

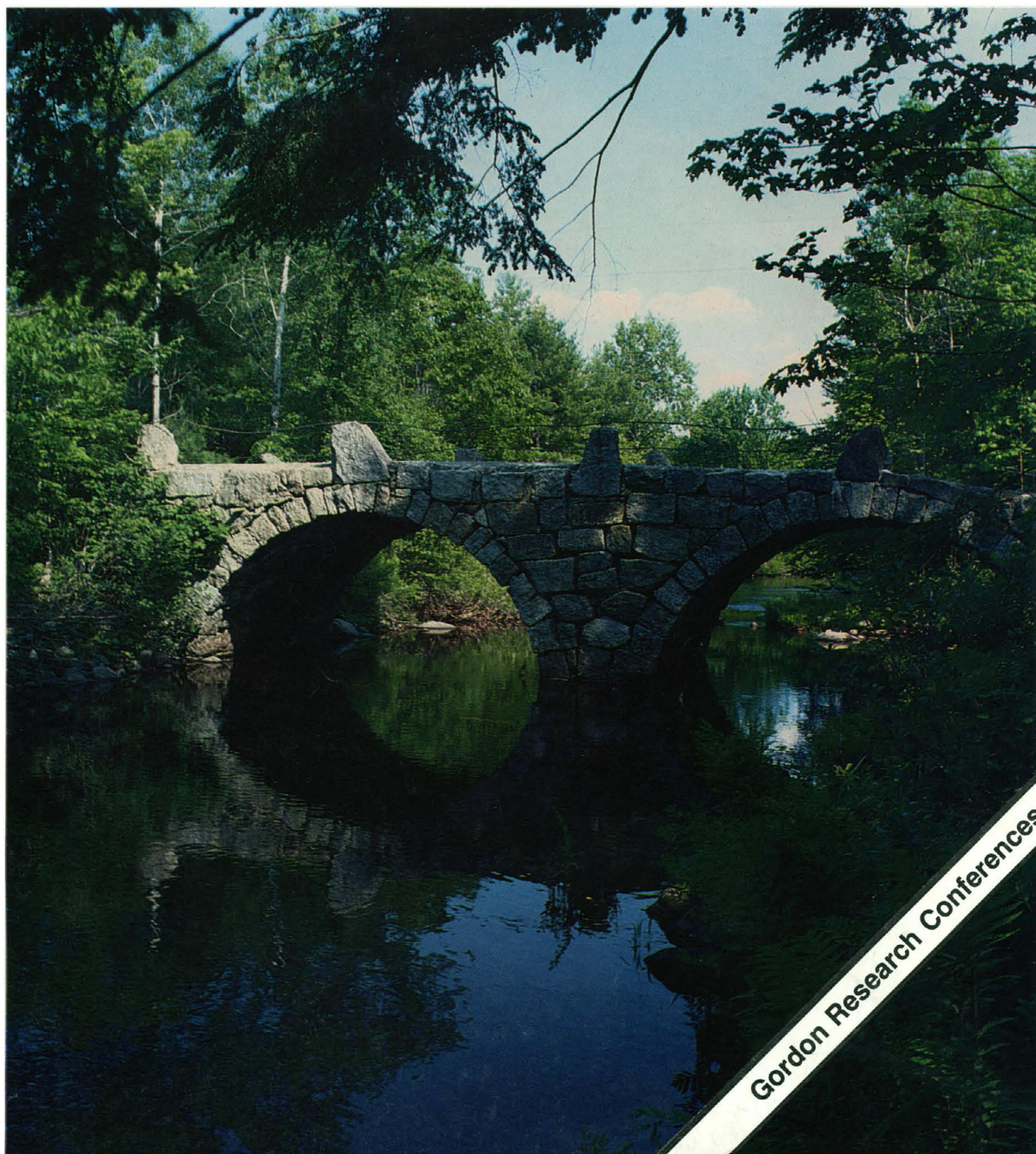
AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

4 MARCH 1988

\$3.00

VOL. 239 ■ PAGES 1069-1216



Gordon Research Conferences



# Our Commitment: Innovative Solutions For Your Ultracentrifugation Needs



**Instruments**—with the advanced L8M Series (80,000 rpm/602,000 g); the hard-working L7 Series (65,000 rpm/485,000 g); the revolutionary TL-100 Tabletop (100,000 rpm/541,000 g). All with vacuum-encased induction drives for outstanding efficiency and reliability. Also available: the Airfuge® air-driven ultracentrifuge (110,000 rpm/199,000 g) for rapid pelleting.

**Rotors**—more than 50 choices. Rotors fine-tuned to Beckman drive systems and enhanced by computer-aided design and an ongoing materials development program. Some recent Beckman

firsts: vertical tube rotors with 1.7 g/mL density ratings so plasmid preps can be run without speed reductions; TL-100 rotors with short pathlengths for isopycnic separations in one-fifth the usual time.

**Tubes and Bottles**—more than 120 versions in six materials. Another Beckman innovation: capless Quick-Seal® tubes that eliminate time-consuming preparation steps. And now our new g-Max™ System extends

Innovative new rotors: the VC-53, a vertical tube rotor made of carbon fiber that weighs only 12 pounds; the Type 50.4 Ti titanium fixed angle rotor for spinning up to 44 6.5-mL lipoprotein samples; and the economical VAC-80, a 10-place vertical tube rotor with aluminum core surrounded by a composite ring for extra strength.

their use to biocontainment in swinging bucket rotors and to short-pathlength runs in standard size rotors.

**Accessories**—take your choice. From something as simple as a new hand-held tube sealer to something as sophisticated as the SpinPro™ Expert System that helps you optimize runs and more.

*All from one source. Beckman service, too!*

Contact Beckman Instruments, Inc., Spinco Division, 1050 Page Mill Road, Palo Alto, CA 94304, U.S.A. (1-800-742-2345). Offices worldwide.

Circle No. 120 on Readers' Service Card

## BECKMAN

A SMITHKLINE BECKMAN COMPANY



**Hot Off the Press!**

**1988**

# THEY'RE HERE! THEY'RE ABSOLUTELY FREE!

OMEGA's **9** New Complete Handbooks & Encyclopedias



- ✓ **TEMPERATURE**—  
872 pages
- ✓ **PRESSURE**—368 pages
- ✓ **FLOW**—304 pages
- ✓ **pH**—168 pages
- ✓ **DATA ACQUISITION**—  
352 pages
- ✓ **BOOK OF DISCOUNT  
SOFTWARE**—400 pages
- ✓ **BOOK OF BOOKS**—  
1,300 pages
- ✓ **TEST INSTRUMENTATION  
& TOOLS**—136 pages
- ✓ **ELECTRIC HEATERS**—  
200 pages

Circle the reader service number to receive  
your free Handbook Qualification form.



An OMEGA Group Company

One Omega Drive, Box 4047, Stamford, CT 06907  
Telex 996404 Cable OMEGA FAX (203) 359-7700

**In a Rush For Your FREE Handbooks?**

**DIAL (203) 359-RUSH  
(203) 359-7874**

© COPYRIGHT 1987, OMEGA ENGINEERING, INC. PRINTED IN USA  
Circle No. 45 on Readers' Service Card



1075 This Week in *Science*

## Editorial

- 1077 Science Advice to the Government

## Letters

- 1079 *Homo photosyntheticus*: Reaction: M. L. STEPHENS AND R. LOCKWOOD;  
D. E. KOSHLAND, JR.; R. D. JONES ■ Foreign Graduate Students:  
J. C. STANLEY; J. V. MARTINEZ ■ Schistosomiasis Eradication in China:  
F. CONRAD ■ Plastic Wrappers: J. F. PETOLINO; F. G. FISK

## News & Comment

- 1082 Science Advice Back to the Future?  
1084 The Long, Lost Survey on Sex  
1086 Pesticides to Be Judged on Leachability  
Locusts Find Prime Jumping-Off Place  
1087 AIDS Policy in the Making  
1088 What *Perestroika* Means for American Business  
1089 Superconductor Funds Flat  
1090 *Briefing*: SSC Site Pick Delayed ■ APA Likely to Sell *Psychology Today* ■ Howard  
Hughes Establishes Unit at MIT ■ Ukrainian Scientists Protest Nuclear Plans ■  
Somalis Escape Execution ■ NAS Opens Japan Office

## Research News

- 1091 Orchestrating the Sperm-Egg Summit: Interferon-Like Factor Signals Pregnancy  
■ Sperm Receptor Gene Sequenced ■ New Functions for a Testes Growth Factor  
1093 Cell Growth Control Comes Under Scrutiny

## Articles

- 1105 Insights into Enzyme Function from Studies on Mutants of Dihydrofolate  
Reductase: S. J. BENKOVIC, C. A. FIERKE, A. M. NAYLOR  
1110 Manufacturing Innovation and American Industrial Competitiveness:  
S. S. COHEN AND J. ZYSMAN  
1115 Free-Electron Lasers: C. A. BRAU

## Research Articles

- 1121 Insertional Mutagenesis of the *Drosophila* Genome with Single P Elements:  
L. COOLEY, R. KELLEY, A. SPRADLING

## Reports

- 1129 Continuing Worldwide Increase in Tropospheric Methane, 1978 to 1987:  
D. R. BLAKE AND F. S. ROWLAND  
1131 Synchrotron X-ray Diffraction Measurements of Single-Crystal Hydrogen to 26.5  
Gigapascals: H. K. MAO, A. P. JEPHCOAT, R. J. HEMLEY, L. W. FINGER,  
C. S. ZHA, R. M. HAZEN, D. E. COX

■ **SCIENCE** is published weekly on Friday, except the last week in December, and with an extra issue in February 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 at an additional entry. Now combined with **The Scientific Monthly**® Copyright © 1988 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): \$65. Domestic institutional subscription (51 issues): \$98. Foreign postage extra: Canada \$32, other (surface mail) \$27, air-surface via Amsterdam \$65. First class, airmail, school-year, and student rates on request. Single copies \$3.00 (\$3.50 by mail); back issues \$4.50 (\$5.00 by mail); Biotechnology issue, \$5.50 (\$6 by mail); classroom rates on request; Guide to Biotechnology Products and Instruments \$16 (\$17 by mail). **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. 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, 21 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/83 \$1 + .10. **Postmaster:** Send Form 3579 to *Science*, 1333 H Street, NW, Washington, DC 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.





COVER Stone arch bridge in New Hampshire. See page 1159 for details about the Gordon Research Conferences in New Hampshire and Rhode Island. [Photo courtesy of New Hampshire Office of Vacation Travel, Concord, NH 03301]

- 1134 A Single Receptor Binds Both Insulin-Like Growth Factor II and Mannose-6-Phosphate: R. G. MACDONALD, S. R. PFEFFER, L. COUSSENS, M. A. TEPPER, C. M. BROCKLEBANK, J. E. MOLE, J. K. ANDERSON, E. CHEN *et al.*
- 1137 Estrogen-Dependent in Vitro Transcription from the Vitellogenin Promoter in Liver Nuclear Extracts: B. CORTHÉSY, R. HIPSKIND, I. THEULAZ, W. WAHLI
- 1139 Germline Transformation Used to Define Key Features of Heat-Shock Response Elements: HUA XIAO AND J. T. LIS
- 1142 Multipotent Precursors Can Give Rise to All Major Cell Types of the Frog Retina: R. WETTS AND S. E. FRASER
- 1145 A Gene for Dihydrofolate Reductase in a Herpesvirus: J. J. TRIMBLE, S. C. S. MURTHY, A. BAKKER, R. GRASSMANN, R. C. DESROSIERS
- 1147 Synaptic Reorganization in the Hippocampus Induced by Abnormal Functional Activity: T. SUTULA, H. XIAO-XIAN, J. CAVAZOS, G. SCOTT
- 1150 The Fos Complex and Fos-Related Antigens Recognize Sequence Elements That Contain AP-1 Binding Sites: B. R. FRANZA, JR., F. J. RAUSCHER III, S. F. JOSEPHS, T. CURRAN

## AAAS Meetings

- 1154 *Thirteenth Annual AAAS Colloquium on R&D Policy*: Advance Registration Form and Hotel Reservation Form

## AAAS News

- 1156 Awards Presented at Annual Meeting: J. WRATHER ■ *SB&F* Reviews High School Texts ■ Pacific Division Holds R&D Conference ■ SWARM Meets in Wichita Late This Month ■ More Museum Benefits for Members: M. ZENDELL

## Meetings

- 1159 *Gordon Research Conferences*: A. M. CRUICKSHANK ■ Program and Registration Form

## Book Reviews

- 1183 Molecules and Morphology in Evolution, *reviewed by* T. ROWE ■ Organic Chemistry: The Name Game, O. C. DERMER ■ Continental Extensional Tectonics, D. B. SLEMMONS ■ Phycomyces, D. H. GRIFFIN ■ Books Received

## Products & Materials

- 1188 Query Software for On-Line Services ■ Microplate Reader ■ Spectrophotometer ■ Glucose, L-Lactate Analyzer ■ Automated Protein, Enzyme Separation ■ Electrophoresis Solution ■ Protein Kinase Inhibitors ■ Literature

### Board of Directors

Sheila E. Widnall  
*Retiring President,  
Chairman*

Walter E. Massey  
*President*

Richard C. Atkinson  
*President-elect*

Harold Amos  
Floyd E. Bloom  
Mary E. Clutter  
Eugene H. Cota-Robles  
Mildred S. Dresselhaus  
Beatrice A. Hamburg  
Donald N. Langenberg  
Frank von Hippel  
William T. Golden  
*Treasurer*  
Alvin W. Trivelpiece  
*Executive Officer*

### Editorial Board

Elizabeth E. Bailey  
David Baltimore  
William F. Brinkman  
Philip E. Converse  
Joseph L. Goldstein  
F. Clark Howell  
James D. Idol, Jr.  
Leon Knopoff  
Oliver E. Nelson  
Helen M. Ranney  
David M. Raup  
Howard A. Schneiderman  
Larry L. Smarr  
Robert M. Solow  
James D. Watson

### Board of Reviewing Editors

John Abelson  
Qais Al-Awqati  
Don L. Anderson  
Stephen J. Benkovic  
Floyd E. Bloom  
James J. Bull  
Charles R. Cantor  
Ralph J. Cicerone  
John M. Coffin  
Bruce F. Eldridge  
Paul T. Englund  
Theodore H. Geballe  
Roger I. M. Glass  
Stephen P. Goff

Robert B. Goldberg  
Corey S. Goodman  
Jack Gorski  
Stephen J. Gould  
Richard M. Held  
Gloria Heppner  
Eric F. Johnson  
Konrad B. Krauskopf  
Charles S. Levings III  
Richard Losick  
Karl L. Magleby  
Philippa Marrack  
Joseph B. Martin  
John C. McGiff  
Mortimer Mishkin  
Jiri Novotny  
Gordon H. Orians

Carl O. Pabo  
John S. Pearce  
Yeshayau Pocker  
Jean Paul Revel  
James E. Rothman  
Daniel V. Santi  
Thomas C. Schelling  
Ronald H. Schwartz  
Otto T. Solbrig  
Robert T. N. Tjian  
Virginia Trimble  
Geerat J. Vermeij  
Harold Weintraub  
Irving L. Weissman  
George M. Whitesides  
Owen N. Witte  
William B. Wood





# Imagine what you could do if your computer could see.

Eikonix® high performance digital imaging cameras give your computer the ability to see. Which in turn gives you the ability to improve the quality of your research, and open new markets.

