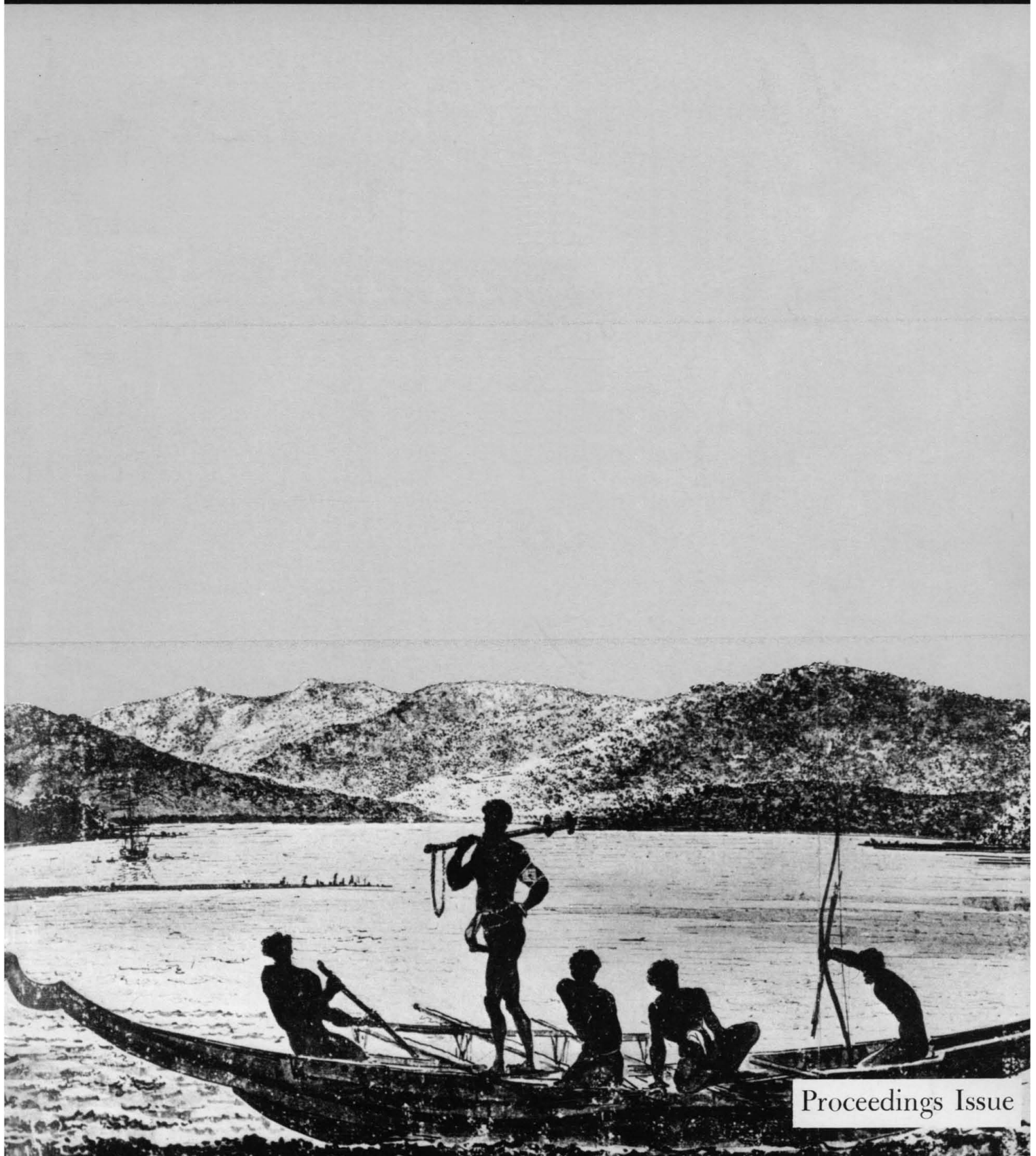


SCIENCE

20 February 1970

Vol. 167, No. 3921

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Proceedings Issue

Now, for under \$70, Polaroid turns the sciences into snap courses.



It's done with the new Polaroid ED-10 Land Instrument Camera. It gives you instant classroom photomicroscopy. And it gives it to you at a price that puts it in a class by itself.

You get full-color pictures in a minute, black-and-white in seconds. And you get the same picture quality as with the most expensive instrument cameras (because they all use the microscope's optical system).

It fits any microscope, attaches in moments, and is easy to operate. You don't even have to know photography to use it. Just frame the subject in the scope; focus with the focusing tube; remove the tube and slip on the camera; and snap the picture. Seconds later, peel off a finished print.

The student gets what he sees. Without laborious sketching. (And he'll be developing more than a picture; he'll be developing an interest.)

It's a snap for the teacher, too. You can gain and hold attention better. Save classroom time. Demonstrate and make comparisons easier.

And you don't have to worry about that rough classroom handling. The ED-10 is molded of high-impact material to withstand it.

For more information, contact your scientific supply house or microscope dealer. Or write to: Polaroid Corporation, Industrial Marketing, Dept. 26-172, Cambridge, Mass. 02139.

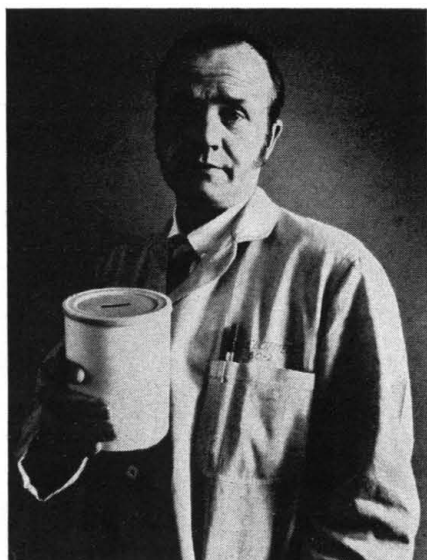
Polaroid may help you ease the class struggle.

The new Polaroid Land Instrument Camera.



The new Cary 61.

The CD spectropolarimeter that lets you save the money you probably don't have.



We've come up with a way to let you make the most of a tight budget without compromising quality. The new Cary 61 is an all solid-state, high performance CD-only instrument that costs less than \$30,000 and can handle any research or routine CD spectropolarimeter problem.

THE BASIC 61

Practical design considerations make the new Cary 61 one of the easiest-to-operate instruments of its kind. Simplified controls allow rapid adaption of operating parameters to sample needs and permit savings in instrument set-up time. Built-in features include: dynode voltage recording for deriving the sample's absorption properties; provision for interfacing computer readout and control; and a specially designed, very spacious sample compartment which accommodates a super-conducting magnet for MCD studies, or other sample handling equipment.

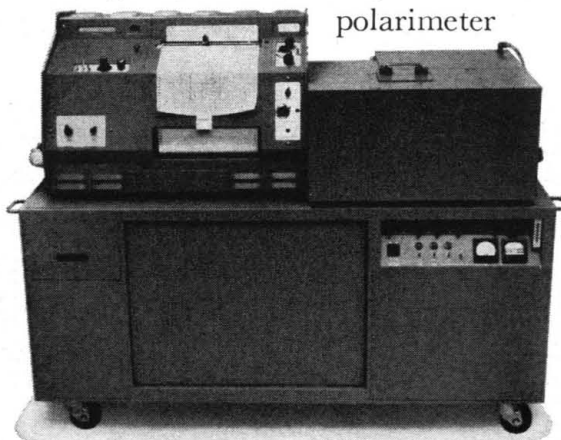
The performance-proven double monochromator and special optical design features of the Cary 61: minimize stray light, reduce the occurrence of artifacts, allow penetration into the ultraviolet with complete confidence, and sharply define small spectral details over its entire 185-800nm range.

As for CD performance, if the 61 can't do it, nothing else can.

MORE CD FOR LESS

Simply add our unique "folded beam" optical accessory and you're set to perform CD difference measurements with extremely high sensitivity. All the while keeping additional expenses to a minimum.

The new Cary 61. Working proof that a good, versatile CD spectro-
polarimeter



and tight money are compatible.

For complete details or a demonstration, write Cary Instruments, a Varian subsidiary, 2724 South Peck Road, Monrovia, California 91016.

Ask for data file E007-20.

cary
instruments

20 February 1970

Vol. 167, No. 3921

SCIENCE

LETTERS	Should College Applicants Be Selected by Lottery? <i>A. P. Gray; A. W. Astin;</i> Element 104: What's in a Name? <i>L. A. Page;</i> Civil Defense: <i>E. P. Wigner;</i> Open Inspection of CBW: <i>H. R. Herschman</i>	1075
EDITORIAL	Long-Term Efforts To Clean the Environment	1081
ARTICLES	Some Three-Body Atomic Systems: <i>J. W. McGowan</i> Moon Illusion Explained on the Basis of Relative Size: <i>F. Restle</i> The Demography of Primitive Populations: <i>N. McArthur</i>	1083 1092 1097
NEWS AND COMMENT	Galveston Bay: Test Case of an Estuary in Crisis NASA: Further Cuts in University Support Spending West Germany: Educational Reform Is the Major Domestic Issue Bertrand Russell (1872-1970): The Constant Critic	1102 1107 1108 1110
RESEARCH TOPICS	Controlled Fusion: Plasma Heating with Lasers	1112
BOOK REVIEWS	<i>The Oppenheimer Case</i> , reviewed by <i>H. Kalven, Jr.</i> ; other reviews by <i>E. D. Goldberg, T. L. Cline, G. I. Rochlin, J. H. Mathewson, S. J. Coward,</i> <i>E. J. Van Scott, C. B. Jacobson;</i> Books Received	1112
REPORTS	Spectra of Backscattered Light from the Sea Obtained from Aircraft as a Measure of Chlorophyll Concentration: <i>G. L. Clarke, G. C. Ewing, C. J. Lorenzen</i> Acidic Mine Drainage: The Rate-Determining Step: <i>P. C. Singer and W. Stumm</i> Viscosity of the Atlantic Ocean Bottom: <i>C. H. Cramer</i> Transverse Wave Instability in a Solid Explosive: <i>B. B. Dunne</i>	1119 1121 1123 1124

BOARD OF DIRECTORS	H. BENTLEY GLASS Retiring President, Chairman	ATHELSTAN SPILHAUS President	MINA REES President-Elect	RICHARD H. BOLT LEWIS M. BRANSCOMB	BARRY COMMONER GERALD HOLTON
VICE PRESIDENTS AND SECTION SECRETARIES	MATHEMATICS (A) Mark Kac F. A. Ficken	PHYSICS (B) Nathaniel H. Frank Albert M. Stone	CHEMISTRY (C) Charles G. Overberger Leo Schubert	ASTRONOMY (D) John W. Firor Frank Bradshaw Wood	
	ANTHROPOLOGY (H) Jesse D. Jennings Anthony Leeds	PSYCHOLOGY (I) Wendell R. Garner William D. Garvey	SOCIAL AND ECONOMIC SCIENCES (K) Sheldon and Eleanor Glueck Harvey Sapolsky		HISTORY AND PHILOSOPHY OF SCIENCE (L) Loren C. Eiseley Raymond J. Seeger
	PHARMACEUTICAL SCIENCES (Np) Joseph P. Buckley Joseph A. Oddis	AGRICULTURE (O) T. C. Byerly Michael A. Farrell	INDUSTRIAL SCIENCE (P) Gordon K. Teal Burton V. Dean	EDUCATION (Q) R. Will Burnett J. Myron Atkin	
DIVISIONS	ALASKA DIVISION Victor Fischer President Irma Duncan Executive Secretary		PACIFIC DIVISION William C. Snyder President Robert C. Miller Secretary		SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION Newell A. Younggren President Marlowe G. Anderson Executive Secretary
SCIENCE is published weekly on Friday and on the fourth 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. Copyright © 1970 by the American Association for the Advancement of Science. Annual subscription \$12; foreign postage: Americas \$3; overseas \$5; single copies, 50¢ (back issues, \$1) except Guide to Scientific Instruments and the 30 January issue, which are \$3 each. School year subscription: 9 months, \$9; 10 months, \$10. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the Reader's Guide to Periodical Literature .					

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Electron Population Parameters from Least-Squares Refinement of X-ray Diffraction Data: <i>P. Coppens, L. Csonka, T. V. Willoughby</i>	1126
Crustal Plates in the Central Atlantic: <i>M. M. Ball and C. G. A. Harrison</i>	1128
Image-Formation Technique for Scanning Electron Microscopy and Electron Probe Microanalysis: <i>K. F. J. Heinrich, C. Fiori, H. Yakowitz</i>	1129
Bladder Tumors in Rats Fed Cyclohexylamine or High Doses of a Mixture of Cyclamate and Saccharin: <i>J. M. Price et al.</i>	1131
Late DNA Replication in Male Mouse Meiotic Chromosomes: <i>N. Odartchenko and M. Pavillard</i>	1133
[8-Arginine]-Vasopressinoic Acid: An Inhibitor of Rabbit Kidney Adenyl Cyclase: <i>T. Dousa et al.</i>	1134
Pseudohermaphrodite Rat: End Organ Insensitivity to Testosterone: <i>C. W. Bardin et al.</i>	1136
Rat Thoracic Duct Lymphocytes: Types That Participate in Inflammation: <i>F. Koster and D. D. McGregor</i>	1137
Fetal Response to Viral Infection: Interferon Production in Sheep: <i>J. C. Overall, Jr., and L. A. Glasgow</i>	1139
Sexual Reproduction in <i>Candida lipolytica</i> : <i>L. J. Wickerham, C. P. Kurtzman, A. I. Herman</i>	1141
Isolation and Zonal Fractionation of Metaphase Chromosomes from Human Diploid Cells: <i>E. L. Schneider and N. P. Salzman</i>	1141
Neuronal Soma and Whole Neuroglia of Rat Brain: A New Isolation Technique: <i>W. T. Norton and S. E. Poduslo</i>	1144
Facilitation of Spindle-Burst Sleep by Conditioning of Electroencephalographic Activity While Awake: <i>M. B. Sterman, R. C. Howe, L. R. MacDonald</i>	1146
ASSOCIATION AFFAIRS	
Mina Rees, President-Elect 1970: <i>F. J. Weyl</i>	1149
AAAS Council Meeting, 1969: <i>D. Wolfe</i>	1151
AAAS Officers, Committees, and Representatives for 1970	1154
The 1969 Meeting of the AAAS: A Brief Appraisal: <i>W. G. Berl</i>	1157
Courses; Forthcoming Events	1162

PHYLLIS V. PARKINS
LEONARD M. RIESER

KENNETH V. THIMANN

WILLIAM T. GOLDEN
Treasurer

DAEL WOLFLE
Executive Officer

GEOLOGY AND GEOGRAPHY (E)
Richard H. Mahard
William E. Benson

ZOOLOGICAL SCIENCES (F)
David Bishop
David E. Davis

BOTANICAL SCIENCES (G)
William A. Jensen
Arthur W. Cooper

ENGINEERING (M)
Paul Rosenberg
Newman A. Hall

MEDICAL SCIENCES (N)
Allan D. Bass
F. Douglas Lawrason

DENTISTRY (Nd)
Robert S. Harris
Richard S. Manly

INFORMATION AND
COMMUNICATION (T)
Dale B. Baker
Ileen E. Stewart

STATISTICS (U)
Ezra Glaser
Rosedith Sitgreaves

ATMOSPHERIC AND HYDROSPHERIC
SCIENCES (W)
Robert M. White
Louis J. Battan

COVER

The critical evaluation of the early historical estimates of the size of a nonliterate population newly contacted by literate people discourages the acceptance of much of the information recorded, and even that which is acceptable raises more questions than can now be answered. See page 1097. ["View of Malekula, New Hebrides," from *Voyages of Captain James Cook*, vol. 2, Cambridge University Press. Wash drawing by William (James) Hodges, courtesy of British Museum]

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.

If everyone were easily satisfied,

Zeiss microscopes are made for the microscopist who demands the best. Regardless of what Zeiss microscope you buy, you get the world's finest optics. And you get the ultimate in mechanical precision. Simply to look through the optics and to touch the focusing knobs on any Zeiss instrument is proof enough.

Our Universal Microscope is exactly what its name states—it is universal, and universally accepted for all applications. But we also offer another instrument, the WL, that for many applications is in the same class. Even if you normally find satisfaction hard to come by, you'll find it easily with one of these microscopes. Which one depends upon what you want to do.

The Zeiss WL Microscope

The WL is an outstanding instrument for most transmitted-light applications, in-

cluding: brightfield, darkfield, phase contrast, Nomarski interference contrast, fluorescence, polarization, microprojection, photomicrography.

A look at just a few of its key features will give you an idea of its excellence:

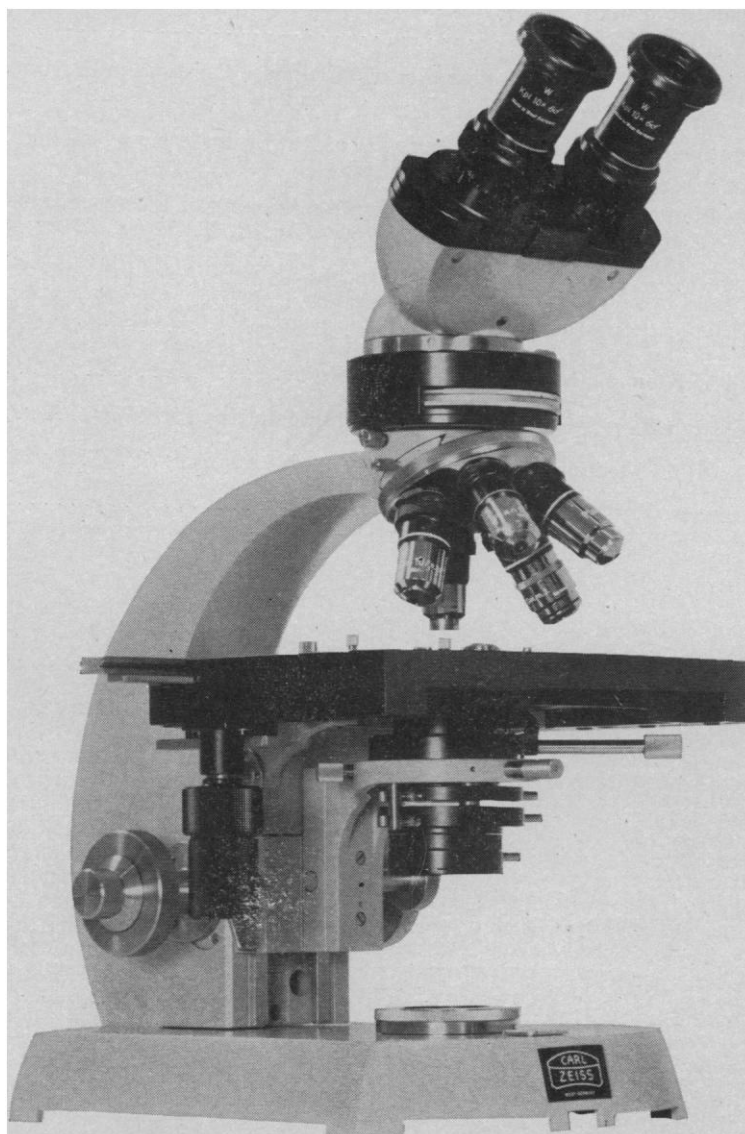
1. Objectives—the most essential component of any microscope. Zeiss objectives are world-famous for their quality. Available for the WL is a complete line of Planapochromats from 4/0.16 to 100/1.3—and *only* Zeiss can offer so many. Complete lines, too, of Neofluars, Planachromats and Achromats. Each, in its class, is the world's best.

2. Brightfield—Phase Contrast—Nomarski Interference Contrast without changing condensers or objectives. And there's no need for a centering telescope either, because the exclusive OPTOVAR

Magnification Changer has an auxiliary lens for centering the light ring on the phase ring. The OPTOVAR also lets you easily change magnifications without changing eyepieces.

3. Stages—Rotating and Centering, Mechanical and Gliding, Polarizing—the most versatile, the sturdiest and smoothest made. Even if you exert pressure on these stages, they won't slip.

4. Attachments—There are cameras (35mm, 4 x 5, Polaroid®, motion picture and video), auxiliary binocular and monocular tubes, projection screens, drawing attachments, a refractometer, etc., etc.—just about anything you might ever want.



The Zeiss WL Microscope

there would be no need for Zeiss.

The Zeiss Universal Microscope

With the Universal, you can do all the things in transmitted light you can do with the WL—plus a few others. What's more, this is a truly great instrument for reflected light. Perhaps its outstanding feature (aside from the magnificent optics and extra-sturdy stand) is the fact that you can switch from reflected to transmitted light, or vice-versa, just by flipping a lever, *without changing light sources*.

Let's take a closer look at the Zeiss Universal Microscope:

1. Objectives—the same great objectives as the WL has. And, in addition, a full line of Epiplans for reflected light work, and famous LUMINARS for photomacrography.

2. The Microscope Stand—the sturdiest stand of any desk-top microscope. This extra stability allows use of the Microscope

Photometer for both reflected and transmitted light, and is of benefit if a great deal of 4 x 5 or motion picture photography is employed.

For reflected light, more intense light, or fluorescent illumination (including phase-fluorescence), the special illuminators, rather than being accessories, become *part* of the instrument, contributing to its ease-of-operation, compactness and sturdiness.

3. Attachments—The same cameras, projection screens, drawing attachments, etc., as for the WL—plus the Microscope Photometer and the Microhardness Tester.

To sum up, the Universal is the instrument to buy when your applications are truly *universal*, when you have to switch from one mode to another during your work. The WL is superb if you are mainly

concerned with transmitted-light microscopy. But no matter which Zeiss microscope you choose, we know you'll be satisfied. Because both are made specifically for the microscopist who is *hard* to satisfy.

For more information on the WL or Universal (or on any of the others in our line) write Carl Zeiss, Inc., 444 Fifth Avenue, New York, New York 10018.

