

AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE

Science

3 MARCH 1989

\$3.50

VOL. 243 ■ PAGES III3-1244



What a difference a J makes.

You'll really appreciate the difference a J Series high-speed or large-capacity centrifuge can make in your lab.

For one thing, they *are* different. They're designed that way. With a lot of attention to little details that make a big difference when you use a centrifuge day after day.

Like being able to set the controls in any order you want. Or attach the rotors with speed and ease.

And J Series centrifuges accept a full range of standard rotors, *plus* some very different ones. Counterflow centrifugal elutriation



for living cell separation is a good example. So is our high-force rotor for mini-preps.

We've even made the J Series easier to live with. They're quieter, accelerate and decelerate faster, and put out less heat. Why less

heat? Their efficient design means they don't have to work as hard to do the job.

All in all, we've done quite a lot to make the J Series friendly. And much more productive.

Find out what a difference a J makes. Contact Beckman Instruments, Inc., Spinco Division, 1050 Page Mill Road, Palo Alto, CA 94304. (800) 742-2345. Offices worldwide.

BECKMAN

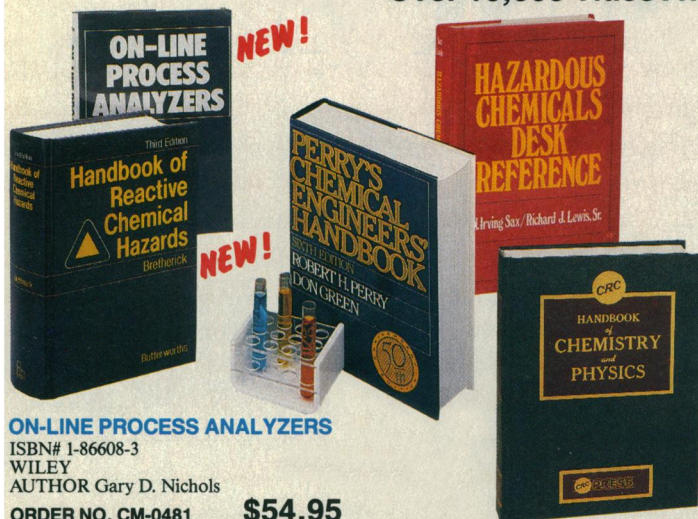
A SMITHKLINE BECKMAN COMPANY

Circle No. 114 on Readers' Service Card



Ω OMEGA PRESS YOUR SOURCE FOR TECHNICAL AND SCIENTIFIC BOOKS

Over 10,000 Titles Available. Call Us with Your Book Request Today!



ON-LINE PROCESS ANALYZERS

ISBN# 1-86608-3
WILEY
AUTHOR Gary D. Nichols
ORDER NO. CM-0481 **\$54.95**

HANDBOOK OF REACTIVE CHEMICAL HAZARDS 3RD ED.

ISBN# 0-408-01388-5
BUTTERWORTHS
AUTHOR L. Bretherick
ORDER NO. CM-0480 **\$128.00**

PERRY'S CHEMICAL ENGINEERS' HANDBOOK 6TH ED.

ISBN# 07-049479-7
MCGRAW-HILL
Robert H. Perry and Don W. Green, Editors
ORDER NO. CM-0102 **\$102.00**

HAZARDOUS CHEMICALS DESK REFERENCE

ISBN# 0-442-28208-7
VAN NOSTRAND REINHOLD
N. Irving Sax and Richard J. Lewis, Sr.
ORDER NO. CM-0452 **\$69.95**

CRC HANDBOOK OF CHEMISTRY AND PHYSICS 69TH ED.

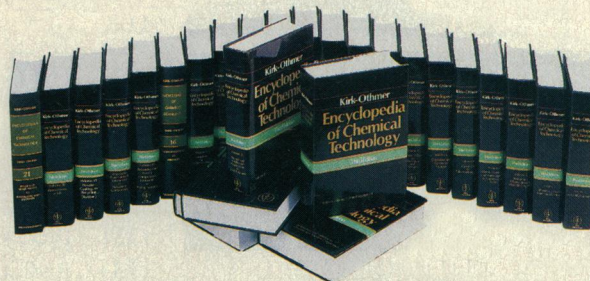
ISBN# 0-8493-0469-5
CRC PRESS
Robert C. Weast, PhD., Editor
ORDER NO. SD-0503 **\$84.95**

KIRK-OTHMER ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY 3RD ED.

ISBN# 0-471-80104-6
Editorial Board: Herman F. Mark,
Polytechnic Institute of New York; Donald F.
Othmer, Polytechnic Institute of New York;
Charles G. Overberger, University of
Michigan; and Glenn T. Seaborg, University
of California, Berkeley

The 3RD ED. of the "bible" of chemical
technology is now available in 26 volumes,
including Index and Supplement.
Complete 26-Volume Set: \$4,650.00
Price per volume purchased separately:
\$200.00

ORDER NO. CH-4000



POLYMERS: AN ENCYCLOPEDIA SOURCEBOOK OF ENGINEERING PROPERTIES

ISBN# 1-85652-5
WILEY
AUTHOR Jacqueline I. Kroschwitz
ORDER NO. GE-0501 **\$67.95**

INSTRUMENTATION REFERENCE BOOK

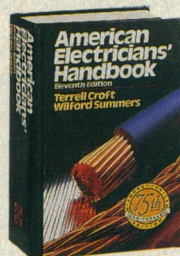
ISBN# 0-408-01562-4
BUTTERWORTHS
AUTHOR B. E. Noltingk
ORDER NO. GE-0500 **\$220.00**

QUALITY CONTROL HANDBOOK 4TH ED.

ISBN# 0-07-033176-6
MCGRAW-HILL
J. M. Juran, Editor-in-Chief; F. M. Gryna,
Jr. and R. S. Bingham, Jr., Associate Editors
ORDER NO. GE-0142 **\$79.50**

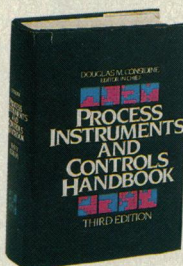
MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS 4TH ED.

ISBN# 0-07-045270
Sybil P. Parker, Editor-in-Chief
ORDER NO. GE-0126 **\$95.00**



AMERICAN ELECTRICIANS' HANDBOOK 11TH ED.

ISBN# 0-07-013932-6
MCGRAW-HILL
Edited by Terrell Croft and Wilford I.
Summers
ORDER NO. EE-0682 **\$64.50**



PROCESS INSTRUMENTS AND CONTROLS 3RD ED.

ISBN# 0-07-0124361
MCGRAW-HILL
Douglas M. Considine, Editor-in-Chief
ORDER NO. MS-0333 **\$99.50**

Ω OMEGA PRESS

An OMEGA Technologies Company

Eight Omega Dr. P.O. Box 4182 Stamford, CT 06907

- ✓ Latest Edition of Books Always Sent
- ✓ One-Stop Shop by Phone Convenience
- ✓ Over 10,000 Important Books from the
Leading Publishers
- ✓ No Handling Charges Ever

CALL TOLL FREE IN THE USA

1-800-222-Book™
1-800-222-2665

IN CT DIAL (203) 359-1660

OR FAX (203) 359-7888



MARKS' STANDARD HANDBOOK FOR MECHANICAL ENGINEERS 9TH ED.

ISBN# 0-07-004127-X
MCGRAW-HILL
Eugene Avallance and Theodore Baumeister,
Editors-in-Chief
ORDER NO. ME-0301 **\$92.00**

PRINCIPLES AND METHODS OF TEMPERATURE MEASUREMENT

ISBN# 01-62767-4
WILEY
AUTHOR Thomas D. McGee
ORDER NO. ME-0750 **\$54.95**

There is never a shipping or handling
charge on prepaid orders.
Checks payable to Omega Press.

Circle No. 34 on Readers' Service Card



1119 This Week in *Science*

Editorial

1121 Fax

Letters

1125 Duesberg's *PNAS* Paper: P. DUESBERG ■ Proposition 65: E. SILBERGELD AND D. ROE ■ Tax on the Six-Cylinder Car: G. J. STIGLER; G. TULLOCK; R. A. STALEY ■ Animal Research and Government Policy: G. A. LANGER ■ Incentives for Energy Conservation: R. H. MALÈS ■ Language Dispute: M. RUHLEN

News & Comment

1131 Peary's North Pole Claim Reexamined
1133 Radical Reform for Science Education
Animal Rightists Claim Bomb Blasts
1134 Ethical Questions Haunt New Genetic Technologies
1136 Watkins Takes the Helm at DOE
1137 Yeutter Backs Plan to Map Crop Genes
NIH Offers AZT to Exposed Workers

Research News

1138 Warfare Over Yanomamö Indians
1140 And Now for a Real Crab Nebula . . .
1141 Ecologists Wary About Environmental Releases
1142 From Real Numbers to Strings of Zeros: Computing over the Reals ■ Information-Based Complexity ■ Progress in Progressions ■ Zeta Zero Update
1144 New Family of Adhesion Proteins Discovered

Articles

1145 Macroecology: The Division of Food and Space Among Species on Continents: J. H. BROWN AND B. A. MAURER
1150 Dendrites, Viscous Fingers, and the Theory of Pattern Formation: J. S. LANGER
1156 Unity in Function in the Absence of Consensus in Sequence: Role of Leader Peptides in Export: L. L. RANDALL AND S. J. S. HARDY

