

New MultiPROBE<sup>®</sup> VersaTip<sup>™</sup> technology automatically adapts pipetting tips to your assay procedures. Disposable tips, fixed washable tips, or both? Microliter or milliliter volumes? Liquid level sensing of ionic or nonionic solutions? Different disposable tip sizes and types? With MultiPROBE, you get it all in one system.

The new VersaTip automatically changes from fixed, washable tips to a variety of disposable tip sizes or types — within the same protocol and without any user-intervention. Now you can minimize consumable costs by using washable tips whenever possible, and at the same time optimize performance by automatically switching from small volume to larger volume disposable tips. In other words, MultiPROBE with VersaTip adapts to your application, instead of your having to adapt the application to it.

#### **Drug Discovery Work**

For drug discovery work, VersaTip will sense small sample volumes in microplates, and handle both ionic and nonionic solutions such as DMSO. With four- and eight-tip MultiPROBE systems, you can stop wasting precious compounds for all solubilization, distribution, and screening applications.

#### **Molecular Biology**

For molecular biology applications, VersaTip can automatically pick up micro tips to handle very small volumes, switch to larger



Packard Instrument Company, 800 Research Parkway, Meriden, CT 06450 U.S.A. Tel: 203-238-2351 Toll Free: 1-800-323-1891 FAX: 203-639-2172 Web Site: http://www.packardinst.com



#### Packard International Offices:

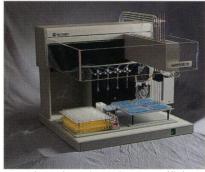
Australia, Mt Waverley 61-3-543-4266; Austria, Vienna 43-1-2702504; Belgium, Brussels 32-2-4668210; Canada, Ontario 1-800-387-9559; Central Europe, Vienna 43-2230-3263; Denmark, Greve 45-42909023; France, Rungis (33) 1 46.86.27.75; Germany, Dreieich 49 6103 385-0; Italy, Milano 39-2-33910796/7/8; Japan, Tokyo 81-3-3866-5850; Netherlands, Groningen 31-50-5413360; Tilburg (013) 5423900; Russia, Moscow, 7-095-238-7335; Switzerland, Zurich (01) 481 69 44; United Kingdom, Pangbourne, Berks (44) 0734 844981.

Circle No. 34 on Readers' Service Card

tips when required, or use washable fixed tips whenever possible. Ultra-sensitive liquid level sensing tips further eliminate any risk for DNA cross-contamination.

#### **Clinical Testing**

For clinical testing, VersaTip will automatically adapt to the carryover requirements of your assays. Four-tip systems with Varispan can switch from



disposable to washable tips, and transfer samples from any size test tube or vial, to microplates or other labware — all without user intervention. Combine this versatility with a large deck capacity and a bar code reader that can read 256 tubes in 90

seconds, and you have the most efficient robotic liquid handler your lab can own.

Now, there's no need to compromise. Demand the MultiPROBE with VersaTip — the first robotic liquid handler that adapts to your assays.

#### Cytometry Reagents

Apoptosis Detection Kit Whole Blood Lyse Kit

#### Labeled Cytokine Kits

G-CSF GM-CSF IL-1α IL-1β IL-2 IL-4 IL-6 IL-10 LIF MCP-1 MIP-1α SCF TGF-β1 TNF-α

Antibodies for Cytometry

BL-CAM (CD22) CD15 CD44H CD44v3 CD44v4/5 CD44v6 E-Selectin (CD62E) ICAM-1 (CD54) ICAM-3 (CD50) IL-1α membrane bound L-Selectin (CD62L) LFA-1a chain (CD11a) LFA-1/Mac-1/p150, 95β chain (CD18) Mac-1a chain (CD11b) NCAM (CD56) p150, 95α chain (CD11c) Platelet GPIIb/IIIa (CD41a) TNF-α membrane bound VCAM-1 (CD106)

#### T cell Enrichment Columns

human CD3<sup>+</sup> mouse CD3<sup>+</sup> human CD4<sup>+</sup> mouse CD4<sup>+</sup> human CD8<sup>+</sup> mouse CD8<sup>+</sup> human CD4<sup>+</sup>/CD45RO<sup>-</sup> mouse CD4<sup>+</sup>/CD45RA<sup>-</sup>



# Looking for the right angle on cell analysis?

The special twist of this puzzle is that each entry in the puzzle grid makes one 90-degree turn somewhere along its length. It's up to you to determine where each word or phrase makes this turn and in which direction. The starting direction of each answer (before it makes a turn) is indicated by a letter following the clue number – N for north, S for south, E for east and W for west.

1E	Cytokine
2E	Apoptosis
3W	Multiparamete
48	Stat
58	Receptor
GN	Biotin
7N	Avidin
88	Lyse
98	FITC
105	Specific
11E	Epitope
12N	Chain
138	Cell
14N	Viable
15N	Laser
16N	FACS
17W	Fluorochrome



## Turn to R&D Systems' flow cytometry reagents

#### Labeled Cytokine Kits include:

- O Labeled cytokine
- O Negative control
- O Blocking antibody
- O Wash buffer

#### Apoptosis Detection Kit includes:

- O Fluorescein-conjugated annexin V
- O Propidium iodide
- O Cell binding buffer

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

U.S.A. and Canada R&D Systems, Inc. 614 McKinley Place NE Minneapolis, MN 55413, USA. Tel: 612 379-2956 Fax: 612 379-6580

**R&D Systems Europe Ltd.** 4-10 The Quadrant, Barton Lane Abingdon, OX14 3YS, UK. Tel: +44 (0)1235 531074 Fax: +44 (0)1235 533420 Germany R&D Systems GmbH Borsigstrasse 7 65205 Wiesbaden, Germany Tel: +49 06122 90980 Fax: +49 06122 909819 Japan Funakoshi Co., Ltd. 9-7, Hongo 2-Chome Bunkyo-ku, Tokyo 113, Japan Tel: +81 (03) 56841622 Fax: +81 (03) 56841633

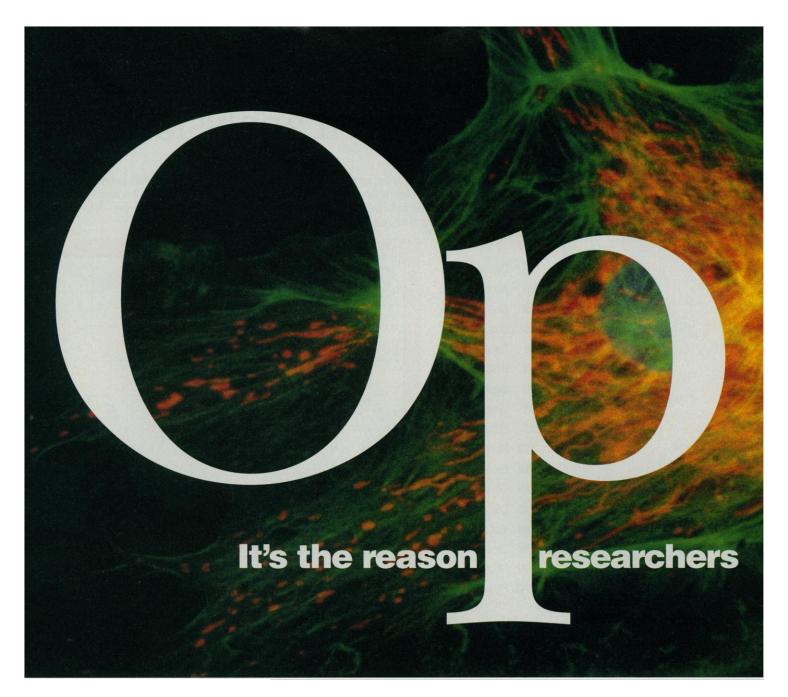
www.rndsvstems.com

International Distributors – Australia: (62) 008-25-1437. Austria: (43) 02 292 35 27. Chile: (56) 2-671-9369. Israel: (972) 02 9230048. Italy: (39) 02 25 75 377. Korea: (850) 82-2-569-0781. Mexico: (52) 5-612-0085. Spain & Portugal: (34) 01 448 84 86 or 03 456 97 06. Taiwan: (866) 2-368-3600.

International Freefone Numbers – Belgique/België: 078 11 04 68. Danmark: 80 01 85 92. Deutschland: 013011 0169. France: 05 90 72 49. Nederland: 060-225607. Norge: 800 1103. Sverige: 02079 31 49. Switzerland: 155 2482.

Circle No. 63 on Readers' Service Card

Europe



### Introducing new CF<sup>®</sup> PLAN FLUOR Universal Objectives.

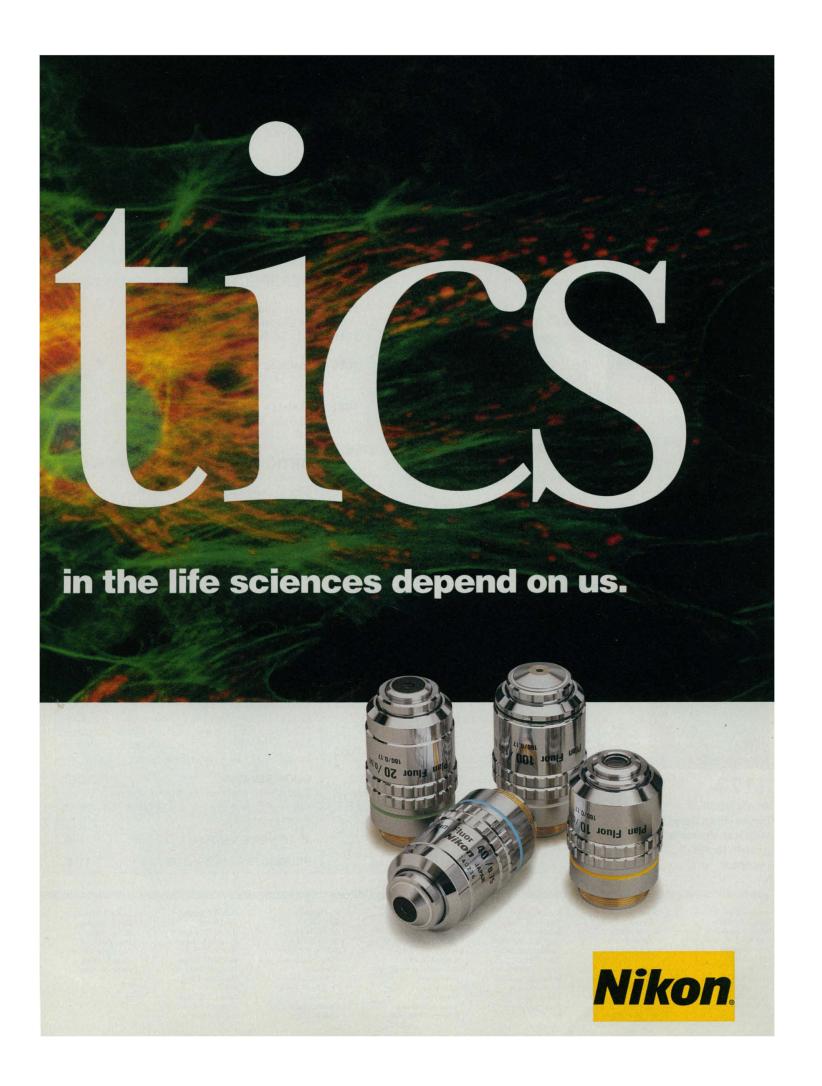
With the introduction of CF<sup>®</sup> chromatic-aberration-free optics in 1975, Nikon elevated the science of microscopy to a new performance level. Now, to meet the exacting demands of today's advanced techniques, we're raising the level even higher with new CF PLAN FLUOR Universal Objectives.

