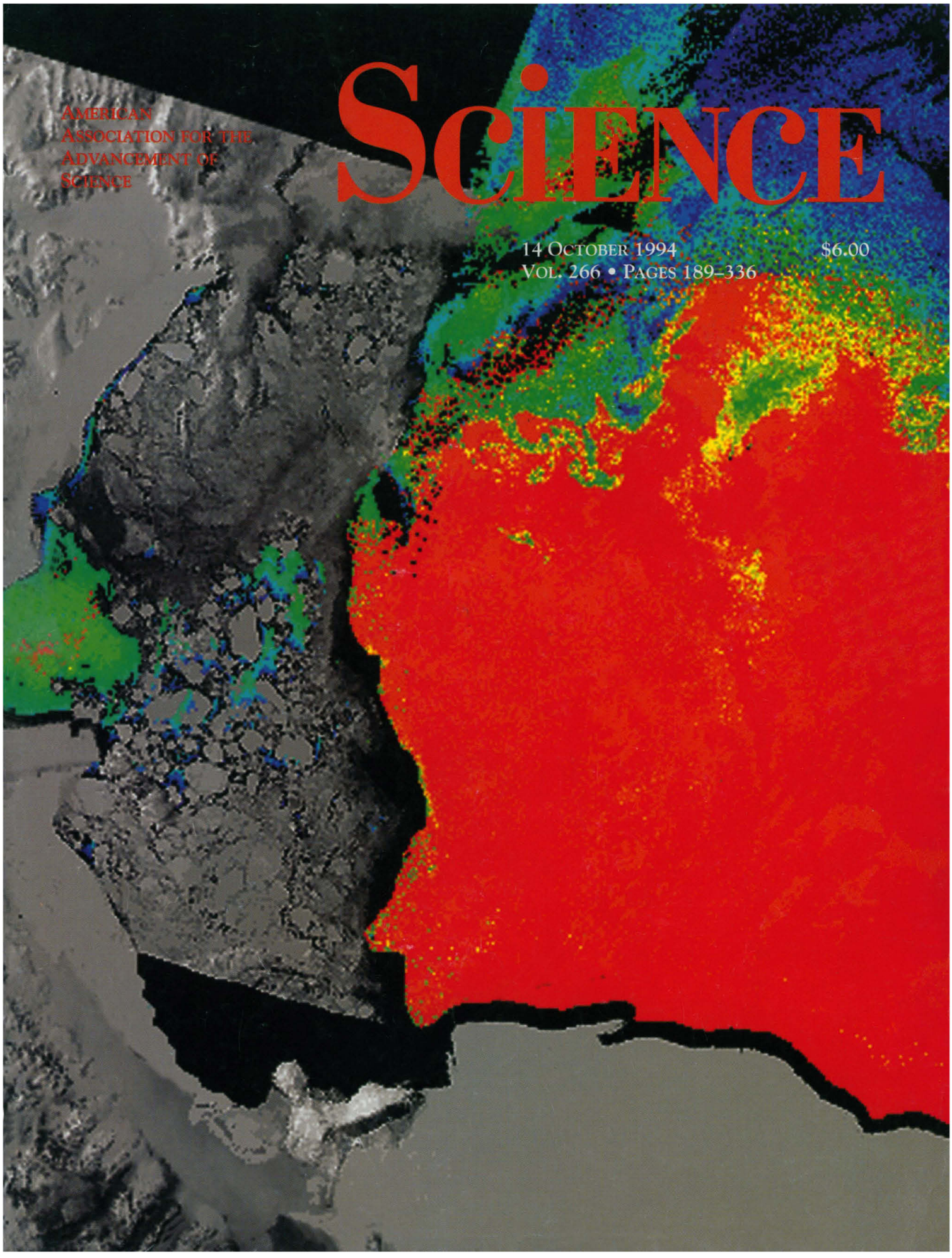


American Association for the Advancement of Science

# SCIENCE

14 October 1994 $6.00
Vol. 266 • Pages 189–336

# Some like it hot...

## Stratagene's *New* RoboCycler™ Gradient 40 Temperature Cycler* lets you zero in on the right annealing temperature...whether your primers like it hot, cool or in between!

Now in 1 run, you can test 8 different temperatures spanning up to 14°C across our unique Gradient block.

Well-to-well temperature is as tight as ±0.1°C. *No other cycler on the market can match that kind of uniformity!*

Get results faster...by getting annealing temperature right the first time. Add to that the 30% reduction in cycling time achieved by the system's robotic arm and 4 blocks. While other cyclers take time ramping block temperature, the RoboCycler system simply moves up to 40 samples from pre-equilibrated block to block.

The time savings are untouchable.

- *Optimizes annealing temperature*
- *Tests 8 temperatures at once*
- *Saves 1 week of sequential experiments*
- *Well-to-well uniformity of ±0.1°C*
- *Reduces cycling time by 30%*

*Get Hot...Get it Right...*
*Get the Gradient!*

STRATAGENE

*Call Stratagene or your Stratagene distributor for the complete picture.*

RoboCycler™ Gradient 40 Temperature Cycler
Catalog #400860 (100/120 V)
Catalog #400862 (220 V)

*RoboCycler™ Gradient 40 Temperature Cycler*


Internet Mail
tech_services@stratagene.com

USA
Corporate Headquarters
(800) 424-5444
(619) 535-5400
Fax: (619) 535-0045

Germany
Stratagene GmbH
Telephone: (06221) 400634
Telefax: (06221) 400639

United Kingdom
Stratagene Ltd.
Telephone: (0223) 420955
Telefax: (0223) 420234

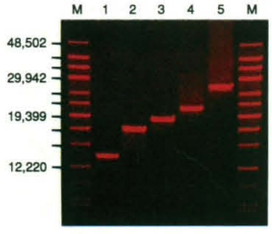
Switzerland
Stratagene GmbH
Telephone: (01) 3641106
Telefax: (01) 3657707


STRATAGENE

* Patent Pending

# 15kb 30kb 40kb

## Announcing a PCR breakthrough of major proportions.




*GeneAmp XL PCR. Lanes 1-3: β-globin cluster, human genomic DNA, 13.5, 17.7, 19.6 kb; Lanes 4 & 5: λ DNA 20.8, 26.4 kb; M: High molecular weight marker.*

The new GeneAmp® XL PCR Kit makes generating long PCR products a routine procedure. In fact, we QC test the kit for 20 kb using lambda DNA.

Our new r*Tth* DNA Polymerase, XL, in combination with a novel reaction buffer, creates optimal conditions for generating long PCR products with high reproducibility and specificity.

What's more, the GeneAmp XL PCR Kit is optimized on GeneAmp® PCR Instrument Systems, and backed by our PCR performance guarantee. It's just as convenient as our other PCR kits, and opens up new possibilities for mapping, sequencing and genome analysis.

The integrated resources of our Applied Biosystems Division offer you the most comprehensive range of systems, technologies and support in PCR, nucleic acid synthesis, genetic analysis and protein research.

The GeneAmp XL PCR Kit—a major breakthrough in PCR technology. To order in the U.S., call 1-800-327-3002. For PCR technical support, call 1-800-762-4001. For more information, call 1-800-345-5224. Outside the U.S., contact your local Perkin-Elmer representative.

**PERKIN ELMER**

**Europe** Weiterstadt, Germany Tel: 49-6103-708-0 Fax: 49-6150-708-210
**Canada** Mississauga, Canada Tel: 905-821-8183 Fax: 905-821-8246
**Japan** Tokyo, Japan Tel: 81-473-80-8500 Fax: 81-473-80-8505
**Latin America** Mexico City, Mexico Tel: 52-5-651-7077 Fax: 52-5-593-6223
**Australia** Melbourne, Australia Tel: 61-3-212-8585 Fax: 61-3-212-8502

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

Roche


SOLUBLE PROTEIN
Made Fresh Daily

# THIOFUSION™

## THE FIRST SYSTEM FOR *Soluble* Protein Expression ..... IN *E. coli.* .....

The ThioFusion™ Expression System from Invitrogen. Finally there is a way to express soluble recombinant protein in *E. coli.* Now solubilization and refolding of proteins that form inclusion bodies are a thing of the past. Recombinant proteins expressed in the ThioFusion™ Expression System are soluble, even at high levels.

## THE *Ideal* FUSION PARTNER.

The ThioFusion™ Expression System takes advantage of the unique properties of the *E. coli* protein thioredoxin. Thioredoxin expresses at levels as high as 40% of the total cell protein, localizes at sites in the *E. coli* cell called adhesion zones, and is stable at high temperature. These properties make thioredoxin the ideal fusion partner. The plasmid vector, pTrxFus, the key to the ThioFusion™ System, carries the entire thioredoxin gene along with the strong $P_L$ promoter to drive expression. In addition, an enterokinase cleavage site, engineered between thioredoxin and the protein of interest, allows removal of the fusion to restore the native protein.

## FAST, SIMPLE PURIFICATION.

The ThioFusion™ System gives you two simple ways to purify your fusion protein. Osmotic shock releases proteins accumulated at adhesion zones into the medium. Heat treatment denatures most native proteins leaving some thioredoxin fusion proteins intact. Both methods are fast and effective.

The ThioFusion™ Expression System (cat. no. K350-01) is the first and only system designed for the expression of soluble recombinant proteins in *E. coli.* To learn more about the next step in *E. coli* protein expression, contact Invitrogen today!


1-800-955-6288

**European Headquarters:**
**Invitrogen BV**
De Schelp 26, 9351 NV Leek
The Netherlands
Tel: (0) 5945-15175
Fax: (0) 5945-15312

Toll free Telephone Numbers
The Netherlands 06-0228848
Belgium 078-111173
Germany 0130 8100 43
Switzerland 155-1966
Austria 0660-8127

UK Tel: +44 (0)235 531074 FAX: +44 (0)235 533420
France 05 90 72 49
Sweden 020 793149
Norway 800 11033
Denmark 80 01 85 92

R&D SYSTEMS

CELBIO
Italy
Tel: 39-238103171
Fax: 39-238101465

Japan
Tel: 81-356841622
Fax: 81-356841633

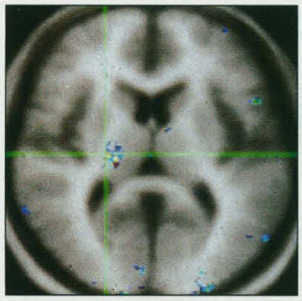
Austria 43-1-8891819 Australia 61-38089077 Finland 35-804208077
Israel 972-8472563 Spain 34-3-4560607 Singapore 65-779-1919

Invitrogen®
3985 B Sorrento Valley Blvd.
San Diego, California 92121
Telephone (619) 597-6200
Fax (619) 597-6201

ISSN 0036-8075
14 OCTOBER 1994
VOLUME 266
NUMBER 5183

# SCIENCE

AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE



**221 & 294**
Slices of schizophrenia

## NEWS & COMMENT



## RESEARCH NEWS



## PERSPECTIVES



## ARTICLE



## RESEARCH ARTICLE



## REPORTS

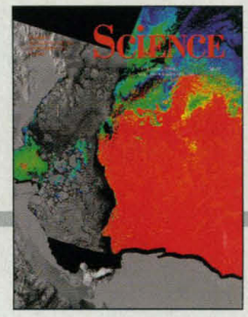


**219 & 267**
A new dinosaur species

## DEPARTMENTS

COVER

Composite coastal zone color scanner image of the Western Ross Sea on 10 December 1978. An intense phytoplankton bloom (red shows the highest concentration of pigment and purple the lowest) is bounded by the Ross Ice Shelf (bottom, gray) and by annual sea ice along the Victoria Land coast (left, gray). This image begins a time series revealing that significant productivity begins in the late spring within the Ross Sea polynya and is thus likely greater than previously estimated. See page 261. [Image: Kevin Arrigo]



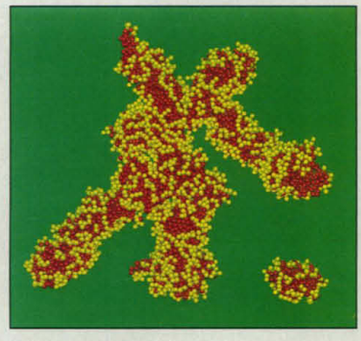



## TECHNICAL COMMENTS



**254**

**Heads and tails**





◩ 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.** Second-class postage (publication No. 484460) paid at Washington, DC, and additional mailing offices.



