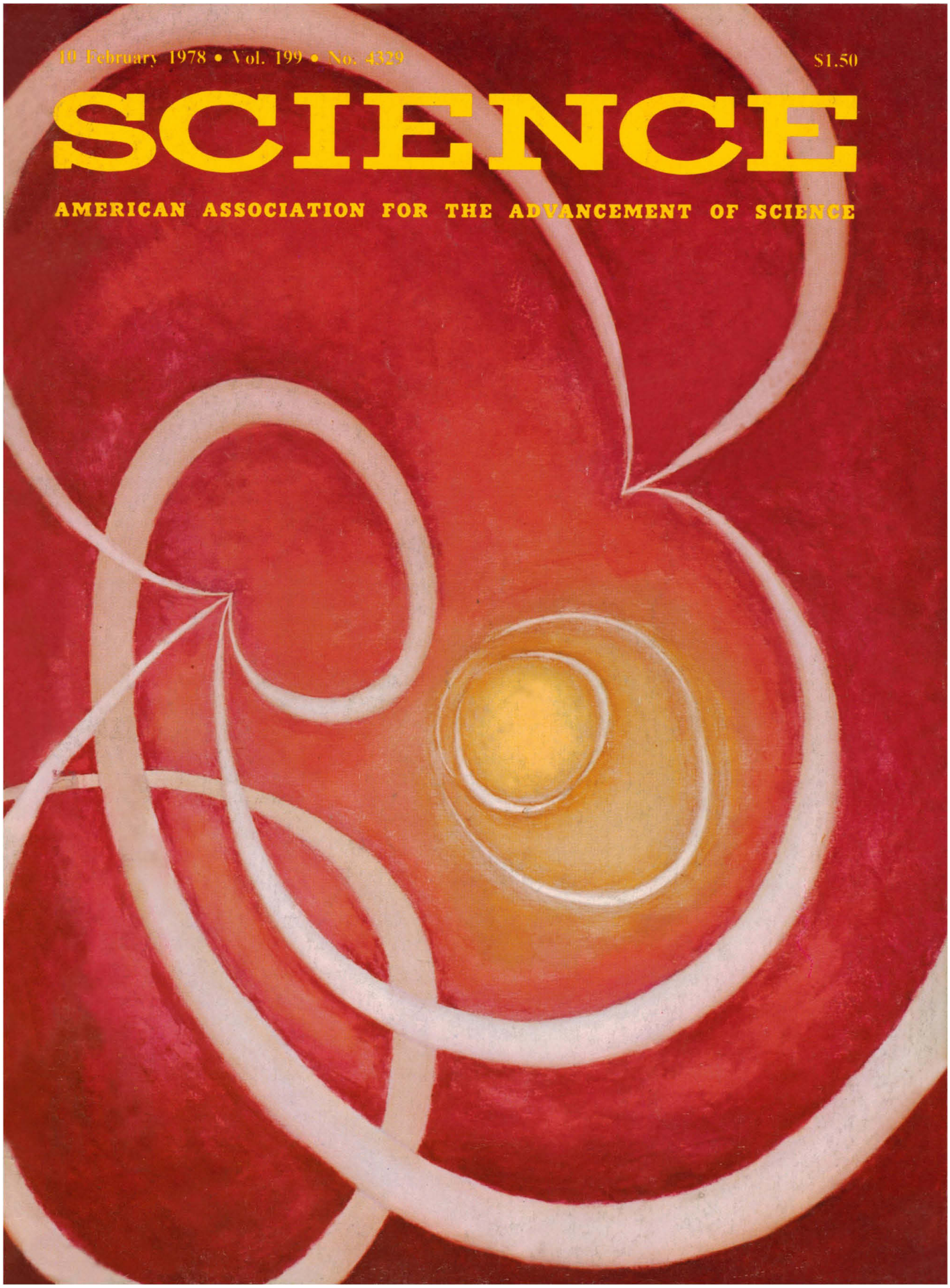
10 February 1978 • Vol. 199 • No. 4329

$1.50

# SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



# How Beckman Ultracentrifuges can save you time.

There are many reasons to own a Beckman Preparative Ultracentrifuge. One of the most important is that it can help you get your work done faster.

**Superior Acceleration/ Deceleration.** Beckman ultracentrifuges have a powerful, efficient electric DC drive that gets rotors to speed and down again in a hurry. For pelleting runs, set the acceleration rate control to maximum. You may save as much as 20 minutes per run compared to drive systems which cannot accelerate and decelerate rapidly.

For density gradient experiments where mixing might occur, use a lower acceleration rate setting. For experiments requiring even slower starts and stops, the L-5 Slow Acceleration Accessory is available.

**$\omega^2$t Integrator.** This accessory continuously accumulates the total centrifugal effect ($\int\omega^2dt$) experienced by the sample during a run. You will find this particularly valuable when a substantial part of the run occurs while the rotor speed ($\omega$) is changing—that is, for runs in which appreciable sedimentation takes place during acceleration and deceleration of the rotor. In fact, it is common practice to program a run so that the rotor runs at constant speed most of the time, in order to minimize the uncertainty in $\int\omega^2dt$ associated with acceleration and deceleration. The integrator makes such concern unnecessary: you can save time by running the rotor to the highest possible speed. It further allows you to reproduce band positions precisely under different run programs. And it saves calculation time in determining sedimentation coefficients.

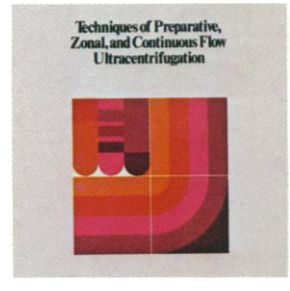

**75,000 rpm Operation.** Beckman offers the Model L5-75 ultracentrifuge for the fastest possible separations. The increase in rotor speed from 65,000 to 75,000 rpm generates a third more centrifugal force. With the Type 75 Ti fixed-angle rotor, forces in excess of 500,000 *g* are available.

**Full Line of Rotors.** The right rotor gives you the most desirable combination of force, volume, number of tubes, and separation efficiency—as well as the preferred rotor material. Beckman offers by far the industry's widest choice: 18 fixed angle, 9 swinging bucket, 3 vertical tube, and 6 zonal and continuous flow rotors.

**Thick-wall Tubes.** Assembling and filling tubes with tube caps takes time. Beckman noncollapsing thick-wall polycarbonate and polyallomer tubes can be run partially filled without tube caps. You can easily save a half hour or more in loading tubes if no caps are used.

Beckman also offers thin-wall tubes in three different tube materials, including cellulose nitrate, plus a wide variety of polycarbonate bottles.

For full information on Beckman Ultracentrifuges, Rotors, Tubes, and Accessories, ask for Data File L5-400/174. For a copy of the booklet "Techniques of Preparative, Zonal, and Continuous Flow Ultracentrifugation," which contains a wealth of helpful information, ask for DS-468. Write Beckman Instruments, Inc., Spinco Division, 1117 California Ave., Palo Alto, CA 94304.




BECKMAN®

Circle No. 170 on Readers' Service Card

# PLANT GEOGRAPHY

**With Special Reference to North America**

By REXFORD DAUBENMIRE

*A Volume in the PHYSIOLOGICAL ECOLOGY Series*

This book gives perhaps the most complete account to date of the natural vegetation of North America and how it developed through time. Ideal as a text for courses in plant geography, it interprets as well as describes, using an ecosystem perspective to view climate, soil, and fire relationships. It also considers economic values and land uses, and paleoecological interpretations of the development of modern vegetation distributions. The book is illustrated by one of the best collections of pictures of North American vegetation types ever published.

*1978, 352 pp., $21.50/£15.25 ISBN: 0-12-204150-X*

# GENETIC MECHANISMS OF CELLS, Volume 1

Edited by LESTER GOLDSTEIN and DAVID M. PRESCOTT

CONTENTS: *E. D. Garber and M. S. Esposito*, Defining the Gene by Mutation, Recombination, and Function. *M. S. Esposito and R. E. Esposito*, Gene Conversion, Paramutation, and Controlling Elements: A Treasure of Exceptions. *P. B. Moens*, The Onset of Meiosis. *S. W. Brown and H. S. Chandra*, Chromosome Imprinting and the Differential Regulation of Homologous Chromosomes. *N. R. Ringertz and T. Ege*, Use of Mutant, Hybrid, and Reconstructed Cells in Somatic Cell Genetics. *E. D. Garber*, Cytogenetics. *R. Sager*, Cytoplasmic Inheritance. *L. B. Preer and J. R. Preer, Jr.*, Inheritance of Infectious Elements. *J. Beisson*, Non-Nucleic Acid Inheritance and Epigenetic Phenomena.

*1977, 448 pp., $39.50/£28.05 ISBN: 0-12-289501-0*
*Subscription price: $33.50**

# THE PORPHYRINS, Volume II

## STRUCTURE AND SYNTHESIS, Part B

Edited by DAVID DOLPHIN

CONTENTS: *H. Scheer*, Synthesis and Stereochemistry of Hydroporphyrins. *H. Scheer and H. H. Inhoffen*, Hydroporphyrins: Reactivity, Spectroscopy, and Hydroporphyrin Analogues. *D. Mauzerall*, The Porphyrinogens. *P. S. Clezy*, Oxophlorins (Oxyporphyrins). *J.-H. Fuhrhop*, Irreversible Reactions on the Porphyrin Periphery (Excluding Oxidations, Reductions, and Photochemical Reactions). *F. R. Hopf and D. G. Whitten*, Chemical Transformations Involving Photoexcited Porphyrins and Metalloporphyrins. *A. Gossauer and J. Engel*, Linear Polypyrrolic Compounds. *J. Subramanian and J.-H. Fuhrhop*, Metal Complexes of Open-Chain Tetrapyrrole Pigments. *H. Brockmann Jr.*, Stereochemistry and Absolute Configuration of Chlorophylls and Linear Tetrapyrroles. *R. Grigg*, Pyrrolic Macrocycles Other than Porphyrins.

*1978, 432 pp., $46.50/£33.00 ISBN: 0-12-220102-7*
*Subscription price: $39.50**

# THE PORPHYRINS, Volume V

## PHYSICAL CHEMISTRY, Part C

Edited by DAVID DOLPHIN

CONTENTS: *C. E. Castro*, Routes of Electron Transfer. *D. Mauzerall*, Electron Transfer Photoreactions of Porphyrins. *R. H. Felton*, Redox properties of metalloporphyrins. *D. G. Davis*, Electrochemistry of Porphyrins. *G. H. Gibson*, The Oxygenation of Hemoglobin. *B. R. James*, Interaction of Dioxygen with Metalloporphyrins. *W. I. White*, Aggregation of Porphyrins and Metalloporphyrins. *W. A. Svec*, The Isolation, Preparation, Characterization, and Estimation of the Chlorophylls and Bacteriochlorophylls. *J. J. Katz et al.*, Chlorophyll Aggregation. Coordination Interactions in Chlorophyll Manomers, Dimers and Oligomers. *F. R. Longo et al.*, Kinetic and Mechanistic Studies of Metalloporphyrin Formation. *A. D. Adler et al.*, Solid State Phenomena in Porphyrins and Related Materials. (The above contents are tentative.)

*1978, 492 pp., $49.50/£34.00 ISBN: 0-12-220105-1*

# LACTATION, A Comprehensive Treatise

## Volume IV: The Mammary Gland/Human Lactation/Milk Synthesis

Edited by BRUCE L. LARSON

This is the fourth volume in a publication which probably constitutes the most comprehensive compendium of information on lactation available in one source. Volume IV, which puts strong emphasis on human lactation, will have special relevance to workers in medicine, pediatrics, obstetrics, gynecology, biology, biochemistry, and immunology. Like the earlier volumes, it will also make an invaluable reference source for anyone connected with dairy science, animal science, food science, nutrition, physiology, anatomy, and related fields. Individual chapters on the mammary gland, human lactation, and milk synthesis have been written by international authorities from the medical and biological sciences in their areas of expertise.

*1978, about 500 pp., in preparation*
*ISBN: 0-12-436704-6*

# HUMAN VARIATION

**The Biopsychology of Age, Race, and Sex**

Edited by R. TRAVIS OSBORNE, CLYDE E. NOBLE and NATHANIEL WEYL

CONTENTS: *N. Weyl*, Prologue. *D. J. Ingle*, Fallacies in Arguments on Human Differences. *D. C. Rife*, Genes and Melting Pots. *A. R. Jensen*, Genetic and Behavioral Effects on Nonrandom Mating. *J. L. Horn*, The Nature and Development of Intellectual Abilities. *R. T. Osborne*, Race and Sex Differences in Heritability of Mental Test Performance: A Study of Negroid and Caucasoid Twins. *R. G. Lehrke*, Sex Linkage: A Biological Basis for Greater Male Variability in Intelligence. *A. M. Shuey*, Own-Race Preference and Self-Esteem in Young Negroid and Caucasoid Children. *R. Lynn*, Ethnic and Racial Differences in Intelligence: International Comparisons. *C. E. Noble*, Age, Race, and Sex in the Learning and Performance of Psychomotor Skills. *C. D. Darlington*, Epilogue: The Evolution and Variation of Human Intelligence.

*1977, about 325 pp., in preparation*
*ISBN: 0-12-529050-0*

*Subscription prices for individual volumes valid only on orders for complete set received before publication of the last volume. Subscription prices are not valid in the United Kingdom, Australia, or New Zealand.

Send payment with order and save postage plus 50¢ handling charge. Orders under $15.00 must be accompanied by payment.

*Prices are subject to change without notice.*


**ACADEMIC PRESS, INC.**

*A Subsidiary of Harcourt Brace Jovanovich, Publishers*

111 FIFTH AVENUE, NEW YORK, N.Y. 10003

24-28 OVAL ROAD, LONDON NW1 7DX

ISSN 0036-8075

10 February 1978

Volume 199, No. 4329

# SCIENCE



**BOARD OF DIRECTORS**

WILLIAM D. MC ELROY, Retiring President, Chairman
EMILIO Q. DADDARIO, President
EDWARD E. DAVID, JR., President-Elect
MARTIN M. CUMMINGS
RUTH M. DAVIS
RENÉE C. FOX
BERNARD GIFFORD

**CHAIRMEN AND SECRETARIES OF AAAS SECTIONS**

MATHEMATICS (A): Dorothy M. Stone, Truman A. Botts
PHYSICS (B): Norman Ramsey, Rolf M. Sinclair
CHEMISTRY (C): Norman Hackerman, Leo Schubert
ASTRONOMY (D): Beverly T. Lynds, Arlo U. Landolt
PSYCHOLOGY (J): Donald B. Lindsley, Edwin P. Hollander
SOCIAL AND ECONOMIC SCIENCES (K): Matilda W. Riley, Daniel Rich
HISTORY AND PHILOSOPHY OF SCIENCE (L): Ernan McMullin, George Basalla
ENGINEERING (M): Ernst Weber, Paul H. Robbins
EDUCATION (Q): Herbert A. Smith, James T. Robinson
DENTISTRY (R): Harold M. Fullmer, Sholom Pearlman
PHARMACEUTICAL SCIENCES (S): Stuart Eriksen, Raymond Jang
INFORMATION, COMPUTING, AND COMMUNICATION (T): Lawrence P. Heilprin, Joseph Becker

**DIVISIONS**

ALASKA DIVISION: Donald H. Rosenberg, President; Keith B. Mather, Executive Secretary
PACIFIC DIVISION: Mildred Mathias, President; Alan E. Leviton, Secretary-Treasurer
SOUTHWESTERN AND ROCKY MOUNTAIN DIVISIO: Erik K. Bonde, President; Max P. Dunford, Executive Officer

**SCIENCE is published weekly, except the last week in December, but with an extra issue on the third Tuesday in September, by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005.** Now combined with **The Scientific Monthly®**. Second-class postage paid at Washington, D.C., and additional entry. Copyright © 1977 by the American Association for the Advancement of Science. Member rates on request. Annual subscriptions $60; foreign postage: Canada $10; other surface $13; air-surface via Amsterdam $30. Single copies $1.50; $2 by mail (back issues $3) except **Guide to Scientific Instruments** $6. School year subscriptions: 9 months $45; 10 months $50. Provide 6 weeks' notice for change of address, giving new and old addresses and postal codes. Send a recent address label, including your 7-digit account number. **Postmaster: Send Form 3579 to *Science*, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005.**

# AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE




MIKE MC CORMACK, FREDERICK MOSTELLER, CHAUNCEY STARR, CHEN NING YANG, WILLIAM T. GOLDEN (Treasurer), WILLIAM D. CAREY (Executive Officer)

