

26 October 1979 • Vol. 206 • No. 4417

\$1.50

# SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





# Now you can choose from two series of Beckman ultracentrifuges.

## L8's—The Most Advanced

The results of six years of intensive research, the Model L8's are so remarkable, so advanced that they introduce a new era in preparative ultracentrifugation.



Discover features like the Ultra-8™ drive, a frequency-controlled induction motor that drives the rotor directly from inside the vacuum system. We warrant the

complete Ultra-8 drive for 16 billion revolutions!

Microprocessor Control lets you select rotor speed, run time, and other parameters by a finger touch control panel—no knobs or switches.

The Memory-Pac™ Programmable Module is the ultimate in automation. You can program/reprogram it in seconds. For duplicate runs using the same rotor speed, temperature, etc., just insert it in the L8: you get error-free runs with no time spent in setups.

There's a Dry Cycle to remove moisture from the chamber, an  $\omega^2t$  Integrator with recall capability, built-in slow-start programs, and internal diagnostic systems for simple servicing.

Choose from three models up to 80,000 rpm—only available in the Beckman L8 series.

## L5B's—Efficient, economical

The Model L5B's have a host of proven features for separating your samples rapidly and economically. They give you convenience in the Automatic mode, with flexibility in the Manual mode.

A Dry Cycle keeps moisture out of the rotor chamber keeping your ultracentrifuge always ready to run—the next hour or the next day.

0 to 40°C operation lets you run physiological samples at body temperature, increasingly important in a variety of research. And the L-5B drive is powerful and efficient with its DC electric design.

Four models are available, from 50,000 rpm to 75,000 rpm.



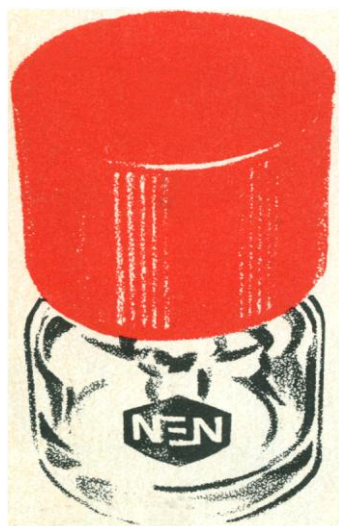
For information on the L8, write for Brochure SB-580; for the L-5B, write for Brochure SB-540—to Beckman Instruments, Inc., Spinco Division, 1117 California Avenue, Palo Alto, CA 94304.

# BECKMAN

Circle No. 217 on Readers' Service Card



# Receptor Site Studies



## **$\alpha$ -Adrenergic**

Clonidine hydrochloride, [4-<sup>3</sup>H]-  
Desmethylinipramine hydrochloride,  
[2,4,6,8-<sup>3</sup>H]-  
Dihydro- $\alpha$ -ergocryptine, 9,10-[9,10-<sup>3</sup>H(N)]-  
WB-4101 (2,6-Dimethoxyphenoxethyl)  
aminomethyl-1, 4-benzodioxane,  
2-[*phenoxy*-3-<sup>3</sup>H(N)]-  
Epinephrine, *levo*-[*methyl*-<sup>3</sup>H]-  
Norepinephrine, *levo*-[7,8-<sup>3</sup>H(N)]-

## **$\beta$ -Adrenergic**

Carazolol, DL-[3,6-<sup>3</sup>H(N)]-  
Dihydroalprenolol hydrochloride, *levo*-  
[*propyl*-2,3-<sup>3</sup>H]-  
Epinephrine, *levo*-[*N-methyl*-<sup>3</sup>H]-  
Hydroxybenzylisoproterenol, *p*-[7-<sup>3</sup>H]-  
Iodoxybenzylpindolol, [1<sup>25</sup>I]-  
Isoproterenol, DL-[7-<sup>3</sup>H(N)]-  
Norepinephrine, *levo*-[7,8-<sup>3</sup>H(N)]-  
Propranolol, L-[4-<sup>3</sup>H]-

## **Aspartate**

Aspartic acid, D-[2,3-<sup>3</sup>H]-  
Aspartic acid, L-[2,3-<sup>3</sup>H]-  
Methyl-D-aspartic acid, *N*-[*methyl*-<sup>3</sup>H]-

## **Benzodiazepine**

Diazepam, [methyl-<sup>3</sup>H]-  
Flunitrazepam, [methyl-<sup>3</sup>H]-

## **Cholinergic**

### **Muscarinic**

Acetylcholine chloride, [N-methyl-<sup>3</sup>H]-  
Choline chloride, [methyl-<sup>3</sup>H]-  
Pilocarpine, [<sup>3</sup>H(G)]-  
Quinuclidinyl benzilate,  
DL-[*benzyl*-4,4'-<sup>3</sup>H(N)]-  
Scopolamine methyl chloride,  
[N-methyl-<sup>3</sup>H]-

### **Nicotinic**

Acetylcholine chloride, [N-methyl-<sup>3</sup>H]-  
 $\alpha$ -Bungarotoxin, [1<sup>25</sup>I]-  
Choline chloride, [methyl-<sup>3</sup>H]-  
Tubocurarine chloride, *dextro*-[13'-<sup>3</sup>H(N)]-

## **Dopaminergic**

ADTN Amino-6,7-dihydroxy-  
1,2,3,4-tetrahydronaphthalene,  
2-[5,8-<sup>3</sup>H]-  
Amphetamine sulfate, D-[<sup>3</sup>H(G)]-  
Apomorphine, [8,9-<sup>3</sup>H]-  
Chlorpromazine, [<sup>3</sup>H]-  
Dihydroxyphenylethylamine,  
3,4-[*ethyl*-1-<sup>3</sup>H(N)]- or [*ethyl*-2-<sup>3</sup>H(N)]-  
Haloperidol, [<sup>3</sup>H(G)]-  
Propylnorapomorphine, *N*-[*propyl*-<sup>3</sup>H(N)]-  
Spiroperidol, [1-*phenyl*-4-<sup>3</sup>H]-

## **GABA**

Alanine,  $\beta$ -[3-<sup>3</sup>H(N)]-  
Aminobutyric acid,  $\gamma$ -[2,3-<sup>3</sup>H(N)]-  
Dihydropicrotoxinin,  $\alpha$ -[8,10-<sup>3</sup>H]-  
Isoguvacine hydrochloride, [<sup>3</sup>H]-  
Muscimol, [methylene-<sup>3</sup>H(N)]- or [4-<sup>3</sup>H]-  
Nipecotic acid, [ring-<sup>3</sup>H]-

## **Glutamate**

Glutamic acid, L-[3,4-<sup>3</sup>H]-

## **Glycine**

Glycine, [2-<sup>3</sup>H]-

## **Histamine**

### **H<sub>1</sub>**

Histamine, [<sup>3</sup>H(G)]-  
Pyrilamine, [*pyridinyl*-5-<sup>3</sup>H]- (Mepyramine)

### **H<sub>2</sub>**

Histamine, [<sup>3</sup>H(G)]-

## **Opiate**

Dihydromorphine, [7,8-<sup>3</sup>H(N)]-  
Enkephalin (5-L-leucine), [*tyrosyl*-3,5-<sup>3</sup>H(N)]-  
Enkephalin (5-L-methionine),  
[*tyrosyl*-3,5-<sup>3</sup>H(N)]-  
Enkephalinamide  
(2-D-alanine-5-L-methionine),  
[*tyrosyl-ring*-2,6-<sup>3</sup>H]-  
Ethylketocyclazocine, [9-<sup>3</sup>H]-  
Morphine, [6-<sup>3</sup>H(N)]-

## **Serotonin**

Hydroxytryptamine binoxalate, 5-[1,2-<sup>3</sup>H(N)]-  
Hydroxytryptamine creatinine sulfate,  
5-[1,2-<sup>3</sup>H(N)]-

## **Steroid**

### **Androgen**

Dihydrotestosterone,  
[1,2,4,5,6,7,16,17-<sup>3</sup>H(N)]-  
Methyltrienolone, [17 $\alpha$ -methyl-<sup>3</sup>H]- (R1881)\*  
Testosterone, [1,2,6,7,16,17-<sup>3</sup>H(N)]-

### **Estrogen**

Estradiol, [2,4,6,7,16,17-<sup>3</sup>H(N)]-  
Iodo-3, 17 $\beta$ -estradiol, 16 $\alpha$ -[1<sup>25</sup>I]-  
Moxestrol, [11 $\beta$ -methoxy-<sup>3</sup>H]- (R2858)\*

### **Glucocorticoid**

Dexamethasone, [6,7-<sup>3</sup>H(N)]-  
Prednisolone, [6,7-<sup>3</sup>H(N)]-  
Triamcinolone acetonide, [6,7-<sup>3</sup>H(N)]-

### **Mineralocorticoid**

Aldosterone, D-[1,2,6,7-<sup>3</sup>H(N)]-

### **Progesterone**

Dihydroprogesterone, [1,2-<sup>3</sup>H(N)]-  
Nor-17 $\alpha$ -ethynyltestosterone, 19-[6,7-<sup>3</sup>H(N)]-  
Progesterone, [1,2,6,7-<sup>3</sup>H(N)]-  
Promegestone, [17 $\alpha$ -methyl-<sup>3</sup>H]- (R5020)\*

\*Manufactured by NEN under licensed agreement of  
ROUSSEL-UCLAF.

## **Miscellaneous**

Dihydroxyvitamin D<sub>3</sub>, 1 $\alpha$ , 25-[26,27-<sup>3</sup>H]-  
Hydroxyvitamin D<sub>3</sub>, 25-[26,27-<sup>3</sup>H]-  
Imipramine hydrochloride, [2,4,6,8-<sup>3</sup>H]-  
Melanocyte stimulating hormone inhibiting  
factor, [*proline*-2,3,4,5-<sup>3</sup>H]- (MIF)  
Phencyclidine, [*piperidyl*-3,4-<sup>3</sup>H(N)]-  
Reserpine, [*benzoyl*-<sup>3</sup>H(G)]-



**New England Nuclear**

549 Albany Street, Boston, Massachusetts 02118  
Call toll-free: 800-225-1572  
(In Massachusetts and International: 617-482-9595)

**NEN Chemicals GmbH:** D-6072 Dreieich, W. Germany  
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



# SCIENCE

<b>LETTERS</b>	Pontryagin's Article: <i>A. Rosenberg</i> ; Treating Mental Disorders: <i>L. Pauling</i> ; Fetal Research Ethics: <i>Y. Brackbill</i> ; <i>L. D. Sabath</i> , <i>A. Philipson</i> , <i>D. Charles</i> . . . . .	404
<b>EDITORIAL</b>	Performance Evaluation of Academic Research: <i>J. E. Gibson</i> . . . . .	407
<b>ARTICLES</b>	Fate of Fossil Fuel Carbon Dioxide and the Global Carbon Budget: <i>W. S. Broecker et al.</i> . . . . .	409
	Fiber, Food, Fuel, and Fungal Symbionts: <i>J. L. Ruehle</i> and <i>D. H. Marx</i> . . . . .	419
	Are Portions of the Urals Really Contaminated?: <i>W. Stratton et al.</i> . . . . .	423
<b>NEWS AND COMMENT</b>	Science in China . . . . .	426
	<i>Briefing</i> : China to Build Synchrotron near the Ming Tombs; China Adopts New Law for Environmental Protection; China's New Birth Policy: One Baby Is Enough . . . . .	428
	Radioactive Waste Backup Threatens Research . . . . .	431
	Crisis in the Alphabet Soup . . . . .	431
	FDA Tells Senators of Doctors Who Fake Data in Clinical Drug Trials . . . . .	432
<b>RESEARCH NEWS</b>	New Information About the Development of the Autonomic Nervous System . . . .	434
	Unlike Money, Diesel Fuel Grows on Trees . . . . .	436
<b>BOOK REVIEWS</b>	National Research in Canada and Physics at the National Research Council, 1929-1952, reviewed by <i>D. K. Allison</i> ; Manipulated Science, <i>R. Amann</i> ; Galileo at Work, <i>M. A. Finocchiaro</i> ; Gender and Culture, <i>J. K. Brown</i> ; Books Received . . . .	438
<b>REPORTS</b>	Archean Rocks in Antarctica: 2.5-Billion-Year Uranium-Lead Ages of Pegmatites in Enderby Land: <i>E. S. Grew</i> and <i>W. I. Manton</i> . . . . .	443
	Magnitude of Shear Stress on the San Andreas Fault: Implications of a Stress Measurement Profile at Shallow Depth: <i>M. D. Zoback</i> and <i>J. C. Roller</i> . . . . .	445

