

AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE

SCIENCE

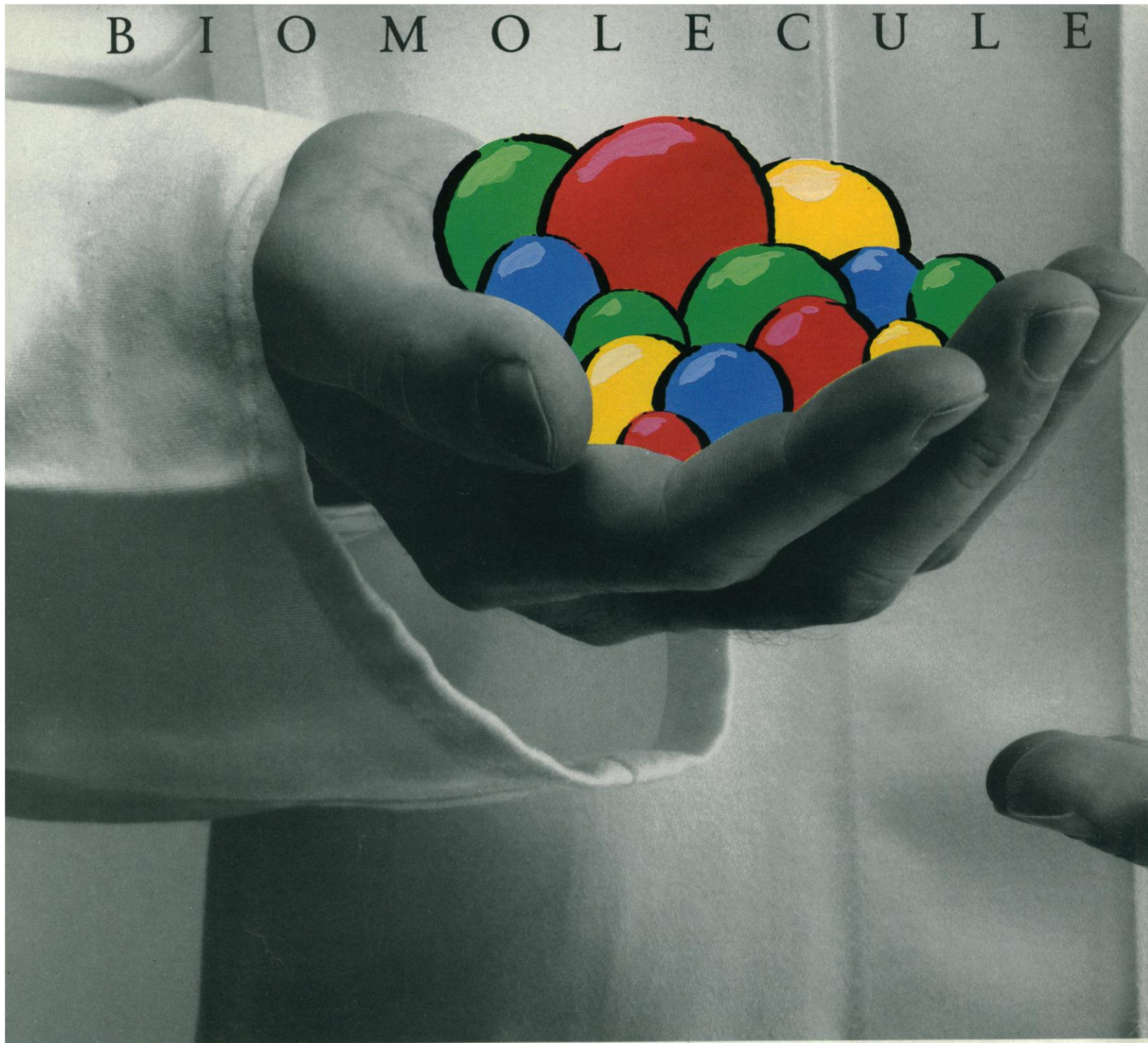
21 APRIL 1989

\$3.50

VOL. 244 ■ PAGES 265-396

Trends in
Energy
Technology

B I O M O L E C U L E



Protein Purification

Handling biomolecules is an everyday task in laboratories throughout the world. Providing the materials, technologies and methodologies to manage this handling is something

we have specialized in for decades.

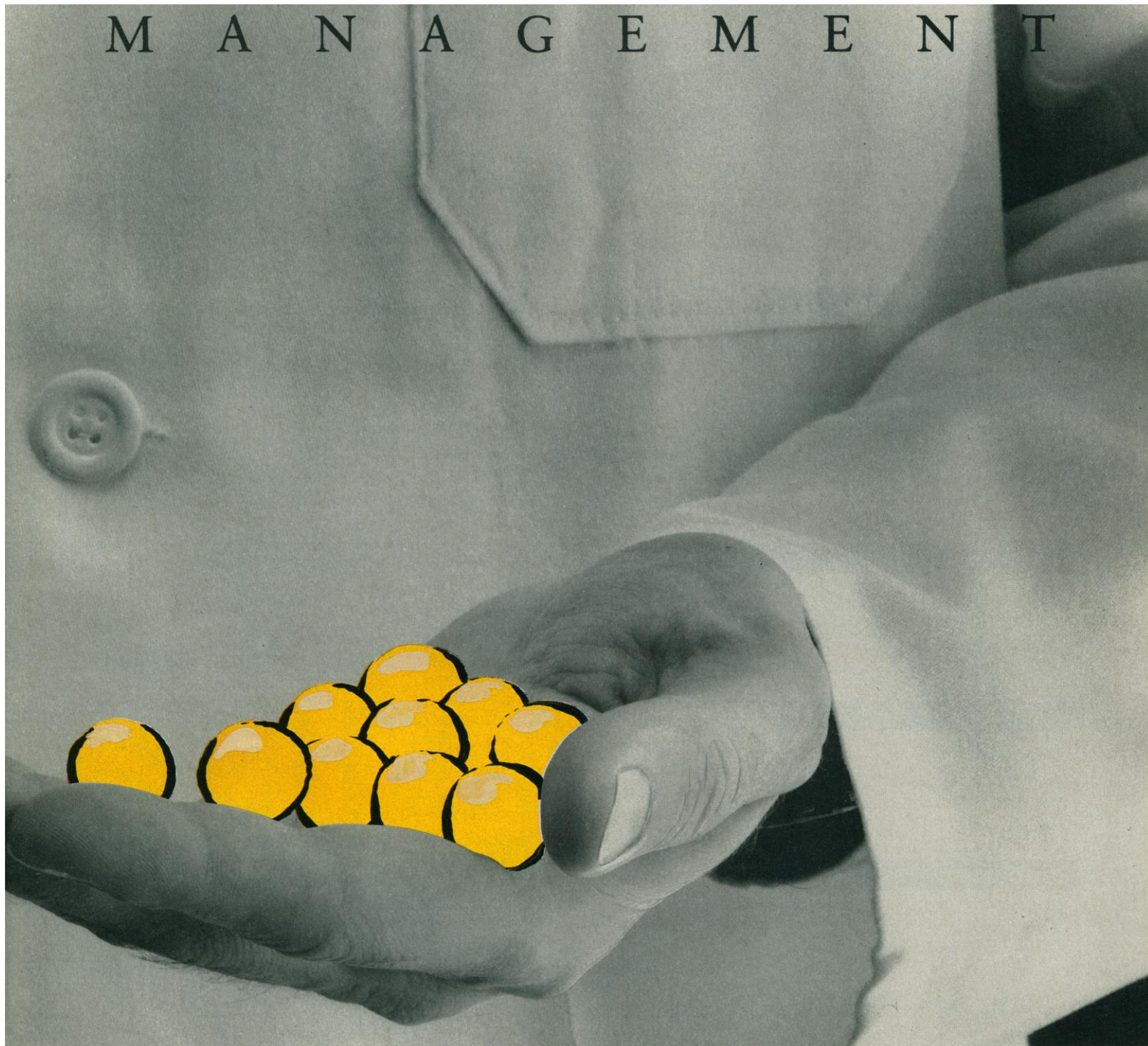
In protein purification, this story started over 30 years ago with the introduction of Sephadex®. Today, we offer a vast gel media

range that passed the 100 mark a long time ago.

All major chromatographic techniques used in managing protein purification are supported, not only with a full complement of gels. We also offer handbooks and workshops detailing methodologies established in our laboratories, or in cooperation with the research and industrial communities.

This diversity of experience also explains why we can help you manage protein purification at al-

M A N A G E M E N T



most any scale, from nanogramme to kilogramme quantities. This applies whether you need new handling systems for a small quantity of a growth factor, or the large scale production of recombinant products, such as insulin and growth hormone.

Your future biomolecule management needs are the focus of our own research efforts, not

only in proteins but also in peptides and nucleic acids.

At Pharmacia LKB, we're always looking for ways to better help you manage biomolecules. And we're constantly finding them. To be sure that you have access to the latest tools in support of protein purification, contact your nearest Pharmacia LKB representative.

We help you manage biomolecules.