Easy-to-use Eikonix cameras are compatible with IEEE 488, DEC Q-Bus, Unibus and Multibus based systems as well as IBM® PCs. They're the most flexible, cost-

Eikonix high performance digital imaging cameras convert stationary pictures and objects into digital form via a linear sensor array. They offer precise analytical capabilities and highly accurate storage and retrieval for more applications than you can imagine.

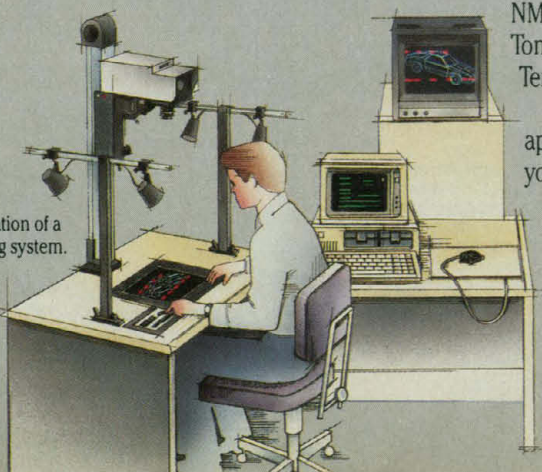


effective, reliable, and accurate means available for getting high resolution image data into a computer for analysis, manipulation, display and storage. And they're backed by a team of specialists that provides all the technical support you need for whatever applications you have—worldwide.

Typical applications: Artificial Intelligence ▫ Pattern Recognition ▫ Remote Sensing ▫ Earth Resource Analysis ▫ Color Infrared Imaging ▫ Electron Microscopy ▫ Astrophysics ▫ CAD input ▫ Modeling (2D & 3D) ▫ Circuit Design ▫ Mapping: Radar, Cartographic, Thematic, Utility, Topographic ▫ Medical Imaging: NMR, X-Ray, Ultrasound, PET, Autoradiography, Tomography ▫ Materials Testing: Surface Analysis, Tensilemetry.

If you'd like us to focus on your particular application, please call us at (617) 275-5070. If you'd like some literature, simply write to us at Eikonix Corporation, 23 Crosby Drive, Bedford, MA 01730, Telex: 951231.

Illustration of a typical imaging system.



**EIKONIX®**  
A KODAK COMPANY

See Us At NCGA '88 Booth #1252.

Circle No. 123 on Readers' Service Card



## This Week in SCIENCE

### Methane in the troposphere

**R**ICE paddies, swamps, cattle rumen, and other anaerobic biologic processes generate and release methane; this gas enters the troposphere predominantly from the Northern Hemisphere and is then mixed and transported globally (page 1129). Measurements of methane show that methane has increased steadily in the air since 1978; methane concentrations today are twice what they were 200 years ago (and similar low values as far back as 3000 years according to records retained in air bubbles in Greenland and Antarctica ice cores). Blake and Rowland discuss the physical and chemical processes by which methane is transported upward into the atmosphere. Through oxidation of methane, water is added to the stratosphere, and this additional water vapor may enlarge the polar stratospheric clouds that form during winter over Antarctica; in turn, these clouds may affect the ozone layer and the depth of the ozone hole. Methane, like carbon dioxide and other compounds, is an important contributor to the greenhouse effect through its ability to trap outgoing infrared radiation. The balance of this gas on the earth and in the atmosphere is complex, because methane is produced by many sources.

### High-pressure hydrogen

**T**HE behavior of hydrogen at high pressures is of considerable interest for understanding the basic physics of molecular solids, the evolution of the solar system, and the astrophysical processes occurring inside the hydrogen-rich planets Saturn and Jupiter (page 1131). At high pressure, solid hydrogen is expected to undergo a transition from an insulating molecular solid to a metal, and this metal may have interesting properties such as high-temperature superconductivity. Mao *et al.* studied the structure of single-crystal hydrogen with a new synchrotron x-ray diffraction technique. The equation of state (which describes the volume of

hydrogen as a function of pressure and temperature) was determined up to pressures of 26.5 gigapascals. By extrapolation, it is predicted that around 230 gigapascals of hydrogen should undergo a transition from the molecular to the atomic phase.

### Heat-shock gene regulation

**I**N response to increases in temperature, regulatory proteins in cells bind to segments of DNA and activate nearby heat-shock genes (page 1139). A common sequence of nucleotides has regularly been found near heat-shock genes and thus has been designated the heat-shock consensus element (HSE), a necessary sequence (actually a pair of sequences) to which regulatory proteins are able to bind. Xiao and Lis show, using recombinant DNA technology and a *Drosophila* germline transformation system, that the original HSE of 14 nucleotides is not the complete consensus sequence. Instead, a somewhat longer region—two 10-base-pair sequences in tandem encompassing the original HSE as well as sequences flanking it—is crucial in determining whether or not the heat-shock gene will be activated. Because the heat-shock response serves as a model for gene activation in general in eukaryotes, molecular features worked out for this response may be relevant to the mechanism of activation of other genes. Through a determination of what turns on the heat-shock gene, it may be possible to design better expression vectors for producing large amounts of desired gene products in eukaryotes.

### Pluripotent precursors of retinal cells

**A**LL of the major cell types of the frog retina can arise from a single progenitor cell in the embryo; the commitment of retinal cells to their final forms and functions appears to be a relatively late-occurring process in development (page 1142). Wetts and

Fraser used fluorescent dextran to label single cells in the optic vesicles of frog embryos; dextran-bearing cells, the progeny of the original "founder" cell, were identified later in retinas of the free-swimming tadpoles. The retina has three layers: an outer nuclear layer containing photoreceptor cells, an inner nuclear layer containing horizontal cells, bipolar cells, amacrine cells, and glial Müller cells, and a ganglion layer of ganglion cells. In all three layers, cells with the label were detected. The emergence of diverse retinal cells from a pluripotent precursor may be a universal phenomenon among vertebrates; it has previously been shown to occur in the rat. Signals that a cell receives from neighboring cells may in some fashion participate in the process of cellular commitment.

### Viruses carry the DHFR gene

**T**wo lymphotropic herpesviruses isolated from New World primates (squirrel monkeys and spider monkeys) have DNA sequences that encode the enzyme dihydrofolate reductase (DHFR) (page 1145). Genes for this enzyme are found in the cells of prokaryotes and eukaryotes; among viruses, they have previously been detected only in bacteriophages (viruses of bacteria) and not in viruses of mammals. DHFR plays a central role in DNA synthesis and has for some time been the target of anticancer therapies because its activity can be inhibited by drugs such as methotrexate. In both herpesvirus saimiri and herpesvirus ateles, sequences of DHFR genes were most similar to sequences from mammalian sources. However, unlike the mammalian genes in which exons (coding sequences) are separated by a number of introns (the noncoding sequences), the viral sequences consisted only of contiguous exons. Trimble *et al.* speculate that these viruses may have captured the DHFR gene by reverse transcription from host cells and that the availability of a ready-to-translate enzyme may facilitate rapid viral reactivation from latency.

# Protein G

## **ENGINEERED TO PERFECTION**

Protein G Sepharose® 4 Fast Flow is the new affinity chromatography medium for the specific separation and purification of polyclonal IgG and monoclonal IgG of different subclasses. With its wider binding specificity, it complements Protein A Sepharose CL-4B — a gel already documented in thousands of references.

Protein G Sepharose 4 Fast Flow has been engineered to perfection by matching the optimized ligand with the best available matrix. Our Protein G is an engineered, recombinant product from which the albumin-binding region has been deleted genetically. The base matrix, Sepharose 4 Fast Flow, was selected after extensive evaluation in search of optimal capacity and flow rate.

The new gel complements Protein A Sepharose CL-4B by binding

- a wide range of IgG's, including human, mouse, rat, cow, goat, sheep, horse, and many others
- specific subclasses, including human IgG<sub>3</sub>, mouse IgG<sub>1</sub>, IgG<sub>2a</sub> and IgG<sub>2b</sub>, and rat IgG<sub>2a</sub> and IgG<sub>2b</sub>.

Protein G Sepharose 4 Fast Flow is excellent for separating monoclonal antibodies from ascites and from cell culture fluid. The gel binds more than 20 mg human polyclonal IgG/ml drained gel; a capacity unrivalled by any other commercial preparation.

In addition, Pharmacia LKB also supplies unbound recombinant Protein G for testing and analysis.

Order your Protein G products today or ask your representative for the Data Sheet.

### Ordering information

Product	Code No.	Pack size
Protein G Sepharose 4 Fast Flow	17-0618-01	5 ml
Protein G Sepharose 4 Fast Flow	17-0618-02	25 ml
Protein G	17-0619-01	5 mg



Pharmacia

UNITED IN SEPARATION **LKB**

Pharmacia LKB Biotechnology Inc. Piscataway, New Jersey 08854, Information: (800) 526-3618, In NJ: (201) 457-8000.

Circle No. 60 on Readers' Service Card



## American Association for the Advancement of Science

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

**Publisher:** Alvin W. Trivelpiece

**Editor:** Daniel E. Koshland, Jr.

**Deputy Editors:** Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*)

## EDITORIAL STAFF

**Managing Editor:** Patricia A. Morgan

**Assistant Managing Editor:** Nancy J. Hartnagel

**Senior Editors:** Eleanor Butz, Ruth Kulstad

**Associate Editors:** Martha Coleman, R. Brooks Hanson, Barbara Jasny, Katrina L. Keiner, Edith Meyers, Phillip D. Szuroni, David F. Voss

**Letters Editor:** Christine Gilbert

**Book Reviews:** Katherine Livingston, *editor*; Deborah F. Washburn

**This Week in Science:** Ruth Levy Guyer

**Contributing Editor:** Lawrence I. Grossman

**Chief Production Editor:** Ellen E. Murphy

**Editing Department:** Lois Schmitt, *head*; Mary McDaniel, Barbara E. Patterson

**Copy Desk:** Joi S. Granger, Beverly Shields, Anna Victoreen, Barbara Wittig

**Production Manager:** Karen Schools

**Assistant Production Manager:** James Landry

**Graphics and Production:** Holly Bishop, James J. Olivari, Eleanor Warner

**Covers Editor:** Grayce Finger

**Manuscript Systems Analyst:** William Carter

## NEWS STAFF

**News Editor:** Barbara J. Culliton

**News and Comment:** Colin Norman, *deputy editor*; William Booth, Mark H. Crawford, Diane Henry, Constance Holden, Eliot Marshall, Marjorie Sun, John Walsh

**Research News:** Roger Lewin, *deputy editor*; Deborah M. Barnes, Richard A. Kerr, Jean L. Marx, Leslie Roberts, M. Mitchell Waldrop

**European Correspondent:** David Dickson

## BUSINESS STAFF

**Business Staff Manager:** Deborah Rivera-Wienhold

**Classified Advertising Supervisor:** Karen Morgenstern

**Membership Recruitment:** Gwendolyn Huddle

**Member and Subscription Records:** Ann Ragland

**Guide to Biotechnology Products and Instruments:** Shauna S. Roberts

## ADVERTISING REPRESENTATIVES

**Director:** Earl J. Scherago

**Traffic Manager:** Donna Rivera

**Traffic Manager (Recruitment):** Gwen Canter

**Advertising Sales Manager:** Richard L. Charles

**Employment Sales Manager:** Edward C. Keller

**Marketing Manager:** Herbert L. Burklund

**Sales:** New York, NY 10036: J. Kevin Henebry, 1515 Broadway (212-730-1050); Scotch Plains, NJ 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); Chicago, IL 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-337-4973); San Jose, CA 95112: Bob Brindley, 310 S. 16 St. (408-998-4690); Dorset, VT 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581); Damascus, MD 20872: Rick Sommer, 24808 Shrubbery Hill Ct. (301-972-9270); U.K., Europe: Nick Jones, +44(0647)52918; Telex 42513; FAX (0392) 31645.

