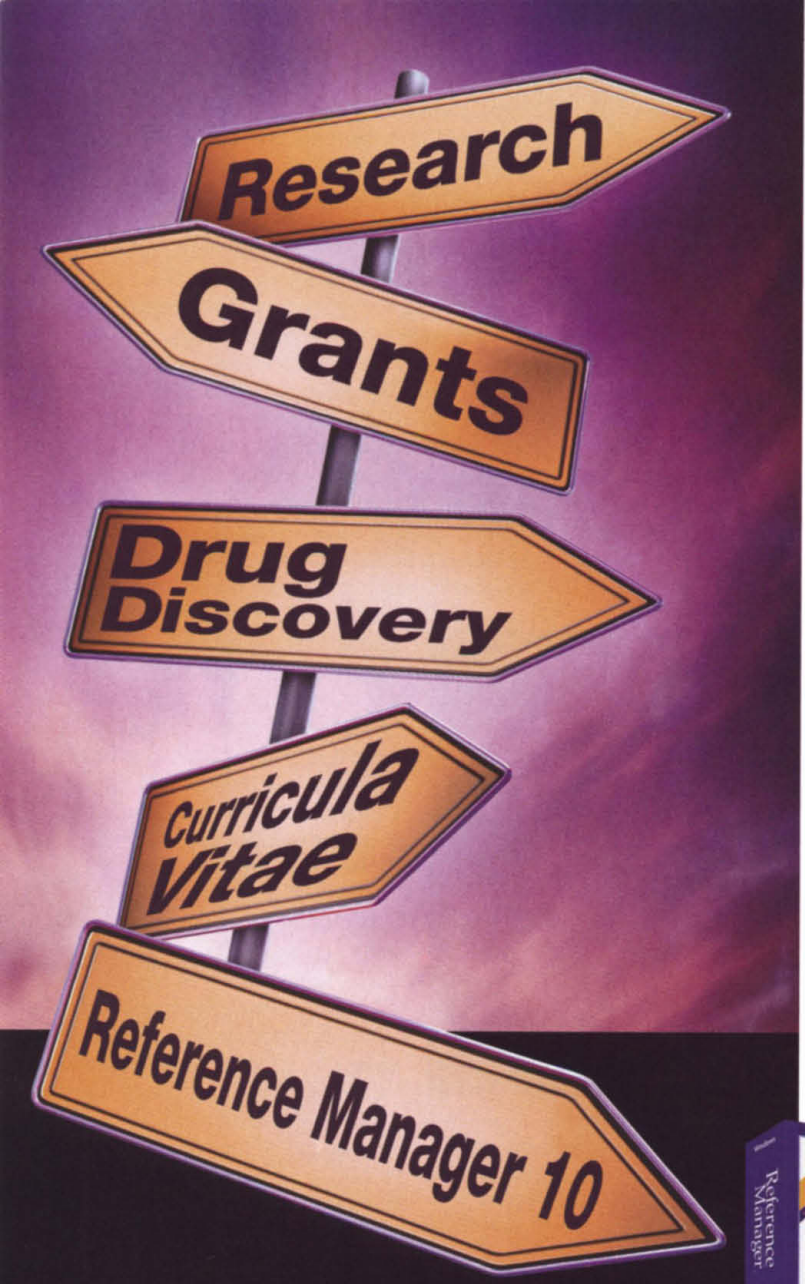
IRIS

HT Mutagenesis

- high throughput site-directed mutagenesis service
- cost effective
- rapid turnaround
- binary error correction system suppresses non-specific secondary mutations
- eliminates necessity of ORF verification sequencing
- cost of offered service can be less than cost of ORF sequencing alone

IRIS GENETICS

Visit us on the web for more information: www.irisgenetics.com e-mail: sales@irisgenetics.com phone: (713) 682-5825



The New Reference Point for Publishing Your Research.

Reference Manager 10 for Windows shortens the path from primary research to published papers.

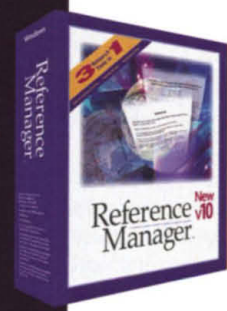
Experience Instant Formatting—bibliographies appear as you write!
Cite While You Write now comes with instant formatting that creates your bibliography as you type. You'll find over 700 styles (e.g., APA, Science, Nature) spanning numerous disciplines to format your bibliography.

Collaborate with colleagues easily—publish papers faster
Sharing your document for collaborative writing is now easier. Reference Manager creates a hidden traveling library automatically as you cite references in Microsoft Word. When you send your document to colleagues for editing, they'll have all the necessary bibliographic information to reformat the citations and bibliography. Wherever the document goes, the references travel with it.

Store links to other resources—full-text articles on the Web or in PDF files
Reference Manager 10 includes dedicated fields in each reference for storing links to related information. Your reference collection expands by linking to full-text articles, PDF files, related links and image files on the Internet or any accessible hard drive. Everything associated with a reference is organized in your Reference Manager database.

Access ISI Web of Science®—Link to more online content
Users at institutions subscribing to ISI Web of Science can now create searches in Reference Manager. Links are built automatically to full-text and other scholarly databases available through ISI Links.™ These new selections complement the over 250 public and subscription online resources available to search. Many online databases including Highwire Press, Ovid, OCLC, ProQuest and others can now export directly into Reference Manager.

Explore Unique Network features—link to new research tools
The Reference Manager network edition is ideal for supporting research teams. Now Reference Manager 10 Network edition includes links to two powerful new research tools increasingly found on users' desktops—data visualization software and OpenURL-linking.



Discover Reference Manager—
Start streamling your research and writing today.
Available for Windows in a single-user and network edition.