6210



Pharmacia LKB Biotechnology
S-751 82 Uppsala, Sweden

Head office Sweden Tel 46 (018) 163000. Australia Tel (02) 8883622. Austria Tel (0222) 6866250. Belgium Tel (02) 2424660. Brazil Tel 55-11 2845815/2898967. Canada Tel (514) 4576661. Denmark Tel (02) 265200. East Europe Tel 43 (0222) 921607. Federal Republic of Germany Tel (0761) 49030. Finland Tel (90) 5021077. France Tel (01) 30643400. Great Britain Tel (0908) 661101. Holland Tel (031) 348077911. India Tel (0812) 29634. Italy Tel (02) 2532844/26700475. Japan Tel (03) 4444811. Norway Tel (02) 549095. Soviet Union Tel 46 (08) 7998000. Spain Tel (34)-36754411. Sweden Tel (08) 7998000. Switzerland Tel (01) 8211816. United States Tel (201) 4578000. Far East Tel 852 (5) 8148421. Middle East Tel 30 (1) 8947396. Other countries Tel 46 (08) 7998000. (8901)

Circle No. 195 on Readers' Service Card

271 This Week in *Science*

Editorial

273 Progress in Energy R&D

Letters

275 Accelerator Production of Tritium: L. T. PAPAY; M. STEINBERG ■ Biotechnology Regulation: P. L. BEREANO; J. RISSLER

News & Comment

277 The Case of the "Misplaced" Fossils
280 "L'Affaire Pasteur" Prompts Canadian Outcry
281 Gramm-Rudman Avoided, for Now
282 Research Group Forswears Financial Ties to Firms Whose Drugs It Tests
National Academy Panel Rejects the Case for a Mini-Space Station
283 Bromley in Line for Science Adviser

Research News

284 Skepticism Grows Over Cold Fusion ■ Fusion Theories Pro and Con
286 New Fault Picture Points Toward Bay Area Quakes
287 AIDS Drugs—Coming But Not Here
288 Does the Ozone Hole Threaten Antarctic Life?
290 *Random Samples*: Market Is Bullish for Nobel Prize ■ A Modest Proposal ■ Save the "Data"!

Articles

Trends in Energy Technology

297 Photovoltaics Today and Tomorrow: H. M. HUBBARD
305 Changing Prospects for Natural Gas in the United States: W. M. BURNETT AND S. D. BAN
311 Improving the Efficiency of Electricity Use in Manufacturing: M. ROSS
318 Improved and Safer Nuclear Power: J. J. TAYLOR

Reports

326 Origin of Granulite Terranes and the Formation of the Lowermost Continental Crust: S. R. BOHLEN AND K. MEZGER
329 Template-Directed Oligomerization Catalyzed by a Polynucleotide Analog: J. VISSCHER, C. G. BAKKER, R. VAN DER WOERD, A. W. SCHWARTZ
331 Access to a Messenger RNA Sequence or Its Protein Product Is Not Limited by Tissue or Species Specificity: G. SARKAR AND S. S. SOMMER

■ **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 © 1989 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): \$75. Domestic institutional subscription (51 issues): \$120. Foreign postage extra: Canada \$46, other (surface mail) \$46, air mail via Amsterdam \$85. First class, airmail, school-year, and student rates on request. **Single copy sales**: Current issue, \$3.50; back issues, \$5.00; Biotechnology issue, \$6.00 (for postage and handling, add per copy \$0.50 U.S., \$1.00 all foreign); Guide to Biotechnology Products and Instruments, \$18 (for postage and handling add per copy \$1.00 U.S., \$1.50 Canada, \$2.00 other foreign). Bulk rates on request. **Change of address**: allow 6 weeks, giving old and new addresses and 11-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 0036-8075/89 \$1 + .10. **Postmaster**: Send Form 3579 to *Science*, P.O. Box 1722, Riverton, NJ 08077. *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 The energy carried by these power lines may flow from diverse technologies. This special issue of *Science* contains articles that survey trends in several areas of energy generation and use. These include photovoltaic solar cells, natural gas, energy efficiency in manufacturing, and nuclear power. See Editorial, page 273. [Photograph by Joe Bator, copyright 1987]

- 334 Expression of High-Affinity Binding of Human Immunoglobulin E by Transfected Cells: L. MILLER, U. BLANK, H. METZGER, J.-P. KINET
- 337 Activation of an Excluded Immunoglobulin Allele in a Human B Lymphoma Cell Line: N. BERINSTEIN, S. LEVY, R. LEVY
- 339 Regulation of Lymphokine Messenger RNA Stability by a Surface-Mediated T Cell Activation Pathway: T. LINDSTEN, C. H. JUNE, J. A. LEDBETTER, G. STELLA, C. B. THOMPSON
- 343 The Role of Cis-Acting Promoter Elements in Tissue-Specific Albumin Gene Expression: P. MAIRE, J. WUARIN, U. SCHIBLER
- 346 A Direct Repeat Is a Hotspot for Large-Scale Deletion of Human Mitochondrial DNA: E. A. SCHON, R. RIZZUTO, C. T. MORAES, H. NAKASE, M. ZEVIANI, S. DIMAURO
- 349 Two Molecular Transitions Influence Cardiac Sodium Channel Gating: D. T. YUE, J. H. LAWRENCE, E. MARBAN
- 352 Modulation of Rod-Cone Coupling by Light: X.-L. YANG AND S. M. WU
- 354 The Incremental Threshold of the Rod Visual System and Weber's Law: L. T. SHARPE, C. FACH, K. NORDBY, A. STOCKMAN
- 357 Oxidation-Reduction and the Molecular Mechanism of a Regulatory RNA-Protein Interaction: M. W. HENTZE, T. A. ROUAULT, J. B. HARFORD, R. D. KLAUSNER
- 359 Isolation of a cDNA Clone Derived from a Blood-Borne Non-A, Non-B Viral Hepatitis Genome: Q.-L. CHOO, G. KUO, A. J. WEINER, L. R. OVERBY, D. W. BRADLEY, M. HOUGHTON
- 362 An Assay for Circulating Antibodies to a Major Etiologic Virus of Human Non-A, Non-B Hepatitis: G. KUO, Q.-L. CHOO, H. J. ALTER, G. L. GITNICK, A. G. REDEKER, R. H. PURCELL, T. MIYAMURA, J. L. DIENSTAG, M. J. ALTER *et al.*

Book Reviews

- 369 Technological Innovation in China, *reviewed by* N. R. LARDY ■ Ruth Benedict, R. HANDLER ■ The Early History of the Ancient Near East, 9000–2000 B.C., R. L. ZETTLER ■ Books Received

Products & Materials

- 373 Latex Particles with Varied Surface Chemistries ■ Peroxidase-Conjugated Fab' Fragments ■ Medium for T Cells ■ Instantaneous Electrophoresis Results ■ Gel Reader ■ Statistics Software ■ Data Analysis Software ■ Literature

Board of Directors

Walter E. Massey
*Retiring President,
Chairman*
Richard C. Atkinson
President
Donald N. Langenberg
President-elect

Mary Ellen Avery
Francisco J. Ayala
Floyd E. Bloom
Mary E. Clutter
Eugene H. Cota-Robles
Joseph G. Gavin, Jr.
John H. Gibbons
Beatrix A. Hamburg
William T. Golden
Treasurer
Richard S. Nicholson
Executive Officer

Editorial Board

Elizabeth E. Bailey
David Baltimore
William F. Brinkman
E. Margaret Burbidge
Philip E. Converse
Joseph L. Goldstein
Mary L. Good
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
Henry R. Bourne
James J. Bull
Kathryn Calame
Charles R. Cantor
Ralph J. Cicerone
John M. Coffin
Robert Dorfman
Bruce F. Eldridge
Paul T. Englund
Fredric S. Fay
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
Carl O. Pabo

Yeshayau Pocker
Michael I. Posner
Dennis A. Powers
Russell Ross
James E. Rothman
Erkki Ruoslahti
Ronald H. Schwartz
Vernon L. Smith
Robert T. N. Tjian
Virginia Trimble
Emil R. Unanue
Geerat J. Vermeij
Bert Vogelstein
Harold Weintraub
Irving L. Weissman
George M. Whitesides
Owen N. Witte
William B. Wood

Master 96 wells with two simple instruments.

One pipettes...

The Brinkmann Transferpette™ 8/12 fits comfortably in your hand while you are performing 8- and 12-channel sample transfers and serial dilutions.

The other repeats...

The Eppendorf Repeater Plus/8™ reduces the fatigue of routinely filling 96-well plates by rapidly dispensing up to 48 times without refilling.

And Brinkmann has both.

Both instruments have unique features to help you master your laboratory procedures.

Call 800-645-3050; in New York, 516-334-7500. Or write Brinkmann Instruments, Inc., Cantiague Road, Westbury, NY 11590. (In Canada: 416-675-7911; 50 Galaxy Blvd., Rexdale, Ont. M9W 4Y5)



BRK 5588

For information circle reader service number 187
For demonstration circle reader service number 188

Shaping the future with **Brinkmann**

This Week in SCIENCE

Growth of continental crust

GRANULITES are rocks that formed under conditions of high pressures and temperatures; they are considered representative of the nature of the lower part of the continental crust. Samples of granulite include xenoliths, which are chunks of the earth's crust that are brought to the surface in erupting magmas, and granulite terranes that are exposed in a few places around the world. Granulite terranes and xenoliths were once thought to have had the same (lower crust) origin, but estimates by Bohlen and Mezger based on the pressures in terranes and xenoliths—which are indications of the depths at which rock metamorphism occurred—suggest that granulite xenoliths come from deeper sources in the earth than do granulite terranes (page 326). The bulk compositions of terranes and xenoliths are also consistent with this distinction. The formation of each, however, may have been induced by the same event—the thickening of the crust (an episodic event) as hot magmas entered and crystallized at the boundary of the crust and the underlying mantle. Most of the granulite xenoliths may be pieces of the crystallized magma; the heat from these magmas would have led to the metamorphism of the overlying crust, forming the granulite terranes.