**Information for contributors** appears on page XI of the 18 December 1987 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005. Telephone: 202-326-6500.

Advertising correspondence should be sent to Tenth Floor, 1515 Broadway, NY 10036. Telephone 212-730-1050 or WU Telex 968082 SCHERAGO.

## Science Advice to the Government

With the Reagan years winding down and a presidential campaign increasingly tense, individuals and groups are speculating about how future developments will affect them. In particular, many scientists and engineers are wondering about their role in a new administration. All of them share a widely held belief that in the future science and technology will be even more important to society than they are now. But some scientists and engineers feel that expertise in research and development is inadequately utilized at the highest levels of government.

William T. Golden, treasurer of the AAAS, who has long been interested in the improvement of the science advisory apparatus, has focused attention on the matter. He is the editor of a just-published book\* that contains more than 80 essays about science advice to the federal government. The contributors include seven presidential science advisers, past and present, a number of key congressmen, and former President Gerald R. Ford. As might be expected, the presentations differ in content and recommendations.

One strain that emerges is a longing for the good old days of the President's Science Advisory Committee (PSAC) of the 1950s and 1960s. At that time, technical people of distinction had the attentive ear of presidents. Many of the matters dealt with had to do with nuclear weapons, a topic in which PSAC had expertise while competing sources of advice were limited. But now, the issues of prime concern to presidents have changed, and the availability of technical information and advice has expanded enormously.

Some of the issues cited as having precedence over R&D are economic competitiveness, trade agreements, deficits, foreign policy, education, jobs, and arms control. Science and technology are relevant to all of these matters but are not recognized as the crucial components in them. Gerald Ford writes (p. 141)

The major portfolios of defense, health, foreign affairs, space, commerce, etc., all contain items of science and technology. As issues in these major portfolios come through government processes . . . pertinent scientific research and development are judged on the basis of their importance to those larger governmental missions.

Another great difference between the days of PSAC and the present is the existence now of many sources of technical expertise. The resources of the departments and agencies of the Executive Branch have increased. More impressive has been the expansion of technical expertise available to the Congress. This includes scientists and engineers who are members of the congressional staff and personnel at the Office of Technology Assessment, the Congressional Research Service, and the General Accounting Office. The National Research Council serves both the legislative and executive branches. In addition, the more than 2000 scientific and professional associations located in Washington, D.C., are determined to advise anyone who will listen or who can read.

In the midst of such a Tower of Babel, a presidential science adviser may or may not be heard above the crowd. Presidents are the targets of countless position papers, and their day's agenda is filled with urgent matters. Issues of science and technology are rarely of sufficient immediate urgency to preempt attention.

Edward E. David, Jr., has pointed to one of the frailties of scientists when they are called upon to advise the government. Too many of them are unable to keep separate their technical knowledge and their ideological convictions.

H. Guyford Stever, who has had extensive experience as a presidential science adviser and as director of the National Science Foundation, is suspicious of highly centralized institutional arrangements for science and technology. He believes pluralistic decentralized mechanisms work best. He recommends that scientists and engineers take responsibility for identifying individuals who are technically competent and who are capable of managing departments and agencies of the government. Such individuals should be brought to the attention of transition teams when the new administration prepares to assume office.

Scientists and engineers will enhance their influence in such matters if they work actively and visibly for candidates and contribute to campaign funds.—PHILIP H. ABELSON

\*W. T. Golden, Ed., *Science and Technology Advice to the President, Congress, and Judiciary* (Pergamon, New York, 1988).



**For innovation, quality and service, call USB,  
the company that introduced . . .**

For scientific advances throughout a wide range of research biochemicals for molecular biology—as well as for unsurpassed quality and service in the supply of more than 6,000 general biochemicals, look to USB.

USB introduced Sequenase, the revolutionary T7 DNA Polymerase that extends the limits of sequencing.

USB's GeneScribe, the first commercially offered T7 RNA Polymerase, is the system of choice for transcription.

USB introduced the first and the purest Cloned Polynucleotide Kinase.

And USB's standards of excellence—plus the guarantees that go with them—also apply to over 6,000 general biochemicals.

For innovation, quality—and technical support—to protect the integrity of your research, turn to USB for proven product integrity in:

Acrylamide	Nucleotides
AMV Reverse	Restriction Enzymes
Transcriptase	SSB and RecA
Cesium Chloride	Proteins
DNA Polymerase-	T4 DNA Ligase
Klenow	Terminal Deoxynucle-
DTT	otidyl Transferase
Hepes	Tris Enzyme Grade

*For a free copy of our Molecular Biology Catalog, or our General Catalog, write USB at P.O. Box 22400, Cleveland, Ohio, 44122. Phone 800/321-9322. From Ohio or Canada, call collect to 216/765-5000. Telex: 980718. FAX: 216/464-5075.*

*\*Patent Pending*

U N I T E D   S T A T E S   B I O C H E M I C A L   C O R P O R A T I O N

Circle No. 90 on Readers' Service Card



they could eliminate the snails in the waterways where barefoot peasants picked up the infection. It was decided that they needed the human fertilizer and must somehow get rid of the snails. After a careful study of the habits of the host snail, a massive nationwide education campaign about the disease and steps necessary to eradicate it was initiated. Then the voluntary labor of millions of peasants, assisted by students, teachers, office workers, and the army, was mobilized to drain the rivers and ditches, dig away the soil along the banks where the snails made their homes, and bury the soil. The effort involved scientists but, just as important, the direct knowledge of the peasants, who could see to it that the waterways would be drained in a logical order, avoiding serious problems of waterlogging or dehydrating various areas.

The campaign continues today village by village and county by county. It has required repeated political decisions to use vast amounts of human labor for the fight against snails, at the expense of many other priorities, during years which saw political attacks from the Soviet Union and several natural disasters. By 1983, the number of infected Chinese had been reduced from an estimated 10 million (2) to about 1 million (3).

Although the war on schistosomiasis in China could perhaps not have been waged in the same labor-intensive way elsewhere, different strategies might have been adopted in other suffering countries. The story is a dramatic illustration that massive public health measures are dependent less on expensive, technology-intensive research than on political will and trust in the strength, power, and intelligence of ordinary people.

FRAN CONRAD  
661 West Johnson Street,  
Philadelphia, PA 19144

#### REFERENCES

1. J. Horn, *Away with All Pests* (Monthly Review Press, New York, 1971).
2. S. P. Mao and B. R. Shao, *Am. J. Trop. Med.* 31, 92 (1982).
3. S. P. Mao, *Chin. Med. J.* 99, 439 (1986).

#### Plastic Wrappers

I was disappointed to see that *Science* is now being mailed in a plastic wrapper. We hear a lot about how communities are having to confront the problems associated with excessive solid waste. Does it make sense to encourage the use of materials that do not

easily disappear from the environment? It seems to me that a simple address stamp would suffice. The American Association for the Advancement of Science should be setting a better example.

JOSEPH F. PETOLINO  
Technology Development,  
United AgriSeeds, Inc.,  
Post Office Box 4011,  
Champaign, IL 61820

At last the striking covers of *Science* can now be enjoyed without being defaced by the address label. I had written several years ago about this "problem" and found that the attitude was that it was a "hopeless problem." I am delighted that a solution has been found.

FRANKLIN G. FISK  
College of General Studies, Science,  
Western Michigan University,  
Kalamazoo, MI 49008

*Erratum:* In Roger Lewin's Research News article "Recount on Amazon trees" (5 Feb., p. 563), two errors occurred. At the end of the third paragraph, the quote from Alwyn Gentry should have ended, "... with 63% of species represented by single individuals and only 15% of species represented by more than two individuals." The last word of the article should have been "importance."

## BURN YOUR REFERENCE CARDS!

### REF-11™

Computerizes your REFERENCES  
and prepares your BIBLIOGRAPHIES

- ☐ Maintains a data base of references
- ☐ Searches for any combination of authors, years of publication, reference title, publication title, keywords or abstract
- ☐ Formats bibliographies exactly as you want them
- ☐ Reads your paper, inserts citations into the paper, and prepares a bibliography of the references cited (optional)
- ☐ Downloads references from MedLine data bases such as NLM, BRS and DIALOG (optional)

IBM PC/XT/AT, MS-DOS, CP/M 80 ... **\$195<sup>00</sup>**

RT-11, TSX-Plus, RSX-11, P/OS ..... **\$250<sup>00</sup>**

VAX/VMS (native mode) ..... **\$350<sup>00</sup>**



ANY  
MANUAL **\$15<sup>00</sup>**

ANY  
MANUAL  
& DEMO **\$20<sup>00</sup>**

322 Prospect Ave., Hartford, CT 06106  
(203) 247-8500

Connecticut residents add 7½% sales tax.

Circle No. 36 on Readers' Service Card

## CUSTOM PEPTIDES

### SPECIAL OFFER BEFORE PRICE INCREASE

- Synthesis
- Radioactive Labeling
- Amino Acid Analysis
- Milligram to Gram Amounts
- Personalized Consultation
- Oriented to the Small Research Laboratory

For more Information Contact:

John B. Bruins  
PEPTIDE SYNTHESIS FACILITY  
DIVISION OF INFECTIOUS DISEASES  
CHILDREN'S HOSPITAL  
300 LONGWOOD AVENUE  
BOSTON, MA 02115

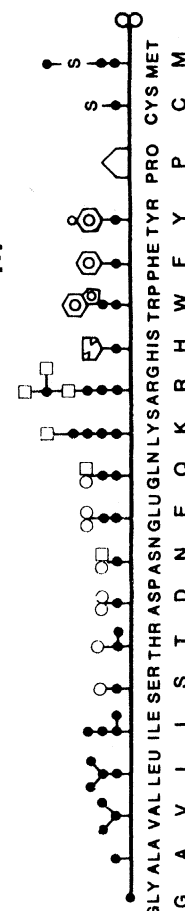
(617) 735-8310

FAX: (617) 735-8387

6:00 PM - 6:00 AM EST

Amino Acid Symbols: Copyright AAAS

Circle No. 106 on Readers' Service Card

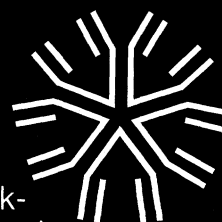


SCIENCE, VOL. 239



## AIDS RESEARCHERS:

# DETECT **HIV ANTIGEN** IN LESS THAN 4 HOURS.



This assay is a dynamic breakthrough in specifically measuring HIV p24 core antigen levels, maximizing sensitivity, specificity, and accuracy while enhancing speed and convenience. Coulter Immunology is pleased to announce the availability of a new microplate HIV Antigen EIA that offers many improvements over existing test systems:

- **FASTER TURNAROUND:** The Coulter HIV Antigen Test delivers accurate results in less than four hours. Technologist time is only 40 minutes.
- **SUPERIOR SENSITIVITY:** Measures less than 10 picograms per milliliter of core-related proteins, primarily p24.
- **HIGH SPECIFICITY:** Monoclonal antibody capture with no cross-reactivity with HTLV-I, HTLV-II, Cytomegalovirus, Herpes Simplex I or II, Epstein-Barr virus, Legionnaires', Toxoplasmosis, Rheumatoid Factor, or Bilirubin.
- **CHOICE OF SPECIMENS:** Plasma, serum, or culture fluid with equal sensitivity.
- **EASIER TO RUN:** Color-coded reagents minimize pipetting error and allow internal and ongoing QC of test performance.
- **FLEXIBILITY/ECONOMY:** Removable 8-well strips permit assays of 8 to 96 wells per run. Therefore, one can perform 12 separate runs using just one plate.
- **MORE SAFETY FEATURES:** Employs non-infective sonified, detergent detoxified HIV. Lyse reagent detoxifies virus in sample during first step of procedure.

For more information about the Coulter HIV Antigen EIA (96-well microplate Kit), call us at 1-800-327-3778 (in Florida, 1-800-327-6531, Ext. 6880). Coulter Immunology, the company with the broadest line of human-specific cell surface monoclonal antibodies, provides solutions to investigations of the most pressing problems of the medical community.