These highly versatile objectives offer crisp, clear images with any source of illumination and any contrasting method you choose. They provide maximum contrast for observation, photomicrography, and video or digital documentation. And with their center-to-edge field flatness, color corrections and high UV transmission, they are ideal for the latest Epi-Fluorescence techniques.

Nikon is the only microscope manufacturer to formulate and produce 100% of its own glass, and has unparalleled expertise in optical coatings and cements. As a result, we have been able to create these superb objectives. All offer longer working distances with extremely high UV transmission ratios, negligible autofluorescence and large numerical apertures for unsurpassed brightness and contrast.

See for yourself the difference these exciting new objectives can make. Ask for a demonstration. Call **1-800-52-NIKON, ext. 285** today.

Fixed mouse fibroblasts are labeled with MitoTracker<sup>™</sup> CMXRos and BODIPY<sup>®</sup> FL phallacidin, and counterstained with DAPI. Photo courtesy of Jennifer Kramer and Paul Millard, Molecular Probes, Inc. BODIPY is a registered trademark of Molecular Probes, Inc. MitoTracker is a trademark of Molecular Probes, Inc. ©1995 Nikon Inc.

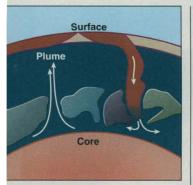


ISSN 0036-8075 **23 FEBRUARY 1996** VOLUME 271 NUMBER 5252





ASSOCIATION FOR THE **ADVANCEMENT OF** SCIENCE



1053 New picture of the mantle





1120 Association of farnesyltransferase with transforming growth factor-β receptor

NEWS & COMMENT	Analyzing With Astro	
Big Science Is Booming in Japan Researchers, Book Your Flights	1046 1047	PERSPE
Clinton's R&D Achievements Tilt Toward Technology Science and the Balanced Budget	1049 1049	Molecular of Chemist T. W. Bel
MIT Torn by Bitter Dispute Over Missile	1050	Evolving C M. M. Da
Russia: Funding Crisis Provokes Street Protests	1052	Delivery of to Solid Tu R. K. Jain
RESEARCH NEWS	Margaretter	rt. rt. juiii
Putting Stiffness in Earth's Mantle	1053	ARTICLE
AAAS Gathering Explores Animals, Aliens, and Atoms	1055	The Galvan Growing A J. M. Berg
Regulating G Protein Signaling	1056	RESEAR
Infrared Astronomy: New Images Wet Researchers' Appetites	1058	The Immu Catalysis
A Split-Personality X-ray Beacon Tantalizes Theorists	1059	P. A. Pat Marks, G Stevens, I
	DEPART	MENTS
THIS WEEK IN SCIENCE	1033	SCIENCES
<b>EDITORIAL</b> Science and the American Dream Neal F. Lane	1037	RANDOM S Genes Conf Dictionary Trail • PN
LETTERS Superconductivity Researchers: R. L. Gr	1039	Journal of P
LETTERS Superconductivity Researchers: R. L. Gro Prediction of the Bose-Einstein Condens Donnelly • Air Quality in Mexico Guzmán, M. E. Ruíz, E. Vega; D. R. Blake Rowland • Climate Change and Consen tinued: M. J. Prather • HIV Viral Load As Fox; B. F. Haynes	eene • A sate: R. J. City: F. and F. S. sus: Con-	
Superconductivity Researchers: R. L. Gra Prediction of the Bose-Einstein Condens Donnelly • Air Quality in Mexico Guzmán, M. E. Ruíz, E. Vega; D. R. Blake Rowland • Climate Change and Consen tinued: M. J. Prather • HIV Viral Load As	eene • A sate: R. J. City: F. and F. S. sus: Con-	Journal of P BOOK REV Tempo and Larson • Pr Books Recei

Molecular Structure 1060 onomical Speed ECTIVES **Trees: A New Branch** 1077 try 11 Catalysts in Real Time 1078 ivis f Molecular Medicine 1079 umors EI inization of Biology: A 1081 Appreciation for the Roles of Zinc g and Y. Shi RCH ARTICLE inological Evolution of 1086 tten, N. S. Gray, P. L. Yang, C. B. J. J. Wedemayer, J. J. Boniface, R. C. P. G. Schultz SCOPE 1045 SAMPLES 1061 firm Archaea's Uniqueness • Antarctic • Piping in the Sun • On the Dinosaur JAS Opens Up Submission Process • lague Years • Bear Facts VIEWS 1075 Mode in Evolution, reviewed by A. rotein Kinases, J. T. Stull • Vignettes • ived

**VS & NOTES** S & MATERIALS Kim Nasmyth Gottfried Schatz Roger A. Nicoll Staffan Normark Stuart L. Pimm

Yeshayau Pocker

Douglas C. Rees

Martin Raff V. Ramanathan

David C. Rubie

Erkki Ruoslahti

T. M. Rice

Ralph S. Quatrano

Jozef Schell

Ronald H. Schwartz

Thomas A. Steitz Michael P. Stryker

Tomoyuki Takahashi

Masatoshi Takeichi

Keiji Tanaka Robert T. N. Tjian

Yoshinori Tokura Emil R. Unanue

Terrence J. Sejnowski

Geerat J. Vermeij Bert Vogelstein Arthur Weiss Zena Werb George M. Whitesides Owen N. Witte William A. Wulf

1149

1150

Frederick W. Alt Don L. Anderson Michael Ashburner Stephen J. Benkovic Alan Bernstein David E. Bloom Piet Borst Henry R. Bourne Michael S. Brown James J. Bull Kathryn Calame Dennis W. Choi

David Clapham Adrienne E. Clarke Adrienne E. Clarke John M. Coffin F. Fleming Crim Paul J. Crutzen James E. Dahlberg Robert Desimone Paul T. Englund G. Ertl Richard G. Fairbanks Douglas T. Fearon Harry A. Fozzard

Klaus Friedrich Roger I. M. Glass Stephen P. Goff Peter N. Goodfellow Corey S. Goodman Peter Gruss Philip C. Hanawalt Nobutaka Hirokawa Tomas Hökfelt Tasuku Honjo Susan D. Iversen Eric F. Johnson

Board of Reviewing Editors Stephen M. Kosslyn Michael LaBarbera Nicole Le Douarin Charles S. Levings III Harvey F. Lodish Richard Losick Reinhard Lührmann Ruth Lynden-Bell Seth Marder Diane Mathis Anthony R. Means Shigetada Nakanishi

SCIENCE • VOL. 271 • 23 FEBRUARY 1996

1030

#### COVER

ł

Representation of a hexameric assembly of dendrimers (hyperbranched polymers, shown with four layers or generations). Hydrogen-bonding contacts at the core of each dendrimer and peripheral van der Waals interactions stabilize the assembly, whose size rivals

#### that of a small protein. White, hydrogen; black, carbon; red, oxygen; and blue, nitrogen. See page 1095 and the Perspective on page 1077. [Image created by Paul A. Thiessen with PovChem (see http:// ludwig.scs.uiuc.edu) on a Silicon Graphics Indigo]

#### REPORTS

Olig	ling and Dating New Jersey gocene-Miocene Sequences: Ice Volu bal Sea Level, and Exxon Records	1092 1me,	S. Faha Linhard
Sh	G. Miller, G. S. Mountain, the I hipboard Party, and Members of the rsey Coastal Plain Drilling Project		The p21 <sup>®</sup> in TGF-f T. Wan S. D. Ki
S.	-Assembling Dendrimers Z C. Zimmerman, F. Zeng, D. E. C. R V. Kolotuchin	<b>1095</b> eichert,	Locus Co Heteroch Effect Va
and	<b>Os Ages of Group IIA, IIIA, IVA,</b> <b>IVB Iron Meteorites</b> . I. Smoliar, R. J. Walker, J. W. Morga	<b>1099</b>	R. Fest Mamala Jones, I
Sim Mor S.	Swelling of Clays: Molecular ulations of the Hydration of ntmorillonite Karaborni, B. Smit, W. Heidug, J. n Oort	<b>1102</b> Urai, E.	Congenit with a M Resistand C. C. F C. T. M
CO Mat	dle to Late Paleozoic Atmospheric 2 Levels from Soil Carbonate and Or ter I. Mora, S. G. Driese, L. A. Colarusso		Scheper IRAK: A Interleuk Z. Cao,
Obs Usin E. Le Sc C.	ial Results of Radio Occultation ervations of Earth's Atmosphere ng the Global Positioning System R. Kursinski, G. A. Hajj, W. I. Bertig roy, T. K. Meehan, L. J. Romans hofield, D. J. McCleese, W. G. Me L. Thornton, T. P. Yunck, J. R. Eyr agatani	s, J. T. lbourne,	TECHN How Mu Clouds A G. L. St Pilewsk Interheli
	ervations of Carbon Monoxide	1110	Stability, P. Lavig
	Comet Hale-Bopp Jewitt, M. Senay, H. Matthews	7	Hodges
D. Imit Rec of the	Comet Hale-Bopp	1113 rs	Hodges

#### AAAS Board of Directors

Rita R. Colwell Retiring President, Chairman Jane Lubchenco President Mildred S. Dresselhaus President-elect

Sheila Jasanoff William A. Lester Jr. Simon A. Levin Marcia C. Linn Michael J. Novacek Anna C. Roosevelt Jean E. Taylor Nancy S. Wexler

William T. Golden Treasurer Richard S. Nicholson Executive Officer

leparin Structure and Interactions	1116
with Basic Fibroblast Growth Factor	1110
S. Faham, R. E. Hileman, J. R. Fromm, Linhardt, D. C. Rees	R. J.
The p21 <sup>RAS</sup> Farnesyltransferase $\alpha$ Subunit TGF- $\beta$ and Activin Signaling	1120
T. Wang, P. D. Danielson, Bv. Li, P. C.	Shah.