## BOARD OF DIRECTORS

EDWARD E. DAVID, JR.  
Retiring President, Chairman

KENNETH E. BOULDING  
President

FREDERICK MOSTELLER  
President-Elect

ELOISE E. CLARK  
MARTIN M. CUMMINGS

RENÉE C. FOX  
ANNA J. HARRISON

## CHAIRMEN AND SECRETARIES OF AAAS SECTIONS

MATHEMATICS (A)  
Garrett Birkhoff  
Ronald Graham

PHYSICS (B)  
Arthur L. Schawlow  
Rolf M. Sinclair

CHEMISTRY (C)  
Fred Basolo  
William L. Jolly

ASTRONOMY (D)  
Peter S. Conti  
Donat G. Wentzel

PSYCHOLOGY (J)  
Frances K. Graham  
Meredith P. Crawford

SOCIAL AND ECONOMIC SCIENCES (K)  
David L. Sills  
Gillian Lindt

HISTORY AND PHILOSOPHY OF SCIENCE (L)  
Melvin Kranzberg  
Diana L. Hall

ENGINEERING (M)  
Daniel C. Drucker  
Donald E. Marlowe

EDUCATION (Q)  
Fletcher G. Watson  
James T. Robinson

DENTISTRY (R)  
Carl J. Witkop, Jr.  
Harold M. Fullmer

PHARMACEUTICAL SCIENCES (S)  
Samuel Elkin  
Robert A. Wiley

INFORMATION, COMPUTING, AND COMMUNICATION (T)  
Mary E. Corning  
Madeline M. Henderson

## DIVISIONS

### ALASKA DIVISION

Daniel B. Hawkins  
President

T. Neil Davis  
Executive Secretary

### PACIFIC DIVISION

William L. Sims  
President

Alan E. Leviton  
Secretary-Treasurer

### SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

Henry J. Shine  
President

M. Michelle Balcomb  
Executive Officer

SCIENCE is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Second-class postage (publication No. 484460) paid at Washington, D.C., and at an additional entry. Now combined with *The Scientific Monthly*. Copyright © 1979 by the American Association for the Advancement of Science. Domestic individual membership and subscription (51 issues): \$34. Domestic institutional subscription (51 issues): \$70. Foreign postage extra: Canada \$12, other (surface mail) \$15, air-surface via Amsterdam \$40. First class, airmail, school-year, and student rates on request. Single copies \$1.50 (\$2 by mail); back issues \$2.50 (\$3 by mail); classroom rates on request. **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. **Postmaster:** Send Form 3579 to *Science*, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

# AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Seasonal Oxygen Isotopic Variations in Living Planktonic Foraminifera off Bermuda: <i>D. F. Williams, A. W. H. Bé, R. G. Fairbanks</i> . . . . .	447
Silicon in Carbonaceous Chondrite Metal: Relic of High-Temperature Condensation: <i>L. Grossman, E. Olsen, J. M. Lattimer</i> . . . . .	449
Salinity Gradient Power: Utilizing Vapor Pressure Differences: <i>M. Olsson, G. L. Wick, J. D. Isaacs</i> . . . . .	452
Zonal Temperature-Anomaly Maps of Indian Ocean Surface Waters: Modern and Ice-Age Patterns: <i>W. L. Prell and W. H. Hutson</i> . . . . .	454
BK Virus DNA: Complete Nucleotide Sequence of a Human Tumor Virus: <i>R. C. A. Yang and R. Wu</i> . . . . .	456
Bird Predation on Forest Insects: An Exclosure Experiment: <i>R. T. Holmes, J. C. Schultz, P. Nothnagle</i> . . . . .	462
Experimental Phenylketonuria: Replacement of Carboxyl Terminal Tyrosine by Phenylalanine in Infant Rat Brain Tubulin: <i>J. A. Rodriguez and G. G. Borisy</i> . .	463
Classification of Opioids on the Basis of Change in Seizure Threshold in Rats: <i>A. Cowan, E. B. Geller, M. W. Adler</i> . . . . .	465
Reading Without a Fovea: <i>K. Rayner and J. H. Bertera</i> . . . . .	468
Phenylethylamine in Paranoid Chronic Schizophrenia: <i>S. G. Potkin et al.</i> . . . .	470
Cholecystokinin Octapeptide: Continuous Picomole Injections into the Cerebral Ventricles of Sheep Suppress Feeding: <i>M. A. Della-Fera and C. A. Baile</i> . . . .	471
Stimulation of Abducens Nucleus Supports Classical Conditioning of the Nictitating Membrane Response: <i>F. W. Mis, I. Gormezano, J. A. Harvey</i> . . . . .	473
Gamma Rays: Further Evidence for Lack of a Threshold Dose for Lethality to Human Cells: <i>P. S. Furcinitti and P. Todd</i> . . . . .	475
Movement Disorders of Aged Rats: Reversal by Dopamine Receptor Stimulation: <i>J. F. Marshall and N. Berrios</i> . . . . .	477
A Correlation Between Platelet Monoamine Oxidase Activity and Plasma Prolactin Concentrations in Man: <i>J. E. Kleinman et al.</i> . . . . .	479
Intrathecal Capsaicin Depletes Substance P in the Rat Spinal Cord and Produces Prolonged Thermal Analgesia: <i>T. L. Yaksh et al.</i> . . . . .	481
Technical Comments: Stereospecific Sorption of L Amino Acids by Colloidal Clay: <i>T. A. Jackson; D. Wellner; S. C. Bondy</i> . . . . .	483
<b>PRODUCTS AND MATERIALS</b>	
Infrared Dryer; Water Chemistry Meter; Controller for HPLC; Cell Disrupter; Atomic Absorption Spectrometer; Glassware Washer; Electrophoresis-Electrofocusing Cell; Literature . . . . .	486

MIKE MC CORMACK  
RUSSELL W. PETERSON

JOHN C. SAWHILL  
CHEN NING YANG

WILLIAM T. GOLDEN  
Treasurer

WILLIAM D. CAREY  
Executive Officer

GEOLOGY AND GEOGRAPHY (E)  
Linn Hoover  
Ramon E. Bisque

MEDICAL SCIENCES (N)  
Theodore Cooper  
Leah M. Lowenstein

STATISTICS (U)  
Richard L. Anderson  
Ezra Glaser

BIOLOGICAL SCIENCES (G)  
Donald S. Farner  
Walter Chavin

AGRICULTURE (O)  
J. Lawrence Apple  
Coyt T. Wilson

ATMOSPHERIC AND HYDROSPHERIC  
SCIENCES (W)  
Eugene W. Bierly  
Glenn R. Hilst

ANTHROPOLOGY (H)  
James B. Watson  
Priscilla Reining

INDUSTRIAL SCIENCE (P)  
Herbert I. Fustfeld  
Robert L. Stern

GENERAL (X)  
Ruth B. Pitt  
S. Fred Singer

## COVER

North ridge of Mount Charles, Enderby  
Land, Antarctica. Pyroxene granulites  
are cut by charnockitic pegmatites  
dated at 2.5 billion years. See page 443.  
[E. S. Grew, University of California,  
Los Angeles]

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

# san francisco



**Symposia**

**Exhibits**

**Science Film**

**Festival**

**Tours**

For details about the Meeting program, as well as housing and registration forms, see the Preconvention issue of Science, 16 November 1979

or write

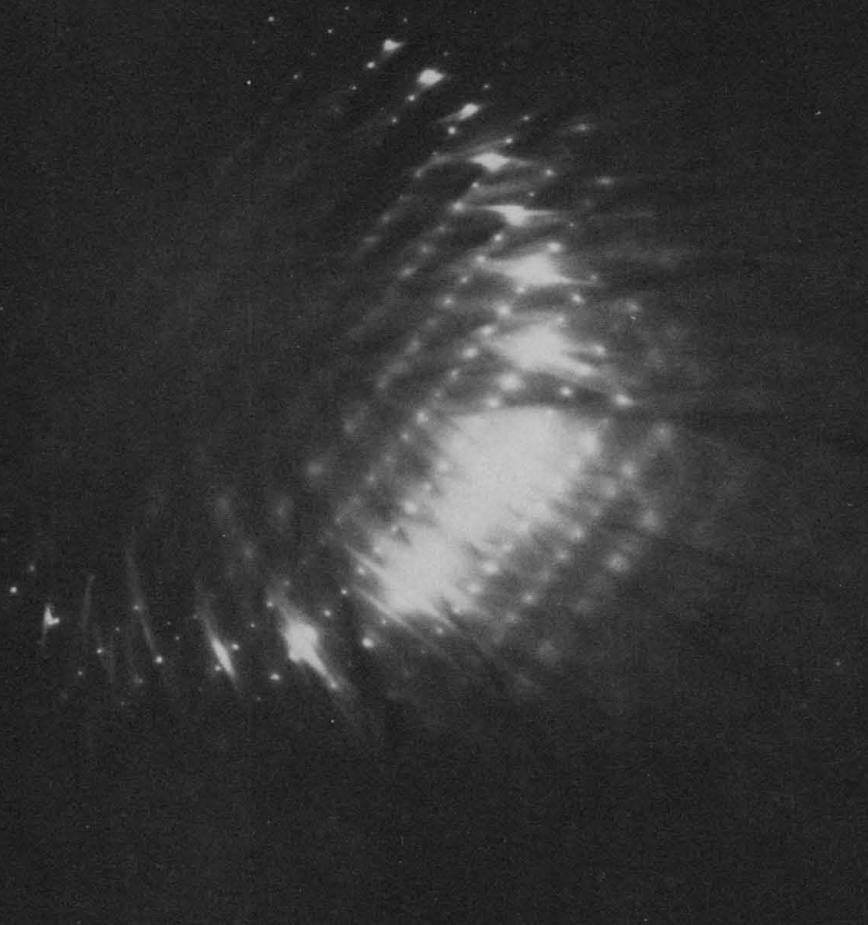
AAAS Meetings Office—Suite 600  
1776 Massachusetts Avenue, N.W.  
Washington, D.C. 20036



**Annual Meeting**  
**San Francisco**  
**3-8 January 1980**

# Philips EM-400 Twin System

## Imaging and analysis with no compromise



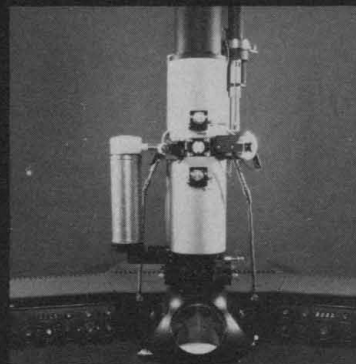
The EM-400 Electron Microscope with Twin Lens objective provides atomic level resolution combined with nano-PROBE capability for analysis of specimen areas as small as a billionth of a meter. For the first time, these capabilities are available to you in TEM, S(T)EM and SEM modes with no compromise in performance.

No compromise means TEM lattice resolution to 0.14 nanometres with  $\pm 60^\circ$  of specimen tilt. Single switch operation to S(T)EM, SEM or micro-micro diffraction modes with probe sizes to 2.0 nanometres. X-ray detector collection angle of 0.13 sr — more than double currently available sensitivity.

No compromise in signal handling means providing six different signals. And the ability of mixing these in any sum or difference combination and display them as mono/dual, dual magnification and stereo images.

There's more. The EM-400 was specifically designed to provide an ultra-clean, high vacuum specimen environment to insure consistently successful microanalysis.

Don't compromise. Get complete details. Write to Philips Electronic Instruments, Electron Optics Group, 85 McKee Dr., Mahwah, NJ 07430.



Electron Diffraction pattern of CdS from a single grain in a solar cell. Courtesy of Dr. J.W. Edington, Dept. of Aeronautical Engineering, Univ. of Del.




**Electronic  
Instruments**

# PHILIPS

Circle No. 54 on Readers' Service Card





**With a  
Brinkmann  
Homogenizer,  
you can  
homogenize  
samples  
under 1 ml**

**...homogenize  
anaerobically**

**...and  
without  
cross  
contamination.**

When it comes to breaking down and homogenizing virtually any type of tissue, small organs, bones, muscle, cartilage, or even an entire mouse, the Brinkmann Homogenizer is in a class by itself.

Consider its power. A 600W motor develops up to 30,000 rpm (1200W on PT-45 model, with up to 20,000 rpm) to assure complete homogenization of most samples within 30 to 60 seconds (other instruments may require 15 minutes or more).

Consider the wide choice of generators, all made entirely of stainless steel. It includes a Microprobe Generator small enough to fit into a standard cuvette (for samples as small as 1 ml or less), Anaerobic Generators for aerosol-free homogenization, a Mechanical Seal Generator to

minimize contamination and cleaning problems, even an in-line bench-top unit that homogenizes without admitting air.

Consider its unique method of tissue destruction, a combination of ultrasonic energy and mechanical shearing action, based on the Willems High Frequency Principle.

Consider the optional electronic speed control unit, with its sensor that continually monitors the actual speed and keeps it constant, regardless of load.