Research Articles

1160 Endothelial Leukocyte Adhesion Molecule 1: An Inducible Receptor for Neutrophils Related to Complement Regulatory Proteins and Lectins: M. P. BEVILACQUA, S. STENGELIN, M. A. GIMBRONE, JR., B. SEED

■ **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): \$70. Domestic institutional subscription (51 issues): \$110. Foreign postage extra: Canada \$32, other (surface mail) \$32, air-surface 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 Spring in New Hampshire. See page 1201 for details about the Gordon Research Conference in 1989. [Photograph by Margo T. Pinkerton, courtesy of New Hampshire Office of Vacation Travel, Concord, New Hampshire 03301]

Reports

- 1165 Mouse Lymph Node Homing Receptor cDNA Clone Encodes a Glycoprotein Revealing Tandem Interaction Domains: M. SIEGELMAN, M. VAN DE RIJN, I. L. WEISSMAN
- 1173 Earthquake Hazard After a Mainshock in California: P. A. REASENBERG AND L. M. JONES
- 1176 Time and Spatial Dependence of the Concentration of Less Than 10^5 Microelectrode-Generated Molecules: S. LICHT, V. CAMMARATA, M. S. WRIGHTON
- 1179 Large-Scale, Low-Amplitude Bedforms (Chevrons) in the Selima Sand Sheet, Egypt: T. A. MAXWELL AND C. V. HAYNES, JR.
- 1182 Stishovite at the Cretaceous-Tertiary Boundary, Raton, New Mexico: J. F. McHONE, R. A. NEIMAN, C. F. LEWIS, A. M. YATES
- 1184 Sequence-Specific Peptide Cleavage Catalyzed by an Antibody: B. L. IVERSON AND R. A. LERNER
- 1188 Sindbis Virus: An Efficient, Broad Host Range Vector for Gene Expression in Animal Cells: C. XIONG, R. LEVIS, P. SHEN, S. SCHLESINGER, C. M. RICE, H. V. HUANG
- 1191 Role of Phosphatidylinositol Kinase in PDGF Receptor Signal Transduction: S. R. COUGHLIN, J. A. ESCOBEDO, L. T. WILLIAMS
- 1194 Cloning and Expression of a *Xenopus* Embryonic Gap Junction Protein: L. EBIHARA, E. C. BEYER, K. I. SWENSON, D. L. PAUL, D. A. GOODENOUGH
- 1196 Signal Peptide for Protein Secretion Directing Glycophospholipid Membrane Anchor Attachment: I. W. CARAS AND G. N. WEDDELL
- 1198 The Effects of Enriched Carbon Dioxide Atmospheres on Plant-Insect Herbivore Interactions: E. D. FAJER, M. D. BOWERS, F. A. BAZZAZ

Meetings

- 1201 *Gordon Research Conferences*: A. M. CRUICKSHANK ■ Registration Form

Book Reviews

- 1221 What Mad Pursuit, reviewed by T. H. JUKES ■ Chromatin, R. T. SIMPSON ■ Eye on the Sky, S. J. DICK ■ Tectonic Evolution of the Himalayas and Tibet, B. C. BURCHFIEL ■ Books Received

Products & Materials

- 1223 Capillary Electrophoresis Instrument ■ Nuclear Graphics Software ■ Whole-Cell Clamp ■ Kits for Immunostaining ■ DNA Synthesizer ■ Photodiode Array Detector for HPLC ■ 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
Philip H. Abelson
Executive Officer, Acting

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

FAST TRACK,*™

The Highest Quality mRNA from Cells or Tissue in 4 Hours Flat...

Get The Message

The FAST TRACK mRNA isolation kit will efficiently isolate high yields of intact poly A⁺ RNA directly from cells or tissue in less than four hours!

**//// Double the Yields of
Standard Procedures**

**//// Combines Speed and
Simplicity with Higher
Yields of Intact RNA**

**//// Half the Cost of Other
Antiquated Procedures**

**//// Isolation of mRNA from
Small or Large Tissue
Samples**

**//// A Complete Set of
Pretested Reagents and
a Simple-To-Follow
Instruction Manual**

The FAST TRACK™ procedure gives you consistently higher yields of active, intact mRNA for the construction of cDNA libraries, primer extension, RNase A protection analysis and Northern blots. FAST TRACK yields 40-100µg of poly A⁺ from 10⁸ cells or 1 gm of tissue.

Let Invitrogen put you on the FAST TRACK. To order, ask for catalog No. K1593-02 after calling ...

1-800-544-4684

//// Invitrogen

11588 Sorrento Valley Road, Suite 20
San Diego, CA 92121

Ask for our new catalog.

Circle No. 49 on Readers' Service Card

*patent pending

This Week in **SCIENCE**

Patchwork protein family

SIMILAR glycoproteins have been identified on two different types of cells—human endothelial cells to which blood neutrophils adhere during inflammatory responses and subpopulations of mouse lymphoid cells. Each protein is made up of a tandem array of domains, some of which are homologous with domains identified on other proteins: they both have a lectin-like domain, an epidermal growth factor-like domain, repeated motifs homologous to domains of complement-regulatory proteins, a transmembrane sequence, and a cytoplasmic domain. Details of the cloning and sequencing of the complementary DNA and of the predicted protein sequences are presented by Bevilacqua *et al.* for the human protein and by Siegelman *et al.* for the mouse protein (pages 1160 and 1165). Because these molecules are linked structurally to other biologically interesting molecules, they likely have functional and evolutionary linkages to them as well. The architecture of these two proteins is unlike that of proteins in other known “families”; members of this new family apparently participate in both normal physiologic activities (homing of cells to organs where they will reside) and pathologic functions (inflammation) that involve interactions of blood cells and endothelial cells at blood vessel walls. (See also Marx’s analysis on page 1144.)

Continuing hazards

A big earthquake hits, buildings are damaged, lines are down, pipes are broken, and then what? The recovery process begins—damage is repaired, compromised buildings are reoccupied, normal activities resume—but will a greater mainshock and aftershocks cause additional destruction and danger to the population? The probability that a given earthquake will be followed by other shocks is assessed in a statistical model developed by Reasen-berg and Jones; the model uses both historic data on earthquakes in the area and emerging foreshock, mainshock,

and aftershock measurements from the earthquake at issue (page 1173). The model addresses the likelihood that a greater mainshock or aftershocks will occur and what their timing will be. Although the model is based on data from California, it can be developed with parameter values from other geographic and tectonic regions and then would be applicable there. Its use should aid in formulation of rational public policies regarding how and when recovery procedures should commence.

Shifting sands

LARGE-SCALE features of the Selima sand sheet of the Sahara were recorded by the Landsat Multispectral Scanner in 1972, 1986, and 1988 (page 1179). The overall pattern seen in this arid barren African plain has been one of alternating dark and light chevrons downwind from major dune fields and scarps; but, the landforms responsible for these images are not obvious on the flat desert. In 1985, Maxwell and Haynes began an intense search for the source of the chevrons in the western part of the sand sheet, melding field observations and detailed satellite images. They explored the relations of the dark and light chevrons to one another, the composition and stratigraphy of the sand sheet, and the role of wind in chevron development and migration. The darker chevrons apparently consist of coarse iron-stained granules eroded on the windward side of large ripples. The light chevrons appear to form as thin layers of fine sand granules transported by the wind. The light chevrons occur where the thin sand sheet deposits, migrating at rates between 100 and 500 meters per year, partially cover immobile desert deposits in a coherent pattern.

Cretaceous-Tertiary stishovite

STISHOVITE is a mineral that can form when quartz is shocked; its formation occurs only under extremely high pressures (greater than 8.5