I. Wang, P. D. Danielson, B.-y. Li, P. C. Shah, S. D. Kim, P. K. Donahoe

#### Locus Control Region Function and 1123 Heterochromatin-Induced Position Effect Variegation

R. Festenstein, M. Tolaini, P. Corbella, C. Mamalaki, J. Parrington, M. Fox, A. Miliou, M. Jones, D. Kioussis

#### Congenital Jaundice in Rats 1126 with a Mutation in a Multidrug Resistance–Associated Protein Gene

C. C. Paulusma, P. J. Bosma, G. J. R. Zaman, C. T. M. Bakker, M. Otter, G. L. Scheffer, R. J. Scheper, P. Borst, R. P. J. Oude Elferink

#### IRAK: A Kinase Associated with the 1128 Interleukin-1 Receptor Z. Cao, W. J. Henzel, X. Gao

#### **TECHNICAL COMMENTS**

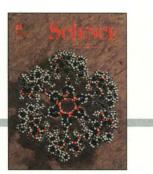
How Much Solar Radiation Do Clouds Absorb?	1131
G. L. Stephens; R. D. Cess and M. H. Zha Pilewskie and F. P. J. Valero	ang; P.
Interhelical Salt Bridges, Coiled-Coil Stability, and Specificity of Dimerization	1136
P. Lavigne, F. D. Sönnichsen, C. M. Kay Hodges; K. J. Lumb and P. S. Kim	, R. S.

**1110** Hale-Bopp in a CO coma

#### Indicates accompanying feature

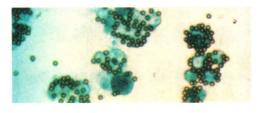
■ SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005. Secondclass postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 1996 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$102 (\$55 allocated to subscription). Domestic institutional subscription (51 issues): \$250. Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$90. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. 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: \$7.00 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 \$4.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for *Science* is 0036-8075/83 \$4.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

SCIENCE • VOL. 271 • 23 FEBRUARY 1996



### Sometimes the best ideas are the simple ones.

Introducing the only way to rapidly select transiently transfected cells.



Transfected SKBR-3 cells after selection with Capture-Tec<sup>™</sup> Beads

### Selection for Transients.

The problem with transient transfection is that efficiencies are typically low and variable, from 5 - 50%. Often, research requires the use of homogeneous cell populations. Invitrogen's new Capture-Tec<sup>™</sup> System allows you to purify a population of transiently transfected cells that contain your gene of

interest just hours after transfection.

### It's Simple.

The key to selection is the innovative pHook<sup>™</sup> vectors. These vectors express a single-chain antibody (sFv) to a specific hapten molecule. This sFv is displayed on the surface of the transfected cells. Your gene of interest is either cotransfected with or subcloned into a pHook<sup>™</sup> vector. Transfected

> cells are selected with hapten-coated magnetic beads. It's that simple.



Captured cells can be used to study temporal events along developmental pathways, acute effects of constitutive mutations, or in any experiment that requires a homogeneous population of transfected cells. These easy-to-use kits come complete with vector, hapten-coated beads, and a control vector. A convenient magnetic stand is also available. Call Invitrogen today for more information on this exciting new technology!



Telephone (619) 597-6200 Fax (619) 597-6201 http://www.invitrogen.com 1-800-955-6288

EUROPEAN HEADQUARTERS: Invitrogen BV De Schelp 12, 9351 NV Leek The Netherlands Tel: +31 (0) 594 515 175 Fax: +31 (0) 594 515 312 Email: tech\_service@invitrogen.nest.nl

pHook

#### TOLL FREE TELEPHONE NUMBERS Austria 0660 8127 Belgium 0800 111 73 Denmark 800 188 67 Finland 990 31 800 5345 France 19 31 800 5345 Germany 0130 8100 43

Hapter

Plasma

The Netherlands 06 022 8848 Norway 800 113 70 Sweden 020 795 369 Switzerland 155 1966 UK 0800 96 61 93

Australia 03 9562 6888 Korea 822 569 6902 Hong Kong 886 2 381 0844 Singapore 65 779 1919 Israel 02 524 447 Italy 02 38 10 31 71

Distributors:

Japan 03 5684 1616

or 29 29 783 Spain 03 450 2601 Taiwan 886 2 381 0844 From all other countries, please contact of European headquarters at +31 (0) 594 515 175

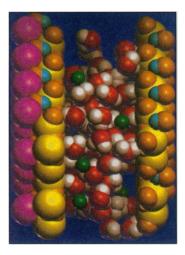
Circle No. 8 on Readers' Service Card

### This Week in Science

edited by PHIL SZUROMI

#### **Clay swelling**

Some clays can swell to several times their original thickness in the presence of water, but the details of water adsorption between the layers within the clay are poorly understood. Kara-



borni *et al.* (p. 1102) present simulations of sodium-montmorillonite, an abundant clay that affects the stability of oil wells during drilling. Particularly strong swelling of this clay may result from the occurrence of two different types of stable structures, depending on the number of water layers between the clay layers. Switching between these two different stable states may facilitate the swelling of the clay.

#### On the level

Reconstructing past changes in sea level has proven difficult, yet it is critical for evaluating causes of sea-level changes (for example, tectonic versus climatic) and controls on deposition. Two controversial studies by Vail and Haq and their coworkers had correlated sequence boundaries and other features in marine stratigraphic records distributed globally to try to delineate past changes in sea level. Miller *et al.* (p. 1092) now test

#### Steps toward catalytic antibodies

Highly specific recognition of antigens by antibodies results during affinity maturation, in which an expanding population of different B cell clones compete for the same antigen. Patten *et al.* (p. 1086; see the Perspective by Davis, p. 1078) cloned and expressed nine affinity mutations from germline cells that occurred during the generation of an antibody that catalyzes ester hydrolysis. A kinetic analysis revealed that as the antibody evolved, its affinity for the transition-state analog increased by a factor of  $10^4$ , and the reaction rate for the ester substrate increased by about a factor of  $10^2$ . A crystal structure of the antibody revealed that these mutations were not in direct contact with the hapten and thus likely played a conformational role.

this interpretation by comparing the oxygen isotope curve, an indicator of sea-level changes due to glaciation, with ages of sequence boundaries in Oligocene-Miocene sediments along the New Jersey coast. The ages of unconformities are correlated with indications of a lowering of sea level inferred from oxygen isotope values.

#### Listening to the air

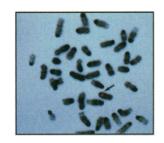
A recently completed network of 24 Global Positioning System satellites has been used to listen to the structure of the Earth's atmosphere using radio occultation. Kursinski et al. (p. 1107) determined preliminary vertical temperature and water vapor profiles that illustrate the enhanced resolution of this technique over limited groundbased balloon radiosonde and model data. Additional measurements should contribute to our understanding of the structure of the stratosphere and enhance weather forecasting.

#### CO in a comet coma

The development of sensitive millimeter-wave telescopes has allowed astronomers to observe distant comets to understand what produces their gaseous comas when they are too cold to sublimate water-ice. Jewitt *et al.* (p. 1110) have determined that the bright coma of comet Hale-Bopp is due to the outgassing of CO. This rare observation of CO outgassing may be a transient brightening that will evolve into an even brighter water outgassing, visible with the naked eye, as Hale-Bopp makes its closest approach to the sun in April 1997.

#### Varying variegation

Locus control regions (LCRs) permit the tissue-specific expression of linked genes at high levels. Festenstein *et al.* (p. 1123) have studied the LCR



from the human CD2 gene in transgenic mice. They find that the CD2 LCR was necessary to prevent variegated expression (expression in some cells of a tissue but not others) when the gene was inserted into centromeric heterochromatin. Such variegated expression was associated with a closed chromatin configuration. They conclude that the LCR functions by establishing or maintaining an open chromatin domain.

#### **Regulation by release**

Like other receptors, the transforming growth factor (TGF)- $\beta$  receptor is expected to transmit signals to the interior of the cell through its interaction with associated proteins. Wang et al. (p. 1120) searched for proteins that interacted with the TGF- $\beta$  receptor and found the  $\alpha$  subunit of farnesyltransferase (FNTA). FNTA regulates the activity of small guanine nucleotide-binding proteins like Ras that participate in many signaling pathways. When TGF- $\beta$ bound to its receptor, FNTA was released. Thus, signaling by the TGF- $\beta$  receptor may be mediated, at least in part, by ligand-induced release of FNTA and consequent regulation of small guanine nucleotide-binding proteins.

#### Liver-specific multidrug transporter

Formation of bile requires the secretion of bile acids from the liver through a canalicular multiorganic anion transporter (cMOAT) that has been defined physiologically but whose molecular definition has remained elusive. Deficiencies in bile acid secretion leads to disease. Paulusma et al. (p. 1126) have described the isolation of the sequence that encodes cMOAT. The protein is related to known multidrug transporters and is specifically expressed in the canalicular membrane of liver cells.

#### Research Notes from

# Nikon

# Puts the Focus on Fluorescence

Like all Nikon optics, the new CF PLAN FLUOR Objectives correct all the various chromatic aberrations from the center to the edges of the image, providing extreme sharpness over the entire field of view. Nikon is the only microscope

manufacturer to formulate and manufacture its own glass, and has taken advantage of this capability to create these truly special objectives. They also feature new optical cements and brigh transmission coatings to permit brighter images and broader wavelength ranges (UV - Deep Red) that length ranges (UV - Deep Red) that are color aberration free with extremestre color aberration free with extremeate color aberration free with extremely high contrast and low background autofluorescence.

The new CF PLAN FLUOR Objectives also offer higher numerical apertures to capture more of the available light emitted by the specimen. The N.A. of the 40X PLAN FLUOR, for for the 40X Plan Achromat. The N.A. of the 100X oil PLAN FLUOR is 1.3 of the 100X oil PLAN FLUOR is 1.3 compared with 1.25 for the 100X Plan compared with 1.25 for the 100X Plan Achromat oil.

For more information on Nikon's new CF PLAN FLUOR at (516) 547-8567, fax us at (516) 547-0306 or contact us on the Internet at nikonbio@aol.com.

#### Nikon Inc., Instrument Group

Biomedical Instrument Department 1300 Walt Whitman Road Melville, NY 11747

#### Smaller objects, finer details

Using fluorescence, scientists can resolve images that cannot be observed with ordinary light. The diameter of a single DNA molecule, for example, is about 2nm, while the optical lenses is about 200nm. However, if a fluorescent dye is conjugated with the DNA molecule and the specimen is viewed with a fluorescence microscope, the molecule can be easily detected and measured.