Leaky gene expression

TISSUE-specific gene expression is in fact not truly tissue-specific: small amounts of messenger RNA molecules for “tissue-specific” genes are produced by cells that are unrelated to the tissue that is normally associated with a given gene activity (page 331). Using a technique called RNA amplification with transcript sequencing (RAWTS), Sarkar and Sommer show that several types of cells (white blood cells, embryonic chorionic villus cells, liver cells, and erythroleukemia cells) all can make small amounts of messenger RNA for four “tissue-specific” proteins—blue pigment (a retina-

specific protein), factor IX and phenylalanine hydroxylase (liver-specific proteins), and tyrosine hydroxylase (specific to brain and adrenal glands). This observation raises the possibility that diagnostic information can be obtained without intrusive biopsies, because tissue-specific messenger RNA molecules can be evaluated directly in readily accessible cells. In addition, because the proteins or segments of proteins specified by the amplified messenger RNA molecules can be produced in vitro, variations in protein structure and function can be observed. Finally, by modifications of the conditions of RAWTS, sequence information can be obtained for homologous proteins in different species and, from this, protein evolution may be better understood.

IgE receptors expressed: nothing to sneeze at

THE binding of a foreign substance—an allergen—to immunoglobulin E (IgE), which is itself bound to a receptor on the surface of a basophil or mast cell, leads to the release of mediators and to the eventual production of an allergic response. The receptors for IgE have been difficult to study for several reasons: the body has a paucity of mast cells and basophils, the cells are difficult to purify, and there are currently no cultured cell lines of either cell type. Miller *et al.* transferred cloned human and rat genes for the four subunits of the receptors—each receptor has one α subunit, one β subunit, and two γ subunits—into cells that were growing in tissue culture; a chimeric rat-human receptor for IgE, which had binding characteristics of normal human IgE receptors, was expressed on the cells (page 334). Access to these receptors should facilitate inquiries into subunit interactions, into how the IgE molecules bind to the α subunits of the receptors, and into the mechanism by which the ensuing immune cascade is triggered. It will be a boon to allergy sufferers if drugs can be identified or designed that inhibit binding of IgE to the receptors or that block triggering after binding has taken place.

Hepatitis C virus

A breakthrough has been made in the identification of the elusive agent(s) of non-A, non-B hepatitis (NANBH); more than 90% of transfusion-associated cases of hepatitis in the United States are of this type. Choo *et al.* proceeded on the assumption that very low amounts of viral antigens are present in infected plasmas; thus, to detect antigens, amplifications would be needed. Plasma from an infected chimpanzee was used as starting material from which antigen amplification was carried out (page 359). Serum from a patient with chronic NANBH (presumed to be a source of antibodies to viral antigens) was used for identifying clones producing NANBH-associated antigens; it was then possible to go back and identify in individual clones the NANBH-associated genetic material—single-stranded RNA. Larger amounts of viral antigen were subsequently produced and a clinical test, based on the antigen, developed for detecting circulating antibodies. Kuo *et al.* report that the virus appears to be a major cause of NANBH in the United States, Italy, and Japan, and, therefore, probably throughout the world (page 362). The availability of an assay for screening blood for “hepatitis C” should make it possible to eliminate this virus from the blood supply. The technique probably can be adapted for cloning genetic material from other poorly characterized viruses and other kinds of infectious agents.

Energy

As it burns, which fuel—gasoline, natural gas, or coal—releases the smallest amount of the greenhouse gas CO₂ into the atmosphere? How has solar energy been beneficial to vaccine delivery? Why were the take-home lessons of the accidents at Three Mile Island and Chernobyl different? This issue of *Science* provides answers to these questions and much much more (pages 273, 297, 305, 311, and 318).

DNA PROBES

FROM OUR HANDS TO
YOURS WITHIN 48 HOURS

Timely and dependable delivery
of **DNA PROBES** is now available
from **AMGEN BIOLOGICALS**.

- *Specificity and consistent quality*
- *Each probe is 30 bases in length*
- *Allow the most stringent hybridization conditions.
(Hybridize at 65° C in 6X SSC and
wash at 65° C in 2X SSC)*

AMGEN BIOLOGICALS offers
you our *experience* in probe
design and our *commitment*
to products of the highest quality.

HUMAN		MURINE
EGF	IL-2	IL-1
FGF-Acidic	IL-3	IL-2
FGF-Basic	IL-4	IL-3
PDGF-A	IL-5	IL-4
PDGF-B	IL-6	IL-5
Erythropoietin	TNF	IL-6
TGF-Alpha	TGF-Beta	IL-7
TGF-Beta	LYMPHTX	IFN-gamma
IGF-1	IFN-gamma	CSF-1
IGF-2	G-CSF	G-CSF
IL-1a	GM-CSF	GM-CSF
IL-1b	M-CSF	

AMGEN
BIOLOGICALS

1900
OAK TERRACE LANE
THOUSAND OAKS,
CALIFORNIA 91320
IN CALIFORNIA
(805) 499-5725
TOLL FREE
(800) 343-7475

CAUTION:
For research use only in
laboratory animals or
in vitro testing. Not
for human use.

Circle No. 33 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: Richard S. Nicholson

Editor: Daniel E. Koshland, Jr.

News Editor: Ellis Rubinstein

Managing Editor: Patricia A. Morgan

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

EDITORIAL STAFF

Assistant Managing Editor: Nancy J. Hartnagel

Senior Editor: Eleanor Butz

Associate Editors: Keith W. Brocklehurst, Martha Coleman, R. Brooks Hanson, Barbara Jasny, Katrina L. Kelner, Edith Meyers, Linda J. Miller, Phillip D. Szuroni, David F. Voss

Letters Editor: Christine Gilbert

Book Reviews: Katherine Livingston, *editor*

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, Patricia L. Moe, Barbara E. Patterson

Copy Desk: Joi S. Granger, Jane Hurd, MaryBeth Shartle, Beverly Shields

Production Manager: Karen Schools Colson

Assistant Production Manager: James Landry

Art Director: Yolanda M. Rook

Graphics and Production: Holly Bishop, Catherine S. Siskos

Covers Editor: Grayce Finger

Manuscript Systems Analyst: William Carter

NEWS STAFF

Correspondent-at-Large: Barbara J. Culliton

Deputy News Editors: Roger Lewin, Colin Norman

News and Comment/Research News: William Booth, Gregory Byrne, Mark H. Crawford, Constance Holden, Richard A. Kerr, Eliot Marshall, Jean L. Marx, Robert Pool, Leslie Roberts, Marjorie Sun, M. Mitchell Waldrop

European Correspondent: David Dickson

Contributing Writer: John Walsh

BUSINESS STAFF

Circulation Director: John G. Colson

Fulfillment Manager: Ann Ragland

Business Staff Manager: Deborah Rivera-Wienhold

Classified Advertising Supervisor: Karen Morgenstern

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

Marketing Manager: Herbert L. Burklund

Employment Sales Manager: Edward C. Keller

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 60914; Jack Ryan, 525 W. Higgins Rd. (312-885-8675); San Jose, CA 95112; Bob Brindley, 310 S. 16th St. (408-998-4690); Dorset, VT 05251; Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581); Damascus, MD 20872; Rick Sommer, 11318 Kings Valley Dr. (301-972-9270); U.K., Europe: Nick Jones, +44(0647)52918; Telex 42513; FAX (0647) 52053.

Information for contributors appears on page XI of the 31 March 1989 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, New York, NY 10036. Telephone 212-730-1050 or WU Telex 968082 SCHERAGO, or FAX 212-382-3725.

Progress in Energy R&D

Our present pattern of energy utilization will someday be substantially altered. Impetus for change will arise from our inability to sustain continued increases in oil imports, or to mounting concerns about the greenhouse effect, acid rain, or urban pollution. Four articles in this issue of *Science* describe progress in developing technologies that may be helpful in responding to the next energy crisis.

Hubbard describes dramatic improvements in photovoltaic (PV) technology. Scores of new PV materials and many new designs have been explored. As a result, the cost of PV electricity has dropped from \$15 per kilowatt-hour to about \$0.30 per kilowatt-hour. To be competitive with future electric generations options, PV modules must exhibit solar energy efficiencies in excess of 15% at costs somewhere between \$0.06 and \$0.12 per kilowatt-hour. Recent striking improvements in efficiency of conversion of solar energy to electricity and continued improvements in methods of manufacture indicate that this goal may be attained by the mid-1990s. A competitive solar cell industry has emerged, and substantial research is being conducted in a number of countries.

Burnett and Ban describe ways in which prospects for natural gas have improved. The energy content of natural gas production in the lower 48 states is already substantially greater than that of oil, and research and development have shown that methane occurs and is recoverable in many places in which oil is not present. Examples include coal seams, shales, and deep formations. A recent U.S. Department of Energy reassessment of the resource base concluded that technically recoverable natural gas in the lower 48 states is 1059 trillion cubic feet—a greater than 50-year supply at today's usage.