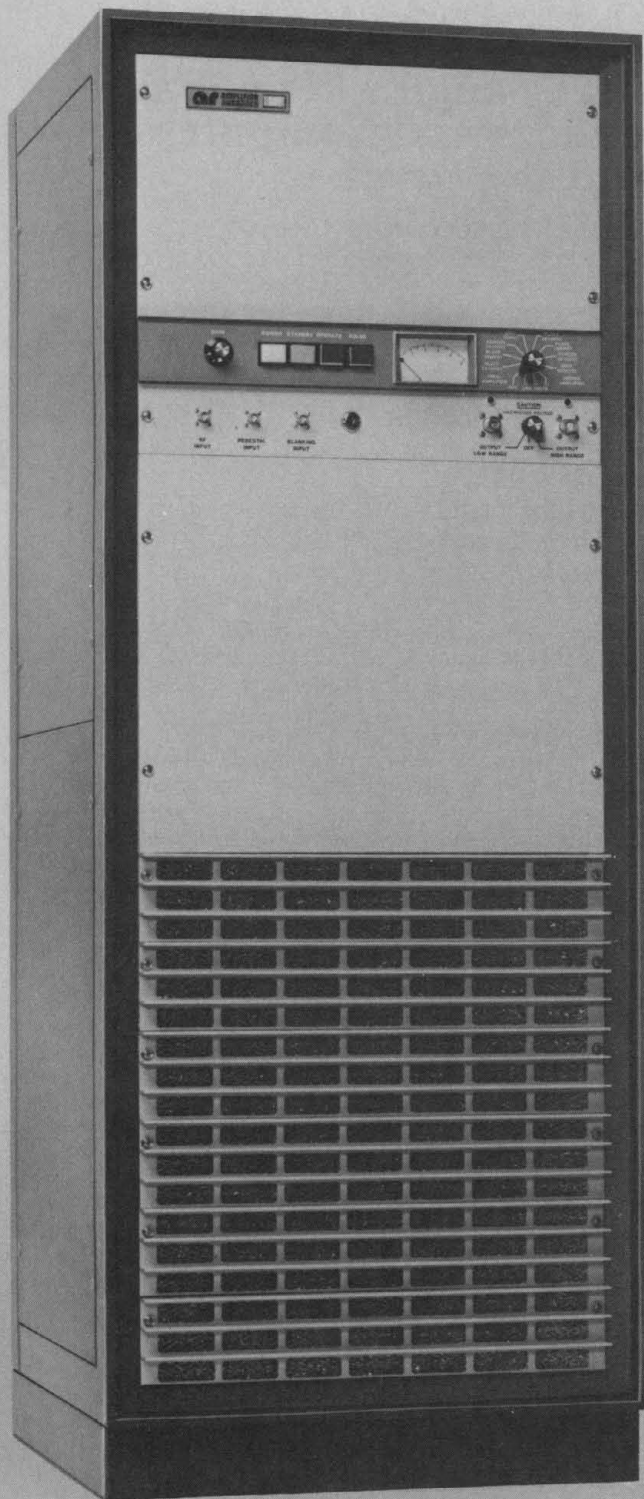
## COULTER HAS THE SOLUTION.

FOR RESEARCH USE ONLY: NOT FOR DIAGNOSTIC OR THERAPEUTIC USE. © 1987 COULTER CORPORATION.

### COULTER IMMUNOLOGY, A DIVISION OF COULTER CORPORATION

Circle No. 81 on Readers' Service Card

# Come where the power is.



Power amplifiers for every rf testing need. Power you can depend on. Power from one watt to ten kilowatts. And these power ratings are ultra-conservative: Whether you order a 10-watt or a 2000-watt amplifier, you can be certain of *at least* its rated output at every point in its frequency band.

Model 2000L, shown, delivers 2000 watts minimum cw saturated power over a bandwidth of 10 kHz to 220 MHz. In pulse mode (up to 25% duty cycle), you can almost double that output rating—a vital feature in NMR.

Our amplifiers are totally immune to damage from load mismatch—from wildly fluctuating VSWR to outright open or shorted output terminals.

The Amplifier Research line covers the frequency range from 10 kHz to 1 GHz. Bandwidth is instantly available without need for tuning or bandswitching. Our booklet, "Your guide to broadband power amplifiers," will tell you a lot more. Send for it.

**ar** **AMPLIFIER  
RESEARCH**

160 School House Road  
Souderton, PA 18964-9990 USA  
Phone 215-723-8181 • TWX 510-661-6094

Circle No. 56 on Readers' Service Card



Now in C...

## Numerical Recipes

*The Art of Scientific Computing*

**William H. Press, Brian P. Flannery,  
Saul Teukolsky, and  
William T. Vetterling**

*Some comments on Numerical Recipes:*

"Numerical Recipes is remarkably complete...it contains many more routines than many commercial mathematics packages and so provides the user with a great deal of flexibility for handling a variety of problems...(it) is an excellent introduction to contemporary numerical methods." — *Byte*

"Any technology company that doesn't have a few copies of this work and the accompanying diskettes is wasting the precious time of its best researchers." — *Forbes*

The product of a unique collaboration among four leading scientists in academic research and industry, *Numerical Recipes* fills a long-recognized need for a practical, comprehensive handbook of scientific computation. Seventeen chapters divided into 130 independently useful sections provide a self-contained treatment that derives, critically discusses, and actually implements over 200 of the most important numerical algorithms for scientific work.

C version: 1988 / c. 735 pp. / 35465-X /  
Cloth \$44.50

FORTRAN/Pascal Version: 1986 / 818 pp. / 30811-9 /  
Cloth \$44.50

## Numerical Recipes Diskettes

**William H. Press, et al.**

These diskettes provide machine-readable source code of all the programs in the book *Numerical Recipes*. The user unpacks the desired programs into text files suitable for modification and incorporation into his or her applications. The files can then be compiled with any standard FORTRAN, Pascal or C compiler for IBM-PC, XT, or AT compatible machines. FORTRAN and Pascal versions are also available for the Apple Macintosh.\*

## Numerical Recipes Example Books

**William T. Vetterling, et al.**

Available in C, FORTRAN or Pascal, these paperback example books contain short model programs that exercise and demonstrate all the *Numerical Recipes* routines.

## Numerical Recipes Example Diskettes

**William T. Vetterling, et al.**

Contains the demonstration programs from *Numerical Recipes Example Book* in C, FORTRAN or Pascal source code for IBM-PC, XT, or AT compatible machines. FORTRAN and Pascal versions are also available for the Apple Macintosh.\*

\*Other formats (including UNIX and VAX/VMS) and license arrangements are available from *Numerical Recipes Software*, P.O. Box 243, Cambridge, MA 02238.

At bookstores or order from

**Cambridge University Press**

32 East 57th Street, NY, NY 10022

Cambridge toll-free numbers for orders only:  
800-872-7423, outside NY State: 800-227-0247,  
NY State only, MasterCard and Visa accepted.

# Neural Network Research . . .

**It's Changing How We Understand Computers and the Brain.**

## NEURAL NETWORKS

**Official Journal of the International Neural Network Society**

Co-Editors-in-Chief:

**Shun-ichi Amari** (Australasia)

**Stephen Grossberg** (N. and S. America)

**Teuvo Kohonen** (Europe and Africa)

Appearing in early 1988, **NEURAL NETWORKS** will publish original contributions on brain and behavior modelling and its application to computer technology.

### Topics will include:

Vision and image processing • speech and language understanding • pattern recognition • associative learning and long-term memory • self-organization • cognitive information processing • cooperative and competitive network dynamics and short-term memory • sensory-motor control and robotics • parallel distributed processing • local circuit and systems analyses of brain-behavior relationships • combinatorial optimization • electronic, optical, hybrid, and virtual devices and neurocomputers.

Authors' instructions may be obtained from the publisher's office.

ISSN: 0893-6080 Vol. 1, 1988 Four issues per annum  
**Individual Rate (1988)\*** US\$49.00  
**Institutional Rate (1988)** US\$95.00

\*Available to those whose library subscribes.

### INTERNATIONAL NEURAL NETWORK SOCIETY (INNS)

INNS membership includes a subscription to **NEURAL NETWORKS**.  
**MEMBERSHIP FEES**

**Regular \$45.00 Student \$35.00 Payments cover 1987 and 1988.**

For society information contact: Dr. Harold Szu, Attn.: INNS,  
NRL-Code 5756, Washington, D.C. 20375-5000, USA.  
Tel. (202) 767-1493

## PERGAMON PRESS

US: Maxwell House, Fairview Park, Elmsford, NY 10523

UK: Headington Hill Hall, Oxford, OX3 0BW



# NOTHING STACKS UP TO NEW CORNING CRYOGENICS

*Pick any eight* Corning® cryogenic vials with round, free standing, or self locking bottoms. Internal or external threads. Large marking area. Double graduations. Color coded cap inserts.

*Set up your vials* in exclusive Corning® workstation rack for sample prep right on your bench. Vials lock securely in the rack for one handed convenience.

*Thaw in the rack* directly in a water bath. Or put hot water in the workstation tray and thaw on your bench.

*Ice up the tray* of the Corning workstation to keep all your vials properly chilled. There's ample room for the storage vessels and tubes you need.

*Pick up and carry* the entire Corning cryogenic workstation wherever you need.

## **Sample Free**

Call our USA number for a free assortment of Corning cryogenic vials and complete details today. **800-448-3400 ext. 917**. Or send coupon for more. See for yourself how nothing stacks up to new Corning cryogenics.



Send coupon on your letterhead for free Corning cryogenic vials plus literature. USA, Canada only. Corning Science Products, Attn: Cryogenics, P.O. Box 7740, Corning, NY 14830.

*Imagine what we can do together*

## **CORNING**

SE-03-88-CV

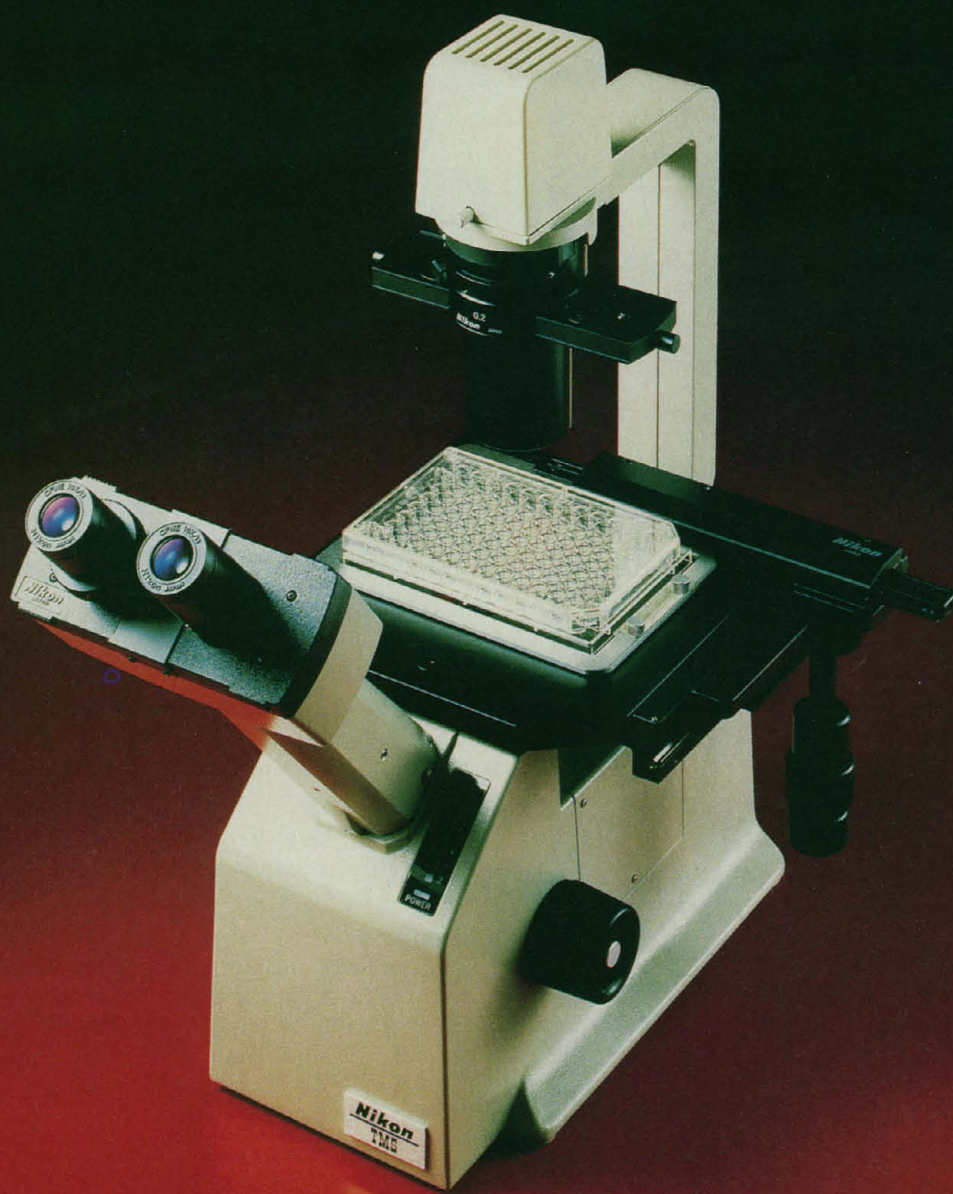
Science Products

a **CORNING** Laboratory Sciences Company

Circle No. 70 on Readers' Service Card



Perfectly simple...simply perfect



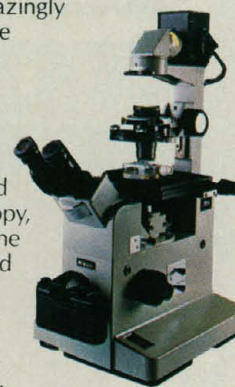
The new Nikon TMS inverted microscope perfectly combines simplicity of operation with Nikon's high performance standards. It utilizes Nikon CF optics, famous for crisp, clear images. Precorrected phase objectives eliminate distortion caused by plastic vessels. The 3-place nosepiece accepts brightfield and phase contrast parfocal objectives from 4X to 40X.

All optics are quick-change, and the condenser is easily removed for scanning rollerbottles. The large stage is fixed for stability and easy micro-manipulation. The 20 watt halogen illumination is pre-centered with built-in filter holders.

The Nikon TMS is the perfect inverted microscope for routine laboratory work—at an amazingly affordable price.

For more advanced microscopy, there is the renowned Nikon Diaphot. It is perfectly suited for documentation; from 35mm to large format and Polaroid® for CCTV and cinemicrography. The Diaphot has complete capability in phase contrast, fluorescence and Nomarski DIC.

Nikon now has the perfect answer to all your inverted microscope needs. For further information, contact Nikon Inc., Instrument Division, 623 Stewart Avenue, Garden City, NY 11530 (516) 222-0200.