Although it is a very powerful and relatively easy to use tool, fluorescence places extreme demands on the microscope's optics. The nearultraviolet wavelengths that are used in energy. At the same time, the light emitted from the specimen is of much lower intensity than the light used to be designed to transmit as much light as possible. Care must also be taken to prevent autofluorescence taken to prevent autofluorescence emissions, which can mask and rob emissions, which can mask and rob

#### Special objectives required

Because today's ultrasensitive techniques place extreme demanda on optics, the emitted fluorescence requires specially designed objecenhanced brightness and higher UV light transmission than those used with other techniques. The new Wikon CF<sup>®</sup> PLAN FLUOR Universal Objectives have these characteristics.

> more powerful technique. promise to make it an even advances in optics design increasingly popular. Recent nanometers, it is becoming with resolution down to several and analysis of these substances cence permits selective imaging and DNA. Because fluoresantibodies, microtubules, RNA cellular organelles, proteins, smaller entities such as some are not adequate for imaging of individual cells, but they techniques work well for studies for microscopic studies. These most popular techniques used and phase contrast were the Until fairly recently, brightfield

DNA sequences in mammalian cells. number, size and location of specific chromosomes and determining the played a key role in identifying (FISH), for example, which has as Fluorescence in situ Hybridization has made possible techniques such ed and observed separately. This men, each substance can be targetdifferent substances within a specichromes, are absorbed selectively by Because fluorescent dyes, or fluoroto be an exceptionally powerful tool. fluorescence microscopy is proving to explore smaller and smaller entities, As biomedical researchers continue

# With Stratagene's New Seamless Cloning Kit

# make large-scale changes to genes in 1 day! .No restriction

- PRECISE
- Directional
- Low background
- >90% cloning efficiency
- No extraneous bases

#### **VERSATILE APPLICATIONS**

- Expression cloning
- Domain substitution
- Insertions and deletions of DNA sequences

UNITED KINGDOM

(01223) 420955

· Chimeric gene construction: receptors, antibodies, and other fusion proteins

#### SIMPLE 1 DAY CLONING

- 1. Design your primers
- 2. PCR
- 3. Digest/Ligate

Headquarters GERMANY

4. Transform E. coli

INTERNET MAIL techservices@stratagene.com

PCR with Pfu and 5-methyl-dCTH

SWITZERLAND

) 364110

Mix PCR products, digest, ligate and transform E.coli

PCR with Pfu

nd 5-methyl-dCTP

- No restriction sites needed
- No fragment isolation
- No extraneous nucleotides
- Seamless directional cloning

Another creative cloning solution from Stratagene!

SEAMLESS" CLONING KIT CATALOG# 214400 Padgett, K.A., and Sorge, J.A. (1996) Gene 168: 31-35

Circle No. 71 on Readers' Service Card







# **Solution Second Seco**



#### Gel Drying with cool, fresh water?

Introducing the new HydroTech Gel Drying System, a system that uses advanced, water-based vacuum technology to dry electrophoresis gels. It keeps the entire drying process refreshingly clean and sensible.

- Oil changes and disposal? NO!
- Liquid or vapor trap maintenance? NO!
- Expensive parts that continually NO!
- YES!

#### Maintenance? {Just add water}

Tap into the new HydroTech Gel Drying System, the sensible way to keep great results flowing. For more information contact your local Bio-Rad representative or call 1-800-4BIORAD.





**Bio-Rad** Laboratories

Life Science Group

U.S. (800) 4B/ORAD California (510) 741-1000 Australia 02-805-5000 Austria (1)-877 89 01 Belgium 09-385 55 11 Canada (905) 712-2771 China (01) 2046622 Denmark 39 17 9947 Finland 90 804 2200 France (1) 49 60 68 34 Germany 089 31884-0 Hong Kong 7893300 India 91-11-461-0103 Italy 02-21609 1 Japan 03-5811-6270 The Netherlands 0318-54066 New Zealand 09-443 3099 Singapore (65) 272-9877 Spain (91) 661 70 85 Sweden 46 (0) 8-735 83 00 Switzerland 01-809 55 55 United Kingdom 0800 181134 SiG 1012 ds 0318-540666 SIG 101295

# Make the most of '96

with the company that brought you the FIRSTS in microplate analysis technology for over a decade.

SPECTRAplate<sup>®</sup> The first UV transparent disposable microplate

Vmax<sup>®</sup> The first kinetic microplate reader



THERMOmax<sup>™</sup> The first thermally regulated microplate reader



SPECTRAmax<sup>®</sup> 250 The first UV/VIS

Microplate Spectrophotometer

## The year of the 96-Well Microplate

For over two decades now the 96-well microplate has served to increase laboratory efficiency by reducing sample and reagent volumes while decreasing the amount of time required to perform an assay. The number of applications now adapted to the microplate format is astounding. To find out about moving your application to the 96-well microplate format call your MDC specialist today: The first name in microplate analysis technology



1311 Orleans Dr., Sunnyvale, CA 94089 1-800-400-9060 Circle No. 24 on Readers' Service Card



Proud sponsor of the Ist International Conference on Microplate Technology. Basel, June 24 - 27, 1996

# FROM NEW ENGLAND BIOLABS... PHOSPHO~SPECIFIC ANTIBODIES

For MAP and cdc2 Kinase

### A New Line of Research Tools for Growth Factor Signaling and Cell Cycle Research

New England Biolabs offers over 20 years of dedication to research, highest quality products and responsive customer service. Now, NEB introduces the first of many antibody-based systems designed to distinguish the active state of specific molecules.

#### PhosphoPlus<sup>™</sup> Antibody Kits

MAP Kinase Kit Cat. No. 9100 cdc2 (Tyr15) Kinase Kit Cat. No. 9110

#### Activation state-specific antibodies for:

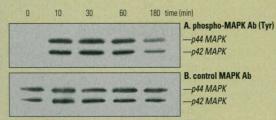
- Rapid analysis of activity within intracellular signaling pathways
- Determination of site-specific phosphorylation
- Phospho-analysis in tissue and whole cells
- Fewer problems with dephosphorylation by western analysis

#### Kit contains everything you need to assay phosphorylation status, including:

- Phospho- and nonphospho-antibodies
- and protein controls
- Phototope<sup>™</sup> Western Detection System

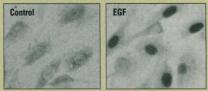
### **Rapid Analysis of** Phospho-MAP Kinase...

#### PC12 CELLS (NGF 100ng/ml)



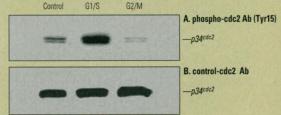
Western Blotting: Quick and easy detection of MAP kinase activation (on Tyr) from SDS-lysates of total PC12 cell extracts using A. phospho- and B. control-MAP kinase antibodies.

#### NIH 3T3 CELLS/PHOSPHO-MAPK Ab



Immunohistochemistry: Phospho-antibody allows in situ detection and subcellular resolution of Epidermal Growth Factor (EGF)-induced MAP kinase activation and nuclear translocation.

# And cdc2 Kinase



Western Blotting of cell extracts from Soac cells treated with Hydroxyurea (G1/S) or Nocodizate (G2/M) with A. phospho- cdc2 (Tyr15) B. control cdc2 antibody.

For more information on Phospho-Specific Antibodies, call 1-800-NEB-LABS or via the internet: <info@neb.com> NEB home page: <http://www.neb.com>

New England Biolabs Inc. 32 Tozer Road, Beverly, MA 01915 USA 1-800-NEB-LABS Tel. (508) 927-5054 Fax (508) 921-1350 email: info@neb.com

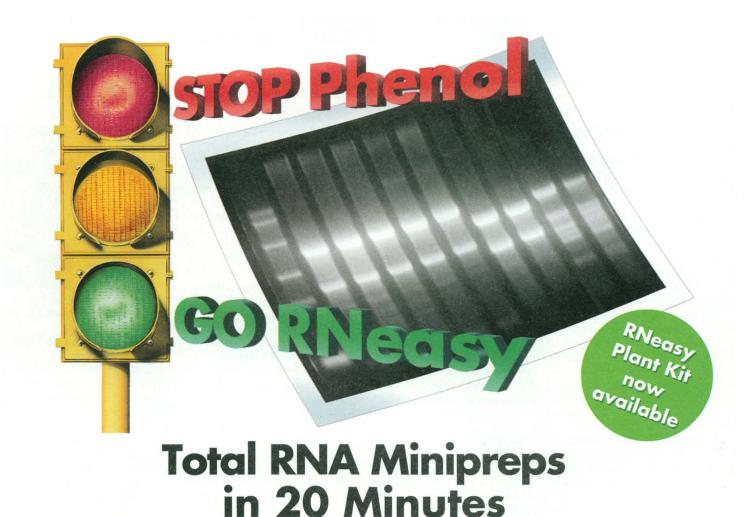
- New England Biolabs Ltd., Canada Tel. (800) 387-1095 (905) 672-3370 Fax (905) 672-3414 email: info@ca.neb.com
- New England Biolabs GmbH, Federal Republic of Germany Tel. (0130) 83 30 31 (06196) 3031 Fax (06196) 83639 email: info@de.neb.com
- New England Biolabs (UK) Ltd. Tel. (0800) 31 84 86 (01462) 420616 Fax (01462) 421057 email: info@uk.neb.com

DISTRIBUTORS: Australia (075) 94-0299; Belgium (0800)1 9815; Brazil (011) 66-3565; Denmark (31) 56 20 00; Finland (90) 420-8077; France (1) 34 60 24 24; Greece (01) 5226547; Hong Kong 649-9988; India (542) 311473; Israel (03) 5351205; Italy (02) 38103171; Japan (03) 3272-0671; Korea (02) 556-0311; Mexico (5) 519-3463; Netherlands (033) 495 00 94; New Zealand (09) 418-3039; Norway 22 22 04 11; Singapore 4457927; Sweden (08) 7348300; Switzerland (061) 481 47 13; Taiwan (02) 8802913



20 years and beyond ..

#### Circle No. 70 on Readers' Service Card



RNeasy<sup>®</sup> Total RNA Kits are a new technology from QIAGEN, designed for total RNA minipreps in just 20 minutes.

Using RNeasy means:

- rapid processing of multiple samples
- immediate inactivation of RNases
- no CsCl ultracentrifugation
- no phenol extractions

RNeasy Kits purify total RNA from

animal and plant cells, and from tissues, fungi or bacteria. Degradation is prevented by immediate inactivation of RNases with specially formulated buffers and reagents, so your RNA remains intact. RNeasy Kits provide all the familar advantages of silica-gel-based membranes and microspin technology – selectivity, speed and convenience. Multiple samples are processed in a fraction of the time needed with other methods – without phenol, CsCl or ethanol precipitation. RNeasy Kits have been optimized for total RNA isolation from small samples including cells, tissue and biopsy

material. Total RNA can be isolated from less than 100 cells or 1 mg of tissue. As much as 100 µg RNA can be bound per spin column. RNeasy purified total RNA is pure, with an

A<sub>260/280</sub> ratio of 1.7 – 2.0. It performs optimally in RT-PCR, northern, dot and slot blotting, primer extension, poly A<sup>+</sup> selection and differential display.