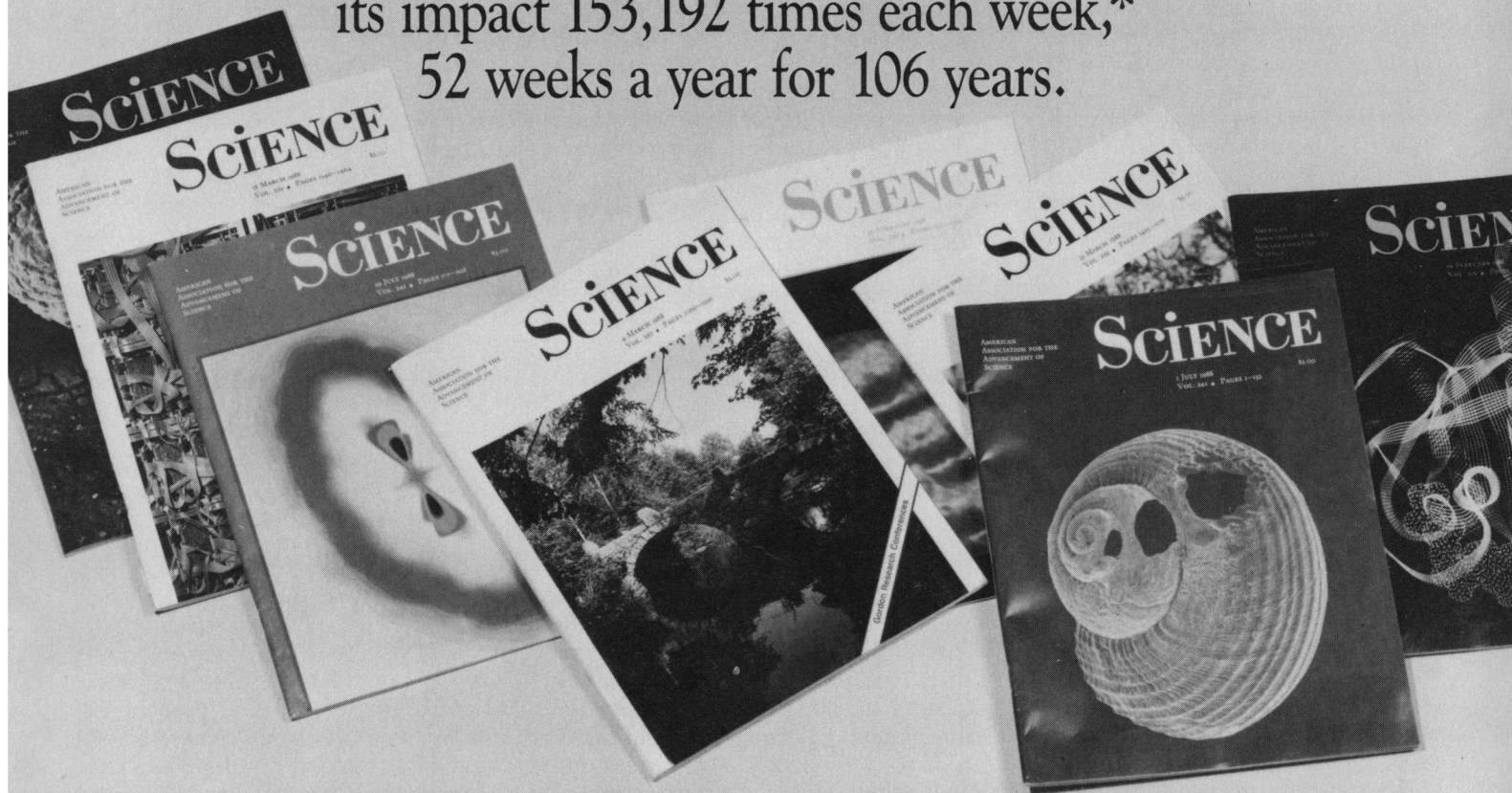
gigapascals), it has been found only in known and suspected impact sites (sites where meteorites have hit the earth), and it is thus considered diagnostic of impact events. In samples from Raton, New Mexico, from the clay layer marking the boundary between the Cretaceous and Tertiary periods (about 66 million years ago), McHone *et al.* detected stishovite in crystalline mineral grains both by high-resolution solid-state ^{29}Si magic-angle spinning nuclear magnetic resonance spectroscopy and by x-ray diffraction (page 1182). The occurrence of stishovite supports the hypothesis that the clay layer at the Cretaceous-Tertiary boundary represents deposits from an impact event rather than deposits from explosive volcanism, because stishovite reverts to other silica polymorphs when it is exposed to heat.

Pocket full of miracles

THE strong amide bond linking two amino acids in a peptide has been broken in the binding pocket of a “designer” catalytic antibody (page 1184). The cleavage of an amide bond is not easy: without enzymatic assistance, for example, a spontaneous amide cleavage has been clocked to occur at a rate that has a half-life of about 7 years. The designer abzymes (antibodies with enzyme activity) were induced with an immunogen that included a metal trien complex cofactor and a peptide containing glycine linked to phenylalanine. The antibodies recognized the glycine-phenylalanine sequence, and a trien complex of the inducing metal or a geometrically similar complex with another metal in the binding pockets promoted amide bond cleavage; geometric factors that affect the hydrolysis are discussed by Iverson and Lerner. Because antibodies can be induced that recognize different pairs of amino acids, it should be possible to prepare a battery of designer abzymes for splitting other amino acid linkages. The precision with which such abzymes work may be comparable to that of the restriction enzymes that cut DNA molecules at very specific sites.

Reproducibility.

SCIENCE magazine has been reproducing
its impact 153,192 times each week,*
52 weeks a year for 106 years.



SCIENCE has reproducibility down to a science.

Just as reproducibility is vital to success in science, so it is in magazine advertising. And no magazine in the field produces results as efficiently and as consistently as SCIENCE. One reason is that we reach nearly *5 times as many* working scientists as any other publication in the field. We're also read by more NIH grant recipients, more doctoral scientists, more science policy leaders. In short, SCIENCE delivers advertisers' messages to more decision-makers, with more impact and better cost-efficiency, every week of the year. That's reproducibility. And the best reason you could have to advertise in our pages.

*ABC Audit of 6/30/88

THE GLOBAL WEEKLY OF RESEARCH
SCIENCE

ADVERTISING REPRESENTATIVES
SCHERAGO ASSOCIATES, INC.
1515 Broadway, New York, N.Y. 10036 • (212) 730-1050

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: Philip H. Abelson, *Acting*

Editor: Daniel E. Koshland, Jr.

Deputy Editor: John I. Brauman (*Physical Sciences*)

EDITORIAL STAFF

Managing Editor: Patricia A. Morgan

Assistant Managing Editor: Nancy J. Hartnagel

Senior Editor: Eleanore Butz

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

Graphics and Production: Holly Bishop, James J. Olivari, Yolanda M. Rook

Covers Editor: Grayce Finger

Manuscript Systems Analyst: William Carter

NEWS STAFF

News Editor: 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. Burkland

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 23 December 1988 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.

Fax

Facsimile transmission of letters and documents by the telephone system has already become an important mode of local and global communication. Activity and sales of equipment are expanding rapidly, with no end to the expansion in sight. Until recently use of telefax machines was largely confined to big business. But their use has spread dramatically to small business and individuals. In the not distant future most scientists will either have a fax or have access to one nearby. They will find it helpful in quick interaction with other scientists in this country and in much of the world. The typical simple machine that an individual might acquire sells for \$2000 or less. Competition among about 50 different manufacturers is keen. Prices have been falling. Additional features, including electronic memory, are being built into the devices.

Personal experience with fax has made me an enthusiast for it. Often I need quick local delivery of a short document. The mails in Washington, D.C., are erratic. Messenger service costing \$5 to \$10 is better than mail but usually requires several hours. Fax takes care of the matter for the cost of paper and a local telephone call. The deed is done in a minute or two. A related situation prevails in communications with places elsewhere in the country. Fax is cheaper and faster than overnight express. Big business has found that by dispatching documents across the country at times when telephone rates are minimal, fax can be cheaper than first-class mail. Already on some campuses use of fax is speeding internal communication. Scientists engaged in international collaboration with others halfway around the world have found fax a substitute for telephoning at inconvenient hours. Chemists and others wishing to transfer detailed structural formulas find fax a convenient tool. Engineering drawings and spread sheets are also being transmitted.

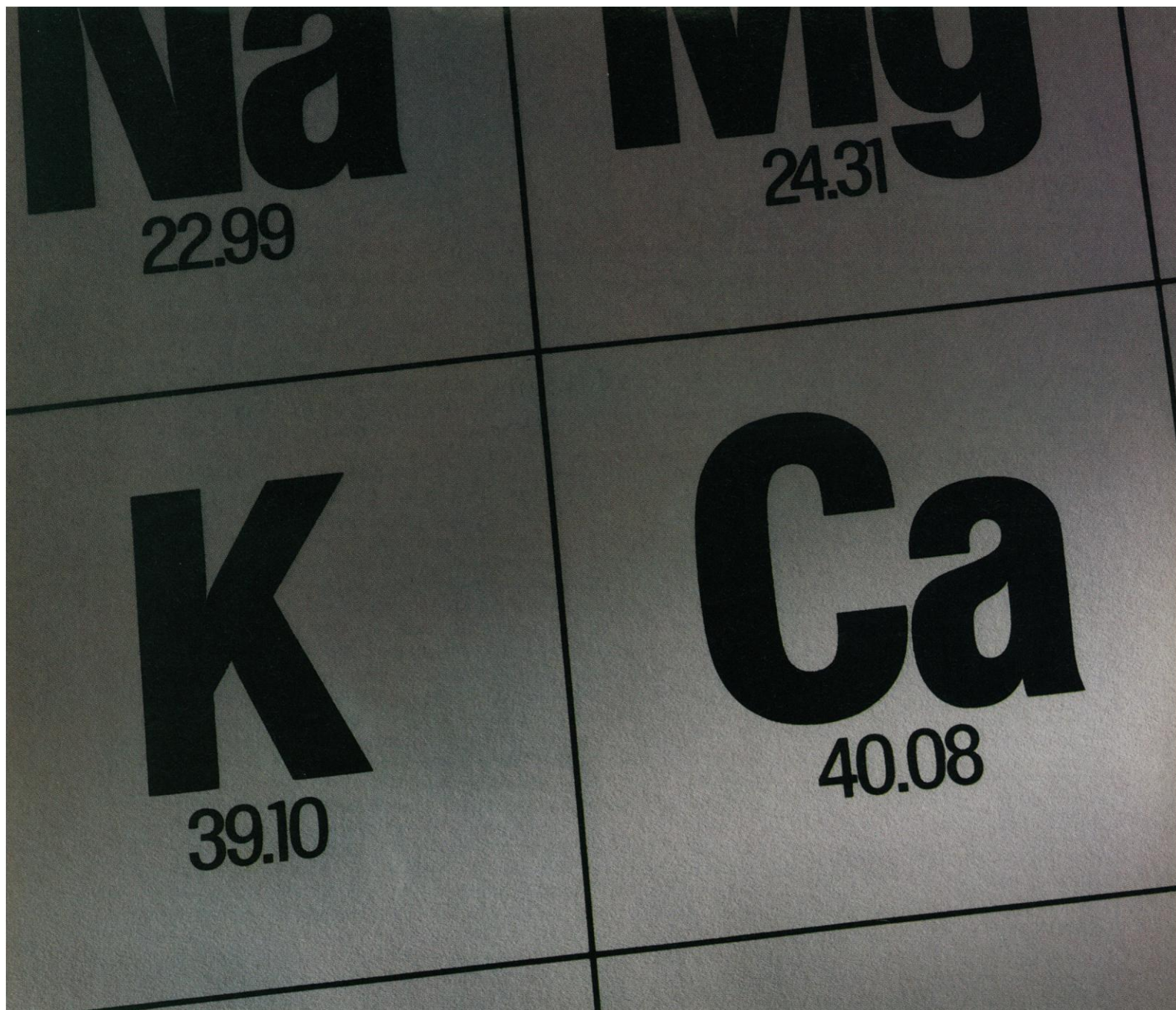
As might be expected, some of the uses are mundane, such as company employees sending their lunch orders to a local deli. Concerns have also been expressed about advertisers using fax for junk mail. But if the problem of unwelcome messages becomes substantial, electronic safeguards can be included as part of the equipment.