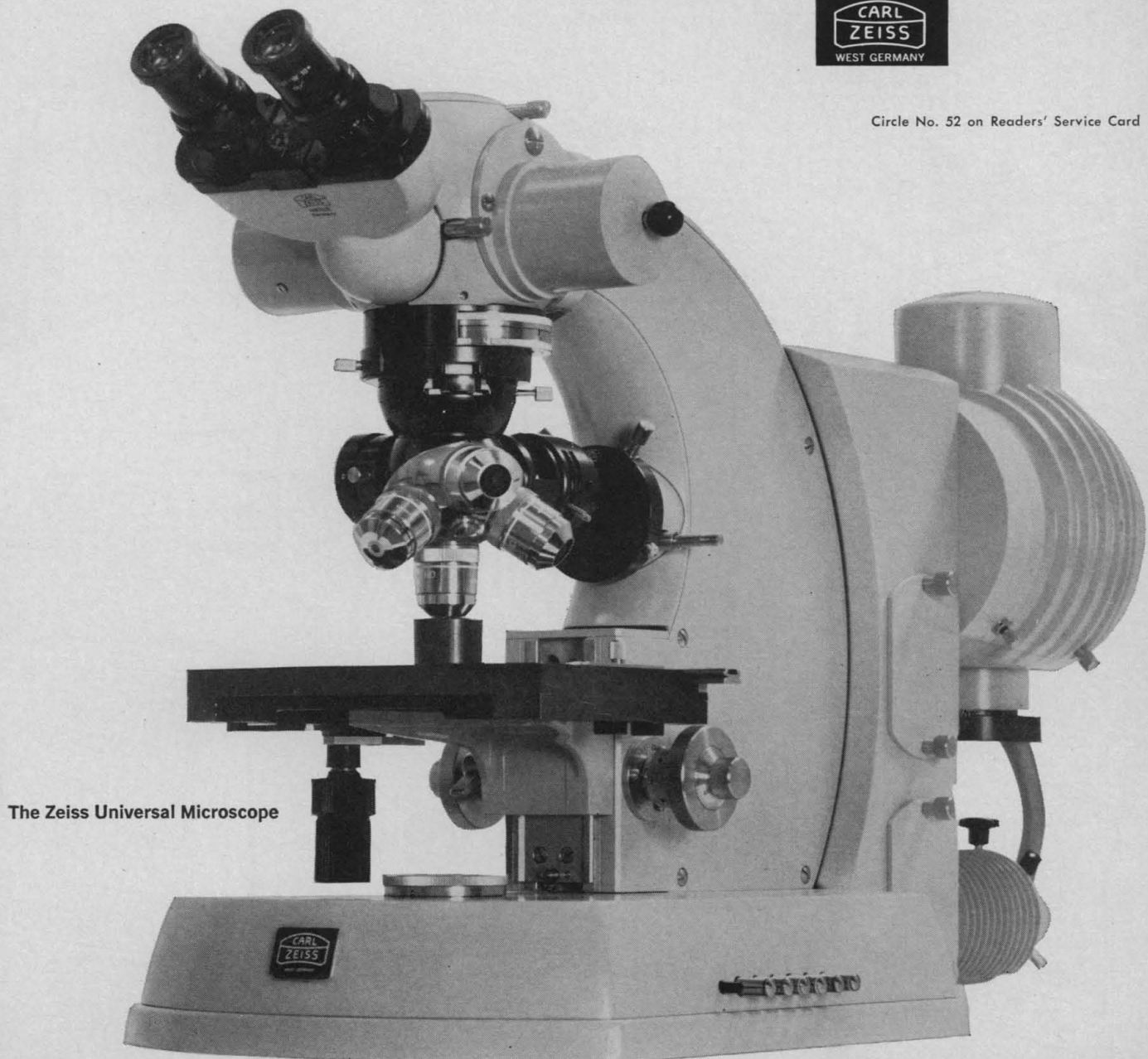
Nationwide Service.

ZEISS

THE GREAT NAME IN OPTICS



Circle No. 52 on Readers' Service Card



The Zeiss Universal Microscope

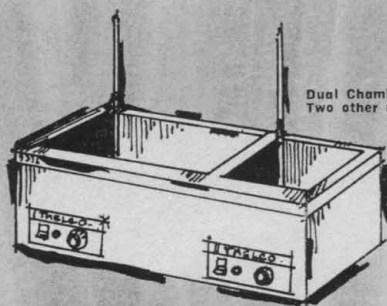
ATLANTA, BOSTON, CHICAGO, COLUMBUS, DENVER, HOUSTON, KANSAS CITY, LOS ANGELES, PHILADELPHIA, SAN FRANCISCO, SEATTLE, WASHINGTON, D.C.

You get more with Thelco—a leader in constant temperature equipment for fifty years. Traditional built-in quality and *guaranteed uniformity*. Ask your Precision Scientific Dealer or write us for performance data and specifications on Thelco—baths, ovens, incubators—many models available. Precision Scientific Company, 3737 W. Cortland St., Chicago, Illinois 60647.

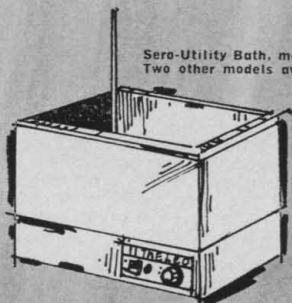
PRECISION
PS
SCIENTIFIC

SUBSIDIARY OF
GCA
CORPORATION

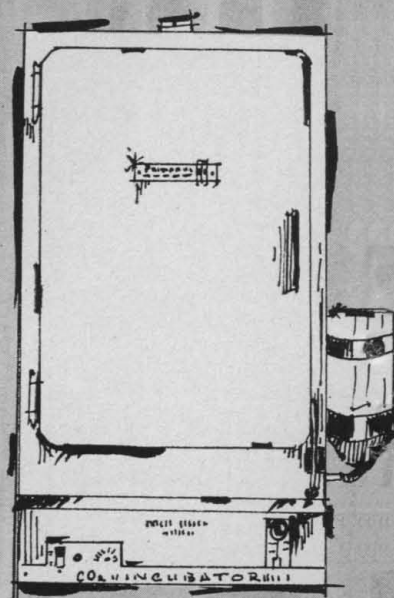
Thelco



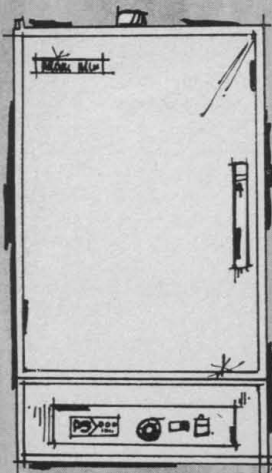
Dual Chamber Serological Bath
Two other models available.



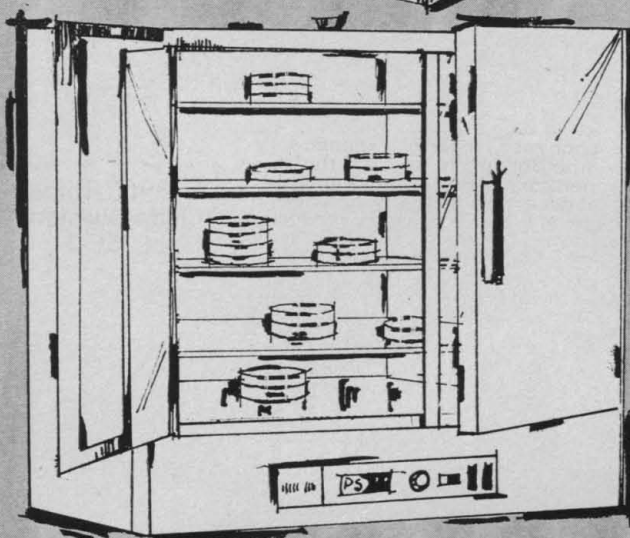
Sero-Utility Bath, medium size.
Two other models available.



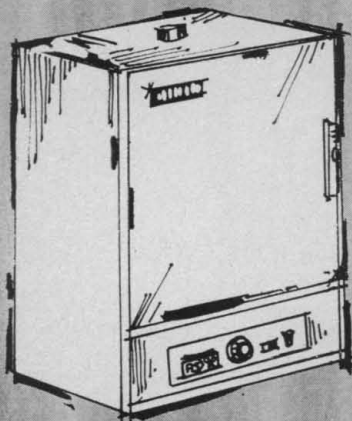
Continuous Flow CO₂
Incubator.



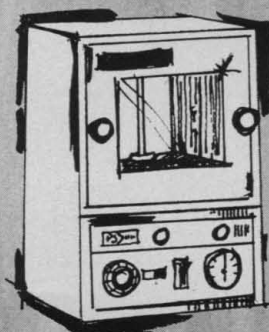
Incubator, Model 4.
Two other models available.



Forced Circulation Incubator,
Model 6M.



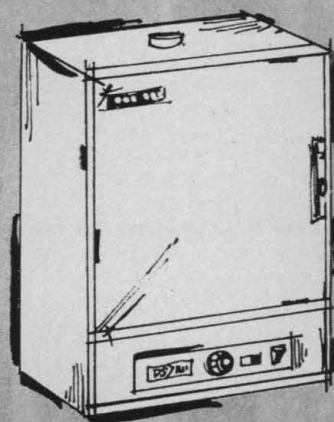
Forced Circulation Oven, Model 18.
Two other models available.



Vacuum Oven, Model 19. 1/2 cu. ft.
capacity, 1 1/2 cu. ft.
model also available.



Anaerobic Incubator, large
size, smaller model available.



Gravity Convection Oven, Model 17.
Two other models available.

1920-Golden Anniversary of Service to Science-1970

How cryogenic storage can be a lifesaver for the bioscientist

The gradual erosion of a biological property that is being maintained as a preservative measure in the frozen state at a temperature of -70°C or higher is an occurrence with which workers in the biosciences inevitably become familiar. Often marvels of ingenuity are exercised in preparing a system for the potentially dangerous phase transition. The bioscientist is able to show that, as the temperature of the basically aqueous medium is lowered, enzyme activity, membrane integrity, or cellular morphology has survived the excursion

from $+15^{\circ}\text{C}$ to -70°C and back. The system, perhaps with the addition of a protective additive, has presumably been well prepared not only for a passage to and from the solid state but also for a storage period in that state. Yet, if the return to $+15^{\circ}\text{C}$ is delayed for weeks, or months or years, these or other desirable and essential properties may be irretrievably lost. What has happened? Why?

The precise mechanisms by which entities of biological origin undergo degradation with time in a frozen environment have not been delineated in terms of their chemistry. The nonfunctioning enzyme system, the infertile sperm cell, the hemolyzed erythrocyte, and other biological disasters nevertheless attest to their reality. Clearly, as the cryobiologists probe the basics of their field, one can expect definition of reactions of great interest, conceivably of wholly new concepts in chemistry. There are portents, perhaps, in Wang's dimerization of 1,3 dimethyl thymine in frozen environments, a photoreaction that proceeds at a negligible rate in the liquid state.

At present known only by their workings, a loss of activity or other form of biological integrity, these degradative reactions are temperature dependent, and it is on this relationship that the success or failure of a frozen storage operation may depend. For over a century we have known that a decline in temperature of 10°C decreases the reaction velocity by approximately $1/2$ or $2/3$, but those of you who remember your problems in chemical kinetics will recall the awe-inspiring influence of temperature on the specific reaction rate as expressed by Arrhenius:

$$K = A e^{-\frac{\Delta E}{RT}}$$

The effect of temperature on K , the specific reaction rate, is exerted exponentially through the Boltzmann factor. If the storage temperature used permits significant biological decay, that is to say, an undesirably high degradative reaction velocity, one can slow the process effectively. How effectively can be seen in almost any text of physical chemistry. Daniels, for example, cites a first-order reaction in which the half-life is increased by a factor approaching 10,000 as the temperature is lowered from -75°C to -100°C . Such considerations are necessarily important when materials of biological origin, many of which are intrinsically unstable, are to be stabilized for indefinitely prolonged periods at reduced temperatures. Remember, too, that the frequency factor, A , diminishes with decreasing temperature.

Among the procedures by which the scientist may capitalize on the relationships inherent in the Arrhenius equation to provide maximum stability to systems of biological interest, the use of cryogenic fluids in appropriate storage equipment offers a relatively simple solution. Liquid nitrogen, abundantly available, is a boiling liquid, -196°C , at atmospheric pressure. An idea of its potential effectiveness as a refrigerating agent can be seen from the diagram below. Here we postulate a reaction with a half-life of one day at 0°C and a reduction of reaction rate by one half for each 10°C decline in temperature.

REFERENCES:

Daniels, F.: *Outlines of Physical Chemistry*, New York, John Wiley & Sons, Inc., 1948, p. 367.
Wang, S. Y.: *Photochemical Reactions in Frozen Solutions*. *Nature* 190:690-4, 1961.

See also: Wang, S. Y.: *Photochemical Reactions of Nucleic Acid Components in Frozen Solutions*. *Fed. Proc.* 24(2) Part III:S-71-9, Mar.-Apr., 1965.

Is a cryogenic refrigerator a biological necessity?

Some bioscientists find cryogenic preservation an indispensable tool for storing many materials of biological origin in a potentially viable or functional state for prolonged periods. For instance, tissue cultures may be so stored without the risk and expense attendant on subculture.

LINDE cryogenic refrigerators come in all shapes and sizes

Union Carbide's LINDE division produces a full line of cryogenic refrigerators, dewars, and controlled-rate freezers. These low-temperature liquid nitrogen units, available with racking systems for easy storage and retrieval, can solve your preservation problems.



Union Carbide Corporation
Linde Division
Dept. SC-3
P.O. Box 264
Radio City Station, New York, N.Y. 10019

I would like additional information:

- ☐ LN_2 refrigerators ☐ Temperature/level controllers
☐ LN_2 dewars ☐ Liquid nitrogen storage and supply

Name _____ (Please Print or Type)

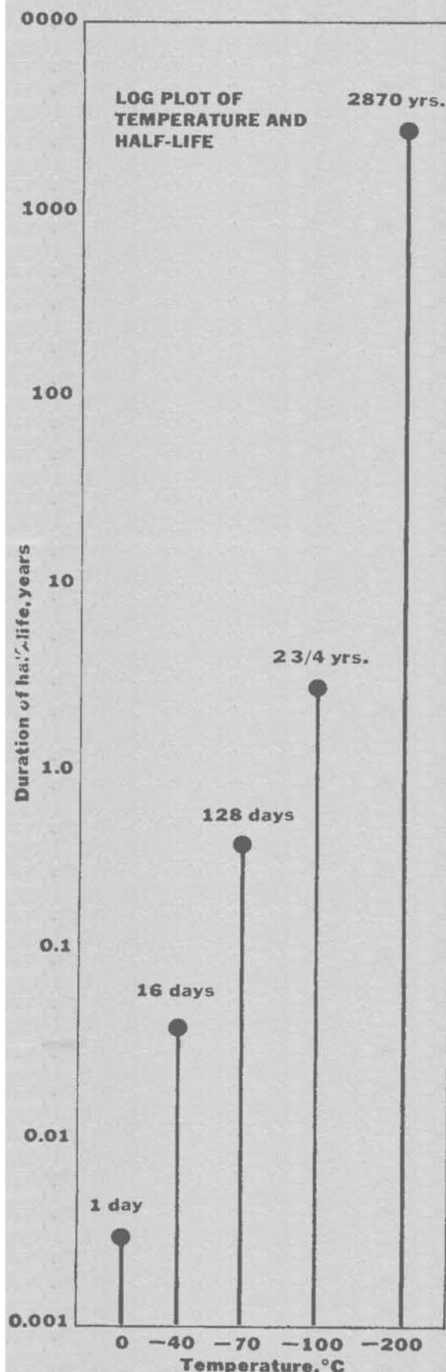
Street _____

City _____ State _____ Zip Code _____



UNION CARBIDE CORPORATION, LINDE DIVISION,
270 PARK AVENUE, NEW YORK, N.Y. 10017

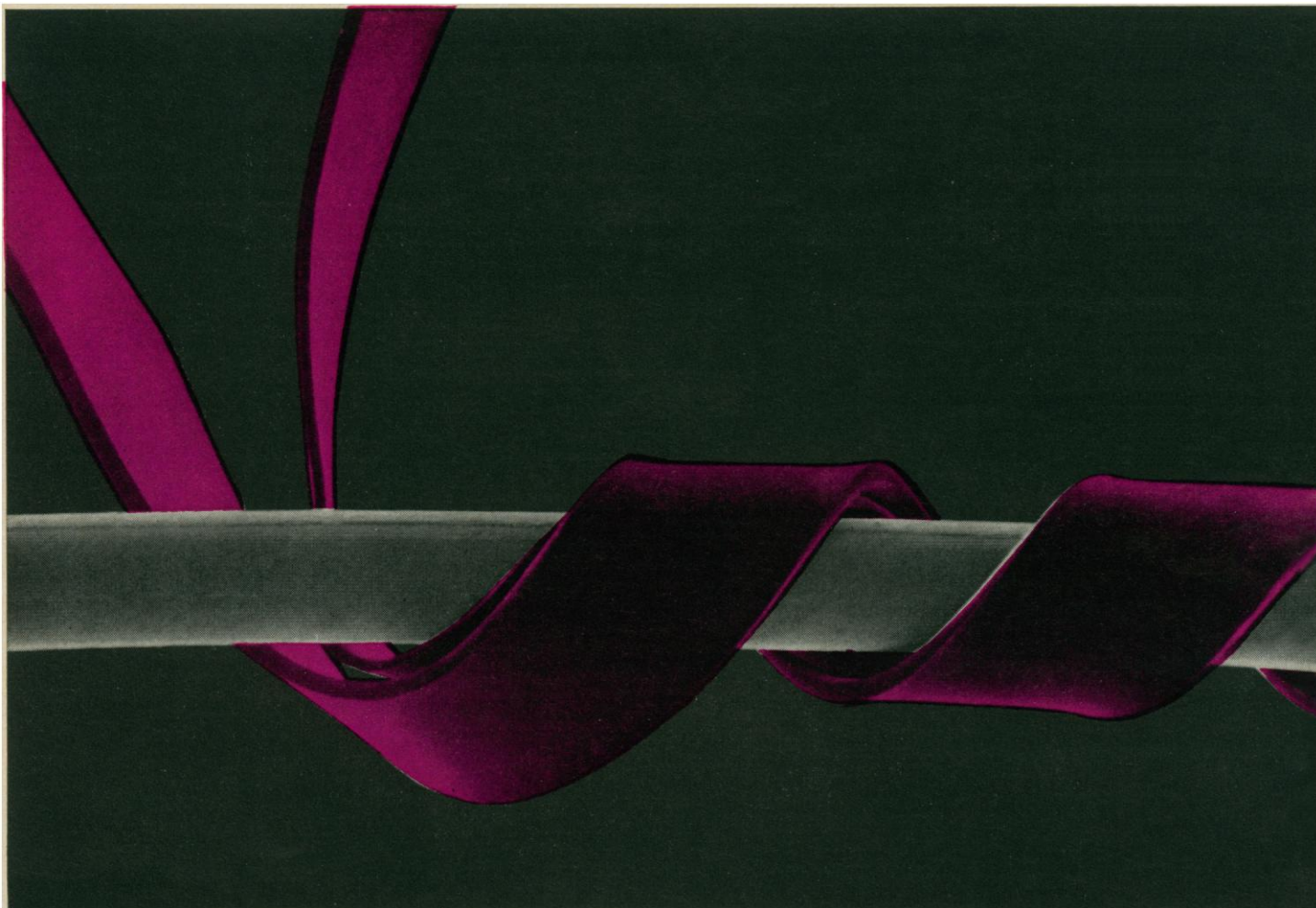
LINDE and UNION CARBIDE are registered trademarks of Union Carbide Corporation.



← Circle No. 97 on Readers' Service Card

Circle No. 47 on Readers' Service Card

1035



Customizing a magnetic alloy

Bell Laboratories scientists have custom tailored a magnetic alloy for the "piggyback twistor," a memory device used in electronic switching systems.

In this device, metal tapes (enlarged 225 times above) are wound into a tight spiral—subjecting them to considerable mechanical stress. The magnetic properties of the alloys must be essentially independent of such stress. That is, they must have low magnetostriction. In addition, the outer tape must be magnetically "hard"—with high coercive force (resistance to change in direction of magnetization). And finally, it must be ductile enough to be formed into tape. No known alloy had this combination of properties. So, E. A.

Nesbitt, G. Y. Chin, and D. Jaffe of Bell Laboratories made one to order.

Tailoring the new alloy for the outer tape required a precise knowledge of the relationship between the magnetic behavior of materials and their structure. So, the Bell Laboratories scientists began with 90% cobalt and 10% iron, a composition they knew had the necessary ductility and low magnetostriction—two of the essential requirements. But, since the coercive force of the composition was inadequate, they were faced with another knotty problem.

To solve it, they went back again to a basic principle—a precipitate in an alloy impedes the motion of magnetic domain walls when a field is applied to reverse the magnetic

polarity. With that foundation, the scientists formulated a composition of 4% gold, 84% cobalt, and 12% iron. (The gold is the precipitate.)

When this new alloy was cold-drawn to produce a 97.5% reduction in cross section and then heat treated, its coercive force increased to the point required for piggyback twistors.

By simplifying the manufacture of piggyback twistors for use in the electronic switching systems now being built by Western Electric, the new magnetic alloy puts basic research in metallurgy at the service of telephone customers.

From the Research and Development Unit of the Bell System—



spectrophotometry ...simplified



Spectronic® 100

Sophisticated instrumentation . . . but automation makes it simple. Set wavelength anywhere from 325-925nm—an automatic system drives the grating, interchanges phototubes, stray light and second order filters. Select one of three readout modes—000.0% to 100.0% T, 0.000A to 2.000A, 0000 to 2000 in concentration with selectable positioning of the decimal point. Four place readout gives instant answers.

An entirely new optical design combines fine accuracy and mechanical stability with easy operation. Multiple sampling options include single, multiple and micro flow-thru cell compartments (permitting rapid sampling and minimal, 0.5ml, sample volume)—which accept test tubes, standard rectangular or cylindrical cells, or micro flow-thru cells.

Optical bandpass (resolution) is 8.0nm. A 40-pin connector for BCD output quickly accepts a variety of recording and printout devices— analog or digital. A unique calibration system is built-in. Write for Catalog 33-6031 or request a demonstration.



Spectronic® 70

So easy to use—just set wavelength, adjust for 100% T or 0.0A with reference, introduce sample and read.

The wide 325-925nm wavelength range is continuous; phototubes and filters are automatically interchanged. All solid state electronics with the latest in integrated circuit technology to assure high stability, reliability, and exceptional precision. Unprecedented sampling flexibility permits use of cylindrical cells up to 50 mm path length and rectangular cells—either semi-micro, short path or constant temperature cells. An accessory outlet allows instant attachment of a variety of readouts. Write for Catalog 33-6030 or a demonstration.