RNeasy Total RNA Kits are supplied with spin columns, RNase-free reagents, and detailed protocols for streamlined RNA minipreps and RNA clean-up.

To receive additional information about RNeasy for total RNA purification, please call QIAGEN or your local distributor.

#### Join the RNA Revolution ... with RNeasy!

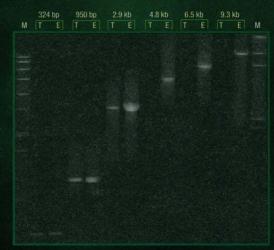
#### **QIAGEN** Inc.

9600 De Soto Avenue Chatsworth, CA 91311, USA Orders 800-426-8157 Fax 800-718-2056 Technical 800-362-7737



# **Expand Beyond the** Limits of Tag DNA Polymerase

Better yields and fidelity than Taq Achieve 2-fold higher yields and up to 3-fold greater fidelity with the Expand<sup>™</sup> PCR System from Boehringer Mannheim. The result is stronger bands than Tag DNA polymerase\* can offer. From even smaller amounts of short and long templates. With fewer misincorporations.



E = amplification with Expand High Fidelity; T = amplification with Taq; M = Molecular Weight Marker.

#### Perform PCR not possible with Tag

Two Expand blends combine the high processivity of our Taq DNA polymerase\* with the proofreading accuracy of our exclusive Pwo DNA polymerase\*, delivering better results than Tag DNA polymerase.

#### **Expand High Fidelity**

- increases yields and fidelity for improved PCR cloning experiments-even from difficult templates
- exhibits a greater tolerance for [Mg<sup>2+</sup>] variations, ensuring consistent PCR results.

#### Expand Long Template

- amplifies human genomic DNA of up to 27 kb
- amplifies λDNA of up to 40 kb.

#### Don't let Tag limit your research possibilities

Expand places premium performance within striking distance. Order today to begin to see striking results.

Expand<sup>™</sup> is a trademark of Boehringer Mannheim.

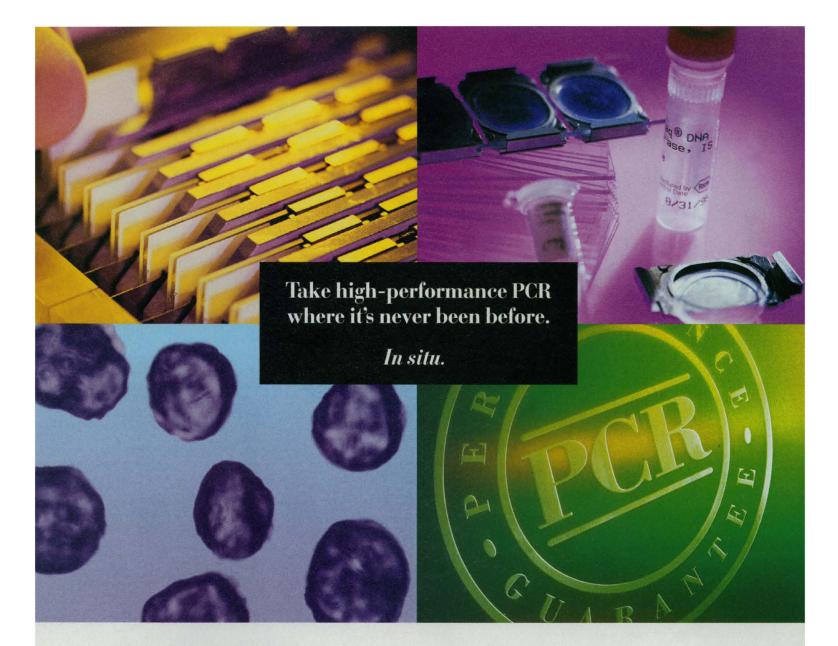
\* Purchase of these products is accompanied by a limited license to use them in the Polymerase Chain Reaction (PCR) process for life science research in conjunction with a thermal cycler whose use in the automated performance of the PCR process is covered by the up-front license fee, either by payment to Perkin-Elmer or as purchased, i.e., an authorized thermal cycle

© 1995 Boehringer Mannheim. All Rights Reserved.

# PREMIUM PCR PERFORMANCE

Striking Results - In the wild, a thin line separates predator and prey. When the falcon crosses that line, it does so with lightning speed and accuracy. Striking with a precision that delivers uncompromising results.







GeneAmp In Situ PCR System 1000 (left). Localization of varciella zoster virus (VZV) by in situ PCR in human brain tissue (right).

power of PCR into the cell. This innovative system streamlines the entire process and provides consistently superior results.

Now in situ PCR is every-

thing it should be. Robust.

Reproducible. Convenient.

The new GeneAmp® In Situ

PCR System 1000,\* with

accessories, expands the

co-optimized reagents and

#### Engineered for In Situ PCR Excellence.

Our novel sample block, accessories and proven thermal cycler design ensure cycle-to-cycle, slide-to-slide uniformity for highly reproducible results. The 10-slide block with vertical slots maximizes thermal contact-without mineral oil-to guarantee optimal PCR performance. Up to 30 samples can be amplified each run.

Setup is convenient with our AmpliCover<sup>™</sup> Discs and Clips and silane-treated glass slides, which create a standardized

reaction chamber, without messy adhesives. This complete system includes our AmpliTaq® DNA Polymerase, IS, specifically formulated for efficient in situ PCR.

Take high performance PCR where it's never been before with the GeneAmp In Situ PCR System 1000 and our line of in situ PCR reagents and accessories. To request information, call 1-800-345-5224. Outside the U.S. and Canada, contact your local Perkin-Elmer representative.

A R



Europe Langen Germany Tel: 49 6103 708 301 Fax: 49 6103 708 310 Japan Tokyo, Japan Tel: (0473) 80-8500 Fax: (0473) 80-8505 Latin America Mexico City, Mexico Tel: 52-5-651-7077 Fax: 52-5-593-6223 Australia Melbourne, Australia Tel: (03) 9212-8585 Fax: (03) 9212-8502

Perkin-Elmer PCR reagents are developed and manufactured by Roche Molecular Systems, Inc., Roche Branchburg, New Jersey, U.S.A.





nding d AmpliTag are registered trademarks of Roche Molecular Systems, Inc. The GeneAmp PCR process is covered by the U.S. patents owned by Hoffmann-La Roche, Inc. and F.Hoffmann-La Roche Ltd. AmpliCover is a trademark of The Perkin-Elmer Corporation. Perkin-Elmer is a registered trademark of The Perkin-Elmer Corporation.

Circle No. 47 on Readers' Service Card

# THE NEW AMES II ASSAY... ENHANCED FOR HIGH THROUGH-PUT SCREENING

NEW AMES II — • COST EFFECTIVE • SIMPLIFIED

 Available in Manual Or Automated Systems

mes II, a new version of the Ames Assay, has been developed to identify basepair substitution mutations upon detection of mutagens. Ames II comes in a 96 and 384-well microtiter format for easy use.

Six Salmonella typhimurium strains have been constructed, each of which carries a different missense mutation in the histidine operon that is designed for reversion via the base substitution unique to each strain. The strains have been combined for use as a single rapid screening mixture.

Ames II identifies missense mutational spectra caused by mutagens without the need to sequence. Low spontaneous reversion frequencies allow detection of mutagens at lower concentrations without loss of sensitivity to a large range of doses.



For more information, or to order a Test Assay Kit, contact:Xenometrix Inc. • 2860 Wilderness Place • Boulder, Colorado 80301 USA • Tel: (303) 447-1773 • Fax: (303) 447-1758 • Toll Free in USA: 1-800-436-2869UK: Cambridge Bioscience • ++44-1223-316855Japan: Funakoshi Co., Ltd • ++81-3-5684-1622Switzerland: Xenometrix GmbH • ++41-61-482-1434

Circle No. 57 on Readers' Service Card

# Lift the limits of your research.



### The Olympus Provis AX-70 Research Microscope

Introducing a unique challenge to the accepted limits of advanced microscopy. The new Olympus Provis AX-70 Research Microscope System. More versatile. More responsive. And better equipped to bring you today's most advanced optical system-including **U.I.S.** Infinity-corrected Optics, brilliant illumination and the visionary power of fluorescence. With easier access to vital controls, a massive Y-shaped stand that offers up to 5 output ports and computer-controlled automation for virtually limitless imaging and photomicrography options. Just go where your research takes you, and so will we. To arrange a demonstration of the new Olympus Provis AX-70 Research Microscope at your convenience, or for more information on the difference it could make for you, please call 1-800-455-8236.

Olympus and Research. Seeing Eye to Eye.



Circle No. 2 on Readers' Service Card



# TaKaRa LA Taq Provides Premium PCR Performance!

*LA Taq* DNA Polymerase achieves longer DNA amplification with high fidelity; especially suitable for human genomic fragments (up to 30 kb).

> LA Tag Inside Powerful kits for Long and Accurate (LA) PCR



TaKaRa LA PCR *in vitro* Cloning Kit

Achieves amplification of long, unknown regions of plasmid, cDNA or genomic DNA. Requires only one user-prepared primer, as this kit includes six restriction enzymespecific cassettes.

#### **TaKaRa LA PCR Kit Ver. 2** This kit includes *LA Taq* , special

buffer concentrates (with and without  $Mg^{2*}$ ), a dNTP mix, a control set of  $\lambda$  phage DNA and primers, and MW markers.

### TaKaRa LA Taq

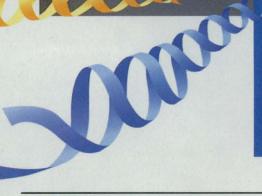
000000

#### TaKaRa RNA LA PCR Kit (AMV)

For efficient amplification of longer cDNA templates following RNA PCR. All reactions are performed in a single tube and RTase is conveniently pre-diluted and ready for immediate use.

#### TaKaRa LA PCR in vitro Mutagenesis Kit

Provides a simple and efficient way to introduce site-specific mutations into longer DNA cloned in either pUC or pUC-derived vectors. Only one primer is required and no repeated transformations are necessary.