As a user of fax, the United States was relatively an underdeveloped country until a year or two ago. But in 1988 sales of 910,000 units had quadrupled from those in 1986. Total inventory at the end of 1988 was about 1.8 million. By the end of 1989 that number will be about 3 million. An International Facsimile Directory published last October provides an indication of the relative number of fax machines elsewhere at the time the directory was compiled, probably in early 1988. The directory provides approximately 700,000 numbers. Most of them are for companies; very few are for academic establishments. Virtually every country in the world is represented. A notable exception is the Soviet Union.

Per unit population, many countries had a greater number of listings than the United States. Switzerland had 15 times as many; Norway, 12, and the United Kingdom, 8. In the summer of 1988, when the postal workers in Britain went on strike, there was practically no outcry. In many other countries of the world the local postal service is slow and unreliable, and fax is a welcome substitute. For the Japanese, fax has been especially beneficial. A page of material consisting of kanji script is as easily transmitted as Roman script. Correspondingly, more than 2.5 million fax machines are in use in Japan. Half of the telephone traffic between Japan and the United States is devoted to fax. In addition, the Japanese are practically the sole manufacturers of telefax machines. As with many other high technology devices, the original modern models were invented and built in the United States. But from about 1980 on, the Japanese took over.

With a global and expanding market that in 1989 is likely to be about \$5 billion in magnitude, competitors are avidly seeking to add new features to the equipment. The inexpensive machine that an individual might buy today uses thermal paper. Resolution is adequate but not excellent. Ultimately, laser printing on plain paper will become widespread. Further along will come transmission of color with high resolution. The more expensive models already employ memory storage of information and computer capabilities. We are only in the beginning phases of a revolution in local and global communication that will have substantial impact on how business is conducted and on collaboration in science.

—PHILIP H. ABELSON



A basic element in any solution is IBM.

It's IBM scientific computing for chemistry: unbeatable combinations of products, applications, service and support that can help chemists in virtually any discipline work more productively.

IBM's chemistry solutions offer a wide range of system choices with the diverse applications, powerful graphics capabilities and development tools chemists need to improve information quality and reduce job turnaround time.

These versatile IBM solutions provide powerful support at every step of the process: instrument data acquisition and control, laboratory information systems, access to



local and remote data bases, mathematical and statistical analysis, highly specialized graphics and technical reporting, and more. Plus, IBM connectivity allows you to put processing power and vital information where you need it today, while providing an unbroken growth path to your future system requirements.

From computational chemistry to genetic engineering, technical office automation to imaging, workstations to supercomputers—IBM is your chemical solution.

For more information, or to arrange to have an IBM Marketing Representative contact you, simply call 1-800-IBM-2468, Ext. 39.



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. Handers, Germany
Ph #02101/666268

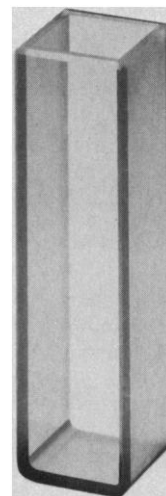
Jandel
SCIENTIFIC

"Microcomputer Tools
for the Scientist"

65 Koch Road ■ Corte Madera, CA 94925

Circle No. 120 on Readers' Service Card

Matched UV Quartz Cells at \$32 Each!



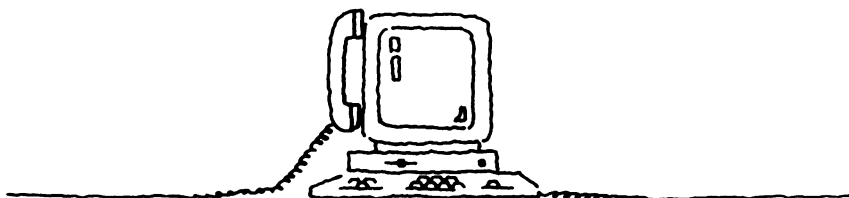
- Type 5H-UV
quartz cell
without cover
- Two windows
polished
- O.D. 12.5mm sq
by 45mm high
- Lightpath
10mm
- Transmission
on empty cell
at 220 mμ approximately
80%
- Deviation in
matching at
220 mμ max 1%
- Price: \$32 ea.



NSG Precision Cells, Inc.

195G CENTRAL AVENUE
FARMINGDALE, NEW YORK 11735
TEL 516-249-7474 ■ FAX 516-249-8575

Circle No. 93 on Readers' Service Card



Your life line. BIOSIS Connection®

Keeping your finger on the pulse of biological and biomedical research information is as easy as pressing a button. The **BIOSIS Connection** is your low-cost direct line to the world's largest abstracting and indexing service for the life sciences, and you can be part of it!

This exciting and invaluable life sciences online end-user system connects you to all research and professional information needs, with current awareness databases covering journal

literature, patents, books, meetings, theses, AIDS research, upcoming events and employment openings.

All it takes to extend your life line is a modem-equipped personal computer or terminal and a phone line. And what's more, you need no special search skills to use the **BIOSIS Connection**!

Put your fingers on the life line... Subscribe now to the **BIOSIS Connection**!

BIOSIS Connection is a trademark of BIOSIS



For more information, a Sign-Up Kit, or a free demonstration disk, contact BIOSIS, 2100 Arch Street, Dept. S389LL, Philadelphia, PA 19103-1399 USA. Telephone (215) 587-4800 worldwide; toll free 1-800-523-4806 (USA except PA); Telex 831739; Fax (215) 587-2016.

Circle No. 31 on Readers' Service Card

Three ways to give yourself more time for research:

Account 7-89918			
Sub	Sub-account Name	Budget	
			Expenses Balance
1000	LAB SUPPLIES	40,000.00	7,311.25 32,688.75
2000	EQUIPMENT	15,000.00	5,805.00 9,195.00
3000	FACILITY SALARIES	35,000.00	6,775.00 28,225.00
4000	RESEARCH ASSOCIATE	15,000.00	4,600.50 10,399.50
5000	FRINGE BENEFITS	7,000.00	4,887.50 2,112.50
	OVERHEAD	45,000.00	1,253.75 36,646.25
Totals (Direct Costs)....		112,000.00	42,521.25 69,478.75
Totals (Indirect Costs)...		45,000.00	6,353.75 38,646.25

Keept track of your budgets with Grant Manager.

A no-nonsense accounting and ordering system for investigators and departments.

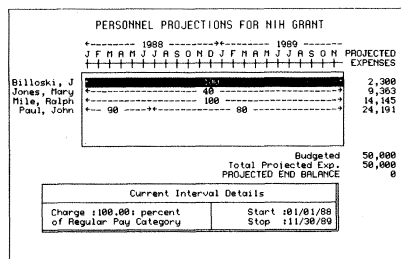
Type orders into your computer, and let Grant Manager print them on your university's order form. To make future ordering even faster, the program records your orders in vendor catalogs. Reorder with the press of a key!

Meanwhile, Grant Manager is tracking your account balances so that you know what's left to spend at any time -- not just once a month.

For IBM PC and compatibles, Macintosh 512KE, Plus, SE, II, or IIfx. Requires 512K RAM and hard disk. \$425. Demo - \$10.

Project salary costs with Personnel Manager.

Working out the charging of people's salaries to your grants can be quite a puzzle. Salaries go up. People come and go. Grants have different time frames. You want to spend your grants, but not overspend.



Personnel Manager helps you solve this puzzle. It keeps a salary database, and enables you to play "what-if" so that you can quickly find the optimal allocation of people to grants over time. Works with Grant Manager.

For IBM PC and compatibles. Requires 512K RAM. \$425. Demo - \$10.

File Edit Search Format Font Document Window EndNote

Paleo - Word

The fossil in question was generally regarded to be the 220 million year-old remains of a mammoth. Several years ago, however, this hypothesis was overturned by the discovery of yet another species, Elasmotherium sibiricum, which is now the progeny of a properly named mammoth. The fossil [14] of the species is of hand, while the bone remains of this larger mammal is of hand.