From any standpoint, nothing compares with a Brinkmann Homogenizer. For literature, write Brinkmann Instruments, Inc., Subsidiary of Sybron Corporation, Cantiague Road, Westbury, N.Y. 11590 or call toll-free 800/645-3050. In Canada: Brinkmann Instruments (Canada), Ltd.

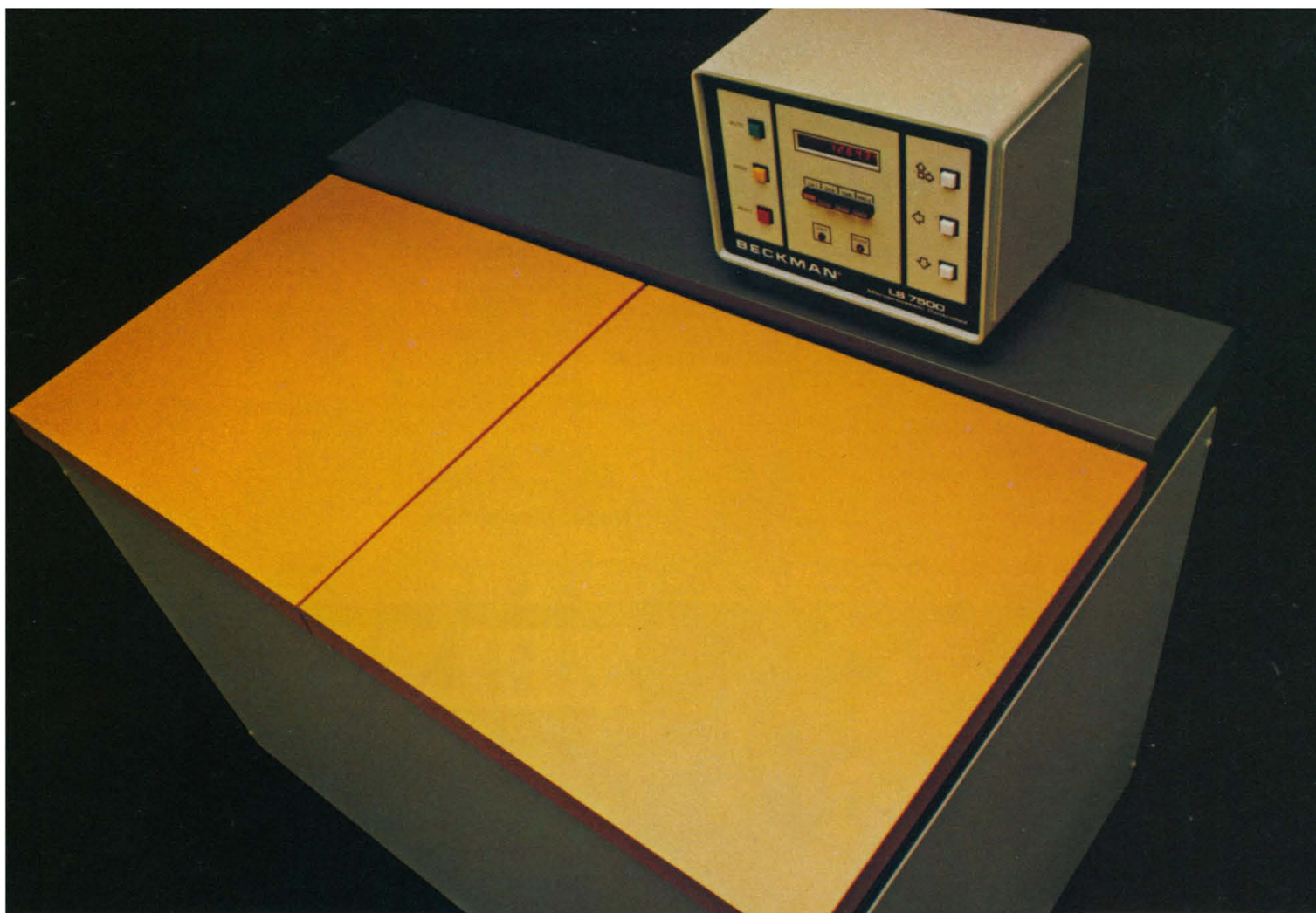
## **Brinkmann Homogenizers**

***From tissue to homogenate in 30 seconds!***

**SYBRON | Brinkmann**

Circle No. 73 on Readers' Service Card





# Now you can handle all the LS answers, all at once.

Presenting the newest liquid scintillation system from Beckman, the LS 7500. Microprocessor-controlled with multi-user capabilities, this is the system that flexes to fit and optimize your counting parameters. But best of all, the LS 7500 puts normalized final answers well in-hand, all for a price that's easy to handle.

Command tower programming gives you the hand-held



versatility to select your own counting requirements, with no switches, knobs or dials to set. The system's memory stores ten library programs, allowing a variety of sample types to be counted at the same time. One investigator—or ten different investigators—can do ten different experiments. Either way, the LS 7500 does an amazing juggling act that keeps it all straight.

The flexibility continues. Complete program editing means customized experiment parameters.

A second command tower can change counting times and 2 sigma counting error. And you can also use it to store and recall all quench curves with the optional

on-line automatic data reduction package.

More design improvements include Automatic Quench Compensation for accurate single and dual label counting conditions, quench monitoring by H# for precision and Automatic Data Computation for answers related to a standard.

The LS 7500, another leader in Beckman's new generation of microprocessor-controlled, multi-user liquid scintillation systems. Now you can get the very highest LS technology at a very down-to-earth price. For full information, contact your Beckman representative or Scientific Instruments Division, Beckman Instruments, Inc., P.O. Box C-19600, Irvine, CA 92713.

**Innovation you can continue to count on**

## BECKMAN

Circle No. 123 on Readers' Service Card



# The convenient, superstable Photo-Invertoscope: IM-35

## A new generation of inverted microscopes.

The IM-35 does for inverted photomicrography what the Zeiss Photomicroscope does for upright. It takes the trouble out of highest quality photomicrography.

For stability and easy access to stage and specimen, the integrated automatic 35mm camera is at the base of the instrument, not added on the top.

Notice how the lamp swings away to clear the entire stage area. This simplifies exchange of specimens and makes it easy to lift off the rigidly supported stage for ready access to the objectives. And the image is upright and side-correct to make manipulation easier.

## Ideal for fluorescence

The Photo-Invertoscope IM-35 is designed to perform a maximum of tasks at minimum cost. For example, no expensive accessories are needed to do fluorescence microscopy - just a lamp, lamp mount, and reflector.

With the full line of interchangeable Zeiss optics and accessories available, the IM-35 is the ideal combination of quality, convenience, and economy in an inverted microscope.

Write or call for complete details today.

## Nationwide service

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

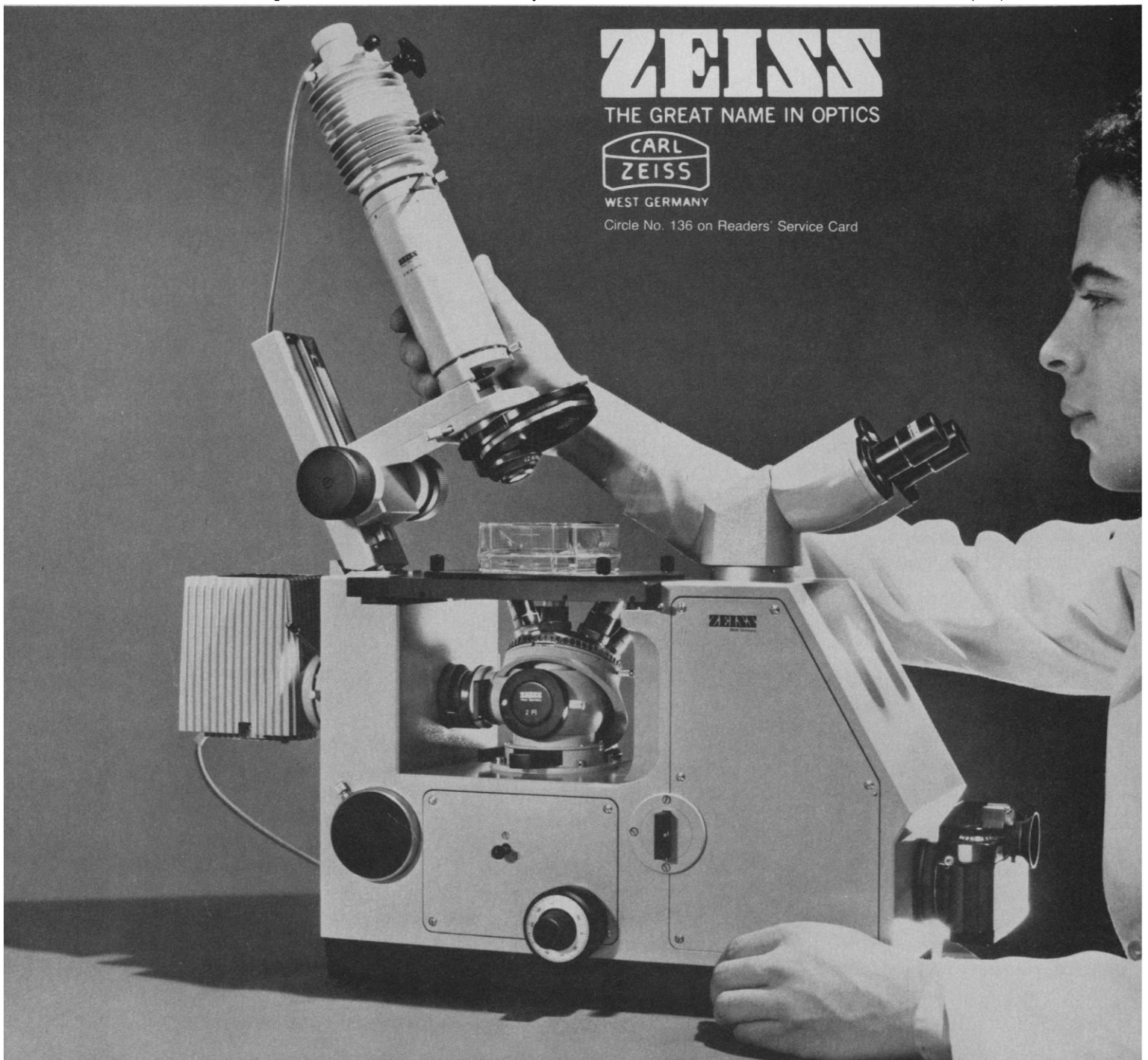
# ZEISS

THE GREAT NAME IN OPTICS



WEST GERMANY

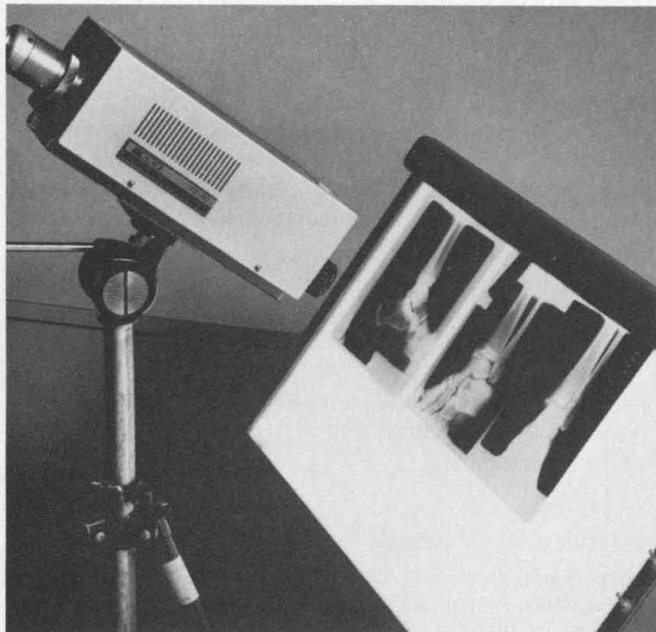
Circle No. 136 on Readers' Service Card





# High acuity tv.

In diagnostics it's the only trustworthy tv.



Bacterial colony counting, patient surveillance, remote x-ray inspection — all diagnostic procedures where television is invaluable. But only if the image is trustworthy. Only if the image has high acuity.

Example: In colony counting, ultra-linearity is vital. Otherwise two colonies appearing to be the same-size one at center-screen and the other at one edge, can actually differ in size.

Example: In patient surveillance, small phenomena such as eye motions require high resolution. Otherwise they can be near-indistinguishable.

Example: In remote x-ray reading, only an extended gray scale allows authoritative interpretation.

High acuity comprises those very three elements: ultra-linearity, high resolution, and extended gray scale. And high acuity is what the Ikegami ITC-82 black-and-white television camera is all about.