# NIKON TMS & DIAPHOT

INVERTED MICROSCOPES

**Nikon**  
Extending Man's Vision

Circle No. 63 on Readers' Service Card



# Cold Feat!

## New Nalgene® Cryoware™ beats the others cold.

The advanced labware system for improved cryogenic storage. All designed by Nalge, the first name in high-tech plastic labware.

## Cool Control with Nalgene Cryovials.

We designed them *right* from the start. We put screw threads outside the vial where they belong. We gave the closure a longer skirt, for uncontaminated aseptic procedures. Our closure seals—without a gasket. And we gave the vial a conical bottom for easier sample extraction—and a flat base to stand on its own. Plus, an opaque marking area for your ID codes and an easy-to-read fill line. In 1.2- and 2-mL sizes.

## Cool Storage with Nalgene Cryoboxes™

Isn't it time you had all-plastic cryogenic storage boxes? Replace your flimsy cardboard or expensive stainless steel boxes with durable and economical Nalgene Cryoboxes. Grid and numbers on box top and inside keep track of inventory—one-way fit keeps grids lined up. In standard 9x9 array (81 vials) and a new 5x5 array (25 vials). Stackable. Autoclavable. Tough. Strong. Never brittle—even at  $-196^{\circ}\text{C}$ !

## Cool Handling with Nalgene Cryovial Holders.

Your lab deserves our new, all-plastic cryovial holders, too. Holder interlocks with up to 50 Nalgene Cryovials to allow single-handed operation. Molded-in alpha-numeric identification system. Autoclavable.

## Cool Fit with Nalgene Cryobox Racks.

We didn't forget to design new stainless steel racks, either. Our racks fit your existing mechanical or liquid-nitrogen

freezers and Dewars. Retainers hold new Nalgene Cryoboxes securely and separately—release quickly. Racks hold your existing cardboard or stainless steel boxes, too.

Order Nalgene Cryoware from your Authorized Nalgene Labware Dealer worldwide.

## Cool Thinking from Nalge.

Call (716)586-8800 now for more information and free trial samples of sterile Nalgene Cryovials. Or send us the coupon today.

## Nalge Company

Nalgene® Brand Products

**The ability to listen.  
The technology to respond.**

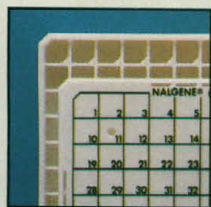
## Send for free samples.

Prove it to me that Nalgene Cryoware beats the others cold. Send *free* trial samples of Nalgene Cryovials and more information about advanced Nalgene Cryoware.

NAME \_\_\_\_\_  
TITLE \_\_\_\_\_  
COMPANY (ORGANIZATION) \_\_\_\_\_ PHONE \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

**Nalge Company, A Subsidiary of Sybron Corp.  
Box 20365, Rochester, NY 14602-0365**

© 1987 Sybron Corporation  
Nalgene, Cryoware and Cryobox are trademarks of Nalge Company



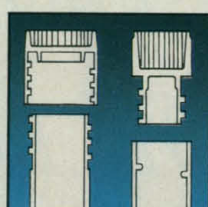
Reusable all-plastic Nalgene Cryoboxes have printed grid and numbers on box top and molded-in grid numbers inside to keep track of inventory.



Nalgene Cryovials are non-cytotoxic, non-pyrogenic, radiation sterilized. Available in 1.2- and 2-mL sizes. Recessed bases interlock firmly with Nalgene Cryovial Holder.



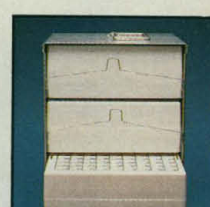
All-plastic Nalgene Cryovial Holder locks Nalgene Cryovials firmly in place for single-handed opening of closures.



Outside thread design on Nalgene Cryovial (left) reduces possible sample contamination. Inside thread of conventional vial (right) increases contamination risk and sample hang-up.



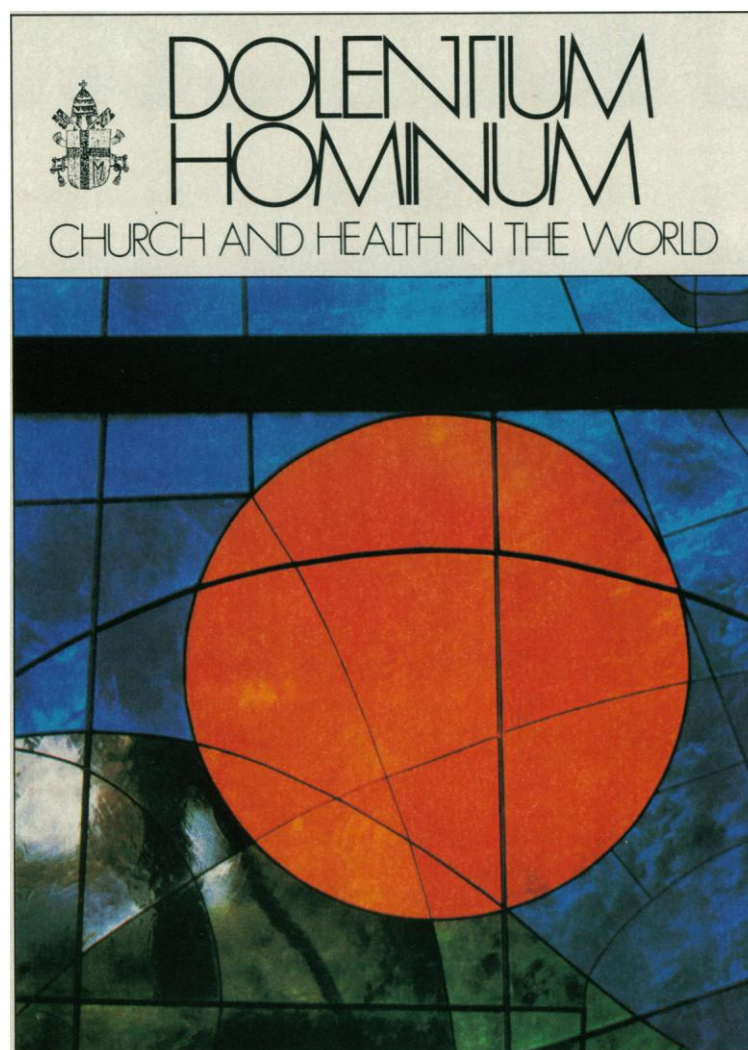
Longer skirt length of closure on Nalgene Cryovials minimizes risk of contamination in aseptic procedures. Conical bottoms allow complete sample extraction.



New stainless steel Nalgene Cryobox Racks hold Nalgene Cryoboxes securely and separately with retainer clamps. Hold standard cardboard and stainless steel boxes, too.

# Advanced Nalgene® Cryoware™





---

*The Journal of the Pontifical Commission for the Apostolate of Health Care Workers  
is making available the proceedings of the*

---

***FIRST INTERNATIONAL  
CONFERENCE  
ON DRUGS  
FOR HUMAN LIFE***

---

*in which three Nobel Prize winners participated along with other guests.*

---

*The three main topics dealt with were:*

### Ethics of Drug Development

Konrad E. Bloch  
*1964 Nobel Prize Winner in Medicine*

Ralph F. Hirschmann  
*Board Member on Chemical Sciences  
and Technology  
National Research Council,  
Washington, DC, U.S.A.*

Bruno Silvestrini  
*Professor of Pharmacology and  
Pharmacognosy,  
University La Sapienza, Rome, Italy*

Erminio Costa, M.D.  
*Professor of Pharmacology  
Georgetown University  
Washington, DC, U.S.A.*

Bonifacio Honings, O.C.D.  
*Professor of Moral Theology  
Lateran Pontifical University, Rome, Italy*

### Ethics of Pharmaceutical Research

K. Sune Bergström  
*1982 Nobel Prize Winner in Physiology  
Pontifical Academician*

Louis Lasagna  
*Dean, Sackler School of Graduate  
Biomedical Sciences  
Tufts University, Boston, MA, U.S.A.*

Rev. Elio Sgreccia  
*Professor of Bioethics, Medical School  
Sacro Cuore Catholic University, Rome, Italy*

Duilio Poggiolini  
*Director General, Pharmaceutical Service,  
Ministry of Health, Rome, Italy*

Tendês Cardoso  
*Professor of Parasitology,  
Central University of Venezuela,  
Caracas, Venezuela*

### Ethics of Drug Use

Max Ferdinand Perutz  
*1982 Nobel Prize Winner in Chemistry  
Pontifical Academician*

Halldan Mahler  
*Director General  
World Health Organization,  
Geneve, Switzerland*

Ferdinando Salleo  
*Director General of the Department  
of Cooperation,  
Ministry of Foreign Affairs, Rome, Italy*

Jean Dréano  
*President of the International Federation  
of Catholic Pharmacists, Paris, France*

Jean Pierre Schaller  
*Ecclesiastical Counsellor,  
International Federation of  
Catholic Pharmacists, Paris, France*

H. E. Giovanni Battista Marini Bettolo  
*Pontifical Academician,  
Professor of Chemistry,  
Sacro Cuore Catholic University, Rome, Italy*

E. Lauridsen  
*Program Manager, Action Program on  
Essential Drugs  
World Health Organization, Geneve, Switzerland*

John A. Norris, J.D., M.B.A.  
*Deputy Commissioner,  
Food and Drug Administration, Washington, DC, U.S.A.*

*Please send me the PROCEEDINGS of the First International  
Conference on Drugs for Human Life*

Last Name \_\_\_\_\_

First Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

Country \_\_\_\_\_

Profession/Institute \_\_\_\_\_

*Please indicate the language and number of copies you wish to receive*

Number of copies \_\_\_\_\_

☐ English ☐ French ☐ Spanish ☐ German ☐ Italian

*Methods of payment:*

☐ amount of Lit. 50.000 or equivalent

☐ cash on delivery

☐ credit on postal giro account n.63353007 payable to:  
Pontificia Commissione per la Pastorale  
degli Operatori Sanitari  
Via della Conciliazione 3  
00193 ROMA (Italy)

☐ personal or banker's cheque payable to:  
Pontificia Commissione per la Pastorale  
degli Operatori Sanitari  
Via della Conciliazione 3  
00193 ROMA (Italy)



Announcing  
the . . .

# 1988 FASEB SUMMER

The Federation of American Societies for Experimental Biology presents Summer Research Conferences designed for experimental biologists' analysis of research of intense scientific interest. The conferences in Saxtons River, Vermont and in Copper Mountain, Colorado, will be limited to 150 persons each week and will be by invitation upon application. A conference fee of \$320 covers one week's room, board and registration. For further information and an application form, see the February *FASEB Journal* or call Robert W. Krauss, (301) 530-7093.



## Saxtons River, Vermont



**YEAST RNA: TRANSCRIPTION, SPLICING, TRANSLATION, REPLICATION, AND TRANSPOSITION** June 12-17 Chairs: Reed B. Wickner, National Institutes of Health, NIDDK; Philip S. Perlman, Ohio State University. **Retrotransposons.** G. Fink, S. Sandemeyer, J. Boeke, D. Garfinkel; **RNA Replicons.** R. Wickner, D. Thomas, N. Van Alfen; **Transcription I, II & III.** T. Cooper, L. Guarente, M. Carlson, G. Fink, K. Struhl, Y. Oshima, A. Sentenac, J. Jaehning; **Splicing I & II.** P. Perlman, A. Lambowitz, A. Jaquier, C. Guthrie, J. Abelson; **Translation.** J. Warner, F. Sherman, A. Hinnebusch, T. Fox; **tRNA.** N. Martin, M. Culbertson, A. Hopper.



**RETINOID** June 19-24 Chairs: DeWitt S. Goodman, Columbia University College of P&S; Luigi M. De Luca, National Institutes of Health, NCI. **Retinoid Metabolism and the Liver.** K. Norum, R. Blomhoff, C. Lieber, D. Knook, J. Olson; **Retinoid-Binding Proteins I & II.** D. Goodman, P. Peterson, D. Soprano, A. Suhara, M. Kato, M. Kanai, F. Chytil, T. Jones, J. Gordon, D. Ong, A. McCormick; **Cancer.** L. De Luca, P. Greenwald, Y. Muto, K. Norum; **Retinoids, Differentiation, and Growth I & II.** M. Sporn, P. Davies, B. Hogan, L. Gudas, C. Brinckerhoff, W. Blaner, D. Kochhar, G. Eichele; **Dermatology.** G. Peck, W. Cunningham, J. McGuire, E. Fuchs, P. Chambon; **Special Lecture:** F. Siebert; **The Eye.** D. Boch, R. Rando, C. Bridges, J. Saari.



**SMOOTH MUSCLE** June 26-July 1 Chairs: R. Kent Hermsmeyer, Chiles Research Institute, Providence Medical Center, OHSU; James T. Stull, University of Texas Southwestern Medical Center. **Neuromuscular Transmission.** J. Szurszewski, G. Hirst, T. Cunnane; **Membrane Excitation.** C. van Breemen, A. Jones, H. Akbarali; **Ca<sup>2+</sup> and Other Channels.** G. Isenberg, C. Benham, N. Rusch; **Second Messengers.** J. Lewicki, H. Rasmussen, K. Kamm; **Intracellular Ca<sup>2+</sup>.** A. Somlyo, C. Rembold, P. Erne; **Myosin Phosphorylation and Cytoskeleton.** D. Hartshorne, J. Sellers, V. Small; **Molecular Biology and Function of Proteins.** R. Adelstein, M. Watterson, W. Catterall; **Microcirculation Mechanisms.** P. Johnson, B. Duling, M. Intaglietta.