EndNote

Showing 1143 references out of 1143

Where the of
myster:
that other
One th
Some th
currently
in the
Whiting

Bilinski 1987 Triceratops extinction linked
Housnik 1984 A stochastic model for the pr
Doustine 1984 A stochastic model for the pr
Jones 1976 The Theory of Taxonomy
Seehoruse 1972 Statistical evidence for each
Schwartz 1976 Evolving ecosystems: role in

Add bibliographic power to your word processor with EndNote.

Still typing bibliographies on your
Macintosh? EndNote will do them for you.

You can store up to 32,000 references in EndNote's database. There's plenty of room for information. For example: up to 32,000 characters of abstracts for *each* reference! Searching is simple and extremely fast.

EndNote works with Microsoft Word, WriteNow, WordPerfect and MacWrite. Use the desk accessory to access the database while you write. Copy citations like [Smith, 1986] from your database and paste them into your text. When you finish writing, select a bibliographic style, and EndNote does the rest: It scans the paper, finds the citations you pasted, and adds a perfectly formatted bibliography to the end of your paper. It even replaces the in-text citations with numbers or (author, date).

For Macintosh 512KE,
Plus, SE, II or IIfx. \$129.
Demo - \$5.



Niles & Associates

2200 Powell, Suite 765
Emeryville, CA 94608
(415) 655-6666

Trademarks: IBM: IBM Corp., Macintosh: Apple Computer Inc., Microsoft: Microsoft Corporation, WriteNow: licensed to T/Maker, Corp. MacWrite: Claris Corp. WordPerfect: WordPerfect Corp.

For Grant Manager or Personnel Manager circle no. 14 on readers' service card.

For EndNote circle no. 15 on readers' service card.

Announcing
the . .

1989 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 \$340 covers one week's room, board and registration. For further information and an application form, see the February *FASEB Journal* or call Dr. Robert W. Krauss, (301) 530-7093.

Saxtons River, Vermont

 **RENAL HEMODYNAMICS: INTEGRATIVE AND CELLULAR CONTROL MECHANISMS** June 11-16 Chairs: L. Gabriel Navar, Tulane University Medical School; Donald L. Marsh, University of Southern California. **Structure and Development.** W. Kriz, A. Evan, D. Abrahamson, D. Casellas, L. Barajas; **Cell Biology of the Renal Microvasculature.** D. Schlondorff, J. Kreisberg, M. Dunn, K. Kurokawa, J. Bonventre, A. Hassid, W. Schrier; **Responses of Vasculature to Extrinsic Perturbations.** W. Arendshorst, H. Kirchheim, G. Navar, A. Premen; **Assessment of Renal Microvascular Responses.** M. Steinhausen, R. Edwards, P. Carmines, D. Harder, J. Briggs; **Tubuloglomerular Feedback Mechanism Control.** J. Schnermann, D. Bell, E. Persson, B-E. Persson, J. Davis; **Control of Renal Vasculature by Angiotensin.** R. Blantz, L. Rosivall, J. Hall, B. Ballermann, B. Zimmerman; **Neural Control of Renal Vasculature.** G. DiBona, E. Johns, V. Kon, M. Wolgast, N. Moss; **Regional Control of Intrarenal Hemodynamics.** F. Knox, R. Roman, S-Y. Chou, M. Sjoquist, R. Jamison; **Mathematical Modelling.** D. Marsh, L. Moore, K. Aukland, N. Holstein-Rathlou.

 **CELLULAR AND MOLECULAR GENETICS** June 18-23 Chairs: Gretchen J. Darlington, Baylor College of Medicine; Inder Verma, The Salk Institute. **Transcription Factors.** M. Rosenfeld, K. Calame, R. Tjian; **Organization and Action of Receptor Proteins.** K. Yamamoto, M. Johnston, C. Wu, J. Thorner; **Gene Regulation by Cytokines.** G. Darlington, G. Wong, J. Massague, G. Stark; **Tissue Specific Gene Regulation.** H. Blau, G. Schutz, R. Roeder, P. Gruss; **Human Disease and Gene Therapy.** S. Woo, L-C. Tsui, R. Mulligan, M. Capecchi; **Cell Cycle Regulation.** D. Nathans, D. Beach, E. Harlowe, A. Murray; **Post-Transcriptional Gene Regulation.** J. Ross, A. Jacobson, R. Klausner, E. Ehrenfeld; **Gene Regulation in Differentiation and Development.** C. Emerson, M. Karin, M. Kuehl; **Molecular Analysis of Oncogenes and Tumor Suppressors.** I. Verma, O. Witte, W-H. Lee, A. Berns.

 **BIOLOGY AND CHEMISTRY OF VISION** June 25-30 Denis Baylor, Stanford Medical School; Bernard Fung, University of California/Los Angeles. **Visual Pigments.** J. Nathans, G. Khorana, D. Orian, C. Zucker; **Cyclic GMP Cascade of Vision - Chemistry.** L. Stryer, M. Chabre, T. Wensel, B. Fung; - **Physiology.** K-W. Yau, P. Detwiler, K. Nakatani; **Photoreceptors.** D. Bok, R. Molday, J. Besharse; **Ion Transport Proteins.** M. Applebury, D. Nicoll, R. Hurwitz; **Hereditary Retinal Degenerations.** D. Farber, W. Pak; **Visual Transduction - In Cones.** J. Hurley, C. Lerea, J. Beavo, L. Haynes; - **In Invertebrates.** J. Lisman, J. Brown; **Molecular Mechanisms of Synaptic Transmission.** J. Dowling, F. Werblin, E. Schwartz, A. Knapp; **Keynote Address: Retinitis Pigmentosa.** E. Berson.

 **UBIQUITIN AND INTRACELLULAR PROTEIN DEGRADATION** July 2-7 Chairs: Milton J. Schlesinger, Washington University School of Medicine; Alfred L. Goldberg, Harvard Medical School. **Genes and Their Expression.** A. Varshavsky, S. Jentsch, R. Vierstra, E. Knight; **Ubiquitin Enzymes I & II.** A. Hershko, K. Wilkinson, I. Rose, C. Pickart, A. Ciechanover, C-C. Liu, A. Haas; **Other Roles for Ubiquitin.** M. Schlesinger, D. Finley, J. Mayer; **Prokaryotic Proteolytic Degredation.** S. Gottesman, C. Gross, J. Little, C. Chung; **The Proteasome.** A. Goldberg; **Protein Breakdown - Regulation of Enzyme Levels.** M. Rechsteiner, P. Coffino, R. Eisenman, J. Richter; - **Regulation by Physiological Factors.** J. Dice, O. Scornik, M. Goodman, J. Etlinger; **Proteolytic Degradation in Organelles.** R. Klausner, P. Stahl, T. Braciale.

 **CALCIUM AND CELL FUNCTION** July 9-14 Chairs: Anthony R. Means, Baylor College of Medicine; Kevin Campbell, University of Iowa. **Structure/Function of Ca²⁺ Binding Proteins.** R. Kretsinger, K. Beckingham, J. Putkey, D. MacLennan; **Gene Regulatory Mechanisms.** M. Rosenfeld, H. Kronenberg; **Regulation in Excitable Cells.** R. Tsien, L. Birnbaumer, S. Snyder, P. Conn; **Sequestration and Release Mechanisms.** P. Volpe, E. Carafoli, T. Vanaman, L. Jones; **The Protein Phosphorylation Cycle.** A. Nairn, H. Hidaka, H. Schulman, C. Klee; **Regulation of Responsiveness and Contractility.** H. Rasmussen, R. Murphy, J. Bryan; **Emerging Ca²⁺ Control Systems.** M. Crumpton, D. Storm, J. Glenney, K. Suzuki; **Growth and Development.** R. Steinhardt, R. Baserga, W. Klein, M. Inouye; **Genetic Analyses of Ca²⁺ Binding Proteins.** C. Rasmussen, T. Davis, C. Kung.

 **CELLULAR AND MOLECULAR STUDIES IN BONE MARROW TRANSPLANTATION** July 16-21 Chairs: Brian Richard Smith, Yale University School of Medicine; Steven J. Burakoff, Dana-Faber Cancer Institute. **The Major Histocompatibility Complex.** J. Hansen, J. Strominger, R. Flavell; **T and NK Cell Ontogeny and Function.** S. Burakoff, J. Ledbetter, R. Miller, S. Strober; **Graft Rejection and Graft Tolerance.** R. O'Reilly, M. Bennett, D. Sachs; **Graft Versus Host Disease I & II.** R. Parkman, A. Abbas, D. Valleria, B. Smith, J. Ferrara, R. Korngold, A. Steinberg; **Regulation of Hematopoiesis.** D. Nathan, I. Bernstein, D. Linch; **Gene Transfer Therapy.** J. Rapoport, A. Neinhuis, J. Barranger, E. Gilboa; **B Cell Ontogeny and Function.** B. Smith, P. Lipsky, K. Denis, D. Well; **Accessory and Endothelial Cell Function.** J. Pober, R. Geha.

 **LYMPHOCYTES AND ANTIBODIES** July 23-28 Chairs: Carol Cowing, Medical Biology Institute; David Parker, University of Massachusetts. **MHC and T Cell Recognition.** L. Glimcher, L. Matis, G. Fathman; **Mechanisms of Self-Tolerance.** H. von Boehmer, C. Goodnow, D. Lo; **T Cell Phenotypes.** K. Bottomly, S. Shaw; **Antigen Processing Pathways.** M. Bevan, P. Allen, K. Fischer-Lindahl; **Early B Cell Development.** N. Rosenberg, P. Kincade, R. Wall; **Regulation of Isotype Switch.** R. Koffman, P. Rothman, J. Stavnezer; **Ontogeny and Function of (g)/(d) Cells.** H. Wotis, J. Bluestone, M. Brenner; **Lymphocyte Activation.** G. Crabtree, W. Leonard, G. Nabel; **Immunopathogenesis of HIV.** L. Chess.