**Takara Shuzo Co.,LTD. BIOMEDICAL GROUP** Otsu, Shiga, Japan Phone:+81 775-43-7247 Fax:+81 775-43-9254

Europe **TaKaRa Biomedical Europe S.A.** 92230 Gennevilliers, France Phone: +33 1 41 47 01 14 Fax: +33 1 47 92 18 80

Korea BOHAN (TaKaRa-Korea) Biomedical Inc. Seoul, Korea Phone: +82 2-577-2002 Fax: +82 2-577-3691 North & South Americas **PanVera Corporation** Madison, WI 53711 Toll Free: 800-791-1400 Fax: 608-233-3007 E-mail: info@panvera.com

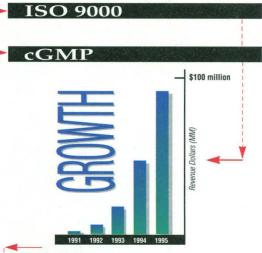
Only U.S.A. Oncor. Inc. Gaithersburg, MD 20877 Toll Free: 800-776-6267 Fax: 301-926-6129 E-mail: custsvc@oncor.com

\* TaKaRa's PCR related products are sold under licensing arrangements with Roche Molecular Systems and F. Hoffman-La Roche Ltd. and The Perkin-Eimer Corporation. Purchase of this product is accompanied by a limited license to use them in the Polymerase Chain Reaction (PCR) process for research in conjunction with a thermal cycler whose use in the automated performance of the PCR process is covered by the up-front license fee, either by payment to Perkin-Elmer or as purchase, i.e., an authorized thermal cycler. \*\* Licensed under U.S. Patent 5,436,149

#### +49 6122 9830-0 • France +33 1 34 52 3030 • United Kingdom +44 1 992 507100 • Japan +81 3 3471 8191



TEL: U.S. 1 (800) 899-5858 FAX: U.S. 1 (508) 383-7851 INT: http://www.pbio.com



At PerSeptive Biosystems, every product we make offers a distinct advantage over the conventional technology it replaces. From reagents to instruments, they help you work faster, and with greater efficiency and insight. And they're backed by an investment in services, technology and the future that is unmatched in the industry. If you work in the life sciences, there's only one way to go...forward. We can show you how to get there faster.

To accelerate *your* work, call us or visit our Web site, today.

# → FAST FORWARD<sup>\*\*</sup>



**PerSeptive Biosystems** 

#### TOOLS TO SYNTHESIZE **>**



FOR THE















ImmunoDetection<sup>™</sup>(ID<sup>™</sup>) Sensor Cartridges Voyager<sup>®</sup> CytoFluor<sup>®</sup> II Biospectrometry<sup>®</sup> Fluorescence Plate Workstations Reader

Expedite" Nucleic Acid Synthesis System

8800<sup>™</sup> Nucleic Acid Synthesis System Nucleic Acid and Peptide Synthesis Reagents 9050 Plus PepSynthesizer™ System

Circle No. 39 on Readers' Service Card

# $\lambda \Delta NA \Phi A \Sigma T?$

It's all Greek without λ Quick!®

http://www.bio101.com

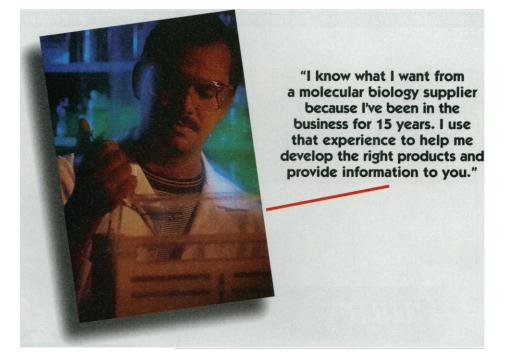


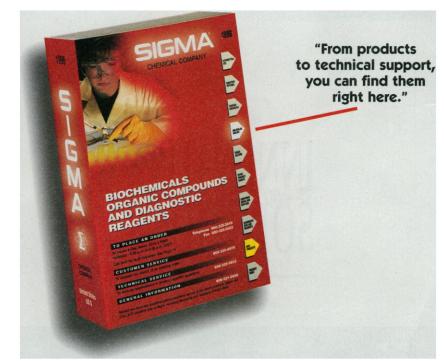
(800) 424-6101

New from the makers of GENECLEAN,  $\lambda$  Quick! Spin, a kit complete with all you need to isolate pure  $\lambda$  DNA fast. . .everything from the agar to the catch tubes. Smart, huh? It gets better. Results show average yields of 20µg per prep! (Some customers claim they've obtained over 200µg per prep!?) The  $\lambda$  phage is precipitated from plate or liquid lysates, lysed with a chaotropic salt and subsequently bound to a proprietary matrix, washed and eluted. What's that tell you? There's no need for phenol/chloroform extractions. The resulting DNA is ready to cut, subclone, sequence or amplify. No two ways about it, with phage comes wisdom. That is, when you use  $\lambda$  Quick! To find out more about  $\lambda$  Quick! check out our web site at http://www.bio101.com or give us a call at (800) 424-6101.

#### Ron Lirette, Ph.D.

- Presently directing research activities and product development for Sigma BioSciences.
- Published in Journal of Cellular Biochemistry, Journal of Virology, Journal of General Virology, and EMBO.
- Presented abstracts at American Society for Cell Biology Conferences, Symposium of the Protein Society, Annual Meeting of The American Society for Virology, and International Symposium on Column Liquid Chromatography.
- Prior to Sigma, worked five years in a molecular biology group in the pharmaceutical industry.
- Also worked in academia at the Wistar Institute of Anatomy and Biology and at the University of Medicine and Dentistry of New Jersey.
- Received his Ph.D. from Louisiana State University.





Ron's experience is just one example of what our scientists bring to Sigma. You can benefit from the experience of all our molecular biologists by ordering products from the Molecular Biology section of the Sigma Catalog. And just like all the Sigma products you know and trust, your satisfaction is guaranteed.

For highly-specific, highly-sensitive molecular biology products and technical support, see Section Four of the Sigma catalog. Call 1-800-325-3010 (USA/Canada) or 314-771-5750 (call collect outside USA and Canada) for your personal copy.



© 1996 Sigma BioSciences

Corporate Headquarters, Framingham, Massachusetts, USA 1 (508) 383-7700 • European Headquarters, Wiesbaden, Germany

# FRATE YOUR WORK **Purify WORLDWIDE RESOURCES** LA N LAIN NALYZE S HESIZE INNOVATIVE SOLUTIONS

#### TOOLS TO PURIFY **>**

















TOOLS TO ANALYZE **>** 



BioCAD™ Workstation Family

POROS® Prepacked Columns and Self Pack™ Column Packaging System

BioCAD" / SPRINT Workstation

POROS\* Bulk Media

AutoPilot® System

INTEGRAL<sup>™</sup> Micro-Analytical Workstation

Real-Time Process Monitor (RPM®) System

## SciFinder See Scientific scientific discovery in a whole new light.

# Presenting SciFinder, a desktop research tool so illuminating, it will make you feel like you've been working in the dark.

Imagine a tool that informs and inspires you, and—with the touch of a few keys—makes you and your organization more efficient and effective than ever before.

That is the power of SciFinder, an enlightening content-based software tool from CAS that offers you:

- Desktop capability to answer routine questions right at your Macintosh<sup>®</sup> or Windows desktop computer system.
- A direct link to a wealth of worldwide information from CAS, including more than 14 million chemical substance records and references from Chemical Abstracts for more than 12 million articles and patents.
- **Point-and-click access** to information, guided by an intuitive graphical interface.

Now, CAS has made the pathways to knowledge even easier for chemical researchers to follow. With SciFinder.

For more details on SciFinder, call 1-800-753-4227 or 1-614-447-3731 for our brochure.

 Outside the U.S., call CAS toll-free:

 U.K. and N. Ireland
 France

 0800-89-6626
 05-90-10-63

 Republic of Ireland
 Germany

 800-55-7560
 0130-8-16862

 Switzerland
 155-0445



Best New Science/Technology Service in 1995

Or via internet: help@cas.org

Circle No. 38 on Readers' Service Card

A division of the American Chemical Society? SciFinder is a trademark of the American Chemical Society? Macintosh is a registered trademark of Apple Computer, Inc.



# Flow-through transport.

Flashing an array of brilliant color patterns on its trunk, the Caribbean reef squid propels itself forward by forcing water through its body. When alarmed, it is capable of greatly increasing the flow rate to quickly accelerate away from would-be predators.

POROS® Perfusion Chromatography® columns provide an advancement in high pressure liquid chromatography by greatly accelerating the process of protein and peptide separations. The unique flowthrough particles overcome the limitations of conventional HPLC columns. So labs get high-resolution separations in just a few minutes, compared to current methods that can take an hour or more.

For more information on how to increase the speed and quality of biomolecule separations in your laboratory, contact your local Boehringer Mannheim representative for a free brochure on POROS Perfusion Chromatography columns. You can also contact us on the Internet at http://biochem.boehringer.com.



High-Resolution. In Minutes.



Australia (02) 899 7999, Austria (0222) 277 87: Belgium (02) 247 4930; Brazil 55 11 66 3565; Canada (514) 686 7050; Chile 00 56 (2) 22 33 737; China 86 21 416 4320; Czech Republic (0324) 45 54, 58 71-2; Denmark 49 13 82 32. Finland (90) 429 2342; France 7675 30 86; Cermany (062) 1798 6545; Greece (01) 64 96 683-6; Hong Kong (652) 24857566; Incia (22) 837 0794; Indonesia 62 (21) 520 2820; Israel 972-5-64 93 111; Italy (02 270 96209; Japan 103 3432 3155; Malaysia 60:03) 755 5039; Mexico (5) 227 7987; Full Statistical (9) 276 4175; Norway 22 00 755 00; Poland (22) 8637769; Portugal (01) 41717; Russia (49) 621 779 8636; Singapore/Philippines 65 272 9900; South Africa (01) 882 6400; South Eastern Europe +43 (1) 277 87; South Korea 02 569 6902; Spain (93) 201 4411; Sweden 08 98 8150; Switzerland 0 41/7 99 6161; Taiwan (02) 736 7125; Thailand 66 (2) 274 0708-13; Turkey 1 349 81 76-79; United Kingdom (0800) 521 578; USA 800 262 1640. ©1996 Bothringer Mannheim

# TRAITS OF A LEADER IN DNA SYNTHESIS

Instrumentation

Automated DNA Synthesizers BioSearch

> Cyclone DNA Synthesizer

8800<sup>™</sup> Plus Large-Scale DNA Synthesis Instrument

Voyager<sup>™</sup> Mass Spec Workstation for Oligo Q/C

\*Expedite<sup>™</sup> 8900 **Nucleic** Acid Synthesis System

\*Oligo Workstation Software

> Expedite<sup>™</sup> PNA Upgrade

\*MOSS 16-Column Unattended **Synthesis** 

# **PROVEN ECONOMY**

Oligo Quality

WORLD-CLASS

SUPPORT AND SERVICE

Amidites Columns Synthesis Solutions for All Makes of **Synthesizers CPG** Solid Supports

Chemistry

**RNA** Chemistry

Fast Deprotection Chemistry

MemSyn™ Membrane-Based Synthesis Devices\*\*

Oligo R-3 for Purification\*\*

2'O Methyl Chemistry\*\*

Expedite<sup>™</sup> PNA Chemistry for Peptide Nucleic Acid\*\*

\*\*New Products

A history of strong technology lines. Generation after generation of continually faster, more flexible and economical alternatives. A heritage of leadership traceable back to the dawn of commercial oligo and peptide synthesis.