**AUTOIMMUNITY** July 3-8 Chairs: Howard L. Weiner, Harvard Medical School; Gary Fathman, Stanford University Medical School. **Molecular Mechanisms of T Cell Activation.** C. Fathman, L. Glimmer, A. Weiss, P. Bjorkman; **Genetics of Autoimmune Disease.** H. McDewitt, E. Leiter, B. Kotzin, G. Nepom; **Immunoregulatory Mechanisms.** E. Engleman, C. Morimoto, N. Damle, R. Rich, D. Hafler; **Immunopathogenic Mechanisms in Endocrine Diseases.** G. Eisenbarth, K. Lafferty, A. Rossini, N. Rose; **Organ Non-Specific Autoimmunity.** A. Steinberg, D. Kastner, S. Datta, C. Laskin, D. Klinman, E. Raveche; **Virus-Induced Autoimmunity and Polyreactive Antibodies.** A. Notkins, P. Casali, G. Jay; **Immune Intervention I & II.** H. Weiner, I. Cohen, H. Wekerle, R. Schwartz, L. Steinman, E. Heber-Katz, T. Strom, Y. Naparstek, K. Krolick.



**PHOSPHOLIPASES** July 10-15 Chairs: Moseley Waite, Bowman Gray School of Medicine; Richard Franson, Medical College of Virginia. **Phospholipid Organization and Phospholipase A<sub>2</sub> Structure I & II.** D. Hanahan, P. Cullis, G. Shipley, R. Heinrichson, J. Maraganore, G. de Haas, J. Drenth, P. Sigler, P. Elsbach; **Mechanism of Action I & II.** P. Elsbach, E. Dennis, A. Slotboom, R. Verger, F. Keddy, M. Wells, M. Jain, R. Biltonen, P. Kinnunen; **Cellular Phospholipases A<sub>2</sub>.** J. Maraganore, R. Franson, I. Kudo, R. Kramer, H. van den Bosch; **Phospholipases A<sub>1</sub>, B, and Lysophospholipases.** J. Law, K. Saito, H. Jansen, M. Waite; **Phospholipases C.** C. Rock, C. Little, M. Low, M. Roberts, R. Gross; **Cloning.** E. Dennis, H. Verheij, J. Seilhamer, M. Okamoto; **Regulation and Function.** M. Clark, H. Chap, S. Rittenhouse, C. Rock, A. Scanu.



**IMMUNOPHARMACOLOGY** July 17-22 Chair: Philip Davies, Merck, Sharp & Dohme Research Laboratories. **Allergic Diseases. The Mediator Systems. Initial Clinical Experience with Specific Inhibitors and Antagonists. Novel Immunosuppressive Strategies for Inflammatory Diseases. Pharmacological Probes of Lymphocytes Activation. Clinical Studies with Antibodies and Antibody-Toxin Conjugates. Cellular Adhesion Molecules in Lymphocytes and Phagocytes. Neutrophil Effector Systems: Mediators and Enzymes. Activation of the Respiratory Burst. Regulation of Lipoxigenase Activity. Elastase and Its Inhibitors. Macrophage Effector Systems I. The Macrophage as a Secretory Cell. The Peptide Mediators: TNF, IL-1, Growth Factors, Chemotactic Factors. Macrophage Effector Systems II.**



**STRUCTURE AND FUNCTION OF CELL MEMBRANES** July 24-29 Chairs: Philip Yeagle, State University of New York/Buffalo; Ron McElhaney, University of Alberta. **Lipid Movement.** R. Simoni, L. Dawidowicz, P. Deveau; **Ca ATPase.** G. Inesi, D. Thomas, P. Yeagle; **Membrane Protein Dynamics.** G. Henry, R. Griffin, R. Cherry; **Lipid Domains and Organization.** T. Thompson, K. Jacobson, G. Shipley; **Transmembrane Signalling.** B. Litman, J. Regan, M. Bitensky; **Non-Bilayer Structures.** S. Gruner, D. Siegel, A. Wieslander; **Membrane Protein Structure.** G. Shull, E. Gogol, V. Marchesi; **Role of Cholesterol.** C. Dahl, L. Parks, Y. Lange; **Lipid Structure and Dynamics.** H. Jarrell, C.-H. Huang, R. McElhaney.



**CELLULAR AND MOLECULAR GENETICS** July 31-August 5 Chairs: Geoffrey Wahl, The Salk Institute; Gretchen Darlington, Baylor College of Medicine. **Technologies.** F. Collins, C. Cantor, G. Carle, T. Gingeras; **Workshop: Gene Manipulation.** F. Costantini, J. Izant, L. Robertson, I. Verma; **Genome Rearrangements and Targeted Gene Insertion.** G. Wahl, M. Capecchi, O. Hyrien, O. Smithies, E. Giulotto; **G. Stark; Nuclear Organization and Chromosome Structure.** V. Zakian, A. Belmont/J. Sedat, M. Yanagida, M. Yao; **Inducible Gene Expression.** M. Karin, J. Nevins, M. Groudine, C. Parker, M. Yaniv; **Mediating Regulatory Proteins.** R. Evans, D. Hogness, L. Guarente, R. Roeder, W. Schaffner; **Tumor Suppressors.** W. Cavenee, S. Aaronson, T. Hunter, E. Stanbridge, M. Wigler; **Regulation During Development and Differentiation.** K. Fournier, R. Jaenisch, A. Lasser, F. Ruddle, M. Weiss; **Biochemical and Genetic Dissection of Eukaryotic DNA Replication.** T. Kelley, M. DePamphilis, J. Roberts, R. Laskey; **Human Diseases.** T. Caskey, A. Beaudet, R. Nussbaum, R. Worton.



**RECEPTORS** August 7-12 Chairs: Richard D. Klausner, National Institutes of Health, NICHD; Marc G. Caron, Duke University Medical Center. **Structure.** A. Ulrich, H. Metzger, R. Stroud, W. Leonard; **Assembly, Dynamics, and Cell Biology.** R. Klausner, A. Helenius, K. Mostov; **Complex Receptors and Families.** M. Caron, E. Barnard, J. Ramachandran, L. Samelson; **Coupling Proteins and Signal Transduction.** H. Bourne, A. Gilman, L. Birnbaumer, R. Bell; **Function and Regulation.** R. Lefkowitz, C. Kahn, P. Hargrave, K. Strader; **DNA Binding Proteins.** W. Schrader, E. Milgrom, R. Evans, G. Klock, M. Carson; **Growth Regulation and Oncogenes.** L. Williams, R. Weinberg, J. Schlessinger, C. Sherr; **Keynote Address:** D. Koshland; **Receptors that Mediate Cell-Cell Interactions.** T. Springer, J. Butcher.



**ELECTROPHYSIOLOGICAL MECHANISMS OF PROPAGATION AND ACTIVATION OF CARDIAC MUSCLE AND SMOOTH MUSCLE** August 14-19 Chairs: David R. Harder, Medical College of Wisconsin; Nicholas Sperelakis, University of Cincinnati. **Keynote Speakers:** H. Kuriyama, H. Fozzard. **Ionic Currents in Smooth Muscle.** D. Harder, K. Hermsmeyer, C. Benham, C.-Y. Kao, R. Schoemacher, M. Kotlikoff; **Propagation and Neuromuscular Transmission — In Arterial Muscle.** K. Hermsmeyer, E. Daniel, D. Hirst, Y. Ohya, M. Hollman, T. Bolton, G. Siegel; **— In Cardiac Muscle.** M. Spach, Y. Rudy, R. Plonsey, R. Joyner, N. Sperelakis; **Cell Coupling.** W. DeMello, R. DeHaan, D. Spray, W. Larsen, W. Cole; **Metabolism and Electrical Activity in Cardiac Muscle.** N. Sperelakis, A. Noma, T. McDonald, H. Reuter, W. Trautwein, G. Wahler, A. Yatani, G. Bakaly; **Free Radicals and Lysophospholipids.** P. Corr, M. Hess, D. Hearse, B. Lucchessi, J. Downey; **Action of Calcium Antagonistic and Agonistic Drugs.** C. Cohen, R. Kass, M. Morad, W. Nayler, M. Kohlhardt; **Ion Channels.** M. Lazdunski, R. Barchi, W. Catterall, H. Glossman, B. Ehrlich; **Ionic Currents in Heart.** H. Brown, J. Hume, H. Irisawa, A. Pappano, J. Lederer, M. Hiraoka.

# RESEARCH CONFERENCES

Copper Mountain, Colorado

**NEUROIMMUNOMODULATION** June 26-July 1 Chairs: Novera H. Spector, University of Alabama/Birmingham; Edward J. Goetzl, University of California/San Francisco. **Genetic and Developmental Determinants of Neuroimmunological Interactions.** F. Bloom, L. Reichardt, R. Milner, E. Shooter, I. Weissman, T. Springer, M. Hemler; **Neural Circuitry and Transmitter Interactions with Immune Organs.** D. Felten, S. Heinemann, S. Felten, S. Livnat, P. Sawchenko, S. Carlson, K. Bulloch; **Mediators and Cellular Constituents.** S. Leeman, L. Steinman, R. Keane, S. Hockfield, G. Frankel, S. Hauser, B. Cunningham, A. Friedman, E. Goetzl, J. Merrill, F. Hofman, S. Bodmer, D. Payan, S. O'Dorisio, S. Sreedharan; **After Dinner Speaker:** J. Axelrod; **Regulation of Cellular Communication and Responses.** B. Arnason, S. Gordon, H. Perry, K. Frei, M. Ruff, H. Besedovsky, D. Richman; **Mediators of Cellular Growth, Differentiation, and Function.** J. Martin, D. Weinreich, J. Bienenstock, B. Udem, D. Gospodarowicz, T. Deuel; **Viral Neuroimmunology.** R. Johnson, M. Buchmeier, B. Fields, I. Miller, O. Narayan, R. Fujinami, R. Price, M. Gardner; **Normal and Abnormal Behavior.** M. Stein, J. Liebeskind, J. Kiecolt-Glaser, S. Perry, J. Weiss; **After Dinner Speaker:** N. Cousins; **Host Defense and Autoimmunity.** N. Spector, W. Pierpaoli, K. Kelley, E. Smith, C. Ottaway, D. Maric, J. Kreuger, J. Lipton, B. Markovic, V. Ghanta, S. Dolina; **Diseases.** B. Jankovic, V. Lennon, P. Paterson, M. Martin, J. Levine, R. Lund, M. Yokoyama, D. Drachman.

**ULTRADIAN AND INFRADIAN MODULATION OF THE CIRCADIAN SYSTEM** July 3-8 Chairs: Lawrence E. Scheving, University of Arkansas; Franz Halberg, University of Minnesota. **Monitoring Dense Long Time Series.** G. Cornelissen, F. Del Pozo, F. Hegge, D. Redmond, D. Wilson; **Biochemical Interactions Among Rhythms with Different Frequencies.** J. Feldman, J. Hastings, D. Lakatua, N. Montalbetti, J. Ringo, D. Woodward; **Rhythms of the Cardiovascular System.** G. Payne, F. Halberg, C. Leach, E. Haen, M. Mkulecky, M. Weber; **Clinical Aspects of Circaseptan Rhythms.** M. Cavallini, D. Hayes, G. Hildebrandt, L. Scheving; **Rhythms in Immunology.** M. Cagnoni, E. Yunis, R. Good, G. Fernandes; **Circatrigintan Rhythms in Both Sexes.** F. Carandente, H. Simpson, M. Smolensky, B. Tarquini; **Intermodulation Among Rhythms in the Neuroendocrines.** R. Reiter, P. Robel, S. de la Pena, N. Spector, D. von Zerssen; **Interaction Between Circadian and Circannual Rhythms.** A. Reinberg, Francine Halberg, E. Haus; **Clinical Applications.** C. Czeisler, K. Griffiths, J. Moore, S. Szabo, L. Kudrow.

**REGULATION OF GENE EXPRESSION IN HIGHER ANIMALS IN RESPONSE TO HORMONES AND NUTRITIONAL SUBSTRATES** July 10-15 Chairs: George Scheele, The Rockefeller University; Gunther Schutz, German Cancer Research Center. **Tissue-Specific Control in the Liver.** R. Cortese, M. Yaniv, S. Tilghman, K. Fournier; **Keynote Address:** R. Evans; **Cell-Specific and Hormone-Mediated Control in the Liver.** G. Schutz, G. Ryffel, M. Karin; **Regulation in the Pancreas.** G. Scheele, H. Kern, W. Rutter, D. Hanahan, R. MacDonald; **Control in the Intestine.** J. Gordon, J. Scott, R. Thach, B. O'Malley; **Regulation in Muscle.** H. Blau, B. Nadal-Ginard, M. Buckingham, C. Emerson; **Genes Involved in Lipid Metabolism.** G. Ringold, T. Leff, B. Spiegelman, R. Lawn; **Neuroendocrine Peptides.** P. Seeburg/K. Nikolics, J. Adelman, R. Goodman, J. Roberts; **Analysis of Human Genetic Disorders.** S. Woo, M. Koenig, B. Williamson, D. Page; **Analysis of Gene Structure and Function.** H. Lehrach, B. Tjian, S. Harrison, P. Becker.