Linearity of the ITC-82 is indeed ultra — deflection distortion less than 1 percent inside a circle having a diameter equal to picture height. Horizontal resolution can be as high as 1023 lines at center; and vertical resolution can be vastly improved by use of eight selectable scan rates, up to 715 lines at center. An optional video amplifier with 30 MHz bandwidth allows full realization of all multi-scan potential of the picture. Shading correction insures uniform overall density for more

accurate interpretation of the picture. Lateral and vertical picture inversion as well as image polarity reversal are useful in diverse diagnostic applications such as microscopy. Cable length compensation to 1000 feet is incorporated.

All of these functions are completely controlled from a fully modularized camera control unit which also lends itself to studio console application. Add to this, extreme stability under voltage varying conditions, and you have a camera ideally suited for application in hospitals, studios and other critical areas.

An optional electronic viewfinder is available.

A lower-cost camera, the ITC-62, is also available. It offers comparable linearity, 850-line horizontal resolution, extended gray scale, and the unusual facility of automatic setup, along with a long roster of sophisticated features that make it the camera of choice where budget is a factor.

The ITC-82 and ITC-62 are the epitome of high acuity. For a demonstration contact

Ikegami Electronics (USA) Inc.

37 Brook Avenue

Maywood, N.J. 07607

(201) 368-9171



## Ikegami

# RESEARCH & DEVELOPMENT

## AAAS REPORT SERIES

**Research and Development: AAAS Reports** are a series of books aimed at promoting a clearer understanding of R&D funding and policy issues among the scientific, technological, and public policy communities and those responsible for policy and funding decisions on R&D.

### ● Now Available ●

#### Research and Development: AAAS Report IV

**AAAS Report IV**, the most recent book in the series, addresses the budgetary and policy issues facing U.S. R&D issues which are shaping the scale and quality of U.S. science and technology. The initial sections of **AAAS Report IV** examine the R&D recommendations and policies associated with the President's FY 1980 budget. Additional sections update the data and policy outlook on R&D in industry and, in a further broadening of the scope of the R&D series, examine various international aspects of R&D and identify some of the key issues in the international arena. Prepared by Willis H. Shapley and Don I. Phillips. ISBN 0-87168-243-5; 1979, xviii + 141 pages, paperbound. \$6.50\*

### ● Also Available ●

#### Research & Development: AAAS Report III

**AAAS Report III** expands the scope of the series beyond federal R&D analysis to cover R&D in industry and a discussion of the impact of R&D on the U.S. economy. Prepared by Willis H. Shapley and Don I. Phillips. ISBN 0-87168-236-2; 1978, xiv + 122 pages, paperbound. \$5.00\*

#### Research & Development in the Federal Budget: FY 1978

**AAAS Report II** takes a closer look at the congressional role in R&D budgeting and suggests a new conceptual basis for R&D budget decisions. Prepared by Willis H. Shapley, Don I. Phillips, and Herbert Roback. ISBN 0-87168-231-1; 1977, xii + 148 pages, paperbound. \$5.00\*

#### Research & Development in the Federal Budget: FY 1977

**AAAS Report I** provides a detailed exposition of the federal budget process for R&D and of policy issues of continuing

concern to the R&D community. Prepared by Willis H. Shapley. ISBN 0-87168-228-1; 1976, ix + 100 pages, paperbound. \$5.00\*

#### Research & Development Colloquium Proceedings

**Proceedings** from the annual colloquia on research and development contain the text of all speeches and in-depth summaries of the subsequent panel discussions. (Quantities are limited.)

**R&D Colloquium Proceedings 1979**, ca. 150 pgs., app., paper. (Companion volume to **AAAS Report IV**) available Sept. 1979. \$6.50\*

**R&D Colloquium Proceedings 1978**, v + 178 pgs., app., paper. (Companion volume to **AAAS Report III**) \$5.00\*

**R&D Colloquium Proceedings 1977**, v + 130 pgs., app., paper. (Companion volume to **AAAS Report II**) \$5.00\*

**R&D Colloquium Proceedings 1976**, vi + 136 pgs., app., paper. (Companion volume to **AAAS Report I**) \$5.00\*

To order your copy(s) of the above R&D Reports and Proceedings please fill in the coupon below and mail today. All orders under \$10.00 must be accompanied by remittance. AAAS Members discount honored on prepaid orders only.\*

#### ORDER FORM — Please send me the following R&D Reports and Colloquium Proceedings:

_____ R&D Report IV, 1980 .....	\$ 6.50	_____ Colloquium Proceedings 1979 .....	\$ 6.50
_____ R&D Report III, 1979 .....	\$ 5.00	_____ Colloquium Proceedings 1978 .....	\$ 5.00
_____ R&D Report II, 1978 .....	\$ 5.00	_____ Colloquium Proceedings 1977 .....	\$ 5.00
_____ R&D Report I, 1977 .....	\$ 5.00	_____ Colloquium Proceedings 1976 .....	\$ 5.00
_____ All four R&D Reports .....	\$20.00	_____ All Four Proceedings .....	\$20.00
_____ The entire R&D Series (8 publications) —		\$36.00	

Send R&D Reports and Proceedings to:

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Total amount of order ..... \$ \_\_\_\_\_

10% Member discount\* ..... \$ \_\_\_\_\_

☐ amount enclosed ..... \$ \_\_\_\_\_

☐ amount to be billed ..... \$ \_\_\_\_\_



#### Mail Order Form To:

AAAS, Department L-1  
1515 Massachusetts Ave., N.W., Washington, D.C. 20005

\*AAAS Members entitled to a 10% discount on prepaid orders only.

☐ Please send me information on additional AAAS publications  
Please allow 6-8 weeks for delivery of order



# Take another book...

## Your free 1979-80 Miles Biochemicals Catalog

### 980 products

...comprising 2,000 product sizes and types. Product groups include immunochemicals, lectins, blood proteins, electrophoresis apparatus and reagents, polypeptides, nucleic acids, recombinant reagents, enzymes, and companion reagents.

### Suggested applications

...with relevant references for most products. Listings are cross-indexed under major subject and individual product headings.

### 150 fact-filled pages

...including datagram numbers for 24-hour ordering and technical/service information to aid you with special orders.

### Free of charge

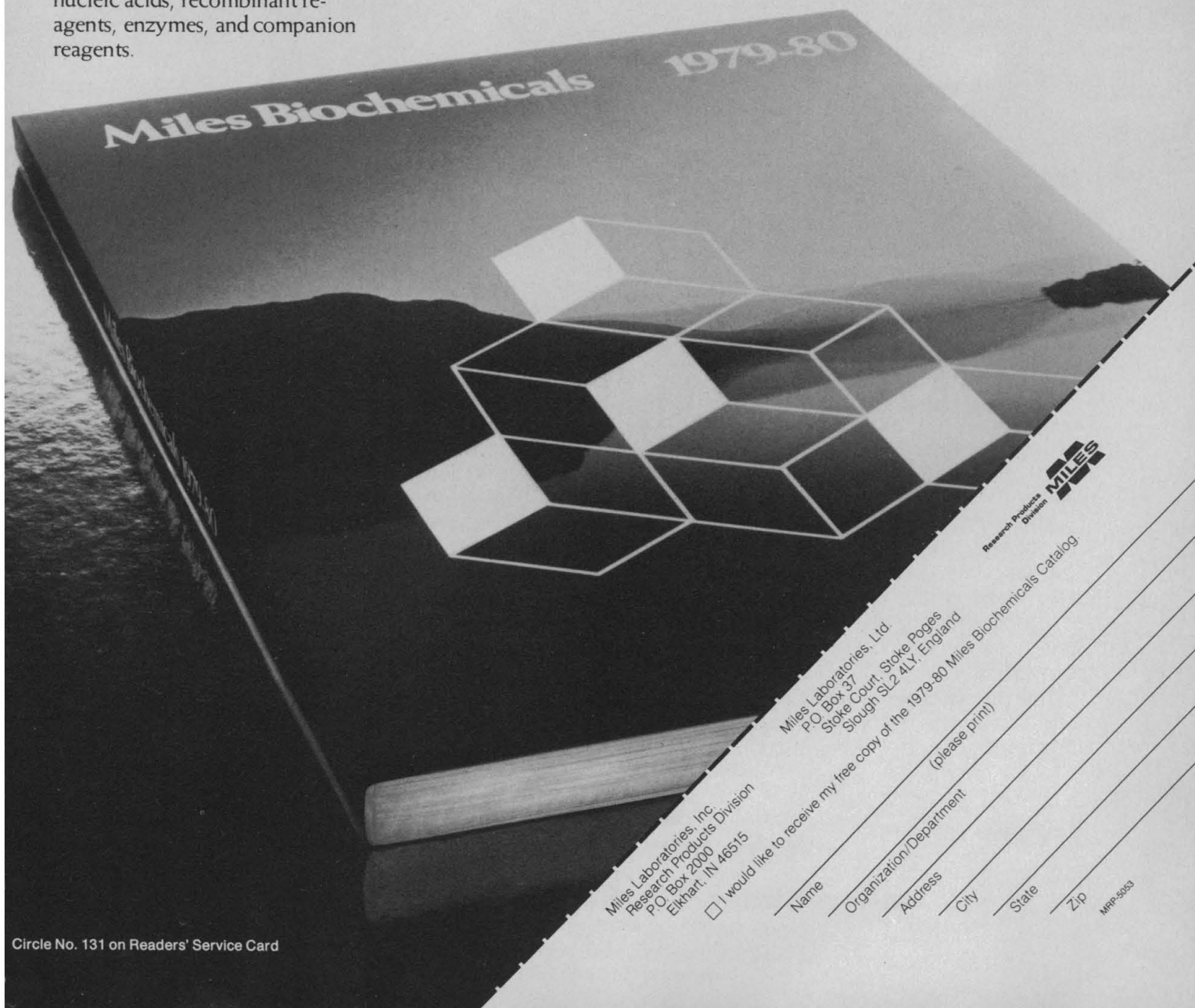
...to receive your new catalog, simply fill out and mail the coupon below.

*Research/Response/Responsibility*


Research Products  
Division



© 1979 MILES LABORATORIES, INC.  
MRP-5053/779



**Miles Biochemicals 1979-80**

Research Products Division 

Miles Laboratories, Ltd.  
P.O. Box 37  
Stoke Court, Stoke Poges  
Slough SL2 4LY, England

☐ I would like to receive my free copy of the 1979-80 Miles Biochemicals Catalog.

Name \_\_\_\_\_  
Organization/Department \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
(please print)

Miles Laboratories, Inc.  
Research Products Division  
P.O. Box 2000  
Elkhart, IN 46515

MRP-5053

# YOU KNOW WHAT'S IN THE BOTTLES...



## BUT WHAT'S IN THE NAME?

All amino acids are supposed to be created equal. But the biochemical houses that supply them aren't.

Consider United States Biochemical Corporation. Products and services from USB are the one part of your work you can count on, absolutely. Because we recognize exactly how much the results of your work depend on products and service from USB.

That perspective is part of our motivation to do the better job. To provide a complete range of Amino Acids (D,

L, DL Isomers and Derivatives), Peptides, Synthetic Biologically Active Peptides, BOC Amino Acids and CBZ Amino Acids with 100% reliability 100% of the time. Guaranteed. (All amino acid products must pass the most rigid quality standards before shipment.) And we'll always remain personally responsive to your requests for assistance, custom service, or simply for information.

In fact, for over 5000 biochemicals, we're the name to remember.



# USB

**We're part of the solution.**

**United States Biochemical Corporation**

P.O. Box 22400 • Cleveland, Ohio 44122  
800-321-9322 • Ohio and Canada call collect 216-663-0330

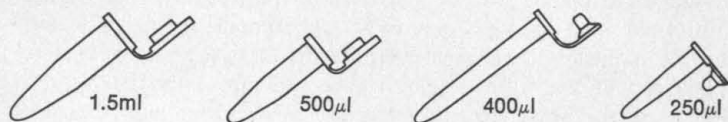
Circle No. 233 on Readers' Service Card



# 15,000 RPM (12,800xG) REGARDLESS OF LOAD

**With some micro centrifuges,  
constant speed is a constant problem,  
but not with an Eppendorf®.**

Within ten seconds, the Eppendorf 5412 attains 15,000 rpm, generating a force of 12,800xG, regardless of load. Performance like this means rapid sample separation, in most cases within 60 seconds or less. An angled rotor accommodates twelve disposable Eppendorf 1.5ml micro test tubes, or twelve 500 $\mu$ l, 400 $\mu$ l or 250 $\mu$ l tubes using adapters. (For higher capacity requirements, the Eppendorf Model 5413 accepts forty 1.5ml, 400 $\mu$ l or 250 $\mu$ l disposable test tubes in four carriers, but operates at lower speeds.) Eppendorf Micro Centrifuges are equipped with automatic 15 min. timer, safety switch (prevents operation with lid open) and safety lid lock (lid stays locked while rotor is spinning).