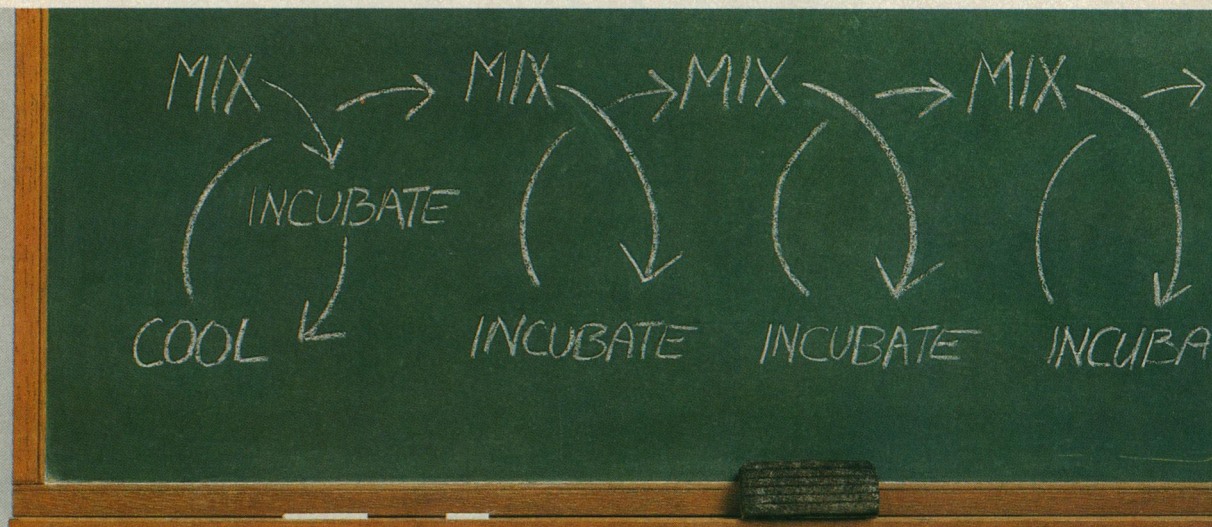
Natural gas is a clean fuel that gives rise to much less pollution than either coal or oil. In applications for cogeneration of electricity and heat, thermal efficiencies of 60% to 80% are achieved. The authors describe other new applications that guarantee an increasing role for natural gas in the U.S. energy mix. For example, the use of small amounts of gas in coal-fired and waste-burning furnaces can lead to substantially decreased emission of pollutants. Improvements in furnaces for home heating have made gas highly competitive with oil or electricity.

Ross discusses energy efficiency in industry. He points out that largely in response to the energy shocks of the 1970s, U.S. manufacturers reduced their real fossil fuel intensity ratio of energy use to production by 50%. In the past decade there have been only sporadic improvements, and Ross states that the cost-effective opportunity now available is very large. In addition to potential financial advantages, the technology of efficient energy use is improving rapidly. Manufacturing is being revolutionized by introduction of new sensors coupled with electronic processing of information, followed by automatic control of processes. For example, equipment being installed in steel mills increases yields by controlling thicknesses during the rolling process. Another development in industry is use of electricity in new applications where special advantages are achieved. That is, electric heating processes can achieve extremely high energy densities. In arc plasmas temperatures of 10,000°C are routine. In almost every sector of industry pioneering methods of obtaining increased efficiency and energy savings are being implemented. If an energy crunch comes, these demonstrations will find energy-saving replications.

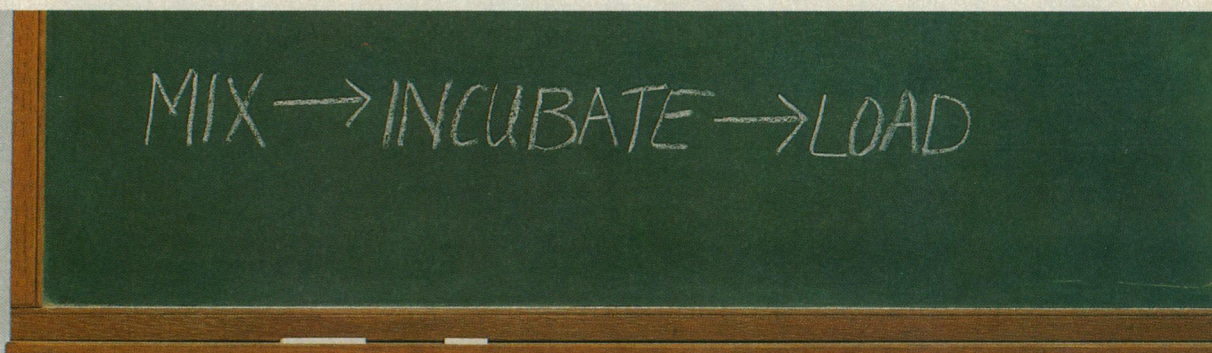
The history of nuclear energy in the United States is a striking illustration of how a great nation can flub a major technological development. Taylor states that the average capacity factor in the United States is about 60% as compared to 75% to 85% in some countries. In addition, U.S. operations and maintenance costs are averaging roughly twice what other countries spend. The U.S. utilities have now set goals to bring their average performance and cost effectiveness to a world competitive level while devoting top priority to safety. Designs of three different reactor systems are moving ahead with five goals in mind: (i) assured safety with features that minimize consequences of human error, (ii) a significantly simpler design, (iii) high reliability throughout a lifetime of on the order of 60 years, (iv) reduction in capital and other costs and a construction time of 3 to 5 years, and (v) a standard design that is predictably licensable.—PHILIP H. ABELSON

FREE SHIPPING & HANDLING
ON ALL
ORDERS


If sequencing has you going around in circles...



let *FASTaq*[™] straighten you out.



Introducing the *FASTaq* sequencing biosystem. The first single incubation protocol.

Finally, there's an end to the mix/incubate/cool cycle. With *FASTaq*, you just mix, incubate once and load. *FASTaq* can cut up to half an hour and up to seven steps from your preparation time while leaving less to go wrong. Best of all, you can walk away while its incubating — and use the time to get more things done.

The *Thermus aquaticus* polymerase actively catalyzes polymerization at

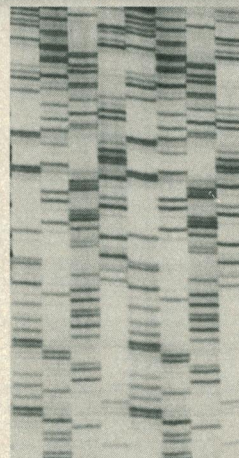
temperatures exceeding 70°C. These higher temperatures denature virtually all template secondary structures and hairpins that cause most data errors. You get crisp, clear, accurate data every time.

Find out more about the *FASTaq* sequencing biosystem. Call or write today...and straighten yourself out. Catalog No. 77190, Price: \$149.00

Call or write.

International Biotechnologies, Inc.,
P.O. Box 9558, New Haven, CT 06535,
1-800-243-2555, (203) 786-5600.

Outside the U.S., please contact IBI for the name of your nearest distributor.



³⁵S labeled sample
prepared using IBI
FASTaq.

VWR Scientific

A VWR COMPANY

The Cutting Edge of Molecular Biology

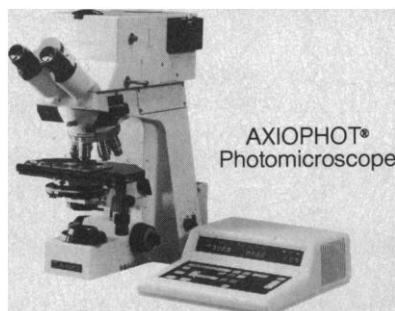
IBI

A Kodak Company

Circle No. 258 on Readers' Service Card

Zeiss Photomicroscopes.

The definitive instruments for scientific, medical, and technical photomicrography.



User-friendly, multi-function control panel automates all camera functions; accommodates all photomicrographic techniques.

ICS (Infinity Color-Corrected System) optics for unexcelled image quality. SI (System Integrated) architecture permits switching among techniques quickly, easily, and without tube factors, loss of light intensity or field of view.

Fully automatic Zeiss 35mm cameras built in; plus 4 × 5 camera and TV.

Light can be distributed for simultaneous observation, photography and TV, or can be concentrated on any one pathway.

Full complement of stages, objectives, condensers, filters, and other accessories.

Don't invest in a scientific/medical photomicroscope before thoroughly investigating Zeiss Photomicroscopes.

Contact your Zeiss dealer today for full details.

Carl Zeiss, Inc.

One Zeiss Drive
Thornwood, NY 10594
914 · 747 · 1800



©1989 Carl Zeiss, Inc.

For Literature Circle Reader Service No. 175
For Literature and Demonstration Circle Reader Service No. 176

least a tradition of altruism, would be greatly exacerbated in committees formed under the auspices of the very entities which they are supposed to be regulating.

PHILIP L. BEREANO
Technology and Public Policy,
College of Engineering,
University of Washington, Seattle, WA 98195

REFERENCES

1. P. L. Bereano, *geneWATCH* 5, 8 (March-June 1988).
2. *Sci. Technol. Hum. Values* 9, 16 (Fall 1984).

Documents recently made public by the Environmental Protection Agency (EPA) indicate that the Office of Management and Budget is refusing to release the EPA rules—in part, because of “fundamental scientific concerns” raised by the White House’s Biotechnology Science Coordinating Committee (BSCC). According to the EPA documents, the BSCC maintains that the “proposed rules do not use scientifically determined likelihood of risk bases for categories of regulated microorganisms” (1).