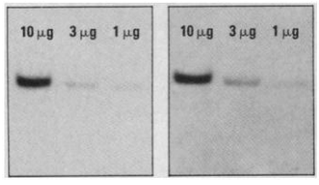
Domestic individual membership and subscription (51 issues): $92 ($50 allocated to subscription). Domestic institutional subscription (51 issues): $215. Foreign postage extra: Mexico, Caribbean (surface mail) $50; other countries (air assist delivery) $95. First class, airmail, student and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. **Printed in the U.S.A.**

**Change of address:** allow 6 weeks, giving old and new addresses and 11-digit account number. **Postmaster:** Send change of address to *Science*, P.O. Box 2033, Marion, OH 43305-2033. **Single copy sales:** $6.00 per issue prepaid includes surface postage; Guide to Biotechnology Products and Instruments, $20. 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 the base fee of $1 per copy plus $0.10 per page is paid directly to CCC, 27 Congress Street, Salem, MA 01970. The identification code for *Science* is 0036-8075/83 $1 + .10. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

# Sensitive touch

The disc-like adhesive pads on the hands and toes of the tree frog enable this nimble creature to perform the most sensitive acrobatic maneuvers. From often perilous heights, the tree frog clings to the most delicate twigs as it leaps from branch to branch in pursuit of insect prey.

The Boehringer Mannheim Genius™ System makes sensitive scientific procedures equally as swift and safe. In hours—not days—probes prepared with the Genius System can detect single copy genes in as little as 1 μg of DNA in a genomic Southern blot, and are guaranteed to detect 0.03 pg of DNA in a direct dot blot.




**Parallel human genomic Southern blots demonstrate the high sensitivity and low background provided by the Genius System (right, 12-min. exposure) compared to probes prepared with $^{32}P$ (left, 3-day exposure).**

Like traditional radioactive methods, the Genius System provides specific and reliable detection of target sequences.

But unlike other nonradioactive methods, the Genius System uses a unique antibody-based protocol that minimizes background interference, maximizes the signal-to-noise ratio, and produces your results faster.

### Safety and sensitivity combined

Every time you make a Southern blot or dot/slot blot, screen a library or conduct an *in situ* hybridization with radioactive methods, you expose yourself and those around you to the risks of radiation. Every time you use the Genius System to perform these same procedures, you receive the assured safety that only nonradioactive products provide, along with guaranteed sensitivity and specificity.

### Sensitivity to your needs

Boehringer Mannheim's user-training programs and technical support personnel can help make your conversion to nonradioactive DNA labeling and detection procedures smooth and trouble-free. Contact your Boehringer Mannheim representative or call 1-800-262-4911 (514-686-7141 in Canada).

NONRADIOACTIVE
BOEHRINGER MANNHEIM
GENIUS™
SYSTEM

*Leaving the Limits Behind*

**BOEHRINGER MANNHEIM**

mannheim boehringer



Circle No. 34 on Readers' Service Card

edited by PHIL SZUROMI

## Cascadian crust

The seismic potential of the Cascadia subduction zone has been enigmatic, in part because the current rate of seismicity has been less than that in other subduction zones. Trehu *et al.* (p. 237) describe a seismic profiling experiment that characterized the structure of the crust between the Cascade volcanoes and the trench offshore. One finding is that as the thickness of accreted strong crust decreases sharply from Oregon to southernmost Canada, seismicity increases.

## Tiny bright bubbles

Trapped in a strong acoustic pressure wave, a bubble of gas can be induced to emit picosecond flashes of light. Such sonoluminescence can concentrate sound energy a trillionfold. The origins of this phenomenon are not completely understood, but Hiller *et al.* (p. 248; see the Perspective by Crum and Roy, p. 233) now show that this luminescence is very sensitive to the gas composition. Adding a noble gas (such as argon or xenon) to a cell with nitrogen bubbles increases the light emission by an order of magnitude, and the spectral content of the light depends on the specific noble gas. The ability to create and study sonoluminescence provides a benchtop environment for probing energetic high-pressure materials.

## Twin study

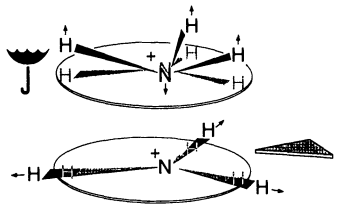
Gemini surfactants have two hydrophilic head groups joined by a spacer group and two hydrophobic tails. Compared with conventional surfactants, they are highly efficient at reducing oil-water surface tension and thus solubilizing oil. Single-tailed surfactants form spherical micelles, but molecular dynamics simulations by Karaborni *et al.* (p. 254) show that gemini surfactants can form unusual thread-like and tree-like micelle structures.

## Schizophrenia and the thalamus

A schizophrenic patient can have cognitive and emotional deficits across a range of functional systems. A long-standing hypothesis for how so many systems could be affected is that the interaction between the neurotransmitter dopamine and its receptors is altered; these receptors are the target of many drugs used to manage schizophrenia. Andreasen *et al.* (p. 294; see news story by Taubes, p. 217) propose that there may be a defect in a central part of the circuitry underlying many aspects of information processing. They used an averaging approach to analyze a compilation of magnetic resonance images from many subjects and found that the thalamus and neighboring nerve tracts were somewhat reduced in size.

## Exerting control

Vibrational energy is usually distributed statistically between different modes in a molecule,



so it is often difficult to study the effect that changes in vibrational excitation can have on reactivity. Guettler *et al.* (p. 259; see news story by Flam, p. 215) studied the ion-molecule reaction $NH_3^+ + ND_3$, which can produce three different product states, as a function of collision energy for $NH_3^+$ states that they had prepared with nearly the same internal energy but very different vibrational excitation. One state had only out-of-plane "umbrella" modes excited, and the other had both in-plane "breathing" and umbrella modes excited. The reaction outcomes were much more sensitive to changes in excitation of the umbrella mode.

## Monsoon model

Several aspects of the climate system show marked cyclic behavior at a variety of time scales; these include the Asian monsoon, El Niño–Southern Oscillation event [which is connected with the tropical biennial oscillation (TBO)], the quasi-biennial oscillation in winds in the upper atmosphere, and others. Meehl (p. 263) uses a coupled ocean-atmosphere model to investigate the possible connections among these phenomena, focusing on the Asian monsoon. Heating over Africa and the western Pacific associated with the TBO helps set up the conditions required for the Asian monsoon. Snow cover in south Asia was important but subservient to the larger climate interactions.

## Inbred risks

Efforts to maintain an endangered mammalian species can depend heavily on breeding programs of captive populations, but inbreeding may compromise the fitness of the offspring when reintroduced into the natural habitat. Jiménez *et al.* (p. 271) analyzed the effects of captive inbreeding on the fitness of a population of white-footed mice. Inbreeding had a detrimental effect on the survivorship of the mice, and the adverse effect was more severe for the population released into the natural environment than for that retained in captivity.

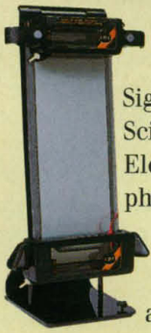
## The surprise factor

Elongation factor 1α (EF-1α) is an essential component of the protein synthesis machinery in eukaryotes. Shiina *et al.* (p. 282) show that EF-1α also has the ability to sever microtubules, a finding that suggests an unanticipated role for this factor in cytoskeletal rearrangements.

## Fear and fury

Defects in α-calcium-calmodulin–dependent kinase II (α-CaMKII) in mice have been associated with learning abnormalities. Chen *et al.* (p. 291) have studied the behavioral responses of mice in which the gene encoding α-CaMKII was disrupted. These knockout mice showed a decreased fear response, as determined by tests such as response to footshock, which normally causes a freezing response in wild-type mice. Heterozygous mice showed increased defensive aggression (biting an intruder), whereas homozygous mice exhibited little defensive aggression (an impaired fear response). Such knockout mice also exhibited reduced serotonin release from putative serotonergic neurons; this neurotransmitter has been previously implicated in fear and anxiety responses in studies of humans and animals.

# Picture Perfect

## KODAK Products and Techware — the perfect match for scientific imaging.

Sigma-Aldrich Techware now offers KODAK Scientific Imaging Systems product line: Electrophoresis units, film and supplies for photography and autoradiography, and image detection and analysis products.

One call to Techware gives you immediate access to the complete line of Kodak products, along with more than 10,000 other laboratory equipment and supply products from the brand names you know and trust. Our wide range of products for biological analysis and imaging allows convenient, one-stop ordering.

We maintain large inventories of all of the products we offer so we are able to ship your order the same day it is received. Our customer and technical service groups are available whenever you need to place an order or ask a question.


Quality products, fast delivery, and excellent technical support make Sigma-Aldrich Techware your preferred source for laboratory supplies.

SIGMA®

Where Science and Service Come Together.

SIGMA-ALDRICH™
Techware
FROM BENCHTOP TO BOOKSHELF

Call collect: 314-771-5750,
800-325-3010,
or contact your local Sigma office.

AUSTRALIA AUSTRIA BELGIUM BRAZIL CZECH REPUBLIC FRANCE GERMANY HUNGARY INDIA ITALY
JAPAN MEXICO NETHERLANDS KOREA SPAIN SWITZERLAND UNITED KINGDOM UNITED STATES

A Sigma-Aldrich Company

**Circle No. 9 on Readers' Service Card**

# What's the least you can expect from Pharmacia Biotech automated DNA sequencing?

# Choice

R1709

The last thing you want automation to do is restrict your choices. So when we designed ALF™, our automated DNA sequencer, we made sure that it gave you maximum choice – in chemistry, in methodology, in data presentation. One important example of the choice it offers is the ability to use labelled or unlabelled primers, an economical way of dealing with the need for a variety of primers.

With its ease of use, speed of operation, choice of chemistries and the ability to present raw as well as processed data, ALF ensures that you get the choices you need for the results you want.

Which means that when it comes to choosing a DNA sequencer, go for the one that gives you choice.