Eppendorf Micro Test Tubes have attached caps and are ideal for centrifuging, mixing, or storing reagents. Economically priced, they are available in the following sizes: polypropylene — 1.5ml, 500 $\mu$ l, 400 $\mu$ l; polyethylene — 400 $\mu$ l, 250 $\mu$ l.

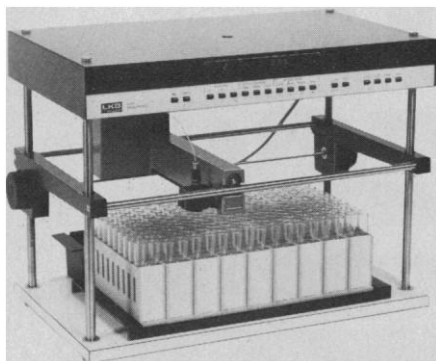
For complete literature, write: Eppendorf Division, Brinkmann Instruments, Inc., Cantiague Road, Westbury, N.Y. 11590.  
In Canada: Brinkmann Instruments (Canada), Ltd.



## Eppendorf Micro Centrifuges



# High, wise and handsome



## The MultiRac fraction collector

LKB's new MultiRac™ fraction collector is a real space saver. On the opposite page you can see that reservoir, column, pump, monitor and recorder all mount on it easily. And you can keep adding decks to take as much more equipment as you want.

The new LKB fraction collector is bright too. It will collect from microliters to liters, adjust fraction size automatically according to OD, stop all flow as the head traverses, and on command will channel all void volume to waste.

Its good looks go well beneath the surface: solid state electronics, rugged materials of construction and a clear, bright, unambiguous LED display all make for an instrument that's safe, dependable and easy to use.

Contact LKB today for full details.

# LKB

LKB Instruments Inc.  
12221 Parklawn Drive Rockville, MD 20852  
301: 881-2510 Telex: 8-9682

58A-311

Circle No. 180 on Readers' Service Card

## LETTERS

### Pontryagin's Article

In order that the readers of *Science* can assess correctly the reliability and veracity of the letter from Academician Pontryagin on page 1083 of the 14 September issue, they are invited to look at the third from the last paragraph of an autobiographical article by Pontryagin that has appeared in *Uspekhi Matematicheskikh Nauk* [33 (No. 6), (1978)]. A translation of this article, with a disclaimer and a rebuttal, will appear in *Russian Mathematical Surveys*, published by the London Mathematical Society, in November 1979.

ALEX ROSENBERG  
Department of Mathematics, Cornell  
University, Ithaca, New York 14853

### Treating Mental Disorders

Gina Bari Kolata reports (Research News, 5 Jan., p. 36) on the 1976 discovery by Wurtman and others that the rate at which the brain synthesizes acetylcholine can be increased by increasing the amount of choline in the blood and on the later observations that tardive dyskinesia, a side effect of antipsychotic drugs such as the phenothiazines and the butyrophenones, can be controlled by a high intake of choline or lecithin (which contains phosphatidylcholine). This article appears to indicate that the idea that dietary constituents can influence the functioning of the brain represents a new approach, discovered by Wurtman. In fact, there had been much earlier work in this field, which in recent years has been called orthomolecular psychiatry.

Kolata states that "It was thought that as long as the brain was supplied with oxygen and glucose it would make whatever it needed, independently of the metabolic and nutritional state of the body." It has, on the contrary, been known since long before 1976 that other exogenous constituents of the brain are required for its proper functioning and that, as I stated in my 1968 article (*Science*, vol. 160, p. 265), "Varying the concentrations of substances normally present in the human body may control mental disease." The most striking early work is that on the treatment of psychiatric patients with large doses of niacin, one of the B vitamins (1). A dozen other nutrients that affect brain function are also discussed in my 1968 article, which includes in addition a discussion of mechanisms such as increasing the rate of

formation of an important substance by increasing the concentration of a reactant. An example, not given in the article, is increasing the amount of the neurotransmitter acetylcholine by increasing the choline concentration.

I defined orthomolecular psychiatry therapy in 1968 as "the treatment of mental disease by the provision of the optimum molecular environment for the mind, especially the optimum concentrations of substances normally present in the human body." Wurtman has been quoted elsewhere as having said that the treatment of tardive dyskinesia by an increased intake of choline has nothing in common with orthomolecular psychiatry. It is clear, however, that it is a good example of orthomolecular psychiatry; especially interesting because the mechanism of its action is understood in greater detail than in the earlier examples.

LINUS PAULING  
Linus Pauling Institute of Science and  
Medicine, Menlo Park, California 94025

### References

1. V. P. Snyderstriker and H. M. Cleckly, *Am. J. Psychiatry* **99**, 83 (1941); A. Hoffer, H. Osmund, M. J. Callbeck, I. Kahan, *J. Clin. Exp. Psychopathol.* **18**, 131 (1957).

### Fetal Research Ethics

The 3 November 1978 issue of *Science* (p.540) contained another chapter in the long, unhappy history of the Philipson *et al.* fetal research study (1). This experiment led, at the state level, to criminal charges (eventually dismissed) of grave-robbing against the principal investigators, and, at the national level, to a scrutiny of fetal research that culminated in a research moratorium and creation of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research.

Throughout the debate on the Philipson *et al.* experiment, ethical questions concerning the fetal subjects of that research have preempted the attention of adversaries, advocates, and reporters like. Ethical questions concerning the maternal subjects of that research have not been raised but are just as important. Twenty-five of the 33 patient-subjects, 10 to 22 weeks pregnant, were aborted by hysterotomy (1). Hysterotomy is a major surgical procedure not normally used for abortion because it entails hospitalization, risk, discomfort, disfigurement, and because it precludes normal vaginal deliveries in future. From an investigator's point of view, however, hysterotomy as a method of



abortion has the advantage of yielding a live, intact fetus.

The doctrine of informed consent, originally put forth in the Nuremberg Code (2) and based on the principles of voluntariness, competence, and understanding, requires that the subject have sufficient knowledge and comprehension of the research "... to enable him to make an understanding and enlightened decision." This in turn requires disclosure of "... all inconveniences and hazards reasonably to be expected; and the effects upon his health or person which may possibly come from his participation in the experiments." Philipson *et al.* claim to have gotten informed consent from their subjects (1, p. 1219), but it is difficult to understand how 25 fully informed, competent people could have opted voluntarily to forego abortion by a simple, minimal risk procedure and submit instead to major surgery.

YVONNE BRACKBILL

*Departments of Psychology and  
Obstetrics and Gynecology, University  
of Florida, Gainesville 32611*

#### References

1. A. Philipson, L. D. Sabath, D. Charles. *N. Engl. J. Med.* **288**, 1219 (1973).
2. *Trials of War Criminals before the Nuernberg Military Tribunals under Control Council Law No. 10: Nuernberg; October, 1946-April, 1949* (Government Printing Office, Washington, D.C., 1949), vol. 2, pp. 181-182.

Brackbill raises an appropriate aspect of patient informed consent in human studies. We fully agree that informed consent is essential in human studies.

In the particular study to which she refers, there was no need for either an intact fetus or "viable" tissue. The method of abortion was selected by a number of different surgeons, in each case on the basis of what would be best for the patient under the circumstances. Although it is correct that the different operative techniques have different risks and consequences, those matters had nothing to do with this study, since the procedure in each instance was selected entirely for the patient's benefit. In fact, the patients were not even invited to participate in the study until after the operative plan had been made.

L. D. SABATH

*Section on Infectious Diseases,  
Box 489, University of Minnesota  
Hospitals, Minneapolis 55455*

AGNETA PHILIPSON

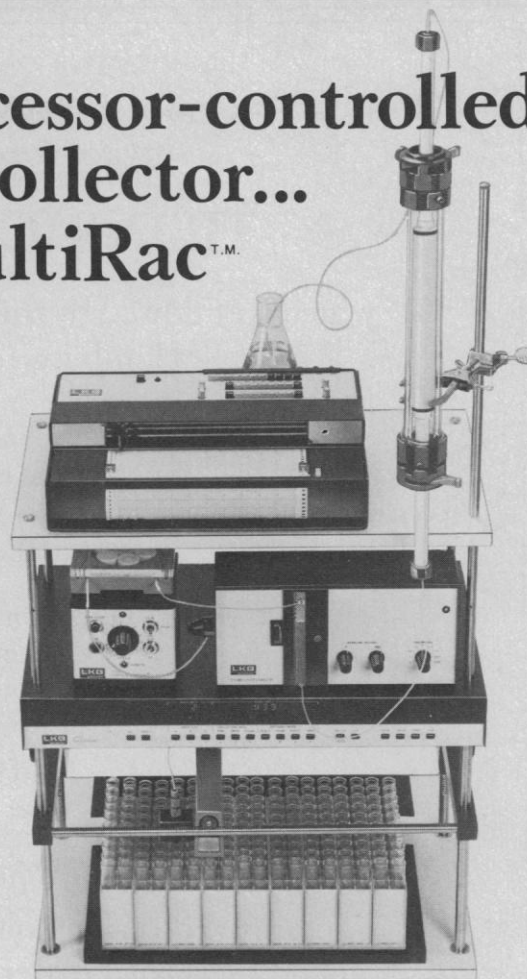
*Department of Infectious Diseases,  
Danderyd Hospital,  
S-182 03 Danderyd, Sweden*

DAVID CHARLES

*Department of Obstetrics and  
Gynecology, Memorial University,  
St. Johns, Newfoundland A1B 3V6*

26 OCTOBER 1979

# The first microprocessor-controlled fraction collector... LKB's MultiRac™



LKB's MultiRac fraction collector is unlike any other in versatility of function, reliability of operation and simplicity of use.

Just push a few buttons and you can program the unit to collect in any size vessel from test tubes to carboys — by time, drop or LKB's precise volume. The 250 msec switch-over between tubes minimizes dribbling and a "stop" feature can eliminate it entirely.

Microprocessor control conserves test tubes by diverting column void volume to a built-in waste container. Still more tubes are conserved by varying fraction sizes according to OD. During peak elution, small fractions are collected for optimal resolution... in the valleys, tubes are filled to capacity. You can start your run and leave for an early dinner, knowing that when you come back the next day, not a single tube will have been wasted.

Non-tipping spring-loaded racks accommodate everything from 8 mm test tubes to 28 mm scintillation vials to funnels feeding carboys. Racks fit in a tray that is removed in one easy movement.

Keeping wet operations below the circuitry and using tough, inert materials make the MultiRac safe and easy to use with all liquids, even aggressive solvents and radioactive solutions. Power interruptions are also tolerated — a memory retains data up to 16 hours. And in the unlikely event that something *should* go wrong, a self-diagnosis function helps you locate the problem.

*By the way — fraction collector, pump, column, monitor and recorder all occupy less than two square feet of bench space.*

## LKB

LKB Instruments Inc.

12221 Parklawn Drive Rockville, MD 20852

301: 881-2510 Telex: 8-9682

Circle No. 181 on Readers' Service Card

57A-310

In accordance with the provisions of the foundation, papers are herewith invited for 1980 in conjunction with the

## HEINRICH WIELAND PRIZE

which is endowed by the Margarine Institute for Health Nutrition, Hamburg, for the promotion of research.

The prize, named after Professor Dr. Heinrich Wieland, the Nobel Prize winner who died in 1957, is awarded annually and is offered for work on the chemistry, biochemistry and physiology of fats and lipids, as well as on their clinical importance and their significance in the physiology of nutrition.

The Heinrich Wieland Prize consists of a „Heinrich Wieland plaque” and the sum of 15,000 West German Marks.

The prize-winner will be selected by a Board of Trustees which consists at present of the following:

Prof. Dr. Karl-Heinz Bäßler, Mainz  
Prof. Dr. Wolfgang Gerok, Freiburg  
Prof. Dr. Rolf Grüttner, Hamburg  
Prof. Dr. Werner Heimann, Karlsruhe  
Prof. Dr. Dr. Konrad Lang, Bad Krozingen  
Prof. Dr. Dr. h.c. Gotthard Schettler, Heidelberg  
Prof. Dr. Dr. Wilhelm Stoffel, Köln  
Prof. Dr. Theodor Wieland, Heidelberg  
Prof. Dr. Viktor Wolf, Hamburg  
Prof. Dr. Nepomuk Zöllner, München

Persons eligible for the HEINRICH WIELAND PRIZE for 1980 are authors of unpublished scientific treatises or treatises published during the period from 1979 to 1980. Papers must be written in German, English or French. All Papers in English or French must be accompanied by a summary of about 3 pages in German. Treatises that have already been awarded some other prize for scientific work are not eligible.

The closing date for sending in Papers for the 1980 award is 1st March, 1980.

A single copy of the Paper must be sent by this date to the following address:

**Board of Trustees for the Award of the Heinrich Wieland Prize**

Prof. Dr. Alfons Fricker, Ringelberghohl 12, 7500 Karlsruhe 41, West Germany.