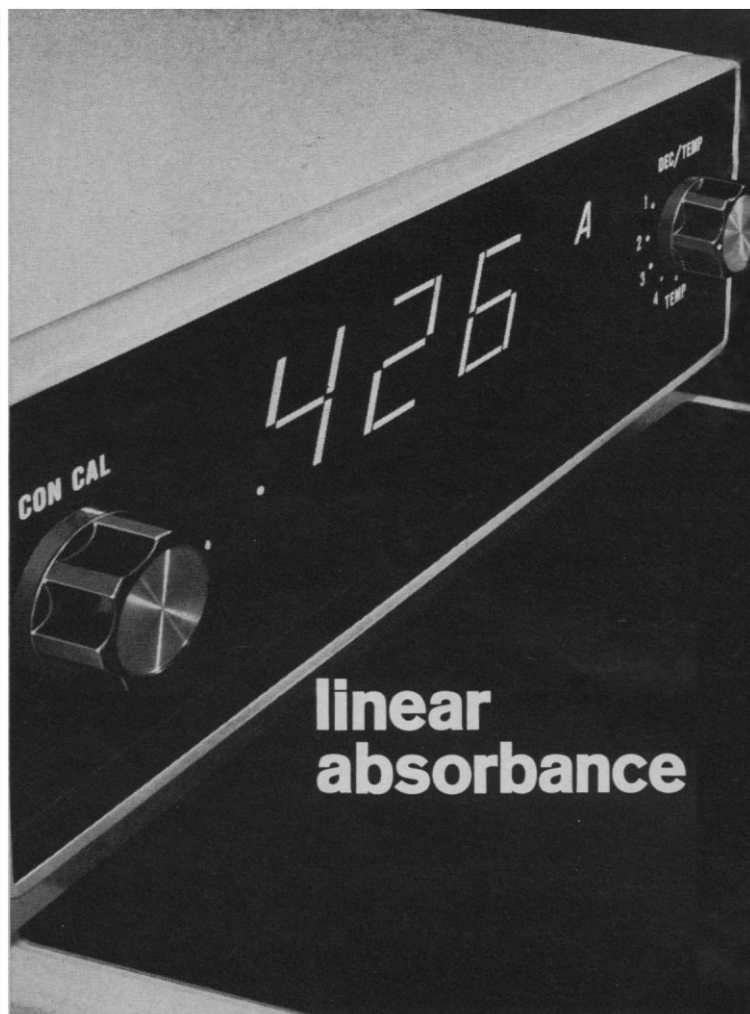


Spectronic® 20

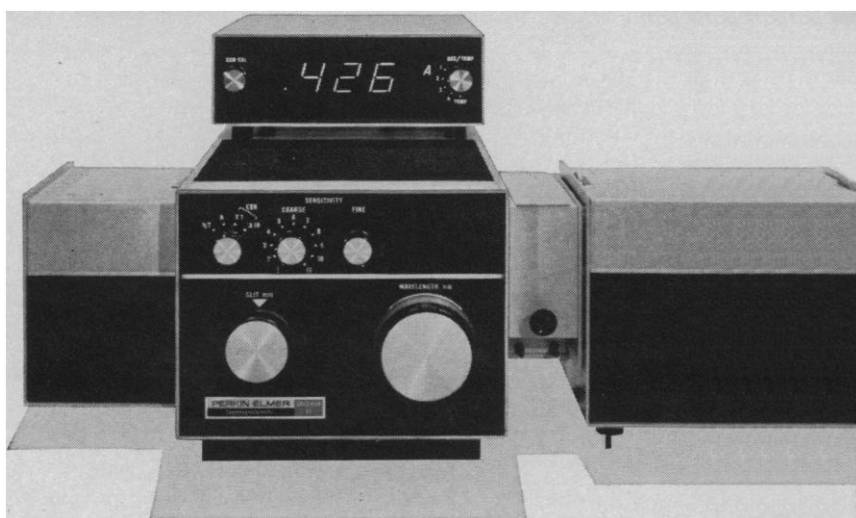
The world's most widely used spectrophotometer. Extremely easy operation, wide 340-950nm range, remarkable stability, low stray light, high sensitivity. Its versatility is further extended by a variety of accessories, including the Concentration Computer for *direct* concentration readings. Over 60,000 in use in laboratories all over the world. Ask for brochure 33-266.

Analytical Systems Division, Bausch & Lomb, 9002-03 Linden Avenue, Rochester, New York 14625.

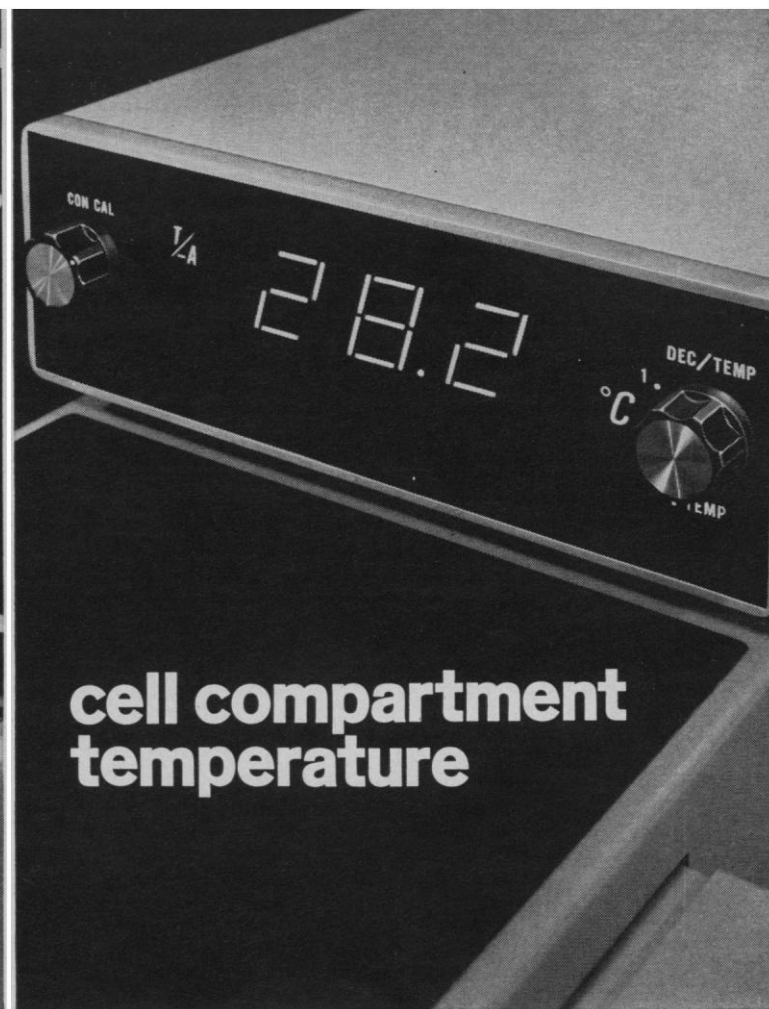
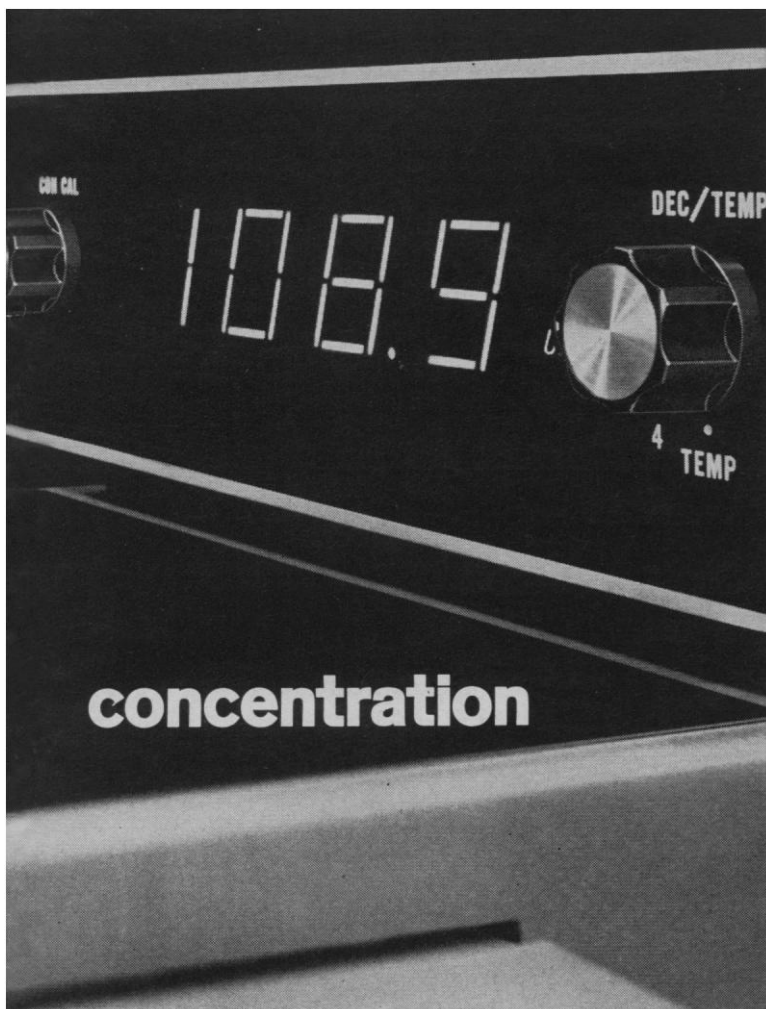
Circle No. 66 on Readers' Service Card



introducing the total information spectrophotometer



**Coleman
Model 46**



new, direct digital presentation spectrophotometer opens new areas of analytical information

TOTAL INFORMATION

Combining proven optics with the most recent advances in solid-state electronics, Coleman Model 46 is the modern TOTAL INFORMATION spectrophotometer. Highly visible, 7-bar electronic digital display presents transmittance, linear absorbance or concentration over the entire spectral range of 195 to 800 nm. A new photodetector, especially selected for wide range, high sensitivity, and low noise levels, eliminates problems of marginal response at either end of the spectrum. Cell compartment temperature is continuously monitored and displayed at the turn of a switch.

PRECISION OPTICAL SYSTEM

A Littrow-type monochromator with a diffraction grating provides constant

dispersion throughout the entire wavelength range. Resolution is better than 0.2 nm and wavelength reproducibility is better than ± 0.1 nm over the entire spectrum. Slits are continuously variable for selection of a wide range of energy levels and bandwidths.

SIMPLE OPERATION

Operation in all modes is straightforward. Simply turning the selector changes modes from %T to A with exact correlation. In the concentration mode, a sample of known concentration value is inserted and the value is set with the concentration calibration control. Unknown samples from 0.000 to 1999 may then be read directly on the digital presentation. Readings are exact, eliminating charts or mathematical conversion; this makes the Model 46 ideal for routine as well as research laboratory use.

NUCLEUS OF A TOTAL SPECTROPHOTOMETRIC RESEARCH LABORATORY

Speedy readout of total information with precision, stability and repeatability makes Model 46 the perfect nucleus of a total spectrophotometric research laboratory. Many different accessories are offered for the Model 46—including fluorometer, flame photometer, sample changer, spectral energy recorder, diffuse reflectance accessory, long path cells, micro cells, flow cells, and many other attachments. Model 46 can perform more photometric techniques than any other instrument in its price range. Phone or write your Coleman dealer for a demonstration.

Request Bulletin S-336

PERKIN-ELMER

Coleman Instruments Division, The Perkin-Elmer Corporation, 42 Madison Street, Maywood, Illinois 60153. (312) 345-7500

VISIT OUR BOOTH—PITTSBURGH CONFERENCE

Circle No. 12 on Readers' Service Card

when weighing animal, vegetable or mineral, there's no substitute for a Mettler

Ever weigh a live rabbit? You're so busy with the animal, you've little time to manipulate knobs and read dials. The Mettler top-loader makes it easy. Just put Harvey on the pan. Then read the precise weight on our new digital readout with its large, legible numbers.



The versatility of the Mettler qualifies it for many other unusual weighing applications. Like setting the price of real estate gravimetrically (write us—we'll tell you how). Or computing the day's take at track pari-mutuel windows. And batching to 1/100th of a gram the many ingredients that go into the manufacture of a wide variety of foods and drugs.

Despite some of the zany places where our top-loaders do their thing, the lab is really their natural habitat.

In thousands of laboratories throughout the world, our top-loaders weigh unknowns, checkweigh, weigh-in, batch weigh, and weigh below the balance. We have top-loaders that perform with ± 1 -mg precision to high capacity models that weigh to 10 kg.

For complete details on our family of top-loading balances, request Bulletin P from our headquarters at 20 Nassau Street, Princeton, New Jersey 08540.

THE ANALYTICAL THAT SPEAKS ITS MIND

The Mettler H20E analytical balance does more than just weigh. It converts weighing results into electrical signals which can be fed to compatible instrumentation, such as recorders. To tolerance meters for sorting control. To digital printers, calculating machines, and tape and punchcard equipment via analog-digital converters. And to computers for conducting real-time research and process control.



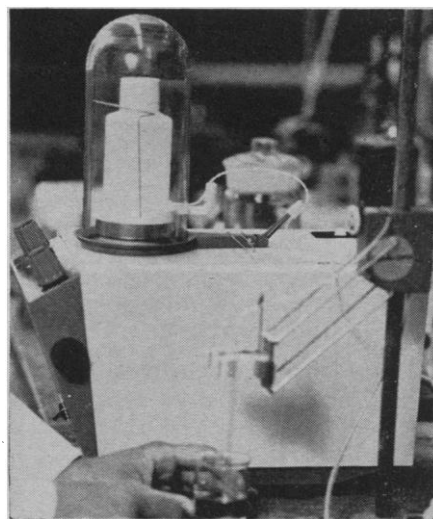
The H20E electronic semi micro has no peer when it comes to making continuous determinations of weight changes. One example is measuring the change in weight of a micro-absorption tube as a function of time. The high repeatability of the instrument's zero point and excellent reproducibility ensure precise results over long experimental runs.

For detailed application data and specs, request Bulletin H20E. For in-

formation on analyticals which are less exotically applied, write for our general analytical balance Catalog M-1023.

TITRATIONS THE EASY "WEIGH"

The Mettler DP11 is a gravimetric titration system which overcomes the many disadvantages of titration by volumetric means. It is the newest in the Mettler family of balance accessories, and is designed for use with top-loading balances Models P162, P120 and the P160 which has a reverse scale that indicates the weight lost by an object.



The DP11 is a joy to use. Simply place the burette containing the titrant on the balance pan and carry out your titration. The quantity of titrant you dispense by a remotely controlled pinch valve is continuously displayed on the digital readout panel of the balance.

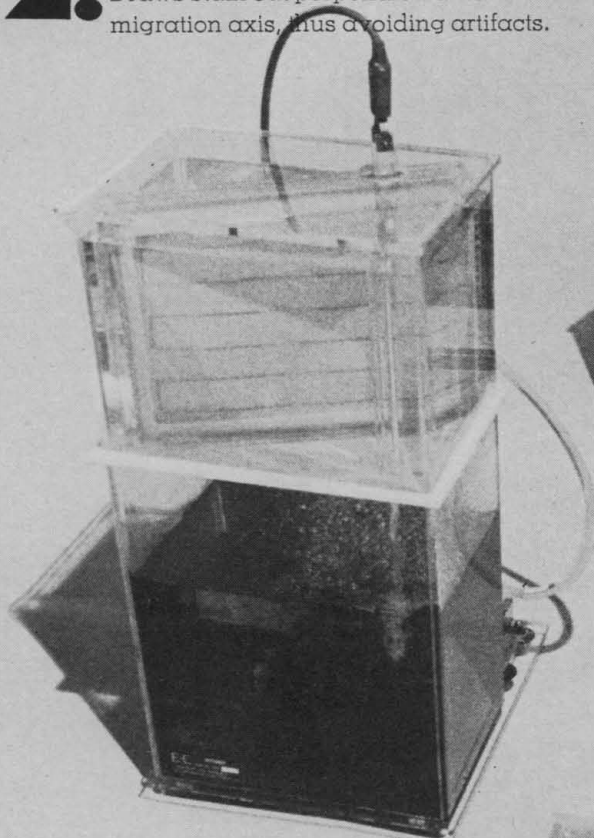
You no longer have to read closely spaced lines and the sometimes invisible numerals on graduated pipettes or other titration glassware. And precision surpasses that of most volumetric titration apparatus.

If you'd like to titrate the easy way, request our flyer on the DP11.

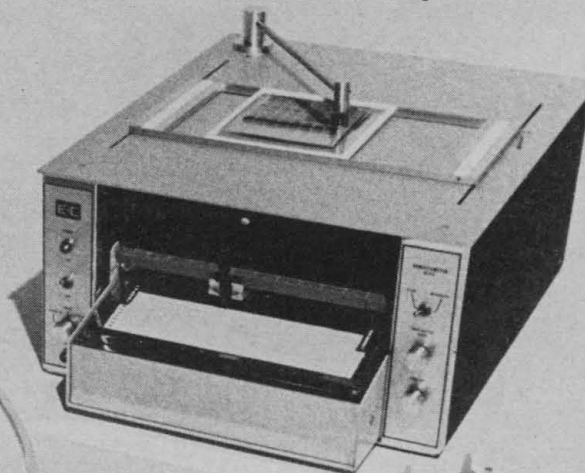
Mettler Instrument Corporation, 20 Nassau Street, Princeton, New Jersey 08540

Fight protein deficiency four ways!

- 2.** ELECTROPHORETIC DESTAINER EC 489
Draws stain out perpendicular to migration axis, thus avoiding artifacts.

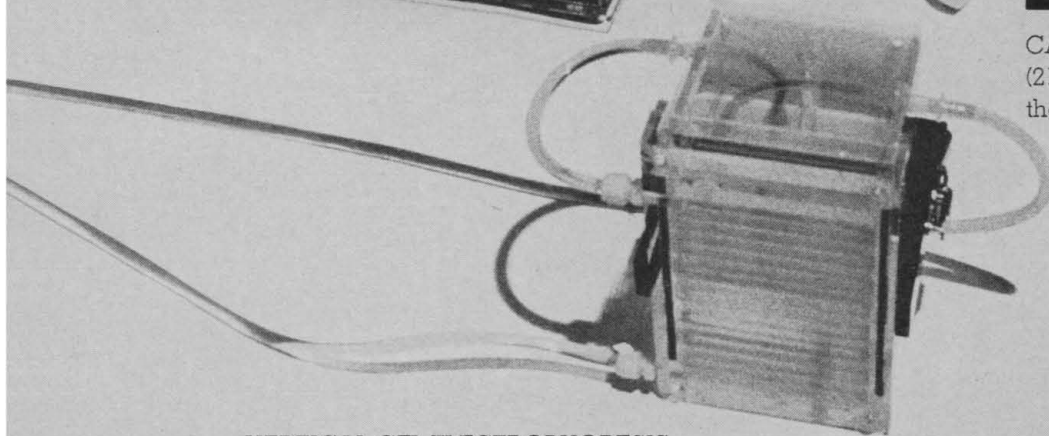


- 3.** DENSITOMETER WITH ELECTRONIC INTEGRATOR EC 810 Less complicated —and less expensive—because it views flat bands, not cylindrical sections.



- 4.** CALL TECHNICAL SERVICE COLLECT
(215) 382-9100 for further details. Or send the coupon.

- 1.** VERTICAL GEL ELECTROPHORESIS
CELL EC 470 Flat gel slabs, giving uniform conditions for all samples.



E-C helps you sort things out.

Please rush details about Vertical Gel Electrophoresis.

Name _____

Address _____

City _____ State _____ Zip _____

Or telephone our Technical Service collect at (215) 382-9100.
E-C Apparatus Corporation, 755 St. Marks Street, University
City, Philadelphia, Pa. 19104.

This cage isn't made to last.

It's made for all sorts of people.

Those who can't justify the cost of maintenance or sterilization.

Those who have problems with residual contamination from infectious diseases, toxic chemicals, or radioactive tracers.

And, those who want to write-off the total cost against one experiment.

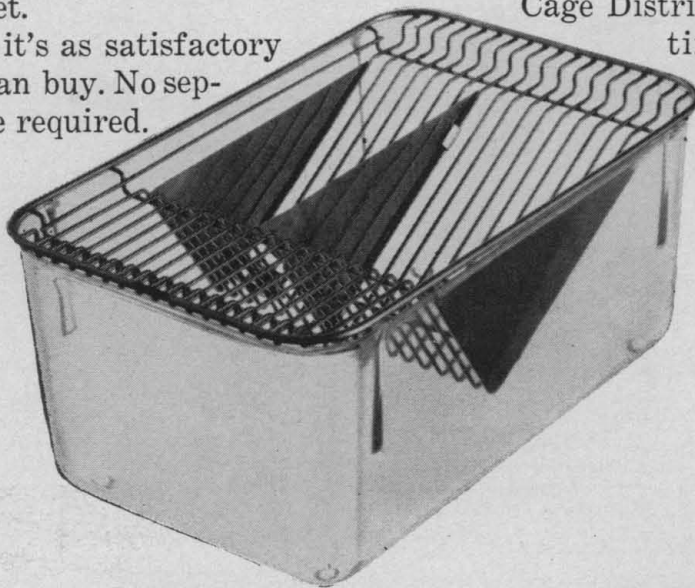
It's the Model E-0210 Econo-Cage disposable plastic cage for mice and dwarf hamsters. So economical you can use it once and throw it away. The lowest cost disposable cage on the market.

Yet, in use it's as satisfactory as any cage you can buy. No separate supports are required.

It is rigid and self-standing. And it provides 86-sq. in. of floor area in accordance with NIH and Public Law 89-544 specifications. Made of clear polystyrene it provides complete see-thru visibility and is available with a variety of zinc-plated, galvanized, and stainless steel lids.

When it's time to dispose of an Econo-Cage you'll find it is still economical. It incinerates to a 1-to-2% residue or pulps to only 20% of original volume.

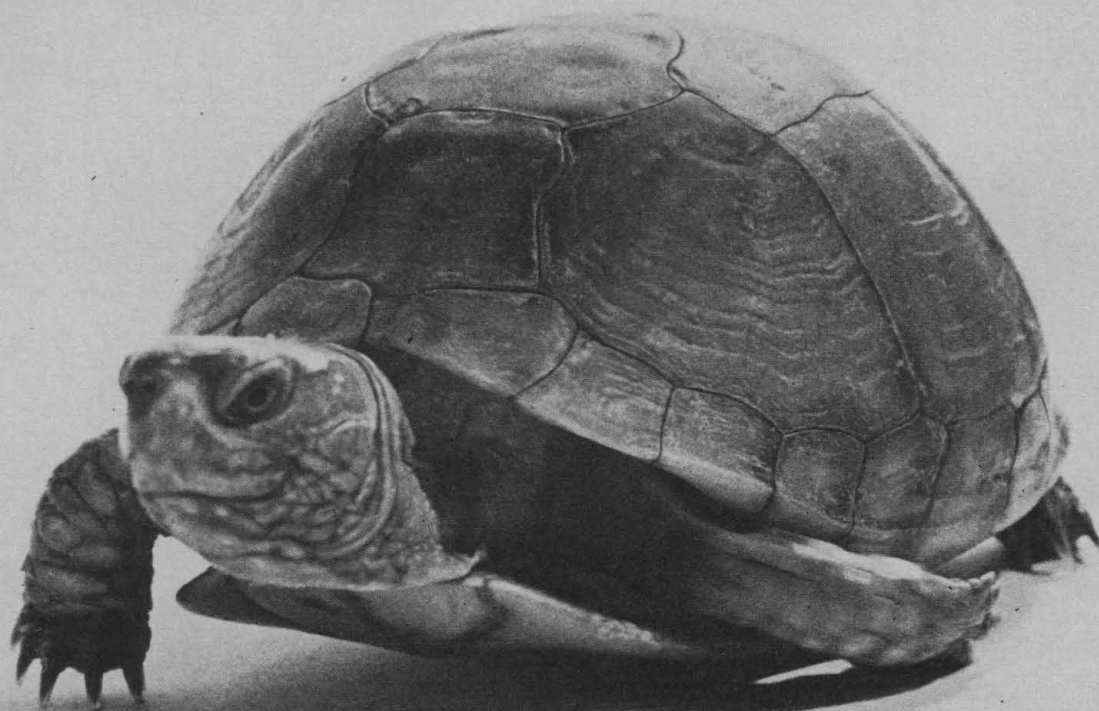
For a complete catalog, contact your Econo-Cage Distributor, or write the Scientific Division, Maryland Plastics, Inc., 9 East 37th Street, N.Y., N.Y. 10016.