**Pharmacia Biotech puts time on your side.**

**Pharmacia Biotech**

**Head office Sweden** Tel +46-18 16 50 00 **Australia** Tel +61-2 367 42 00 **Austria** Tel +43-1 68 66 25 0 **Belgium** Tel +32-3 272 14 69 **Brazil** Tel +55-11-872 68 33 **Canada** Tel 1-800-463-5800 **Denmark** Tel +45-48 14 10 00 **Finland** Tel +358-0 5021 077 **France** Tel +33-1 30 64 34 00 **Germany** Tel +49-761 490 30 **Great Britain** Tel +44-727 8140 00 **Holland** Tel +31-1650 80 400 **Hong Kong** Tel +852 811 8693 **India** Tel +91-44 453622 **Italy** Tel +39-2 27 32 21 **Japan** Tel +81-3 3492-9497 **Malaysia** Tel +603 7353 972 **Norway** Tel +47-63 89 23 10 **People's Republic of China** Tel +86-1 256 5603, Ext.1202/1204 **Portugal** Tel +351-1 417 2472 **Republic of Korea** Tel +82-2 5110801 **Russian Federation** Tel +7-95 941 61 39 **Spain** Tel +34-3 589 07 01 **Sweden** Tel +46-8 623 85 00 **Switzerland** Tel +41-1 802 81 50 **Taiwan** Tel +886-2 831 53 10 **United States** Tel 1-800-526-3593 **Eastern Europe** Tel+ 43-1 982 38 26 **Far East** Tel +852 811 8693 **Latin America** Tel +55-11 872 68 33 **Middle East** Tel +30-1 96 27 396 **Other countries** Tel +46-18 16 50 00 (9401)

Circle No. 15 on Readers' Service Card

# Seeing is believing!

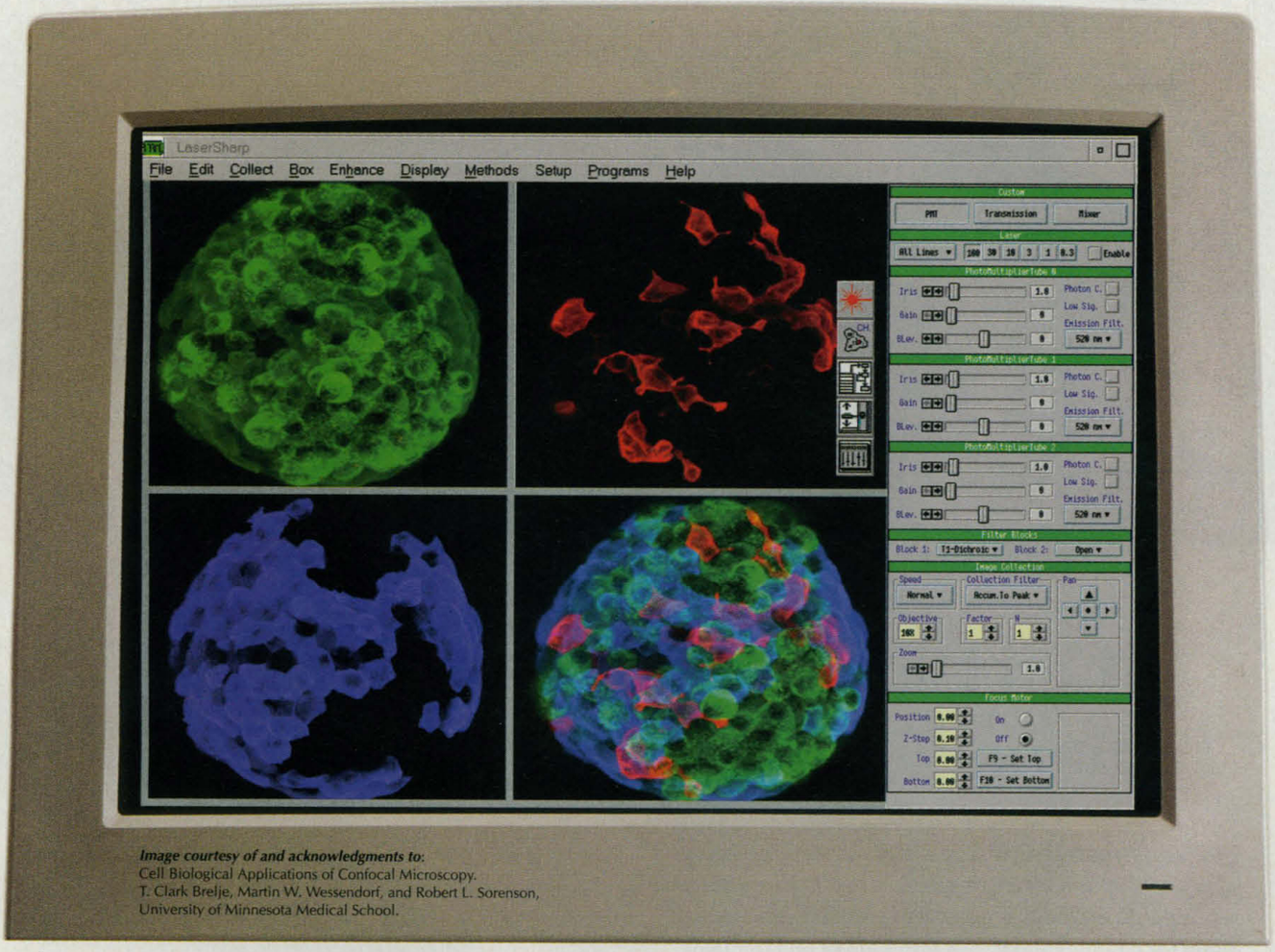



*Image courtesy of and acknowledgments to:*
Cell Biological Applications of Confocal Microscopy.
T. Clark Brelje, Martin W. Wessendorf, and Robert L. Sorenson,
University of Minnesota Medical School.

## The *Best* Software and the *Finest* Confocal Performance Combined.

## The MRC-1024 from Bio-Rad with LaserSharp Software.

- **True 24-bit imaging system**
- **1280 x 1024 image resolution**
- **User defined instrument control**
- **Multi-tasking environment**
- **Built-in Advanced 3-D visualization software**

NEW

Call us and see the difference...

BIO-RAD

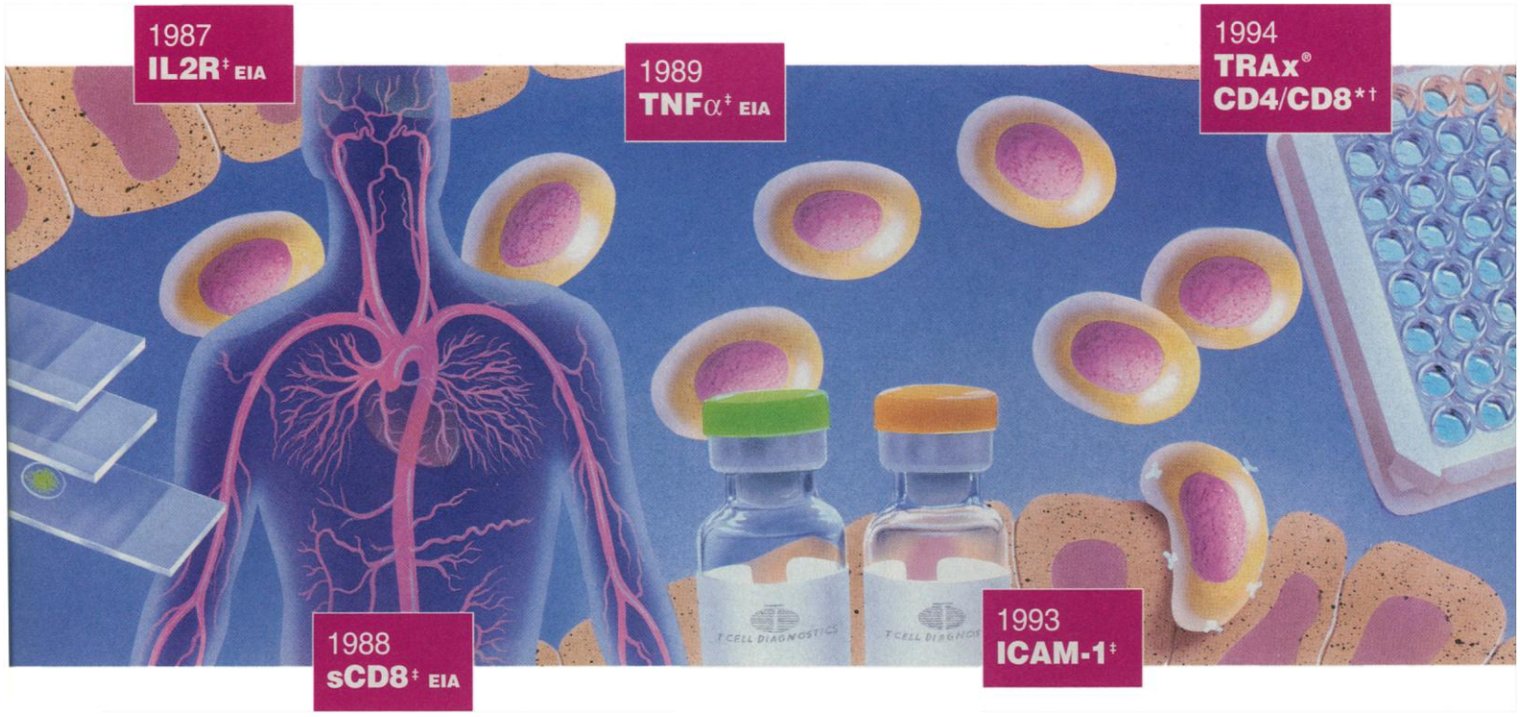
Microscopy Division

**U.K.** (0442)232552 • **AUSTRALIA** (02) 805 5000 • **AUSTRIA** 877 89 01 • **BELGIUM** (09) 385 55 11 • **CANADA** 1-905-712-2771 • **CHINA (Beijing Office)** 1-2051850 ext 3401 or 3406
**CHINA (Shangai Office)** (8621) 5459151 • **DENMARK** 39179947 • **FRANCE** 00-33-1-49-60 68 34 • **GERMANY** 0891 31884-0 • **ITALY** (02) 216091 • **FRANCE** 01-4960 6834
**MALAYSIA** 603-7195072 • **NETHERLANDS** 08385-40666 • **NEW ZEALAND** (09) 443 3099 • **PACIFIC** (852) 789 300 • **PACIFIC** 011-4610103 • **PACIFIC** (Korea Liaison Office) 822) 578-8167
**USA** (510) 741-1000 • **SINGAPORE** 65-4432529 • **SPAIN** Phone: 91-661 7085 • **SWEDEN** 08-735 8300 • **SWITZERLAND** 01-810 16 77

**For Countries not listed.** Please Contact U.K. Office. • Phone: 0442 232552 • Fax: 0442 234434

Circle No. 14 on Readers' Service Card

**CYTOKINES ▪ ADHESION MARKERS ▪ T CELL RECEPTORS ▪ SOLUBLE RECEPTORS**




# T Cell Diagnostics Puts a Decade of Immunology Research in Your Hands.

***The path your research takes is often dictated by the resources at hand. For 10 years, T Cell Diagnostics and our parent company, T Cell Sciences, have developed tools for novel explorations into human immunology.***

### High-Performance EIA Kits Lead the Way

Accurately quantitate cytokines and soluble receptors with our complete line of high-sensitivity, high-specificity immunoassay kits. Calibrated standards and easy-to-follow protocols ensure reproducible results in a few quick steps.

Obtain absolute CD4 and CD8 lymphocyte counts in your lab without flow cytometry by using the familiar TRAx® ELISA format.