The presentation of this year's prize will take place at 10.30 a.m. on 12th October, 1979 in the Adolf-von-Baeyer Lecture Hall of the University of Munich, which is located in Meiserstrasse.



# 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

1979: E. PETER GEIDUSCHEK, WARD GOODENOUGH, N. BRUCE HANNAY, MARTIN J. KLEIN, FRANKLIN A. LONG, NEAL E. MILLER, JEFFREY J. WINE  
1980: RICHARD E. BALZHISER, WALLACE S. BROECKER, CLEMENT L. MARKERT, FRANK W. PUTNAM, BRYANT W. ROSSITER, VERA C. RUBIN, MAXINE F. SINGER, PAUL E. WAGGONER, F. KARL WILLENBROCK

## Publisher

WILLIAM D. CAREY

## Editor

PHILIP H. ABELSON

## Editorial Staff

**Managing Editor** ROBERT V. ORMES  
**Assistant Managing Editor** JOHN E. RINGLE  
**News Editor** BARBARA J. CULLITON  
**News and Comment** WILLIAM J. BROAD, LUTHER J. CARTER, CONSTANCE HOLDEN, ELIOT MARSHALL, DEBORAH SHAPLEY, R. JEFFREY SMITH, NICHOLAS WADE, JOHN WALSH. **Editorial Assistant**, SCHERRAINE MACK  
**Research News**: BEVERLY KARPLUS HARTLINE, FREDERICK F. HARTLINE, RICHARD A. KERR, GINA BARI KOLATA, JEAN L. MARX, THOMAS H. MAUGH II, ARTHUR L. ROBINSON. **Editorial Assistant**, FANNIE GROOM  
**Consulting Editor**: ALLEN L. HAMMOND  
**Associate Editors**: ELEANORE BUTZ, MARY DORFMAN, SYLVIA EBERHART, RUTH KULSTAD  
**Assistant Editors**: CAITILIN GORDON, LOIS SCHMITT  
**Book Reviews**: KATHERINE LIVINGSTON, **Editor**: LINDA HEISERMAN, JANET KEGG  
**Letters**: CHRISTINE KARLIK  
**Copy Editors**: ISABELLA BOULDIN, STEPHEN KEPPEL  
**Production**: NANCY HARTNAGEL, JOHN BAKER; YA LI SWIGART, HOLLY BISHOP, ELEANOR WARNER, MARY MCDANIEL, 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 Editor**: JACK R. ALSIP  
**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 xi, *Science*, 28 September 1979.  
**BUSINESS CORRESPONDENCE**: Area Code 202. Membership and Subscriptions: 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.

# Performance Evaluation of Academic Research

Congressmen and administrators are responsible for seeing to it that government R & D funds are spent effectively and that misuse does not occur. Since it is not possible for them to judge the value of the output of scientific research, they have tended to emphasize what they can understand, namely monetary accountability for funds.

Performance measurement in research, even by experts, is difficult and controversial. The difficulty in evaluating performance in federally supported R & D has led, step by step, to the present unsatisfactory state of effort reporting. Although it is easy now to see that things are not right, no consensus has developed on how to correct them.

Three classes of evaluation instruments exist for measuring the effectiveness of research, namely effort planning, indirect performance measures such as the citation index, and direct performance evaluation. For those who have not had their fill of effort reporting, the new federal regulations contained in Office of Management and Budget Circular A-110 provide a surfeit.

Effort reporting is fundamentally flawed as an instrument for measuring either the quality or the quantity of research. What reputable academic scientist would permit students to count hours spent in the classroom or used in attempts to do assignments as an indication of readiness for a degree? What scientist, when refereeing a journal paper or an NSF research proposal, cares how many hours it took to do the research or to prepare the document? Only performance should count in scientific research.

Undoubtedly, there is resistance in the research community to the concept of direct evaluation of the quality of research. Such a suggestion may raise the spectre of a corps of federal bureaucrats who evaluate research results and control funding. But this is highly unlikely. There is ample evidence that peer evaluation is a practical and effective basis for continued funding. The peer review process would permit disassembly of the costly government bureaucracy that deals with effort reporting and a reduction in the indirect cost (overhead) now added by universities to contracts.

Peer review is not only fair and in the best tradition of science, but it has several ancillary benefits. Membership on a review board serves to keep members in touch with current trends and with promising young scientists. One of the problems recognized by NSF is that investigators sometimes pay insufficient attention to final reporting requirements. If the investigators know that reports will be evaluated by a panel of their peers, with a view toward continued funding, final report quality will immediately improve.

Since this concept is an obvious extension of current best practice and apparently has few, if any, drawbacks, why has it not been tried? The answer is that it has, and it works very well. In the 1960's, the Department of Defense initiated an electronics research program with about a dozen outstanding university electrical engineering departments. Each principal investigator participated in site visits to the other grantees to evaluate progress and to recommend on renewal. On the average, four 2-day visits would take place in a year. During these visits, graduate students and postdoctorals were encouraged to make their own presentations, and the sharp grilling that followed was more challenging than many Ph.D. orals. This keen honing improved the quality of electronics research throughout the nation. The 3-year, step-funded grants and the lack of programmatic restrictions made the program very attractive, and applications for admission mounted.

Why is this program not functioning today? All parties were satisfied with its cost effectiveness, and undoubtedly it would have been expanded and utilized in other Defense Department research programs, but in 1969 the Mansfield amendment forbade the defense agencies to support basic research, and the program had to be discontinued.—JOHN E. GIBSON, *Commonwealth Professor and Dean, School of Engineering and Applied Science, University of Virginia, Charlottesville 22901*

# Click-set and pipette 44.7 $\mu$ l



## ...or any volume from 2.0 to 1,000 $\mu$ l.

**Three new, continuously adjustable Eppendorf® Digital Pipettes let you set any desired volume with precision.**

These new continuously adjustable pipettes by Eppendorf feature digital readout to indicate the set volume. To change the setting, simply twist the control button until the desired volume appears. Incorrect adjustment is virtually impossible; with every twist of the control button, a unique ratchet mechanism clicks the changed volume precisely into place.

Unlike pipettes with micrometer adjustments and hairline volume settings, Eppendorf Digital Pipettes assure

consistently accurate and reproducible volumes time after time. Practically the same size as our single-volume models, these new pipettes retain all the operating conveniences for which Eppendorf is famous. A finger rest at the top provides positive support during use and keeps the pipette from rolling on flat surfaces. All operations, including tip ejection, are controlled by a single button and without changing grip position.


Eppendorf Digital Pipettes with built-in tip ejector are available in three

models: 2-10 $\mu$ l (contin. adjustable in steps of 0.1 $\mu$ l); 10-100 $\mu$ l (contin. adjustable in steps of 0.1 $\mu$ l); and 100-1,000 $\mu$ l (contin. adjustable in steps of 1.0 $\mu$ l). For literature, write: Brinkmann Instruments, Inc., Subsidiary of Sybron Corporation, Cantiague Road, Westbury, N.Y. 11590. In Canada: Brinkmann Instruments (Canada), Ltd.

## Eppendorf Digital Pipettes

**SYBRON | Brinkmann**

Circle No. 74 on Readers' Service Card



**... with  
tip ejector,  
of course!**



You need **P-L**  
to make your lab  
**COMPLETE**

That's right, your lab just isn't complete without the new, expanded Catalog 106 from P-L Biochemicals.

Catalog 106 will provide you with direct access to the quality biochemicals you need; biochemical reagents for nearly every facet of life sciences research.

Find out today how P-L can help make your lab complete with products and information from Catalog 106.

Write or call  
for your free copy.

excellence in biochemistry



**P-L biochemicals, inc.**

1037 WEST MCKINLEY AVENUE, MILWAUKEE, WIS. 53205

® Call 414/347-7442 TWX 910-262-1111

Circle No. 234 on Readers' Service Card

**aa  
as**

## Aging from Birth to Death

Interdisciplinary Perspectives

edited by Matilda White Riley



Reviews existing knowledge in the field of aging, identifies interrelated social, biological, and psychological events affecting the aging process, and seeks convergences among disciplines.

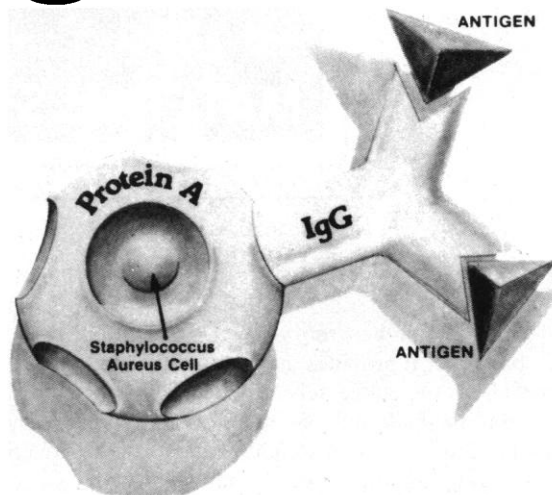
**AAAS Selected Symposium 30**  
196 pages • \$16

**Westview Press**

5500 Central Avenue • Boulder, Colorado 80301  
Frederick A. Praeger, Publisher

26 OCTOBER 1979

# IgGSORB



## The New IgG Adsorbing Agent

- 1 minute incubation
- separates antibody-antigen complex from free antigen
- eliminates double antibody
- highly specific for IgG
- separates IgG from crude mixture
- lyophilized
- long term storage life

**IgGsorb**, the new IgG Adsorbing Agent from the enzyme center inc., simplifies the separation of antibody-complexed antigen from free antigen — eliminates double antibody procedures and reduces incubation time from several hours to minutes. IgGsorb is Protein A, fixed to the walls of inactivated, lyophilized staphylococcus aureus cells. It specifically binds the FC portion of IgG antibody, separating it from the solution and eliminating long incubations where double antibody processes are usually required.

**IgGsorb** is particularly useful in performing IgG purification and separation of antibody complexes from uncomplexed antigen. IgGsorb binds rapidly within one minute and separates easily by centrifugation or filtration. With a long storage life, IgGsorb has almost universal use and in some cases can replace charcoal and other cumbersome separation methods.

### ORDER DIRECT

Order Code: IGSL

(reconstitutes to a 10% cell suspension)

100ml vial \$ 80.00

Ten—10ml vials \$115.00

One—10ml vial \$ 19.00



**the enzyme  
center inc.**

33 Harrison Avenue • Boston, MA 02111

Tel. (617) 482-7123

Circle No. 201 on Readers' Service Card

485



## PRODUCTS and MATERIALS

### Infrared Dryer

The LP15 is an accessory for top-loading balances. It provides information on dry weights or, conversely, on moisture content of materials. Samples are evenly distributed in lightweight pans. After determining the exact sample weight, the operator closes the hood and selects from among 12 reproducible heating intensities. When the sample is dried, the balance indicates the dry weight. When used with the manufacturer's balances and an application input device, many calculations may be performed automatically. Mettler Instrument. Circle 766.

### Water Chemistry Meter

The model 341 Universal Meter measures pH, temperature, conductivity, dissolved oxygen, and redox potential in the field with a single probe. The probe contains five sensors and a stirrer mounted in a watertight housing. The housing may be lowered to depths of up to 7 meters. Five parameters are sequentially measured by flipping a selector. In the laboratory, the meter may be used with separate electrodes. Temperature compensation is automatic. Eco. Circle 767.

### Controller for HPLC

A microprocessor-based controller, designated SLIC-1400, automates high-performance liquid chromatography. It is operated by a keyboard which is coded for functions and by a programmed cas-

sette. Parameters such as rate of flow, solvent gradient, time and duration of sample injection, and the operation of detectors, waste valve, and fraction collectors are controlled and monitored. The memory comprises 1000 steps with ability to control four variable outputs and to switch up to 40 external devices on and off. At the same time up to 32 external signals may be evaluated. Sys-Tec. Circle 768.

### Cell Disrupter

The Bead-Beater utilizes a Teflon rotor to drive minute glass beads at high speeds. The device homogenizes unicellular organisms completely in 2 to 3 minutes without foaming. Samples containing up to 20 grams (dry weight) of biomass are homogenized and their enzymes and organelles are available for further study. The device is powered by a 0.43 horsepower motor and furnished with a supply of reusable lead-free glass beads. Biospec Products. Circle 771.

### Atomic Absorption Spectrophotometer

Model 4000 offers high energy throughput, double-beam background correction, and a resolution of 0.3 nanometer in the ultraviolet range. Mode of operation, wavelength, use of background correction, and data processing are controlled by a microcomputer. Up to six sets of analytic conditions may be stored. A full complement of accessories is available. Perkin-Elmer, Instrument Division. Circle 772.