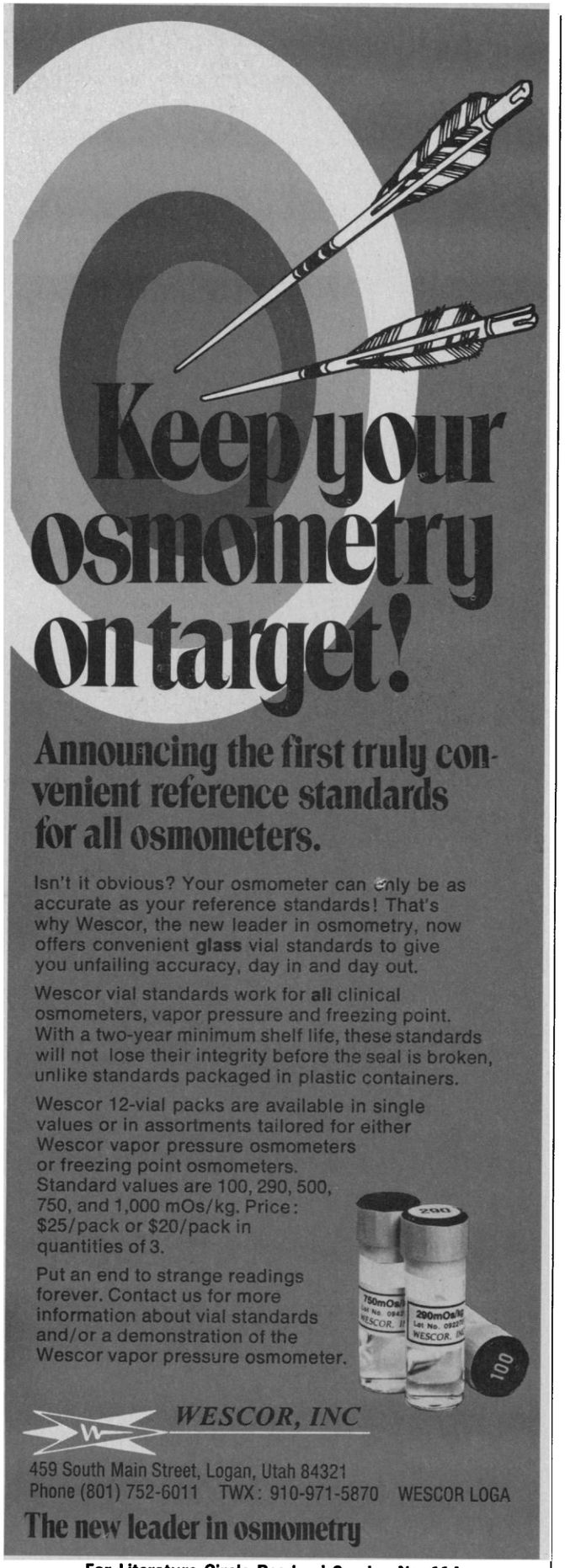
GEOLOGY AND GEOGRAPHY (E): Howard R. Gould, Ramon E. Bisque
BIOLOGICAL SCIENCES (G): Mary E. Clark, Jane C. Kaltenbach
ANTHROPOLOGY (H): Raymond H. Thompson, Philleo Nash
MEDICAL SCIENCES (N): Robert W. Berliner, Richard J. Johns
AGRICULTURE (O): John P. Mahlstede, J. Lawrence Apple
INDUSTRIAL SCIENCE (P): Joseph H. Engel, Robert L. Stern
STATISTICS (U): John W. Pratt, Ezra Glaser
ATMOSPHERIC AND HYDROSPHERIC SCIENCES (W): Robert G. Fleagle, Stanley A. Changnon, Jr.
GENERAL (X): Mary Louise Robbins, Joseph P. Coates

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 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**

Artist's interpretation of the sun, an energy source of growing interest. See page 607. [*Summer Sun*, oil painting by Emlen Etting; courtesy of Midtown Galleries, Inc., 11 East 57 Street, New York 10022]


**Science** is indexed in two general periodical indexes—**Readers' Guide to Periodical Literature** and **Monthly Cumulating Periodical Index**—and in several specialized indexes.




For Literature Circle Readers' Service No. 114.
For Demonstration Circle Readers' Service No. 115.



10 February 1978

**Science Up-Date**

on

ENERGY

**Science** presents eight previously unpublished Reports on energy use in today's society. Among the subjects covered in the 10 February special **Science** issue are:

- Energy and water
- Innovation and change in industrial energy use
- Photovoltaic power systems
- Solar energy for village development
- CANDU reactor systems
- Fuels and the biomass
- Liquid fuels and coal

Prepublication copies are available for $3.00 each.
Remittance must accompany all orders.

Send name and address with remittance to

Energy Issue
American Association for the Advancement of Science

1515 Massachusetts Avenue, NW
Washington, DC 20005


Photomicrograph by Jack Kath, Merck, Sharpe & Dohme Research Laboratories

# Look to Nikon

Man's eyes transmit more information to his mind than any other sense. For sixty years Nikon has extended man's vision and knowledge with the world's finest optics. Nikon manufactures its own optical glass. And monitors the creative process from mixing rare earth elements, through fiery melting, slow cooling, careful polishing, painstaking inspection. For total dedication to optical quality, look to Nikon.

# ニコンとご用命下さい

眼。それはもっとも多くの情報を人間の頭脳に伝達する感覚器官です。過去六十年間にわたり、ニコンは、世界最高の光学技術をもって人間の視覚を拡張し、人間の知識を豊かにしてまいりました。ニコンはその光学ガラスを自製します。稀土と各種添加材の混合過程をはじめ、高熱熔解、緩徐冷却、ていねいな研磨、厳密な検査、すべての創造過程をくまなく監視します。光学的品質に対するおしみない努力をお求めなら、ニコンとご用命ください。

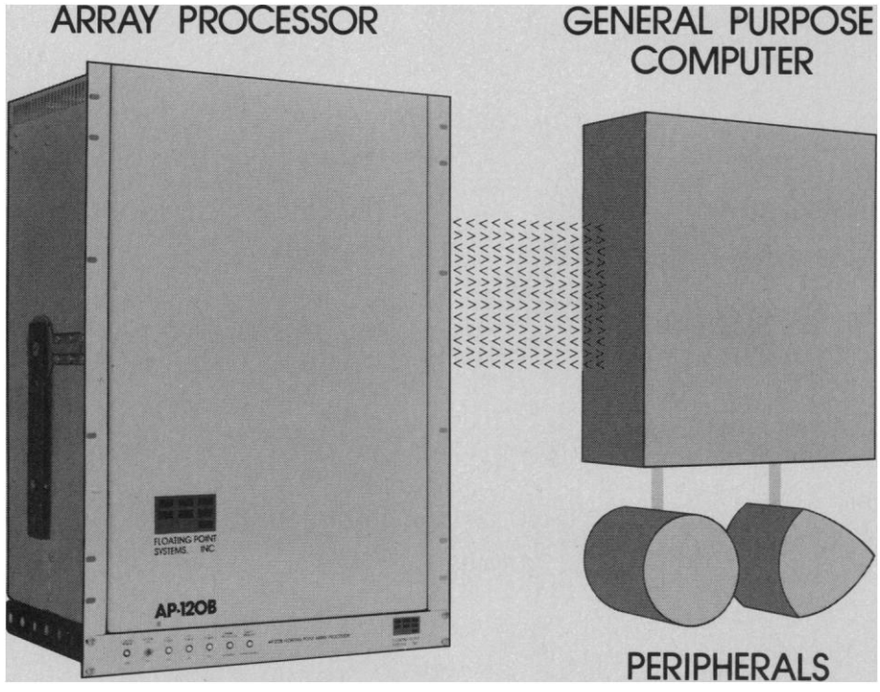
# Blicken Sie auf Nikon

Die Augen des Menschen übertragen auf seinen Verstand mehr Informationen als irgendein anderes Sinnesorgan. Seit sechzig Jahren hat Nikon Sicht und Wissen des Menschen durch die beste Optik der Welt erweitert. Nikon stellt optisches Glass in eigener Regie her. Und überwacht diesen kreativen Prozess vom Mischen seltener Erdelemente über Schmelzen, langsamer Abkuehlung, feinstem Polieren bis zur sorgfältigsten Endkontrolle. Nikon . . . *der* Name für optische Qualität.

**Nikon** Nikon Inc., Instrument Division, Ehrenreich Photo-Optical Industries, Inc., Garden City, New York 11530 U.S.A.

Circle No. 49 on Readers' Service Card

# A new advance in scientific computing




A breakthrough in computer architecture, the Array Processor is bringing unparalleled computational power to continually growing numbers of applications in **research, engineering,** and **signal processing.**

The Array Processor is **a computer in its own right,** specifically designed **for extremely efficient processing of large vectors or arrays** of data. Although fully capable of working in an independent system, the Array Processor is typically implemented as a powerful complement to a host computer (which acts primarily as a controller), greatly increasing the computational power of the entire system.

The Array Processor **takes blocks of data and instructions** from the complementary CPU or other device and **performs the computations** called for **at speeds of 100 to 200 times greater than** a stand-alone computer. This means that **a minicomputer** based system can have its computational throughput increased to a degree only available on the largest, and most expensive mainframe computers. It also means that a **large mainframe can have its throughput increased up to 20 fold.** The rationale is simply this: if massive computations are required to effect a simulation or algorithmic model, why not design a programmable processor to handle these tasks efficiently. FPS has pioneered this approach by designing extremely efficient, cost effective Array Processors, interfacing them to all popular computers and providing a package consisting of software development programs, diagnostic programs, and an extensive math library. All documentation and support are provided to bring the systems promptly on line. The significance of this approach becomes evident when one realizes that for **less than $50K** he can have the power of a multi-million dollar CDC 7600 immediately available to implement his scientific analysis programs. Hundreds of FPS Array Processors are in use today.

Time and again the Array Processor has allowed significant research to be accomplished where before budgets did not allow access to the computational power required. This accessability has also produced a catalytic effect allowing new research ideas to come forward for implementation.

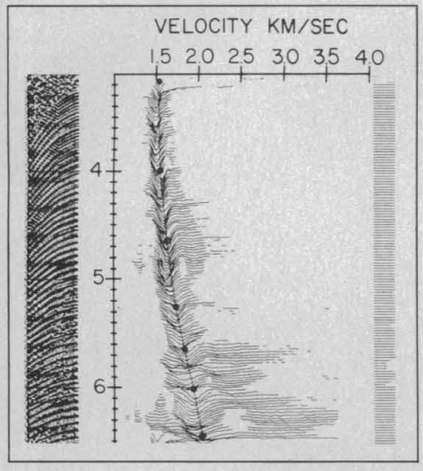
**Architecturally,** Floating Point Systems' Array Processors consist of fast registers, program memory, data memory, **a pipelined floating-point adder,** and **pipelined floating-point multiplier**—all interconnected by **seven parallel synchronous data buses.** These features are combined with a fast **(167 nanosecond)** instruction cycle. While the conventional computer instruction word can only specify a single operation, such as a **multiply, add, memory fetch, decrement, or test, the FPS Array Processor can do all of these operations in a single 167 nanosecond cycle.** The result is the ability to do the reiterative computations required on large vectors or arrays of data in a very short time.

There is another "unexpected" benefit from this kind of computer architecture. Most algorithms used to implement scientific models and their associated data sets are naturally structured in vector (array) form. While the conventional computers of today require restructuring of the models, the design of the architecture and instruction set of FPS Array Processors is virtually congruent to the mathematical models. Researchers using Array Processors find that they **can readily write new program routines** either in **FORTRAN IV** through their host computer or in **the Array Processor's own assembly language.**

Powerful models can be readily implemented through the extensive FPS Scientific **Math Library (SML) of more than 250 routines** callable through the host FORTRAN. New programs can be added to the SML using the assembly language of the Array Processor.

For example, **Peter Buhl** of the **Lamont Doherty Geological Observatory of Columbia University** applied these techniques to the analysis of **marine seismic reflection data.**

# ...the Array Processor

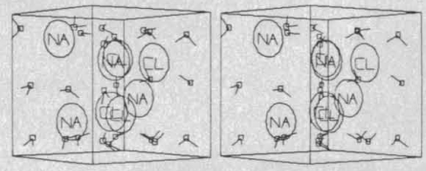



The above data is a plot of the earth's response due to an air gun source at 24 locations along the earth's surface. The vertical scale is propagation time in seconds. Sound velocity in the earth is determined by fitting one-sided hyperbolas to the data. This fitting is done in the Array Processor by multiple cross-correlations of short time windows of the 24 traces. The strength of the correlation as a function of propagation time and assumed velocity is plotted in the center graph as a downward deflection. A line through the deflection troughs defines velocity vs. depth. **The center graph requires 100 million multiply-adds.**

Sound velocity data as a function of depth of the earth provides valuable information about the nature of the strata. A single velocity analysis via a multiple cross-correlation (or semblance) technique required **six hours with conventional computational equipment.** Utilizing an **FPS Array Processor reduced this time to three minutes,** (a 120X throughput improvement) thereby allowing these velocity analyses to be done at closer spacings along the line of profile, **adding an extra dimension to earth cross sections.**

Floating Point Systems' Array Processor also forms part of a system used to process nuclear reactor operating data generated by **reactor safety experiments.** The portion of that system developed by **Sam Sparck, Senior Development Engineer at the Time/Data Division of Gen Rad, Inc.** is a real-time multi channel **digital filter subsystem.** Input data arrives in buffers of variable length at rates from 50 to 650 buffers/sec. Maximum throughput requirement is 131,000 words/sec. The Array Processor program performs data demultiplexing into separate channel buffers, digital filtering/decimation, bounds checking, and remultiplexing of the decimated data into output buffers. **Decimation ratios of 3:1 to 6,000,000:1** are attained. Certain **selected parameters are tested in real-time** for bounds exceedance, and when exceedance conditions are detected, an audible and visual alarm is generated to alert system operators.

In the area of pure science, a Floating Point Systems' Array Processor is used by researchers at the **University of California, San Diego** to integrate **several hundred coupled differential equations** in the study of the **molecular dynamics of chemical reactions.** A dynamic display system then processes the vector positions of the atoms and shows them in 3D moving images. Chemistry is a field with obvious needs for large increases in computer power. Its fundamental axioms are well known, but the computations involved in applying these axioms are so extended that as yet only relatively simple systems have been studied from first principles.



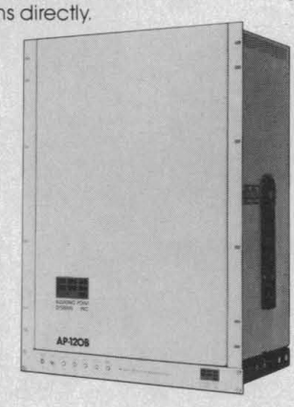

Hard copy output of single time step in the dissolution and solvation of a salt crystallite in water is shown here. You can see this stop-action in striking depth if you fuse the two pictures together into a single stereoscopic image with a slight crossing of your eyes. The experimenters actually have moving 3D pictures literally at their fingertips. The calculations are aimed at a deeper understanding of molecular processes in terms of the motions of the atoms involved.

While the computational limitation of this generation of Array Processors does exist, its potential contribution to technology has yet to be discovered in many areas of scientific analysis. Every day numerically intensive array processing techniques are applied to new areas of research and engineering.

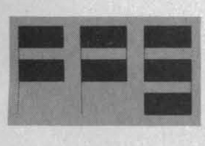
Today **Array Processors can be found in** the calculation, reconstruction, and enhancement of **images** (X-ray, satellite, and seismic)...the **conversion of speech** signals into compressed digital data and the subsequent resynthesis...the composition of images in **radio astronomy**...the statistical analysis of the data affecting **economic models**...the **simulation of mechanical systems,** airframes, and environments... and more.

The Array Processor has literally created a new era in signal processing and scientific computation. An FPS Array Processor interfaced to a **minicomputer** provides the computational power of a megadollar mainframe at a fraction of the cost...combined with a **major mainframe,** it brings the user the computational ability previously available only at tremendous cost.

To learn more about Array Processors...use the coupon below or contact Floating Point Systems directly.




The age of Array Processing is here...and Floating Point Systems is the Array Processor company.



FLOATING POINT SYSTEMS, INC.

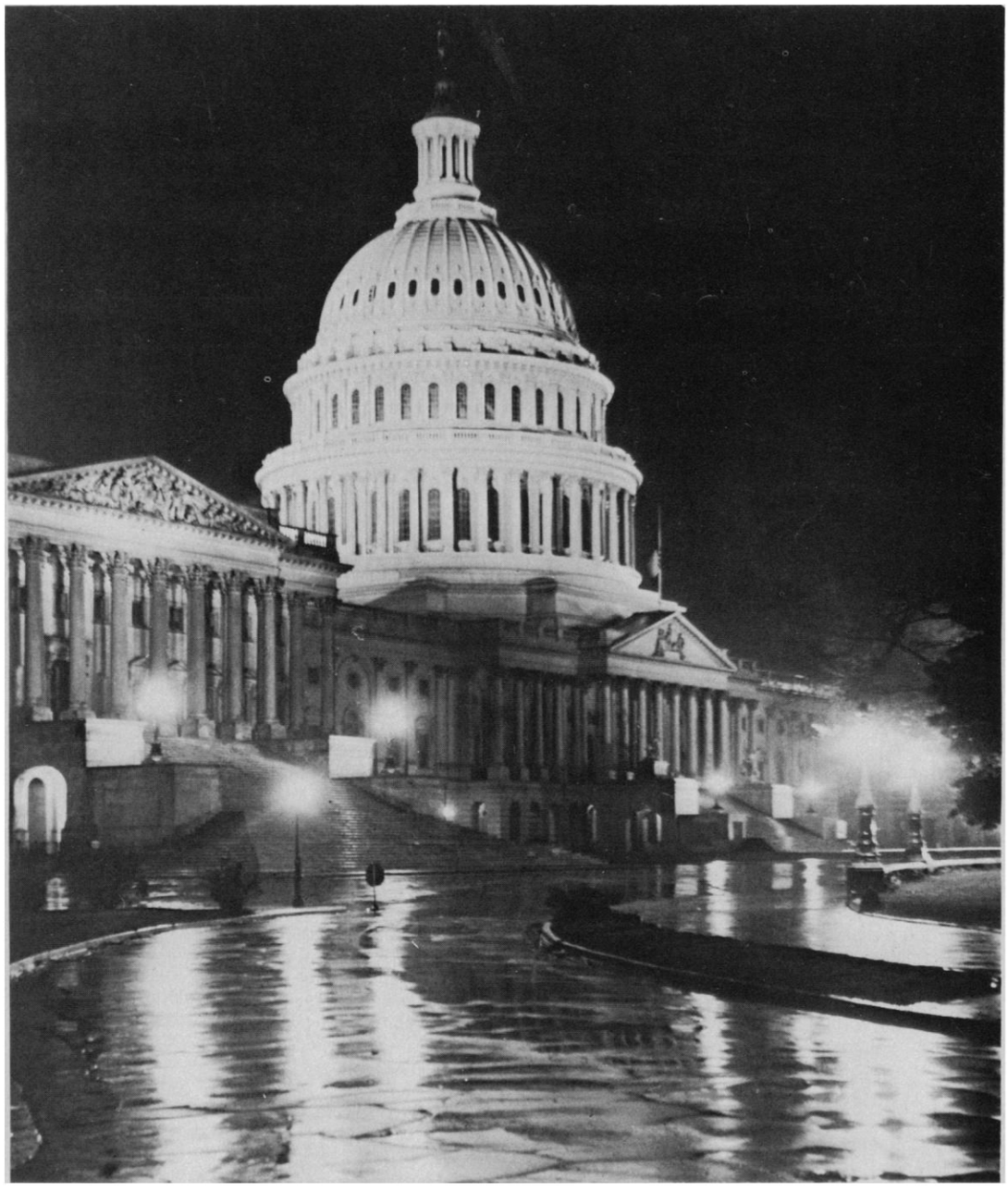
CALL TOLL FREE 800-547-9677 or 800-547-1445
P.O. Box 23489, Portland, OR 97223
(503) 641-3151, TLX: 360470 FLOATPOINT PTL

Please send additional information.