Visit www.refman.com and download a free trial!

"It's highly recommended for anyone needing a powerful reference tool."
—Science

"The new Cite While You Write feature of Reference Manager is excellent. ...Congratulations. This a new standard for bibliographic programs."
—Joe LaManna,
Department of Neurology,
Case Western Reserve University

THOMSON
ISI RESEARCHSOFT

REFERENCE MANAGER.

Sales: 800-722-1227 • 760-438-5526 • Fax:760-438-5573
info@isiresearchsoft.com • www.refman.com

Making the Complex Achievable

*Trans*IT-TKO® siRNA Transfection Reagent

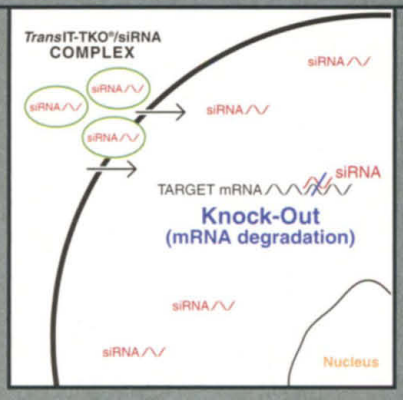
Deliver A Knock-Out

RNA interference is a powerful mechanism for silencing genes and has become the chosen method for studying gene function and control. Mirus' *Trans*IT-TKO® Transfection Reagent is the first reagent specifically developed for optimal transfection of siRNA in mammalian cells and is used by researchers worldwide. Join the leaders in the field and use the "gold standard", *Trans*IT-TKO® siRNA Transfection Reagent.

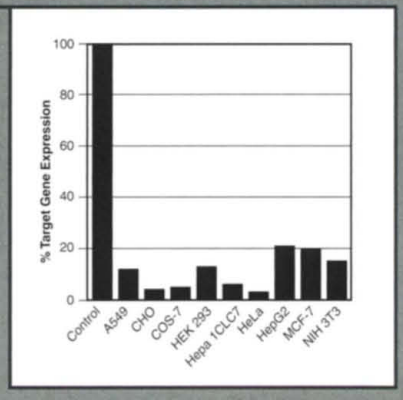
- **Optimized** - High efficiency transfection of siRNA for silencing endogenous genes and transgenes.
- **Versatile** - Low toxicity reagent proven to perform in a wide variety of cell lines.
- **Convenient** - One step reagent; add complexed *Trans*IT-TKO® reagent and siRNA directly to cells in media.

Mirus specializes in developing and manufacturing state-of-the-art nucleic acid transfer and labeling technologies for use in biomedical research and drug discovery.

888-530-0801
www.genetransfer.com



*Trans*IT-TKO® delivers siRNA to the cytoplasm where it binds to the target mRNA. The target mRNA is degraded resulting in inhibition of mRNA translation.



Efficiency of knock-out using *Trans*IT-TKO® Transfection Reagent with 5 nM anti-firefly luciferase siRNA in various cell lines.

Call Mirus today to request a free copy of Mirus' *Technical Report* on *Trans*IT-TKO® Transfection Reagent.

Mirus

Gene Transfer Specialists™

In 1929

SCIENCE ADVANCED WITH A BIG BANG.

Edwin Hubble in the Palomar Observatory, 1949
His namesake, the Hubble Space Telescope, is shown above.

Courtesy of Carnegie Observatories, Carnegie Institute of Washington.

In 1929, AAAS member and Fellow Edwin Hubble proved that galaxies move apart in an expanding universe, caused by the "Big Bang" billions of years earlier. He had originally proved that other galaxies existed, and won the AAAS Newcomb Cleveland Prize in 1924 for research on "Cepheids in Spiral Nebulae," presented at the AAAS Annual Meeting.

Today, AAAS members continue in the forefront with their own research and by supporting vital programs in education, public policy, and global cooperation.

Since 1848, AAAS has worked to advance science and serve society—with the help of members, including Edwin Hubble. Join us. Together we can do even more.

To join AAAS or renew your membership, access join.aaas.org or call in the U.S. 202-326-6417 or international +44 (0) 1223 326 500.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Advancing science • Serving society

Creating the future of biotechnology–Together

Invitrogen's Research Tools Development Grants Program is an international funding opportunity for investigators developing innovative life science research tools that accelerate biological discovery and understanding.

Annual awards for the program are generally of US$100,000. We'll also consider larger grants and longer-term awards. Academic, institutional, and biotechnology researchers are encouraged to apply.

If you have an idea you'd like to develop or if you're working on a project that will lead to a novel research tool, please apply. A preproposal is required prior to submitting a Grant Proposal.

Proposals for the following fields of interest are due no later than:

- April 1, 2003 for **Cell Biology**
- August 5, 2003 for **Functional Analysis**
- December 2, 2003 for **Nucleic Acids-Proteins**

Topics include amplification, arrays, bioengineering, cell culture, cell lines, cloning, electrophoresis, enzymes, expression, gene display, informatics, labeling & detection, modeling, molecular interactions, protein engineering, purification, reporters, separations, sequencing, transgenics, and others.

For more information, visit our web site, e-mail **grants@invitrogen.com**, or call today. Join us in creating the future of biotechnology.