 **REGULATION OF ENERGY BALANCE AND NUTRIENT PARTITIONING** July 30-August 4 Chairs: M. R. C. Greenwood, Vassar College; Ahmed Kissebeh, Medical College of Wisconsin; Samuel W. Cushman, NIDDK/NIH. **Modulating Sensory and Metabolic Factors.** A. Sclafani, J. Stern, J. Vasselli, N. Rowland, A. Drewnowski, B. Rolls; **Three Integrative Perspectives on Energy Balance.** E. Horton, J. Hirsch, E. Jequier, G. Bray; **Caloric Balance.** E. Ravussin J. Hill, D. Schoeller, A. Prentice, S. Roberts, B. Horowitz, J. Wilmore; **Nutrient Partitioning and Utilization - Within Organs.** R. Leibel, R. Martin, J. Kinney, B. Levin, R. Eckel, J. Kinsella; **Among Different Adipose Tissues.** S. Cushman, S. Fried, U. Smith, A. Kissebah, M. Rebuffe-Scrive, M. Lavau, D. West; **Systemic and Cellular Integration.** G. Wade, T. Bartness, A. Campfield, S. Cushman, C. Landos; **Molecular and Genetic Aspects.** M. Greenwood, M. Schotz, P. Belfrage, B. Spiegelman, G. Ringold, D. Ricquier; **Keynote Address: Substrate and Hormonal Regulation of Apo-Lipoprotein mRNA and Lipid Partitioning.** H. Brewer, Jr., B. Hansen; **Clinical and Medical Aspects of Metabolic Dysregulation.** S. Heymsfeld, R. Atkinson, G. Reaven, P. Bjorntorp, J. Brunzell, J. Gibbs.

RESEARCH CONFERENCES

THE NEUROBIOLOGY OF CNS INJURY August 6-11 Chairs: Alan I. Faden, University of California/San Francisco; Wise Young, New York University Medical Center. **Methodological Issues.** C. Hsu, J. Lightall, W. Pulsinelli, D. Choi, R. Traystman, T. Colton; **Behavioral Evaluation.** J. Wrathall, M. Goldberger; **Blood Flow/Metabolism.** W. Obrist, M. Ginsberg, W. Powers, K. Welsh; **Neurochemistry Methods/Approaches.** S. Panter, J. Prichard, B. Siesjo; **Neurochemical Factors in Secondary Injury.** B. Meldrum, P. Demediuk, M. Braugher, T. McIntosh, R. Kraig, W. Young, R. Vink; **Pharmacology.** A. Faden, E. Hall, J. Holaday, R. Miller, J. Zivin, B. Lyeth, R. Simon; **Histological Methods.** J. Povlishock, L. Noble; **Physiological Methods.** C. Tator, A. Blight.

MOLECULAR NEUROGENETICS August 13-18 Chairs: J. Gregor Sutcliffe, Research Institute of Scripps Clinic; Allan Tobin, University of California/Los Angeles. **Cell Specification - Vertebrates.** M. Kennedy, G. Travis, S. Heinemann; - **Invertebrates.** L. Zipursky, S. Crews, S. Benzer; **Genetic Manipulation.** G. Evans, C. Cepko, M. Capecchi, T. Claudio; **Genetic Disorders.** E. Ginns, P. Ray, E. Gershon, U. Franke; **Cell Specializations: Vertebrates.** A. Tobin, R. Milner, D. Anderson, R. McKay; **Behavior Genes: Invertebrates.** J. Hall, J. Dunlap, J. Fisher, C. Zuker; **Cell and Molecular Biology of Learning.** P. Hyslop, S. Rose, D. Clayton; **Neural Development -Invertebrates.** M. Chalfie, R. Horvitz, M. Young, J. Carlson; - **Vertebrates.** R. Mullen, K. Herrup, M. Brennan, R. Brackenbury, M. Chai.

Copper Mountain, Colorado

BIOCHEMICAL AND BIOPHYSICAL MECHANISMS IN GRAVITY RESPONSES June 25-30 Chairs: Carl Leopold, Cornell University; Marc Tischler, University of Arizona. **Evolution of Gravity Systems.** D. Wolgemuth, F. Sack; **Sensing Mechanisms.** R. Hertel, R. Wayne; **Ion Pumps and Electric Regulation.** T. Bjorkman, W. Schreurs, R. Nuccitelli, K. Rathor; **Environmental Sensing Systems.** M. Jaffe, K. Lohman; **Ionic Regulation.** S. Roux, R. Cleland, D. Perdue; **Hormonal Involvements.** M. Evans, S. Max, E. Holton, C. Leopold; **Growth and Development.** E. Holton, M. Tischler, R. Levine; **Genetic Regulation.** K. Poff, M. Marron. **Overview.**

GASTROINTESTINAL TRACT III: REGULATION OF ORGAN/CELLULAR FUNCTIONS July 2-7 Chairs: Jackie D. Wood, Ohio State University; Gilbert A. Castro, University of Texas HSC/Houston. **Cell/Molecular Mechanisms of Development.** D. Alper, B. Ponder, J. Gordon, M. Neutra; **Cell-to-Cell Interactions in Regulation of Epithelial Development.** J. Jameson, P. Ekblom, M. Bernfield, N. Gilula, J. Madara; **Oncogene Expression and Regulation of Tumor Development.** D. Poldosky, S. Hamilton, R. Bernards, R. Coffey; **Epithelial Transporters, Channels and Pumps.** L. Reuss, N. Wills, Y. Segal, S. Schultz, M. Cerreijido; **Dietary and Hormonal Regulation.** S. Henning, O. Koldovsky, R. Grand, T. Goda, N. Davidson, C. Haffen; **Neural Regulation.** H. Cooke, A. Surprenant, M. Gershon, O. Lundgren; **Mechanisms of Regulation of Gastrointestinal Musculature.** J. Szurszewski, J. Singer, G. Makhoul, K. Sanders; **Eicosanoid Messengers.** M. Wasserman, A. Robert, S. Konturek, D. Rachmilewitz, P. Smith; **Immunological Trigger Systems.** G. Castro J. Bienenstock, M. Perdue, G. Gall, D. Powell.

GENETIC RECOMBINATION AND GENOME REARRANGEMENTS July 9-14 Chairs: John Wilson, Baylor College of Medicine; Richard Kolodner, Dana-Farber Cancer Institute. **Genome Rearrangements.** R. Rothstein, K. Blackwell, E. Selker; **Physical Structures in Recombination.** P. Modrich, D. Lilley, J. Griffith; **Genetic Control.** R. Esposito, G. Smith, J. Haber; **Genome Remodeling in Mammals.** C. Caskey, D. Miller; **Catalysis of Homologous Pairing.** M. Cox, C. Radding, D. Camerini-Otero; **Site-Specific Recombination.** A. Landy, N. Grindley, R. Hoess, H. Nash; **Nucleases Involved in Recombination.** A. Clark, F. Heffron, S. Kushner; **Transposition.** N. Cozarella, K. Mizuuchi, N. Craig; **Mismatch Repair.** M. Lieb; **History of the DNA Heteroduplex.** R. Holliday.

PROTEIN KINASES July 16-21 Chairs: Perry J. Blackshear, Duke University Medical Center; Jackie D. Corbin, Vanderbilt University School of Medicine. **Opening Address.** Y. Nishizuka; **Mitogen and Cell-Cycle Dependent Protein Kinases.** J. Maller, M. Czech, R. Erikson, P. Nurse; **Protein Kinase C.** K-P. Huang, P. Blackshear, G. Nelsestuen, P. Parker, R. Davis, C. Harley; **Ca²⁺/Calmodulin Dependent Protein Kinases.** A. Nairn, J. Stull, M. King, A. Means; **Cyclic Nucleotide-Dependent Protein Kinases.** J. Corbin, B. Kemp, M. Zoller, J. Gold, J. Avruch; **Tyrosine Kinases: Viral/Cellular.** T. Hunter, O. Witte, T. Pawson, B. Sefton; **Receptors.** J. Avruch, R. Roth, G. Gill, L. Williams; **Protein Phosphatases.** P. Cohen, E. Fischer, T. Ingebritsen, R. Kincaid; **Plenary Session.** E. Krebs; **Protein Kinases and Gene Transcription.** D. Granner, J. Habener, M. Montminy.

MICRONUTRIENTS: TRACE ELEMENTS July 23-28 Chairs: Robert J. Cousins, University of Florida; Ananda S. Prasad, Wayne State University; Robert B. Rucker, University of California-Davis. **Absorption and Transport.** K. Smith, J. Glass, B. Lonnerdal, J. Turnlund, G. Brewer; **Workshop.** L. Schiff, D. Foster; **Gene Expression I.** J. B. Neilands, J. Gitlin, H. Nick; **Cellular Metabolism.** E. Harris, H. Cohen, R. Cousins; **Gene Expression II.** F. Sunderman, Jr., D. Hamer, R. Sunde, N. Amy; **Experimental Immunology.** P. Fraker, R. Winchurch, J. Prohaska, M. Failla; **Free Radicals.** S. Aust, J. Gutteridge, T. Bray; **Biological Effects.** R. Rucker, D. Baly, M. Korc, H. Lukaski; **Clinical Effects.** K. M. Hambidge, C. McClain, F. Nielsen, A. Prasad.