Name _____ Title _____
Company _____ Phone _____
Address _____
City _____ State _____ Zip _____
My Computer System is _____ My application is _____

SCIENCE 2/78

# WASHINGTON TAPES



**Annual Meeting**
**Washington**
**12-17 February 1978**

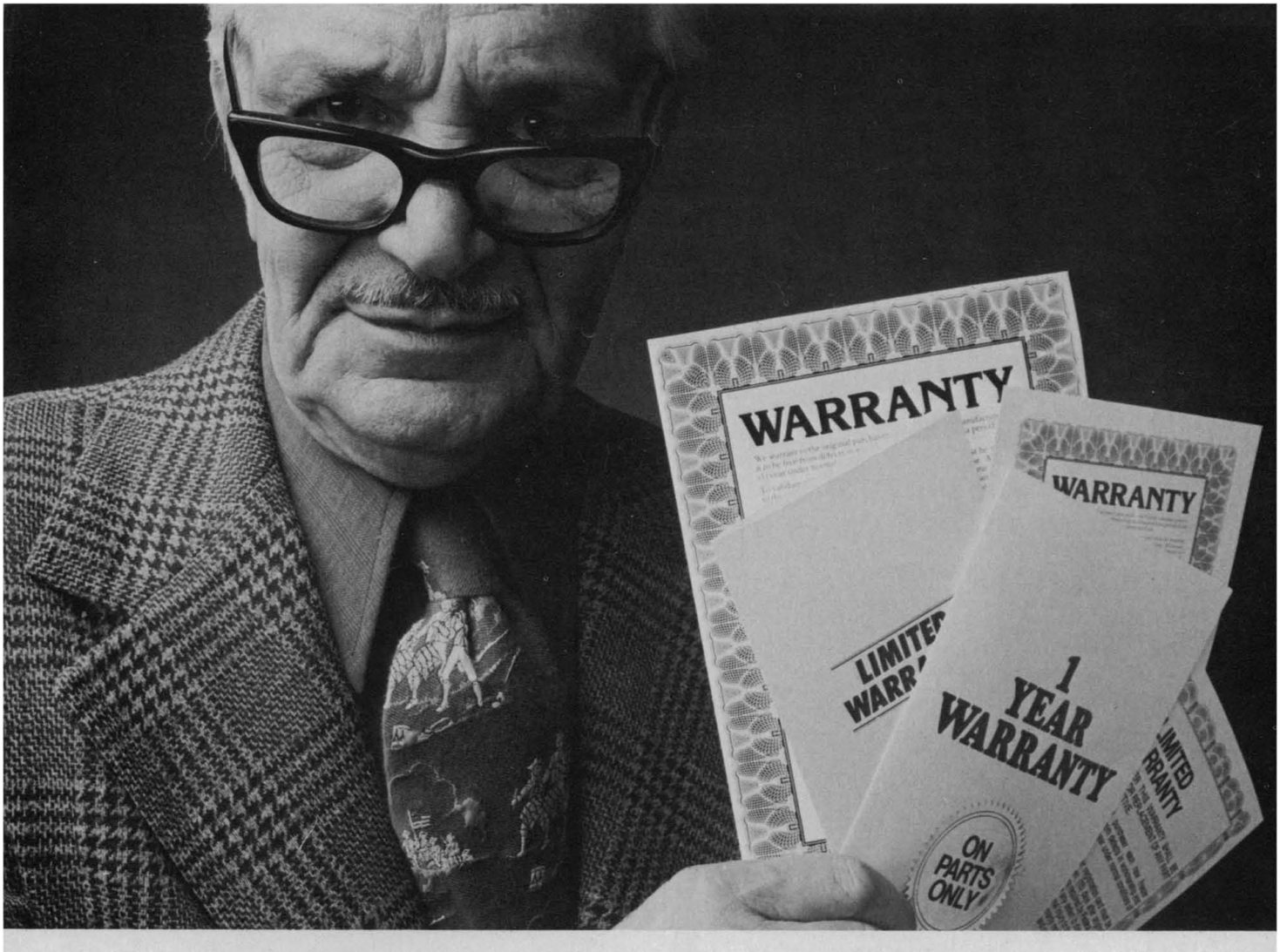
aaas

For a list of those sessions taped
at this year's Annual Meeting, visit the
CEBAR Sales Desk
AAAS Registration Area
Sheraton-Park Hotel

or write

CEBAR Communications, Inc.
2735 Central Street
Evanston, Illinois 60201

Ordering information for all AAAS publications available at the AAAS Exhibit Booth.




# People who've been pushing a one-year warranty won't be happy about this ad.

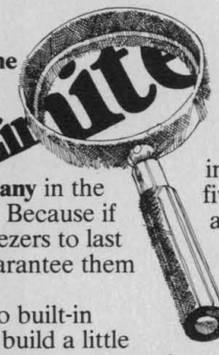
The fine print on many freezer warranties is enough to send cold chills up and down your spine.

Some people, for example, make a big deal out of supposedly long-term warranties in the headlines. But when you get down into the legalese, you find out they're really only guaranteeing the insulation, or something equally absurd.

Well, those people will turn green when they see what we're putting down in black and white.

**Because Revco is now offering a five-year warranty.** A full five years on Revco parts, plus a five-year warranty on labor, as well, from one of our 200 coast-to-coast service centers.

It's the **number-one warranty** in the entire freezer industry, and it's precisely what you'd expect from the **number-one company** in the entire freezer industry. Because if we didn't build our freezers to last longer, we couldn't guarantee them to last longer.




And in addition to built-in dependability, we also build a little pride into every one of our ULTra-Low® temperature freezers. Because we still believe in doing things the **right** way, and not just the **easy** way.

That's the way we've been doing business for 40 years now, and we expect to keep on doing it the same way for at least 40 more.

40 Years of Excellence

For further information on our five-year warranty and a copy of our new full-color catalog just call or write us at 1100 Memorial Drive, West Columbia, S.C. 29169. Area Code 803/796-1700. TWX: 810-666-2103. Cable: Revco

**REVCO**

*The world's leader in ULTra-Low® temperature equipment.*

Circle No. 197 on Readers' Service Card

# Unique Protein-Labelling Reagents

## available only from Amersham

PHENYL [ $^{35}$S] ISOTHIOCYANATE
Now with increased specific activity
200-1000mCi/mmol
code SJ. 189
For the sequencing of proteins by the Edman degradation technique

[ $^{32}$P]DFP
200-400$\mu$Ci/mg
code PB. 1
Labels proteins, for example esterases, by phosphorylating serine moieties

*N* - SUCCINIMIDYL [2,3-$^{3}$H] PROPIONATE
30-60Ci/mmol
code TRK. 556
Acylates proteins under very mild conditions

1-FLUORO-2, 4-DINITRO [U- $^{14}$C] BENZENE
5-20mCi/mmol
code CFA. 282
For the Sanger technique of end-group analysis of proteins

*N* -FORMYL-L-[ $^{35}$S] METHIONINE SULPHONE
>50Ci/mmol
code SJ. 231
For labelling amino groups of proteins on outside of cell walls via the methyl phosphate derivative

Amersham

AMERSHAM CORPORATION:
A SUBSIDIARY OF THE RADIOCHEMICAL CENTRE

2636 S. Clearbrook Dr., Arlington Heights, IL 60005
312/593-6300 or 800/323-9750 (Toll-free)

**In Canada**
505 Iroquois Shore Rd., Oakville, ONT L6H 2R3
416/842-2720 or 800/261-5061 (Toll free)

Circle No. 202 on Readers' Service Card


**Hellma—the largest assortment of highest precision glass and quartz cells.**
**Standard · Flow-through · Constant-temperature**
**Anaerobic · Special Designs**
**Also available—ULTRAVIOLET LIGHT SOURCES**
**Deuterium Lamps · Mercury Vapor Lamps**
**Hollow Cathode Lamps · Power Supplies**

HELLMA CELLS, INC.

**Write for literature**
**Box 544**
**Borough Hall Station**
**Jamaica, New York 11424**
**Phone (212) 544-9534**

Circle No. 14 on Readers' Service Card


# Sol stands up to the mini's.

If you need a small computer fully capable of standing up against the mini's at one-third or less the cost, see the Sol Terminal Computer.

Only Sol is complete. All the necessary interfaces are included in one package. Sol gives you the software packages and disk operating system. Languages include Extended BASIC, FORTRAN*, FOCAL, PILOT* and Assembler.

Sol carries up to 64K bytes of memory and works with up to 3 megabyte on-line disk memory. It's S-100 bus compatible for peripheral gear flexibility.

Sol is conservatively engineered, of proven reliability (more than 5,000 in the field), and fully supported by documentation and service personnel.

Prices begin at $1350. For full information, see your dealer or address Processor Technology Corporation, Box Q , 7100 Johnson Industrial Drive, Pleasanton, CA 94566. Or phone (415) 829-2600. *available soon

ProcessorTechnology

Circle No. 74 on Readers' Service Card

If you ever have an equipment breakdown...

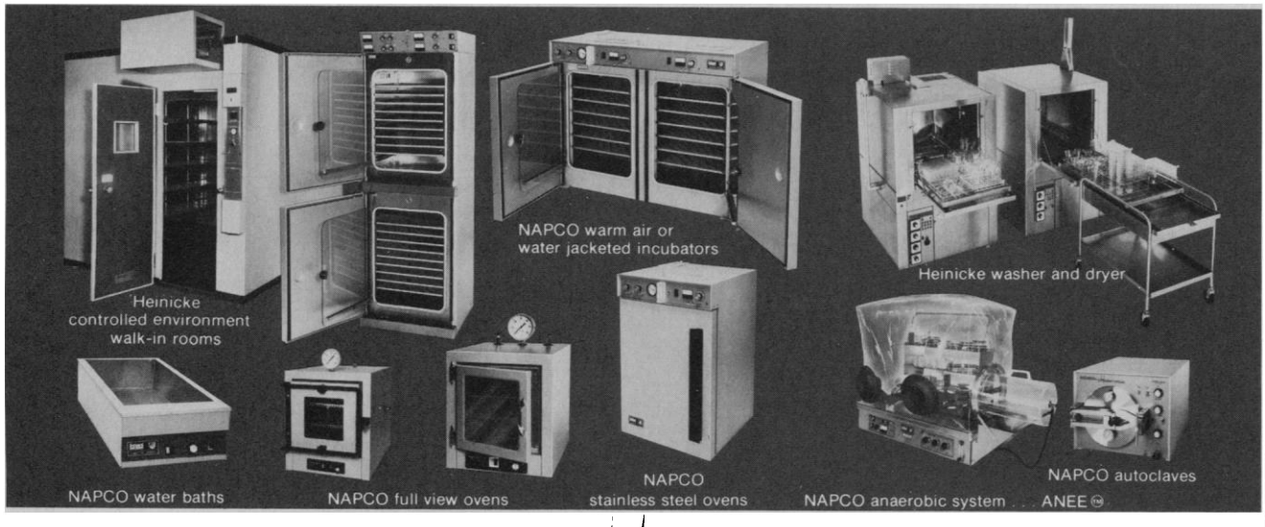
# a Heinicke Minute Man will be on his way to you in 48 hours!

You should seldom have to make use of this Heinicke Minute Man service, since we build laboratory instruments to work, and to last. But it's good to know that we stand back of them...all the way.

No more letter writing—and waiting. Just pick up a phone and dial the toll-free number, 800-327-9783. We'll dispatch a Minute Man no matter where you are in the continental United States. He'll either fix the trouble on the spot, or diagnose it and arrange for factory service. You'll pay only the normal cost for servicing.

***Minute Man*** service policy extends to all Heinicke and NAPCO® equipment. Remember this toll-free number **800-327-9783**

Heinicke and NAPCO laboratory equipment have been the standard of quality in the field for a generation. Now, with Minute Man service, they represent the complete package of performance and satisfaction.




**HEINICKE INSTRUMENTS COMPANY**
**NATIONAL APPLIANCE COMPANY**

3000 Taft Street. Hollywood. Florida 33021
800-327-9783 • (Florida) 305-987-6101

# NATO ADVANCED STUDY INSTITUTES 1978

The purpose of the Advanced Study Institutes (ASI) Programme, one of the main activities of the NATO Science Committee, is to disseminate advanced scientific knowledge and to allow formation of contacts among scientists from different countries. ASIs are intended to be meetings where a small faculty of internationally known experts teaches a carefully defined subject in a coherent lecture programme. Generally, between 50 to 100 scientists are admitted and take an active part in the meeting.

The Advanced Study Institutes listed below, sponsored or co-sponsored by NATO, are organised under the entire responsibility of the director of the institute or his organising committee. Those scientists with adequate background and interest who wish to participate in one of the institutes should **apply direct to the director** of the particular institute. It should be noted that location, dates and deadlines for application for the institutes might be subject to change and it is therefore recommended that contact be made with the appropriate director well in advance of the dates indicated.

A limited number of small grants are available to defray part of the expenses of deserving participants. These grants can only be obtained through application to the ASI director.

## THE NATO ASI SERIES

The results of most of the courses are published in the NATO ASI Series, the official vehicle for publication of the Proceedings. For more information, please contact the Scientific Affairs Division, NATO, B-1110 Brussels.

NOTE: For reasons of space some of the titles have been abridged.

| | |
|---|---|
| Antiviral Mechanisms in Neoplasia Control; 15-25/3/78; Corfu, Greece | Prof. P. Chandra; Klinikum; Univ.; T. Stern Kai 7; D-6 Frankfurt 70, Germany |
| Solitons, Instantons, Turbulence; 20/3-9/4/78; Les Houches, France | Dr. M. Béal-Monod; Phys. des Solides; Univ. de Paris-Sud; 91405 Orsay, France |
| Pollution Surveillance by Electromagnetic Waves; 9-19/4/78; Spatind, Norway | Dr. D. Gjessing; NTNF, Remote Sensing Prg.; PO Box 25; 2007 Kjeller, Norway |
| Structure and Function of Chromatin; 12-26/4/78; Erice, Sicily, Italy | Prof. C. Nicolini; Biophysics Div.; Temple Univ.; Philadelphia, Pa 19140, USA |
| Stochastic Differential Equations; 29/5-10/6/78; Cortona, Italy | Prof. R. Conti; Ist. Matematico; V. le Morgagni 67A; 50134 Firenze, Italy |
| Excited States of Atoms, Molecules and Solids; 5-19/6/78; Kos, Greece | Prof. C. Nicolaides; Hellenic Res. Found.; Vas. Constantinou; Athens 501/1, Greece |
| Theor. Methods in Medium-Energy, Heavy-Ion Physics; 12-23/6/78; Madison, Wi., US | Dr. K. McVoy; Univ.; Physics Dept.; 1150 Univ. Ave; Madison, Wi. 53706, USA |