**MOLECULAR BIOLOGY AND INFECTIOUS DISEASES** July 17-22 Chairs: Richard A. Young, Whitehead Institute for Biomedical Research; David Sacks, National Institutes of Health, NIAID. **Perspectives.** K. Warren; **Mechanisms of Microbial Pathogenesis.** M. So, J. Mekalanos, F. Heffron, H. Seifert; **Mechanisms of Parasite Pathogenesis.** L. Miller, K. Joiner, M. Pereira, R. Howard; **Cellular and Parasitic Gene Expression Strategies.** R. Davis, J. Donelson; **Components of T Cell Recognition and Function.** B. Bloom, A. Abbas, J. Lamb, J. Cerny; **T Cell Immunity in Infectious Diseases.** D. Sacks, S. Kaufmann, P. Scott, M. Good, B. Bloom; **Molecular Biology of AIDS.** F. Wong-Staal; **Vaccine Vehicles.** R. Young, E. Paoletti.

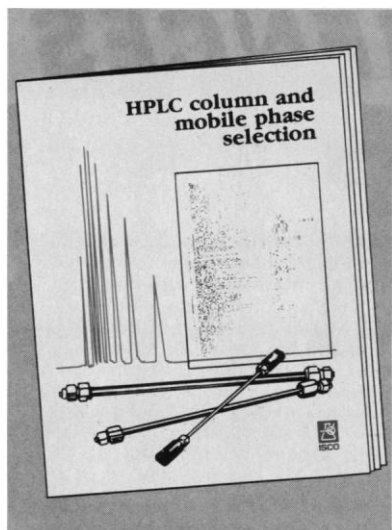
**TRICOTHECENE, BLUE-GREEN ALGAL, AND MARINE TOXINS: MECHANISMS, DETECTION, AND THERAPY** July 24-29 Chairs: Adrienne E. Rogers, Boston University School of Medicine; Val Beasley, University of Illinois College of Veterinary Medicine. **Trichothecene Toxins.** A. Rogers; **Cardiovascular Toxicity and Shock.** G. Feuerstein, A. Lefer, I. Paakkari, W. Woods, C. Templeton; **Trichothecene Toxins—Toxicity to Reproductive Systems and GI Tract.** M. Conner, L. Trenholme, A. Rogers, Y. Matsuoka, C. Rousseaux; **—Metabolism, Decontamination, Blocking and Therapeutic Measures.** D. Bunner, A. Lefer, D. Prelusky, C. Rousseaux, G. Feuerstein, W. Busby, R. Wannemacher, R. Lambert; **Blue-Green Algal Toxins—Occurrence, Chemistry, and Metabolism.** V. Beasley, W. Carmichael, K. Sivonen, T. Krishnamurthy, J. Pace; **—Toxicity, Decontamination, and Therapy.** W. Haschek, M. Runnegar/I. Falconer, D. Bunner, W. Thompson, G. Codd, N. Mahmood; **Membrane Activity and Modes of Toxin Action.** G. Strichartz; **Ion Channel Function—Sodium Channels.** G. Strichartz, G. Brown, W. Woods, E. Moczydlowski, G. Wang, S. Hall; **—Potassium Channels.** G. Brown, N. Castle, P. Paponne; **—Calcium Channels.** E. Moczydlowski, D. Yoshikami, B. Olivera, S. Levinson.

**FOLATE, VITAMIN B-12, AND ONE CARBON METABOLISM** July 31-August 5 Chairs: Raymond L. Blakley, St. Jude Children's Research Hospital; Victor Herbert, Mt. Sinai School of Medicine/Bronx VA Medical Center. **Metabolism in Protozoa.** D. Santi, Y. Yuthavong, B. Chabner, C. Allegra; **Transport of Folate and B-12.** I. Rosenberg, J. Freisheim, J. Lindemans; **Folate Enzymes as Targets for Drugs.** J. Bertino, J. Houghton, P. Beardsley, J. McGuire; **Metabolism of S-Methylthioadenosine and S-Adenosylmethionine.** R. Abeles, A. Pegg, N. Kredich; **Enzymes of Cobalamin Metabolism.** J. Stubbe, J. Roth, R. Matthews; **Disorders of Methionine, Folate, and Cobalamin Metabolism.** S. Mudd, R. Erbe, D. Rosenblatt; **Dihydrofolate Reductase.** S. Benkovic, G. Roberts, D. Matthews, R. Blakley; **Interrelationships.** J. Scott, J. Metz, I. Chanarin, D. Weir; **Effect of Ethanol and Other Drugs.** V. Herbert, N. Colman, C. Halsted, S. Waxman.

**ENDOTHELIUM AND CARDIOVASCULAR FUNCTION** August 7-12 Chairs: Paul M. Vanhoutte, Mayo Foundation; Robert F. Furchgott, SUNY Health Science Center. **Morphology and Production of Vasoactive Hormones.** U. Ryan, G. Palade, G. Zimmerman, N. Sutorp; **Metabolic Role.** C. Gillis, M. Gerritsen, S. Oparil, C. Dinarello, E. Block, S. Nees; **Barrier and Transport Function.** C. Owman, C. Michel, E. Renkin, N. Simionescu, R. Michel, R. Traystman; **Endothelium-Dependent Relaxations.** R. Furchgott, M. Peach, U. Forstermann, R. Rapoport, K. Komori, V. Miller, D. Ku; **Is Nitric Oxide EDRF?** S. Moncada, R. Furchgott, L. Ignarro, R. Palmer, W. Martin, B. Berkowitz, H. Kontos; **Other Vasoactive Factors.** P. Vanhoutte, U. Hoeffner, Z. Katusic, G. Rubanyi, R. Highsmith; **Physiological Role of EDRF.** J. Shepherd, E. Bassenge, H. Sparks, T. Griffith, A. Mark, R. Busse, F. Abboud, P. Vanhoutte; **Hypertension and the Endothelium.** R. Winquist, A. Chobanian, W. Lockette, J. Angus, T. Luscher, W. Mayhan; **Atherosclerosis.** D. Heistad, S. Schwartz, D. Steinberg, M. Jacobs, A. Herman, D. Harrison, P. Henry; **Vasospasm.** R. Alexander, R. Cohen, R. Robertson, H. Shimokawa, P. Ganz, P. Kim.

**NEOPLASTIC TRANSFORMATION OF LIVER CELLS** August 14-19 Chairs: Snorri S. Thorgeirsson, National Institutes of Health, NCI; George Michalopoulos, Duke University. **Models of Multistage Carcinogenesis.** S. Thorgeirsson, E. Farber, C. Peraino, B. Lombardi, J. Reddy; **Interactions with Extracellular Matrix.** L. Reid, D. Kaufman, C. Guguén-Guillouzo, M. Bissel; **Growth Regulation of Normal Hepatocytes.** N. Bucher, G. Michalopoulos, T. Nakamura, A. Francavilla, J. Cruise; **Growth Inhibition of Liver Cells.** A. Ichihara, B. Carr, H. Moses, A. Huggett, M. Hayes; **Role of Protooncogenes/Oncogenes in Transformation I & II.** N. Fausto, H. Isom, M. Anderson, S. Thorgeirsson, S. Strom, G. Neal, B. Huber; **Mechanism of Promotion.** P. Seglen, R. Schulte-Hermann, R. Jirtle, J. Yager, J. Rice; **Mechanism of Progression.** J. Grisham, R. Cameron, W. Kaufmann, D. Hixson, A. Sirica, P. Seglen; **Cell Lineages.** S. Sell, R. Everts, N. Marceau, J. Grisham.





## Free Guide!

**HPLC column and mobile phase selection** will help you choose the right column and mobile phase for the best HPLC separation possible. This 36-page guide describes preferred column characteristics for different types of chromatography and provides a compilation of several thousand separation conditions, indexed by compound, indicating the column and mobile phase used for each. Also included is a column selection chart for working with unknown compounds.

For your free copy, simply complete the following and mail it to Isco, Inc., P.O. Box 5347, Lincoln, NE 68505. Available by completed coupon only.



Name \_\_\_\_\_

Organization \_\_\_\_\_

Street \_\_\_\_\_

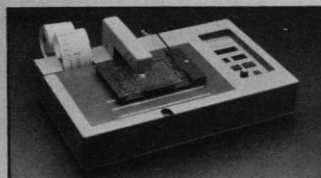
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone \_\_\_\_\_

I am ☐ am not ☐ planning to buy HPLC equipment within 12 months.



## ANALYZING ONLY A HANDFUL OF EIA PLATES PER WEEK?



### Use your hands to save thousands on a Microplate Reader.

The Model 700 Manual Microplate Reader is easy to use and measures 96 wells in less than 5 minutes. Its optics are as accurate as the most expensive instruments, and it offers all these features for only **\$2885**:

- A built-in printer that uses easy-to-find plain paper.
- An RS-232C computer interface.
- Electronic sensing of well location. Read wells in any sequence.
- Filter changing without tools in seconds.
- Built-in thresholding. Partitions absorbance readings into  $\pm$  matrix.
- Operates accurately to absorbances greater than 3.000.

Evaluate without risk on our 60 day trial. Satisfaction guaranteed or your money back.

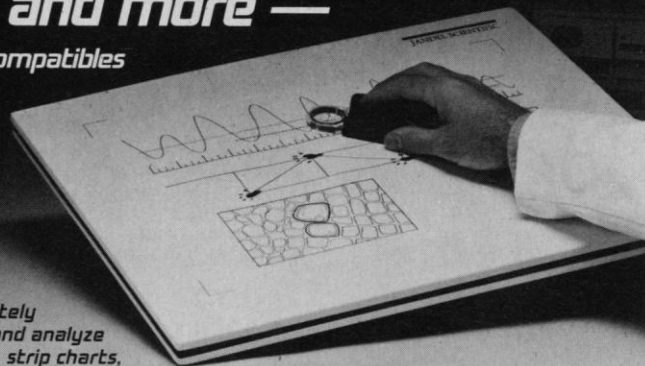
Cambridge Technology, Inc.

23 ELM STREET, WATERTOWN, MA 02172 U.S.A. (617) 923-1181

Circle No. 115 on Readers' Service Card

**SigmaScan™**  
measures areas, lengths  
coordinates, angles,  
slopes, and more —  
IBM PC and Compatibles

NEW  
VERSION 3.1



Quickly and accurately digitize, measure and analyze photomicrographs, strip charts, X-rays, maps, and more — using your own PC.

- Areas, lengths, angles, and slopes
- X,Y digitizing
- User-defined units
- Standard ASCII data output (use in Lotus, dBase, etc.)
- Keyboard macros
- User-defined data transforms

Save hundreds of hours annually over manual measurement techniques. Automate complex analyses. Comes complete with software, choice of digitizing tablet, money-back guarantee and full year hardware warranty.

Sigma-Scan™ software is also available separately.

Free brochure **800-874-1888**  
In CA **415-924-8640**  
FAX: 415-924-2850 / Telex: 4931977  
In Europe: R.J.A. Honders, Germany  
Ph #02101/666268

**Jandel**  
SCIENTIFIC

"Microcomputer Tools for the Scientist"

■ 65 Koch Road ■ Corte Madera, CA 94925

Circle No. 145 on Readers' Service Card

# R&D in FY 1989: Looking Ahead in an Election Year

Thirteenth Annual AAAS Colloquium  
on R&D Policy

14 & 15 April 1988

Capital Hilton ♦ Washington, DC

- ♦ Discussion will be based on *AAAS Report XIII: Research and Development, FY 1989*, a timely and comprehensive analysis of the proposals for R&D in the FY 1989 budget, prepared by AAAS and a group of its affiliated scientific, engineering, and higher education associations.
- ♦ Trends and prospects for R&D in defense, energy, health, space, and other areas will be explored by leaders from industry, universities, agencies of the federal government, Congress, the White House, and the scientific and engineering communities.
- ♦ Perspectives will be provided on topics such as budget deficits and other constraints on R&D programs, setting priorities for science and technology, science advice to the government, evaluation of research, and superconductivity and government's role.
- ♦ Registrants will also receive *Proceedings* following the Colloquium and *Congressional Action on R&D in the FY 1989 Budget* in the fall.

**For further details, write:** AAAS R&D Colloquium, Public Sector Programs,  
1333 H Street, NW, Washington, DC 20005

Sponsored by the AAAS Committee on Science,  
Engineering, and Public Policy

American Association for the Advancement of Science



**13th AAAS R&D Colloquium**  
**Washington, D.C.**  
**14–15 April 1988**

**Advance  
Registration  
Form  
SR2**

The Capital Hilton, 16th & K Streets, N.W., Washington, D.C.

Please Print or Type Clearly

Name \_\_\_\_\_  
(last) (first and initial)

Affiliation \_\_\_\_\_

Mailing Address \_\_\_\_\_  
(street and number)

\_\_\_\_\_  
(city) (state & zip) (telephone number)

☐ Check enclosed or charge to my ☐ VISA or ☐ MasterCard  
(no other credit cards accepted)

Card No. \_\_\_\_\_ Expiration Date \_\_\_\_\_

Cardholder's signature \_\_\_\_\_

☐ Check here if you need special services due to a handicap. We will contact you  
before the meeting.

**Registration Fees**

\$195 Full (meals & publications) \$ \_\_\_\_\_

\$145 Partial (publications only) \_\_\_\_\_

\$ 70 Student (publications only) \_\_\_\_\_

**Separate Meal Tickets**

\$ 25 Lunch, Thursday (14 Apr.) \_\_\_\_\_

\$ 8 Breakfast, Friday (15 Apr.) \_\_\_\_\_

\$ 25 Lunch, Friday (15 Apr.) \_\_\_\_\_

**TOTAL AMOUNT:** \$ \_\_\_\_\_

Packets will be mailed to preregistrants on about 24 March; registrations received after 24 March will be held at the AAAS Registration Desk in the Capital Hilton. **Refund Policy:** Advance registration fees and meal tickets will be refunded for cancellations received by 8 April; no refunds will be made on cancellations received after this date.