### High-Quality Mabs for High Specificity

Precisely identify T cell antigen receptors and adhesion markers by using our broad range of monoclonal antibodies and extensive applications expertise.

### Measure Immune Profiles for Clinical Research

With our unique combination of products, you have the capability to study immune status in HIV, infectious disease, and organ transplantation.

### Complete Support at Your Fingertips

Our experienced Technical Support Staff and Researchers will work closely with you to realize every advantage that our products bring to your lab.

***Let us put a decade of immunology research in your hands. Call 1-800-624-4021 for our catalog.***

T CELL DIAGNOSTICS

HELPING YOU EXPLORE THE IMMUNE RESPONSE

**T Cell Diagnostics, Inc.**, 6 Gill Street, Woburn, MA 01801 Tel: 617-937-0890, 1-800-624-4021 *For Investigational Use Only. Pending FDA clearance. †Patents Pending, T Cell Diagnostics Inc. ‡For Research Use Only.

Circle No. 19 on Readers' Service Card

D.C. #564

# Fuse cells and manipulate embryos faster than you can say "polyethylene glycol."


## Just look at all the ways to use Electrofusion.

- **Transgenic Animals**
- **Nuclear Transplants**
- **Tetraploid Embryos**
- **Parthenogenesis**
- ***In vitro* Fertilization**
- **Human Hybridomas**
- **Human/Mouse Hybridomas**
- **Hybrids**
  **(Plant, Yeast, Fungi, Algae)**
- **Membrane Fusion Research**

## The process is simple, easily controlled, non-toxic, reproducible, and can save you hours in the lab.

Here's how the ECM 200 works: After placing cells or manipulated embryonic cells in an electrofusion chamber, an AC field is applied for alignment, followed by a brief DC pulse for fusion. Not only is Electrofusion faster and more reproducible than PEG, the ECM 200 system allows the entire process to be viewed as it happens.


The Optimizor®, an optional graphic pulse analyzer, has been designed for monitoring of chamber conditions.

We can provide protocols for many cell lines, and you can quickly develop your own by using the optional Graphic Pulse Analyzer. To receive references and protocols from our proprietary 2500 paper Electronic Genetics® Database and a copy of our catalog, call us toll free: **1-800-289-2465**

**FREE! Call for the BTX 1994 Catalog**

BTX®
ELECTRONIC GENETICS®

**Electroporation. It's not just what we sell. It's what we are.**

11199-A Sorrento Valley Road • San Diego, CA 92121-1334 USA **1-800-289-2465** • (619) 597-6006 • Fax: (619) 597-9594
BTX is a division of Genetronics, Inc.

Circle No. 37 on Readers' Service Card

# Bio Medic's New World Standard!

## Now you can *'write'* your own animal information on our new super *programmable* microchip. It even transmits *temperature* readings!


With the outstanding acceptance of ELAMS,™ system (Electronic Laboratory Animal Monitoring System) by the Bio Medical Research community, our customers asked if we could provide them with a transponder that is programmable and has temperature sensing capability. One that they could 'write' their own animal ID codes and animal study data directly to the implantable transponder, and additionally sense the important parameter of animal body temperature.

*Our Re²D answer...*BMDS™ now introduces the unique, super-smart, implantable micro transponder establishing a New World Standard for animal identification. The objectives of end user programmability and temperature sensing that was once a dream, is now a reality, marking major advance in the ease of data collection, accuracy, and security.

Now for the first time, your animals of any species, can become walking mini data bases carrying information that you program directly into the glass-encapsulated transponder. The new transponder is easily programmed with your own animal information, using up to 16 alpha-numeric characters that you choose to represent anything from a simple animal ID number and or combined with such information as project number, animal species, sex, cage number, etc.


Programmable Glass-Encapsulated Transponder

Our advanced transponder utilizes a temperature sensor that measures and reports in increments of 1/10 of a degree Fahrenheit.

Combined with our new line of scanner read/write systems, developed to communicate with this breakthrough transponder, BMDS now offers you state of the art in 'user control'; a total automatic ID tracking and temperature sensing system. Call or write us to establish a dialogue on this extraordinary system today.

**BMDS™**
**Radio Frequency Technologies**

Bio Medic Data Systems, Inc., 255 West Spring Valley Ave. Maywood New Jersey 07607 Phone: 201-587-8300
**Toll free: 1-800 526-2637 Fax: 201-843-8816**



Circle No. 32 on Readers' Service Card

# We've Created A **Breakthrough** in Our Industry,


# So You Can Achieve One in Yours.

**More and more scientists are finding the answer in the image.** And now, Kodak is providing that image with greater resolution than ever before possible. Introducing the remarkable **KODAK Professional DCS 460** Digital Camera. Designed to give you all the power of the highest resolution digital camera in the world, combined with the freedom of a **compact,** SLR-style body.

Available with either color or monochrome sensors, the DCS 460 Camera **instantly** captures an amazing **18 MB** of information per image. That's **3060 x 2036 pixels,** providing the **ultra-fine** details you need for analysis. Right when you need them. With resolution almost **16 times** that of still video systems. And equivalent to the highest possible scanned resolution of standard KODAK Photo CD Master discs.

There's special software built in to maximize image **data security.** An open systems construction allows **easy interface** with any personal computer, with automatic recording on PCMCIA Type III removable hard drives. So you can store, share, manage, and output your images as easily as you capture them.

Ultra-high resolution digital imaging is right here. Right now. With the KODAK Professional DCS 460 Digital Camera. **Call 1 800 23-KODAK** for all the details. About the breakthrough camera that can capture your great moments in science.

**THE SCIENCE BEHIND THE IMAGE**

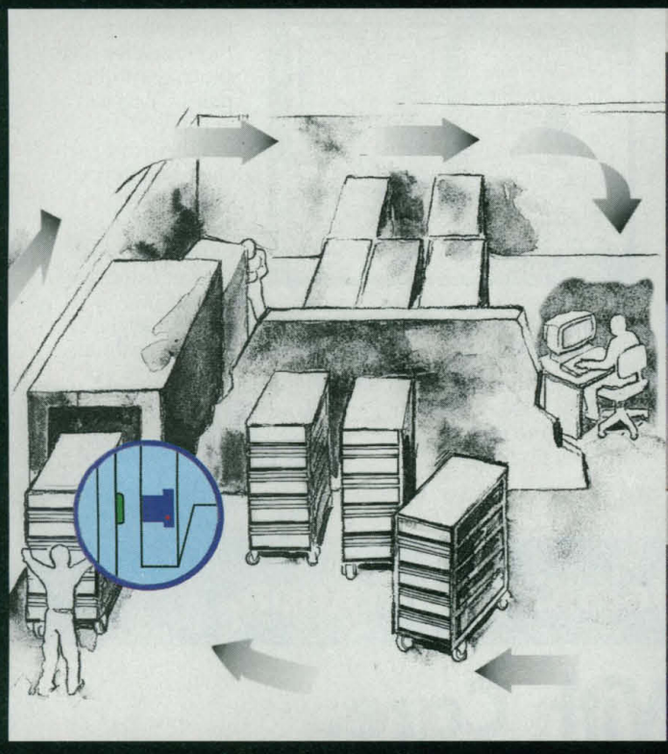
Kodak

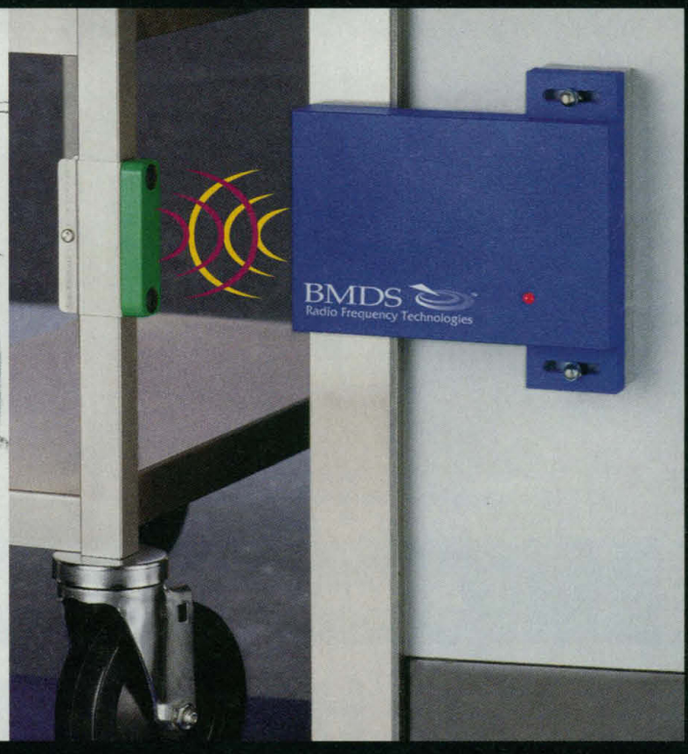


Circle No. 36 on Readers' Service Card

# The End of Lab Chaos:

## Now you can solve the nightmare of identifying, tracking and monitoring animals, equipment and procedures with a new Bio Medic Radio Frequency System.






The outstanding acceptance by the research community of Bio Medic's Electronic Lab Animal Monitoring System (ELAMS™) has led to the research and development of a new level of sophistication in data collection, storage, and manipulation for today's more demanding protocols and complex lab environments.

Now, with the advent of super-smart programmable microchips and advanced reader/programmers combined with the engineering and production of a variety of transmitting/sensing equipment, a comprehensive system of identifying, tracking and monitoring your animals, equipment and procedures — all automatically! — can be designed to meet your specific project or permanent physical needs.

Your lab animal personnel can be almost entirely freed from all the tedious, time-consuming, error-prone accounting drudgery and allowed to focus on the care and observation of fragile, costly animals which are the scientific and economic bottom-line of your research.

Let us show you how we can design and install an automatic electronic monitoring system to eliminate electronic chaos, reduce complexity, and produce order in your own unique system.

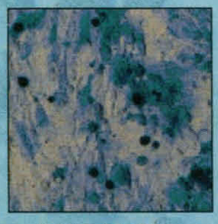

**BMDS™**
**Radio Frequency Technologies**

Bio Medic Data Systems, Inc., 255 West Spring Valley Ave.
Maywood New Jersey 07607 Phone: 201-587-8300
**Toll free: 1-800 526-2637 Fax: 201-843-8816**

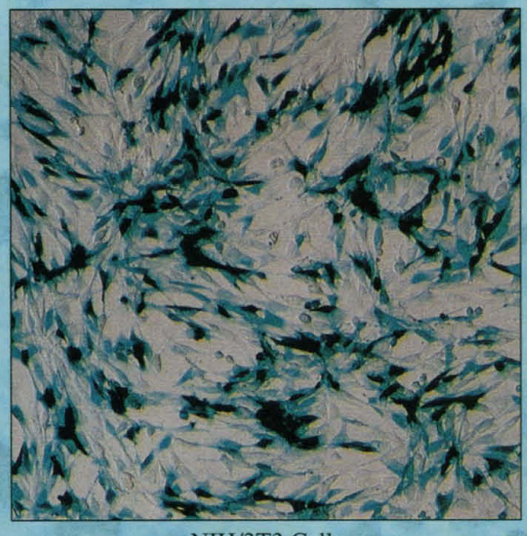


Circle No. 33 on Readers' Service Card

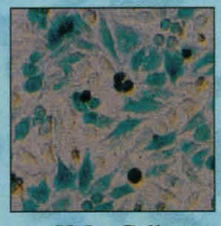
# Get the Blues



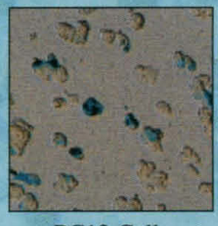
BHK-21 Cells



NIH/3T3 Cells



HeLa Cells



PC12 Cells

CHO-K1 Cells

## Hit a High Note with LIPOFECTAMINE,™ the New Standard in High Efficiency Transfection Reagents from the Makers of LIPOFECTIN®

You'll feel like singing about your transfections when you use GIBCO BRL LIPOFECTAMINE Reagent because you'll see previously unattainable transfection efficiencies—up to 90% positive ß-galactosidase-expressing cells!