| | |
|---|---|
| Advances in Analysis of Visual Behaviour; USA; 15-24/6/78; Waltham, Ma. | Dr. D. Ingle; McLean Hospital; Neuropsychology Lab.; Belmont, Ma. 02178, USA |
| Digital Image Processing; 19-30/6/78; Castera Verduzan, France | Prof. J. Simon; Inst. de Programmation; Place Jussieu; 75230 Paris, Cédex, France |
| Methods f. Automated Reliability Studies; June 78; Urbino, Italy | Prof. E. Henley; University; Chemical Eng. Dept.; Houston, Texas 77004, USA |
| Cosmic Ray Astrophysics; 22/6-6/7/78; Erice, Sicily, Italy | Prof. M. Shapiro; Naval Res. Lab.; Code 7020; Overlook Ave.; Washington, D.C. 20375, U.S.A. |
| Pattern Recognition and Signal Processing; 25/6-4/7/78; Paris, France | Prof. C. Chen; Southeastern Univ.; Electrical Eng. Dept.; N. Dartmouth, Mass., USA |
| Fiber and Integrated Optics; 26/6-7/7/78; Cargèse, Corsica | Prof. D. Ostrowsky; Univ.; Parc Valrose; 06034 Nice, France |
| Advanced Technobiology; 30/6-12/7/78; Caen and Paris, France | Prof. B. Rybak; 21 Rue Béranger; 75003 Paris, France |
| Potential Surfaces and Molecular Reality; 1-15/7/78; Menton, France | Prof. G. Leroy; Inst. Lavoisier; 1 Place L. Pasteur; 1348 Louvain-la-Neuve, Belgium |
| Topics in Theor. Organic Chemistry; 2-15/7/78; Pugnochiuso, Italy | Prof. A. Mangini; Università; Ist. di Chimica Organica; 40136 Bologna, Italy |
| Water Resources, Land Use Planning; 3-14/7/78; Louvain-la-Neuve, Belgium | Dr. P. Laconte; Univ.; Expansion Dept.; Ave. Lemaître; 1348 Louvain-la-Neuve, Belgium |
| Polynomial Approximation and Error Analysis; 6-22/7/78; Calgary, Canada | Prof. B. Sahney; Univ.; Math. Dept.; 2920-24th Ave. NW; Calgary, Alberta T2N 1N4, Can. |
| Progress in Biomechanics; 10-21/7/78; Ankara, Turkey | Dr. N. Akkas; Middle East Tech. Univ.; Civil Eng. Dept.; Ankara, Turkey |
| Developments in Theory of Gravitation; 10-29/7/78; Cargèse, Corsica, France | Prof. M. Lévy; Univ.; Tour 16; 1er Etage; 4 Place Jussieu; 75230 Paris, Cédex 05, France |
| Percolation Processes; 17-29/7/78; Espinho, Portugal | Prof. A. Rodrigues; Univ.; Chem. Eng. Dept.; Rua dos Bragas; Oporto, Portugal |
| Globular Clusters; 17-29/7/78; Cambridge, U.K. | Prof. M. Rees; Astronomy Inst.; Madingley Road; Cambridge, CB3 OHA, U.K. |
| Ill-condensed Matter; 3/7-19/8/78; Les Houches, France | Prof. R. Balian; Ecole d'Eté de Physique Théor.; 74310 Les Houches, France |
| Turbulent Convection in Channels and Rod Bundles; 20/7-2/8/78; Istanbul, TU | Prof. S. Kakaç; Middle East Tech. Univ.; Mech. Eng. Dept.; Ankara, Turkey |
| Set Theory; 23/7-12/8/78; Cambridge, U.K. | Dr. A. Mathias; Peterhouse; Cambridge, U.K. |
| Ion Beam Interactions with Solids; 24/7-5/8/78; SUNY, Albany Campus, USA | Prof. W. Gibson; State Univ.; Phys. Dept.; Washington Ave.; Albany, N.Y. 12222, U.S.A. |
| Programme Construction; 27/7-5/8/78; Munich, Germany | Prof. F. Bauer; Inst. f. Informatik; TU; Arcisstr. 21; D-8000 München 2, Germany |
| Instabilities in Dynamical Systems, Celestial Mechanics; 30/7-12/8/78; Cortina, Italy | Prof. V. Szebehely; Univ.; Aerospace Eng. Dept.; Austin, Tx 78712, USA |
| New Aspects of Subnuclear Physics; 1-10/8/78; Erice, Sicily, Italy | Prof. A. Zichichi; Univ.; Ist. di Fisica; Via Irnerio 46; 40126 Bologna, Italy |
| Rings with Polynomial Identity; 1-13/8/78; Antwerp, Belgium | Prof. F. van Oystaeyen; U.I.A.; Universiteitsplein 1; 2610 Wilrijk, Belgium |
| Biological Energy Transduction; 1-13/8/78; Spetsai, Greece | Dr. G. Papageorgiou; Center Democritos; Aghia Paraskevi; Athens, Greece |
| Metal Non-Metal Transition in Disordered Systems; 7-25/8/78; St. Andrews; UK | Dr. D. Finlayson; School of Phys. Sciences; Univ.; St. Andrews, KY16 9SS, Scotland |
| Statistical Ecology, Ecological Statistics; 7-25/8/78; Europe | Prof. G. Patil; State Univ.; Statistics Dept.; Univ. Park; Pennsylvania 16802, U.S.A. |
| Group Theory and M.C.D. Spectroscopy; 8-20/8/78; Antigonish, Canada | Dr. J. Donini; Chemistry Dept.; St. Francis Xavier University; Antigonish, N.S., Canada |
| Information Science; 14-25/8/78; Crete, Greece | Dr. A. Debons; University; 730 LIS Bldg.; Pittsburgh, Pa. 15260, USA |
| Electr./Magnetic Distributions in Molecules/Xtals; 16-31/8/78; Arles, France | Dr. P. Becker; Centre de Méc. Ondulatoire; 23 Rue du Maroc; 75019 Paris, France |
| IR and Raman Spectroscopy of Biological Molecules; 22-31/8/78; Athens, Greece | Dr. T. Theophanides; Nat. Hellenic Res. Found.; Ave. Constantinou; Athens, Greece |
| Applications of Synchrotron Radiation; 20/8-1/9/78; Rome, Italy | Prof. I. Quercia; Ist. Naz. Fisica Nucl.; PO Box 56; Frascati, Rome, Italy |
| Nuclear Theory; 21/8-2/9/78; Banff, Alberta, Canada | Prof. B. Castel; Queen's Univ.; Physics Dept.; Kingston, Ontario K7L 3N6, Canada |
| Molecular and Cell Biology; 21/8-3/9/78; Spetsai, Greece | Prof. B. Clark; Chemistry Dept.; Univ.; Langelandsgade 140; 8000 Aarhus C, Denmark |
| Interlinking of Computer Networks; 28/8-8/9/78; Castera Verduzan, France | Fr. K. Beauchamp; Univ.; Computer Services Dept.; Bailrigg, Lancaster LA1 4YW, UK |
| Electrons in Disordered Metals and Surfaces; 28/8-9/9/78; Gent; Belgium | Prof. P. Phariseau; Rijksuniv.; Krijgslaan 271/S9; 9000 Gent, Belgium |
| Chem. Applications of Chem. Relaxation Spectrometry; 31/8-10/9/78; Wales, U.K. | Dr. E. Wyn-Jones; Univ.; Chem. Dept.; Salford, Greater Manchester M5 4WT, U.K. |
| Molecular Biology of Thalassaemia; 4-15/9/78; Crete, Greece | Prof. R. Williamson; St. Mary's Hospital; Biochemistry Dept.; London W2 1PG, UK |
| Kinetics of Ion-Molecule Reactions; 4-15/9/78; LaBaule, France | Dr. P. Ausloos; Nat. Bureau of Standards; Rm. 316.03; Washington, DC 20234, USA |
| New Phenomena in Lepton-Hadron Physics; 4-16/9/78; Karlsruhe, Germany | Prof. J. Wess; Inst. f. Theor. Physik; TH; Kaiserstr. 12; 75 Karlsruhe 1, Germany |
| Molecular Biology of Picornaviruses; 8-18/9/78; Positano, Italy | Dr. R. Perez-Bercoff; Anatomy Inst.; Gloriastrasse 19; 8006 Zürich, Switzerland |
| Advances in Stereoregular Polymers; 9-20/9/78; Tirrenia (Pisa), Italy | Prof. R. Lenz; University; Chemical Eng. Dept.; Amherst, Mass. 01003, U.S.A. |
| Motor Learning and Control; 10-21/9/78; Marseilles, France | Dr. G. Stelmach; Univ.; Phys. Education Dept.; Observtry Dr.; Madison, Wi. 53706, U.S.A. |
| Humoral Immunity in Neuro. Diseases; 10-22/9/78; Antwerp, Belgium | Prof. A. Lowenthal; U.I.A.; Born-Bunge Foundation; 2610 Wilrijk, Belgium |
| Chiral Discrimination and Optical Activity; 10-22/9/78; Brighton, UK | Prof. S. Mason; King's College; Chemistry Dept.; Strand; London WC2R 2LS, U.K. |
| Implanted Atoms in Materials; 10-23/9/78; Corsica, France | Dr. A. Perez; Univ.; Phys. Matériaux Dept.; Bd. 11.11.'18; 69621 Villeurbanne, France |
| Organometallics of the f-Elements; 11-22/9/78; Urbino, Italy | Prof. T. Marks; Northwestern Univ.; Chemistry Dept.; Evanston, Il. 60201, USA |
| Non-destr. Evaluation of Semi-conductor Materials; 18-30/9/78; Rome, Italy | Prof. J. Zemel; Univ.; Moore School of Elec. Eng./D2; Philadelphia, Pa. 19104, USA |
| Plant Growth Research and World Food Production; 19-30/9/78; Izmir, Turkey | Prof. T. Scott; Univ.; Botany Dept.; Coker Hall 010-A; Chapel Hill, N.C. 27514, U.S.A. |
| Developmental Neurobiology of Vision; September 78; Crete, Greece | Prof. R. Freeman; University; School of Optometry; Berkeley, Calif. 94720, U.S.A. |
| Environmental Stress, Life Crises-Adaptation; June or Sept. 78; Athens, Greece | Prof. I. Sarason; Univ.; Dept. of Psychology, NI-25; Seattle, Washington 98195, USA |
| Theor. Advances in Behav. Genetics; 29/9-8/10/78; Banff, Alberta, Canada | Dr. J. Royce; Univ.; Center f. Theor. Psychology; Edmonton, Alberta, Canada |

# How we fit into
# Receptor Site Studies

**Steroid Receptor Studies**
Dihydrotestosterone, [1,2,4,5,6,7,16,17-$^{3}$H(N)]-
Dihydrotestosterone, [1,2,4,5,6,7-$^{3}$H(N)]-
Dexamethasone, [6,7-$^{3}$H(N)]-
Estradiol, [2,4,6,7,16,17-$^{3}$H]-
Estradiol, [2,4,6,7-$^{3}$H]-
Prednisolone, [6,7-$^{3}$H(N)]-
Progesterone, [1,2,6,7-$^{3}$H(N)]-
Testosterone, [1,2,6,7,16,17-$^{3}$H(N)]-
Triamcinolone acetonide, [6,7-$^{3}$H(N)]-
R5020-$^{3}$H (manufactured by New England Nuclear under licensed agreement of ROUSSEL UCLAF)

**$\alpha$-Adrenergic Receptor Studies**
Dihydroergocryptine,9,10-[9,10-$^{3}$H(N)]-

**$\beta$-Adrenergic Receptor Studies**
Dihydroalprenolol hydrochloride, *levo*-[*propyl*-2,3-$^{3}$H]-
Propranolol hydrochloride, DL-[$^{3}$H(G)]-
Propranolol hydrochloride, *levo*-[4-$^{3}$H(N)]-

**Cholinergic Receptor Studies**
Choline chloride, [*methyl*-$^{3}$H]-
(QNB) Quinuclidinyl benzilate, DL-[*benzilic*-4,4′-$^{3}$H(N)]-
Tubocurarine chloride, *dextro*-[13′-$^{3}$H(N)]-

**Dopamine Receptor Studies**
Dihydroxyphenylethylamine, 3,4-[*ethyl*-1-$^{3}$H(N)]-
Dihydroxyphenylethylamine, 3,4-[*ethyl*-2-$^{3}$H(N)]-
Haloperidol, [$^{3}$H(G)]-
Spiroperidol, [1-*phenyl*-4-$^{3}$H]-

**Amino Acid Receptor Studies**
Aminobutyric acid, $\gamma$-[2,3-$^{3}$H(N)]-
Glycine, [2-$^{3}$H]-

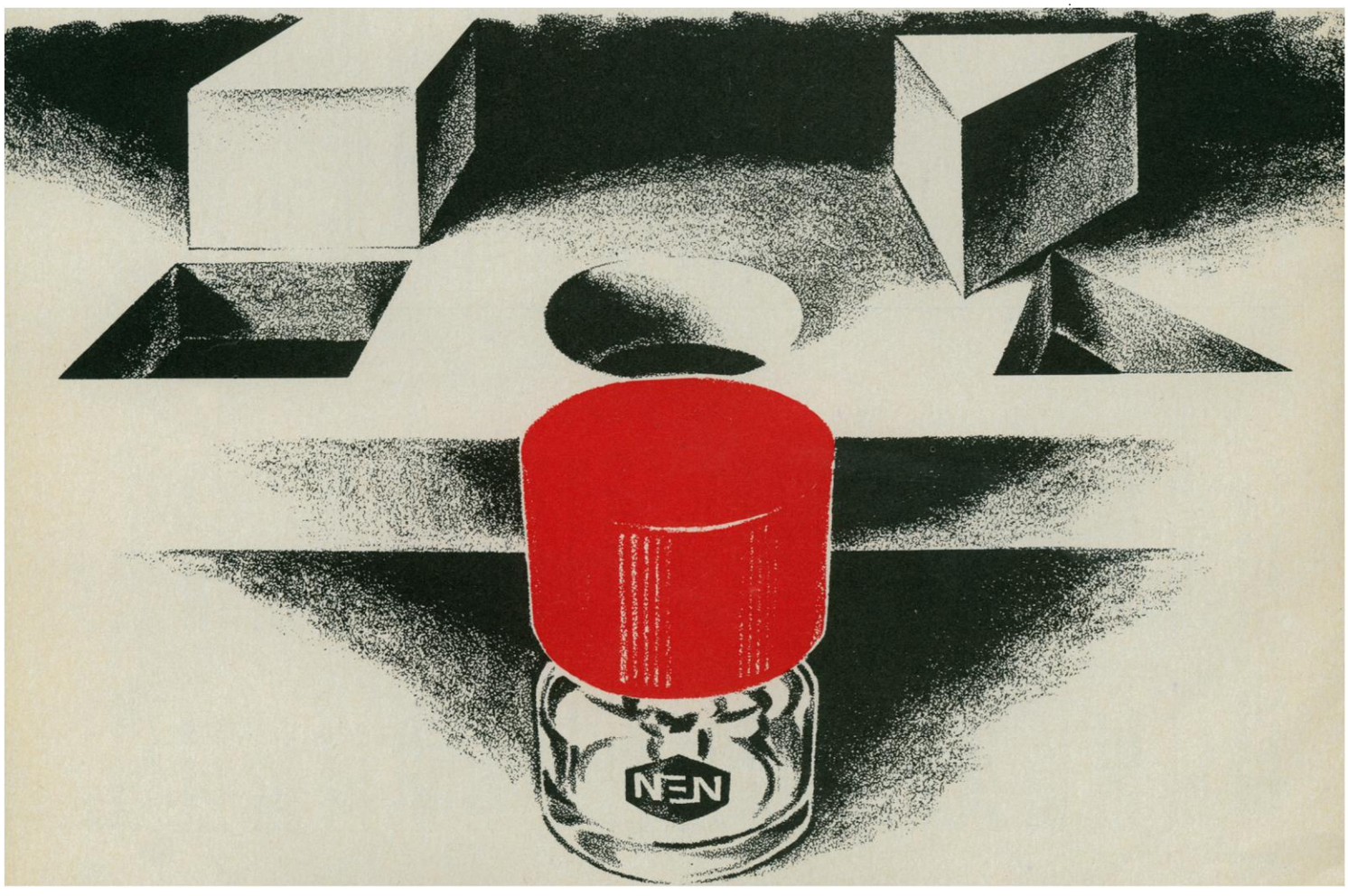
**Opiate Receptor Studies**
Enkephalin (5-L-methionine), [*tyrosyl*-3,5-$^{3}$H(N)]-
Enkephalin (5-L-leucine), [*tyrosyl*-3,5-$^{3}$H(N)]-
Enkephalinamide (2-D-alanine-5-L-methionine), [*tyrosyl-ring*-2,6-$^{3}$H]-
Dihydromorphine, [7,8-$^{3}$H(N)]-
Diazepam, [*methyl*-$^{3}$H]-

This is not the end of our list of labeled ligands. Call us for the current status of new compounds in development.

**New England Nuclear**
549 Albany Street, Boston, Mass. 02118
Customer Service 617-482-9595

**NEN Chemicals GmbH:** D-6072 Dreieich, W. Germany, Daimlerstrasse 23, Postfach 401240, Telephone: (06103) 85034, Telex: 4-17993 NEN D

**NEN Canada Ltd.,** 2453 46th Avenue, Lachine, Que. H8T 3C9, Telephone: 514-636-4971, Telex: 05-821808




Circle No. 152 on Readers' Service Card

## LETTERS

### Health: Whose Responsibility?

John H. Knowles' recent editorial "Responsibility for health" (16 Dec. 1977, p. 1103) is terribly American: it puts the responsibility for an individual's health squarely on the individual. The gist of the argument is that "the idea of a 'right' to health should be replaced by that of a moral obligation to preserve one's own health" through better habits, intelligence, and the individual's will. Otherwise, the spiraling costs of health care will continue to rise, and so will the level of our collective frustration. Where, in that argument, is the responsibility of society, and the responsibility of its government, for our less fortunate citizens? What about society's contributions to illness itself?

We are not reminded in the editorial that a greater proportion of people get sick when they are poor—according to countless reliable studies—and that poverty in the United States is not predominantly self-inflicted. Not at all. Nor are we reminded that intelligent, voluntary use of health care services is related to social class, and that choice of class (and associated income or educational level) are hardly matters that are solely within an individual American's control. Knowles does not remind us, either, that man-made environmental conditions have something to do with man-made illness.

Finally, there is the relatively recent phenomenon in modern life [recognized in Knowles' book (*1*), from which his editorial is drawn] that most disease today is chronic rather than acute. We suffer from cancer, heart disease, diabetes, back disease, arthritis, and chronic respiratory illness. Those who suffer from these diseases have not chosen them, and medical science can do little more than make palliative gestures on behalf of the sufferers. [See, for instance, the excellent article in (*1*) by Thomas (pp. 35–46).] Those who suffer mostly from chronic illness are, again, the aged and the poor—especially the aged poor—whose symptoms are more likely to be both exacerbated and increased by their living conditions. How is the individual habit and will—to use Knowles' terms—to rectify *that* situation?

Do not society and its government share some of the responsibility for the national health problem—let alone the inadequate scope and shape of its health care system? Much as I respect Knowles' other work and writing, I see his editorial as not merely missing the mark but as putting technical and moral burdens on the wrong party. If we continue to go that route (the English are being given the same advice by some of their medical authorities), we only increase the problems of health care and the burdens of those who suffer from the inadequacies of both our health care system and our society.

ANSELM L. STRAUSS
*Department of Social and Behavioral Sciences, School of Nursing, University of California, San Francisco 94143*

#### References

1. J. H. Knowles, Ed., *Doing Better and Feeling Worse: Health in the United States* (Norton, New York, 1977).

Congratulations and a note of thanks are due John H. Knowles for his eminently reasonable and succinct statement on the responsibility for health. With clarity and persuasiveness, he addresses an important issue that is intimately linked to providing good health care for all people. Unless individuals assume more responsibility for their own health, the goal of providing good health care probably will not be brought any closer by simply expanding the present health delivery system. For most adult individuals, the likelihood of a change in philosophy or motivation is minimal. But the youth of our society can be informed about human biology, about prevention of common diseases, about the physician's limited effectiveness in dealing with "after-the-fact" illness, and about the responsibility for their own health as they reach adulthood.