A new report (2) from the Ecological Society of America (ESA) discredits this BSCC argument against the rules. The ESA report, while supporting the principle of

regulation scaled according to risk, concludes that risk-based categories of transgenic organisms should be developed *after*, not *before*, experience is gained from field experiments and risk assessment research. In other words, it is too soon to develop risk-based categories.

The report also provides well-documented positions and ecological perspectives on other controversial matters that are central not only to the EPA rules but to other federal regulation of biotechnology. For example, it concludes that (i) small-scale releases deserve oversight; (ii) a safe record in traditional agricultural breeding should not exempt from review transgenic organisms that the traditional methods could not have produced; and (iii) techniques other than recombinant DNA produce transgenic organisms that should be subject to federal oversight.

JANE RISSLER
National Biotechnology Policy Center,
National Wildlife Federation,
1400 Sixteenth Street, NW,
Washington, DC 20036-2266

REFERENCES

1. *Fed. Reg.* 54, 7027 (15 February 1989).
2. J. M. Tiedje *et al.*, *Ecology* 70, 298 (1989).

PLAN NOW TO ATTEND!



NEUROSCIENCE Integrative Functions

A symposium honoring VERNON B. MOUNTCASTLE

October 11 - 12, 1989



As a tribute to the pioneering role of Vernon B. Mountcastle in systems neurophysiology, this two-day meeting at The Johns Hopkins University School of Medicine will comprise invited lectures by world leaders in neuroscience with some focus on systems analysis, as well as poster presentations. *Attendees are invited to submit abstracts for poster presentation.*

SPEAKERS

PER ANDERSEN
JOHN E. DOWLING
MICHAEL S. GAZZANIGA
TOMAS HOKFELT
EDWARD G. JONES
ERIC R. KANDEL
MARCUS E. RAICHLE
W. MAXWELL COWAN
GERALD M. EDELMAN
DAVID H. HUBEL
BELA JULESZ
T.P.S. POWELL
PASKO M. RAKIC

FOR FURTHER PROGRAM INFORMATION, CONTACT:

Solomon H. Snyder or Robert Tinker
Room 813 WBSB
The Johns Hopkins University
School of Medicine
725 N. Wolfe Street
Baltimore, Maryland 21205-2195 U.S.A.
(301) 955-3024

FOR REGISTRATION OR GENERAL INFORMATION, CONTACT:

Program Coordinator
Office of Continuing Education
The Johns Hopkins Medical Institutions
Turner Building
720 Rutland Avenue
Baltimore, Maryland 21205-2195 U.S.A.
(301) 955-2959

Announcing... **HUMAN GENOME I**

**October 2 – 4, 1989
Town & Country Hotel • San Diego, CA**

Human Genome I, the conference on the largest biological project ever contemplated, is set for October 2-4, 1989 in San Diego, CA. It is an international conference on the status and future of research on the Human Genome.

Co-chaired By

Charles R. Cantor, Ph.D.
Director, Human Genome Center
Lawrence Berkeley Laboratory

Daniel E. Koshland Jr., Ph.D.
Editor of **SCIENCE**

PARTIAL LIST OF SPEAKERS FOR HUMAN GENOME I

Sydney Brenner
*Director, MRC Molecular Genetics Unit
Cambridge, England*

Eric Lander
*Fellow of the Whitehead Institute for Biomedical Research
Cambridge, Massachusetts*

Robert Moyzis
*Genetics Group Leader
Los Alamos National Laboratory*

Charles Cantor
*Professor of Molecular Biology
University of California, Berkeley
Director, Human Genome Center
Lawrence Berkeley Laboratory*

James Watson
*Director, Cold Spring Harbor Laboratory
Associate Director, NIH Human Genome Project*

Victor McKusick
*University Professor of Medical Genetics
Johns Hopkins University School of Medicine
President, International Human Genome Organization (HUGO)*

Francis Collins
*Associate Investigator, Howard Hughes Medical Institute
Chief, Division of Medical Genetics
University of Michigan Medical Center*

Tasuku Honjo
*Professor of Medical Chemistry
Kyoto University Faculty of Medicine*

Jean Dausset
*Professor, College de France
President, Human Polymorphism Study Center (CEPH)*

Hans Zachau
*Professor, Institute for Physiological Chemistry
University of Munich*

Ronald Davis
*Professor of Biochemistry
Stanford University School of Medicine*

Peter Pearson
*Chairman, Department of Human Genetics
Sylvius Laboratories, Leiden*

Allan Wilson
*Professor of Biochemistry
University of California, Berkeley*

Thomas Caskey
*Professor and Director, Institute for Molecular Genetics
Investigator, Howard Hughes Medical Institute
Baylor College of Medicine*

Russell Doolittle
*Professor of Chemistry and Biology
Center for Molecular Genetics
University of California, San Diego*

Cassandra Smith
*Associate Professor of Molecular Biology
University of California, Berkeley*

Peter Dervan
*Professor of Biochemistry
California Institute of Technology*

David Cox
*Associate Professor of Psychiatry
University of California, San Francisco*

George Church
*Assistant Professor of Genetics
Harvard Medical School*

Raymond White
*Investigator, Howard Hughes Medical Institute
University of Utah*

Norman Arnheim
*Professor of Molecular Biology
Ahmanson Center for Biological Research
University of Southern California*

Renato Dulbecco
*Distinguished Research Professor and Acting President
Salk Institute*

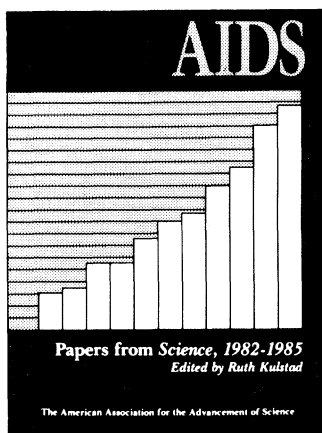
Michio Oishi
*Professor of Applied Microbiology
University of Tokyo*

Sponsored By
SCIENCE MAGAZINE

**A Publication of the American Association for the Advancement of Science
and
The Human Genome Organization (HUGO)**

The conference will be accompanied by an exhibition open to commercial firms offering or planning to offer appropriate equipment. The magnitude of the project and its requirements for the latest in scientific laboratory equipment, supplies and services will make the exhibit a significant contribution both to scientists and the companies that serve the scientific community.

Organized By
SCHERAGO ASSOCIATES, INC.
A Professional Conference Organizer
1515 Broadway, New York, NY 10036
Tel: (212) 730-1050 • Fax: (212) 382-3725



A One-Volume Library of Essential AIDS Research

AIDS: Papers from Science, 1982-1985

Edited by Ruth Kulstad

Some of the most frequently cited papers on acquired immune deficiency syndrome (AIDS) that appeared in *Science* between August 1982 and September 1985 are included in this volume. Arranged chronologically, these 108 research papers and *Science* news reports show how far AIDS research has come and provide an indication of the directions in which it might go. This fully indexed collection is useful not only for the experimental data and conclusions, but also as an excellent source of references to AIDS work in other major journals worldwide.

An overview of research in AIDS to date is provided in the introduction by Dr. Myron Essex, chairman of the Department of Cancer Biology, Harvard University School of Public Health.

654 pp.; fully indexed and illustrated
Hardcover \$32.95 (AAAS member price \$26.35)
Softcover \$19.95 (AAAS member price \$15.95)

Order from: AAAS Marketing, Dept. A, 1333 H St., NW, Washington, DC 20005. Add \$1.50 postage and handling per order. Allow 4-6 weeks for delivery.

American Association for the Advancement of Science

Yes! Please send me the following copies of *AIDS: Papers from Science, 1982-1985*:

____ hardcover \$32.95 (AAAS member price \$26.35) \$ ____

____ softcover \$19.95 (AAAS member price \$15.95) \$ ____

Postage and handling \$ 1.50

TOTAL \$ ____

☐ Check ☐ VISA ☐ MasterCard

credit card number

expiration date

signature

Name _____

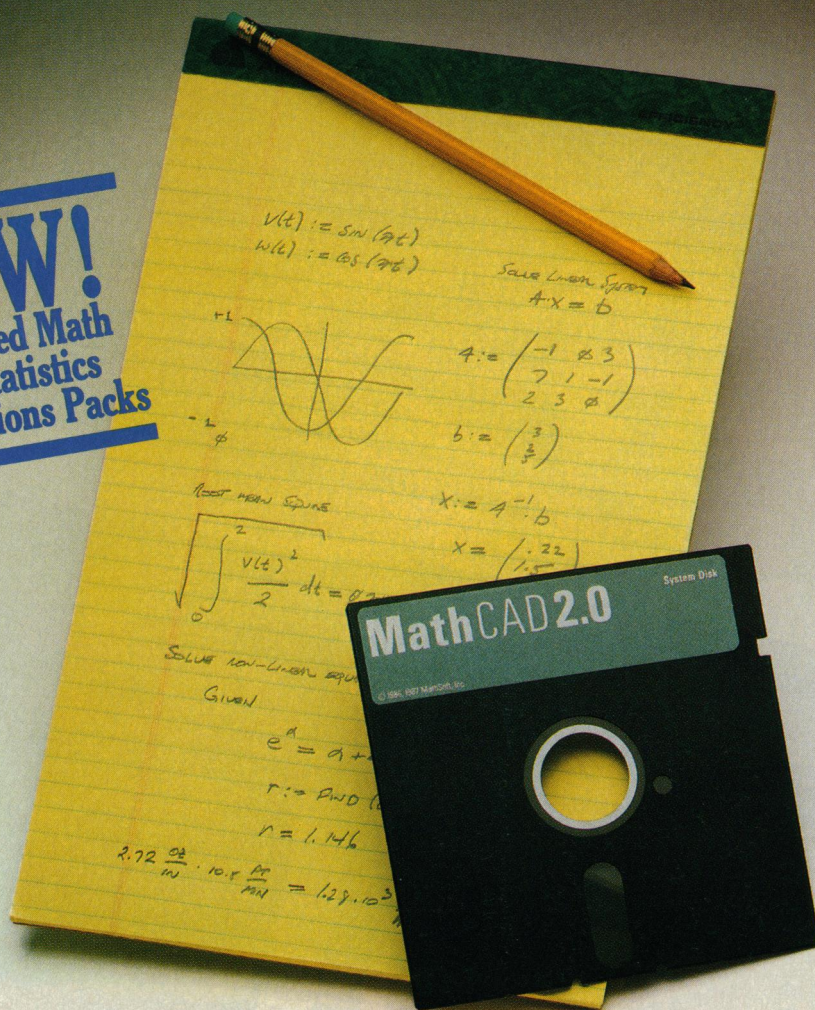
Street Address _____

City _____ State _____ Zip _____

AAAS member number (from *Science* mailing label) _____

Thank you for your order. Please send it to: AAAS Marketing, Dept. A, 1333 H Street, NW Washington, DC 20005. Please allow 4-6 weeks for delivery.

NEW!
Advanced Math
and Statistics
Applications Packs



Your pad or ours?

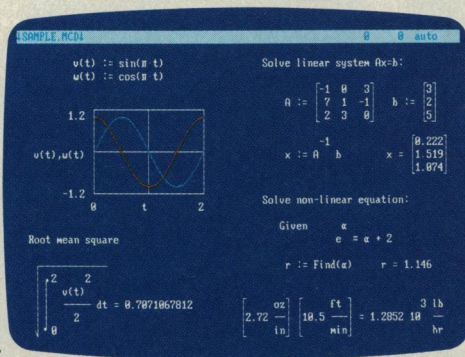
If you perform calculations, the answer is obvious.

MathCAD 2.0.

It's everything you appreciate about working on a scratchpad—simple, free-form math—and more. More speed. More accuracy. More flexibility.

Just define your variables and enter your formulas anywhere on the screen. MathCAD formats your equations as they're typed. Instantly calculates the results. And displays them exactly as you're used to seeing them—in real math notation, as numbers, tables or graphs.

MathCAD is more than an equation solver. Like a scratchpad, it allows you to add



text anywhere to support your work, and see and record every step. You can try an unlimited number of what-ifs. And print your entire calculation as an integrated document that anyone can understand.

Plus, MathCAD is loaded with powerful

built-in features. In addition to the usual trigonometric and exponential functions, it includes built-in statistical functions, cubic splines, Fourier transforms, and more. It also handles complex numbers and unit conversions in a completely transparent way.

Yet, MathCAD is so easy to learn, you'll be using its full power an hour after you begin.

Requires IBM PC® or compatible, 512KB RAM, graphics card.
IBM PC® International Business Machines Corporation.
MathCAD® MathSoft, Inc.

What more could you ask for? How about two new applications packs to increase your productivity?

The **Advanced Math Applications Pack** includes 16 applications like eigenvalues and eigenvectors of a symmetric matrix, solutions of differential equations, and polynomial least-squares fit.

The **Statistics Applications Pack** lets you perform 20 standard statistical routines such as multiple linear regression, combinations and permutations, finding the median, simulating a queue, frequency distributions, and much more.

MathCAD lets you perform calculations in a way that's faster, more natural, and less error-prone than the way you're doing them now—whether you use a calculator, a spreadsheet, or programs you write yourself. So come on over to MathCAD and join 45,000 enthusiastic users.

For more information, contact your dealer or call **1-800-MATHCAD** (In MA: 617-577-1017).

MathCAD®

MathSoft, Inc., One Kendall Sq., Cambridge, MA 02139

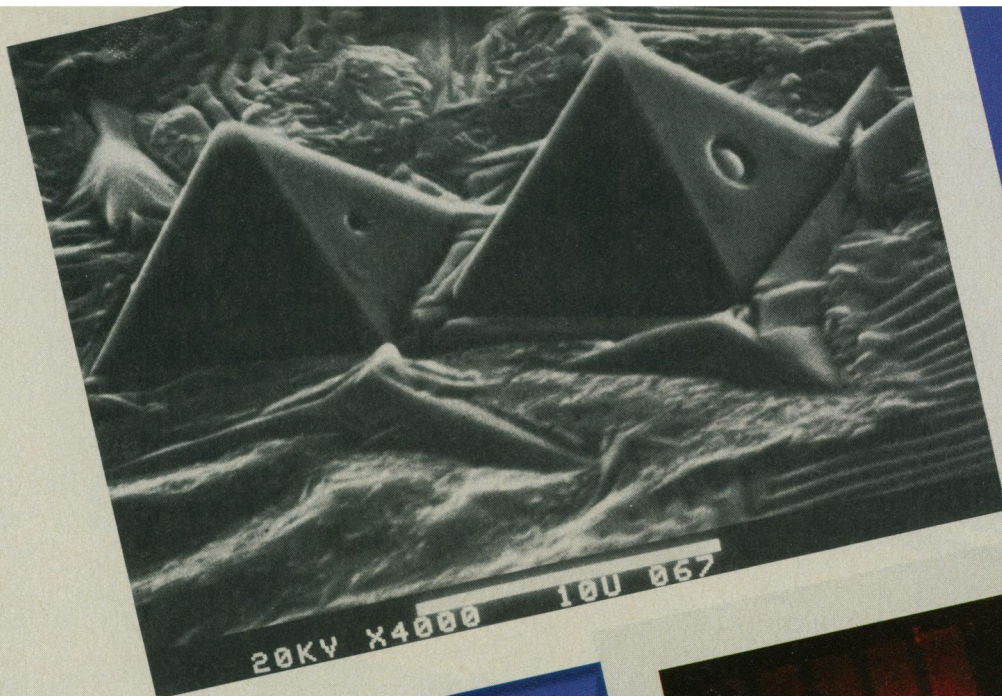


Fig. 1

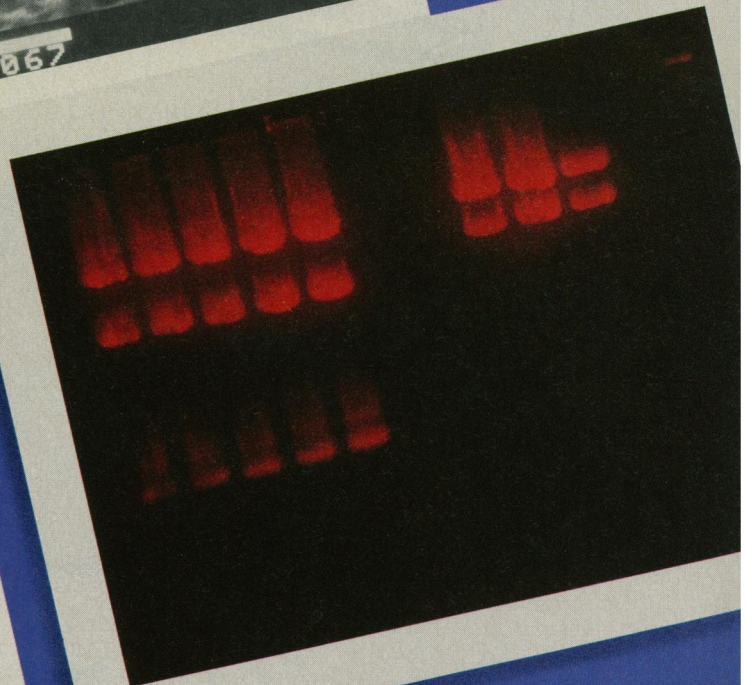


Fig. 2



Fig. 3



Fig. 4

How to save work.

There's no faster, easier, or better way to capture your research findings than with Polaroid instant films and imaging systems. Whether it's for review, analysis, documentation, or sharing your findings with your colleagues, Polaroid can help you capture the results of your work instantly. The images on the left were created in seconds, and they show just some of the many ways that Polaroid can help you develop your own research in house.

This S.E.M. image magnified $4000\times$ (Fig. 1) is an inner surface shrinkage cavity formed on solidification of a nickel-tin eutectic alloy sphere levitated in microgravity aboard the space shuttle. The fine detail was captured on Polaroid Type 55 black and white instant film.

PolaColor ER Type 669 film and the Polaroid MP-4 Multipurpose Camera were used to produce this image of an electrophoresis pattern from an enzyme digestion of Plasmid DNA (Fig. 2).

This particle analysis of a metal alloy (Fig. 3) is shown on High Speed AutoFilm Type 339. Type 339 displays consistent saturated color and requires no pulling, timing or peeling. It was made with the Polaroid FreezeFrame Video Image Recorder.