Invitrogen™
life technologies

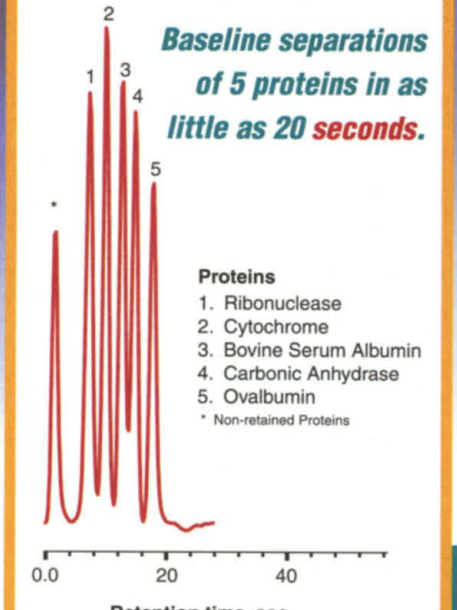
Corporate Headquarters:
Invitrogen Corporation
1600 Faraday Avenue
Carlsbad, California 92008 U.S.A.
Tel: 1 760 603 7200
Tel (Toll Free): 1 800 955 6288
Fax: 1 760 603 7229
Email: tech_service@invitrogen.com

European Headquarters:
Invitrogen Ltd
Inchinnan Business Park
3 Fountain Drive
Paisley PA4 9RF, UK
Tel: +44 (0) 141 814 6100
Fax: +44 (0) 141 814 6260
Email: eurotech@invitrogen.com

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

Swift

Swift, the fastest Bird
Swift™ the fastest Biocolumn



New Monolithic Media

for proteins, peptides, oligonucleotides, nucleic acids and synthetic polymers have a network of pores and channels putting convection rather than diffusion in control of mass transfer. Swift columns offer excellent resolution at very fast separation speeds on both MPLC and HPLC equipment.

- Compatible with pH 1 to 14
- Great reproducibility up to 1000+ runs
- Batch to batch reproducibility with coefficient of variation less than 1%
- Protein and peptide friendly
- Available in 4.6 and 10 mm i.d. for microgram to 100+ milligram sample loads

Swift. Stay ahead of the curve.
Call or e-mail today and ask about our 30-day no-risk trial.
(800) 228-4373 · e-mail: **SwiftMonolith@isco.com**

Isco, Inc.

www.swiftcolumns.com

THE Human Kinome

Science

stke

SUGEN
a PHARMACIA company

Cell Signaling
TECHNOLOGY®

Authors
Gerard Manning, David B. Whyte, Ricardo Martinez, Sucha Sudarsanam, Sugen Inc., South San Francisco, CA, USA; Tony Hunter, Salk Institute, La Jolla, CA, USA. This poster accompanies the paper "The Protein Kinase Complement of the Human Genome" (Manning et al., Science, 6 December 2002)

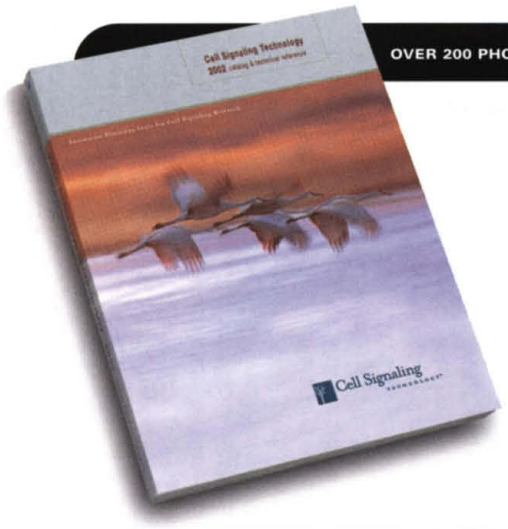
Science coordinator
L. Bryan Ray

Design and production
Anne Ashley, David Comb, Michael Melnick, C. Faber Smith, J. White, David M. Tompkins, Marcus Spiegler

Copyediting
Harry Jach

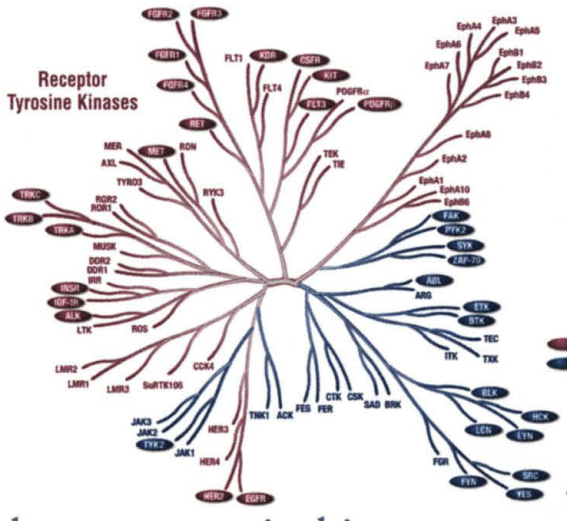
Sponsored by
Cell Signaling Technology, Inc. and Sugen, Inc.

OVER 200 PHOSPHORYLATION, CLEAVAGE & ACETYLATION-SPECIFIC ANTIBODIES FOR CELL SIGNALING RESEARCH



Announcing a Unique Informational Resource for Signal Transduction Research ...from Cell Signaling Technology

Visit the Cell Signaling Technology Reference Section online at www.cellsignal.com or see our new 2002 catalog's reference appendix to find the most comprehensive and up-to-date reference material.