PerSeptive Biosystems helps you build a more robust and competitive synthesis program with proven technology and business advantages. From our Expedite family of systems and chemistries to worldwide ISO 9002 manufacturing, you'll find the traits of a leader.

Learn more about our products and technology including each of the Product Loci shown above.

Visit our interactive Chromosome Maps on our Web site.

FAST FORWARD

**PerSeptive Biosystems** 

For more information or a demonstration in your lab on our new high through-put Expedite/MOSS Synthesis System, call us at:

TEL: US 1 (800) 899-5858 / Germany +49 6122 9830-0 France +33 1 34523030 / UK +44 199 250 7100 Japan +81 3 3471 8191 FAX: US 1 (508) 383-7885

EXPEDITE<sup>™</sup>/MOSS

NUCLEIC ACID SYNTHESIS SYSTEM

INT: http://www.pbio.com/

Circle No. 22 on Readers' Service Card

#### SC&A'S "READERS CHOICE" AWARD WINNER 4 YEARS RUNNING!

# New SigmaPlot 3.0!

NEW! Create graphs easily "Point and click" toolbar graph creation • Step-by-step, interactive graph wizard • Easier to use templates

**NEW!** Graph anywhere! Embed images into SigmaPlot or embed SigmaPlot graphs into your documents with OLE 2 container and server

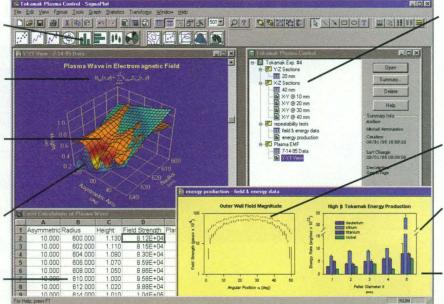
#### NEW! Visualize 3D

Multiple, intersecting 3D graphs with hidden line removal, discrete and continuous shading, and light source • Scatter, trajectory, mesh, and 3D bar charts

Robust multidimensional nonlinear curve fitting 10 independent variables, 25 parameter • Piecewise continuous, multifunctional, weighted, and boolean functions

#### **NEW!** Excel<sup>®</sup> inside SigmaPlot

Use Excel as your spreadsheet and pick data from it to create SigmaPlot graphs



**NEW! Jandel Notebook** Organize multiple data worksheets and multiple graph pages effectively

#### **NEW!** Time-saving

transforms Create quick and powerful mathematical analysis routines to use again and again, including FFT functions

#### NEW! Visual Display

Graph Library Edward Tufte's templates and style guidelines • The Visual Display of Quantitative Information book • Data density meter

#### NEW! Control axes

completely Linear, semi-log, log, logit, probit, probability, polar, and category and custom axes • Offset axes • Axis breaks

#### **NEW!** Flexibility of multiples

Multiple pages per worksheet Multiple graphs per page • Multiple curves per graph • Multiple axes per graph

# Create and customize the exact scientific graph you want

You've spent months collecting and analyzing data. Don't spoil your work now! Maximize the impact of your research with *new* SigmaPlot. When you want to document, present, and publish your work, financial spreadsheets and business graphing software can't do what SigmaPlot *already does* for tens of thousands of researchers worldwide.

#### AWARD-WINNING SIGMAPLOT

Since 1985, scientists and engineers have chosen award-winning SigmaPlot for the technical analyses and graphing they *want* – and for the total flexibility they *need*. Clear, precise technical graphs provide new insights into your data and allow you to present your results better.



#### **POWERFUL DATA ANALYSIS**

*The best scientific graphs* begin with powerful data analysis. SigmaPlot has what you need – huge data worksheets, FFTs, mathematical transform language, automatic regressions, nonlinear curve fitter, and much more.

#### **CREATE GRAPHS EASILY**

Click on a graph toolbar icon, pick your data with the new Graph Wizard, and you have your graph! Double click on any graph element and customize it with the new Graph Properties Dialog – everything's in one easy-to-use dialog.

#### **CUSTOMIZE GRAPHS YOUR WAY**

Create multiple technical axes per graph, control error bars, and choose from a variety of new 3D graphs. Don't settle for "canned graphs" software. Make the graphs you want.

#### **EASY EXCEL AND OLE 2 INTEGRATION**

Annotate your SigmaPlot graph with Word<sup>\*</sup>'s Equation Editor. Embed your graph in PowerPoint<sup>\*</sup> or Word. Analyze your data with an Excel worksheet *right inside of SigmaPlot – Excel's menus actually merge with SigmaPlot's!* 

#### ANNOUNCING THE VISUAL DISPLAY GRAPH LIBRARY

Dr. Edward Tufte designed The Visual Display Graph Library using the unique flexibility of SigmaPlot. This graph library includes: the book *The Visual Display of Quantitative Information*, style guidelines, data density meter, fonts, and templates.

#### To get started with SigmaPlot's graphing flexibility and to create the graphs you want, CALL 1-800-4-JANDEL (1-800-452-6335)

#### OTHER JANDEL PRODUCTS

SigmaPlot\*: DOS Macintosh SigmaStat\*: Advisory statistical software SigmaScan\*: Image measurement software SigmaScan\*Pro: Automated image analysis software SigmaSuite\*: Integrated graphing, statistics & image measurement software

SigmaGel": Gel analysis software

 TableCurve<sup>\*</sup> 2D: Equation generator & curve fitting software

 TableCurve<sup>\*</sup> 3D: Equation generator & surface fitting software

 PeakFit<sup>\*</sup>: Automated peak analysis software

#### FOR MORE INFORMATION PLEASE CALL, FAX OR E-MAIL:

Jandel Scientific: 2591 Kerner Blvd., San Rafael, CA 94901 415-453-6700 Fax 415-453-7769 Internet: sales@jandel.com In Europe: Jandel Scientific, Schimmelbuschstrasse 25, 40699 Erkrath, Germany 02104/9540 02104/95410 (FAX).

International Dealers: Australia 2 958 2688, Brazil 11 453 5588, Canada 519 767 1061, Chile 56 2 635 2422, Denmark 45 4615 4464, France 05 90 37 55, Hong Kong 852 739 2001, India 40 31 3368, Israel 972 349 0823, Japan 3 3590 2311, 3 5689 8000, Korea 822 886 3983, Kuwait 965 242 1851, Malaysia 603 777 2597, South Africa 12 660 2884, Switzerland 41 617 12 16 16, Taiwan 2 788 6777, 2 705 1590, UK 0800 89 49 82 All company and/or product names are trademarks of their respective companies. ©1995 Jandel Corporation.





Circle No. 58 on Readers' Service Card

# SHIMADZU

# EXTEND YOUR RESEARCH HORIZONS WITH KOMPACT MALDI SYSTEMS.



You can learn more about your peptides, proteins and DNA faster than ever before with Time Of Flight MALDI Systems from Shimadzu. We offer

For sequencing, the new MALDI IV.

the only complete range of benchtop products for rapid molecular weight and primary structure (sequencing) analysis.

With the Shimadzu family of MALDI instruments, you will always be technically ahead. You can choose an instrument to meet current needs -

and upgrade within the Shimadzu MALDI family at any time, with your investment protected.

To find out more about the Shimadzu commitment to meeting your research needs over the life of the technology, please call our Customer Support Center.



7102 Riverwood Dr. Columbia, MD 21046 Customer Support Center 1-800-477-1227 (Ext. 1350)

Pittcon Booth #1909

Circle No. 35 on Readers' Service Card

# Forma Introduces Your Next Incubator.

Abother Breakthrough

370 50

Forma Scientific

100% HEPA Filtered Alrilow System continuously filters entire chamber volume every 60 seconds.

Heated, dual pane, inner glass door with clear, heat conducting film eliminates condensation while providing faster temperature recovery and improved temperature uniformity.

Chamber interior is constructed of mirror finish stainless steel with 100% coved corners for easy cleaning.

 Forma is the only manufacturer who covers construction and integrity of the water jacket chamber for the lifetime of the unit.  Contact Forma Scientific or your local sales representative regarding additional advances and features of our new Universal CO<sub>2</sub> Water Jacketed Incubators.

### Forma Scientific, Inc.

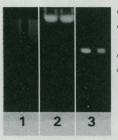
Box 649, Marietta, OH 45750 1-614-373-4763 • Fax: 1-614-373-6770 USA and Canada 1-800-848-3080 International Distributors Worldwide An ISO 9001 Company

Circle No. 56 on Readers' Service Card



The most reliable and cost-effective reagents for DNA and RNA isolations. Using separation technology based on the recognition of target molecules by a liquid phase, these innovative reagents outperform traditional DNA and RNA isolation methods. No enzymatic treatments! No columns! No prolonged protocols!

**DNAZOL**<sup>TM</sup> a new standard of simplicity and effectiveness in the isolation of high quality genomic DNA, developed by P. Chomczynski.

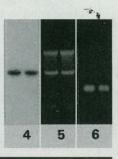


• Requires only 10 - 30 minutes • Effective with cells, tissue and

- liquid samples, including blood. • No phenol or other toxic agents
- Isolated DNA (2) is ready for Southern blotting, restriction analysis (1), PCR (3), molecular cloning and other applications.

**TRI REAGENT**<sup>°</sup>, the most advanced version of the single-step method of RNA isolation.

- Isolates high quality total RNA in less than one hour
- Can be used to simultaneously isolate RNA, DNA and proteins
- Effective with cells, tissue and liquid samples, including blood.
- Isolated RNA (5) is ready for Northern blotting (4), RT-PCR (6), and other applications

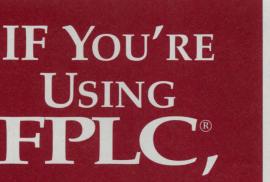


For information or to place an order from USA, Canada and countries not listed below call 1-800 462-9868, 513-841-0900 or Fax 513-841-0080.

Į



AUSTRIA: Biomedica Gessellschaft 43-222-292-3527; AUSTRALIA: A.G.P. Technologies Pty Ltd 1-800-631-093; FRANCE: Euromedex 33-88-180722; GERMANY: BioTech Trade & Service GmbH 49-6227-51308 WAK-Chemie Medical 496-172-22073; HONG KONG: Onwon Trading Ltd. 852-275-77569; INDIA: Lab Care Products 91-11-6425156; ISRAEL: Tal Ron 972-8-472563; ITALY: Bio-Optica Milano SpA 39-2-2640274; JAPAN: Cosmo Bio 81-3-5632-9630; KOREA: Choong II Chemical, Inc. 822-294-6411; MALAYSIA: Far East Scientific 603-718-7457; SWITZERLAND: Lucerna Chem Ag 41-41-359636; TAIWAN: Pan Asia Biomedical Technology, Inc. 886-2-7418169; UNITED KINGDOM: Molecular Research Centre Oxford 44-993-706736.