A polycationic lipid reagent that introduces nucleic acids into eukaryotic cells, LIPOFECTAMINE works well with a wide variety of cell lines (1). These include popular *and* hard-to-transfect cell lines such as: CHO-K1, BHK-21, HeLa, COS-7, NIH/3T3, PC12, and Jurkat. Passaged primary cultures such as human fibroblasts can also be transfected with high efficiency.

LIPOFECTAMINE is an innovative product (patent pending) which may be used for stable or transient transfections and can be used in the presence of fetal bovine serum. It is pre-formulated so it is easy to use, and it has a long shelf life at 4°C. Best of all, LIPOFECTAMINE is from Life Technologies, the makers of LIPOFECTIN and the pioneers in transfection technology. So try LIPOFECTAMINE and watch your transfection efficiencies scale new heights. You'll even feel good about getting the blues!

**NOW AVAILABLE:**
**GIBCO BRL Guide to Eukaryotic Transfections with Cationic Lipid Reagents**

**To Order/TECH-LINE℠: (800) 828-6686**
**Industrial Customers: (800) 874-4226**
**Cat. No. 18324-012**

Photographs depict ß-galactosidase expression of cells transfected with pCMV ß-gal DNA and LIPOFECTAMINE Reagent.

LIFE TECHNOLOGIES™

Producers of GIBCO BRL Products

**Corporate Headquarters**
8717 Grovemont Circle
P.O. Box 6009
Gaithersburg, MD 20884-9980 **U.S.A.**
(301) 840-8000

**U.S.A. Orders**
P.O. Box 68
Grand Island, NY 14072-0068 **U.S.A.**
Facsimile: (800) 331-2286
To Order/TECH-LINE: (800) 828-6686
Industrial Customers: (800) 874-4226

**U.S.A. Office for Latin America**
To Order/TECH-LINE: (301) 840-4027
Facsimile: (301) 258-8238

**Canada Orders**
Burlington, Ontario L7P 1A1 **Canada**
To Order: (905) 335-2255
TECH-LINE: (800) 757-8257

1. Hawley-Nelson, P., Ciccarone, V., Gebeyehu, G., Jessee, J. and Felgner, P., (1993) *Focus® 15, 73.*



94-169

Circle No. 35 on Readers' Service Card

# Pierce linked in disappearance of slow, radioactive Oligonucleotide labeling

## *Further investigation uncovers development of new OligoLink™ Derivatization and Alkaline Phosphatase Conjugation Kits.*

**By Pierce Research Staff**

Evidence is mounting against Pierce in the case of the mysterious disappearance of traditional oligonucleotide labeling. The accused has reportedly replaced the conventional time-consuming radioactive labeling procedure with *fast, easy-to-use* kits for labeling any oligo or other nucleic acid probe. According to eyewitness accounts, users of the new kits *avoid the need for custom conjugation, derivatized nucleotides or enzyme reactions.*

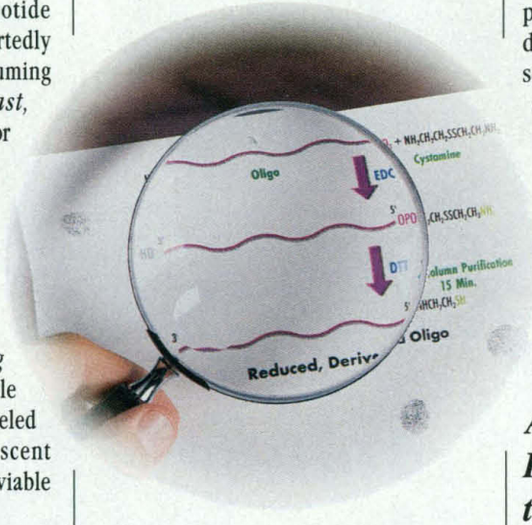
The kits are described as being a *sensitive, non-radioactive labeling method*, and have drawn considerable attention, as alkaline phosphatase-labeled probes detected with chemiluminescent substrates are the most sensitive and viable safe alternative to radioisotopes.

Sources close to the case have learned that the new kits are *versatile*, allowing users to *label an oligonucleotide with any conjugate, including cross-linkers, fluorescent labels or biotinylation reagents.* There are also reports claiming that probes labeled with this "OligoLink™" remain *stable for months –or even years.*

Detectives on the case are hindered by the unusually large number of crime scenes to investigate–reported as being hundreds of labs worldwide. Officials believe a recovery of the missing labeling procedure is highly unlikely.

### Watch for these suspects - and their M.O.

The Pierce *OligoLink™ Derivatization Kit* utilizes a simple cross-linking step to end modify any oligonucleotide with a 5′-phosphate group. The resulting derivatized oligo can then be coupled to the label or protein of your choice, or attached to a solid support. If you want to label with alkaline phosphatase, the Pierce *OligoLink™ Alkaline Phosphatase Conjugation Kit* allows users to form stable oligonucleotide-alkaline phosphatase conjugates which are useful in detecting the presence of specific sequences in colony lifts, Southern Blots and DNA Dot Blots. This kit has been optimized for use with the OligoLink™ Derivatization Kit, but it will conjugate any oligo containing a free sulfhydryl group. Because any synthetic oligo can be labeled with this alkaline phosphatase conjugation kit, the preparation of custom conjugates is not needed.




***Also Wanted: OligoLink™ Hybridization Kit–believed to be headed for the area soon.***

| Product # | Description | U.S. Price |
|---|---|---|
| 17700 | **OligoLink™ Derivatization Kit**<br>*Includes sufficient materials for two phosphorylated oligonucleotide derivatizations.*<br>Contents: Derivatization Reagent, OligoLink™ Purification Matrix, EDC, DTT, Binding Buffer, Wash Buffer, Spin Columns with accessories, Collection Tubes and Instructions | $175 |
| 17701 | **OligoLink™ Alkaline Phosphatase Conjugation Kit**<br>*Includes sufficient materials for two oligonucleotide-alkaline phosphatase conjugations.*<br>Contents: Activated Alkaline Phosphatase, Conjugation Buffer, Desalting Units, SuperFreeze™ Phosphatase Stabilizer and Instructions | $100 |

**To order in the U.S.A.:** Pierce · 3747 N. Meridian Rd. · P.O.Box 117 · Rockford, IL 61105 · **Telephone: 800.874.3723 FAX: 800.842.5007** · Internet E-mail Address: PierceChem@mcimail.com
**European Office:** Pierce Europe B.V. · P.O. Box 1512 · 3260 BA Oud Beijerland · The Netherlands · Telephone: 31.1860.19277 FAX: 31.1860.19179

**European Distributors:**
Austria 018891819 · Belgium 036465511 · Denmark 44948822 · France 070038855 · Germany 0224196850 · Italy 025097220 · Holland 0206113133 or 076795795 · Norway 22722100 · Spain 017290333 · Switzerland 0217287772 · United Kingdom 0244382525 · Sweden 087460035

**Outside Europe and the U.S., contact Pierce U.S. for your local Pierce distributor. Telephone:** 815.968.0747 FAX: 815.968.8148

PIERCE
a Perstorp Biotec Company



Circle No. 12 on Readers' Service Card

# Gordon Research Conferences

## Carlyle B. Storm, Director

### Fixed Conference Fees—1995

| | CA | Italy |
|---|---|---|
| Conferee (double occupancy) | $590 | $610 |
| Conferee (single occupancy) | $685 | $690 |
| Conferee (non-resident) | $470 | $480 |
| Guest (double occupancy) | $440 | $460 |
| Guest (single occupancy) | $535 | $540 |
| Guest (non-resident) | $320 | $330 |

If the final pre-paid registration is postmarked at least three weeks prior to the meeting, a $50 discount may be taken on the Fixed Fee.

The 1995 Winter and Spring Gordon Research Conferences will be held in Southern California and in the Tuscany region of Italy.

**Attendance is limited—it is recommended that applicants apply immediately for early consideration by the Chair.** Feel free to copy the application form, before it is completed, or request more forms or additional information from the

Gordon Research Conferences
University of Rhode Island
P.O. Box 984
West Kingston, RI 02892-0984
USA.

E-mail: grc@grcmail.grc.uri.edu
Fax: (401) 783-7644
Phone: (401) 783-4011

More detailed information on these Conferences can be obtained via e-mail:
via **gopher**, hackberry.chem.niu.edu port 70
via **word-wide web**, http://hackberry.chem.niu.edu:70/0/webpage.html
via **anonymous ftp** to hackberry.chem.niu.edu (in the pub/Conferences/GordonConferences directory)

### Biology of Aging

**Il Ciocco (Site 1)**
**Barga, Italy (Tuscany)**

J.R. Smith, O.M. Pereira-Smith, co-chairs;
T. Johnson, vice chair

**7—12 May**

"Proliferative Homeostasis and Aging" G.M. Martin
*Cellular Aging—I*
*Cell Cycle Control*
**J. Campisi, G. Gabbiani**
J. Pines, S. Shall, V. Sorrentino
*Cellular Aging—II*
*Transcription Control*
**R. Sager, S. Shall**
J. Campisi, T. Maciag, G. Stein
*Aging and Cancer*
**G. Stein**
R. Sager, E. Wang
*Osteoporosis*
**D. Hamerman**
P.D. Delmas, A. Kahn, J. Pfeilschifter
*Alzheimer's Disease*
**G.M. Martin, M.T. Ramacci**
L. Amaducci, J. Carney, E.M. Mandelkow, R. Tanzi
*Evolution and Experimental Manipulation of Lifespan*
**E. Masoro, J. Vaupel**
T. Kirkwood, A. Richardson
*Longevity Assurance Genes—I*
**A. McCormick**
M. Jazwinski, C. Kenyon, J. Tower
*Longevity Assurance Genes—II*
**T. Johnson**
R. Miller, M. Peacocke

### Agricultural Sciences: Chemical/Biological Synergies to Reduce Inputs for Pest Control

**Casa Sirena Resort**
**Oxnard, CA**

D. Fischoff, J. Gressel, co-chairs; R. Feyereisen, M. Subramanian, co-vice chairs

**5—10 February**

*Chemical/Chemical Synergies*
**D. O'Keefe**
N. Forrester, U. Gisi, J. Green, B. Hammock, M. Lyttle, C. Preston
*Biocontrol Agents and Chemicals*
**M. Hoy**
B. McCutchen, C. Quimby
*Biopesticide/Biological Synergies*
**D. Sands**
T. Bewick, R. Granados
*Synergizing Crop Resistance*
**B. Maxwell**
K. Feldmann, J. Ryals, J. Tumlinson, M. Wolfe
*Synergies Between Engineered Genes*
**R. Beachy**
D. TeBeest
Informal Workshop—*Can Genetic Engineering Reduce Inputs?*
**M. Whalon**
Banquet—"The Ethics of Crop Protection" R. Straughan
*Constraints in Applying Synergies*
**P. Lemaux**
H. Miller, R. Prokopy