This image of a pollen grain, magnified $3300\times$ (Fig. 4), was taken

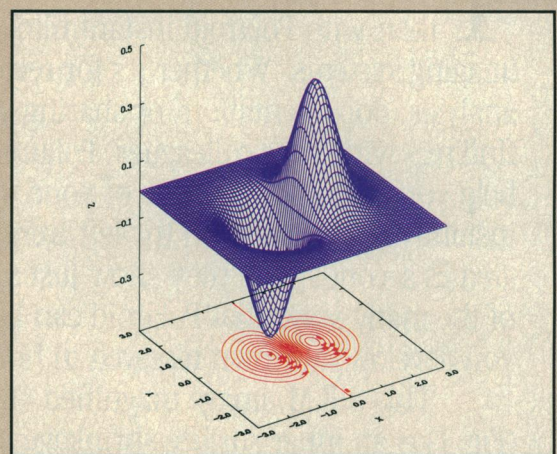
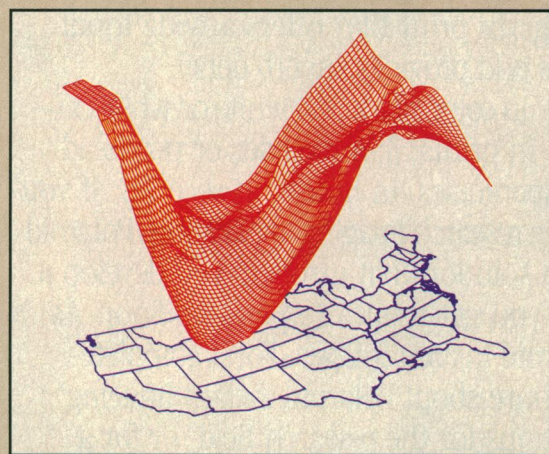
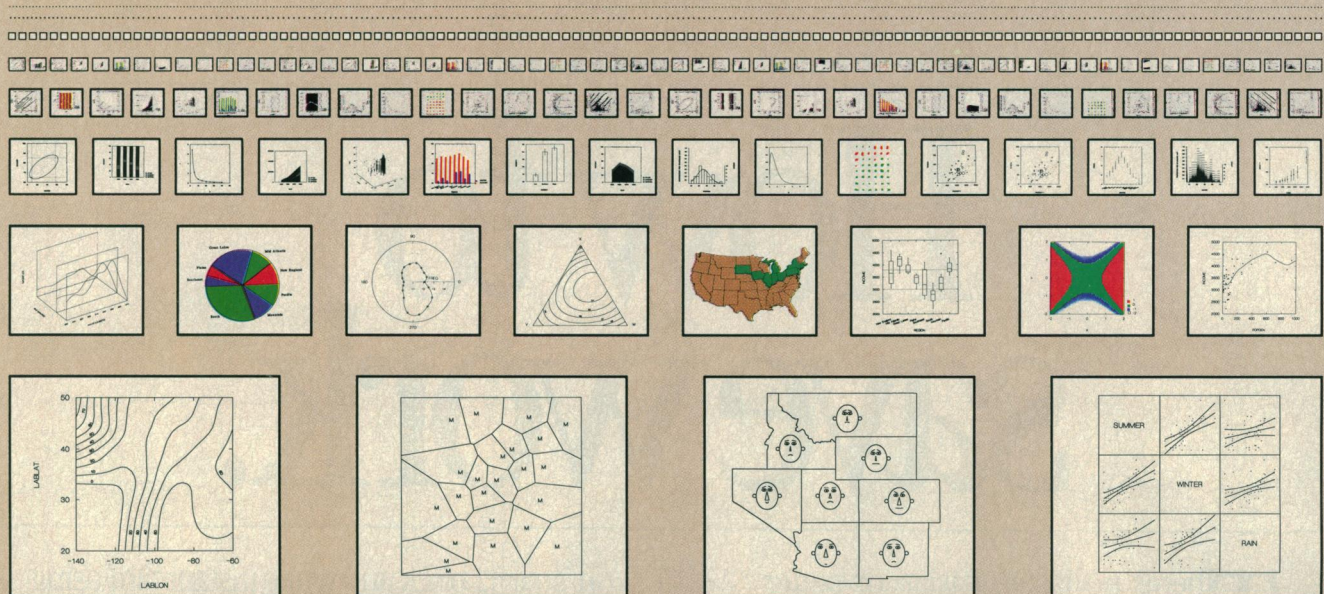
on Type 52 black and white instant film using a JEOL scanning electron microscope. This fine grain print film offers a wide tonal range and provides superb detail.

In color, black and white or white-on-blue. In prints, 35mm slides or overhead transparencies. In house. In seconds. If you have a research imaging application, Polaroid has a solution that can help you develop it. And you get it all A.S.A.P.—As Soon As Polaroid instant images. For a complete brochure about Polaroid instant imaging solutions for the research field, or for a free consultation, call **1-800-343-5000**. Or write, Polaroid Corporation, Dept. 694, P.O. Box 5011, Clifton, N.J. 07015.

Circle No. 174 on Readers' Service Card

A.S.A.P.
As Soon As Polaroid
Polaroid

"Polaroid" and "Polarcolor"® "FreezeFrame" and "AutoFilm"™ © Polaroid 1988



If a picture is worth a thousand words, what are a thousand pictures worth?

Sygraph has more technical graphics than any other PC or mainframe package.

If you already use a technical graphics package, you probably have been frustrated to find that it cannot produce the sophisticated graphs you need for presentation or publication. You want asymmetrical error bars, but it draws only symmetric. You want logs to any base, but it does only base 10. You want contouring over irregularly spaced data points with several different smoothers, but it contours only over regular grids.

Sygraph was developed for the scientist. Text can be infinitely sized and angled in two or three dimensions. Composite 3-D graphs can be produced with a surprisingly simple set of commands. And unlike "paint" programs, it can process programmable macros to produce customized graphs for similar applications on different data.

Sygraph interfaces to popular microcomputer file formats and it includes drivers for over 50 color boards, plotters, printers, cameras and other graphic devices. If you use a spreadsheet, a data base, or a statistics package like SYSTAT, SAS or SPSS, now you can produce the graphics worthy of your research.

Sygraph operates on IBM PCs and compatibles. Single copy price \$495. Site licenses, quantity prices and training seminars available. No fees for technical support.

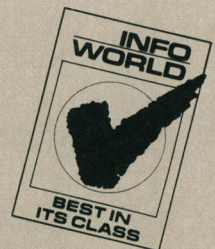
SYSTAT, SAS and SPSS are registered trademarks of SYSTAT, Inc., SAS Institute Inc. and SPSS Inc., respectively.

Features: Overlay plots • Drivers for most graphics devices • *Two-dimensional:* Error Bars • Scatterplots • Line and Vector Graphs • Vector, Dot, Bubble and Quantile Plots • Bar Graphs (single, multiple, stacked, range) • Box plots (single and grouped) • Stem-and-leaf diagrams • Linear, quadratic, step, spline, polynomial, LOWESS, exponential smoothing • Confidence Intervals and ellipsoids (any alpha value) • Smooth mathematical functions • Rectangular or polar coordinates • Log and power scales • ANOVA interaction plots • Histograms (regular, cumulative, fuzzy) • Stripe and jitter plots • Gaussian histogram smoothing • Scatterplot matrices • Voronoi Tessellations • Minimum spanning tree • Maps with geographic projections (U.S. state boundary file included) • Chernoff faces • Star plots • Fourier plots • Pie charts • Contour plots on regularly and irregularly spaced points • Control charts and limits • *Three-dimensional:* Data plots • Smooth function plots • Vector plots • Linear, quadratic, spline, least squares surface smoothing • Three-dimensional type fonts • Import/export Lotus, dBase, and DIF files • Full screen data editor

SYGRAPH

For more information, call 312.864.5670 or write Systat, Inc.,
1800 Sherman Avenue, Evanston, IL 60201. FAX 312.492.3567.

Systat. Intelligent software.



SORVALL® Ultracentrifuges let you select the speed and automation that's right for you!

Choose from 6 models, including 3 new OTD-B ultraspeeds

The successful OTD-B series of ultraspeed centrifuges now includes speed ranges of 60-, 70-, and 80,000 rpm. This series has proven so reliable that we are increasing the drive warranty to 25 billion revolutions. These models are microcomputer-controlled and have automatic rate control. Also new is an optional Programmer Accessory that increases research versatility through delayed start runs and time-related rotor speed changes (Step Mode).

Our other line of ultraspeeds—the RC-Ultras—does your detail work automatically with such features as a Step Mode that changes rotor speed and time sequentially. A built-in memory enables you to store all run parameters for repetitive runs. The optional printer produces records of run parameters and even logs cumulative rotor usage, all automatically.

You can use any SORVALL® and almost all Beckman ultra rotors, fully warranted, in your SORVALL® RC or OTD-B. Ultraversatility—another example of the edge your research gets from the “working knowledge” built into all Du Pont Biotechnology products.

For a 20-page ultraspeed brochure, call 1-800-551-2121. In Canada, call 1-800-387-2179.

Or write Du Pont Company, Biotechnology Systems, P16-2130, Wilmington, DE 19880-0016.


**Working Knowledge
in Biotechnology**

REG. U.S. PAT. & TM. OFF.