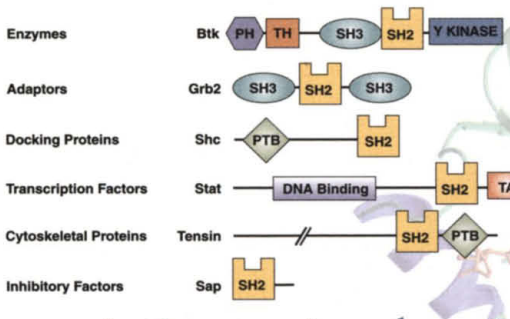


Phospho-specific antibodies available from CST

Cytoplasmic Tyrosine Kinases

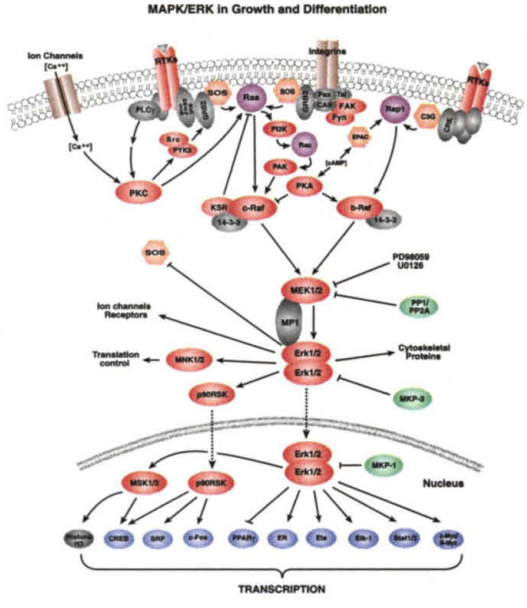
human protein kinases

The Human Protein Kinase section presents the complete list of human serine, threonine and tyrosine kinases, organized into families by sequence similarity.



protein interaction domains

The Protein Interaction Domain section reviews the structure and function of 40 protein domains that are important elements of cell signaling pathways.



pathway diagrams

Pathway diagrams, prepared in-house by CST scientists, present the most up-to-date information about 20 signaling pathways.

Cell Signaling TECHNOLOGY®

www.cellsignal.com

Orders (toll-free) 1-877-616-CELL (2355) orders@cellsignal.com **Fax ordering** 1-978-867-2488 **Technical support** (toll-free) 1-877-678-TECH (8324) support@cellsignal.com **Inquiries** info@cellsignal.com

CST offers over 200 phospho-specific antibo

including 100 antibodies to the active kinases shown

NOVEL ANTIBODIES FOR CELL SIGNALING RESEARCH

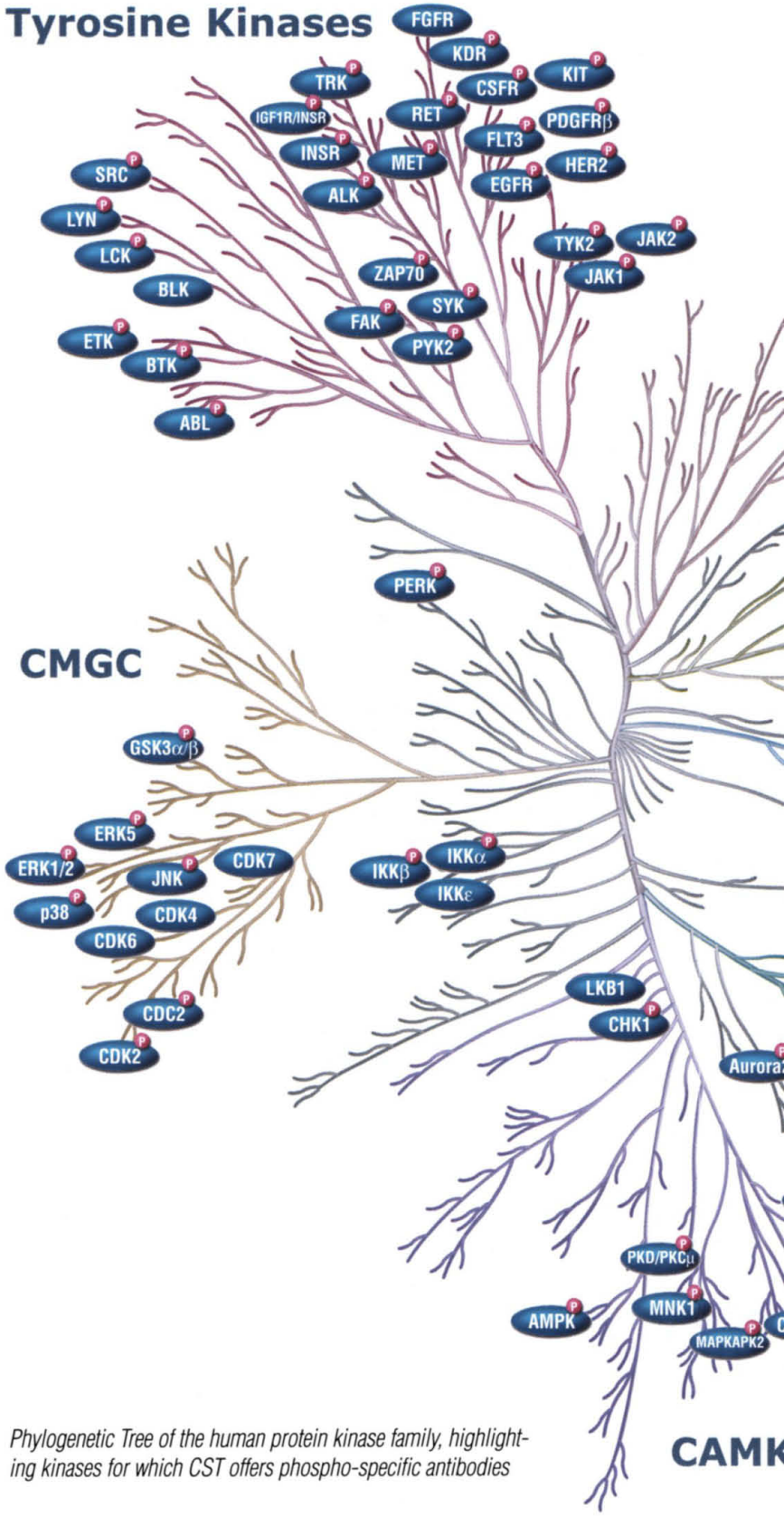
The protein kinases have proven to be critical regulators of a wide variety of cellular processes, making convenient assays of their activity essential for determining their function in the cell and their role in disease.