NUTRIENTS AND GENE EXPRESSION IN CARCINOGENESIS July 30 - August 4 Chairs: Willard J. Visek, University of Illinois College of Medicine; Lionel A. Poirier, National Center for Toxicological Pathology. **Gene Expression and Cancer: Perspectives.** J. Rowley, T. Waldman, T. Osborne, B. Ames; **Calories, Fat, and Gene Expression.** R. Hart, R. Eastbrook, D. Busbee, K. Randerath; **Oncogenes and Growth Control and Carcinogenesis.** D. Blair, M. Barbacid, M. Greenberg, H. J. Kung; **Methyl Deficiency and Biological Systems.** P. Newberne, L. Poirier, R. Hoffman, F. Feo; **Methylation of DNA.** J. Christman, R. Challet, S. Baylin, R. Perry; **Calcium, Cell Proliferation, Differentiation, and Carcinogenesis.** M. Lipkin, R. Wasserman, G. Stoner, H. Newmark, M. Wargovich; **Nutrients and Signal Transduction.** P. Blumberg, S. Joseph, R. Reed, M. Karin; **Hormones, Hormone Receptors, and Gene Expression.** J. Gustafsson, G. Norstedt, M. Rechler; **Vitamins' Trace Elements and Gene Expression.** L. DeLuca, P. Davies, B. Komm, M. Linder.

PLANT GENE EXPRESSION August 6-11 Chairs: Peter H. Quail, Plant Gene Expression Center; Michael Bevan, PBI Cambridge. **Mutant Isolation and Analysis I & II.** V. Walbot, H. Goodman, B. Baker, S. Dellaporta, J. Jones, C. Somerville, G. Fink, M. Freeling, M. Yanofski; **Floral Development.** M. Crouch, E. Coen, A. Clarke, S. Levings, S. McCormick; **Workshop: Transformation Methods.** R. Horsch, M. Fromm, K. Barton, K. Hinata, L. Herrera-Estrella, E. Picard; **Developmentally-Regulated Genes.** R. Goldberg, N. Raikhel, R. Beachy, D. Grierson; **Regulatory Molecules I.** D. Baulcombe, S. Theologis, R. Fischer, D. McCarty, M. Estelle; **Workshop: Novel Methods.** R. Horsch, I. Potrykus, J. Paszkowski, B. Hiatt, J. Haselhoff, S. Rogers; **Regulatory Molecules II.** H. Klee, T. Guilfoyle, J. Schell, W. Bruce; **Environmentally-Regulated Genes.** E. Tobin, A. Cashmore, P. Gilmartin, G. Coruzzi, W. Gurley; **Plant-Pathogen Interactions.** C. Lamb, C. Ryan, L. Willmitzer, J. Bennetzen, B. Staskawicz; **Keynote Address: LEA Proteins and their Genes.** L. Dure; **Agricultural Applications.** R. Fraley, J. Leemans, J. Bedbrook, B. Mazur.

MOLECULAR MECHANISMS OF CARCINOGENESIS August 13-18 Chairs: Michael J. Weber, University of Virginia School of Medicine; Michael W. Lieberman, Baylor College of Medicine. **Molecular Epidemiology.** W. Cavenee, R. White, E. Solomon or W. Bodmer, J. Minna, E. Fearon; **Viral Oncogenesis.** P. Howley, D. Lowy, A. Levine, F. Chisari; **Oncogene/Carcinogen Interactions in Experimental Neoplasia.** G. Bowden, M. Anderson, S. Garte, S. Sukumar; **Cellular Responses to Carcinogens and Genotoxic Agents.** J. Whitlock, J. Essigman, B. Ames, M. Gottesman; **Oncogene Structure and Function.** J. Parsons, C. Sherr, J. Brugge; **Signal Transduction.** M. Weber, R. Erikson, J. Gibbs, N. Colburn; **Gene Expression I & II.** M. Lieberman, H. Herschman, B. Crombrugge, R. Eisenman, B. Spiegelman, T. Curran; **Anti-Oncogenes and Tumor Suppression.** E. Harlow, W. Lee, M. Noda.



Advanced Course in Plant Tissue Culture and Plant Transformation

Monsanto

August 6 through 19, 1989
University of Guelph • Guelph, Canada

A lab and lecture course for researchers at the advanced graduate student or postdoctoral level on cell culture and plant transformation techniques with dicots and monocots.

Topics:

- somatic embryogenesis
- haploidy
- *in vitro* selections
- flow cytometry
- transformation techniques
- nucleic acid and protein characterizations
- artificial seeds
- *in vitro* flower development
- somaclonal variation
- fermentor technology
- protoplast fusion

Instructors/Speakers include: R. Beachy (Washington), D.C.W. Brown, Agriculture Canada (Ottawa), J. de Wit (Stanford), S. Fabijanski (Palladin), R. Meeks-Wagner (Oregon), J.C. Sanford (Cornell), W. Scowcroft (Biotechnica), C. Baszczyński and R. Kemble (Allelix), R.J. Legge and B. Moffatt (Waterloo), W.D. Beversdorf, S. Bowley, D. Falk, K.J. Kasha, L. Kott, T.E. Michaels, P. Pauls, S. Rothstein and T. Senaratna (Guelph).

Fee: \$700 Canadian includes registration, board and accommodation.

Applications: including abstract describing previous and current research activities, C.V., representative reprint, and one letter of recommendation — to be sent by **May 15, 1989** to Plant Biotechnology Centre, University of Guelph, Guelph, Ontario, Canada N1G 2W1; telephone (519) 824-4120, ext. 8773; telex 069-56645; Fax (519) 821-5236.

Sponsor: Monsanto Canada

PAPYRUS™

The new standard in
Personal Bibliographic Databases

	PAPYRUS	dms 4 Cite	Ref- 11	Reference Manager	Pro- Cite	Sci- Mate
Output independent of external word processor	YES	No	Yes	No	Yes	Yes
Provision for nonstandard references	YES	Yes	Yes	No	Yes	Yes
Alphabetical keyword list	YES	No	Yes	Yes	Yes	No
Underlining, sub- & superscripting, boldface	YES	Yes	Yes	Yes	Underlining only	No
Rewriting manuscript to insert citations	YES	Yes	Yes	Yes	Yes	Yes
Importing national database files	ANY	Some	Some	Some	Some	Any
Cost*	\$99	\$295	\$350	\$538	\$590	\$640

*Cost of full system for IBM-PC compatible computers, including all features indicated in table.

**Prepares your manuscripts and bibliographies,
perfectly customized
for each journal or granting agency**

• **New Version** — able to import references from national databases, other personal bibliography systems, or almost any other database or text file

• Over 50 predefined Journal Formats, plus the ability to create your own additional Formats

• Correctly handles references "In Press" or "Submitted"

• Up to 16,000 characters per reference

• Compatible with all major word processors (and most minor ones)

**IBM PC and
compatibles**

Demo System ————— \$25⁰⁰

Complete Registered System — \$99⁰⁰

VAX-VMS

Demo price credited toward subsequent Registered System purchase.
Outside North America add \$10 shipping charge—U.S. funds, on a U.S. bank.

**Research Software
Design**

2718 SW Kelly Street, Suite 181
Portland, OR 97201
(503) 796-1368

Circle No. 137 on Readers' Service Card

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 . . . **\$195⁰⁰**

RT-11, TSX-Plus, RSX-11, P/OS **\$250⁰⁰**

VAX/VMS (native mode) **\$350⁰⁰**



ANY
MANUAL **\$15⁰⁰**

ANY
MANUAL & DEMO **\$20⁰⁰**

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

Connecticut residents add 7½% sales tax.

Circle No. 51 on Readers' Service Card

PUMPING A LITTLE?

WE JUST HAPPEN TO HAVE
SOME GREAT LITTLE
PUMP HEADS THAT HANDLE

LITTLES

ACCURATE LITTLES (like 0.1% of flow range)

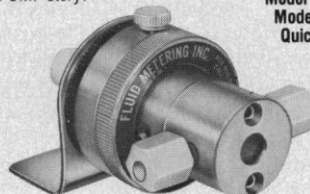
BIG LITTLES (up to 0.1 ml/stroke)

LITTLE LITTLES (down to 0.005 ml/stroke)

CORROSIVE LITTLES (fluids contact only
ceramic and fluorocarbon)

FMI's LAB PUMP JR. "tiny flow" line of pump heads features molded fluorocarbon cylinder shells with alumina ceramic pistons and cylinders for optimum chemical inertness, temperature tolerance and physical ruggedness. Integrally molded compression fittings at the ports provide enhanced hookup and disconnect convenience, and an all-new family of port adapters covers the most commonly used feed line sizes. A novel calibrated control ring arrangement permits convenient adjustment of flow rate at any time. With Quick Fit Kits RH/P and RH/Q, FMI LAB PUMP JR. pump heads may be toollessly interchanged with any standard FMI pump head, thus providing tiny-flow pumping capability to all FMI pumps in the field. The LAB PUMP JR. pump heads can also be panel mounted using your special motor drive. Write or call today for Catalog RP401—the FMI LAB PUMP story.