Circle No. 48 on Readers' Service Card

Discover the faster, easier, more cost-effective way to get purer proteins, peptides or polynucleotides. POROS® Perfusion Chromatography® media give you high-capacity, highresolution separations 10x-100x faster than conventional resins.

Our easy-to-read guide shows you how to crank through samples so fast, you'll be using chromatography in ways you never imagined.

Get your copy FREE by returning the coupon below, or call, toll-free: **1-800-899-5858**, ext 7879 or visit us at http://www.pbio.com/

I'M TIRED OF WASTING TIME ON CHROMATOGRAPHY Please send me my FREE copy of

The Busy Researcher's Guide to Biomolecule Chromatography.

Name \_\_\_\_\_ Institution \_\_\_\_\_

City\_\_\_\_\_

Address

Phone (\_\_\_\_)\_\_

FAX ( )

FAX (\_\_\_\_\_) E-mail
PerSeptive Biosystems, Inc. 500 Old Connecticut Path. Framingham MA 01701



PerSeptive Biosystems

Zip

State

Circle No. 17 on Readers' Service Card





#### DISPLAY CLASSIFIED ADVERTISEMENTS

Call for rate and deadline information on display classified advertisements.

Bethany Ritchey Recruitment Display Advertising Telephone: (202) 326-6541 FAX: (202) 289-6742

Janis Crowley Recruitment Advertising Manager Telephone: (212) 496-7704 FAX: (202) 289-6742

Debbie Cummings European Recruitment Advertising Telephone: +44 (0) 1223 302067 FAX: +44 (0) 1223 576208

MEETINGS, CONFERENCES & SYMPOSIUMS For meeting, conference and symposium display advertisements, turn to pages 1184 and 1186.

#### LINE CLASSIFIED ADVERTISEMENTS

How to Submit a Line Classified Ad: Submit double-spaced typewritten copy. Do not include any abbreviations. SCIENCE will edit and typeset ads according to SCIENCE guidelines. Include billing information and desired publication date. Available categories: Positions Open, Meetings, Announcements, Courses and Training, Services. SCIENCE cannot provide proofs of typeset line ads. Line advertisements are not commissionable.

Estimates: SCIENCE will provide a cost estimate for line ads. This is an approximate cost only. Allow for variation between estimated lines and actual typeset lines and resulting final cost. Purchase orders must allow for some degree of flexibility and/or adjustment.

For line advertising rates and deadlines, call Rachael Wilson. Telephone: (202) 326-6555; FAX: (202) 289-6742

Credit Cards: SCIENCE accepts American Express, MasterCard and VISA. Discount does not apply to credit cards.

Cancellations: Deadline for cancellation is Tuesday,10 days prior to issue date. Discounts: A 3% cash discount is granted to all prepaid ads. Ads from Outside the U.S.: A discount

of \$30 will be offered to advertisers making payment in U.S. dollars by checks drawn on U.S. banks. Contact Debbie Cummings. Telephone: +44(0) 1223 302067; FAX: +44(0) 1223 576208.

SCIENCE Global Career Network: Unless otherwise instructed, every classified advertisement submitted for publication in SCIENCE is automatically posted on SCIENCE's on-line classified advertising service, SCIENCE Global Career Network, at no additional charge. SCIENCE Global Career Network address: WWW: http://www.aaas.org

Gopher: gopher.aaas.org

Mail, FAX or Email materials to: SCIENCE Classified Advertising 1333 H Street, N.W., Room 814 Washington, DC 20005 FAX: 202-289-6742

FAX: 202-289-6742 Internet Email: science\_classifieds@aaas.org (please include your telephone number in Email)

SCIENCE reserves the right, at its discretion, to edit or decline to publish advertisements submitted to it.

# INFLAMMATION BIOCHEMISTRY

### Scientist/Sr. Scientist

The R.W. Johnson Pharmaceutical Research Institute conducts research in a number of therapeutic areas for the Johnson & Johnson companies: Cilag, Ortho-McNeil Pharmaceutical, Ortho Biotech and Ortho Dermatological. We have an excellent drug discovery research opportunity on our Inflammation Research Team located in Raritan, NJ (central New Jersey).

As a key member of the team, you will identify, develop and validate receptor and enzyme-based assay systems suitable for High Throughput Drug Discovery. Additionally, you will supervise and train associate staff.

To qualify, you must have a PhD in Biochemistry, Pharmacology or a related field and 3-5 years of postdoctoral experience. Knowledge of inflammation, cytokinemediated signal transduction and molecular biology techniques is also required along with experience in enzyme and receptor isolation, purification and assay development.

We offer a competitive salary and excellent benefits, including medical/dental insurance, 401(k) plan and our LIVE FOR LIFE Wellness Program. Please forward a copy of your curriculum vitae suitable for scanning into our database (i.e., clean/clear, no graphics and preferably unfolded) to: Dept. 573, Johnson & Johnson Recruiting, P.O. Box 16597, New Brunswick, NJ 08906-6597. We are an equal opportunity employer and support diversity in the workplace.



#### THE R.W. JOHNSON PHARMACEUTICAL RESEARCH INSTITUTE

a Johnson Johnson company



Ciba Pharmaceuticals is recognized internationally for the discovery, development and manufacture of innovative drug therapies that enhance quality health care. We currently have an opportunity for a Staff Scientist to direct the Assay Related Technology laboratory within the New Lead Discovery Group.

Working with teams world-wide, you will incorporate state-of-the-art technologies and develop novel tools to develop/optimize assays for the High Throughput Screening Program. A Ph.D. in Biology, Biochemistry, Molecular Biology or related discipline, 2 years' post-doctoral training and 2-5 years of experience in the pharmaceutical industry are required. A strong background in assay development and biochemical methodologies is essential. Experience studying the regulation of gene expression, yeast molecular biology, fluorescent detection methods and lead discovery is preferred.

We offer a salary commensurate with your experience and education, comprehensive benefits, as well as ample opportunity for personal and professional development. For confidential consideration, please send your resume with salary history and requirements to: **Staffing Center, Ciba Pharmaceuticals Division, Department ED-356, 556 Morris Avenue, Summit, NJ 07901**. We are an equal opportunity employer M/F/D/V.

Preparing for the future



Wanted: Committed, ambitious scientist. Must be a team player with a vision for the future. M.D./Ph.D., Ph.D., M.S. or B.S. degree necessary.

### Does this describe you?

If it does, then plan to attend the bioSCIENCE Career Fairs sponsored by SCIENCE. The bioSCIENCE Career Fairs offer the perfect opportunity for scientific professionals to meet in person with representatives from top biotechnology and pharmaceutical companies, universities, governmental agencies and institutions.

EDITORIAL SEMINAR: On the first day of the event from 11:00 - 11:30, a SCIENCE editor will conduct a seminar on "How to get a research paper published in SCIENCE."

### **1996 bioSCIENCE Career Fairs**

Cambridge, MA on the MIT Campus. March 1: 11 am - 4 pm; March 1 Seminar: 11 am - 11:30 am. March 2: 12 pm - 4 pm.

San Francisco, CA on the Stanford Campus in Palo Alto, May 3-4. May 3: 11am - 4pm; May 3 Seminar: 11 - 11:30am. May 4: 12 noon - 4pm.

La Jolla, CA at The Scripps Research Institute, October 4-5.

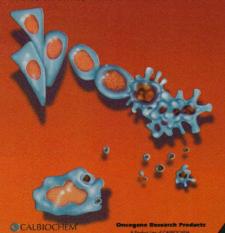


To pre-register, please submit your resume or CV via fax: (202) 289-6742, or via e-mail: bioscience@aaas.org. Please indicate to which bioSCIENCE Career Fairs you would like to have it distributed. Please remember to bring multiple copies of your CV or resume with you to the Career Fairs.

#### For more information please call (202) 326-7018.

bioSCIENCE Career Fair Information On-line: http://www.aaas.org (Choose SCIENCE Classified Advertising from the menu)

### APOPTOSIS



Circle No. 52 on Readers' Service Card

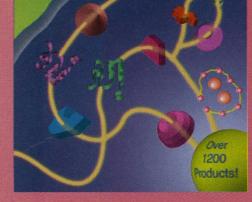
1996

CALBIOCHEM

1996 CALBIOCHEM®-Oncogene Apoptosis Handbook and Catalog An indispensable reference guide for apoptosis-related research, this catalog features an overview of current research and methodologies. It contains over 100 diagrams and information on 300 products for the study of regulation of cell cycling and cell proliferation.

NOVABIOCHEM® Combinatorial Chemistry and SPOC Handbook From the world leader in resin and linker technology, this resource features the newest solid supports, linkers, condensation reagents and building blocks for Solid Phase Organic Chemistry (SPOC).

# Four new catalogs no life scientist should be without.



1996 CALBIOCHEM® Signal Transduction Catalog With over 1300 products, including 500 new ST reagents, this comprehensive publication also contains concise literature reviews, structures, application comments and comparative tables.

1996 CALBIOCHEM® Biochemical and Immunochemical Catalog This complete guide to over 4000 biochemicals and immunochemicals is expanded to include over 700 new products and handy application indices for protein kinases, calcium metabolism, nitric oxide, G-Proteins and more.

valuable resources, the sooner

you'll learn what we now carry,

and what we can do for you.

Circle No. 53 on Readers' Service Card

Biochemical & munochemical 1996 Catalog

novabiochem

Combinatorial Chemistry

to over 4000 nochemicals is iver 700 new lication indices

Circle No. 55 on Readers' Service Card

Circle No. 54 on Readers' Service Card

uick, find the reader service card. Or, better still, a phone. Because the sooner you request these

Calbiochem-Novabiochem San Diego, CA, USA Phone: 800-854-3417 Fax: 800-776-0999 Calbiochem-Oncogene Cambridge, MA, USA Phone: 800-662-2616 Fax: 617-577-8015

Calbiochem-Novabiochem GmbH, Germany Phone: (06196) 63955 Fax: (06196) 62361

Call us today.

Calbiochem-Novabiochem, Ltd. United Kingdom Phone: (0115) 9430840 Fax: (0115) 9430951

Calbiochem-Novabiochem Japan Ltd. 40 Phone: (03) 5443-0281 Fax: (03) 5443-0271 Calbiochem-Novabiochem, Pty Australia Phone: (612) 318-0322 Fax: (612) 319-2440

**CALBIOCHEM** NOVABIOCHEM

Calbiochem, Novabiochem and Oncogene Research Products are all product lines of Calbiochem-Novabiochem International. As of April 1996, you can reach us via the World Wide Web: http//www.calbiochem.com



Circle No. 28 on Readers' Service Card

Circle No. 62 on Readers' Service Card