The Disposable Econo-Cage. by Maryland Plastics.

Circle No. 36 on Readers' Service Card

The only thing we don't sell.



In other words, E & M is an electronics firm, not a vivarium. We design and produce the most complete electronic recording system made for life science teaching.

Every part of our Physiograph® system is produced under our design and control.

So you can be sure of its performance.

Our system features total reliability and absolute simplicity of operation.

So your students can concentrate on their experiments, and not on the equipment they use in their experiments.

Which is how it should be.

We offer four recorder models. Our Physiograph Six accepts

up to six channels, our Physiograph Four "A", Projector Physiograph, and Desk Model Physiograph accept up to four channels.

An additional servo channel, can be installed on any model.

And all of our Transducers, Pre-amplifiers, Accessory Plug-In Modules, Biotelemetry Systems, and Accessories are completely interchangeable and compatible with any Physiograph.

Including the very first one we made, over ten years ago.

If you'd like information about our systems, or have questions about the availability of special application accessory items, call us. Collect.

Or drop us a line, and we'll arrange a demonstration.

E&M

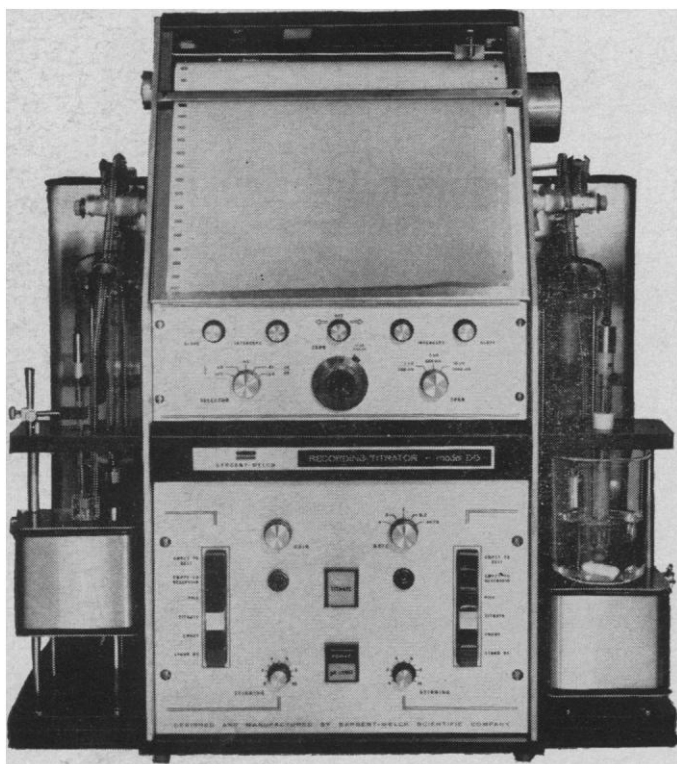
1. PHYSIOGRAPH SIX MAIN
2. DESK MODEL PHYSIOGRAPH
3. PROJECTOR PHYSIOGRAPH



A NARCO COMPANY

Just because

it's hard to titrate, write, watch, and prepare samples, all at the same time:



We give you the Sargent-Welch Model DG Automatic Recording Titrator.

We give you, in fact, our *second-generation* automatic recording titrator. For dual pH or other potentiometric titrations. For plots of pH or e.m.f. vs. volume of titrant (and for first derivatives of such plots). Consider the DG's many advantages.

Consider first the time-saving value of the Model DG's *dual* titrating stations. While one station is in use, the second can be readied for following titrations. Using different reagents or concentrations. Virtually continuous, serial titrations of a large volume of samples. Pushbutton operation. Four fixed delivery rates and a variable rate controlled by curve slope for the best combination of speed in non-critical regions and accuracy at inflection points.

And burettes are quickly replaced as a *unit* for titrant changes.

Burette stopcocks work automatically, too (no more forgotten, open settings). Stepper motor drives burettes and chart for precise, *electronic* synchronism without awkward mechanical linkages.

Next to be considered are the recording functions of the DG. Separate inputs for each titration station, with asymmetry and electrode-response adjustments for each input. Spans of 2, 5, and 10 pH (200, 500, and 1000 mv), with accuracy of 0.25% of full scale. Ten-turn zero adjustment *calibrated* to 0.01 pH or 1 mv. Pen response of 2 seconds (1.5 sec. *faster* than the DG's predecessor).

Also to be mentioned: An adjustable cam-and-microswitch that permits either (1) stopping the titration at predetermined endpoint or (2) operating the Model DG as a

pH-stat. And optional automatic temperature compensation.

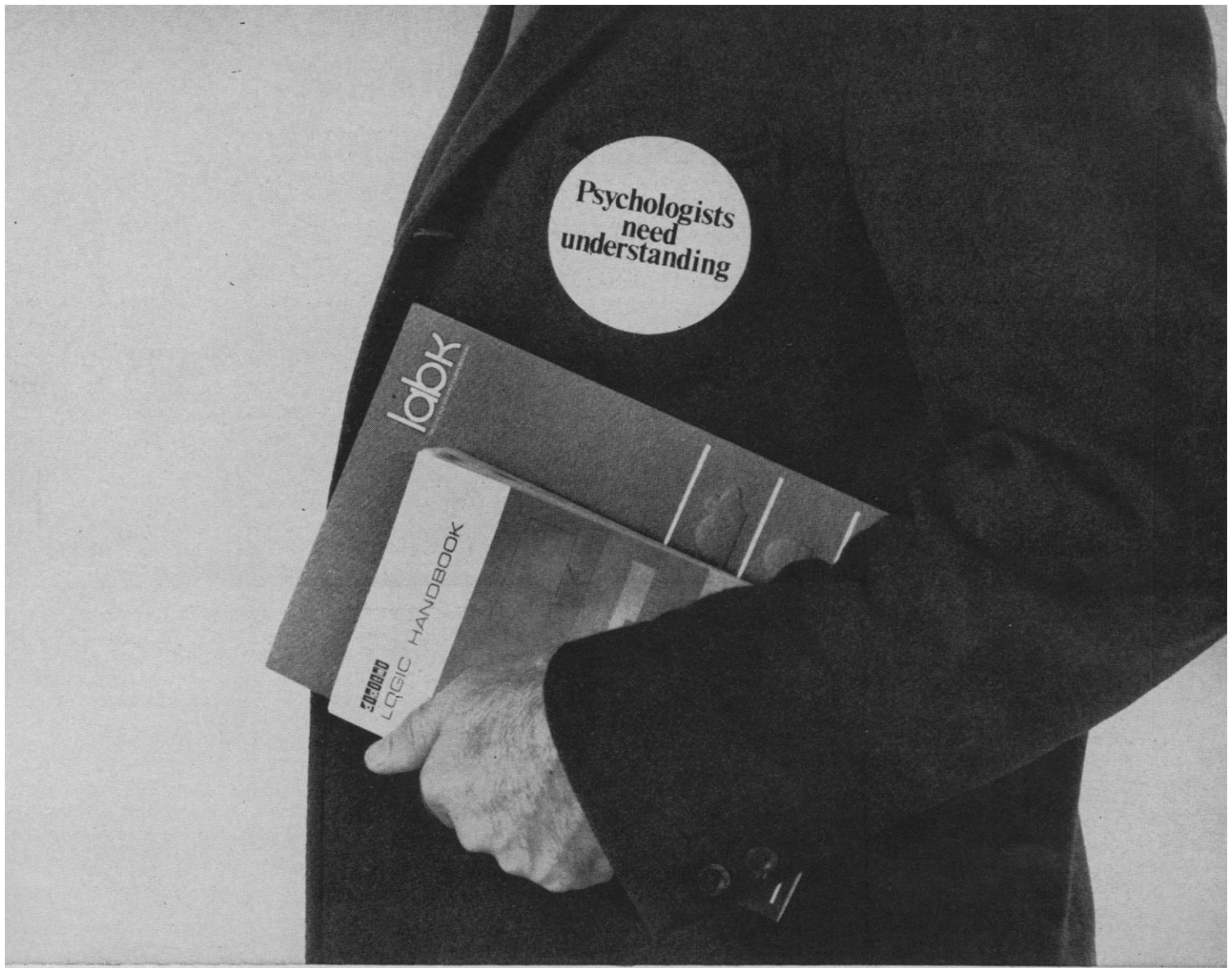
Finally, a look inside the DG. All solid-state circuitry. Standard 115/230-volt, 50-60 Hz operation. The Model DG Automatic Recording Titrator—\$3100. More details from your Sargent-Welch representative. Or write.

9-214

 **SARGENT-WELCH**

Scientific instruments, apparatus, chemicals.
Sargent-Welch Scientific Company
7300 N. Linder Ave.; Skokie, Illinois 60076

Chicago/Anaheim/Birmingham/Cincinnati
Cleveland/Dallas/Denver/Detroit
Springfield, N.J./Toronto/Montreal/Vancouver



The LAB-K Pre-computer with plug-in programming

LAB-K is a new, all solid state controller kit for the psychology laboratory. It stands alone, works alone, controls alone. In its basic \$2,700 configuration, it will do most of the time and event control functions that you would want done, all by itself.

In the building block kit is a hardware programmer. A 200-position plug board provides all the functional control capabilities that the most expanded configuration of LAB-K requires . . . the patch board receiver prewired by printed circuit board techniques. Setting up an experiment, or changing to another experiment, is a simple matter of plugging in. And expanding is simply a matter of plugging in.

But beyond all that, LAB-K is also a pre-computer. It is designed to interface easily with the computer that you may acquire in the future, and will back up that computer through the life of an experiment. (Remember it stands alone.)

LAB-K is made with K-Series solid state modules that are ultra-reliable, easy to use, and designed to be immune to the electrical noise generated by other apparatus in the

laboratory. Furthermore, the modules are compatible with the complete K-Series module line that was first designed for the industrial factory environment. They are that rugged.

Write for the LAB-K brochure and the "Positive Logic Handbook". The button will be sent along too.

Biomedical Department #152-B
Digital Equipment Corporation
146 Main Street
Maynard, Mass. 01754

digital
COMPUTERS • MODULES

Send me the LAB-K brochure, the "Positive Logic Handbook" and my button.

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Neurobiology of Cerebellar Evolution and Development

First International Symposium
of the Institute for Biomedical Research

Edited by R. Llinás, M.D., Ph.D.

SECTION I / INTRODUCTION

Vertebrate history with special reference to factors related to cerebellar evolution—A. S. ROMER.

Comparative aspects of cerebellar morphology—E. C. CROSBY.

Physiological and morphological organization of the cerebellar circuits in various vertebrates—R. LLINÁS and D. E. HILLMAN.

SECTION II / FISH

General morphology of the fish cerebellum—H. N. SCHNITZLEIN and J. R. FAUCETTE.

A survey of the general morphology, the fiber connections, and the possible functional significance of the gigantocerebellum of mormyrid fishes—R. NIEUWENHUYNS and C. NICHOLSON.

Aspects of the histology of the cerebellum of mormyrid fishes—R. NIEUWENHUYNS and C. NICHOLSON.

Fine structural studies of the cerebellar cortex in a mormyrid fish—I. R. KAISERMAN-ABRAMOFF and S. L. PALAY.

Influence of electric organ control system on electrosensory afferent pathways in mormyrids—M. V. L. BENNETT and A. B. STEINBACH.

Neural elements of the cerebellum in elasmobranch fishes: Structural and functional characteristics—C. NICHOLSON, R. LLINÁS and W. PRECHT.

Electrophysiological studies on parallel fibers of the corpus cerebelli of the dogfish *Scyliorhinus canicula*—D. H. PAUL.

Electrophysiological study of cerebellar nucleus neurones in the dogfish *Mustelus canis*—N. TSUKAHARA.

Cerebellar and vestibular control of fish oculomotor neurones—Y. KIDOKORO.

SECTION III / AMPHIBIANS AND REPTILES

Neuronal organization of the cerebellar cortex in amphibia and reptilia—D. E. HILLMAN.

Ultrastructural aspects of the cerebellar cortex of the frog—C. SOTELO.

Spontaneous and evoked discharges of cerebellar Purkinje cells in the frog—A. C. NACIMIENTO.

The cerebellum as a timing device: An experimental study in the frog—J. A. FREEMAN.

A technique for current density analysis of field potentials and its application to the frog cerebellum—J. A. FREEMAN and J. STONE.

Electrophysiological analysis of alligator cerebellar cortex: A study on dendritic spikes—R. LLINÁS and C. NICHOLSON.

Behavioral aspects of cerebellar stimulation and ablation in the frog and alligator and their relationship to cerebellar evolution—D. C. GOODMAN.

Patterns of localization in the cerebellar corticofugal projections of the alligator (*Caiman sclerops*)—D. SENN and D. C. GOODMAN.

Inhibition in the cerebellar cortex of the lizard, *Lacerta viridis*—S. T. KITAI, T. SHIMONO and D. T. KENNEDY.

SECTION IV / MAMMALS

The importance of fiber connections in the comparative anatomy of the mammalian cerebellum—J. VOOGD.

Cerebellar organization in the light of cerebellar nuclear morphology and cerebellar corticogenesis—H. K. KORNELIUSSEN.

The sagittal organization of the cerebellar anterior lobe as revealed by the projection patterns of the climbing fiber system—O. OSCARSSON.

On the functions of dorsal spino-cerebellar tract in cat—P. G. KOSTYUK.

Synaptic organization of the mammalian cerebellum—K. UCHIZONO.

Modes of termination of Purkinje cell axons in the cerebellum of the cat—R. P. EAGER.

Climbing fiber branching in the granular layer—C. A. FOX, A. ANDRADE and R. C. SCHWYN.

Interfolial mossy fiber branching in the cat cerebellum—K. SASAKI.

Recurrent facilitation by disinhibition in Purkinje cells of the cat cerebellum—R. LLINÁS and W. PRECHT.

Mossy fiber and climbing fiber responses evoked in the cerebellar cortex by pontine stimulation—K. SASAKI.

The functional and morphological evolution of the cerebellum and its role in behavior—A. I. KARAMIAN, V. V. FANARDJIAN and A. A. KOSAREVA.

SECTION V / VESTIBULO-ACOUSTIC INPUT

Comparative aspects of the vestibular input to the cerebellum—W. PRECHT and R. LLINÁS.

Analysis of auditory and cerebrocortically evoked activity in the immature and adult cat cerebellum—R. J. SHOFER, D. S. SAX and M. G. STROM.

SECTION VI / ONTOGENY

Correlative survey of electrophysiological, neuropharmacological, and histochemical aspects of cerebellar maturation in rat—D. J. WOODWARD, B. J. HOFFER and L. W. LAPHAM.

Autoradiographic studies on histogenesis of the cerebellar cortex—S. FUJITA.

Ultrastructural studies on the cerebellar histogenesis. II. Maturation of nerve cell populations and establishment of synaptic connections in the cerebellar cortex of the chick—E. MUGNAINI.

The development of the mouse cerebellum. A Golgi and electron microscopical study—K. MELLER and P. GLEES.

Analysis of synaptogenesis in the cerebellum of the mouse—L. M. H. LARRAMENDI.

Development of synaptic organization in the partially agranular and in the transneurally atrophied cerebellar cortex—J. HAMORI.

Some aspects of the ontogeny of the cerebellum—L. B. VERBITSKAYA.

SECTION VII / CLOSING REMARKS

On cerebellar evolution and organization from the point of view of a morphologist—J. JANSEN



Published by the
American Medical Association
535 North Dearborn Street, Chicago, Illinois 60610

U.S., U.S. Possessions,
Canada, Mexico
\$35.00 per copy

All Other Countries
\$39.00 per copy

Payment must accompany all orders.

SERIES 7620 GAS CHROMATOGRAPHS

Cryogenic Chromatography Easy and Effective

With the 7620 GC's cryogenic module, sub-ambient oven temperature control is as easy and effective as high-temperature control has been for years.

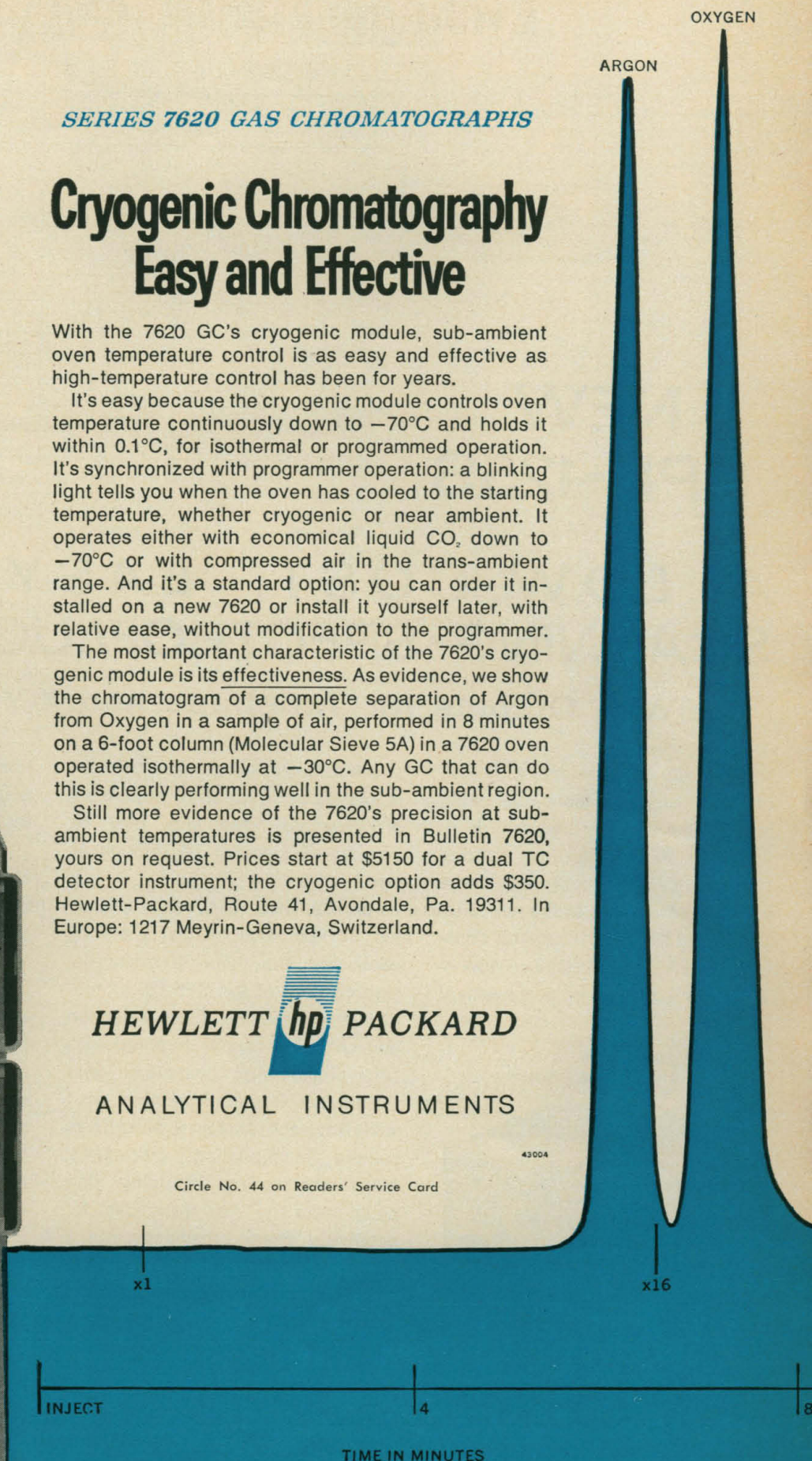
It's easy because the cryogenic module controls oven temperature continuously down to -70°C and holds it within 0.1°C , for isothermal or programmed operation. It's synchronized with programmer operation: a blinking light tells you when the oven has cooled to the starting temperature, whether cryogenic or near ambient. It operates either with economical liquid CO_2 down to -70°C or with compressed air in the trans-ambient range. And it's a standard option: you can order it installed on a new 7620 or install it yourself later, with relative ease, without modification to the programmer.

The most important characteristic of the 7620's cryogenic module is its effectiveness. As evidence, we show the chromatogram of a complete separation of Argon from Oxygen in a sample of air, performed in 8 minutes on a 6-foot column (Molecular Sieve 5A) in a 7620 oven operated isothermally at -30°C . Any GC that can do this is clearly performing well in the sub-ambient region.

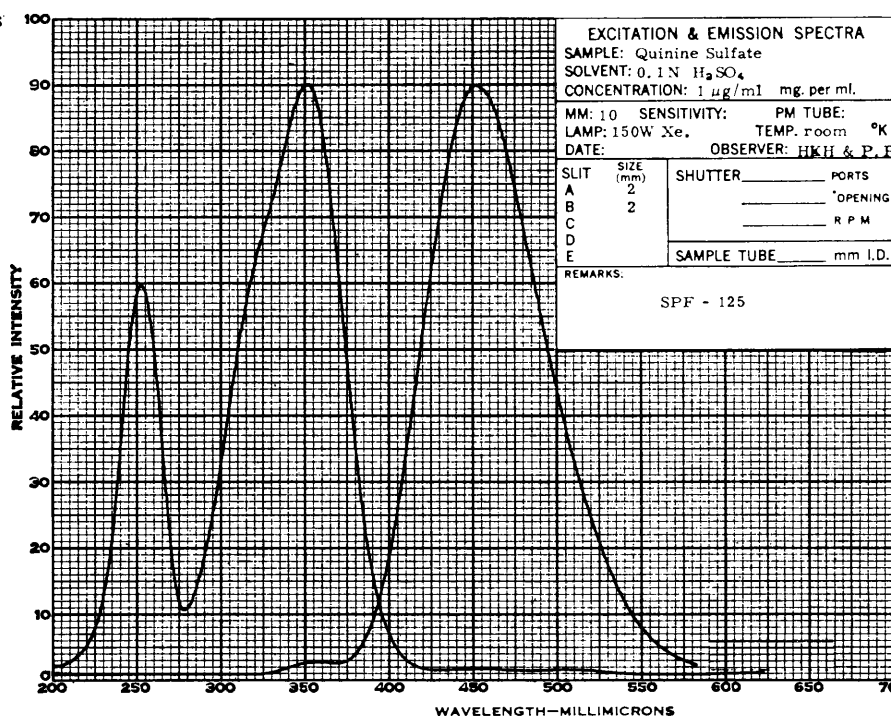
Still more evidence of the 7620's precision at sub-ambient temperatures is presented in Bulletin 7620, yours on request. Prices start at \$5150 for a dual TC detector instrument; the cryogenic option adds \$350. Hewlett-Packard, Route 41, Avondale, Pa. 19311. In Europe: 1217 Meyrin-Geneva, Switzerland.