As Knowles indicates, a "beneficent government" cannot solve the mounting health problems of our nation by the knee-jerk reflex initiation of more comprehensive and burdensome nationwide health care programs. The problem is too large and will require coordinated approaches from many different directions. If the executive, legislative, and judicial branches of government were truly responsive and altruistic, there would be closer consultation and cooperation with leaders in the biomedical community.

It should be recognized that if there is a "right" to health then there are the attendant responsibilities of the individual, who with the help of society and perhaps a benevolent government can be informed about important aspects of preventive medicine.

JACK C. SIPE
*Department of Neurosciences, University of California at San Diego, La Jolla 92037*

I appreciate very much the letters from both Strauss and Sipe. The editorial was abstracted from my essay in *Doing*

**New Ways**

**to Monitor Trace Organic Pollutants in Wastewater**

**New!**

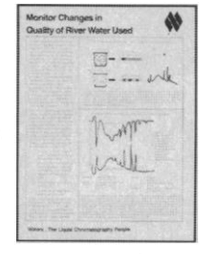
**Monitor Pentachlorophenol for EPA Discharge Requirements**


Describes how one manufacturer used liquid chromatography to monitor plant effluent for PCP at trace levels. Simple 20-minute analysis ensures EPA compliance and turns a problem analysis into a routine test.

Circle No. 166 on Readers' Service Card

**New!**

**Monitor Changes in Quality of River Water Used**




Describes how new trace enrichment technique enables manufacturers to monitor river water at the inlet, during manufacturing process, and after wastewater treatment. Undesirable organics can be detected, and corrective measures taken *before* problems occur.

Circle No. 167 on Readers' Service Card

**Published Periodically**

**"Environmental Notes"**


This informative bulletin keeps you updated on new applications of LC for environmental analyses. Enter your request now to get current issue and those to follow.

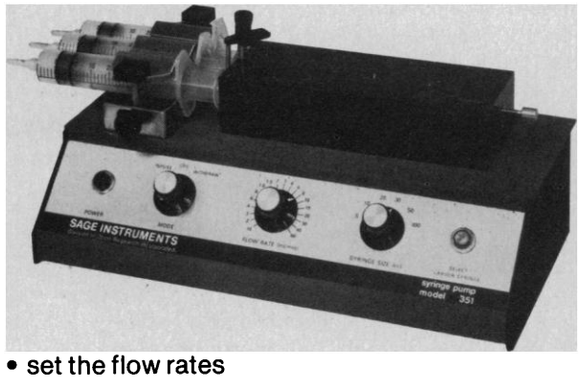
Circle No. 168 on Readers' Service Card

**free from**

**Waters**

201 Maple Street, Milford, MA 01757
Telephone (617) 478-2000
*The Liquid Chromatography People*

move fluids accurately




- set the flow rates you want at the turn of a dial
- models that hold up to three syringes
- models that will both infuse and withdraw
- nonpulsatile flow – insensitive to back pressure
- flow rates from 10's of milliliters per minute to microliters per day – depending on syringe used

**SAGE INSTRUMENTS**
**380 Putnam Avenue**
**Cambridge, MA 02139 U.S.A.**

**with Sage syringe pumps**

Circle No. 165 on Readers' Service Card

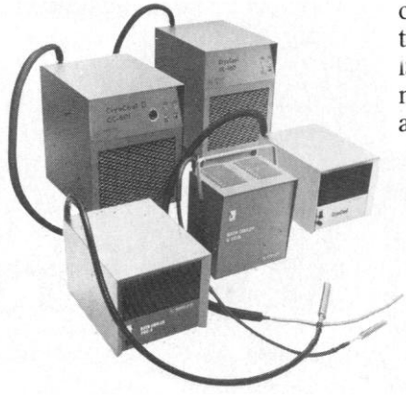
**Say goodbye to a couple of troublemakers.**

If you use liquid nitrogen or dry ice in applications such as vapor freezing traps and low temperature baths, you know how expensive they are. And how difficult to handle and store.

What you may not know is that Neslab's CryoCool Refrigeration Units can do the same job. Better. More efficiently. With virtually no bother. And at far less cost.

Hard to believe? Talk to some of the hundreds of satisfied CryoCool users, and you'll be a believer. We'll even send you a list of their names.

Send for our new catalogs on cooling systems, heat exchangers and/or constant temperature baths and circulators. Call if you need technical assistance with an applications problem.



NESLAB

NESLAB INSTRUMENTS, INC.
871 Islington Street
Portsmouth, NH 03801 U.S.A.
(603) 436-9444

*Better and Feeling Worse*, and I hope Strauss will read the essay. After calling for individual responsibility and specifying the simple practices for healthy living, I concluded: "These simple rules can be understood and observed by the majority of Americans, namely the white, well-educated, and affluent middle class. But how do individuals in minority groups follow these rules, when their members include disproportionately large numbers of the impoverished and the illiterate, among whom fear, ignorance, desperation, and superstition conspire against even the desire to remain healthy? Here we must rely on social policies *first*, in order to improve education, employment, civil rights, and economic levels, along with efforts to develop accessible health services."

Surely Strauss knows how I feel about the aged and the poor. We are not at odds with each other, and my writing over the years has been consistent and is entirely consonant with Strauss's values.

JOHN H. KNOWLES
*Rockefeller Foundation, 1133 Avenue of the Americas, New York 10036*

### Jensen's Election as a AAAS Fellow

Two statements concerning the election last year of Arthur Jensen as a AAAS fellow have been sent to the AAAS Council. They were largely circulated by the International Committee Against Racism and were signed by 335 people, consisting mainly of faculty, staff, and graduate students of seven institutions. Some 100 additional signatures endorsing a similar statement have since been received. Although the texts of these statements differ slightly, all strongly protest Jensen's election and demand that the granting of this honor be rescinded. Jensen's conclusions on the heritability of intelligence depend on unscientific methodology and interpretations. They are tied, in part, to and continue the spirit of Cyril Burt's work. Leading scientists have now become "convinced that Burt published false data and invented crucial facts to support his controversial theory that intelligence is largely inherited" (*1*). This work figures strongly in the formulation of racist social policies.

His election as a fellow legitimates such antiscientific doctrines and declares to the world community that the AAAS is willing to honor American scientists whose work serves the cause of racism. An alarming parallel to events in Germany in the 1930's is suggested.

Considering the terrible human and

scientific implications of Jensen's election, we feel the AAAS has an obligation to the scientific community and world opinion to make public the fact that a significant number of members of the academic community are unequivocally opposed to this action. We are certain that thousands more would endorse these statements if given the opportunity.

HERBERT GOLDSTONE
TOBIAS SCHWARTZ, JAMES SCULLY
*International Committee Against Racism, 41 Union Square West, New York 10025*

**References**

1. O. Gillie, London *Sunday Times*, 24 October 1976, p 1.

## Chemicals: The "Strawman List"

Thomas H. Maugh II (Research News, 13 Jan., p. 162) implies that the Chemical Abstracts Service (CAS) played a role in selecting the 33,000 chemicals that are thought to be in common use and that CAS "submitted to EPA [this] list," often referred to as the "strawman list," on which the Toxic Substances Control Act (TSCA) inventory will be modeled.

In fact, the list of 33,579 compounds was derived from the merger of several files from the National Institutes of Health (NIH)–Environmental Protection Agency (EPA) Chemical Information System (*1*). Among the EPA files used were those on oil and hazardous materials (858 compounds), chemical spills (577), and pollutants in drinking water (215). Also used were the Stanford Research Institute's file on industrial chemicals (26,780), the Consumer Product Safety Commission's Chemric monographs (866) and files on chemicals in products (3300), and the U.S. International Trade Commission list (9194). The decisions as to the makeup of the strawman list were made entirely by EPA and NIH staff; CAS, under contract to EPA, simply performed the registration of these chemicals.

It is now becoming clear that a strawman list composed of such files will contain few chemicals that are not commonly found in commerce in the United States and, as such, it serves as a useful model for the TSCA inventory.

WILLIS GREENSTREET
*Management Information and Data Systems Division, Environmental Protection Agency, Washington, D.C. 20460*

**References**

1. S. R. Heller, G. W. A. Milne, R. J. Feldmann, *Science* **195**, 253 (1977).

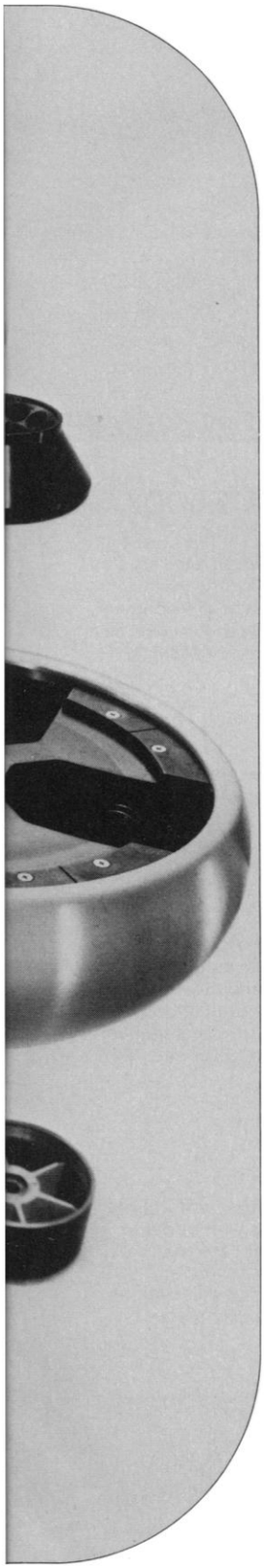



Circle No. 104 on Readers' Service Card

# Latest in


DuPont Instruments
Sorvall RC-5B Refrigerated Superspeed Centrifuge

# an evolutionary line:



## Versatility, high performance and reliability make the new Sorvall® RC-5B the best-buy superspeed centrifuge.

### Multi-rotor versatility

An exceptional variety of applications is possible with a selection of 12 rotors—including DuPont's patented Sorvall® vertical rotors* in addition to fixed angle, swinging bucket, zonal and continuous flow types.

### Dramatically improved performance

Sorvall® vertical rotors enable the RC-5B to give ultracentrifuge performance in some density gradient separations in less time and with larger volumes. Long the established leader for pelleting, the RC-5B now provides improved performance for density gradient runs and other demanding jobs.

### Automatic rate control

The performance of Sorvall® vertical rotors has been further enhanced by an Automatic Rate Controller that provides controlled acceleration and soft stops.

### 5-year refrigeration system warranty

A warranty unmatched in the field backs up an efficient, reliable refrigeration system. Rotors are warranted for 7 years.

### Widest selection of accessories

DuPont offers the widest range of tubes, bottles and adapters available from any centrifuge manufacturer for superspeed applications.

Get details on these and other features of the new Sorvall® RC-5B system by writing to DuPont Company, Room 36006, Wilmington, DE 19898.

*U.S. Patent 3,998,383

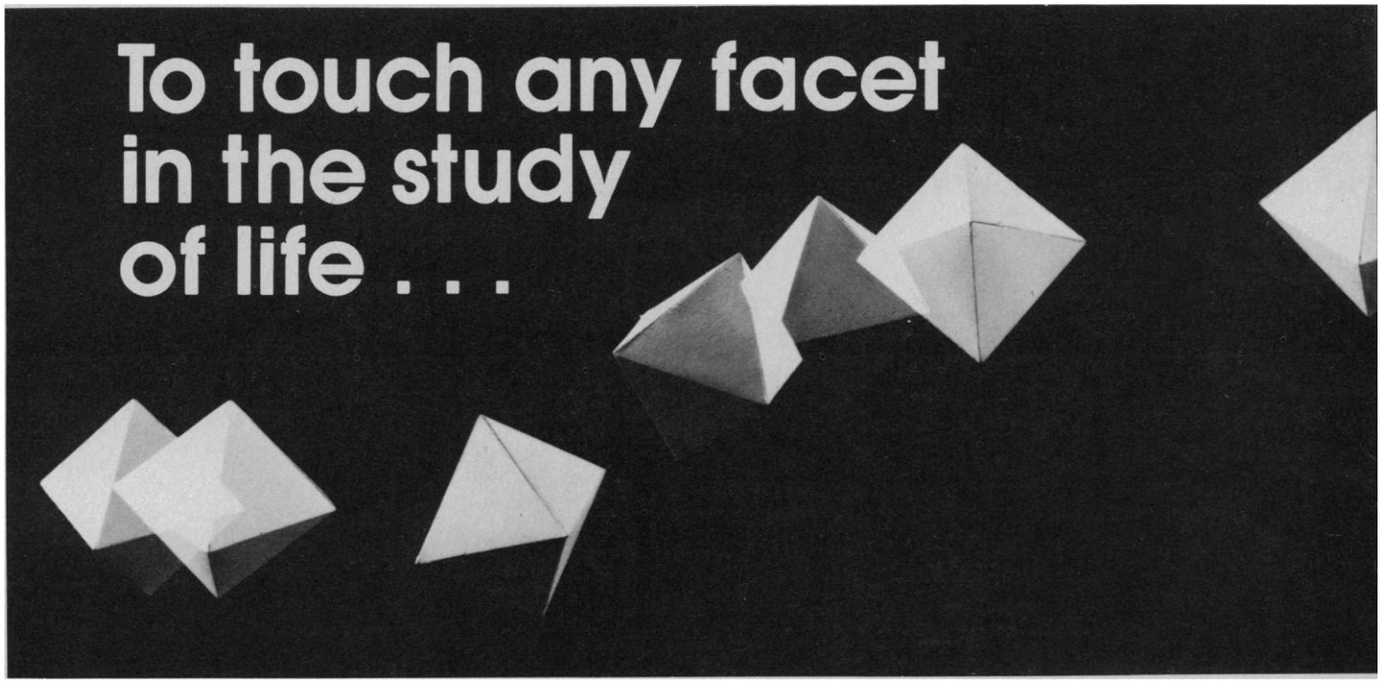
**With Sorvall® Centrifuges the spin times are changing.**

**DuPont Instruments**

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



Circle No. 158 on Readers' Service Card




## Villee, Walker & Barnes: **GENERAL ZOOLOGY,** 5th Ed.

This edition offers both the instructor and the student more comprehensive coverage of both invertebrate and vertebrate zoology. New chapters on development and specific animal functions have been added. An Instructor's Manual and a Study Guide by W. Holt Harner (***Order #4532-1***) that is keyed to the parent text are available. *By **Claude A. Villee, Warren F. Walker, Jr.** and **Robert D. Barnes.** About 995 pp., 810 ill. About $15.95. Just ready.* ***Order #9039-4.***

## Vaughan: **MAMMALOGY,** 2nd Ed.

The second edition of this fascinating look at the life of mammals incorporates new findings on behavior and echolocation, new information on continental drift and mammalian evolution and dispersal, and new diagrams of the worldwide movements of
the tectonic plates. *By **Terry A. Vaughan.** About 530 pp., 405 ill. About $16.95. Just ready.*
***Order #9009-2.***

## Gardner & Osburn: **ANATOMY OF THE HUMAN BODY,** 3rd Ed.

New features in this edition include: correlation of embryology, electron microscopy and histochemistry with gross anatomy; separate treatment of connective tissue; combination of skeletal and articular systems; a new chapter on the structure of selected subregions of the body; and recent findings on the heart's conduction system. An Instructor's Manual is available. *By **Weston D. Gardner** and **William A. Osburn.** About 575 pp., 825 ill., (16 pp. in color). About $13.95. Ready Mar. 1978.*
***Order #4022-2.***

## Brewer: **PRINCIPLES OF ECOLOGY**

The transition from a theoretical viewpoint (Ecology as a Science, chapter 1) to the nuts and bolts side of the subject (The Practical Ecologist, final chapter) is painlessly and skillfully accomplished in this concise, well-balanced text. *By **Richard Brewer.** About 305 pp. Illustd. Soft cover. About $7.95. Ready Apr. 1978.* ***Order #1988-6.***

## Romer & Parsons: **THE VERTEBRATE BODY,** 5th Ed.

A classic in comparative anatomy, this text incorporates studies of function that demonstrate the relationships of the various systems within the animal, and of the animal to its environment. *By the late **Alfred Sherwood Romer** and **Thomas S. Parsons.** 624 pp. 435 ill., (36 in color). $14.95. May 1977.* ***Order #7668-5.***

## **SHORTER VERSION,** 5th Ed.

The above, condensed for one-semester or one-quarter courses. *About 465 pp., 435 ill. About $12.95. Ready Mar. 1978.*
***Order #7682-0.***