### Angiotensin

**Il Ciocco (Site 1)**
**Barga, Italy (Tuscany)**

D. Ganten, chair;
T. Inagami, vice chair

**30 April—5 May**

*Clinical Genetics*
**S. Harrap**
P. Corvol, J.-M. Lalouel, M. Lathrop
*Molecular Aspects of Therapy; New Treatment Modalities (Gene Therapy)*
**J. Leiden**
D. Dichek, R. Morishita, E. Nabel
*Drug Targets in the RAS and Related Systems*
**J. Reid**
M. Clozel, A. Seymour, M. Wayner
*Ang II Receptor, Signal Transduction*
**M.I. Philips**
J. Kakuchi, M.B. Marrero, C. Summers
*Mineralcorticoids*
**C.R.W. Edwards**
K. Parker, B. Rossier, P.M. Stewart
*New Transgenic Technologies*
**K. Gross**
K. Murakami, M. Rajewski, O. Smithies
*The Tissue RAS*
**T. Unger**
F. Mendelsohn, R.E. Pratt, H. Urata
*Vascular Biology*
**G. Owens**
P. Delafontaine, Y. Kitami, E. Sage

### Biodegradable Polymers

**Casa Sirena Resort**
**Oxnard, CA**

R.W. Lenz, chair;
E. Chiellini, vice chair

**19—24 February**

*Production and Applications of Biodegradable Polyesters*
**R. Marchessault**
M. Nuti, W. Page, M. Vert
*Enzymatic Degradation of PHAs*
**L. Garcia-Rubio**
J. Foster, Y. Doi
*Enzymatic Degradation of Other Biopolymers*
**D. Kaplan**
C. Roberts, O. Smidsrod, D. Wilson
*Polymer Synthesis with Enzymes*
**R. Gross**
J.S. Dordick, S. Kobayashi
*Hydrolytic Degradation of Medical Polymers*
**Z. Jedlinski**
J. Anderson, C. Chu, H. Garreau
*Biodegradation of Polymers in Practice*
**R.C. Fuller**
S. Goodwin, C. Pettigrew
*Applications and Biodegradation of Synthetic Polymers*
**G. Schornick**
P. Guerin, Y.H. Paik, A.P. Wheeler
*Biodegradation Standards and Methods*
**S. Huang**
R. Narayan, G. Swift
*Biodegradable Polymer Blends*
**A.-C. Albertsson**
C. Bastioli, S. McCarthy, R. Wool

### Carotenoids

**Doubletree Hotel**
**Ventura, CA**

J.A. Olson, chair;
J.W. Erdman, Jr., vice chair

**5—9 February**

*Biosynthesis of Carotenoids*
**P. Scolnik**
F. Brinkhaus, G. Sandmann, E. Wurtzel
*Carotenoid Absorption, Transport and Tissue Distribution*
**J.W. Erdman, Jr.**
G. Beecher, P. Bowen, P. Hoppe, E. Johnson
*Chemistry, Characterization and Application of Carotenoids*
**H. Pfander**
S. Liaaen-Jensen, A. Ong
*Carotenoid Metabolism*
**J.A. Olson**
B.J. Burri, J. Curran-Celentano, R. Parker, W. Schalch
*Light Reactions of Carotenoids in Photosynthesis*
**T. Moore**
T.M. Cotton, H. Frank
*Antioxidant and Singlet Oxygen Quenching Properties of Carotenoids*
**N.I. Krinsky**
L. Canfield, D. Liebler, H. Sies, J. Terao
*Carotenoids, Foods and Perceptions of Health*
**T. Bray**
A. Bendich, J. Hathcock
*Relations of Carotenoids to Disease Risk*
**R. Ziegler**
D. Albanes, D. Birt, S. Mayne
Roundtable Discussion—*Should a Recommended Dietary Allowance be Proposed for β-Carotene?*
*Overview of Carotenoid Functions and Actions*
**G. Britton**
N. Krinsky

**Discussion Leaders** are shown in **Bold type**; Speakers, in alphabetical order, are indicated in Regular type; *Topics* are printed in *Italics*

## Catecholamines

**Il Ciocco (Site 2)**
**Barga, Italy (Tuscany)**

Ian Creese, chair;
N. Zahniser, vice chair

**7—12 May**

"New Directions in Schizophrenia Research" A. Carlsson
*Adrenoreceptors*
**S. Langer**
*Catecholamine Receptors: Structure/Function*
**M. Caron**
B. Kobilka, G. Milligan, A. Strosberg
*Dopamine Receptor Subtype Function*
P. Sokoloff, H. Van Tol
*Transgenic/Antisense Knockouts*
**I. Creese**
E. Borrelli, D. Sibley
*Catecholamine Transporters*
**G. Uhl**
B. Hoffman, R. Innis
*Neuromodulatory Actions of Dopamine*
**J. Surmeier**
P. Calabresi, S. Hyman
*Dopamine Regulation of GABA Neurons*
**M.-F. Chesselet**
M.-J. Besson, J. Walters
*Regulation of Neurotransmitter Release*
**N. Zahniser**
E. Abercrombie
*Neurotoxicity: ALS, Alzheimer's and Parkinson's Diseases*
**M. Zigmond**
E. Hirsch
*Depression*
**G. Di Chiara**
P. Willner
*Drug Abuse: Basic and Clinical Studies*
**Y. Hurd**
P. Kalivas, N. Volkow

## Chemical Reactions at Surfaces

**Holiday Inn**
**Ventura, CA**

R.J. Madix, chair;
B. Koel, vice chair

**22—27 January**

*Reactions on Metal Surfaces*
**L.D. Schmidt**
B. Nieuwenhuys, J. Reutt-Robey, D. Salahub, K. Tanaka
*Oxide and Modified Surfaces*
**V. Henrich**
M.A. Barteau, G. Brown, H.J. Freund, M. Salmeron
*Semiconductors and Advanced Material Surfaces*
**K. Jensen**
R. Creighton, R. Hamers, W. Ho, J. Whitten
*Nonthermal Reactions on Surfaces*
**T. Madey**
I. Harrison, N. Lewis, J. Tully, J.M. White
*Horizons*
**C.M. Friend**
B.D. Kay, E.M. Stuve, M. Tolbert

## Chemotherapy of AIDS

**Holiday Inn**
**Ventura, CA**

M.-C. Hsu, chair;
G. Tarpley, vice chair

**19—24 February**

*Viral Resistance*
**E. DeClercq**
J.M. Coffin, D.D. Ho, B.A. Larder
*Clinical Research*
**R. Yarchoan**
P. Deutsch, R. Ginsberg
*Gene Therapy*
**N. Sarver**
J.A. Merritt, L. Poste, B. Sullenger
*Reverse Transcriptase*
**E. Arnold**
S. Hughes, D. Stuart, R. Thomas
*Viral Regulatory Genes*
**M.J. Gait**
M.R. Green, M.R. Sumner-Smith, J. Williamson
*Integrase*
**C. Dieffenbach**
R. Craigie, D.J. Hazuda
*Protease Inhibitors*
**D. Kempf**
M. Bryant, R.D. Tung, J. Vacca
*Clinical Research*
**P. Lietman**
D. Richman
*Pathogenesis and Immune Modulation*
**J. Martin**
G. Pantaleo, D. Pauza, R.T. Schooley

## Chronobiology

**Il Ciocco (Site 2)**
**Barga, Italy (Tuscany)**

S. Daan, chair;
G.D. Block, vice chair

**30 April—5 May**

*Human Circadian Rhythms*
**E. van Cauter**
J. Aschoff, D.G.M. Beersma, K. Honma, S. Honma
*Season and Melatonin*
**J. Arendt**
H. Illnerova, S.M. Reppert, A. Wirz-Justice
*Circadian Rhythms in Behavior: Functional Approaches*
**N. Mrosovsky**
R. Mistlberger, T. Ruf, I. Tobler
*Circadian Rhythms in Behavior: Pacemaking Systems*
**B. Rusak**
W. Puchalski
*Circadian Photoreception*
**M. Menaker**
J. Falcon, R. Foster, M. Pierce
*Physiology of Pacemaking Neurons*
**G.D. Block**
F.E. Dudek, D. Welsh
W. Schwartz, commentator
*Molecular Approaches: Animals*
**J. Loros**
P. Hardin, M. Hotz Vitaterna, P. Sassone-Corsi
*Molecular Approaches: Bacteria and Plants*
**T. Roenneberg**
C. Johnson, B. Piechulla
J. Takahashi, commentator
*Circannual Rhythms and Photoperiodism*
**E. Gwinner**
A. Foa, F. Karsch, A. Loudon

## Innovations in College Chemistry Teaching

**Holiday Inn**
**Ventura, CA**

M.A. Fox, J.K. Whitesell, co-chairs;
B. Spencer, vice chair

**8—13 January**

*Handling the Large Class*
**B. Shakhashiri**
J. Arce, L. McDermott, A. Stacy
*Assessing the Changes*
**C. Parravano**
E. Seymour, R. Watson
*Enriching Chemical Education*
**B. Spencer**
A. Ellis, J. Lagowski, Z. Lerman
*Computers in Chemical Education*
**B. Sawrey**
C. Abrams, B. Luceigh
*Involving Minorities in Chemistry*
**B. Andreen**
C. Fenselau, J. Swartz, R. Turner
*Cooperative Learning*
**S. Tobias**
J. Ibers, J. Stewart
*Curriculum Reform*
**S. Hixon**
L. Knight, J. Walters, S. Ware
*New Directions in Teaching*
**M. Apple**
O. Chapman, R. Zare
*The Research Experience*
**R. Lichter**
M. Doyle, R. Damrauer

## Electrochemistry

**Doubletree Hotel**
**Ventura, CA**

J. Janata, chair;
J. Osteryoung, vice chair

**15—20 January**

*Structured Layers*
**N. Lewis**
N. Armstrong, J. Michl
*New Techniques*
**P. Ross**
L. Sorensen, A. Wieckowski
*Miscellaneous*
**D. Crooks**
M. McKubre, J.-M. Saveant
*Miscellaneous*
**B. Miller**
A. Davenport, A. Fujishima
*Liquid/Liquid Interface*
**M. Majda**
V. Marecek, G. Richmond
*Young Investigators Session*
**P. Vanysek**
C. Bruckner-Lea, P. Guyot-Sionnest, T. Palmore, R. Quinn
*Environmental Electrochemistry*
**R. Quinn**
D. Johnson, R. Probstein
*Short Talks*
**J. Osteryoung**
*Electroanalytical*
**S. Feldberg**
S. Brown, A. Heller

## Enzyme Organization and Cell Function

**Casa Sirena Resort**
**Oxnard, CA**

M. Deutscher, chair;
J. Clegg, vice chair

**15—20 January**

*Cell Structure*
**E. Salmon**
D. Goodsell, J. Heuser, E. Salmon, M. Terasaki
*Cell Microenvironments*
**A.S. Verkman**
K. Luby-Phelps, R.P. Rand, A.S. Verkman