HEWLETT  PACKARD
ANALYTICAL INSTRUMENTS

Circle No. 44 on Readers' Service Card



Curve demonstrates SPF-125S high performance characteristics:

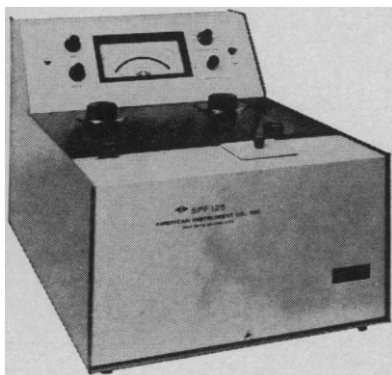


NEW SPF-125S

A LOW-COST, EASY-TO-USE SCANNING SPECTROFLUOROMETER

With Outputs for Timebase and X-Y Recording

Whether you are considering the use of fluorometry as a technique, doing routine fluorescence analyses, or involved in original research utilizing fluorescence, you should consider the multiple advantages of the new SPF-125 and -125S (with scanning capability): EASE OF OPERATION — Solid-state design in a convenient



single package; sample compartment is located up front; easily adjustable disc-mounted fixed slits may be varied in 6 steps of 1.5 through 44 nm.

For ROUTINE ANALYSES, choose the SPF-125 with manual scanning capability. The monochromator design concept of the SPF-125 eliminates the need for filter selection and changing usually required with filter fluorometric procedures, and the increased specificity associated with monochromators simplifies sample manipulation procedures. Many accessories, including flow cells, make the instrument ideal for automatic chemical systems. As a RESEARCH INSTRUMENT, the SPF-125S offers high performance at a low price. Check these specifica-

tions: SENSITIVITY: Parts-per-trillion range; RESOLUTION: 1.5 nm; STABILITY: 0.3% short-term fluctuation, 1%/hr long-term drift with temperature control, 2%/hr long-term drift without temperature control (the cell compartment is channeled to permit circulation of a controlled temperature fluid); SCANNING SPEED: 220 seconds for a complete scan (faster or slower speeds are available); SCANNING RANGE: 200-800 nm, each monochromator; FOCAL LENGTH: 125 mm; RECORDER: Any 50 mv, 1 sec. full-scale response recorder; PRICE:* SPF-125 — \$2850 with mercury lamp and manual scanning; SPF-125S — \$3950 includes xenon lamp and automatic scanning.

For complete information, request Bulletin 2424-S2.



At the forefront of Spectrofluorescence Technology since its inception.

AMERICAN INSTRUMENT CO., INC.

* Prices subject to change without notice, FOB Silver Spring, Md.

8030 Georgia Avenue, Silver Spring, Maryland 20910

1048

Circle No. 48 on Readers' Service Card

Circle No. 8 on Readers' Service Card →

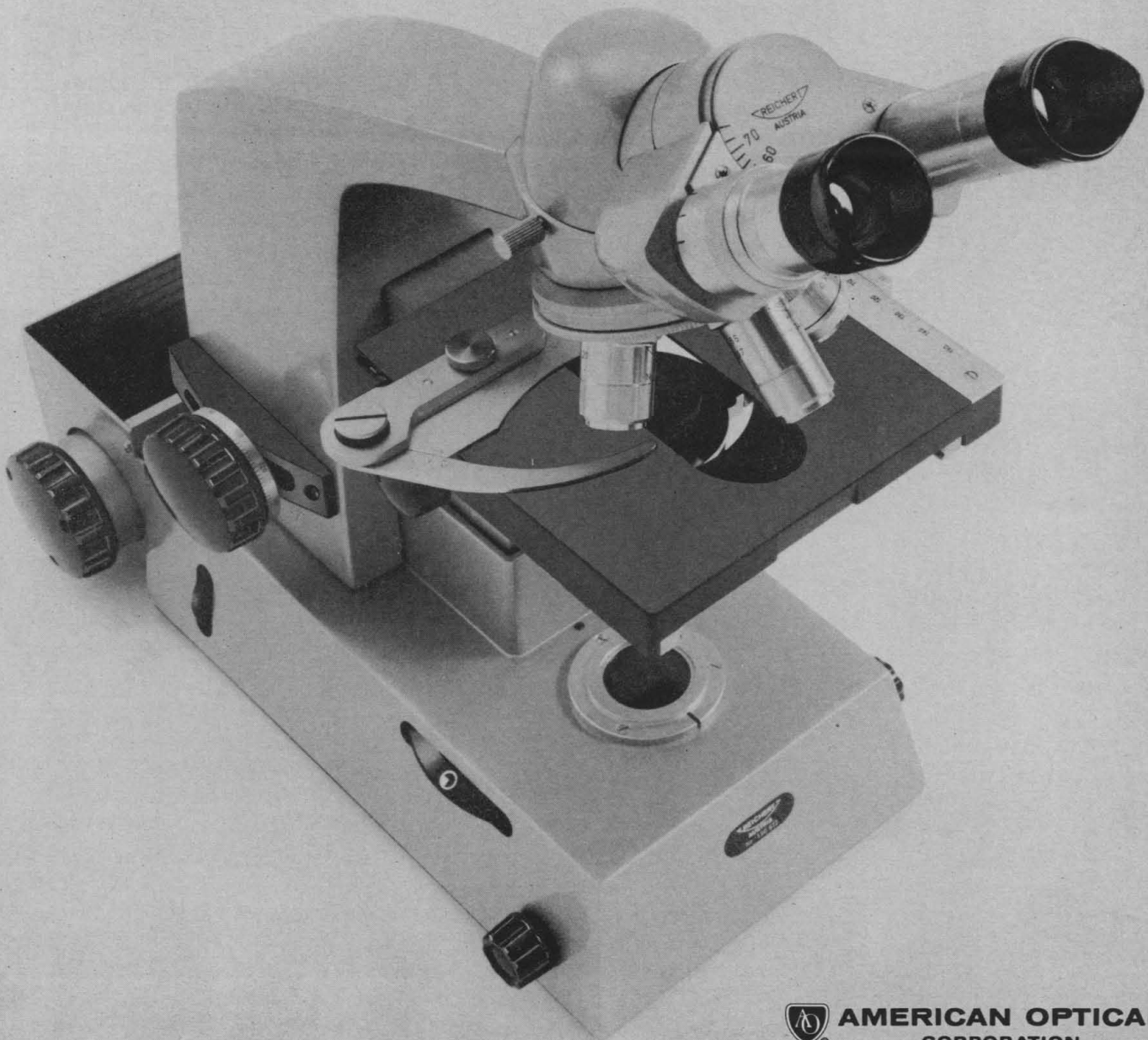
The Reichert Diapan Microscope:

for people
who don't want to
get too involved.

The Diapan demands minimum effort for outstanding results in routine research applications. It is a compact, easy-to-use stand with built-in illumination and filter control. Lamp housing is fitted with 100W halogen lamp. Microflash insert is also available.

Coarse and fine focusing adjustments are controlled from a single knob.

Best of all, it offers the unmatched quality of Reichert instruments plus the reliability of AO. Ask your AO Representative for a demonstration or write for detailed information.



**AMERICAN OPTICAL
CORPORATION**

SCIENTIFIC INSTRUMENT DIVISION • BUFFALO, N.Y. 14215

This is the first new nuclear counting system in over ten years. It's the General Electric NUCLE-EYE^(TM) Monitor System, an entire nuclear laboratory in a 10 x 14 x 3" case.

With a built-in power supply and carrying handle, the eight-pound GE NUCLE-EYE Monitor goes everywhere your rack of nuclear instruments can't.

But don't think we've sacrificed capability for compactness. Fact is, General Electric's NUCLE-EYE System competes with far costlier systems when it comes to ultra sensitivity. Even low radiation counting is practical because the NUCLE-EYE Monitor features a semi-conductor detection system with high gain.

The heart of this amazing Monitor System is its solid-state "front end." It contains a silicon "avalanche" diode, the world's

first solid-state proportional detector. And it also features high speed tunnel diode circuitry.

Detection by the NUCLE-EYE Monitor is extremely fast. In fact, almost as fast as a nuclear particle can create a signal in a solid. The result? Background noise is virtually eliminated. You can count low energy radiations with low background at elevated temperatures or count at the highest rates with no loss of precision.

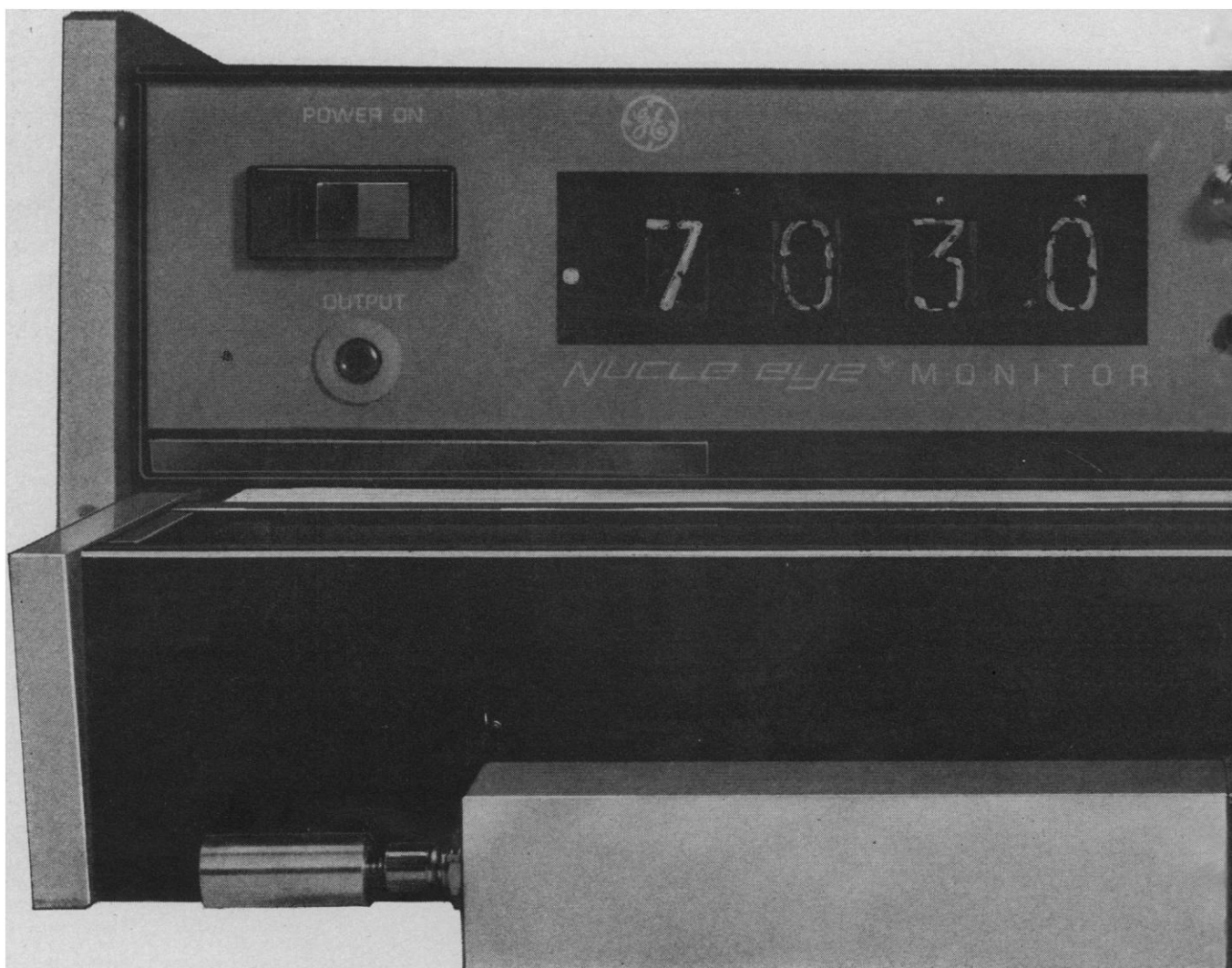
With General Electric's NUCLE-EYE System, you easily detect nuclear radiation from the softest betas to high energy gamma radiation. Interchangeable heads are available, optimized for beta or gamma radiation.

What applications do we foresee for our exciting new system? Here are just a few:

Nuclear biology and physics

- Ultra soft x-ray and low energy beta research

General Electric introduces the first fully portable, ultra-sensitive nuclear counting system. And, it's under \$3,000.





- Non contamination radiotracing
- Ultra low-level counting
- Electron microprobe fluorescence detectors
- High temperature radiation detection
- Fast timing of nuclear events

Analysis and control

- X-ray fluorescence probes
- Beta particle backscatter probes
- Portable tritium monitors
- Density gauging
- Radioisotope production

Medicine and dentistry

- In-vivo probing
- X-ray fluorescence scanning and analysis
- Dental enamel studies
- Bone density scanning with isotopes
- Health physics instrumentation
- Carbon-14 research and experiments
- Ophthalmological tumor detection

The portable model (illustrated) is equipped with an x-ray detection head sensitive to energies greater than 1 keV, digital readout, sampling time control and a rechargeable nickel-cadmium battery system. Provisions are made for driving external rate meter, printer, comparator or other data systems.

**For more information, contact
Space Technology Products,
P. O. Box 8439, Philadelphia, Pa.
19101 Phone: (215) 962-8300**

162-48



Circle No. 43 on Readers' Service Card

We've got 19 original spin labels in four convenient kits.

Some just might be right for your particular biological problem.

Free radical spin labels are important new members of the family of spectroscopic probes for biological systems. The pronounced effect of the molecular environment on the labels' EPR (electron paramagnetic resonance) spectra allows you to study conformational and structural changes in macromolecules and membranes.

Our initial spin label kit is an Attaching Group "sampler" which contains four 25 mg vials of the tetramethylpiperidinoxyl radical in combination with four attaching groups: iodoacetamide, isothiocyanate, maleimide and bromoacetamide.

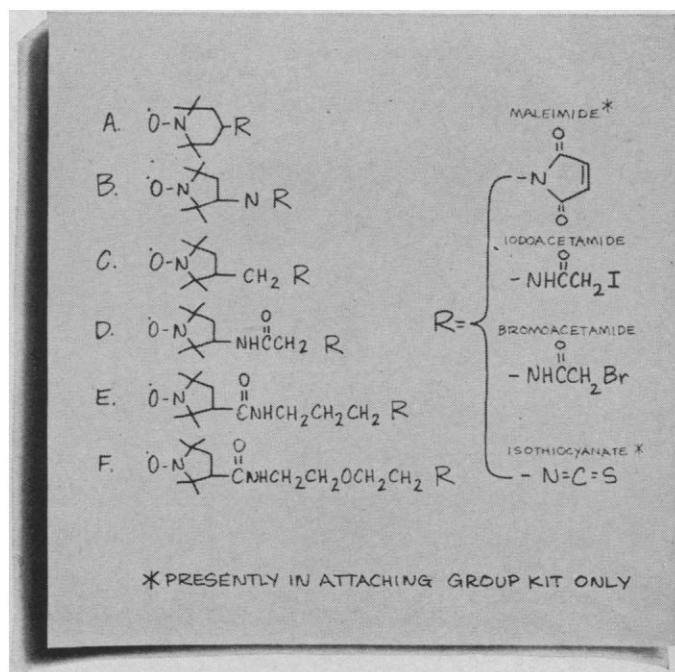
Each of these attaching groups has been found useful in spin labeling proteins and other biomolecules. Since the selectivities of the attaching groups vary, the most effective group must be found by trial and error. And so, our "sampler" kit does the job nicely. For only \$160.00.

In each of our other three kits (iodoacetamide, maleimide or bromoacetamide), one of the attaching groups is supplied in combination with five tetramethyl-1-pyrrolidinyloxy radicals of systematically varied chain lengths. The use of five different spin label side-chains permits a label to be selected which reflects optimum mobility to the radical. This variation

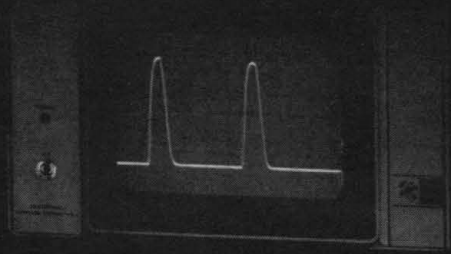
of chain length may give added information about the molecular environment in which the label is attached.

Additional kits and individual spin labels (including an isothiocyanate kit and a mercury compound) will soon be available and more are under development in our laboratories. We invite your product suggestions as well.

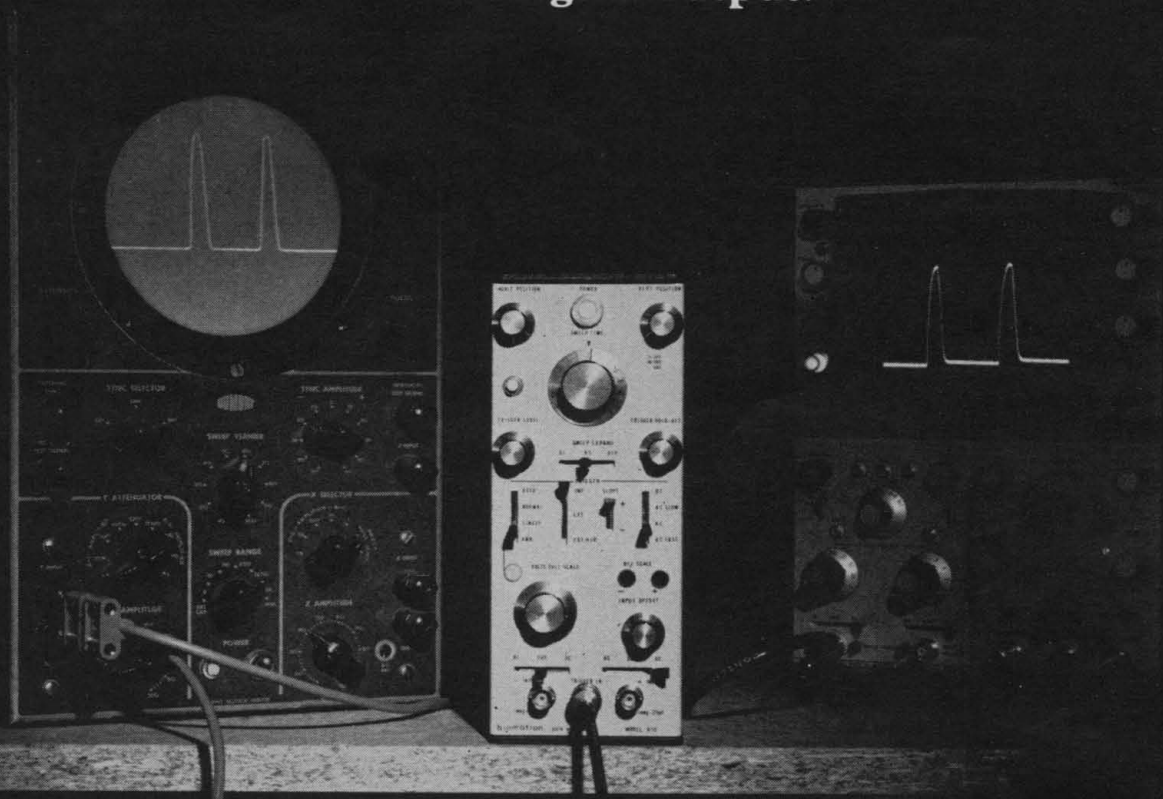
For complete information on any of our spin labels or kits, write Synvar Associates, 3221 Porter Drive, Palo Alto, California 94304. Telephone: (415) 328-2200



SYNVAR
a joint venture of subsidiaries of
Syntex & Varian.



**New transient recorder
makes every scope a 1 MHz storage scope
with digital output.**



Shown above on the Dumont and Hewlett-Packard oscilloscopes and Tektronix Display Unit are a pair of 500 ns wide pulses which have been stored and continuously displayed for one week.

Connect your new 610 Transient Recorder to any oscilloscope, old or new, and it becomes one of the finest storage scopes in the industry.

The 610 is specifically designed to catch single shot transient signals and hold or display them indefinitely.

It employs a 6 bit analog to digital converter with a 10 MHz word conversion rate, feeding a 6 bit x 128 word MOS shift register memory. This combination will capture and hold the digital equivalent and accurately reproduce any analog signal to 1 MHz.

Sweep is triggered externally or by the signal itself. Most important: the 610 can be triggered *before, during, or after* the signal has occurred.

Recorded information can be output in analog or digital form without erasing from memory. The analog output is smoothed and the result can be displayed, expanded or repositioned, on any oscilloscope, X-Y recorder, strip chart or other analog device. If you prefer, stored information can be recorded on a digital recorder or passed directly to a computer for processing.

Applications include observing and recording single shot or repetitive signals wherever they occur

in Electronics, Physics, Chemistry, and Life Sciences. As a computer peripheral unit, the 610 combines a very high speed ADC with a buffer memory to allow data gathering at very high rates with asynchronous transfer to a computer.

Price: \$1385.00.

For complete technical information, write Biomation Corporation, 1070 East Meadow Circle, Palo Alto, California 94303. Tel: (415) 321-9710. Eastern Office: 205-07 Hillside Avenue, Hollis, New York 11423. Tel: (212) 465-2110. In Europe: Data Laboratories, Mitcham, Surrey, England. 01-648,4643

biomation

1070 East Meadow Circle, Palo Alto, Calif. 94303

☐ Yes, I would like to learn more. Send product file.

☐ Have your salesman call for a demonstration appointment.

Name..... Title.....

Address.....

City..... State..... Zip.....

Phone.....

The new 4400 Series gas chromatographs from Fisher/Victoreen are ready for your lab today — with tomorrow's features.

Consider the 1250 cubic inch column oven (biggest of its kind). The 4-detector 4-column capability. The automatic recycling programmer. The cryogenic capability. The vibrating reed electrometer. The most repeatable pyrolyzer on the market today. A true

proportional temperature control system.