About CST...

Cell Signaling Technology (CST), founded in 1999 by scientists from New England Biolabs, is the leading provider of Phosphorylation-specific Antibodies and other innovative biomedical research tools. All of our antibodies are developed, manufactured and tested in-house, resulting in high quality antibodies that often can only be found from CST. To make these antibodies as useful as possible we validate them in a wide range of applications, from western blotting to immunohistochemistry. In addition technical support is provided by the very scientists who make a given antibody and know it best.

Please visit our website for the latest new products and cell signaling reference material.

www.cellsignal.com

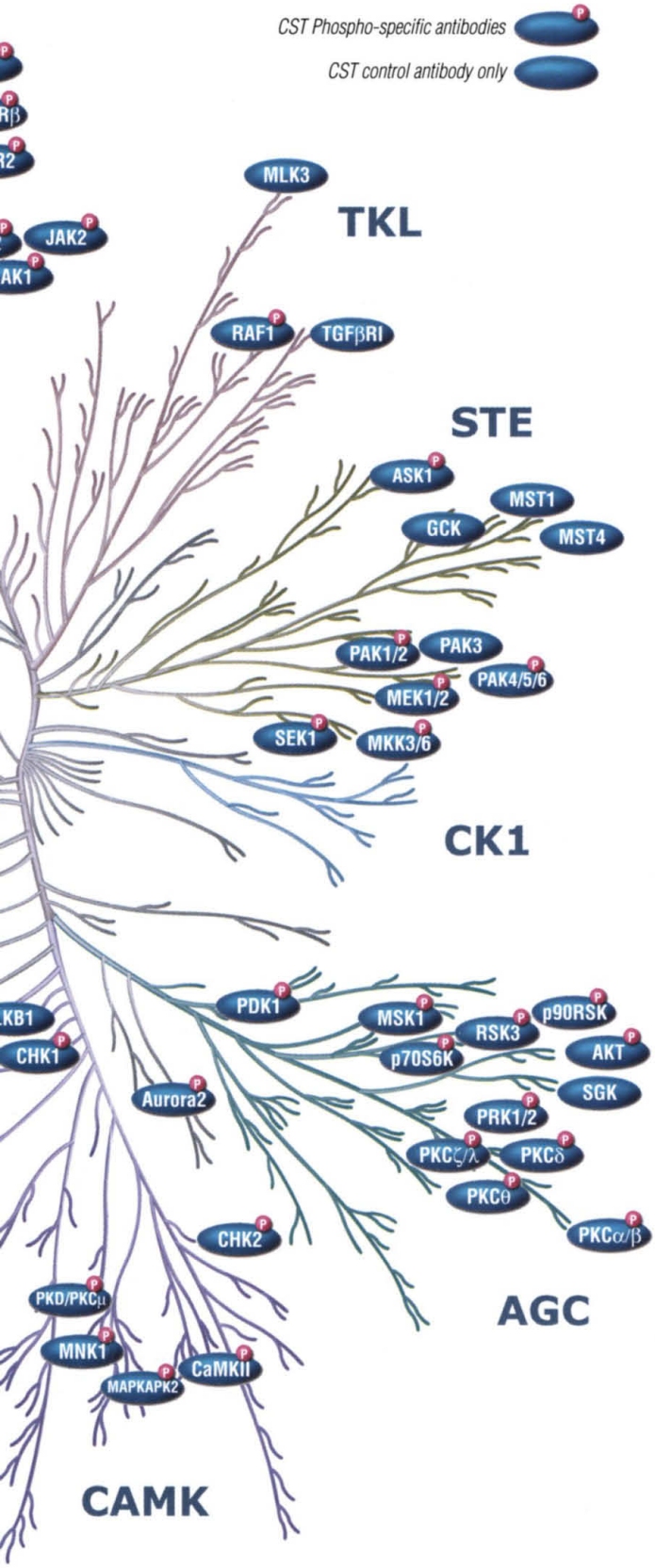


Phylogenetic Tree of the human protein kinase family, highlighting kinases for which CST offers phospho-specific antibodies

Orders (toll-free) 1-877-616-CELL (2

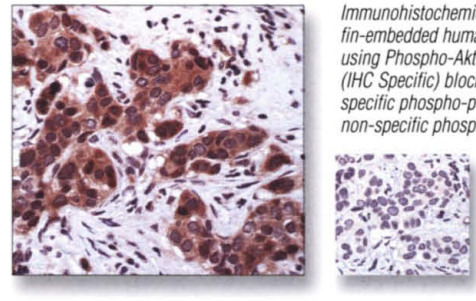
ic antibodies,
ses shown below.

Cell Signaling TECHNOLOGY®



IMMUNOHISTOCHEMISTRY

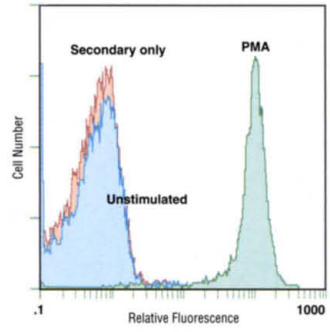
#9277 Phospho-Akt (Ser473) Antibody (IHC Specific).



Immunohistochemical staining of paraffin-embedded human breast carcinoma using Phospho-Akt (Ser473) Antibody (IHC Specific) blocked with an antigen-specific phospho-peptide (below) or a non-specific phospho-peptide (left).