*Organization of Metabolism—I*
**C. Mathews**
S.A. Kauffman, C. Mathews, L. Pagliaro, W. Peticolas
*Microcompartmentation by Enzyme Redistribution*
**C. Kent**
C. Kent, M. Mueckler, S. Taffet
*Organization of Metabolism—II*
**C. McHenry**
C. McHenry, M. Mirande, I. Pryme, M. Rechsteiner
*Localized Gene Expression*
**A. Fulton**
J. Carson, A. Fulton, M.L. King
*Theoretical Approaches to Organization and Channeling*
**D. Atkinson**
D. Atkinson, P.B. Chock, A. Cornish-Bowden, H. Westerhoff
*Metabolite Channeling*
**P. Srere**
D. Appling, P. Panzeter, P. Srere
*Cytoskeleton in Orgnization and Trafficking*
**R. Singer**
J. Condeelis, T. Schroer, R. Singer, K. Suprenant

## Fibronectins, Integrins and Related Molecules

**Casa Sirena Resort**
**Oxnard, CA**

J.E. Schwarzbauer, chair;
M.E. Hemler, vice chair

**26 February—3 March**

*Structure and Function of Nectins and Integrins*
**K. Yamada**
R. Chiquet-Ehrismann, J. Sottile
*Higher Order Structures*
**D. Mosher**
D. Leahy, E. Lord, D. Peters
*Responses at the Plasma Membrane*
**A. Woods**
F. Giancotti, T. Parsons
*Integration of Environmental Cues*
**C. Damsky**
R. Juliano, E.H. Sage, M. Schwartz
*Developmental Roles for Nectins and Integrins*
**R. Hynes**
D. DeSimone, L. Fessler, L. Reichardt
*Modulation of Integrin Function*
**M. Ginsberg**
R. Assoian, J. McCarthy, F. Watt

**Discussion Leaders** are shown in **Bold type**; Speakers, in alphabetical order, are indicated in Regular type; *Topics* are printed in *Italics*

*Nectins and Integrins in Cell-Cell Interactions*
**N. Hogg**
E. Brown, D. Dean, J. White
*Matrix Regulation of Cell Function*
**E. Ruoslahti**
D. Cheresh, D. Ingber, Z. Werb
Keynote Address
M. Bissell
Workshop—*Integrins as Therapeutic Targets*
**M. Pierschbacher**
Workshop—*Tissue Distribution of Nectin and Integrins*
**C. Buck, D. Sheppard**

## Glycobiology
**(formerly Glycoproteins and Glycolipids)**

**Casa Sirena Resort**
**Oxnard, CA**

A. Varki, chair;
G. Hart, vice chair

**12—17 February**

*Monosaccharides, Sugar Nucleotides and Oligosaccharide Donors*
C. Hirschberg, P. Robbins
*ER and Early Golgi Glycosylation Mechanisms*
A. Helenius, S. Krag
*Golgi Glycosylation Mechanisms*
U. Lindahl, K. Moreman
*Atypical Forms of Glycosylation*
G. Hart, F. Troy
*Glycosylation in Intra- and Inter-cellular Trafficking*
S. Kornfeld, K. Rice
*Mechanisms of Degradation and Turnover of Glycoconjugates*
Y. Inoue, A. Varki
*New Technologies in the Analysis and Synthesis of Oligosaccharides*
A. Dell, O. Hindsgaul
*Carbohydrate-Protein Interactions*
K. Bock, A. Lander
*Glycosylation in Cell Growth and Cell-Cell Interactions*
P. Crocker, M. Fukuda
*Glycosylation in Host:Microbial Interactions*
R. Cummings, K.-A. Karlsson, S. Turco
*Altered Glycosylation in Cultured Cells*
J. Esko, E. Muchmore
*Role of Glycosylation in Whole Animal Physiology*
J. Baenziger, J. Lowe
*Altered Glycosylation in Complex Organisms*
T. Kinoshita, J. Marth, P. Stanley

## Glycolipids and Sphingolipids, Structure and Function of

**Holiday Inn**
**Ventura, CA**

R.A. Laine, chair;
Y. Nagai, vice chair

**15—20 January**

*Glycosphingolipid Glycosyl Hydrolase Activator Proteins*
**Y.T. Li**
G.A. Grabowski, S.-C. Li, J.S. O'Brien, K. Sandhoff
*Sphingoid Second Messengers: Signal Transduction*
**S. Spiegel**
Y. Igarashi, A. Merrill, G. Tettamanti
*Sphingolipid Motifs in Cell Regulation*
**S.-I. Hakomori**
Y. Hannun, R. Kolesnick, M. Krönke, K. Minoguchi
*Sphingolipid Controlled Pathways and Mechanisms*
**G. Dawson**
D.R. Green, W. Halloran, Y. Kozutsumi, T. Okazaki
*Glycosyl Transferases and Cellular Regulation*
**Y. Nagai**
Y. Hirabayashi, C. Lingwood, Y. Sanai, N. Taniguchi
*Glycobiology of Ganglioside Receptors*
**M. Saito, R. Schnaar**
E. Bremer, S. Kelm, S. Tsuji
*Biological Activity of Microbial Glycolipids*
**P. Brennan**
R.L. Lester, D.-i. Mizuno, T. Taki
*Immunomodulation*
**R. Kannagi, D.M. Marcus**
R. Kannagi, P. Livingstone, T. Tai
*Ganglioside Expression and Function*
**S. Chatterjee, M. Hoshi**
B. Bochner, S. Ladisch, D. Saggioro, A. Suzuki

## Kallikreins and Kinins

**Holiday Inn**
**Ventura, CA**

D. Proud, chair;
W. Müller-Esterl, vice chair

**5—9 February**

*ACE/Kallikrein Polymorphisms and Disease*
**E. Erdos**
F. Alhenc-Gelas, S. Hunt
*Cardiovascular/Endothelial Actions of Kinins*
**O. Carretero, A. Nasjletti**
T. Hintze, R. Levi, J. Parratt, B. Scholkens
*Cellular Actions of Kinins and Second Messengers—I*
**A.G. Scicli**
U. Förstermann, P. Vanhoutte
*Cellular Actions of Kinins and Second Messengers—II*
**R. Colman, H.S. Margolius**
B. Dixon, A. Jaffa, J. Liao, A. Schmaier
*Transgenic Studies of the Kinin System*
**A. Cuthbert**
L. Chao, J.F. Hess
*Receptor Structure/Function—I*
**W. Müller-Esterl, J. Stewart**
M. Haasemann, K. Jarnagin, D. Kyle, C. Strader
*Receptor Structure/Function—II*
**D. Regoli**
F. Leeb-Lundberg, J. Menke
*Pathophysiology/Inflammation*
**L. Greenbaum, C. Vlo**
R. De La Cadena, M. Perkins, A. Ribeiro, M. Siebeck
*Kinin Antagonists/Clinical Trials*
**D. Proud**
N. Bender, T. Rodell

## Mammalian DNA Repair Mechanisms

**Doubletree Hotel**
**Ventura, CA**

M.J. Smerdon, chair;
M.C. Paterson, vice chair

**29 January—3 February**

*Substrate of Repair Enzymes: The Chromatin Template*
**A. Wolffe**
E.M. Bradbury, R. Morris, F. Thoma
*Modulation of DNA Damage and Repair by Chromatin Proteins*
**M. Lambert**
J. Essigmann, M. MacCleod
*Repair Heterogeneity in Chromatin*
**P. Hanawalt**
V. Maher, I. Mellon, G. Pfeifer
*Genes Implicated in Transcription and Repair*
**J. Hoeijmakers**
J.-M. Egly, S. Prakash
*DNA Repair Pathways—I*
**S. Prakash**
T. Kunkel, L. Prakash, S. Wilson
*DNA Repair Pathways—II*
**R. Wood**
D. Bogenhagen, P. Jeggo, A. Yasui
*Gene Induction by DNA Damage*
**M. Kastan**
M. Karin, K. McEntee, M. Smith
*DNA Instability, DNA Repair and the Cell Cycle*
**T. Tlsty**
B. Stillman
*DNA Repair Deficient Diseases in Humans*
**M. Paterson**
R. Fishel, J. Hoeijmakers

## Metals in Biology

**Doubletree Hotel**
**Ventura, CA**

E.C. Theil, chair;
S.J. Lippard, vice chair

**22—26 January**

*Models for Metallobiomolecules*
**B. Haymore**
J. Groves, J.P. Sauvage, A. Schepartz
*Metalloproteins Bound by DNA or RNA*
**J. Coleman**
J. Berg, C. Kennedy, P. Schimmel, D. Thiele
*DNA and RNA Interactions with Transition Metal Complexes*
**J. Reedyk**
J. Barton, C. Burrows, J. Morrow, D. Sigman
*Metal/RNA Interactions*
**H. Noller**
T. Cech, T. Steitz, I. Tinoco
*Iron Mineralized Protein*
**E. Stifel**
N. Allewell, P. Harrison, S. Lipppard
*Multinuclear Metalloproteins—Mn, Ni*
**M. Klein**
G. Brudvig, A. Karplus, P. Lindahl, V. Pecararo, J. Penner-Hahn
*Multinuclear Metalloproteins—Fe*
D. Ballou, V. Huynh, J. Stubbe
*Metalloproteins—Cu, Zn and Heme*
**P. Kroneck**
I. Bertini, J. Burtsyn, J. Peisach, J. Valentine

## Molecular and Ionic Clusters

**Casa Sirena Resort**
**Oxnard, CA**

G. Scoles, chair;
U. Buck, M. Johnson, co-vice chairs

**8—12 January**

*Reactions In and With Clusters*
**C. Lineberger**
J.M. Mestdagh, R. Naaman, C. Wittig
*Spectroscopy of van der Waals Dimers*
**R.E. Miller**
A. van der Avoird, G. Fraser, R.J. LeRoy
*Highly Quantum Clusters*
**J. Northby**
R. Froechtenicht, W.D. Phillips, S. Stringari
*Spectroscopy of van der Waals Oligomers*
**D. Nesbitt**
Z. Bacic, M. Havenith
*Three Body Forces in Clusters*
**R. Saykally**
J. Bevan, J.M. Hutson
*Large Clusters*
**P. Felker**
H.P. Cheng, A. Fuchs, T.E. Gough
*Electronic Spectroscopy of Clusters*
**H.L. Dai**
T. Miller, D. Pratt, K. Yamanouchi
*Water Clusters*
**M. Berkowitz**
V. Buch, M. Okumura, T. Zwier
*Ionic Clusters and Electron Spectroscopy*
**M. Bowers**
J. Knee, K. Müller-Dethlefs, D. Neumark
*Grand Finale*
**J. Jortner**
W. Klemperer

## Molecular Pharmacology

**Holiday Inn**
**Ventura, CA**

G.L. Johnson, chair;
S. Coughlin, vice chair

**12—17 February**

*Structure, Function and Regulation of G Protein-coupled Seven Transmembrane Receptors*
**M. Hosey**
J. Benovic, S. Coughlin, L. Limbird
*Function and Properties of Heterotrimeric G Proteins*
**E. Neer**
H. Bourne, P. Casey, G. Milligan
*G Protein Effectors*
**R. Iyengar**
D. Clapham, H. Hamm, P. Sternweiss

**Discussion Leaders** are shown in **Bold type**; Speakers, in alphabetical order, are indicated in Regular type; *Topics* are printed in *Italics*