### Glassware Washer

This device has a solid-state control panel that activates six washing cycles including a rinse with distilled water. A heavy-duty 0.5-horsepower motor provides sufficient water pressure to ensure complete washing and rinsing without

breakage. There is an integral 1100-watt blower-dryer and a 750-watt heater for drying. The device is manufactured in undercounter, freestanding, or mobile models, all of which are front-loading. A variety of accessory racks is available in addition to two standard forms that accommodate the most frequently used type of laboratory ware. Labconco. Circle 769.

### Electrophoresis-Electrofocusing Cell

Model 1415 flat-bed cell is the basis of five systems for high-resolution analytical and preparative electrofocusing, immunoelectrophoresis, zone electrophoresis, and preparative DNA separation. The cell features a cooling platform 125 by 430 millimeters and a condensation-control coil that keeps moisture off the lid and gels. There are dual electrode jacks so that the operator may run two electrofocusing processes at once. The platinum ribbon electrofocusing electrodes are detachable and adjustable and they are available in two sizes. The electrodes are built into removable buffer chambers for ease of operation. Bio-Rad Laboratories. Circle 770.

### Literature

*Water Purification* features systems for the production of pure water for medical, electronics, research, and industrial uses. Vaponics. Circle 761.

*Temperature Handbook* lists instrumentation and techniques of thermal measurement with applications and specifications. Nanmac. Circle 763.

*Histology* describes the Tissue-Tek III Vacuum Infiltration Processor which automates complete tissue processing with a fluid-exchange principle. Lab-Tek Division, Miles Laboratories. Circle 773.

*Polyaromatic Hydrocarbons* is devoted to a new means of determining these substances by photoionization. HNu Systems. Circle 774.

*Chromatography and Electrophoresis* is a catalog of instruments, reagents, teaching aids, and much more. Shandon Southern Instruments. Circle 775.

*Fluorescence UV/Visible Analytical Instrumentation* describes a complete line of spectrophotometers, data processors, pressure cells, and others. American Instrument. Circle 778.

*HPLC Columns* are shipped with assurance chromatograms to document their effectiveness. A brochure describes these custom-packed components. Alltech Associates. Circle 779.

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 Reader Service Card (on pages 406A and 486G) and placing it in the mailbox. Postage is free.

—RICHARD G. SOMMER



## Newest Ligands

### Dopaminergic agonists

**Propylnorapomorphine, N**-[propyl-<sup>3</sup>H(N)]- NET-619

**ADTN**, [5,8-<sup>3</sup>H]- (2-amino-6,7-dihydroxy-1,2,3,4-tetrahydronaphthalene) NET-620

**Apomorphine**, [8,9-<sup>3</sup>H]- NET-611

### Post-synaptic GABA receptor agonist

**Isoguvacine hydrochloride**, [<sup>3</sup>H]- NET-624

### Neuroexcitant

**Methyl-D-aspartic acid, N**-[methyl-<sup>3</sup>H]- NET-628

Also

**Phencyclidine**, [piperidyl-3,4-<sup>3</sup>H(N)]- NET-630

Not for use in humans or clinical diagnosis.



**New England Nuclear**

549 Albany Street, Boston, Mass. 02118

Call toll-free: 800-225-1572

(In Massachusetts and International: 617-482-9595)

NEN Chemicals GmbH, Dreieich, W. Germany; NEN Canada Ltd., Lachine, Quebec

Circle No. 142 on Readers' Service Card



## Control High Pressure With Confidence

K-LINE valves offer outstanding reliability and performance under pressures to 60,000 psi, plus low maintenance and exclusive design features that extend seat and stem life. All this at a price that compares favorably to that of ordinary high pressure valves.

K-LINE valves are quality built and engineered to withstand high-cycle operation. Each valve is rigidly tested before shipment.

### CHECK THESE FEATURES:

- Non-rotating, ball bearing stem
- High strength, corrosion-resistant body
- Double weep holes for pressure venting, leak detection
- Rolled threads resist galling
- Minimum backlash, positive operating fuel

Write for Bulletin PD-220



**PRESSURE PRODUCTS INDUSTRIES**  
Warminster, Pennsylvania 18974  
Division of The Duriron Company, Inc.



Circle No. 231 on Readers' Service Card

## Scientists: How do you handle pipetting small volumes?

### With Positive Displacement SMI MICRO/PETTORs®

- SMI MICRO/PETTORs eliminate air blow-out (Pipetman™, Eppendorf etc.) worries.
- SMI MICRO/PETTORs dispense 1 µl to 10ml with ±1% reproducibility.

Call or write for more information.

**smi**® **scientific  
manufacturing  
industries inc.**

800 University Ave., Berkeley, CA 94710

Call toll free (800) 227-0650, (In California) call (800) 772-3937  
or (415) 548-8000. SMI holds Patent Nos. 3815790 and 4098125.



# Do the better labs use the OSMETTE<sup>®</sup>



Results from national proficiency tests show that laboratories using the OSMETTE consistently get better precision on more of the specimens than all the other instruments combined. A recently published study<sup>1</sup> shows the OSMETTE laboratories had the best S.D. on 10 of 12 specimens, and best C.V. on 11 of 12 (one other instrument had equal C.V. on 3 specimens). Such remarkable inter-lab precision must reflect OSMETTE's inherent characteristics, including precision, long term stability, and ease of calibration.

We urge you to check the survey results yourself. Then if you note that a freezing point measurement, as made by the OSMETTE, is the only way to avoid missing the effect of alcohol and other volatiles on concentration<sup>2,3</sup>, we think you will agree—the OSMETTE is the right osmometer for your laboratory.

Write today for full details, or to arrange a demonstration—you will be pleased to find the OSMETTE is the fastest, simplest, most dependable, and most *economical* osmometer available.

**PRECISION SYSTEMS, INC.**  
60 Union Avenue, Sudbury, Mass. 01776  
Telephone: 617-443-8912

<sup>1</sup> Juel, R., Serum Osmolality, *AJCP* July 1977 (165-169).

<sup>2</sup> Rocco, R.M., Letter, *Clin Chem* 22: No. 3, 1976, p. 399.

<sup>3</sup> Champion, H.R. et al., Alcohol Intoxication and Serum Osmolality, *The Lancet* June 28, 1975 (1402-1404).

Circle No. 190 on Readers' Service Card

## BOOKS RECEIVED

(Continued from page 442)

**The Fishes of Illinois.** Philip W. Smith. Published for the Illinois State Natural History Survey by University of Illinois Press, Urbana, 1979. xxx, 314 pp., illus. + plates. \$20.

**Flame-Retardant Polymeric Materials.** Vol. 2. Menachem Lewin, S. M. Atlas, and Eli M. Pearce, Eds. Plenum, New York, 1978. xii, 334 pp., illus. \$35.

**Food, Climate, and Man.** Margaret R. Biswas and Asit K. Biswas, Eds. Wiley-Interscience, New York, 1979. xxvi, 286 pp., illus. \$24.95. Environment Science and Technology.

**The Ford Foundation at Work.** Philanthropic Choices, Methods, and Styles. Richard Magat. Plenum, New York, 1979. 208 pp. + plates. \$14.95.

**Formshaping Movements in Neurogenesis.** Papers from a symposium, Uppsala, Sweden, Sept. 1977. Carl-Olof Jacobson and Ted Ebendal, Eds. Almqvist & Wiksell, Stockholm, 1978. 258 pp., illus. Sw.kr. 180. Also published as *Zoon* 6 (1978).

**From Idea to Application.** Some Selected Nuclear Techniques in Research and Development. Proceedings of a meeting, San José, Costa Rica, May 1977. International Atomic Energy Agency, Vienna, 1978 (U.S. distributor, Unipub, New York). viii, 304 pp., illus. Paper, \$23. Panel Proceedings Series.

**Introduction to Bioinstrumentation.** With Biological, Environmental, and Medical Applications. Clifford D. Ferris. Humana Press, Clifton, N.J., 1978. xiv, 330 pp., illus. Cloth, \$29.50; paper, \$14.50.

**Introduction to Chemistry.** T. R. Dickson. Wiley, New York, ed. 3, 1979. xiv, 466 pp., illus. \$15.95.

**Introduction to Marine Pollution Control.** Jerome Williams. Wiley-Interscience, New York, 1979. xvi, 174 pp., illus. \$21.95. Ocean Engineering.

**Investigations into Lead from Motor Vehicles.** A. C. Chamberlain and 5 others. AERE Harwell, Oxfordshire, England, 1979 (available from H. M. Stationery Office, London). 152 pp., illus. Paper, £3.50. AERE-R 9198.

**The Kinetics of Simple Models in the Theory of Oscillations.** N. G. Basov, Ed. Translated from the Russian edition (Moscow, 1976) by Donald H. McNeill. Consultants Bureau (Plenum), New York, 1978. viii, 208 pp., illus. \$42.50. The Lebedev Physics Institute Series, vol. 90.

**Language Development and Intervention with the Hearing Impaired.** Richard R. Kretschmer, Jr., and Laura W. Kretschmer with contribution by Roberta R. Truax. University Park Press, Baltimore, 1978. xvi, 358 pp. \$16.50. Perspectives in Audiology Series.

**Language Shift.** Social Determinants of Linguistic Change in Bilingual Austria. Susan Gal. Academic Press, New York, 1979. xiv, 204 pp., illus. \$16.50. Language, Thought, and Culture.

**Late Biological Effects of Ionizing Radiation.** Proceedings of a symposium, Vienna, Mar. 1978. Vol. 1. International Atomic Energy Agency, Vienna, 1978 (U.S. distributor, Unipub, New York). xii, 550 pp., illus. Paper, \$44. Proceedings Series.

**Laws of Form.** C. Spencer-Brown. Dutton, New York, 1979. xxxii, 144 pp., illus. Paper, \$4.95. Reprint of the 1972 edition.

**Learning Systems.** Decision, Simulation, and Control. Yousri M. El-Fattah and Claude Foulard. Springer-Verlag, New York, 1978.

viii, 120 pp., illus. Paper, \$9. Lecture Notes in Control and Information Sciences, vol. 9.

**Life in Organizations.** Workplaces as People Experience Them. Rosabeth Moss Kanter and Barry A. Stein, Eds. Basic, New York, 1979. xvi, 444 pp. Cloth, \$17.50; paper, \$6.95.

**Life on Mars.** David L. Chandler. Dutton, New York, 1979. xii, 212 pp., illus. \$9.95.

**Life Strategies, Human Evolution, Environmental Design.** Toward a Biological Theory of Health. Valerius Geist. Springer-Verlag, New York, 1978. xxii, 500 pp., illus. \$29.80.

**Lithium.** Needs and Resources. Proceedings of a symposium, Corning, N.Y., Oct. 1977. S. S. Penner, Ed. Pergamon, New York, 1979. vi + pp. 235-418, illus. \$25. Originally published as special issue of *Energy*, vol. 3, No. 3.

**Long-Term Studies on Side-Effects of Contraception.** State and Planning. Papers from a symposium, Munich, Sept. 1977. Ursula Kellhammer and Karl Überla, Eds. Springer-Verlag, New York, 1978. vi, 240 pp., illus. Paper, \$12.50. Lecture Notes on Medical Informatics, vol. 3.

**Luminescence Spectroscopy.** Michael D. Lumb, Ed. Academic Press, New York, 1978. xii, 376 pp., illus. \$49.75.

**Lymphocyte Hybridomas.** Papers from a workshop, Bethesda, Md., Apr. 1978. F. Melchers, M. Potter, and N. Warner, Eds. Springer-Verlag, New York, 1978. xxiv, 248 pp., illus. \$26.40. Current Topics in Microbiology and Immunology, 81.

**Measure Theory Applications to Stochastic Analysis.** Proceedings of a conference, Oberwolfach, Germany, July 1977. G. Kallianpur and D. Kölzow, Eds. Springer-Verlag, New York, 1978. xii, 262 pp. Paper, \$14.30. Lecture Notes in Mathematics, vol. 695.

**The Menarini Series on Immunopathology.** Vol. 1. Papers from a symposium, Cremona, Italy, June 1977. Peter A. Miescher, L. Bolis, S. Gorini, T. A. Lambo, G. J. V. Nossal, and G. Torigiani, Eds. Springer-Verlag, New York, 1978. 340 pp., illus. Paper, \$44.80.

**The Metal Non-metal Transition in Disordered Systems.** Proceedings of a summer school, St. Andrews, Scotland, Aug. 1978. L. R. Friedman and D. P. Tunstall, Eds. Scottish Universities Summer School in Physics, Edinburgh University Physics Department, Edinburgh, 1978. xx, 510 pp., illus. \$30.

**Methods in Microbiology.** Vol. 10. T. Bergan and J. R. Norris, Eds. Academic Press, New York, 1978. xvi, 386 pp. \$36.75.