Model RH0: 0 to 0.05 ml/stroke—\$360
Model RH1: 0 to 0.1 ml/stroke—\$360
Quick Fit Adapter Kits RH/P and RH/Q—\$21



**FMI FLUID
METERING, INC.**
29 ORCHARD STREET
OYSTER BAY, NY 11771
(516) 922-6050 • TELEX 5101001281

Circle No. 104 on Readers' Service Card

GORDON RESEARCH CONFERENCES

"FRONTIERS OF SCIENCE"

APPLICATION — MAIL EARLY

Please complete this application and mail (in duplicate)
to the Director — **PLEASE PRINT.**

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

IMPORTANT NOTE

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

Conference on _____ Date: _____
(Name of Conference — Please Print)

Name: (Please Print) _____ Conference _____

Organization: _____ Location: _____

Business Address: _____ Accommodations _____
(inc. dept., street & no.) _____ (Room & Meals) For: _____

City and State _____ Zip Code _____ Applicant _____

Spouse _____

Child(ren) _____

Total _____

IMPORTANT

Please check if you have applied to another 1989 Summer Conference _____

PROFESSIONAL ACTIVITIES:

What type of position do you have? Graduate Student _____ Post-Doctoral _____ Research Scientist _____ University Professor _____

Research Director _____ Program Manager _____

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

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

Indicate your particular activities (separate page if necessary) which justify favorable consideration of you as a participant in and contributor to this Conference. (Not required of speakers.) Applications are referred to the Conference Committee for review in accordance with the established regulations, and this information is essential.

FIXED CONFERENCE FEES — Summer, 1989 — New Hampshire & Rhode Island

NEW HAMPSHIRE

Conferee (double occupancy) \$360.00

(\$310 if postmarked 3 weeks prior to conference)

Non-Resident Conferee (meals, no room) \$320.00

(\$270 if postmarked 3 weeks prior to conference)

Guest (room, meals) \$270.00

(\$220 if postmarked 3 weeks prior to conference)

RHODE ISLAND

Conferee (double occupancy) \$375.00

(\$325 if postmarked 3 weeks prior to conference)

Non-Resident Conferee (meals, no room) \$320.00

(\$270 if postmarked 3 weeks prior to conference)

Guest (room, meals) \$285.00

(\$235 if postmarked 3 weeks prior to conference)

Children under 12 years of age are not permitted in the meeting rooms, or dormitories at any host sites.

1. Full fixed fee charged regardless of time conferee attends Conference. Please note detail of fees.

2. Fixed fees cannot be prorated or reduced for anyone (speakers, discussion leaders, conferees).

3. Non-resident conferees are expected to eat all meals in the Conference Dining Room and, therefore, the Fixed Fee for non-residents includes the full meal charge.

4. Off-site accommodations (hotel, motel, etc.) near the host schools are available; however, early reservations are recommended. The office will send on request a list of outside housing for your information and use.

PAYMENT:

The full fixed fee will be required IN ADVANCE of ALL PARTICIPANTS AND GUESTS. Attendance and/or accommodations will NOT be reserved unless this fee is received in our office 3 weeks prior to the Conference. Foreign participants will also be required to pay Gordon Research Conferences in advance in U.S. dollars payable by wire only to a U.S. bank. Checks drawn on Canadian banks and foreign banks cannot be accepted and will be returned. Scientists in Canada must use a bank draft obtained from their bank payable in U.S. dollars and drawn on a U.S. bank. Remittance information on the transfer must include the conferee's name, conferee number and Conference title. Detailed information on payment, travel, etc. mailed with registration material.

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

FAX No. (401) 783-7644 / BITNET Address: BCP101@URIMVS

Please return to:

Dr. Alexander M. Cruickshank

Gordon Research Conferences

Gordon Research Center

University of Rhode Island

Kingston, Rhode Island 02881-0801

Tel.: (401) 783-4011 or (401) 783-3372

Office — Summer Schedule

Colby-Sawyer College

New London, NH 03257

Tel.: (603) 526-2870

Signature _____

Date _____

Telephone: Business _____

Home _____

RECEIPT OF THIS APPLICATION WILL BE ACKNOWLEDGED — PLEASE DO NOT SEND PAYMENT WITH THIS APPLICATION

Lick Observatory

Eye on the Sky. Lick Observatory's First Century. DONALD E. OSTERBROCK, JOHN R. GUSTAFSON, and W. J. SHILOH UNRUH. University of California Press, Berkeley, CA, 1988. xii, 295 pp. + plates. \$25.

Lick Observatory was the first of the large privately endowed observatories responsible for the rise of American astronomy to worldwide preeminence. Followed by Lowell (1894), Yerkes (1897), Mt. Wilson's 60-inch (1908) and 100-inch (1917) telescopes, and eventually Palomar's great 200-inch in 1948, the completion of Lick in 1888 may be seen in hindsight as a landmark in the history of astronomy in America.

This centennial history is therefore an important and welcome volume. The authors, one of them (Osterbrock) a former director of the observatory, state that this is a popular history, and as such it must be judged.

Fifteen years elapsed from James Lick's decision in 1873 that his monument would be an observatory housing the world's largest telescope to its transfer to the Regents of the University of California upon completion in 1888. The first four chapters of the book deal with this "prehistory," from the courting of the eccentric millionaire to the consultations with Naval Observatory astronomers Simon Newcomb and Edward S. Holden and the difficulties of constructing an observatory on the 4200-foot elevation of Mt. Hamilton in California. The latter subject has recently been discussed in detail in Helen Wright's *James Lick's Monument: The Saga of Captain Richard Floyd and the Building of the Lick Observatory* (1987), to which the authors had access in manuscript. Most of the remaining chapters center on the tenures of the directors, who included Holden, James E. Keeler, William W. Campbell, Robert G. Aitken, C. Donald Shane, and Albert E. Whitford. Two thematic chapters deal with the observatory's solar eclipse expeditions and its important role as a center for graduate education in astronomy.

The authors describe personalities, politics, and science beginning with Holden, the controversial first director, and concluding with the 10-meter Keck telescope now planned in collaboration with Caltech. In between is sandwiched the story of the 36-inch Crossley reflector that became operational in 1898, the successful post-war effort to acquire a large new telescope (the 120-inch reflector was placed in operation in 1959), the controversial association with the Santa Cruz campus of the University of California begun in 1964, and an enormous

amount of scientific research. Little attention is given to Lick's early work in positional astronomy, but the observatory quickly delved into the new astronomy: the pioneering work of Keeler with spiral nebulae and Campbell with spectroscopic radial velocities established Lick's reputation as an innovative institution. Subsequent work on solar eclipses, double stars, and proper motions is also described, if not in great detail, as well as the work in astrophysics.

Numerous archives have been used in this study, but most especially the Mary Lea Shane archives of the Lick Observatory. Historians of science and technology will wish for the use of more secondary historical sources, for footnotes, for a more analytic approach, and for placement of Lick's work in the broader context of American science. Among the tasks left for historians of science are an examination of the relation between positional astronomy and astrophysics at Lick, an externalist study of funding policies and institutional interactions, and an internalist history of much of the astronomy at Lick touched on only briefly in this volume.

But as a popular history this volume succeeds very well. It is eminently readable, it lays out the chief personalities involved and lines of research undertaken, and it whets the appetite for more. Reading it, one realizes the need for histories of more of our scientific institutions. A knowledge of where we have been cannot help but point the way to where we should go.

STEVEN J. DICK
U.S. Naval Observatory,
Washington, DC 20392

An Area of Deformation

Tectonic Evolution of the Himalayas and Tibet. R. M. SHACKLETON, J. F. DEWEY, and B. F. WINDLEY, Eds. The Royal Society, London, 1988. vi, 325 pp., illus., + plates. £69. From a meeting, London, Nov. 1987.

Stretching for more than 1300 kilometers north-south and 2000 kilometers east-west, the Himalaya and the Tibetan plateau form the greatest region of high elevation on earth today and part of the broadest region of intracontinental deformation. Their topographic expression and deformational history are the result of continent-continent collision and continued convergence between India and Eurasia during the past 45 million years. The Himalayan-Tibetan region is one of the most tectonically active areas in the world and serves as a natural laboratory for studying the poorly understood processes of intracontinental deformation. With the exception of a few



KEEP PACE WITH EMERGING TECHNOLOGIES

PARTICIPATE IN THE MIT ADVANCED STUDY PROGRAM

The Advanced Study Program of the Center for Advanced Engineering Study at the Massachusetts Institute of Technology is a unique, individualized course of study that offers engineers, scientists, and technical managers

- the opportunity to study emerging technologies firsthand, increase professional capabilities, and broaden perspectives;

- on-campus curriculum formats tailored to the backgrounds of individual participants and the needs of their organizations.

Divided into 15-week segments which coincide with the MIT Fall and Spring terms, the Program combines academic courses and seminars with guided independent study and research.

Participants are provided on-campus offices, computer facilities, a videotape library, and a private lounge in the Center for Advanced Engineering Study building. In addition, participants may use MIT resources such as libraries, Faculty Club, and athletic facilities.

For complete information, contact:

Dr. Paul E. Brown, Director,
Advanced Study Program,
MIT/CAES, Room 9-335,
Cambridge, MA 02139.

Telephone: 617-253-6128
Telex: 92-1473 MIT CAM
Telecopier: 617-258-8831