FLOW CYTOMETRY

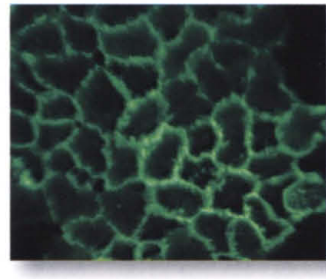
#9101 Phospho-p44/42 MAP Kinase (Thr202/Tyr204) Antibody



Phospho-p44/42 MAP Kinase (Thr202/Tyr204) Antibody was used with FITC-conjugated secondary antibody to label isolated human peripheral blood lymphocytes. Three histograms are overlaid: unstimulated lymphocytes (blue), lymphocytes stimulated with PMA (green) or PMA-stimulated lymphocytes detected with secondary antibody only (orange). (Courtesy of Dr. David Hedley, Princess Margaret Hospital, Toronto.)

IMMUNOFLUORESCENCE

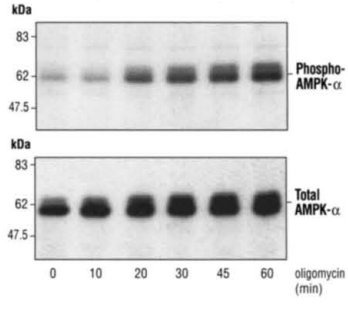
#2245 Phospho-HER2/ErbB2 (Tyr1112) Antibody



Immunofluorescent staining of EGF treated (left) or untreated (below) A431 cells using Phospho-HER/ErbB2 (Tyr1112) Antibody, showing membrane localization.

WESTERN BLOTTING

#2531 Phospho-AMPK-α (Thr172) Antibody and #2532 AMPK-α Antibody



Western blot analysis of HEK293 cell lysates treated with oligomycin for different time periods, using Phospho-AMPK-α (Thr172) Antibody (upper) or control AMPK-α Antibody (lower).

BEYOND IMAGINATION

PITTCON® 2003

Bringing Together the Elements of Science

The 2003 Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy will be the year's largest single event in science.

PITTCON® 2003 brings together the key elements of science…
technology, innovation, knowledge, creativity and people like you.

It all starts with an outstanding **Technical Program**. Our **Invited Symposia** feature world-class speakers on the cutting edge of laboratory science. **Contributed presentations** and **posters** address real-life, practical problems on the analytical techniques and spectroscopic methods used in everyday laboratories. Over 80 **Short Courses** provide ideal training opportunities on both core and emerging technologies.

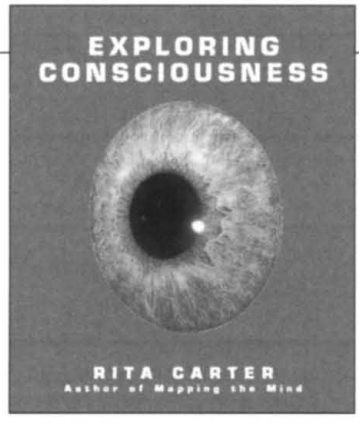
It wouldn't be the Pittsburgh Conference without a truly amazing **Exposition**. Everybody in the field of laboratory instrumentation—over 1000 companies—will be there. Sunday **New Product Forums** showcase the latest developments. Our handy **Product Locator Service** helps you quickly find what you want. And ride our **courtesy trams** to get around all 750,000 square feet of exhibit space.

Experience PITTCON® 2003…
Your Source for Knowledge and Innovation for Laboratory Science.

For more information or to get on our mailing list, call or visit our web site.

March 9-14, 2003 • Orlando, Florida • www.pittcon.org • 412-825-3220

The Nature of Science



Rita Carter
EXPLORING CONSCIOUSNESS

"A treasure trove of fact, argument and opinion, doing an excellent job of conveying both research and controversies."
—*The New Scientist*

$34.95 hardcover

Luis M. Chiappe and
Lawrence M. Witmer, Editors
MESOZOIC BIRDS
Above the Heads of Dinosaurs

"*Mesozoic Birds* is the first book to bring together world-renowned specialists on fossil birds and their importance to avian origins and, more importantly, it stresses a unified approach (cladistics) and presents the most anatomically detailed analyses available to date. No other study or collection of studies has ever done so much." —David Weishampel, editor of *The Dinosauria*

$95.00 hardcover

Brian Groombridge and
Martin D. Jenkins
WORLD ATLAS OF BIODIVERSITY
Earth's Living Resources in the 21st Century

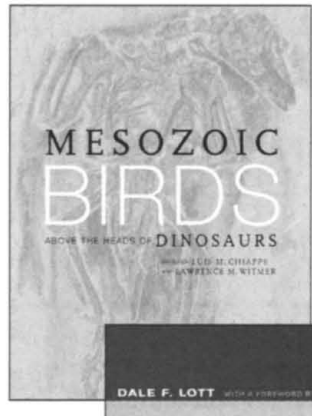
"An indispensable resource on information about Earth's biological variety and why its conservation is crucially important."
—Joel Cracraft, Curator-in-Charge, Department of Ornithology, American Museum of Natural History

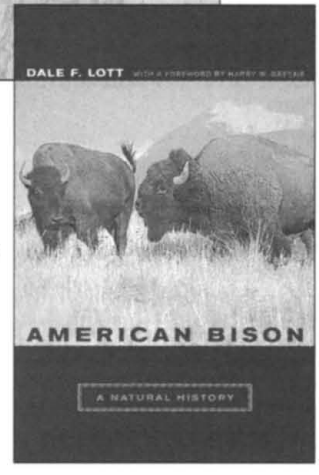
$54.95 hardcover

Dale F. Lott
AMERICAN BISON
A Natural History
Foreword by Harry W. Greene

"In this rich and enthusiastic narrative, Lott uses exuberant humor and great passion for his subject to elicit reader interest, illuminating the biological and mythical bison and what they tell us about nature, human and otherwise."
—*Los Angeles Times*

Organisms and Environments, $29.95 hardcover





Ernest B. Hook, Editor
PREMATURITY IN SCIENTIFIC DISCOVERY
On Resistance and Neglect

"Remarkable....The book should be enthusiastically welcomed by all readers who are interested in how science works."—Stephen G. Brush, co-author of *Physics, The Human Adventure*

$80.00 hardcover

J. William Schopf, Editor
LIFE'S ORIGIN
The Beginnings of Biological Evolution

This book brings a summary of current research and ideas on life's origin to a wide audience. Presented in nontechnical language and including a useful glossary, *Life's Origin* gives a state-of-the-art encapsulation of the fascinating work now being done by scientists as they begin to characterize life as a natural outcome of the evolution of cosmic matter.