Registration fees include all sessions and publications; meals are included only with payment of full registration fee. All registrants receive *AAAS Report XIII: Research and Development, FY 1989* before or at the Colloquium, published *Proceedings* after the meeting, and a supplementary report, *Congressional Action on R&D in the FY 1989 Budget*, in the fall.

**Mail registration form to:** AAAS Meetings Office, R&D Colloquium, 1333 H Street, N.W., Washington, D.C. 20005

**Capital Hilton Hotel Reservation**  
**AAAS R&D Colloquium ♦ 14–15 April 1988**

(Reservations received after 24 March cannot be guaranteed)

Send confirmation to:

Name \_\_\_\_\_ Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_ Telephone No. \_\_\_\_\_

**Other occupants of room:** Name \_\_\_\_\_ Name \_\_\_\_\_

**Room:** ☐ Single (\$118)\* ☐ Double (\$138)\* ☐ Twin (\$138)\* \*Add 10% D.C. sales tax and \$1 occupancy tax.

**Arrival:** Date \_\_\_\_\_ Time \_\_\_\_\_ **Departure:** Date \_\_\_\_\_ Time \_\_\_\_\_

Be sure to list definite arrival and departure time. Check-in time is 3:00 p.m.; check-out time is 12 noon.

**Special housing needs due to handicap:** \_\_\_\_\_

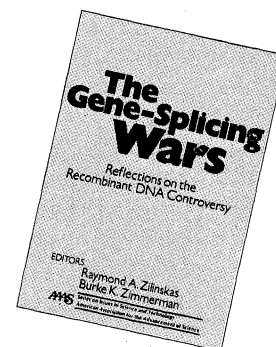
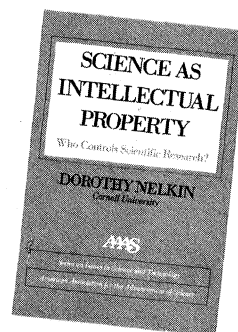
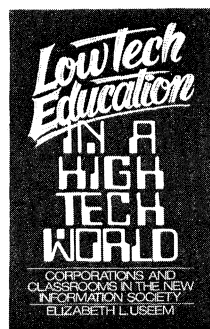
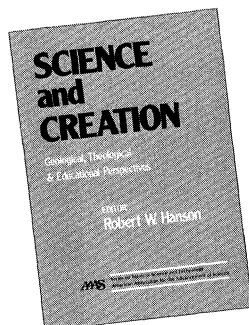
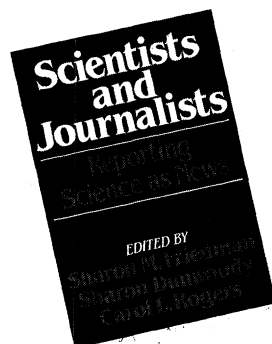
Enclose separate check, made out to **The Capital Hilton**, for first night's room deposit or provide major credit card information:

Credit Card Name \_\_\_\_\_ Number \_\_\_\_\_ Expiration Date \_\_\_\_\_

Cardholder's Signature \_\_\_\_\_

**Mail hotel reservation form to:** Reservations, The Capital Hilton, 16th & K Streets, N.W., Washington, D.C. 20036

# New Titles Available from AAAS



## **Scientists and Journalists: Reporting Science as News**

*Edited by Sharon M. Friedman,  
Sharon Dunwoody, and Carol L. Rogers*

The public is interested in science and depends largely on the mass media for the latest information. But how well do scientists and journalists connect to communicate to the public? This book examines the human aspect of the links between scientists and journalists through the eyes of both.

1985, 352 pp., hardcover; \$24.95, AAAS members \$19.95

## **Science and Creation: Geological, Theological, and Educational Perspectives**

*Edited by Robert W. Hanson*

The creation/evolution controversy is examined by scientists, theologians, educators, and historians. These authors view the controversy as a false dichotomy and as an attempt to force a choice between two ideas that are not mutually exclusive. Includes case studies from several states.

1986, 240 pp., hardcover; \$24.95, AAAS members \$19.95

## **Low Tech Education in a High Tech World: Corporations and Classrooms in the New Information Society**

*Elizabeth L. Useem*

Are students in the U.S. developing the skills necessary for a high technology society, or will it be technological boom, educational gloom? Useem examines education in California's "Silicon Valley" and Boston's Route 128, two of the country's leading high tech centers, and suggests ways for education and industry to forge a stronger partnership for the future.

1985, 256 pp., hardcover; \$19.95, AAAS members \$15.95

## **Science as Intellectual Property: Who Controls Scientific Research?**

*Dorothy Nelkin*

Who controls research? A growing number of legal and administrative disputes raise critical issues of professional sovereignty, scientific secrecy, and proprietary rights. Nelkin offers cases illustrating the dilemmas that arise as the interests of scientists, the rights of citizens, and the security needs of government and industry come into increasing conflict.

1984, 130 pp., softcover; \$10.00, AAAS members \$8.00

## **The Gene-Splicing Wars: Reflections on the Recombinant DNA Controversy**

*Edited by Raymond A. Zilinskas and  
Burke K. Zimmerman*

Questions of safety and ethics about recombinant DNA techniques continue to surface. This book takes a look at historical, political, industrial, scientific, and international aspects of these issues. The authors show how lessons learned from the experience can be used to cope with similar issues in the future.

1986, 256 pp., hardcover; \$24.95, AAAS members \$19.95



All orders must be prepaid. VISA, MasterCard, and Choice accepted; include account number, expiration date, and signature.

Send orders to: AAAS Marketing, 1333 H Street, NW, Dept. M, Washington, DC 20005. Please add \$1.50 postage and handling per order. Allow 4-6 weeks for delivery.

*Published by Macmillan, Inc., for the American  
Association for the Advancement of Science*



## RECOMBINANT DNA

## WORKSHOPS

# Life on the Edge.

Beginning in March, 1988, IBI will offer monthly workshops in the basic concepts and laboratory techniques of recombinant DNA. The four-day "hands-on" course is designed for teachers, businessmen, or researchers with a scientific background but without previous experience in recombinant DNA technology.

### Techniques covered in the workshop include:

- *care and handling of bacterial cultures*
- *isolation and purification of plasmid DNA*
- *restriction enzyme digestions and mapping*
- *agarose gel electrophoresis*
- *recovery of DNA from agarose gels*
- *use of linkers and DNA modifying enzymes to join DNA fragments*
- *transformation of competent bacterial cells*

Workshops will be conducted by David F. Betsch, Ph.D. of the IBI staff. Tuition will be \$495.00 (\$US) which includes all consumable materials. Arrangements for meals or lodging are left to the individual participants.

### Upcoming Workshop sites and dates include:

Date	Departmental Sponsor	Location
March 15 – 18	Molecular Biology and Biochemistry Wesleyan University	Middletown, CT
April 26 – 29	Chemistry, University of Oklahoma	Norman, OK
May 10 – 13	Biology, Washington University	St. Louis, MO
June 21 – 24	Biological Sciences, Wright State University	Dayton, OH

If you are interested in sponsoring a workshop at your facility, there are only a few requirements.

### Sponsors will provide:

- *a lab facility with a capacity for 20 people and available for one week, Monday through Friday, 9:00 a.m. – 5:00 p.m.*
- *autoclave, incubators and refrigeration*

For more information or registration, please call:

David F. Betsch, Ph.D.  
IBI – A Kodak Company  
(800) 243-2555 • (203) 786-5600

*The Cutting Edge of Molecular Biology*



A Kodak Company

## Book Reviews

### New Issues for Phylogenetics

**Molecules and Morphology in Evolution.** Conflict or Compromise? COLIN PATTERSON, Ed. Cambridge University Press, New York, 1987. x, 229 pp., illus. \$49.50; paper, \$15.95. From a congress, Sussex, U.K., July 1985.

Systematics, a traditional bastion of classical morphology, has been deluged by new data from sources that were undreamed of a generation ago. Through a host of new techniques a huge body of molecular data has been amassed in an amazingly short time, and molecules now threaten to overwhelm morphology in phylogeny reconstruction. But contention persists over what some of the new methods measure and how they fit with classic methods and goals. As Patterson asks, "Have molecules superseded morphology as guides to the history of life, or are the two approaches sides of the same coin, with the same problems and limitations? Do molecules and morphology give the same picture of the history of life, or two more or less distorted views of the same picture, or two quite different pictures?" (p. 1). This well-conceived symposium takes stock of the situation.

For both morphological and molecular systematists who are trying to come to grips with each other's data and methods, this is the most accessible and informative volume yet published. It was designed to promote interdisciplinary understanding and succeeds to a large degree. Commendably, most of the contributors have included summaries of the data used to generate their phylogenies, and this alone will ensure the book's lasting utility.

In a fascinating introductory chapter, Patterson compares concepts of homology and phylogeny reconstruction in morphological and molecular systematics. Predictably, some of the conflict between schools lies more in their fundamental philosophies than in the nature of the data being analyzed. However, molecules have unique evolutionary properties that raise issues that have never confronted morphologists. For example, most molecular homologs exist in multiple copies per organism (homonyms), leading to a novel statistical view of molecular homology. Moreover, exon duplication and shuffling can result in the uniting of exons homologous with two or more different genes or proteins, and thus "partial homology" must also be considered. Morphologists are familiar with structures duplicated in ontogeny (serial homology), but gene dupli-

cation in phylogeny has spawned the uniquely molecular concept of *paralogy*, in which paralogous genes may have patterns of descent that are independent of patterns of species descent. Further differences emerge when the roles of pseudogenes, foreign genes, neutral genes, and clocks in phylogeny reconstruction are considered. These issues are explored in the subsequent papers.

Hominoid phylogeny is analyzed cladistically by Andrews using gross morphology, chromosome structural morphology, blood group morphology, protein distance data, amino acid sequencing, and DNA molecular evidence. Andrews argues that previous studies of protein distance data and DNA-DNA hybridization are phenetic and rejects them as representing viable phylogenetic techniques. Morphology and molecular data are congruent in indicating that *Homo* and African apes are more closely related to each other than to the orang. The position of chimps is equivocal, however; amino acid sequencing links them with humans, morphology links them with gorillas, and DNA sequencing has produced ambiguous results.

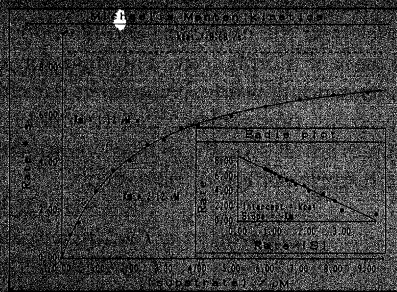
High-level mammalian relationships are cladistically analyzed by McKenna first using morphological data from living and

fossil mammals and then with amino acid sequences from myoglobin and lens alpha crystallin A. McKenna also rejects DNA hybridization and transferrin serology studies as "a dubious mixture of phenetic and cladistic methodology" (p. 57). Discrepancies in details of mammalian relationships arise from the different data sets, especially for aardvarks and pangolins. But McKenna finds basically the same tree topology for major taxa in which both molecules have been studied, and it agrees closely with his morphologically generated tree. He notes that Goodman and associates achieved similar results using cytochrome c, fibrinopeptides A and B, and alpha and beta hemoglobin. Laudably, McKenna's molecular-data summary tabulates all hypothetical substitutions instead of merely listing their number for each locus.

Ignoring Andrews's and McKenna's objections, Sibley and Ahlquist evaluate bird relationships using DNA-DNA hybridization distances. They view convergence as a fatal hazard for morphological systematics that obstructs elucidation of higher-level relationships among birds. For them, DNA-DNA hybridization "solves the problem of homology and thereby eliminates the possibility of convergence" (p. 100). Where mor-

SOFTWARE

## ENZFITTER: THE ULTIMATE CURVE-FITTING PACKAGE FOR IBM PC



ENZFITTER fits sets of experimental data by non-linear regression (Marquand algorithm) to one of several different equations provided. If the equation or transformation you require is not on the list below, you can add your own with the integrated equation editor and store it on disk.

The results are presented in tabular and graphic form, with a presentation quality screen dump facility available for Epson compatible printers and the Hewlett Packard LaserJet. Extra sets of data and transformed/derivative plots of the same data can be shown on screen at the same time. You can draw one graph next to another for comparison. To distinguish data sets, you can select a variety of symbols, semi-continuous lines and add your own labels (including some Greek alphabet characters).

ENZFITTER can be set up to perform robust weighting (removal of outlying data) and to run in batch mode (performing several analyses automatically without user intervention). All results can be sent to a printer or to disk. ENZFITTER provides sophisticated entry and editing facilities for data and it will also read ASCII files including LOTUS 1-2-3 PRN.

ENZFITTER is presented in menu form, with windows and context-sensitive help. It supports Hercules, CGA, and Enhanced graphics cards.

Equations fitted:	Transformed/derivative plots fitted:
Linear regression	Residuals
pKa determination	Scatchard
Michaelis-Menten	Eadie
Kinetics	Lineweaver-Burk
Ligand binding (1 or 2 sites)	Semi-Logarithmic
Single, double or triple exponential decay	Linear pKa
1st order rate equation	
Hill equation	

Package includes comprehensive manual - 5.25" floppy disk for IBM PC (384K RAM min; DOS 2.0 or later).

\$249 - UKC125

Payment with order please. Checks payable to BIOSOFT in US dollars or pounds sterling.

## BIOSOFT

P.O. Box 580, Milltown, New Jersey 08850. Telephone (201) 613 9013.