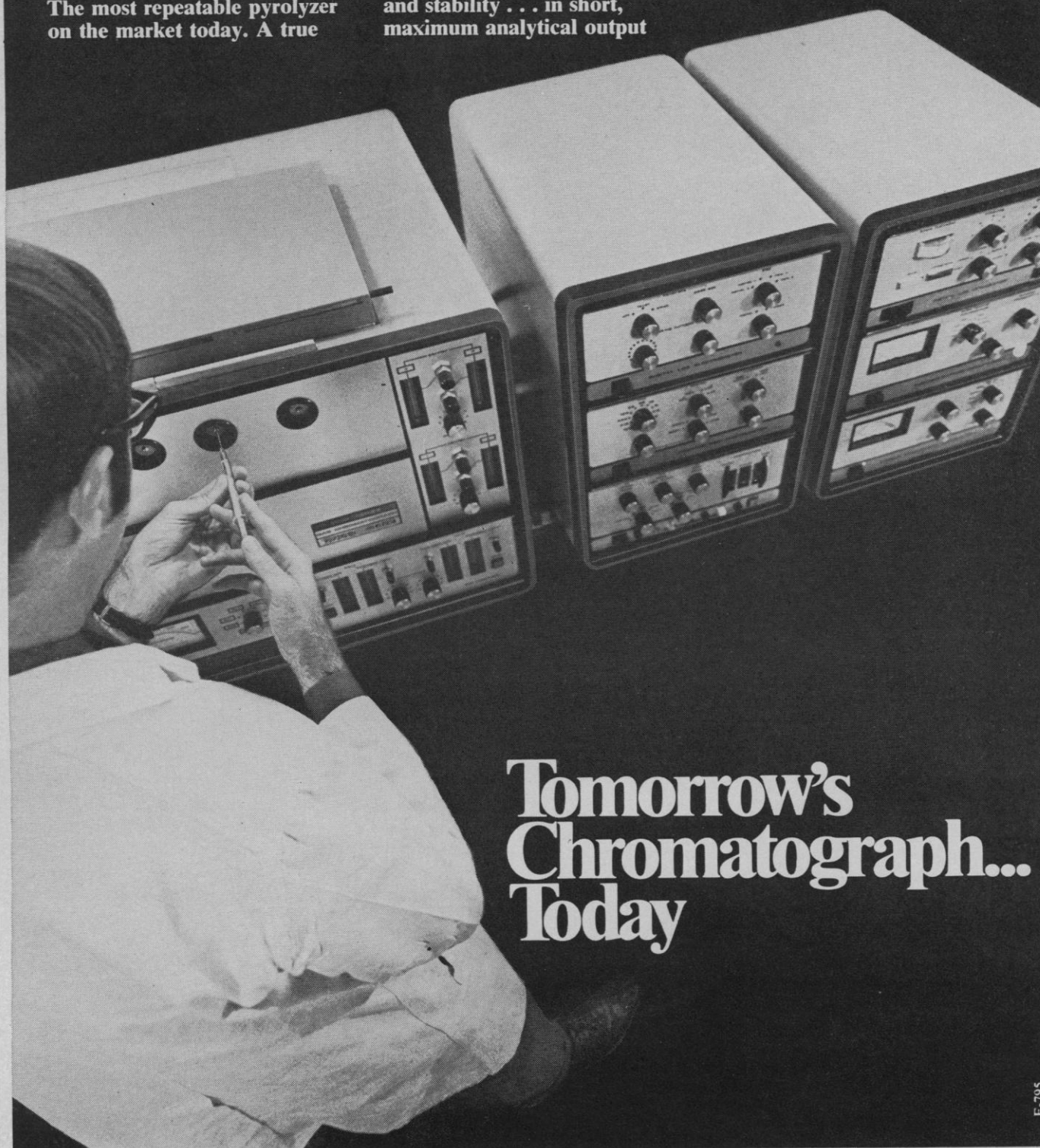
All this adds up to a superb research-grade instrument that allows permanent connection to detectors and inlet accessories . . . continuous linear programming from -180° to 500°C . . . small-signal detection to 6×10^{-15} . . . attention-free integrator and recorder operation . . . unsurpassed repeatability and stability . . . in short, maximum analytical output

with minimum human error or effort.

A NEW BULLETIN describes the instrument in detail. For your copy, circle No. 9 on the Reader Service Card.

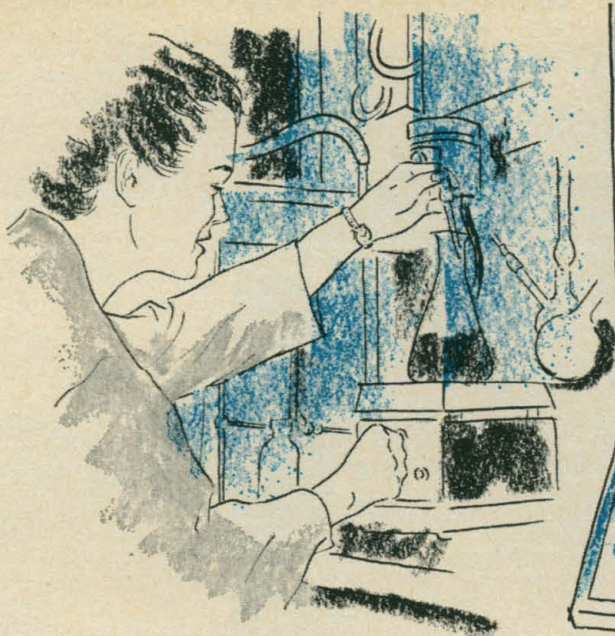


Fisher/Victoreen



Tomorrow's
Chromatograph...
Today

F-795



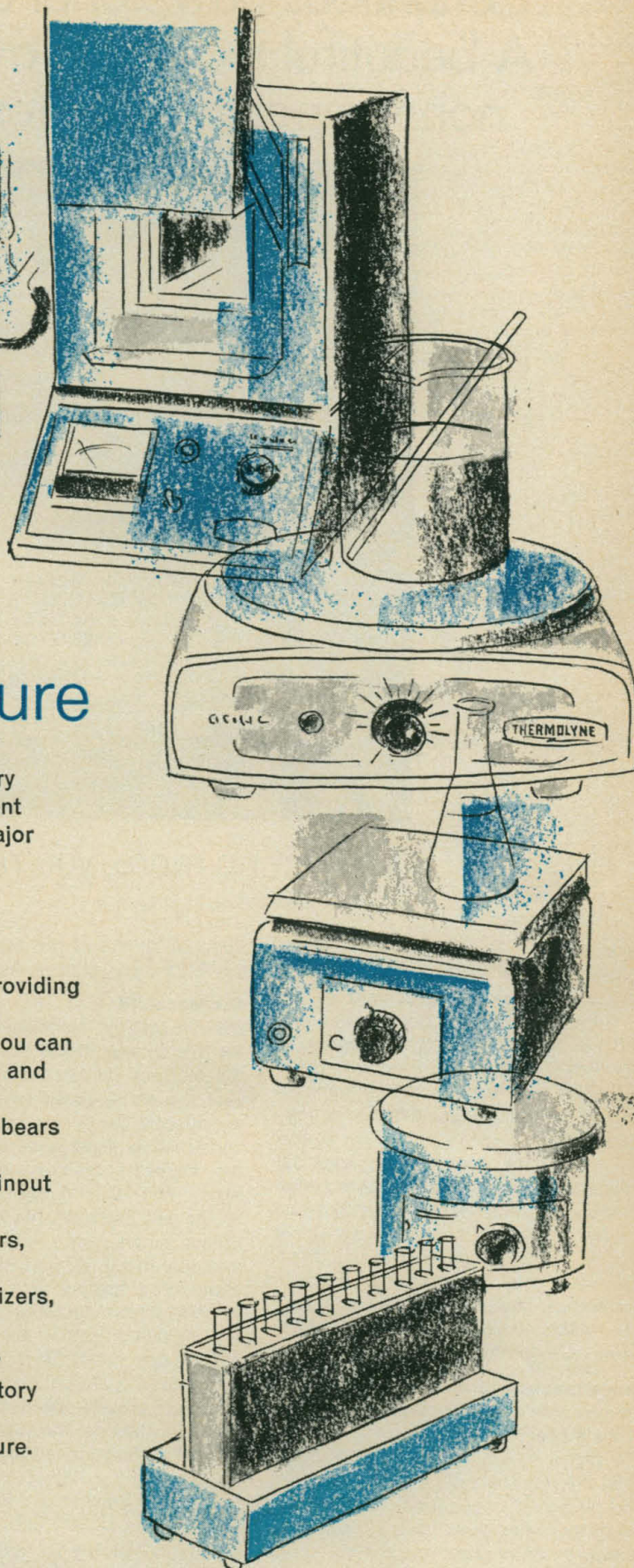
In your work . . . you have to be sure

To be absolutely sure about your laboratory apparatus, insist on Thermolyne. Consistent quality and advanced design have been major factors in Thermolyne's attainment of a leadership role in this field.

Thermolyne, a subsidiary of Sybron Corporation, devotes its entire research, development and manufacturing effort to providing the very best in industrial, educational and clinical laboratory apparatus . . . the kind you can depend on. Each unit is skillfully produced and thoroughly tested. Every one of the wide variety of Thermolyne laboratory products bears the distinctive mark of quality . . . precise temperature controlled furnaces, stepless input and electronic controllers, Nucerite and explosion proof hot plates, magnetic stirrers, Dri-bath and water-bath incubators, laboratory lamps, culture incubators, sterilizers, modular Histo-Centers and several new, advanced products soon to be announced.

Thermolyne's accurate and durable laboratory apparatus has been designed with you in mind . . . insist on Thermolyne . . . to be sure.

Write for free Thermolyne catalog.



THERMOLYNE
SYBRON CORPORATION

2555 Kerper Blvd., Dubuque, Iowa 52001

Continuous-flow zonal ultracentrifugation: A beautiful technique awaiting a practical, non-temperamental research instrument.



(Wait no more: you're looking at it.)

Background

Continuous-flow zonal ultracentrifugation was a major development of Dr. N. G. Anderson and co-workers in the AEC-NIH Molecular Anatomy Program at Oak Ridge National Laboratory. And because this technique combined high resolution, high capacity, and high practicality, a production-scale centrifuge is now being used by major pharmaceutical companies for the production purification of influenza virus vaccine. The high resolution of this device is now providing vaccine up to 10X purer than any previously available commercially. (Electro-Nucleonics, Inc., is the only company making this ultracentrifuge—the Model K—available commercially.)

Now announcing the Model RK: the research and pilot-plant version of the Model K.

The high capacity of the Model K is beyond the requirements of many research and pilot-plant applications. The obvious need, then, has been for a simple, non-temperamental continuous-flow zonal ultracentrifuge as dependable and versatile as the production-oriented Model K, but designed for the smaller volumes of

material typical of the research laboratory and the pilot plant. Enter the Model RK.

The Model RK

Oversimplifying somewhat: the Model RK is a smaller Model K. Accordingly, it too features continuous flow capability over the entire speed range. And, most importantly, the design, engineering, and construction aspects of the Model K—the elements responsible for its simplicity and dependability—are retained by the RK. Example: the RK has the K's unique single-pass rotating seal design and operates to 60,000 RPM completely eliminating fussing with complex temperamental demountable seal systems for loading and unloading the rotor.

Now specifications, briefly. The currently available aluminum and titanium RK rotors provide speeds of 35,000 RPM and gravitational forces in excess of 90,000 g. (Subsequent rotors—fully compatible with the RK system—will provide even higher gravitational fields at the RK's full speed of 60,000 RPM.) The RK rotor volume is typically 1.7 liters and the sample flow rate may be 500 ml/min or higher.

The RK is a safety-oriented instrument with a monitoring system which con-

stantly scans the critical operating conditions and forecasts problem areas in sufficient time to correct them. Result: the RK monitoring system protects both your run *and* your instrument.

Applications of continuous-flow zonal ultracentrifugation

This technique has been most effectively used to isolate viruses, bacteria, mitochondria, polysomes, ribosomes, ribosomal subunits, macroglobulins, microsomes, and other sub-cellular particles. It has wide application wherever high-resolution separation of such components is desired. (For background information see: "The Development of Zonal Centrifuges and Ancillary Systems for Tissue Fractionation and Analysis," National Cancer Institute Monograph 21, GPO, Washington, D.C. 20402. \$4.75)

For further details

We'll be happy to send further information on the new Model RK and/or the production-scaled Model K. Write Tom Guerin (or call collect 201-227-6700), Electro-Nucleonics, Inc., Fairfield, New Jersey 07006.

ELECTRO-NUCLEONICS



**We concentrated
on improving the art
of protein concentration.**

**The result:
Sartorius Collodion Bags**

If your problem is concentrating protein solutions quickly and efficiently, Sartorius Collodion Bags and accessories are something you really should look into.

Sartorius Collodion Bags are made of pure nitrocellulose and are tapered to facilitate protein collection. Their extremely fine pore structure retains any compounds with molecular weights over 30,000. Thus, a 5 ml. sample of body fluid can be reduced under vacuum to 0.02 ml. of concentrate in just two hours. An additional important advantage of these bags is that they need not be discarded after one-time use. Cleaned carefully and kept moist, Sartorius Collodion Bags may be re-used up to five times. To mount these bags for pro-

tein concentration, Sartorius makes a complete line of bag holders with ground-glass joints, flat and round bottom suction flasks, and racks made of PVC.

Sartorius Collodion Bags are just one of many different types of membrane filters and related apparatus made by Sartorius to meet virtually every laboratory need. All are fully described in our new Membrane Filtration Catalog. For your free copy, write: Sartorius Filter Division, Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590.

**sartorius
membrane filters**

A DIVISION OF



6.025×10^{23} is an illuminating number. Based on Count Amedeo Avogadro's celebrated leap in the dark to find how many molecules there are in a mole, his number threw light on mysteries concealing the nature of matter.

But it has a fearful lot of 0's in it. We like our number.

When you dial 6.025×10^{23} you don't get to talk to somebody who understands. But when you dial (312) 296-1055 you get light on

your radiochemical problems.

Share the benefits of our noble ancestry: The Radiochemical Centre, Amersham, which is operated by the United Kingdom Atomic Energy Authority, and America's G. D. Searle & Co.

We offer a wide range of labelled compounds, radiation sources, standards, and nuclear laboratory supplies. We make stock items or custom preparations. We ship the fastest way, usually the day

we get your order. Fast almost always. Reliable always.

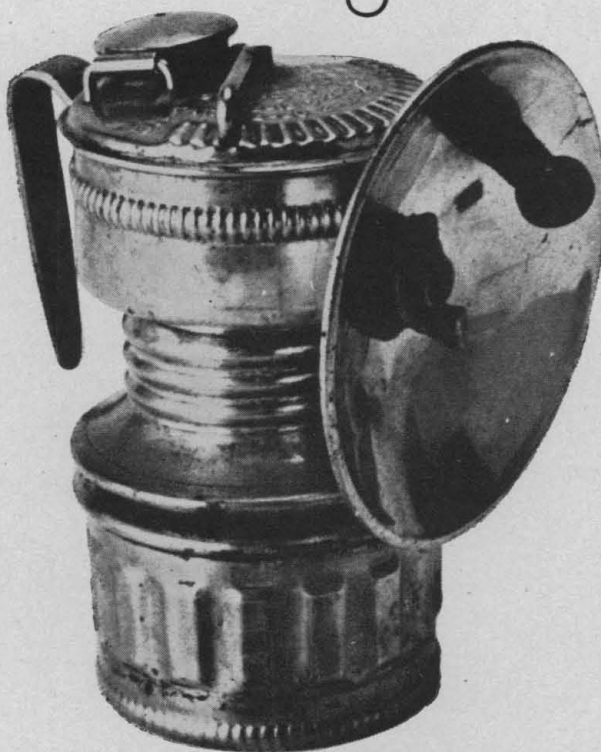
All you get when you dial 6.025×10^{23} is sore fingers. When you dial (312) 296-1055 you get service.

Turn on the light. Give us a jingle and ask for our Customer Service.

And send for our first edition.



our number's illuminating, too,
Dr. Avogadro



312
296-1055

2000 NUCLEAR DRIVE, DES PLAINES, ILLINOIS 60018 TELEPHONE: (312) 296-1055



Amersham/Searle

AMERSHAM/SEARLE CORPORATION:
AN ACTIVITY OF G. D. SEARLE & CO. AND THE RADIOCHEMICAL CENTRE

Enlightened Photometric Measurements

Plug-in
Turn-on
Read-out



Standard Photometric Probe, 5116

■ NBS traceable accuracy to within 5% at any point on the CIE Standard Observer Curve ■ Non-visual sensitivity less than 0.01% — zero hysteresis ■ Temperature compensated measurements from 10^{-5} to 10^{+4} footcandles (footlamberts) ■ 0.5" square active sensor ■ Silicon detector—repeatability 0.2% per month non-cumulative, 1% per year. Price \$370.00

Telephotometric Spot Probe, 5466

■ Triggered "sample and hold" digital photometric measurements from 10^{-3} to 10^{+6} footlamberts ■ 1° measurement angle— $12^\circ \times 15^\circ$ field of view—optional close up adapters ■ Through-the-lens viewing with superimposed meter indicator ■ 5% point-by-point match to CIE photopic response—zero hysteresis—2% per year repeatability Price \$490.00

Photometric Photomultiplier Probe, 5586

■ Low level photometric measurements— 10^{-9} to 10^{+1} footcandles ■ CIE photopic response—fast AC output—interchangeable filter compartment ■ Adjustable iris—1½" maximum aperture ■ Ultra-low current operation assures 1% linearity—low hysteresis—magnetic shielding ■ Repeatability 2% per hour, 5% per month Price \$586 (S-5 corrected) \$430.00 Model 100 power supply \$595.00

Cosine Corrected Probes, 5756, 5757, and 5758

■ Selenium, cosine-corrected CIE photopic response ■ Autoranges from 10^{-4} to 10^{+5} footcandles (10^{-6} to 10^{+5} for Model 5758) ■ Linearity 1% Price Model 5756 \$380.00 Model 5757 \$240.00 Model 5758 \$310.00

Microphotometer, 5006

■ Resolves 10^{-11} lumens emanating from sources as small as 0.0001" ■ Alternately measure, view or photograph any portion of the viewing field ■ Includes microphotometer adapter, camera, microscope, PM probe Model 5586 and Model 100 PM power supply Price \$1,505.00²

Differential Probe Module, 3011

■ Permits individual, differential and summation measurements of two, not necessarily similar, CINTRA probes ■ Compare lamps, phosphors, etc. for light output changes as small as 1 part in 10^5 Price \$320.00

Photometric Pencil Probe, 5266

■ Handy photometric surface measurements from 10^{-3} to 10^{+8} footlamberts—CIE photopic response ■ 0.02" diameter sensing area—adjustable focus ■ Repeatability 0.2% per month, 2% per year—NBS traceable Price \$440.00

Large Aperture Photometric Probes, 5396, 5796

■ NBS traceable accuracy to within 5% at any point on the CIE Standard Observer Curve ■ Non-visual sensitivity less than 0.01% ■ Temperature compensated measurements from 10^{-5} to 10^{+4} footcandles (footlamberts) ■ Interchangeable filter compartment—anodized aluminum housing—1" diameter active sensor ■ Silicon detector—repeatability 0.2% per month non-cumulative, 1% per year Price Model 5396 \$440.00 Model 5796 (calibrated with cosine corrector) \$490.00



Model 150 Digital Photometer

■ Measures footcandles and footlamberts ■ Digital readout ■ 0.1% long term stability ■ Seven decade autoranging ■ Reliable silicon IC design ■ "Sample and Hold" remote programming ■ Precalibrated plug-in probes and wide range of accessories ■ Binary coded decimal and analog outputs for printer, recorder, etc. Make true visible photometric measurements with this versatile plug-in digital photometer even in the presence of considerable non-visible radiation. Instrument parameters are permanently set to within 0.1%. Select any precalibrated probe shown, plug it in and read directly in absolute units.

Model 150 (without probe) \$2,490.00

Photometric Plug-In Probes

Probes with Standard Observer CIE photopic response—both with and without cosine correction—are precalibrated to measure directly in units of footcandles, footlamberts and lumens traceable to NBS. Special calibrations for other units are available. Different probes automatically compensate for specific measurement conditions. Fast accurate "brightness" measurements of lamps, light emitting diodes, instrument panels, CRT displays, streetlighting levels, lasers and other light sources become simple routines. Match the probe to your application and measure with confidence.

Photometric Photomultiplier Probe, 5686

■ Ultra sensitive photometric measurements— 10^{-11} to 10^{-1} footcandles ■ CIE photopic response—fast AC output—interchangeable filter compartment ■ Adjustable iris—1½" maximum aperture ■ Ultra low current operation assures 1% linearity—low hysteresis—magnetic shielding ■ Repeatability 2% per hour, 5% per month Price \$686 (S-20 corrected) \$920.00



Cassegrainian Telephotometer, 3016

■ Ultra high resolution—measures the difference between two 25 watt lamps one foot apart and a mile away ■ Selectable field of view—focal plane iris ■ Resolves 10^{-10} footcandles—3½" diameter front surface optics ■ Includes: telescope, Model 5586 PM probe (CIE response) and Model 100 PM power supply Price \$2,425.00²



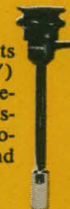
4π Emission Adapter, 3000

■ Ellipsoidal reflective collector has 10 to 100 times the sensitivity of an integrating sphere ■ Measures total hemispherical or spherical candlepower from small sources ■ Useable with interchangeable filters ■ can be ordered calibrated with Model 5396 or most other CINTRA probes Price (without probe) \$250.00



Contact Microphotometer, 3002

■ Fast accurate "see and scan" surface measurements ■ Resolves 10^{-3} footlamberts from 0.005" (or 0.010") diameter sources ■ Built-in superimposed Rotatable-scale reticle shows source dimensions in mils ■ Measures emitted or reflected light ■ Includes microphotometer adapter, Model 5686 PM probe, light pipe and Model 100 PM power supply Price \$1,275.00²



Multiple Probe Module, 3010

■ Permits operation of up to four different CINTRA probes with a single Model 150 photometer ■ Probe readout is sequenced either automatically, manually or by external triggering ■ Direct readout in absolute units on all probes ■ Gain corrections for filters, lenses, etc. can be made on one channel Price \$490.00



Flash Integration Module, 3009

■ Enables "sample and hold" measurements of single pulses in total footcandle-seconds ■ Measures nanosecond to millisecond pulses with most CINTRA probes for pulses typically below 10^7 footcandles peak ■ Can be triggered externally or can trigger an external source Price \$490.00



Computing Calculator 909

■ Automatic on-line or manual processing of optical data ■ Complete capability for mathematical manipulation of optical variables Price (909 only) \$3,780.00 On-line interface (typical) \$1,000.00



1. requires two different voltage settings on the Model 100 PM power supply
2. alternative silicon detector probes available at lower cost
3. with clip-on attenuator

Other probes with special responses ■ a broad variety of accessories to suit your requirements ■ standard lamps and calibration services ■ optical benches ■ thermal energy sources ■ quantum radiometer and thermal radiometer systems Prices outside U.S. and Canada slightly higher.



Cintra Incorporated—a subsidiary of Physics International Company • 440 Logue Avenue, Mountain View, California 94040 • (415) 969-9230

Circle No. 17 on Readers' Service Card

SEE LIFE AS IT IS...

...with the OLYMPUS CK

A Basic Tool for Tissue Culture Research

The CK is simply and specifically designed—and priced—to be the live-culture investigator's basic tool. It embodies compactly all of his basic needs, without rarely-used or superfluous features.

A basic tool must perform all of its appointed tasks easily and precisely. The CK's precision starts with its Olympus Achromat 4X, 10X and C20X objectives corrected for viewing through petri dishes or culture bottles.

LWD 40X (long-working distance) corrected for viewing through petri dishes or culture bottles is also available.

These objectives are noted for their high image contrast, field flatness, and superb correction—selected here with an eye to the depth-of-field requirements of live-culture investigation. Focusing is accurate and backlash-free, with tension instantly adjustable.

Accessories adapt the CK for phase contrast or polarizing microscopy. For photography, the binocular body may be replaced with a straight monocular tube, accepting any Olympus 35mm, Polaroid or sheet-film eyepiece attachment camera.

A transformer in the CK's base powers its low-voltage, high-intensity light source. The lamphouse incorporates a built-in condenser with iris diaphragm and filter holders. The light support may be moved to accommodate any type of culture vessel.

Like any basic tool, the Olympus CK is designed for comfortable, fatigue-free use over long periods. Its large, unobstructed stage and all controls are low down in the "Ready Region" for operating ease; its high-eyepoint, wide-field oculars are inclined and are raised well above the desk for maximum comfort.