Circle No. 252 on Readers' Service Card



Weighing is now easier than phoning a friend. **METTLER BasBal. The new Basic Balances.**



Making a telephone call to a friend is routine yet complicated. You must look up the number, pick up the receiver, listen for the dial tone, dial the number, wait for your friend to answer, and then only if your friend is at home and his telephone line isn't busy can you finally begin talking. Weighing with the new METTLER BasBal is much easier. Place your sample on the pan and read the results. That's it! Nothing could be easier to use or easier on your budget. The same technical advances that make the BasBal very compact so that it uses so little of your precious bench space, also make it available at a very attractive price. The only hard part about the BasBal is selecting which of the 10 models is right for your work. When all you need is a "Basic Balance" the new METTLER BasBal offers you the performance and after the sale service that comes only when you own a METTLER.

Now you know why weighing is now easier than phoning a friend.

Mettler Instrument Corporation
Box 71, Hightstown, N.J. 08520
Phone 1-800-METTLER
in New Jersey 609-448-3000

**METTLER**

Circle No. 231 on Readers' Service Card



To design these
microscopes
takes a
supercomputer
powerful
enough to send
man to the stars.



It is an analytical
mind of formid-
able proportion.
Computing opti-
cal formulae

of daunting complexity. Rigorously
testing its calculations on intricate,
self-generated models. Then meticu-
lously honing the chosen formula for
absolutely optimum performance.

And it accomplishes all this at
speeds that defy belief. Procedures
once monitored on a calendar are
now clocked.

The ends justify these means—
optics of exceptional clarity and bril-
liance. On such microscopes as the
AHS, IMT2 and BH2, these optics
couple with innovative design and
precision machining to give you the
one thing a microscope must provide:
Superior vision.

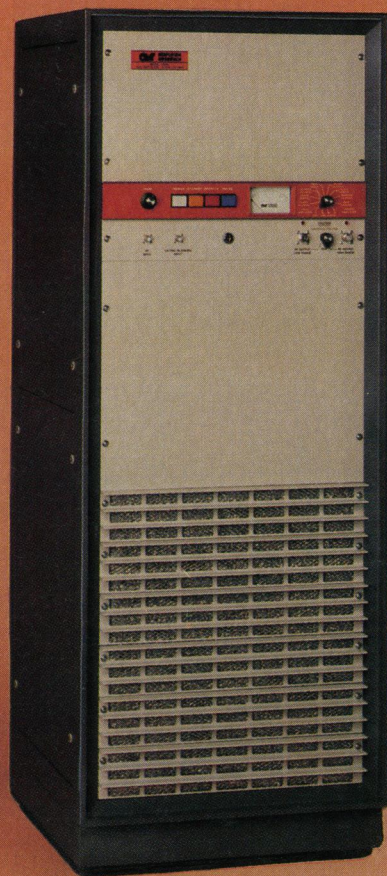
The microscopes of Olympus—
they'll change the way you look
at things.

For a demo or tech information,
call toll-free: 1-800-446-5967.

Olympus Corporation, Precision
Instrument Division, 4 Nevada Drive,
Lake Success, New York 11042-1179.
In Canada: W. Carsen Co., Ltd., Ontario.

OLYMPUS®
The Image of Quality.

For information circle reader service number 193
For demonstration circle reader service number 194



Eight percent mortgages. Affordable auto insurance. Thirty bucks a watt.

Sound too good to be true? The first two probably are, but \$30 a watt is about all you'll pay for our new model 1000L power amplifier—\$30 a watt in the bandwidth you need for rf susceptibility testing.

For little more than \$30 a watt, the 1000L delivers a full 1000 watts over a bandwidth of 10 kHz to 220 MHz. In pulse mode, the output rating is more than doubled—2500 watts to 150 MHz—or a little under \$13 a watt.

As important to you as its cost is the fact that the 1000L will come through any load mismatch without damage, foldback, or oscillation. And this self-contained amplifier is smaller than similarly-rated competitive

amplifiers. While we're comparing, please note also that its 1000-watt rating indicates the *minimum* output at every point in its frequency range.

Admittedly, mortgages and auto insurance are 'way outside our expertise, but thirty bucks a watt we can do.



160 School House Road, Souderton, PA 18964-9990 USA
TEL 215-723-8181 • TWX 510-661-6094 • FAX 215-723-5688

frowned upon" (p. 158; cf. p. 263). Here Caffrey depicts Benedict as an innovator struggling against repression, but to do so creates an overly dramatic intellectual history. Most good anthropology theorizes as well as describes. And Caffrey herself indicates that Boas early approved the new directions that Benedict explored (p. 156). Finally, in a book that exhaustively footnotes its sources, Caffrey makes large claims, on apparently slim evidence, for the influence of feminist writings on Benedict's thought. Benedict's last great undertaking, the Research on Contemporary Cultures project, is described as explicitly feminist in spirit and organization. Yet to make this case, Caffrey must insert the writings of feminist Ellen Key into her narrative (pp. 346-347), as if they represented Benedict's own philosophy, even though Benedict's acquaintance with Key's work is only vaguely documented (p. 85). Ironically, Caffrey concludes her book with a celebration of this cooperative, egalitarian research organization, though she had earlier celebrated Benedict as a lone scientific discoverer.

In general, Caffrey's work has the plodding thoroughness of a doctoral dissertation. She summarizes enormous amounts of material from a number of disciplines. Her reviews of trends and ideas that influenced Benedict are revealing, and they explore

themes in intellectual history overlooked by Benedict's other biographers. But, like her discussions of the history of anthropology, Caffrey's summaries are sometimes simplistic and, like her reviews of feminist thought, mechanically inserted into the narrative. Ruth Benedict taught that every culture has the vices of its virtues, and the same might be said of biography.

RICHARD HANDLER
Department of Anthropology,
University of Virginia,
Charlottesville, VA 22906-9024

Ancient Mesopotamia

The Early History of the Ancient Near East, 9000-2000 B.C. HANS J. NISSEN. University of Chicago Press, Chicago, 1988. xiv, 215 pp., illus. \$34.95. Translated from the German edition (Darmstadt, 1983) by Elizabeth Lutzeler with Kenneth J. Northcott.

The greatest achievement of ancient Near Eastern civilization, in the view of Hans J. Nissen, was the creation and elaboration of universally valid forms of political organization. In *The Early History of the Ancient Near East*, Nissen traces the development of those forms of organization from the first permanent settlements in the area to the establish-

ment of regional states under dynasties centered at the southern Mesopotamian cities of Akkad (about 2334 to 2154 B.C.) and Ur (about 2112 to 2004 B.C.).

The book opens with an introductory chapter, "Sources and problems," that includes a provocative discussion of the respective characters of archeological and written sources. Ancient Near Eastern political developments are then treated according to phase: the time of settlement (roughly 9000 to 6000 B.C.), the evolution of isolated settlements into towns (6000 to 3200 B.C.), the periods of early high civilization (3200 to 2800 B.C.), rival city-states (2800 to 2350 B.C.), and the first territorial states (2350 to 2000 B.C.). There are a short conclusion, headed "Prospects," and a bibliography organized chapter by chapter.

Without any doubt, *The Early History of the Ancient Near East* is an original and coherent synthesis of 7000 years of political evolution, but it is also idiosyncratic. As Nissen admits in his preface, the book is one of several possible historical reconstructions. As such, it is not primarily for a general audience. It can be most effectively used by those with some background in the archeological and textual sources for the area and time periods in question and the ability to evaluate Nissen's arguments and interpretations, which provide a balance to the stock

Is your Protein Research on Track?

Electrophoresis with Titan® III cellulose acetate is a fast, inexpensive method for monitoring protein research. Separations are complete in minutes and cost just pennies per sample.

Titan III tells you quickly...

- Identity
- Purity
- Binding properties
- Approximate concentrations

Cellulose acetate electrophoresis is flexible, technically simple and requires tiny sample volumes. Migration is fast — only minutes to separate and stain. Patterns may be enhanced by general staining, immunofixation, transfer to nitrocellulose, autoradiography or many other techniques.

About Titan III Cellulose Acetate

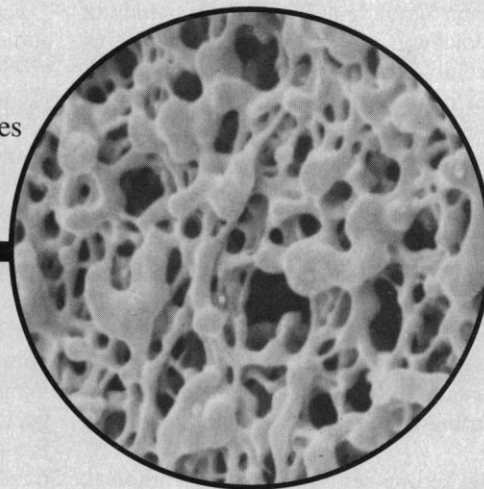
- Available in several convenient sizes
- Indefinite shelf life
- Requires very little storage space
- Stable at room temperature

Other Applications for Researchers

- Monitoring column chromatography elutions
- Evaluation of samples in protein purification experiments
- Monitoring the progress of protein digestion by tryptic agents
- Assessing contents of cell extracts

For more information and details about packaging and pricing, call toll free 800-231-5663.

In Texas, 800-392-3126.



Helena Laboratories
Beaumont, Texas 77704

Circle No. 184 on Readers' Service Card