$29.95 paperback, $60.00 hardcover

Albert A. Harrison
SPACEFARING
The Human Dimension

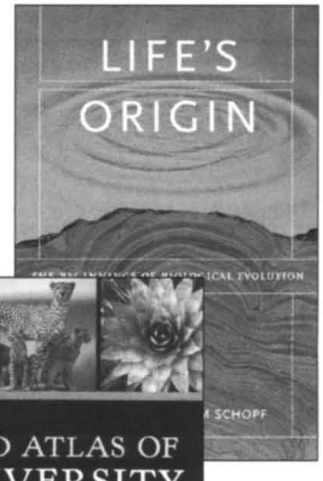
***New in paperback*—"Well-written, covers a range of research and makes several interesting points on almost every page."**
—*American Scientist*

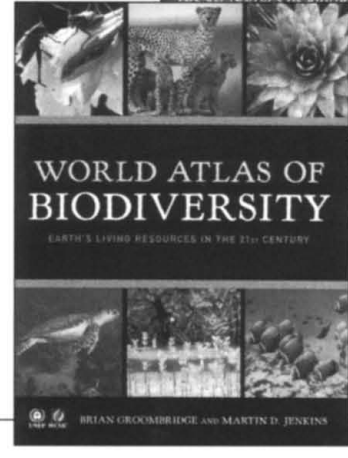
$19.95 paperback

David Hancocks
A DIFFERENT NATURE
The Paradoxical World of Zoos and Their Uncertain Future

***New in paperback*—"[F]izzes and crackles with perception and provocation."**
—*Science*

$19.95 paperback





At bookstores or order (800) 822-6657 • www.ucpress.edu

UNIVERSITY OF CALIFORNIA PRESS

WOMEN'S INTERNATIONAL SCIENCE COLLABORATION (WISC) PROGRAM 2002–2003

OVERVIEW ► The Women's International Science Collaboration (WISC) Program is funded by the National Science Foundation (NSF) and administered by the International Office of the American Association for the Advancement of Science (AAAS). Because the application rate of women scientists and engineers to work with colleagues overseas to the NSF Office of International Programs has been disproportionately low, the goal of this Program is to increase the participation of women as PIs and co-PIs in international research projects. This program provides grants to individual US scientists who plan to establish new research partnerships with their colleagues in Central/Eastern & Western Europe, the Newly Independent States of the former Soviet Union, Near East, Middle East, Africa, the Americas, Pacific, and Asia. Each grant, up to $4,000 or $5,000, will provide travel and living support for a US scientist. When appropriate, an additional grant may be made to an American co-PI. The grants do not cover salary or institutional expenses (e.g. overhead). US scientists can spend up to four weeks in a partner country to develop a research program and design. The grantee's home institution will be responsible for overseeing the grantee's adherence to NSF and federal guidelines regarding grant administration.

ELIGIBILITY ► Both male and female scientists who have their Ph.D.s or equivalent research experience are eligible, although there are special guidelines for each region in this regard. Potential applicants should review the full program guidelines (URL below) or consult a AAAS administrator. Applicants must be US citizens or permanent residents of the US. Graduate students (Ph.D. candidates) are also eligible to apply, if they will be conducting research in an established Ph.D. program in the US. Government employees can only apply if they also are affiliated with another institution eligible to receive NSF grants (e. g. an adjunct professorship at a university).

NEXT DEADLINE ► January 15, 2003 (notification by April 15)

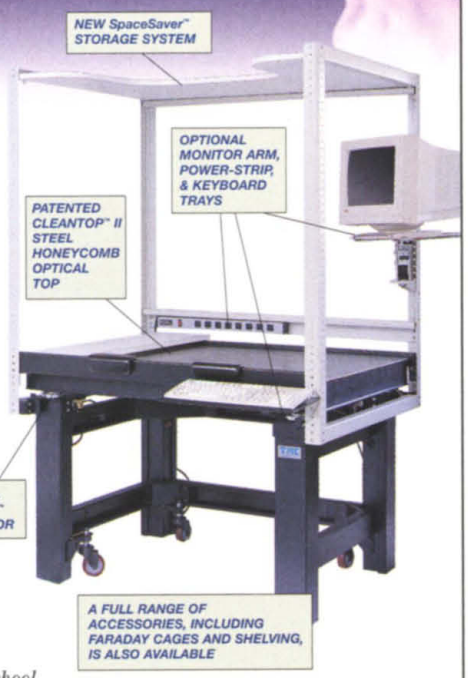
INFORMATION ► For questions, please contact the appropriate AAAS administrator: Curtis Cook (Central/Eastern & Western Europe, Newly Independent States of the former Soviet Union), ccook@aaas.org; Suteera Nagavajara (East Asia, Pacific), snagavaj@aaas.org; John Schoneboom (Africa, Middle East, Near East, South Asia), jschoneb@aaas.org; Marina Ratchford (Americas, Caribbean), mratchfo@aaas.org. For complete guidelines and application forms please visit our website at: **www.aaas.org/international/wiscnew.shtml**

AAAS

NSF

A PERFECT 10

Don't take our word for it, ask a colleague why your next vibration isolation table should be from TMC.