The CK is just one model in the complete Olympus scientific and industrial microscope line. Information on the CK—or on other microscopes for your particular application—is yours for the asking.



OLYMPUS CORPORATION OF AMERICA
PRECISION INSTRUMENT DIVISION / DEPT. S
2 Nevada Drive, New Hyde Park, N.Y. 11040

Send information on:

- ☐ The Olympus CK ☐ Olympus upright microscopes
☐ Olympus photo accessories.

My applications include:

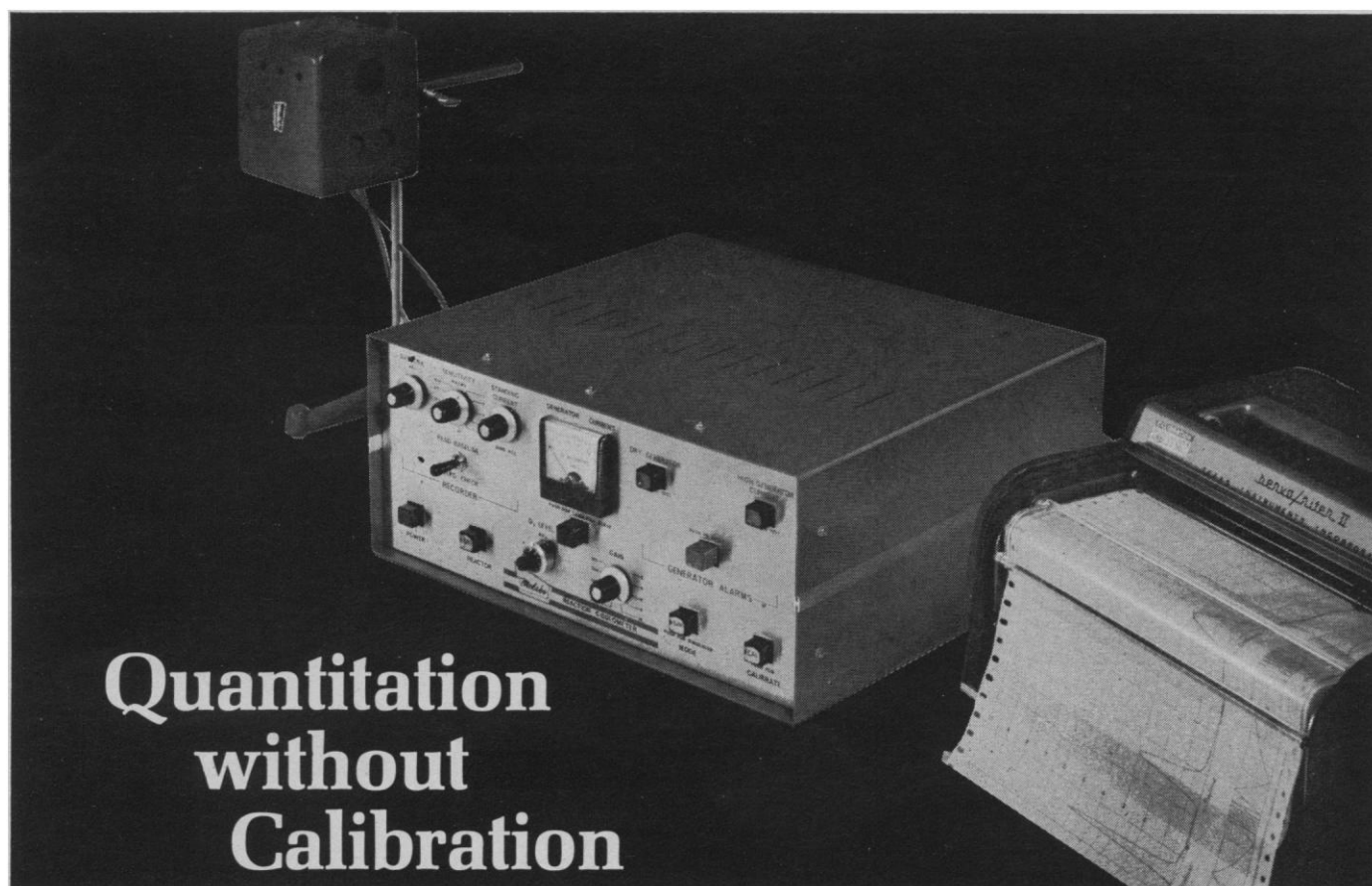
Name _____

Title _____

Organization _____

Address _____

City _____ State _____ Zip _____



The Melabs Reaction Coulometer is a **quantitative** detector for gas chromatography. Detecting most compounds combustible over a platinum catalyst, the Melabs detector provides important advantages over conventional detectors:

1. Completely **eliminates calibration**. Response is absolute.
2. Response is **independent** of flow rate, temperature.
3. Because the detector is quantitative, it offers a built-in check of **column holdup**.
4. Permits **quantitative analysis** of compounds **not eluted** from the chromatographic column.
5. Provides **positive check** of calibration and response factors of other (empirical) detectors.
6. **Rapid Response**—all key processes take place in the gas phase.

Developed by Burton, Littlewood and Wiseman¹, the Melabs Reaction Coulometer uses the proven principle of closed loop, automatic null-seeking circuitry. Key specifications: sensitivity, 10-20 ng; dynamic range, 1:10,000; absolute accuracy, better than 0.5%.

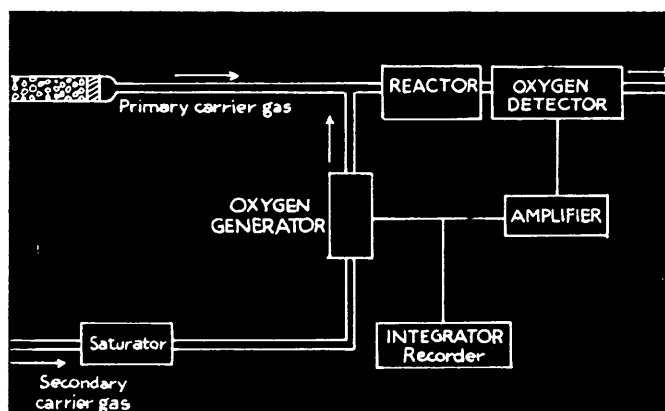
For additional details, please write to Melabs, Scientific Instruments Department, 3300 Hillview Ave., Stanford Industrial Park, Palo Alto, California 94304. Phone (415) 326-9500. In Europe, address Reaction Coulometers Ltd., Boyn Valley Rd., Maidenhead, Berks, England.

¹Burton, G., Littlewood, A.B., and Wiseman, W. A., "A Sensitive Quantitative Detector for Gas Chromatography using Electrochemical Measurement of Oxygen." **Gas Chromatography 1966**, *Proceedings of the 6th Int'l. Symposium on Gas Chromatography and Associated Techniques*, Rome, Sept., 1966, pp 193-207, Institute of Petroleum, London, 1967, Elsevier, Amsterdam (agent).

Booths 831-833 Pittsburgh Conference at Cleveland

20 FEBRUARY 1970

Circle No. 16 on Readers' Service Card

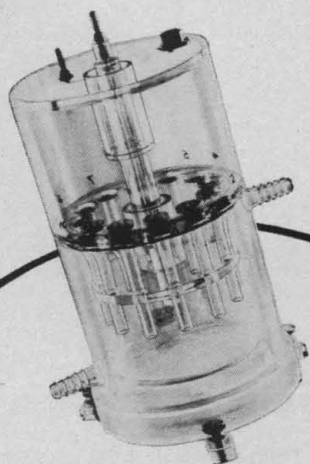


A constant amount of oxygen from the generator is mixed with the carrier gas and passes through the reactor and oxygen detector. Essentially 100% of any combustible compound coming from the chromatographic column is burned at 1,000° C over platinum in the reactor, consuming oxygen. The oxygen detector, therefore, sees a lower oxygen level, and its signal to the servo amplifier changes. The amplifier interprets this signal change as an error signal, and provides additional current to the oxygen generator, increasing its oxygen output until the oxygen deficiency no longer exists. The recorder or integrator records the exact amount of oxygen needed to make up the deficiency caused by the burned compounds. The amount of each material present is computed directly from the peak area, without reference to calibration standards.



MELABS, INC.
SUBSIDIARY OF SCM CORPORATION

Buchler gives you a **CHOICE** of instruments for
**POLYACRYLAMIDE GEL
 ELECTROPHORESIS**



Polyanalyst™

Basic analytical unit for separation and destaining. Compact, temperature-controlled, measures 6"W x 12"H. Migration takes place in 12 glass tubes perfectly aligned and equidistant from each other. Indispensable in determining operating parameters of the Buchler Poly-Prep unit.

Bulletin #3-1750

Buchler provides these important instruments for analytical or preparative procedures in gel electrophoresis. They are used for separating proteins, hemoglobin, albumin, enzymes and other compounds using polyacrylamide or another supporting medium. For complete information and prices, write for appropriate bulletin.

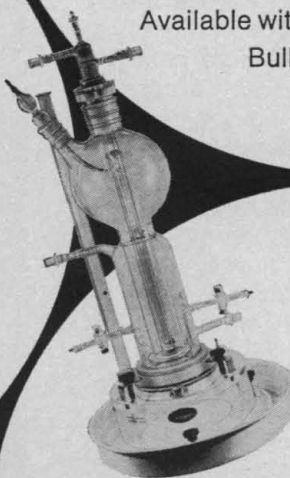


Fractophorator®

Preparative unit automatically elutes separations and delivers them to a fraction collector. Load capacity of a few micrograms to 25 mg.

Available with temperature-control.

Bulletin #3-1800



Poly-Prep® '200'

Temperature-regulated preparative instrument for continuous fractionation and elution. High yields and extreme purity are attained in a few steps. May also be used to concentrate protein solution. Also available in a compact 100 mg load capacity unit.

Bulletin #3-1700



LABORATORY APPARATUS • PRECISION INSTRUMENTS
BUCHLER INSTRUMENTS, INC.
 1327 16TH STREET, FORT LEE, NEW JERSEY 07024

The HP 1200 Oscilloscope System is designed to let you see and measure sophisticated physiological, mechanical and chemical occurrences.

But even more important, it is designed with built-in ease of operation. Now you can make expert scope measurements in any scientific field, without having to be an instrument specialist.

The low cost HP 1200 Series is the first all-solid-state scope designed for science-oriented measurements in the last 10 years. Its state-of-the-art concepts provide many features normally found only on today's most expensive scopes.

You can see low-level signals without error-producing drift. No need to worry about obtaining a base line, because autotriggering makes signal acquisition simple. Lightweight and rugged, the HP 1200 Scope Series gives you outstanding day-to-day

performance, with less maintenance and fewer adjustments. Controls are grouped according to function. The dials are direct reading and interlocking to prevent false measurements.

You see your measured signal more accurately, too. The big 8 x 10 cm CRT displays sharp, easy-to-read traces even in brightly lighted labs.

The HP 1200A Oscilloscope (\$990) gives you dual channel displays, with 100 μ V sensitivity. You can compare and measure very low level signals, such as nerve potentials or sensitive transducer outputs, without using preamplifiers. Specially designed circuits for noise suppression and common mode rejection greatly reduce stray pickup. Make your measurements quickly and easily, with no extra equipment.

With the HP 1200 Scope Series you have the added dimension of variable

persistence and storage. Holds one-shot phenomena for extended periods of time for precise measurements. Eliminate jittery traces from signals that change rapidly.

Storage and variable persistence are available in the HP 1201A, with dual trace and 100 μ V sensitivity. Price, \$1,900.

Nine different models, each in rack or cabinet configurations, are available in the HP 1200 Scope Series.

To determine which model will best help you see and measure sophisticated occurrences in your discipline...call your local HP field engineer. He will help you choose the 1200 Scope that best meets your requirements.

Or, write to Hewlett-Packard, Palo Alto, California 94304. Europe: 1217 Meyrin-Geneva, Switzerland.

088/6A

The Sophisticated Scope... You get expert measurements without being a scope expert!

HEWLETT  PACKARD

OSCILLOSCOPE SYSTEMS

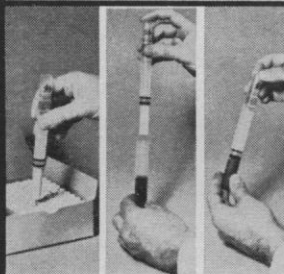
Circle No. 39 on Readers' Service Card



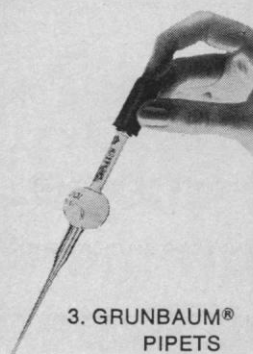
Error Eliminators and \$ Savers from L/I



1. L/I LABQUAKE™



2. STAT-FILTER®



3. GRUNBAUM®
PIPETS

1. L/I LABQUAKE™. A silent, small, submersible tube rocker and rotator for all sizes of tubes, 1/4" to 1 1/2" diameter. Occupies only 2 1/2 x 10 x 4 inches when fully loaded with 14 tubes. LABQUAKE has 28 tube positions altogether that accommodate clips to hold tubes of varying sizes. Adjustable bracket holds LABQUAKE fully or partially submerged in water bath.

Price: LABQUAKE (patent pending), for 110-120 VAC, furnished with (14) 13 mm and (14) 16 mm clips, \$59.50. Maximum capacity, 250 ml. Other clips may be substituted.

2. STAT-FILTER®. For instant filtration by high pressure or vacuum—in the palm of your hand. You get crystal clear filtrates within 3 seconds after precipitates form. All precipitates over 10 microns are retained with no possibility of remixing after separation. The versatile STAT-FILTER uses disposable polypropylene test tubes and plungers, making it suitable for any filtration. Inexpensive demonstration kits are available.

Price: complete STAT-FILTER SYSTEM, including 3 plungers, 100 disposable polyethylene filters and test tubes, and 25 test tube closures, \$38. Demonstration STAT-FILTER kit with 1 plunger, 10 filters, 7 test tubes and 3 closures, \$9.00.

3. GRUNBAUM® PIPETS (The Perfect Pipet). The versatile GRUNBAUM micro-pipet aliquots, dilutes, transfers, and stores reagents. It's self-adjusting, self-filling, non-dripping and self-cleaning (sample B washes out sample A). Guaranteed accuracy: 5 μ l, $\pm 3\%$; 10 and 20 μ l, $\pm 2\%$; 25 μ l and larger, $\pm 1\%$. Guaranteed reproducibility: 0.1% at 100 μ l. Sizes stocked for immediate delivery: 1, 2, 3, 4, 5, 10, 15, 20, 25, 50, 75, 100, 150, 200, 250, 300, 400, and 500 μ l. Other sizes on request.

Prices: 1 through 5 and 75 μ l, \$7. All others \$6.

4.-5. Automatic REPIPETS® and Dilutors. These unique instruments pipet, dilute and dispense with a *guaranteed* accuracy of 1% and a reproducibility of 0.1%. PYREX® L/I REPIPETS and Dilutors are of one-piece fused glass construction with no connections—eliminating any chance for leaks. L/I's instruments fit directly on your reagent bottles, 1/2 ounce and larger. Any reagent can be handled. All amber instruments are supplied for your labile reagents. Use L/I LAMBDA-DIALS® to increase precision to 1% at 10 lambdas! L/I stocks REPIPETS and Dilutors in 1/2, 1, 5, 10, 20, and 50 ml sizes, each adjustable from zero to full capacity. Square amber liter bottles optional at N/C.

Prices: REPIPETS, \$52.50; Dilutors, \$99.50. Micro and Macro Teflon® tips included.

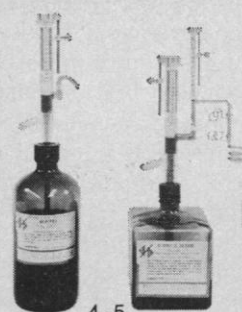
6. Aquametry Apparatus. L/I's inexpensive Karl Fischer Aquametry Apparatus precisely determines water content of most materials in 4 minutes (1 ppm to 100% water). L/I's versatile apparatus uses the original stock K-F reagent bottle as a reservoir. The "reaction vessel" is an ordinary 4 oz., commonly available, disposable "cream" jar. It is interchangeable with a micro-reaction vessel requiring less than 2 cc total reaction volume for micro-aquametry applications.

No false end points are possible with L/I's color-coded meter indicator. A two-lambda excess of K-F reagent in a 100 ml reaction volume is detectable. The apparatus includes a 1 and 25 ml dual buret with .01 ml divisions in the micro range for high accuracy.

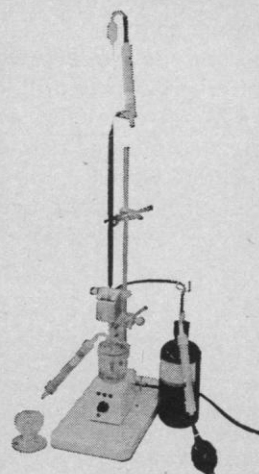
Price: \$340 complete. Components available separately.

Order from Labindustries or your distributor.

LABINDUSTRIES
The Error Eliminators



4.-5.
Automatic REPIPETS®
and Dilutors



6. Aquametry Apparatus



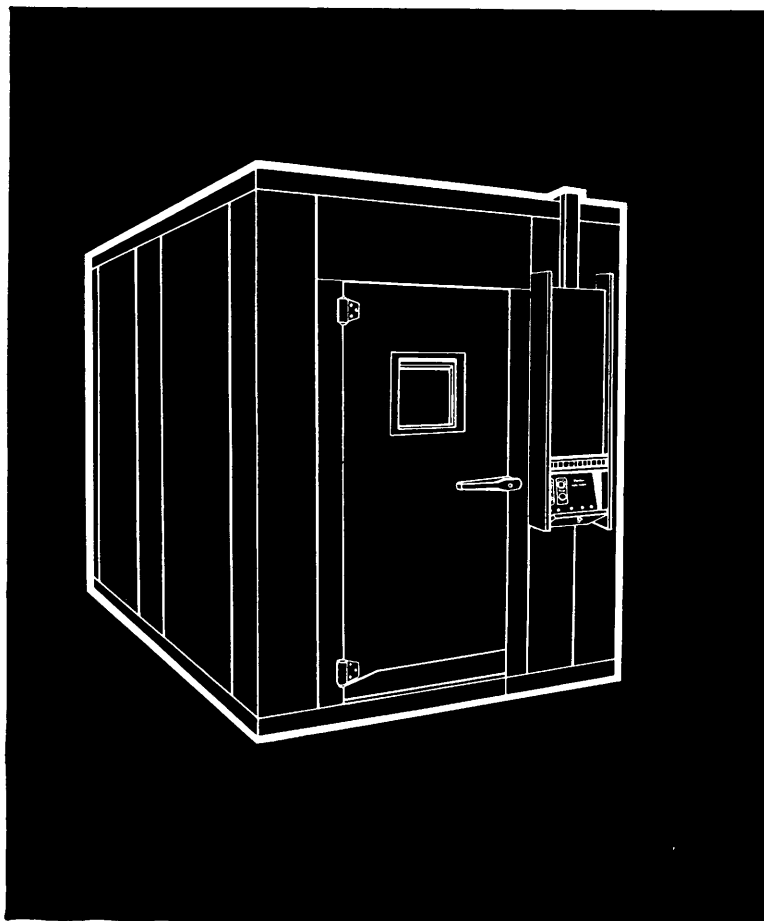
L/I LAMBDA-DIAL® attachment for all 1 ml REPIPETS and Dilutors. Direct dial any volume from 0.1 to 100 microliters with 0.01% f.s. reproducibility. Accuracy is 1% at 10 lambdas. Price: \$49.50.

1802 M Second Street • Berkeley, Calif. 94710 • Phone (415) 843-0220 • Cable: LABIND, Berkeley, Calif. (USA)

Creation

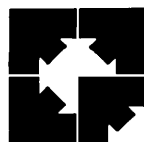


At Forma Scientific we create environmental chambers, not manufacture them. We feel that since our rooms will be used to create a special environment, our customers deserve a product that can handle any life scientist research project. So with every room, we're searching for a better way to do certain things.



For a few standard instances:
We've made our FORMA-LAB Rooms solid state. That way it's much easier to control air flow and environment to $\pm 0.15^\circ \text{C}$. We've built our rooms well with metal construction, a 4" urethane insulation, and special locking joints. Results are no moisture bleeding, minimal temperature variations — in fact, better than $\pm 0.3^\circ \text{C}$. We've also installed a silencer. Our modern new control center, without cycling relays or solenoids, is clickless.

One more thing we try to create for all of our customers; that's the best service in the business. Write for our free Early Planning Guide: Forma Scientific, Inc., Box 649, Marietta, Ohio 45750.



Forma Scientific

Carl Zeiss, Inc.

Dept. Elo-2
444 Fifth Avenue
New York, N.Y. 10018

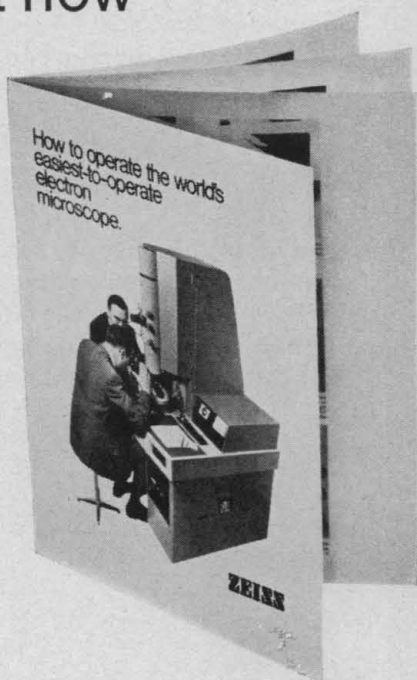
Gentlemen:

- ☐ Please send me your free booklet "How to Operate the World's Easiest-to-Operate Electron Microscope."
☐ Please have a technical representative call to give me complete information on installation, service and price.

Name _____ Title _____
Institution _____
Address _____
City _____ State _____ Zip _____

The world's easiest-to-use
electron microscope
is the new
Zeiss EM-9S.

This free booklet
shows just how
easy it is.



The new ZEISS EM-9S is the electron microscope for researchers and teachers interested in electron microscopic studies, not electron microscopes. It is the easiest-to-operate, most foolproof instrument on the market. To show you, or your students, just how easy it is, we've put together a little booklet that illustrates every step of the operation. It shows such features as:

(1) The fully automatic camera system—just moving one lever closes the shutter, moves the screen out of the beam path, reads the electron density *directly* (a spot reading, not an integration), opens the shutter for the correct length of time, closes the shutter, superimposes the exposure number photographically on the film, and changes the negative. A red warning light shines directly into the binocular to indicate when the film magazine is empty.

(2) The foolproof airlock—it lets you change specimens in less than 10 seconds, with one hand, sitting down, and in darkness.

(3) The standard-equipment, multiple (21 holes) thin-metal film aperture—specially made for all EM-9 models, it assures care-free use over prolonged periods of time.