*Low Molecular Weight G Proteins*
**G. Bokoch**
R. Cerione, R. Kahn, I. Macara
*Inactivation of Signal Transduction Genes*
**B. Kobilka**
C. Malbon, G. Martin, G. Schultz
*Model Systems in Signal Transduction*
**R. Firtel**
J. Thorner, C. Zucker
*Cell Signaling*
**R. Davis**
J. Noel, R. Williams
*A Chemical Approach to Understanding and Controlling Signal Transduction*
**S. Schreiber**
*Structure-based Drug Design*
**F. Cohen**
A. Tulinsky, J. Wells, R. Zuckerman

## Nitric Oxide in Biochemistry and Biology

**Holiday Inn**
**Ventura, CA**

J.R. Lancaster, Jr., W.J. Payne, co-chairs;
L. Ignarro, J. LeGall, co-vice chairs

**29 January—3 February**

*Overviews: Chemistry and Biology of NO*
**J. Beckman**
L. Ignarro, J. Lancaster, W.J. Payne
*Detection and Analysis of NO*
**W.J. Payne**
T. Malinski, I. Moura
*Molecular Sites of NO Interaction—I Metals*
**J. Lancaster**
Y. Henry, B.-H. Huynh, A.J. Thomson
*Molecular Sites of NO Interaction—II Oxygen and Nitrogen*
**M. Feelisch**
J. Beckman, S. Tannenbaum, D. Wink
*Molecular Sites of NO Interaction—III Sulfur*
**L. Ignarro**
M. Feelisch, J. Fukuto, J. Stamler
*Enzymological Generation of NO—I*
**J. LeGall**
E. Adman, W. Zumft
*Enzymological Generation of NO—II*
**W. Zumft**
B. Masters, B. Mayer, D. Stuehr
Keynote Address
J.B. Hibbs, Jr.
*Enzymological Generation of NO—III*
**D. Stuehr**
S.J. Ferguson, T. Michel

## Plant-Herbivore Interactions

**Casa Sirena Resort**
**Oxnard, CA**

M.D. Rausher, chair;
M.D. Bowers, vice chair

**22—27 January**

*Plant-Herbivore Interactions and Chemistry*
M. Blum, A. Hagerman, E. Haslam, I. Kubo, J. Pasteels
*Plant-Herbivore Interactions and Behavior and Physiology*
M. Isman, D. Papaj, F. Provenza, M. Simmonds
*Plant-Herbivore Interactions and Ecology*
M. Berenbaum, M. Hay, C. Jones, N. Ohsaki, K. Raffa, N. Stamp
*Plant-Herbivore Interactions and Evolution*
E. Bernays, D. Futuyma, T. Mitchel-Olds, C. Mitter, N. Moran, E. Simms
Panel Discussion
I. Baldwin, D. Pilson, J. Schultz, L. Vet

## Polymers (West)

**Doubletree Hotel**
**Ventura, CA**

J.M. Pochan, chair;
E. Samulski, vice chair

**8—13 January**

*Morphology*
**J.D. Hoffman**
F. Bates, H. Marand, J. Vancso
*Reptation*
**J. Rabolt**
R. Wool
*Supercritical Fluid Applications and Synthesis*
**B. Brittain**
J. DeSimone, K. Johnston, C. Pugh
*Theory*
**A. Balasz**
G. Fredrickson, M. Rubinstein
*Relaxation*
**G. Williams**
S. Chu, J. Kornfield, F. Kremer
*Single Site Catalysts*
**B. Novak**
J. Stevens, R. Waymouth
*Interfaces*
**A. Mayes**
E. Kramer, T. Russell, M. Tirrell
*Theory*
**M. Muthukumar**
P.-G. de Gennes
*New Analytical Techniques*
**E. Samulski**
P. Danis, T. Ryan

## Quantitative Genetics and Biotechnology

**Doubletree Hotel**
**Ventura, CA**

B.S. Weir, chair;
W. Beavis, vice chair

**12—17 February**

*QTL Mapping Theory*
**B. Weir**
R. Jansen, S. Zeng
*Success Stories*
**F. Enfield**
D. St. Clair, R. Sederoff
*Human Quantitative Genetics*
**R. Cloninger**
M.C. King, E. Thompson
*Plant Quantitative Genetics*
**W. Beavis**
M. Edwards
*Mutations and Quantitative Traits*
**W. Hill**
T. Mackay, M. Rothschild
*Molecular Genetic Advances*
**B. Burr**
R. Davis, W. Dietrich
*Evolutionary and Conservation Genetics*
**W. Atchley**
J. Doebley, P. Keim
*Developmental Genetics*
**A. Clark**
B. Bowen
*Animal Quantitative Genetics*
**E. Eisen**
D. Pomp, T. Rocheford

## Quinone and Redox-Active Amino Acid Cofactors

**Doubletree Hotel**
**Ventura, CA**

D.M. Dooley, chair;
P.F. Knowles, vice chair

**19—24 February**

*Tyrosine Radicals, Quinones and Semiquinones in Enzymes—I*
J. DeGray, R.M. Garavito, J. McCracken, J. Sanders-Loehr
*Tyrosine Radicals, Quinones and Semiquinones in Enzymes—II*
J.P. Klinman, K. Tanizawa
*Radicals and Semiquinones in Enzymes and Photosystem II*
G.T. Babcock, B.A. Barry, B. Branchaud, S.E.V. Phillips, A.W. Rutherford
*Ribonucleotide Reductases*
M. Fontecave, B.-M. Sjöberg, J. Stubbe
*Enzyme Radicals*
P. Frey, J. Knappe, J.W. Kozarich, H.-W. Park
*Structure and Function of Quinoproteins*
C.A. Anthony, V.L. Davidson, H. Duine, F.S. Mathews
*Biological Electron Transfer*
H.B. Gray
*Mechanisms of Protein Oxidation: Models and Effects of Free Quinones*
R. Dean, D.E. Hultquist, P.R. Ortiz de Montellano

## Structures, Energetics and Dynamics of Gaseous Ions

**Doubletree Inn**
**Ventura, CA**

M.T. Bowers, chair;
R.R. Squires, vice chair

**26 February—2 March**

*Organic Mechanisms*
**C. DePuy**
J. Brauman, S. Kass, R. Squires
*Interstellar Chemistry*
**E. Herbst**
M. Smith, P. Thaddeus
*Chemical Physics*
**R. Marx**
T. Baer, G. Brenton, C. Ng
*New Faces*
**J. Brodbelt**
D. Dearden, M. Okamura
*Biological Methods*
**J. Adams**
J. Beauchamp, B. Chait, F. McLafferty
*Theory*
**M. Gordon**
G. Scuseria, D. Truhlar
*Clusters*
**T. Kondow**
P. Armentrout, M. Duncan, K. Homann
*Featured Speaker*
**M. Bowers**
K. Jennings
*Reactivity*
**H. Grutzmacher**
V. Bierbaum, D. Böhme, C. Lifshitz

## Temperature Stresses in Plants

**Casa Sirena Resort**
**Oxnard, CA**

M.F. Thomashow, chair;
D. Ort, vice chair

**29 January—3 February**

*Life at Extreme Temperatures*
**R. Prince**
S. Smith, G. Zeikus
*Effects of Temperature on Photosynthesis*
**D. Ort**
I.R. Davison, E. Robertson
*Role of Membranes in Temperature Stress Tolerance*
**J. Crowe**
J. Browse, N. Murata, P. Steponkus
*Whole Plant Responses to Temperature Stress*
M. Ball, J. Burke
*Mechanisms of Sensing Temperature*
**R. Dhindsa**
W. Gurley, T. Palva, B. Pickard
*Heat-Stress Proteins*
**E. Vierling**
A. Gatenby, J. Jordano
*Links Between Temmperature and Drought Stress Responses*
**C. Vertucci**
T. Close, C. Liljenberg, K. Shinozaki
*Breeding for Temperature Stress Tolerance*
**J. Greaves**
H. Nguyen, J. Palta

More detailed information on these Conferences can be obtained via e-mail:

via **gopher**,
hackberry.chem.niu.edu port 70

via **word-wide web**,
http://hackberry.chem.niu.edu:70/0/webpage.html

via **anonymous ftp** to
hackberry.chem.niu.edu
(in the pub/Conferences/GordonConferences directory)

**Discussion Leaders** are shown in **Bold type**; Speakers, in alphabetical order, are indicated in Regular type; *Topics* are printed in *Italics*

**PLEASE DO NOT SEND PAYMENT WITH THIS APPLICATION**

# GORDON RESEARCH CONFERENCES

*"Frontiers of Science"*

# APPLICATION – MAIL EARLY

**PLEASE PRINT OR TYPE**

**IMPORTANT NOTE**

Applications are required from all individuals participating in a Conference. This applies to the Chair, Co-Chairs, Vice Chair, Discussion Leaders, Speakers, Poster Participants and Potential Conferees.

***Deadline for Receipt of Applications is 6 Weeks Prior to the Conference.***

Please return to:

Conference Application, Gordon Research Conferences, University of Rhode Island,
P.O. Box 984, West Kingston, RI 02892-0984 USA (mail)
or
Conference Application, Gordon Research Center, 3071 Route 138, Kingston, RI 02881 USA (delivery)
Fax: (401) 783-7644 Phone: (401) 783-4011/3372 E-mail: grc@grcmail.grc.uri.edu

Conference Location _____
Name of Conference _____ Date of Conference _____
Name _____
First Middle Initial Last
Organization _____
Business Address _____
_____
City _____ State _____ Accommodation (Room & Meals) for:
Country _____ Code _____ Applicant _____
Phone _____ Fax _____ Guest(s) - Adult _____
E-mail _____ Child(ren) _____

Please check: I work in ❒ Academic Institution – if predominantly undergraduate, please check here ❒
❒ Government Agency ❒ Industrial Corporation

Please check: ❒ Chair ❒ Vice Chair ❒ Discussion Leader ❒ Speaker ❒ Poster Presenter ❒ Attendee

**IMPORTANT**

Previous Conferences Attended: ❒ None ❒ 1-5 ❒ 6-10 ❒ 10+
Your Position? ❒ Graduate Student ❒ Postdoc ❒ Research Scientist
❒ Professor ❒ Research Director ❒ Program Manager ❒ Other _____

Are you personally involved in research activities in the subject area of the Conference? ❒ Yes ❒ No

How many papers have you published during the past 3 years in the subject area of the Conference? _____

You are invited to submit an abstract for a poster presentation at the Conference; many Chairs find abstracts very useful in making decisions concerning admission to their Conferences. **Applications are referred to the Conference Chair in accordance with the established regulations. Following the Chair's acceptance, the registration card will be sent to you. Please complete it and return it immediately with payment of the Fixed Fee.**

GORDON RESEARCH CONFERENCES ADMITS SCIENTIFICALLY-QUALIFIED CONFEREES OF ANY SEX, RACE, AGE, COLOR AND NATIONAL ORIGIN

Indicate your particular activities which justify favorable consideration of you as a participant and contributor to this Conference (required for poster presenters and attendees)

The recording of lectures by tapes, etc. and the photography of slide material are prohibited. Printed reference to Gordon Research Conference papers and discussion is not permitted. Authors are requested to omit references to the Conferences in any publication. Guests are not permitted to attend the conference lectures and discussion sessions.
Each member of the Conference agrees to these regulations when registration is accepted.

Signature _____ Date _____