## Villee: **BIOLOGY,** 7th Ed.

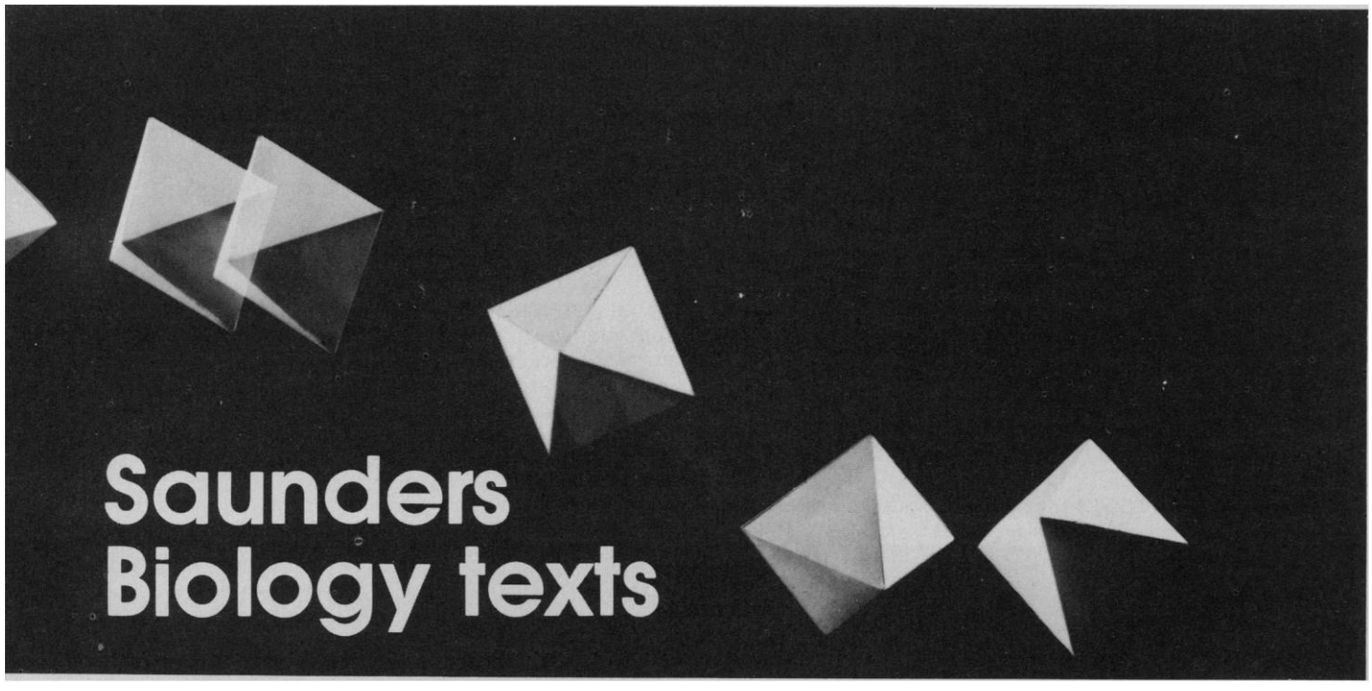
Biology with a human orientation is the keynote to success for this outstanding text. New material includes: a complete reorganization of material on cellular biology and biochemistry; a totally new chapter on human ecology; and careful updating of information from active research areas. An Instructor's Manual is available. *By **Claude A. Villee.** 980 pp. 650 ill. $15.95. Feb. 1977.*
***Order #9023-8.***

## Carpenter: **MICROBIOLOGY,** 4th Ed.

New features in this edition include: a complete rewrite of the chapter on Systematic Study of Bacteria along with updated nomenclature of genera and species throughout the text; total restructuring of the chapter on bacterial metabolism; and further additions to an already excellent group of illustrations. *By **Philip L. Carpenter.** 512 pp. 349 ill., (plus 4 color plates). $12.95. May 1977.* ***Order #2438-3.***

## Baer: **THE GENETIC PERSPECTIVE**

Here your students will learn exactly how genetics relates to everyday life. They'll find topics that are in the forefront of genetic discussions today, including: genetic counseling, cancer, aging, plant breeding, and recombinant DNA. *By **Adela S. Baer.** 279 pp. Illustd. $12.95. Apr. 1977.* ***Order #1471-X.***




## Walker: **A STUDY OF THE CAT with Reference to Human Beings,** 3rd Ed.

Revisions in this manual include new information on: mechanical forces involved in the evolution of the skull; the biomechanics of the jaw; fetal, neonatal, and adult circulation; and the functional significance of the carotid rete mirabile. *By **Warren F. Walker, Jr.** 216 pp. 114 ill., (17 in color). Soft cover. $6.50. Mar. 1977. **Order #9093-9.***

## Norstog & Long: **PLANT BIOLOGY**

The economic and cultural aspects of various plant groups are stressed in this compact book. Organized principally from an evolutionary standpoint, the text integrates the physiology and ecology of the plant groups into the chapters of the divisions. An accompanying laboratory manual by Long and Norstong (***Order #5791-5***) is available. *By **Knut Norstog** and the late **Robert W. Long.** 585 pp. 373 ill. $15.25. Mar. 1976. **Order #6864-X.***

## De Witt: **BIOLOGY OF THE CELL: An Evolutionary Approach**

Presuming no previous knowledge of biology or chemistry, the author skillfully incorporates a review of basic chemistry, pH, basic biochemical information, and introductory aspects of cytology and molecular genetics. An accompanying laboratory manual by De Witt and Brown (***Order #3047-2***) is available. *By **William De Witt.** 568 pp. 287 ill. $13.95. Jan. 1977. **Order #3045-6.***

## Walker: **VERTEBRATE DISSECTION,** 5th Ed.

This lab manual offers a systemic approach to dissection through true structural comparison of the dogfish, mudpuppy, cat, rabbit and mink. Material on mammalian muscle provides better correlation between species, and the exposition of mammalian circulation has been rewritten to cover arteries and veins simultaneously. *By **Warren F. Walker, Jr.** 397 pp. 186 ill., (26 with color). $8.50. May 1975. **Order #9098-X.***

*To examine titles on 30-day approval, please enter order number and author below:*

☐ **check enclosed—Saunders pays postage** ☐ **bill me** **Prices subject to change**

**Sci 2/78**

FULL NAME (Please Print) POSITION

AFFILIATION ADDRESS

CITY STATE ZIP PURCHASE ORDER NUMBER

***Educators: to examine titles for adoption consideration, please specify:***

COURSE ENROLLMENT PRESENT TEXT

**W.B. Saunders Company** West Washington Sq. Philadelphia, PA 19105

# The same NEW Universal!

**Always up to date.**

Every Zeiss Universal Microscope, whether made twenty years ago or yesterday or tomorrow, will always accept and perform perfectly with the latest accessories for qualitative and quantitative microscopy. Try this with any other brand of microscope and you'll appreciate the value of Zeiss design and Zeiss optics. Because they've always been so good, there's never been a need for a major design change.

**All accessories for all disciplines.**

MEDICINE... BIOLOGY... CHEMISTRY... MICROELECTRONICS... METALLOGRAPHY... or any other discipline, you'll find accessories for your every need: photomicrography, cinematography and TV, photometry, quantitative stereometric image analysis, or anything else.

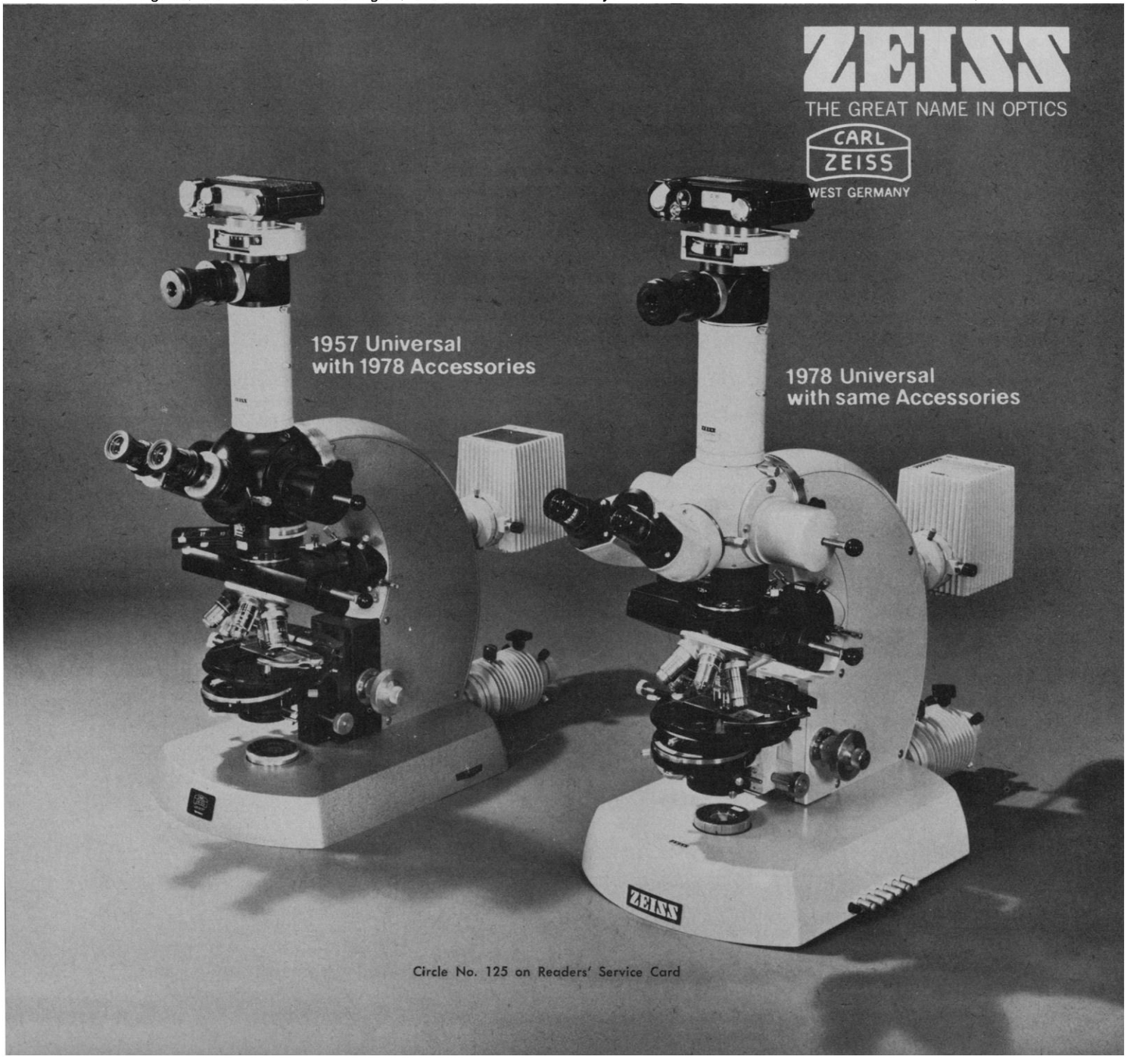
**All ways the best.**

Whatever microscope techniques or combination of techniques you employ, the Zeiss Universal assures you of consistently superb images. And there is no microscope that lets you switch so easily from any one technique to any other, either in reflected or transmitted light.

For complete details, write or call today.

**Nationwide service.**

**Carl Zeiss, Inc., 444 5th Avenue, New York, N.Y. 10018** (212)730-4400. Branches in: Atlanta, Boston, Chicago, Columbus, Houston, Los Angeles, San Francisco, Washington, D.C. In Canada: 45 Valleybrook Drive, Don Mills, Ont., M3B 2S6. Or call (416)449-4660.




Circle No. 125 on Readers' Service Card

10 February 1978, Volume 199, Number 4329 **SCIENCE**

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.

**Editorial Board**

*1978:* RICHARD E. BALZHISER, JAMES F. CROW, HANS LANDSBERG, EDWARD NEY, FRANK W. PUTNAM, MAXINE SINGER, PAUL E. WAGGONER, F. KARL WILLENBROCK

*1979:* E. PETER GEIDUSCHEK, WARD GOODENOUGH, N. BRUCE HANNAY, MARTIN J. KLEIN, FRANKLIN A. LONG, NEAL E. MILLER, JEFFREY J. WINE

**Publisher**

WILLIAM D. CAREY

**Editor**

PHILIP H. ABELSON

**Editorial Staff**

*Managing Editor* ROBERT V. ORMES

*Business Manager* HANS NUSSBAUM

*Assistant Managing Editor* JOHN E. RINGLE

*Production Editor* ELLEN E. MURPHY

*News and Comment:* BARBARA J. CULLITON, *Editor;* LUTHER J. CARTER, CONSTANCE HOLDEN, DEBORAH SHAPLEY, R. JEFFREY SMITH, NICHOLAS WADE, JOHN WALSH. *Editorial Assistant,* SCHERRAINE MACK

*Research News:* ALLEN L. HAMMOND, *Editor;* RICHARD A. KERR, GINA BARI KOLATA, JEAN L. MARX, THOMAS H. MAUGH II, WILLIAM D. METZ, ARTHUR L. ROBINSON. *Editorial Assistant,* FANNIE GROOM

*Associate Editors:* ELEANORE BUTZ, MARY DORFMAN, SYLVIA EBERHART, JUDITH GOTTLIEB

*Assistant Editors:* CAITILIN GORDON, RUTH KULSTAD, LOIS SCHMITT

*Book Reviews:* KATHERINE LIVINGSTON, *Editor;* LINDA HEISERMAN, JANET KEGG

*Letters:* CHRISTINE KARLIK

*Copy Editors:* ISABELLA BOULDIN, OLIVER HEATWOLE

*Production:* NANCY HARTNAGEL, JOHN BAKER; YA LI SWIGART, ELEANOR WARNER; JEAN ROCKWOOD, LEAH RYAN, SHARON RYAN

*Covers, Reprints, and Permissions:* GRAYCE FINGER, *Editor;* CORRINE HARRIS, MARGARET LLOYD

*Guide to Scientific Instruments:* RICHARD SOMMER

*Assistant to the Editors:* RICHARD SEMIKLOSE

*Membership Recruitment:* GWENDOLYN HUDDLE

*Member and Subscription Records:* ANN RAGLAND

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Area code 202. General Editorial Office, 467-4350; Book Reviews, 467-4367; Guide to Scientific Instruments, 467-4480; News and Comment, 467-4430; Reprints and Permissions, 467-4483; Research News, 467-4321; Cable: Advancesci, Washington. For "Instructions for Contributors," write the editorial office or see page xv, *Science*, 30 September 1977.

BUSINESS CORRESPONDENCE: Area Code 202. Business Office, 467-4411; Circulation, 467-4417.

**Advertising Representatives**

*Director:* EARL J. SCHERAGO
*Production Manager:* MARGARET STERLING
*Advertising Sales Manager:* RICHARD L. CHARLES
*Marketing Manager:* HERBERT L. BURKLUND

Sales: NEW YORK, N.Y. 10036: Steve Hamburger, 1515 Broadway (212-730-1050); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); CHICAGO, ILL. 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772); DORSET, VT. 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581)

ADVERTISING CORRESPONDENCE: Tenth floor, 1515 Broadway, New York, N.Y. 10036. Phone: 212-730-1050.

# Intercountry Energy Comparison

Few energy comparisons have involved an analysis of factors leading to differences among the major industrial countries. The usual procedure has been to compare the ratios of total energy consumption to gross domestic product (GDP) on a per capita basis. Such comparisons show that the United States is topped only by Canada in its ratio of energy use to GDP, and one is left with the impression that the United States might easily halve its energy consumption while maintaining its current gross national product. However, in some respects the United States is more efficient than other countries. In the transportation of freight, the energy used per ton-mile is less here than elsewhere.

To benefit from the experience and technology of other countries, it is necessary to examine in detail the various factors involved in energy use. In a recent book by Darmstadter *et al.** a comparative analysis is presented of energy use by the United States, Canada, France, West Germany, Italy, the Netherlands, Sweden, the United Kingdom, and Japan. The authors set forth the complexity of making comparisons and the difficulties in measuring efficiency and wastefulness in energy consumption. They focus on the year 1972; however, modes of energy use change only slowly so that the analysis is relevant.

The crude ratio of energy to GDP conceals differences in energy sources, physical factors, and mix of productive activities. Canada and Sweden have abundant hydroelectricity; others depend on imported oil. Still others employ oil and substantial amounts of coal. Physical factors play an important role. The Netherlands, with a small area and a high population density, differs from the United States or Canada in transportation needs. Some kinds of productive activities are far more energy-intensive than others. Making steel utilizes much more energy per dollar of output than does agriculture.

When the various factors are taken into account, the United States and Canada stand out as relatively the most energy-consuming countries. An examination of components of usage in the various sectors reveals that transportation is the major factor in the difference between the United States and Canada and the other countries. Residents of the United States, for example, travel an average of twice as far each year as do residents of other countries. We use less public transportation and our automobiles get less mileage. Fuel economy for cars is in the process of being changed. However, our comparatively low population density and long distances will continue to influence energy consumption in transportation.

The United States uses relatively more energy in space heating and cooling than do the other countries. In part this is due to the prevalence of single dwellings and to inadequate insulation. Insulation deficiencies are being partially overcome. But the heat losses inherent in single dwellings will remain for a long time. Homeowners are not about to abandon a multitrillion-dollar investment.

Industrial use of energy in the United States in 1972 was about 20 percent greater per unit product than the average for the other countries. At that time, the principal energy source was natural gas; the price was a tiny fraction of its present value. With higher energy costs, industry has been achieving greater energy efficiency. The gap between the United States and other countries is probably narrowing.

Darmstadter *et al.* frequently cite the influence of price in determining energy consumption. People of the United States enjoyed comparatively cheap energy for many decades. The present transportation system, housing patterns, and industrial processes reflect that past. Adjustment to the new realities will take a long time.—PHILIP H. ABELSON

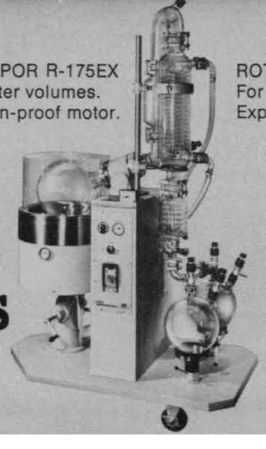
*J. Darmstadter, J. Dunkerley, J. Alterman, *How Industrial Societies Use Energy: A Comparative Analysis* [Johns Hopkins University Press (1977) for Resources for the Future, Inc., Washington, D.C.]

# The only rotary evaporator with an air hose instead of an electrical cord.

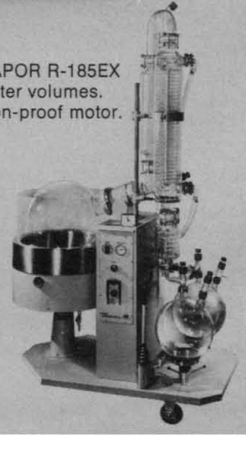

The explosion-proof Rotavapor 115EX is Büchi/Brinkmann's innovative solution to the hazard posed by sparking electrical motors when working with highly-volatile materials.