**Modeling, Estimation, and Their Applications for Distributed Parameter Systems.** Y. Sawaragi, T. Soeda, and S. Omatu. Springer-Verlag, New York, 1978. vi, 270 pp. Paper, \$14.30. Lecture Notes in Control and Information Sciences, vol. 11.

**NETL.** A System for Representing and Using Real-World Knowledge. Scott E. Fahlman. MIT Press, Cambridge, Mass., 1978. x, 278 pp., illus. + index. \$17.50. MIT Press Series in Artificial Intelligence.

**Neural Mechanisms in Cardiac Arrhythmias.** Peter J. Schwartz, Arthur M. Brown, Alberto Malliani, and Alberto Zanchetti, Eds. Raven, New York, 1978. xviii, 442 pp., illus. \$35. Perspectives in Cardiovascular Research, vol. 2.

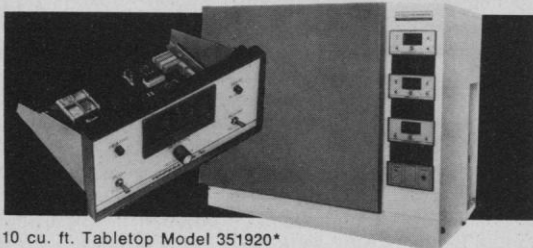
**The Neurobiologic Mechanisms in Manipulative Therapy.** Proceedings of a workshop, East Lansing, Mich., Oct. 1977. Irvin M. Korr, Ed. Plenum, New York, 1978. xxii, 466 pp., illus. \$25.

**Neurotoxicology of Insecticides and Pheromones.** Proceedings of a symposium, Ana-



# multi-mode!

the 100% solid state automatic CO<sub>2</sub> incubators with built-in reliability



10 cu. ft. Tabletop Model 351920\*

The first and only, all-solid-state control system ever developed for incubators.

#### Outstanding features of Hotpack Model 351920

- constant digital display of ALL conditions
- direct dial set points
- choice of 20 to 60C, or 5 above ambient to 60C models
- automatic two-stage 0 to 20% CO<sub>2</sub> control
- fully proportional RH with  $\pm 0.1\%$  resolution
- electronically timed self-decontamination
- up to 87.5 sq. ft. of usable load area



a Heinicke Company

H-149

HOTPACK CORPORATION (215) 824-1700 WATS 800-523-3608  
10940 DUTTON RD. PHILADELPHIA, PA 19154

Circle No. 176 on Readers' Service Card

## INTRODUCE "STATE OF THE ART" MOLECULAR BIOLOGY TO YOUR STUDENTS

### BRL CONCEPT™ I Restriction Endonucleases

Write or Call for full information!

**BRL**

**Bethesda Research Laboratories, Inc.**

411 North Stonestreet Avenue, Rockville, MD 20850  
(301) 340-0448 in Maryland • Toll Free (800) 638-8992  
Telex 440582 BRL XUI

**"THE MOLECULAR BIOLOGY COMPANY"**

Circle No. 213 on Readers' Service Card

# Announcing the New AAAS Science Cover Calendar for 1980

On July 3, 1880, the first issue of *Science* magazine rolled off the presses.

AAAS is proud to commemorate this 100th anniversary with the publication of our annual 12" x 36" wall calendar of *Science* covers.

In addition to 14 striking full-color reproductions of covers from *Science* magazine, the calendar provides birth dates of notable contributors to scientific thought; dates for AAAS meetings, symposia and conferences; legal holidays; AAAS membership information; and large blocks for making notations.

Celebrate the *Science* centennial with us by ordering your **1980 Science Cover Calendar** today.

Please send me \_\_\_\_\_ copy(ies) of the **1980 Science Cover Calendar** at \$3.95 (\$3.25 for AAAS members) per calendar, check or money order enclosed.

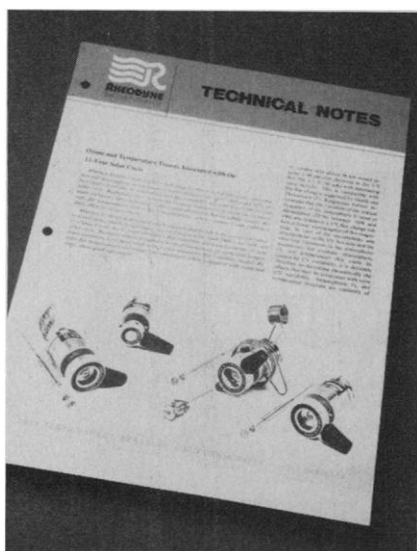
Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

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

Calendars will be shipped in November. Please allow 4-6 weeks for delivery. AAAS Calendar, 1515 Massachusetts Avenue, NW, Washington, DC 20005.



# How sample injectors affect LC accuracy.

**Free report tells how to improve precision by choice of injection technique.**

This 8-page Rheodyne technical note reports the results of experiments using different sample loading techniques — and discusses the distinctive characteristics of eight popular injectors. Among the questions answered are:

- What analytical precision can be expected in HPLC?
- Which injection techniques provide the highest reproducibility?
- What role is played by variations in flow rate, solvent composition and temperature?
- How can volumetric errors of injectors be avoided?

The report covers sample injectors from various manufacturers. It contains practical advice on the use of injectors for the novice — as well as for the experienced chromatographer.

## Send for Tech Note #1

To get your free copy promptly, contact Rheodyne, Inc., 2809 Tenth St., Berkeley, Calif. 94710. Phone (415) 548-5374.



heim, Calif., Mar. 1978. Toshio Narahashi, Ed. Plenum, New York, 1979. viii, 308 pp., illus. \$29.50.

**The New Religions of Africa.** Bennetta Jules-Rosette, Ed. Ablex Publishing Corporation, Norwood, N.J., 1979. xxiv, 248 pp. \$19.95. Modern Sociology.

**Nonsmooth Optimization.** Proceedings of a workshop, Mar. 1977. Claude Lemarechal and Robert Mifflin, Eds. Pergamon, New York, 1979. viii, 186 pp. \$25. IASA Proceedings Series, vol. 3.

**The Ocean Basins and Margins.** Vol. 4B, The Western Mediterranean. Alan E. M. Nairn, William H. Kanes, and Francis G. Stehli, Eds. Plenum, New York, 1978. xiv, 448 pp., illus. + plates. \$49.50.

**On Neuroses.** Paul Schilder. Lauretta Bender, Ed. International Universities Press, New York, 1979. x, 388 pp. \$22.50.

**Opus 200.** Isaac Asimov. Houghton Mifflin, Boston, 1979. xiv, 330 pp. \$10.95.

**Perception.** The World Transformed. Lloyd Kaufman. Oxford University Press, New York, 1979. xii, 416 pp., illus. \$19.95.

**Percutaneous Vascular Recanalization.** Technique, Application, Clinical Results. E. Zeitler, A. Grüntzig, and W. Schoop, Eds. Springer-Verlag, New York, 1978. xii, 206 pp., illus. Paper. \$31.90.

**Plant Species and Plant Communities.** Proceedings of a symposium, Nijmegen, The Netherlands, Nov. 1976. Eddy van der Maarel and Marinus J. A. Werger, Eds. Junk, The Hague, 1978 (U.S. distributor, Kluwer Boston, Hingham, Mass.). x, 178 pp., illus. Paper, \$36.85.

**Pre-Columbian Shell Engravings from the Craig Mound at Spiro, Oklahoma.** Part 1. Philip Phillips and James A. Brown with the collaboration of Eliza McFadden, Barbara C. Page, and Jeffrey P. Brain. Peabody Museum Press, Harvard University, Cambridge, Mass., 1978. xvi, 514 pp., illus. Paper, \$25.

**Proceedings of the 1978 CERN School of Physics.** Austerlitz-Zeist, The Netherlands, June 1978. CERN, Geneva, 1978. x, 124 pp., illus. Paper. CERN 78-10.

**Proceedings of the 1978 CERN School of Computing.** Jadwisin, Poland, May 1978. CERN, Geneva, 1978. x, 236 pp., illus. Paper. CERN 78-13.

**Sensory Ecology.** Review and Perspectives. Papers from a NATO Advanced Study Institute, Lennoxville, Quebec, Canada, July 1977. M. A. Ali, Ed. Plenum, New York, 1978. x, 598 pp., illus. \$49.50. NATO Advanced Study Institutes Series A, vol. 18.

**Sensory Systems of Primates.** Charles R. Noback, Ed. Plenum, New York, 1978. xiv, 208 pp., illus. \$25. Advances in Primatology.

**A Simple Non-Euclidean Geometry and Its Physical Basis.** An Elementary Account of Galilean Geometry and the Galilean Principle of Relativity. Translated from the Russian edition (Moscow, 1969) by Abe Shenitzer. Springer-Verlag, New York, 1979. xviii, 310 pp., illus. Paper, \$19.80. Heidelberg Science Library.

**Social Development.** The Origins and Plasticity of Interchanges. Robert B. Cairns. Freeman, San Francisco, 1979. xiv, 438 pp., illus. \$15. A Series of Books in Psychology.

**The Solar System.** John A. Wood. Prentice-Hall, Englewood Cliffs, N.J., 1979. x, 196 pp., illus. Cloth, \$10.95; paper, \$6.95. The Prentice-Hall Foundations of Earth Science Series.

316 pp., illus. Cloth, \$16; paper, \$8.50. Reprint of *New Sources of Energy*, vol. 5.

**The Solid State.** An Introduction to the Physics of Crystals for Students of Physics, Materials Science, and Engineering. H. M. Rosenberg. Clarendon (Oxford University Press), New York, ed. 2, 1978. x, 276 pp., illus. Cloth, \$14.50; paper, \$7.95. Oxford Physics Series.

**Statistical Analysis.** A Computer Oriented Approach. A. A. Afifi and S. P. Azen. Academic Press, New York, ed. 2, 1979. xx, 442 pp., illus. \$19.50.

**Statistical Methods in Sonar.** V. V. Ol'shevskii. Translated from the Russian edition (Leningrad, 1973). David Middleton, Technical Ed. Consultants Bureau (Plenum), New York, 1978. xx, 242 pp. \$45. Studies in Soviet Science.

**Surveillance of Environmental Pollution and Resources by Electromagnetic Waves.** Proceedings of a NATO Advanced Study Institute, Spåtind, Norway, Apr. 1978. Terje Lund, Ed. Reidel, Boston, 1978. xx, 402 pp., illus. \$39. NATO Advanced Study Institutes Series C, vol. 45.

**The Swedish Academic Marketplace.** The Case of Science and Technology. Göran Jense. University of Lund Department of Sociology, Lund, Sweden, 1979. iv, 242 pp., illus. Paper.

**Technics and Praxis.** Don Ihde. Reidel, Boston, 1979. xxviii, 152 pp. Cloth, \$21.95; paper, \$8.50. Boston Studies in the Philosophy of Science, vol. 24.

**Techniques for the Study of Mixed Populations.** Papers from a meeting, Weybridge, Surrey, England, Oct. 1975. D. W. Lovelock and R. Davies, Eds. Academic Press, New York, 1978. xii, 228 pp., illus. \$25.75. The Society for Applied Bacteriology Technical Series No. 11.

**Time Lags in Biological Models.** Norman MacDonald. Springer-Verlag, New York, 1978. viii, 112 pp., illus. Paper, \$9. Lecture Notes in Biomathematics, vol. 27.

**Topics in Algebra.** Proceedings of an institute, Canberra, Australia, Jan. 1978. M. F. Newman, Ed. Springer-Verlag, New York, 1978. xii, 230 pp. Paper, \$12.50. Lecture Notes in Mathematics, vol. 697.

**Toxicity of Heavy Metals in the Environment.** Part 2. Frederick W. Oehme, Ed. Dekker, New York, 1979. xii pp. + pp. 517-970, illus. \$45. Hazardous and Toxic Substances, 2.

**Transport across Multi-Membrane Systems.** G. Giebisch, Ed. Springer-Verlag, New York, 1978. xviii, 462 pp., illus. \$74. Membrane Transport in Biology, vol. 3.

**Turbulent Fluxes through the Sea Surface, Wave Dynamics, and Prediction.** Proceedings of a conference, Marseille, France, Sept. 1977. A. Favre and Klaus Hasselmann, Eds. Plenum, New York, 1978. xiv, 678 pp., illus. \$49.50. NATO Conference Series V, vol. 1.

**The University.** The Anatomy of Academe. Murray G. Ross. McGraw-Hill, New York, 1979. xiv, 310 pp. Paper, \$4.95. Reprint of the 1976 edition.

**Wind.** Making It Work for You. Douglas R. Coonley. Franklin Institute Press, Philadelphia, 1979. iv, 100 pp., illus. Paper, \$7.95.

**Workshop on Concepts of Uranium Resources and Productivity.** National Academy of Sciences, Washington, D.C., 1978. x, 210 pp. Paper, \$7.25.

**Your Health Care and How to Manage It.**