We continually ask our customers to rank our tables on a scale from 1 to 10. We also ask why they chose TMC. Here's what they say:

- **"10!! This is our 2nd table, they work well… Price. Ken McKay very helpful"**
  Dartmouth Medical School
- **"10...Quality, service, price"**
  UC Santa Barbara, Physics Department
- **"10...We have used TMC tables for years. Always pleased...past experience"** *National Institutes of Health*
- **"10...Very reliable/good quality and workmanship… previous experience at NIH"** *Howard University*
- **"10...Easy set-up and hook-up...Competitor recommended you!"** *UMass Medical Center*
- **"10...This is my fourth TMC table purchase… Price and fast delivery"** *University of New Mexico*
- **"10...Excellent help from Wes Wigglesworth ...Past experience"** *Neuroscience Department at a NYC University*
- **"Let me tell you that <u>your table is working beautifully</u>. There is no vibration in the tip of the electrode!!!!!!!! Thanks again, you made my life much easier."**
  Baylor College of Medicine

TMC™

Technical Manufacturing Corporation
15 Centennial Drive
Peabody, MA 01960 USA
Tel: 978-532-6330, Fax: 978-531-8682
e-mail: sales@techmfg.com

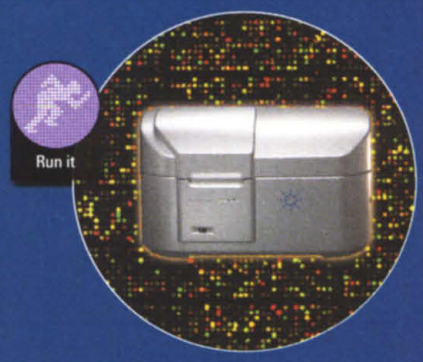
1-800-542-9725 www.techmfg.com

ISO 9001 TÜV ISO 9001 CERTIFIED

VIBRATION SOLUTIONS

Accelerate the pace

Agilent Technologies Microarray Scanner



www.agilent.com/chem/dna

u.s. and canada 1 800 227 9770
japan 0120 477 111
europe: marcom_center@agilent.com
global: dna_microarray@agilent.com

Time saved
Experience the freedom of walk-away ease of use with the scanner's 48-slide load 'n' go carousel.

Adaptable platform
Built on an open and flexible architecture, the Microarray Scanner accommodates most set-ups and most standard 1"x 3" glass slides.

Quicker results
Generate dual-color scans in an average of just eight minutes per slide.

Accurate data
Get better sensitivity from the Microarray Scanner's unique dynamic autofocus that continually adjusts for glass slide imperfections and gradients.

Added performance
Generate rapid image quantitation with statistical-confidence-limits using Agilent's Feature Extraction Software.

The Agilent Microarray Scanner is backed by worldwide maintenance and technical support.

Agilent Technologies

dreams made real

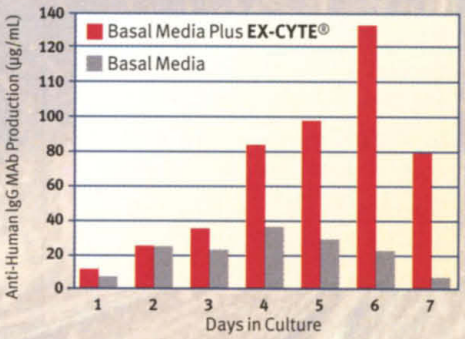
Program 4537

EX-CYTE® Powers Cell Culture Productivity

- Increases Protein Yield
- Promotes Cell Viability
- Lot-to-lot Consistency
- Quality Guaranteed

Serologicals® Corporation, a leading manufacturer and global supplier of cell culture reagents, proudly offers **EX-CYTE®**, a patented formulation of essential lipoproteins and fatty acids which enhance cell culture productivity.

EX-CYTE® Growth Enhancement Media Supplement is currently being used by biopharmaceutical manufacturers to achieve up to 6-fold increases in protein yield and to reduce dependence on serum. Additionally, using EX-CYTE® simplifies the downstream processing and purification of recombinant proteins and monoclonal antibodies.



Cell Growth and Antibody Production of a Hybridoma Cell Line Supplemented with EX-CYTE®.

Cells were adapted for growth in media supplemented with EX-CYTE® at 30 µg cholesterol/ml. Other media supplements were HSA (10 mg/ml), human APO-transferrin (2.5 µg/ml), insulin (5 µg/ml) and 10^{-7} M sodium selenite.

We at Serologicals are committed to providing enabling products and technologies designed to accelerate your research from the laboratory to the marketplace.

Our two high-volume production and distribution facilities have been providing the highest quality recombinant insulin, transferrin, BSA (Heat Shock and Cohn process), aprotinin, and fetuin to the cell culture industry for over 20 years. Plus, our cell culture supplements are manufactured under cGMP and ISO9000 quality standards.

Call us or visit **www.serologicals.com** for detailed information.

Serologicals® Corporation

Serologicals® Corporation Contact and Ordering Information

North America	1.866.737.6246	North America Fax	1.866.737.6247
Europe	44.1865.784.646	Europe Fax	44.1865.784.648
All Others	1.678.728.2246	All Others Fax	1.678.728.2247

5655 Spalding Dr., Norcross, GA 30092 customerservices@serologicals.com www.serologicals.com

Contact us today to qualify for a **FREE SAMPLE!**
Email: ex-cyte@serologicals.com
While supplies last