The Rotavapor 115EX has no electrical components whatsoever. Instead, its high-torque, variable speed motor is powered by compressed air. Simply connect the 115EX to any air source of 20-100psi and evaporate in safety at speeds from 15 to 270 rpm. Like the electrically-driven Büchi/Brinkmann standard models, the 115EX comes equipped with 1 liter evaporating and receiving flasks and is available with V-stand, quick-action jack, heating bath and a wide selection of other accessories.

Büchi/Brinkmann Rotary Evaporators are unsurpassed in versatility, durability, and safety of operation. In addition to the 115EX, there are eleven electrically-powered models to meet every concentrating need, from 5ml to 50 liters or more (Pilot Plant models). Our new brochure describes them all. Just write: Büchi Division, Brinkmann Instruments, Inc., Cantiague Road, Westbury, N.Y. 11590. In Canada: 50 Galaxy Blvd., Rexdale, Ont. M9W 4Y5.



ROTAVAPOR R-175EX
For 20-liter volumes.
Explosion-proof motor.



ROTAVAPOR R-185EX
For 50-liter volumes.
Explosion-proof motor.

**Büchi/Brinkmann**
**EXPLOSION-PROOF EVAPORATORS**

Circle No. 105 on Readers' Service Card

# PRODUCTS and MATERIALS

### Detailing Knife

This Skiver's blade security and release are facilitated by a draw-bar collet that accepts flat and round blades and won't freeze. Features include autoclavable stainless steel, brass, and anodized aluminum construction and hexagonal cross section. A variety of blade configurations renders this tool suitable for many scientific and industrial applications. Über Grafic Instruments. Circle 697.

### Liquid Sampler

The Adjustable Sampler can be set rapidly. Eight revolutions of a vernier dial covers the full scale and allows the user to compensate for variations in temperature or liquid viscosity. The handle is insulated and is constructed of a polymer with a low thermal coefficient. Thus, the sampler may be used over a prolonged period without its reproducibility being affected. The Adjustable Sampler features a positive, audible calibration stop and the accuracy of its delivery is well within tolerances accepted in standard laboratory practice. Oxford Laboratories. Circle 693.

### Laboratory Freezer

Model PR140-E is designed for medical research, biological storage, preservation of tissues and fluids, and other scientific uses. The cabinet is steel and the lid is counter-balanced. An indicating temperature control provides adjustability from −40° to −96°C. The condenser is air-cooled and requires no liquid. Chamber dimensions are 30 inches by 18 inches by 16 inches high. Exterior dimensions are 40 inches by 28 inches by 46 inches high. The PR140-E is available with a recording thermometer and an alarm system. So-Low Environmental Equipment. Circle 694.

### Spectrophotometer

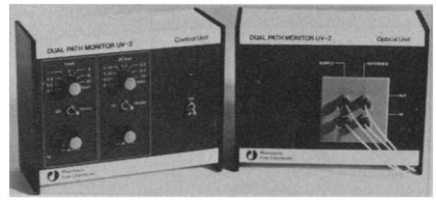
The PM-2 covers the spectral range from 290 to 850 nanometers. Ultraviolet accessories extend this range to 200 nanometers. A funnel cell allows for rapid sample determination and an accessory is available for automatic blank reference. Absorption, concentration, concentration factor, and transmission are displayed. The PM-2 has digital and analog outputs for a recorder, printer, or other data processor. Zeiss. Circle 696.

### Automated Slide Stainer

The GLS360 is designed for histology and cytology laboratories. It processes up to 360 slides per hour. Each slide is transported through a heater to dry the specimens and then through a series of selected solvents, stains, and rinses. The slides are then treated in xylene while they await cover slips. Honeywell Test Instruments Division. Circle 698.

### Ultraviolet Monitor

The UV-2 has a 20-microliter cell that simultaneously monitors a sample through pathlengths of 20 and 1 millimeter. Simultaneous use of the two pathlengths allows quantitation of large and small peaks and eliminates problems of interpretation created by scale expansion. The uniform, 1-millimeter dimension of the fused quartz cell is the same as that of standard chromatographic tubing. Further elimination of bubble formation is effected by a heat sink on the inlet side of the cell. The UV-2 measures up to optical density 20 full scale at 254 and 280 nanometers with a choice of absorbance or transmittance output. The 20-millimeter pathlength has a sensitivity of 0.0001 OD and a drift of less than 0.00005 OD per hour. The 1-millimeter pathlength channel at 254 nanometers has a sensitivity of 0.0004 OD and a drift of less than 0.00001 OD per hour. Pharmacia Fine Chemicals. Circle 695.



### Rotating Axis Protractor

The Rotangle Protractor Square is precise to within 0.1 degree and 5 minutes of arc. Any angle may be measured, read, and drawn by dialing an inner rotor and using the rotated axis as a drawing guide. Sines and cosines are given for angles at 5-degree intervals. Basic trigonometric formulas and radian values are given for major angles. The square and the axis are ruled in inches and in centimeters. Each protractor is packaged with instructions. Labindustries. Circle 699.

### Literature

*Instruments for Environmental and Scientific Measurements* includes oxygen meters, conductivity meters, *p*H electrodes, and colorimeters. Chemtrix. Circle 700.

*Reagents for Acrylamide Gel Electrophoresis* has a selected bibliography to document applications and specifications. Eastman Organic Chemicals. Circle 701.

*Dissolved Oxygen Probe* describes the model 8012 suited for determination of biological oxygen demand and other environmental parameters. Extech International. Circle 702.

*Reagents and Instruments for Clinical Laboratories* are listed in an extensive product catalog. Dade Division, American Hospital Supply. Circle 703.

*Reverse Osmosis* includes information on high volume water purification systems. Millipore. Circle 704.

*Strip Chart Recorders* features two flatbed, single-channel models, two vertical models, and two portable models. Gow-Mac Instrument. Circle 705.

*Incubators* introduces a line of solid-state, automatic, carbon-dioxide devices that feature mechanical convection and are water-jacketed. Hotpack. Circle 706.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card (on pages 598A and 694A) and placing it in the mailbox. Postage is free.

—RICHARD G. SOMMER

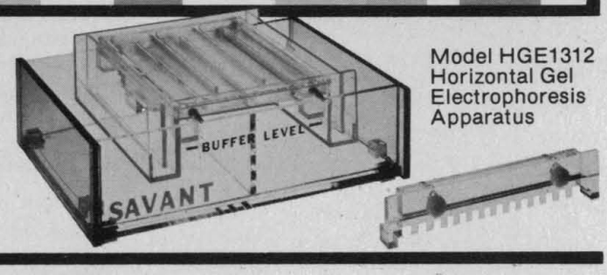
# sharp bands on a horizontal flat bed
# ELECTROPHORESIS

- For Agarose or Acrylamide
- Clear lucite construction
- Horizontal design supports weak gels
- Eliminates "smearing" effect of gravity
- Eliminates paper wicks and endosmosis
- Built-in integral cooling
- Removable rack affords rapid set-ups
- Easy-to-level design permits countertop use
- 13 sample-well comb for multiple operations
- Proven for preparation and analysis of restriction fragments of T7 DNA and determination of molecular weight

For free literature, contact:

**Savant**

SAVANT INSTRUMENTS, INC.
221 Park Avenue Hicksville, New York 11801
(516) 935-8774




Model HGE1312
Horizontal Gel
Electrophoresis
Apparatus

Circle No. 130 on Readers' Service Card

**Melted and re-crystallized chemical in polarized light.**

The Olympus BHA-P is an extraordinary microscope. While it's impossible to describe everything you can do with it, it's a pleasure to report how easily it performs its polarizing capabilities.

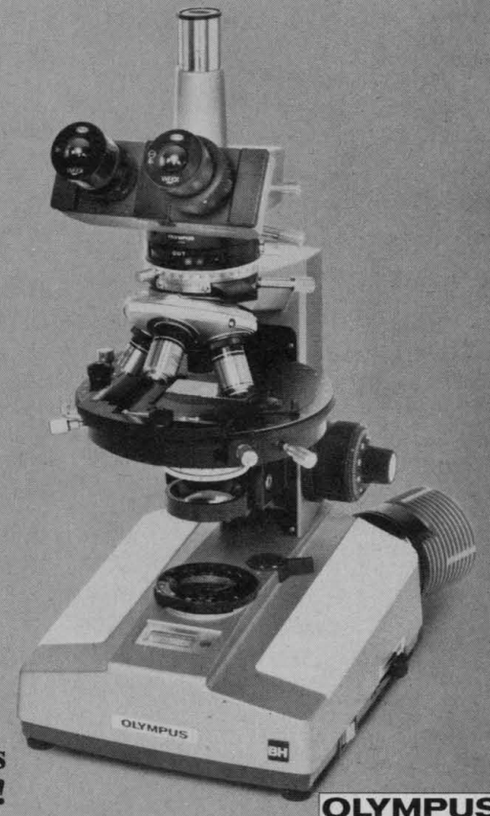
The Olympus BHA-P begins with the sturdiest of stands. All "square line." All modern. We even give you arm rests for added support. All controls are placed where your hands would like to find them.

The circular stage rotates 360°, with a 0.1° vernier scale. Two knobs make it effortless to center the stage.

A quadruple centerable nosepiece revolves with unfailing smoothness. Ball bearings and a positive click stop help to position objectives firmly in place over your specimen. Rotation is light, yet precise. Coarse adjustment spans 40mm to get you within range in seconds. Fine adjustment zeroes in with 0.002mm increments without backlash. Adjustable focusing lock prevents drift or crash landings on valuable specimens.

Olympus strain free achromatic objectives include 4x, 10x, 20x, 40x, and 100x. And you can document your discoveries with any Olympus PM-10 camera attachment.

For additional information and a demonstration just write: Olympus Corporation of America, 2 Nevada Drive, New Hyde Park, New York 11040.




# The Olympus BHA-P.

**For geology, petro-chemistry and mineralogy, it's one of the finest polarizing microscopes on earth!**

*In Canada: W. Carsen Co., Ltd., Markham, Ontario.*

OLYMPUS
SEEING BEYOND MAN'S VISION

Circle No. 196 on Readers' Service Card

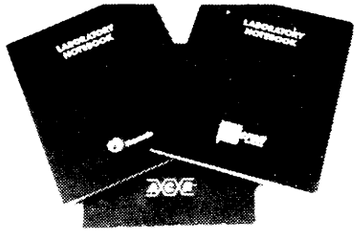
# NOW

## AAAS announces an expanded reprint service.

Any Article, Report, or Editorial published in SCIENCE, beginning with the 6 January 1978 (Vol. 199) issue, will be available in reprint form. Selected items from "News and Comment" and "Research News" will also be available.

The cost is 50¢ per title (invoiced orders not less than $5.00). Checks should be made payable to AAAS. Please send remittance plus specific requests (quantity/author/title) to

AAAS—REPRINTS
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005



*Unquestionably yours!*

## Lab notebooks with your name or logo FREE!

**Our laboratory notebooks are supplied with your corporate logotype or organization name at no extra charge.***

- 50, 100 and 192-page versions. Standard format for patent protection.
- Hard cover, sewn binding. Cased or spiral bind available.
- Shipped the week you order.
- Competitive to unstamped books.
- Special page- and volume-numbering available.

**Scientific Notebook Co.**
P.O. Box 208, Stevensville, Mich. 49127

☐ Send product bulletin.
☐ Send____sample copies at $5.00 each (unimprinted)

Name

Title Organization

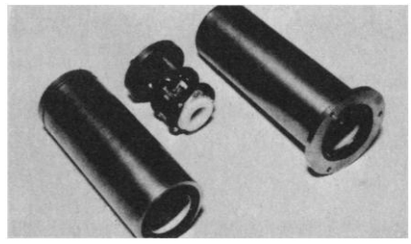
Address

City

State Zip

*Free imprinting in case quantities: nominal one-time charge for logos.

Circle No. 173 on Readers' Service Card



## EMI GENCOM PMT HOUSINGS FOR

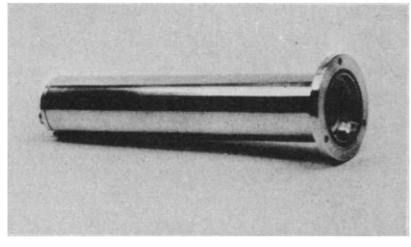
**: Broadband Photon Counting**

**: General Lab Use**

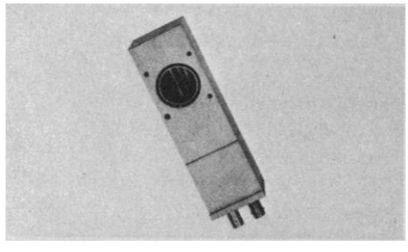
**: O.E.M. Applications**

**EMI Gencom PMT Housings are unsurpassed for flexibility, ease of use, litetite construction, and RFI shielding. They are designed by engineers with years of Photomultiplier Application experience.**

**The "B" type shown above uses the unique Bayonet Lock, is available in STD and RFI versions, with and without flange and provides space for AC-DC Power Supply if required. It accommodates all EMI 2'' tubes and some competitive types.**



**The QL-30 is similar in design and fits all EMI 1-1/8'' tubes. When supplied less flange, the slim line design allows compact packaging for OEM use. RFI shielded version available.**



**The new "S" Housing for side looking (squirrel cage) PMTs fits all tubes of this type, EMI or others. STD or RFI shielded versions available.**

**All of these new designs give improved performance at lower cost. Available from Stock.**

*Detailed data from:*

**EMI GENCOM INC.**

**80 Express St.**
**Plainview, New York 11803**
**Tel (516) 433-5900**
**TWX 510-221-1889**

Circle No. 128 on Readers' Service Card


*Announcing the 3rd AAAS Colloquium on*

# Research & Development in the Federal Budget and in Industry

## June 20-21, 1978

*The third annual AAAS report on R&D in the federal budget for FY 1979 and including a special section on R&D in industry and its impact on the economy will be the subject of an*

**AAAS**
**Science & Public Policy**
**Colloquium**
**Washington, D.C.**
**June 20 and 21, 1978**

*The AAAS R&D analysis project, sponsored by the AAAS Committee on Science and Public Policy and initiated in 1976, has resulted in two well-received books on research and development in the federal budgets for FY 1977 and FY 1978, and two highly successful colloquia in June of 1976 and 1977, attended by 200-250 AAAS members, government officials, and others.* * *The June 20-21, 1978 colloquium will offer a forum for constructive discussion of current issues in federal and industry R&D with officials of the Executive and Legislative branches and from industry and universities.* **Research & Development: AAAS Report III** *by Willis H. Shapley and Don I. Phillips will be available in book form for the June 1978 colloquium.*

*Specific topics this year will be the impact of the first complete Carter budget on R&D, trends and problems of R&D in industry, and the impact of R&D on the economy. For information and reservations, write to*

**Ms. Patricia S. Curlin**
**AAAS Office of Public Sector Programs**
**1776 Massachusetts Ave., N.W.**
**Washington, D.C. 20036**

*Research and Development in the Federal Budget: FY 1977 *and* Research and Development in the Federal Budget: FY 1978 (*$5.50 each; AAAS members, $4.95*) and the 1976 and 1977* Colloquium Proceedings *(*$5.25 each; AAAS members, $4.75*) may be purchased from AAAS.*

## BOOKS RECEIVED

*(Continued from page 678)*

Press, New York, 1977. xii, 340 pp., illus. Paper, $14.

**Applied Biology**. Vol. 2. T. H. Coaker, Ed. Academic Press, New York, 1977. x, 272 pp., illus. $19.25.

**Arachnida**. Theodore Savory. Academic Press, New York, ed. 2, 1977. xii, 340 pp., illus. $21.15.

**Contemporary Quantum Chemistry**. An Introduction. J. Goodisman. Plenum, New York, 1977. xii, 376 pp., illus. $32.50.

**Copper**. Its Geology and Economics. Robert Bowen and Ananda Gunatilaka. Halsted (Wiley), New York, 1977. xii, 366 pp., illus. $49.50.

**Crowd Action in Revolutionary Massachusetts, 1765–1780**. Dirk Hoerder. Academic Press, New York, 1977. xvi, 396 pp., illus. $19.50. Studies in Social Discontinuity.

**Design of Biopharmaceutical Properties through Prodrugs and Analogs**. Papers from a symposium, Orlando, Fla., Nov. 1976. Edward B. Roche, Ed. American Pharmaceutical Association, Washington, D.C., 1977. viii, 456 pp., illus. $20.

**The Determination of Sulphur-Containing Groups**. Vol. 3, Analytical Methods for Sulphides and Disulphides. M. R. F. Ashworth. Academic Press, New York, 1977. xii, 220 pp. $21.50. The Analysis of Organic Materials, vol. 2.

**Development and Differentiation in the Cellular Slime Moulds**. Proceedings of a workshop, Porto Conte, Sardinia, Apr. 1977. P. Cappuccinelli and J. M. Ashworth, Eds. Elsevier/North-Holland, New York, 1977. xx, 318 pp., illus. $39.75. Developments in Cell Biology, vol. 1.

**Dukes' Physiology of Domestic Animals**. Melvin J. Swenson, Ed. Comstock (Cornell University Press), Ithaca, N.Y., ed. 9, 1977. xii, 914 pp., illus. $32.50.

**Earth Materials and Earth Processes**. An Introduction. Lynn S. Fichter and George T. Farmer, Jr. Burgess, Minneapolis, ed. 2, 1977. viii, 262 pp., illus. + maps. Spiral bound, $8.95.

**Electron Spectroscopy**. Theory, Techniques and Applications. Vol. 1. C. R. Brundle and A. D. Baker, Eds. Academic Press, New York, 1977. xvi, 460 pp., illus. $46.90.

**Electronic Meters**. Techniques and Troubleshooting. Miles Ritter-Sanders, Jr. Reston (Prentice-Hall), Reston, Va., 1977. xii, 300 pp., illus. $16.95.

**Ethnobotanical Techniques and Approaches at Salmon Ruin, New Mexico**. Vorsila L. Bohrer and Karen R. Adams. Eastern New Mexico University, Portales, 1977. xx, 220 pp., illus. Paper, $6.95. San Juan Valley Archaeological Project Technical Series No. 2. Eastern New Mexico University Contributions in Anthropology, vol. 8, No. 1.

**Experimental Psychology**. Theory and Practice. Philip J. Dunham. Harper and Row, New York, 1977. xviii, 488 pp., illus. $13.95. Harper's Experimental Psychology Series.

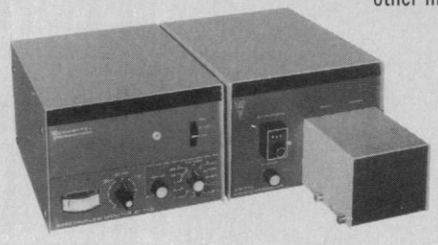
**Facing Up to Modernity**. Excursions in Society, Politics, and Religion. Peter L. Berger. Basic, New York, 1977. xx, 234 pp. $11.50.

**Festkörperprobleme XVII**. Advances in Solid State Physics. Papers from a meeting, Münster, Germany, Mar. 1977. J. Treusch, Ed. Vieweg, Braunschweig, Germany, 1977. xviii, 410 pp., illus. DM 98.

**Fighting Infection**. Conquests of the Twentieth Century. Harry F. Dowling. Harvard University Press, Cambridge, Mass., 1977.


**The only thing variable about the SF 770 Spectroflow Monitor for liquid chromatography ...is the wavelength!**

- It consistently offers highest sensitivity with low noise and baseline drift.
- It classically follows Beer's law in its measurements.
- It routinely includes an automatic gain control and zero suppression.
- It equally interfaces with all Liquid Chromatography systems.
- It inconspicuously takes up very little room.
- It uniquely incorporates a double-beam design.
- It invariably is an honest instrument, not relying on gimmicks to achieve unrealistic specs.
- It indubitably is preferred by more liquid chromatographers than all other models combined.



**Call or write now!**

24 BOOKER STREET, WESTWOOD, NEW JERSEY 07675
(201) 664-7263

SCHOEFFEL
INSTRUMENT CORPORATION

Circle No. 179 on Readers' Service Card

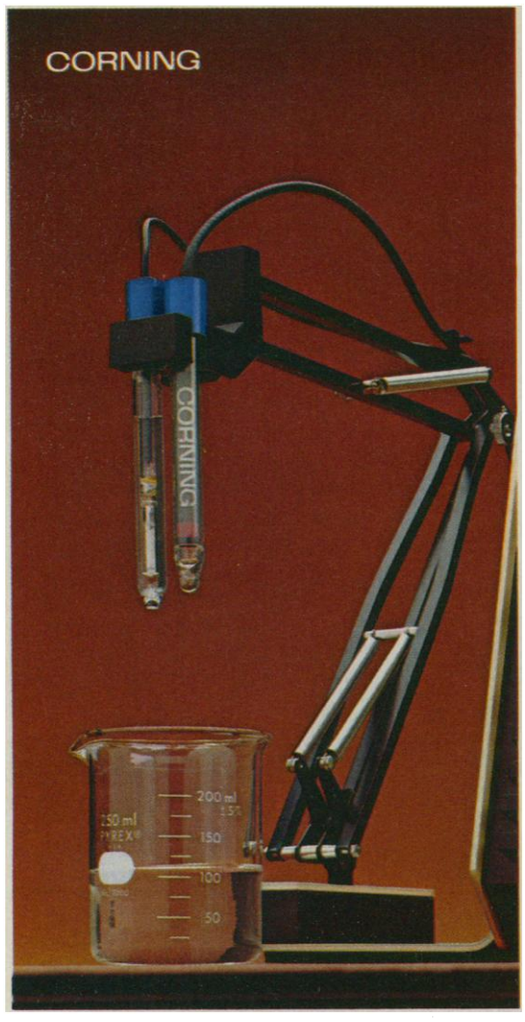
**Our compact MM-33 micromanipulator drives by hand or motorized 'joy stick'.**

Ideal for working at magnifications up to 250X, the MM-33 provides coarse movements in 3 planes (XYZ) plus fine movement in the thrust axis. Excursions calibrated in millimeters with vernier readings to 0.1 mm; final drive calibrated to 10 microns. Ball-bearing raceways assure smooth, backlash-free operation. All controls aligned in same vertical plane permits use of several MM-33's side by side. Mounts on Flexbar or a variety of bases.

Also available in a motorized version (MM-33M), with 'Joy Stick' remote unit for vibration-free control of speed and direction. For literature, write: Brinkmann Instruments, Cantiague Rd., Westbury, N.Y. 11590.

**Brinkmann Micromanipulators**

Circle No. 103 on Readers' Service Card




# THE WAY WE HANDLE CORNING™ ELECTRODES OUGHT TO TELL YOU HOW WE FEEL ABOUT CORNING ELECTRODES

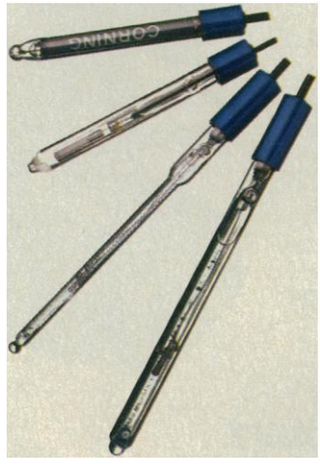
When we originated the Tall Meter we changed everything we had ever done with pH meters **except the electrodes.**

We did change the sidearm to make them easier to use than ever before.

We did **not** change the triple-purpose glass membrane we use on all our electrodes, insuring a broad pH measurement range and the ability to function in varied temperatures.

We did **not** change the warranty. You still get a full six months to work with them under lab conditions. Any functional error and we replace them without cost to you. It's still in writing.

**New.** We've prepared a new catalog to tell just why Corning electrodes are the best you can use with our meters or anyone else's. Write for a copy. Science Products Division, Corning Glass Works, Corning, N.Y. 14830




- General-purpose workhorse for routine determinations.
- Calomel internal reference, fiber junction for good KCl flow rate.
- Semi-micro combination measures samples as low as 0.3 ml.
- Rugged bulb combination has ceramic junction for stable readings.

CORNING™ pHware


xii, 340 pp. $15. A Commonwealth Fund Book.

**Finite Element Programming.** E. Hinton and D. R. J. Owen. Academic Press, New York, 1977. xiv, 306 pp., illus. $23. Computational Mathematics and Applications.

**First Course in Rings, Fields and Vector Spaces.** P. B. Bhattacharya and S. K. Jain. Halsted (Wiley), New York, 1977. xii, 238 pp., illus. $6.95.

**For the Director: Research Essays in Honor of James B. Griffin.** Charles E. Cleland, Ed. University of Michigan Museum of Anthropology, Ann Arbor, 1977. xvi, 362 pp., illus. Paper, $6.50. Anthropological Papers, No. 61.

**Genetics of Human Cancer.** Papers from a conference. John J. Mulvihill, Robert W. Miller, and Joseph F. Fraumeni, Jr., Eds. Raven, New York, 1977. xxii, 520 pp., illus. $20. Progress in Cancer Research and Therapy, vol. 3.

**Genetics Study Guide.** Marie E. Conklin and Daniel L. Hartl. Lippincott, Philadelphia, 1977. viii, 296 pp., illus. Paper, $5.95.

**Grasshoppers and Locusts.** A Handbook of General Acridology. Vol. 2, Behaviour, Ecology, Biogeography, Population Dynamics. Boris Uvarov. Centre for Overseas Pest Research, London, 1977. x, 614 pp., illus. $40.

**Handbook of Interactive Computer Terminals.** Duane E. Sharp. Reston (Prentice-Hall), Reston, Va., 1977. vi, 266 pp., illus. $17.95.

**Herbicides and Fungicides.** Factors Affecting Their Activity. Proceedings of a symposium, Bangor, Wales, Sept. 1976. N. R. McFarlane, Ed. Chemical Society, London, 1977. xii, 142 pp., illus. Paper, $15. Special Publication No. 29.

**How to Prepare a Research Proposal.** Suggestions for Those Seeking Funds for Behavioral Science Research. David R. Krathwohl. Published by the author, Syracuse, N.Y., ed. 2, 1977 (available from Syracuse University Bookstore, Syracuse, N.Y.). 112 pp. Paper, $2.95.

**Human Emotions.** Carroll E. Izard. Plenum, New York, 1977. xvi, 496 pp., illus. $25. Emotions, Personality, and Psychotherapy.

**Images, Perception, and Knowledge.** Papers from a workshop, London, Ontario, Canada, May 1974. John M. Nicholas, Ed. Reidel, Boston, 1977. x, 310 pp., illus. $38. The University of Western Ontario Series in Philosophy of Science, vol. 8.

**Immunochemistry of Proteins.** Vol. 2. M. Z. Atassi, Ed. Plenum, New York, 1977. xx, 438 pp., illus. $44.50.

**International Cell Biology, 1976–1977.** Papers from a congress, Boston, Sept. 1976. B. R. Brinkley and Keith R. Porter, Eds. Rockefeller University Press, New York, 1977. xvi, 694 pp., illus. $30.

**The Logical Flaws of Einstein's Relativity.** Leonard Parish. Cortney Publications, Luton, England, 1977. viii, 172 pp., illus. £6.50.

**Mathematical Models for the Study of the Reliability of Systems.** A. Kaufmann, D. Grouchko, and R. Cruon. Translated from the French edition (Paris, 1974). Academic Press, New York, 1977. x, 222 pp., illus. $18.50. Mathematics in Science and Engineering, vol. 124.

**Mechanics of Fluids.** R. A. Duckworth. Longman, New York, 1977. x, 276 pp., illus. Paper, $11.50. Introductory Engineering Series.

**Primary Prevention of Psychopathology.** Vol. 1, The Issues. Papers from a conference, Burlington, Vt. George W. Albee and Justin M. Joffe, Eds. Published for the University of Vermont by the University Press of New En-

gland, Hanover, N.H., 1977. xiv, 426 pp. $20.

**Principles of Isotope Geology**. Gunter Faure. Wiley, New York, 1977. xii, 464 pp., illus. $19.95. Smith and Wyllie Intermediate Geology Series.

**Proceedings of the Conference on Stochastic Differential Equations and Applications**. Park City, Utah, Feb. 1976. J. David Mason, Ed. Academic Press, New York, 1977. x, 254 pp. $10.50.

**Psychopathology**. Experimental Models. Jack D. Maser and Martin E. P. Seligman, Eds. Freeman, San Francisco, 1977. xiv, 474 pp., illus. Cloth, $17.95; paper, $8.95.

**Psychopharmacology**. From Theory to Practice. Jack D. Barchas, Philip A. Berger, Roland D. Ciaranello, and Glen R. Elliott, Eds. Oxford University Press, New York, 1977. xxiv, 558 pp., illus. Cloth, $17.95; paper, $10.95.

**Pulsars**. Richard N. Manchester and Joseph H. Taylor. Freeman, San Francisco, 1977. xiv, 282 pp., illus. $19.95. A Series of Books in Astronomy and Astrophysics.

**Punishment**. Gary C. Walters and Joan E. Grusec. Freeman, San Francisco, 1977. xvi, 302 pp. Cloth, $14; paper, $5.95. A Series of Books in Psychology.

**The Pursuit of Nature**. Informal Essays on the History of Physiology. A. L. Hodgkin, A. F. Huxley, W. Feldberg, W. A. H. Rushton, R. A. Gregory, and R. A. McCance. Cambridge University Press, New York, 1977. vi, 180 pp., illus. $15.95.

**The Race Bomb**. Skin Color, Prejudice, and Intelligence. Paul R. Ehrlich and S. Shirley Feldman. Quadrange (New York Times), New York, 1977. xiv, 208 pp., illus. $9.95.

**Radar Probing of the Auroral Plasma**. Proceedings of a summer school, Tromsø, Norway, June 1975. Asgeir Brekke, Ed. Universitetsforlaget, Oslo, Norway, 1977 (U.S. distributor, Columbia University Press, New York). 464 pp., illus. Paper, $28.

**Rare Gas Solids**. Vol. 2. M. L. Klein and J. A. Venables, Eds. Academic Press, New York, 1977. xiv + pp. 609–1252, illus. $50.75.

**Rays of Hope**. The Transition to a Post-Petroleum World. Denis Hayes. Norton, New York, 1977. 240 pp. Cloth, $9.95; paper, $3.95. A Worldwatch Institute Book.

**A Reassessment of the Concept of Criminality**. An Analysis of Criminal Behavior in Terms of Individual and Current Environment Interaction: The Application of a Stochastic Model. Eggert Petersen. Munksgaard, Copenhagen, and Halsted (Wiley), New York, 1977. 136 pp. $32.50.

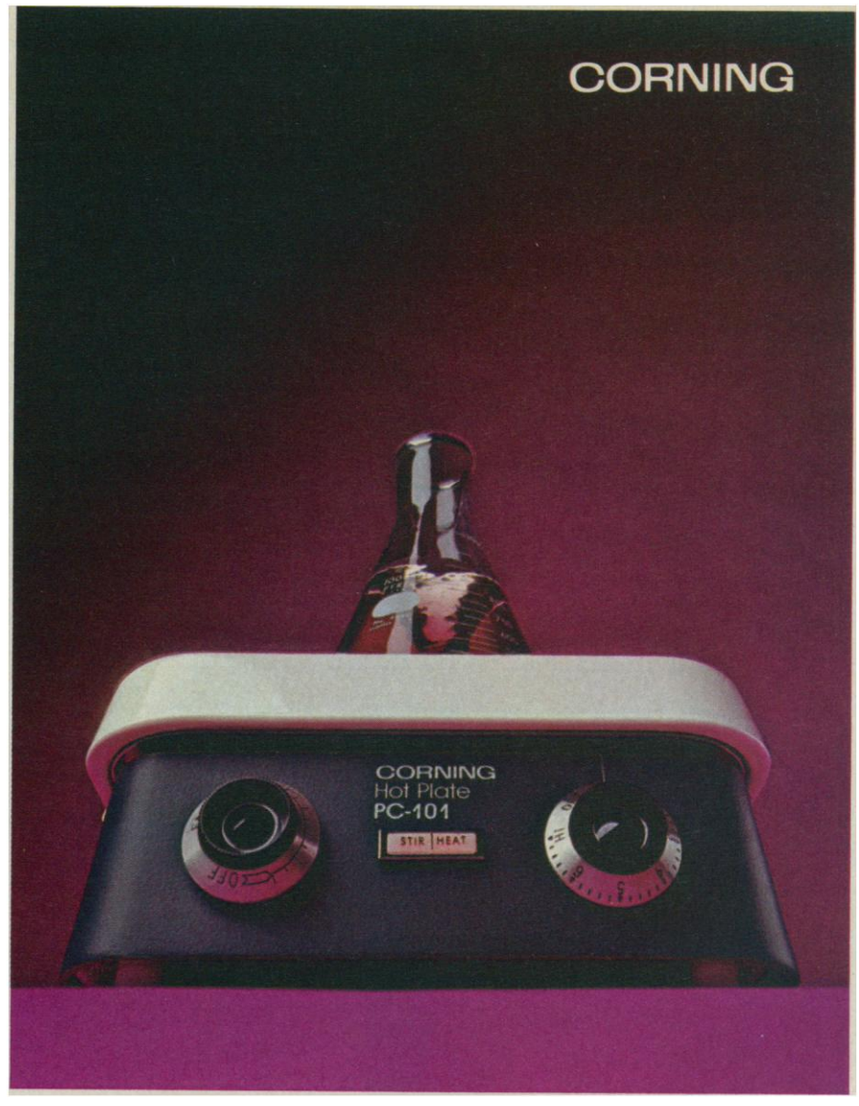
**Red and Expert**. Education in the People's Republic of China. Ruth Gamberg. Schocken, New York, 1977. xviii, 300 pp., illus. loth, $13.50; paper, $6.95.

**The Relevance of Biomedical Engineering to Dentistry**. Proceedings of a workshop, Bethesda, Md., Feb. 1976. Ernst Attinger and Paul Parakkal, Eds. National Institute of Dental Research, Bethesda, Md., 1977. x, 176 pp., illus. Paper. DHEW Publication No. (NIH) 77-1198.

**Science Fiction Handbook, Revised**. A Guide to Writing Imaginative Literature. L. Sprague de Camp and Catherine Crook de Camp. McGraw-Hill, New York, 1977. xii, 220 pp. Paper, $3.95.

**The Scientific Analysis of Personality and Motivation**. R. B. Cattell and P. Kline. Academic Press, New York, 1977. xii, 386 pp. $22.50. Personality and Psychopathology, 17.

**Sea Water**. Cycles of the Major Elements. James I. Drever, Ed. Dowden, Hutchinson


# BIG TOP CREATES BIG STIR

- 100 SQUARE INCH TOP. NOW WITH STIRRER.
- Stirs 100 to 900 r.p.m. With or without heat.
- 10" x 10" surface. Holds big vessels.
- Fast, accurate heat. Fast heat-up. Fast cool-down.
- Overhang protects insides.
- PYROCERAM® glass-ceramic top. Inert. Impervious. Stays white.
- Nylon feet. Very quiet. Very smooth.
- Infinite variable control. LO to HI.
- Big, easy-to-read knobs.

NEW HOT PLATE/STIRRER, MODEL PC-101. Order from your distributor. Or call or write for the name of the distributor nearest you: 607-974-4126. Science Products Division, Corning Glass Works, Corning, New York 14830

CORNING® hotware

Circle No. 146 on Readers' Service Card