When you've been sitting in the dark for hours, fighting specimens whose preparation has followed Murphy's Law, you'll appreciate these and the other features of the EM-9S that enable you to concentrate entirely on the screen, not on the machinery.

Combine all this with 7Å point-to-point resolution, a magnification range from 0 to 60,000x, small size and low price, and you have an instrument that is really in a class by itself.

Fill in the coupon and we'll rush you the free booklet and any other data you may wish on the EM-9S.

Nationwide Service.

ZEISS

THE GREAT NAME IN OPTICS



ATLANTA, BOSTON, CHICAGO, COLUMBUS, DENVER, HOUSTON, KANSAS CITY, LOS ANGELES, PHILADELPHIA, SAN FRANCISCO, SEATTLE, WASHINGTON, D. C.

Circle No. 55 on Readers' Service Card

Circle No. 4 on Readers' Service Card →

The most for your money: in 8 channel recorders, it's the new Brush 480.

Minimum cost per channel and maximum data presentation.

That's the cost/performance package called the Brush 480... most versatile, least expensive 8-channel recorder of its kind.

It's the economical solution to your problem of analyzing eight variables on a common time base.

The Brush 480 has eight 40 mm channels, two event markers, and twelve pushbutton-controlled chart speeds that run from 0.05 to 200 mm/second. It's available as a compact portable or can be rack mounted.

Although small in size, the 480 has all those familiar Brush exclusives. Like a patented pressurized ink system that puts crisp rectilinear traces

right into the paper. So there's no smudging, no puddling. And messless throw-away ink cartridges can be replaced in minutes.

The 480 comes factory-calibrated and, thanks to our special pen-position servo system, we guarantee 99½% accuracy. Frequency response at 50 divisions is flat within $\pm 2\%$ of full scale from d-c to 40 Hz.

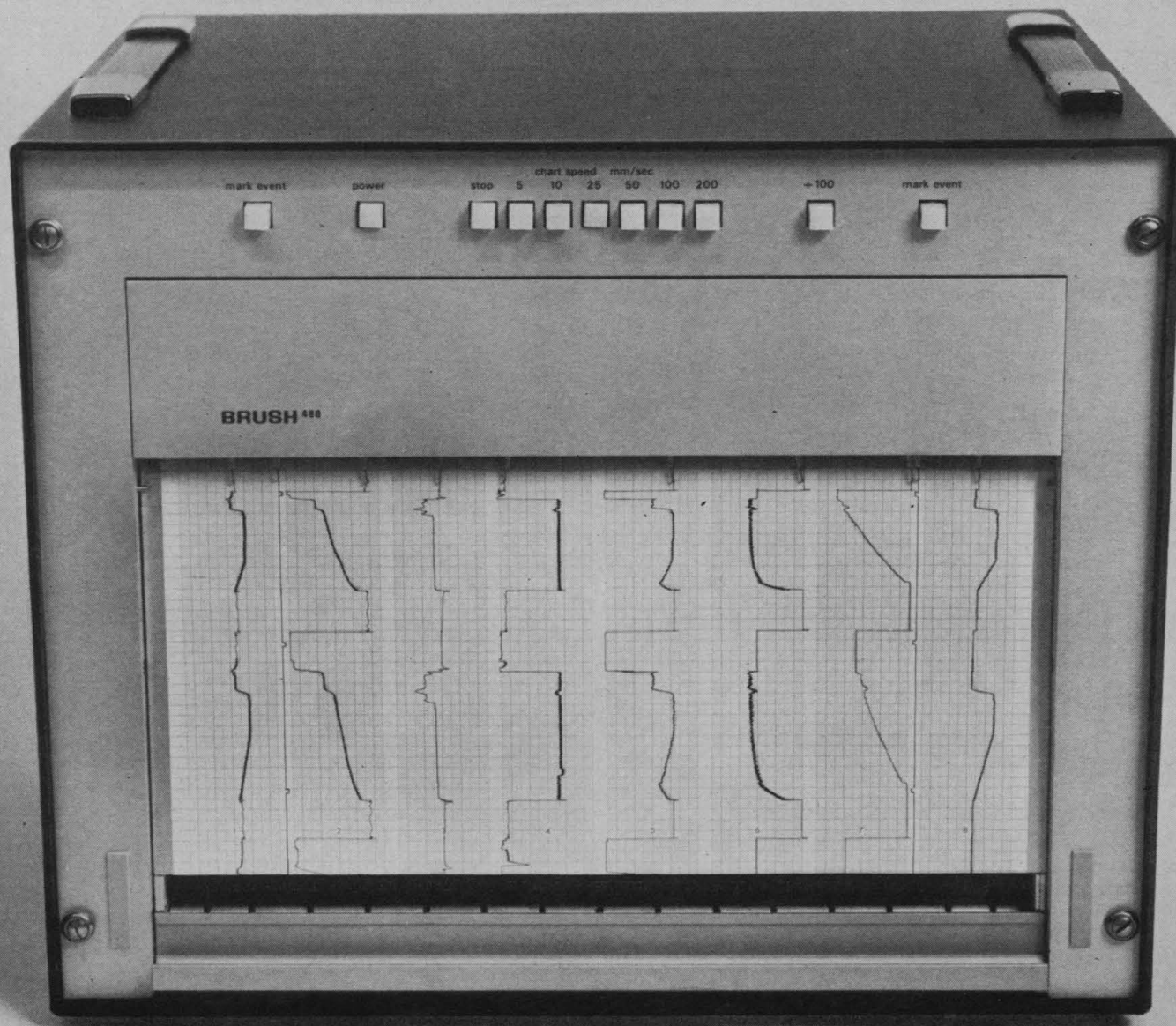
And the Brush 480 is compatible with our multi- and single channel signal conditioners so you can select the conditioning best suited for your measurements, whether it's temperature, pressure, strain, voltage, current, position, velocity or what have you.

The Brush 480. It's one of the few bargains left. For more information,

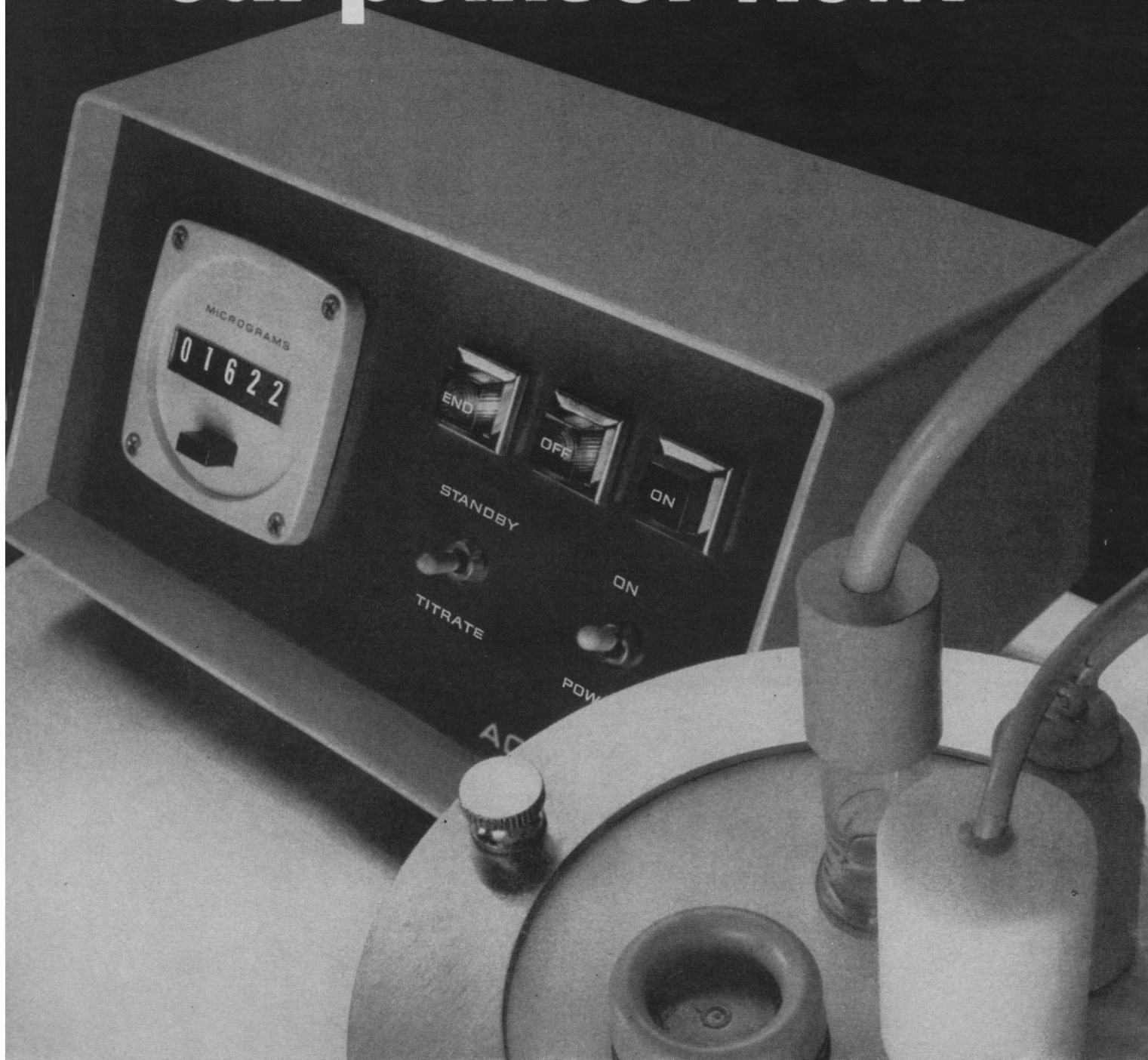


write for bulletin 934-18. Brush Instruments Division, Gould Inc., 3631 Perkins Avenue, Cleveland, Ohio 44114, or Rue Van Boeckel #38, Brussels 14, Belgium.

GOULD BRUSH



our point of view!

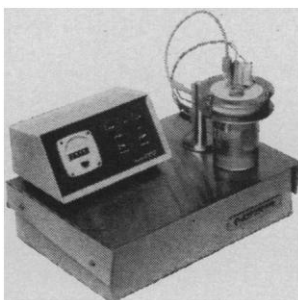


Finding a drop in a bucket is a lead pipe cinch...with AQUATEST

AQUATEST is the only truly automatic Karl Fischer titrator.

Just inject sample...flip switch...step back...read answer!

Digital readout...no standardization...no drying system...no burettes...no measuring...no computations



Accuracy, reproducibility, and sensitivity all within 25 micrograms of water...that's 10 ppm in a 2.5 ml sample!

Our point of view is that "drop in the bucket" water determinations are really a cinch with our AQUATEST. Try one and let us know your point of view.

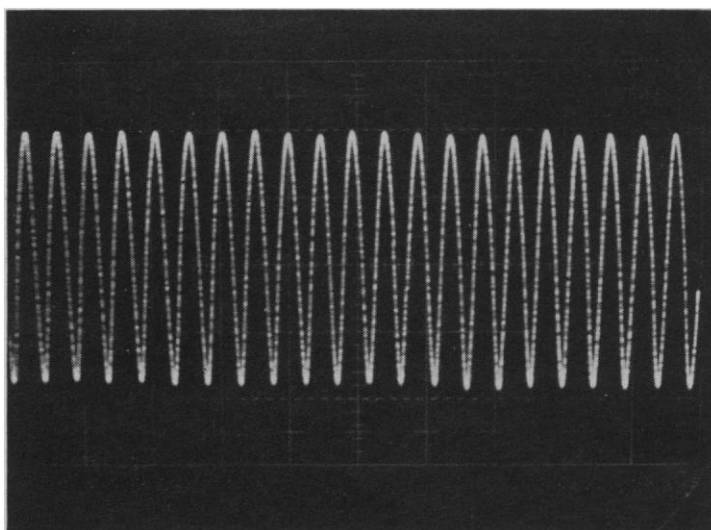


PHOTOVOLT CORPORATION 1115 Broadway, New York, N.Y. 10010 • (212) 989-2900

See us at Booth 1010 Pittsburgh Show.

Circle No. 61 on Readers' Service Card

ELECTROPHOREGRAM SCANNING?



Scan of a Ronchi Ruling with Oscilloscope Sweep*

The photographic record illustrates exceptional precision for scanning electrophoresis gels in either the UV or VIS, using the new Gilford Model 2410-S Linear Transport.

The new Model 2410-S is an improved version of the widely accepted Gilford Model 2410 Linear Transport. A new line frequency synchronous motor drive gives you even better positional reproducibility.

The oscilloscope display was taken from the standard output terminal of a Gilford Model 240 Spectrophotometer. This method makes full use of the resolving power of the Gilford Linear Absorbance Photometer and may be used in your laboratory. The alternative of using a strip

chart recorder will produce comparable results.

The new Model 2410-S is another example of the Gilford program of continuous development of superior devices for simplifying and upgrading spectrophotometric techniques, without making your existing Gilford equipment obsolete.

Your present Gilford Model 2410 Linear Transport can be converted to synchronous drive with a replacement kit that is easily installed in your laboratory. Like other Gilford auxiliary devices, the Model 2410-S is easily installed on the optical bench rods of your Gilford Spectrophotometer. It can also be adapted to an existing quality monochromator.

Write for details today, or call 216/774-1041.

gilford®

*CONDITIONS: **Oscilloscope:** Sweep: 2 sec./cm, Amplitude: 200 mv./cm. = 0.1 A/cm, **Monochromator:** Wavelength: 550 nm, Slit Width: 0.04 mm, **Scanning:** Aperture: 0.05 x 2.36 mm, Speed: 0.5 cm./min, **Line Distance:** $\approx 40 \mu$
SOURCE: Gilford Applications Laboratory, Oberlin, Ohio 44074

GILFORD INSTRUMENT LABORATORIES INC., OBERLIN, OHIO 44074

EXCLUSIVE REPRESENTATIVES THROUGHOUT THE WORLD . . . IN EUROPE, CONTACT:

Gilford Europe, S.A. • 74 Rue M.S. Defresne • 94-Vitry-Sur-Seine • Phone: 726 43 70

Circle No. 49 on Readers' Service Card

Our scanning microscope has a lot less to it than our competition's.

Two lenses instead of three. So there's less difficulty lining things up. And less loss of intensity, once they're lined up.

Less waiting to change specimens. Because they pass through our air lock in under 30 seconds. Leaving contamination outside the instrument, where it belongs.

Less guessing about specimen composition with our x-ray detector.

Less fiddling with specimens. Our goniometer stage lets you tilt and rotate the sample, without touching the focus.

Less time finding what you're looking for with our TV scan.

It has fewer knobs. So it takes less time to learn how easy it is to operate.

Needs less floor space. As it's mostly solid state.

Now wait till you see how much more you can do with so much less.

Like using our transmitted electron detector. To observe intricate internal structures.

Or viewing the continuous image on our unique TV scan. For more rapid specimen examination.

Or putting our expert x-ray detector to work. To give you a complete spectrum analysis. All in one step.

Or adding other stages in seconds. To run more special projects.

And that's our JSM-2. More or less.

jeolco

U.S.A. INC. ELECTRON OPTICS DIVISION
477 Riverside Avenue, Medford, Massachusetts 02155/Telephone (617) 396-6021
Circle No. 50 on Readers' Service Card



A Newsworthy Compendium of How EAI Hybrid, Digital and Analog systems help make a complex world relatively simpler.

HOW ROUND IS ROUND?

Grammarians assure us that something is either round or it is not, not more nor less. But what is so in the world of grammar may not be necessarily so in the world of dynamics. Take an ordinary automobile tire for example. At rest it may look round, measure round, and, indeed be round. But at 60 MPH, it is subject to enormous stresses of centrifugal force as 87.5 feet of tread-face whip past a given point in a second's time. How now, round tire? How round? How imbalanced? The time to answer these fair and important questions is not after the fact but during the manufacture. And that is just what a solid-state control system engineered by EAI is doing daily for a number of tire manufacturers. Result: a superior product with a much lower reject rate, a faster manufacturing cycle, and added peace of mind for grammarians and others travelling at 60 MPH.

If you're concerned with making things that must maintain their geometry under dynamic as well as static conditions you'd be well advised to see what we have for you. Write and request "Tire", Dept. 206E. Please mention what you want to measure and control, too.

GC PEAKS AND THE SOFTWARE DEMON

As with motherhood and the flag, consensus holds that computerized data reduction is with us to stay. But, in practice, it all gets a bit hairy. Take data from an analytical instrument like a GC. A few giants in the industry continue to stumble over problems in GC like noise, signal processing, or really useful software. EAI is still the pioneer here in its PACE III analytical data system. One seemingly small thing is a software technique for resolving complex GC peaks. It consistently and accurately apportions complex areas, ranging from overlapping components to poorly resolved shoulder peaks. Part of the technique accommodates the usual "skew" in component elution to give consistent improvement in accuracy of quantitative analysis. (Our research people gave a paper on it at the 158th National ACS meeting.) It's all part of the whole PACE III system--a turnkey data system for many analytical instruments--GC, mass spec, and the like.

For a copy of the paper and a detailed booklet on PACE III write to Dept. 206E.

IMITATION POLLUTION CAN BE A SOLUTION

A topic destined to polarize the citizenry these days is pollution--any kind of pollution. Take a simple thing like free oxygen in water. Overload the water with oxygen-hungry chemicals--no oxygen. Or develop too many organisms--plant life prospers (called eutrophication) and no oxygen. Either way, no fish. And with no fish, you've upset the water ecology. Pragmatic scrutiny tells us we can't shut down our industries to bring back pristine, airy waters. Fortunately, we can imitate these conditions by computer simulation, and get a grip on the ameliorative aspects of a solution.

Recently, EAI provided the HEW with a hybrid-computer simulation of the Delaware River Estuary. From this simulation engineers can tell where to best locate stand-by reservoirs, what flow rates to employ, and when to do it. We've written this one up. A request to "Delaware", Dept. 206E. will get you a copy, and get us both cracking on another solution.

KINETIC DATA MEANINGFULLY SHAPED BY COMPUTER

In olden times petrochemical process design involved finding rate and equilibrium constants for several reactions required a trial-and-error method. Much trial. Much error.

Most process designs involve the solution of ordinary differential equations --in a lumped-parameter system where changes are taking place in time but not space. With the use of analog computers, solutions poured forth. However, distributed parameter systems involve changes in time and space simultaneously--expressed by partial differential equations. Many approaches to PDE solution have evolved for digital computers. But such solutions consume more and more hardware, with ever-present error creeping back in as problem complexity increases.

Hybrid computers clear this difficulty up. Kinetic data is programmed into the analog portion, actual results go into digital computer memory. The analog makes a series of process condition runs, the digital stores the data, matches the results from the plant and computes least mean square deviations. The "solution" has been found when results of simulation most closely match actual conditions, and no further reductions can be made in mean square deviation values. Optimization is achieved--in time, money and results.

After much struggle, EAI is pleased to offer a software package in this arcane speciality--write to "Kinetic", Dept. 206E. Electronic Associates, Inc., West Long Branch, N.J. 07764.

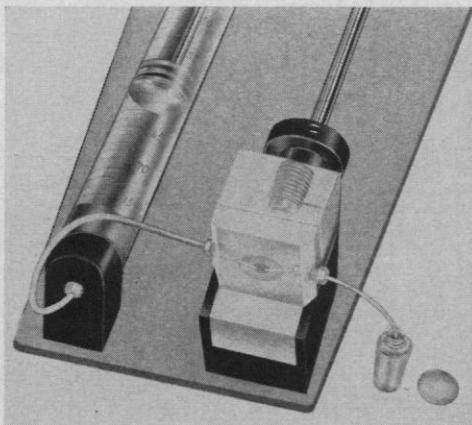
EAI[®]

An equal-opportunity employer with unequalled employment opportunity.

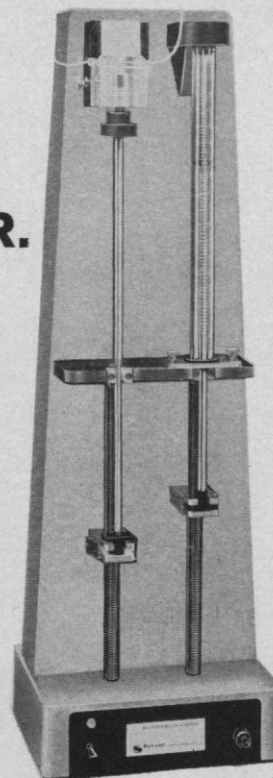
NOW! ANALYZE AND COLLECT PROTEINS IN ACRYLAMIDE GELS WITH OVER 100% INCREASED RESOLUTION...WITH THE NEW MODEL AGD-30B AUTOGELDIVIDER.

- A new sturdier frame provides uniform delivery without spurting.
- A new Acrylic Extrusion Block which eliminates the funnel in the old block design.
- The Screen is now built into the block.
- NO NEEDLE VALVE TO ADJUST. It has been eliminated.
- The new block is easier to clean.
- The new Autogeldivider is easier to use.
- Results are reproducible.

The Model AGD-30B AUTOGELDIVIDER is superior to any hand slicer and much less tedious. It will pay you to investigate this new, advanced model.



U.S. Patent No. 3451629



SAVANT SYSTEMS

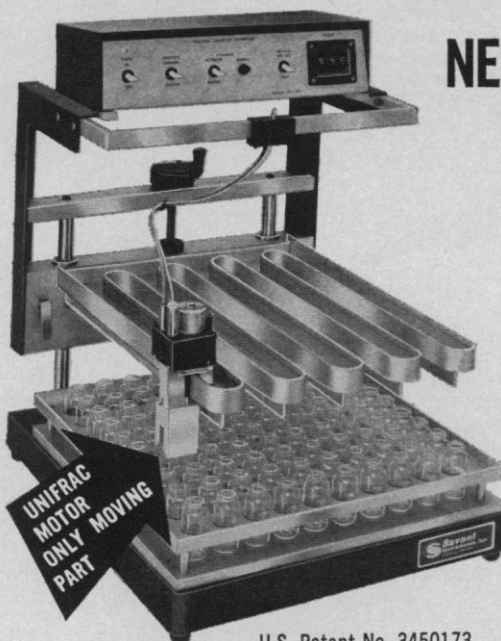
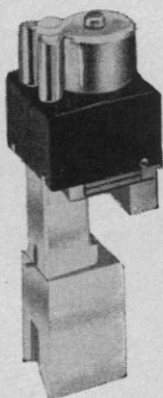
CALLING ALL COLLECTORS ... in Planchets, Scintillation Vials, Test Tubes and Gradient Tubes

NEW & IMPROVED UNIFRAC COLLECTOR SYSTEM

NEW, FILLING MACHINE OPERATION CAPABILITY has been added to Unifrac Systems, and is now used in conjunction with a continuous Pipetting device to fill tubes automatically.

- Just change the rack and you can collect in almost any container. Infinite flexibility!
- New Unifrac Motor design, the only moving part of the system.
- New sensitive UV Monitor available for direct mounting on frame. 0.0002 O.D. units at 254 mμ.
- Use it with Model AGD-30B Autogeldivider to collect gels automatically.

Now, more than ever before, is the time to start building and using Unifrac Collector Systems. We have a catalog AU-22 which describes the two systems.

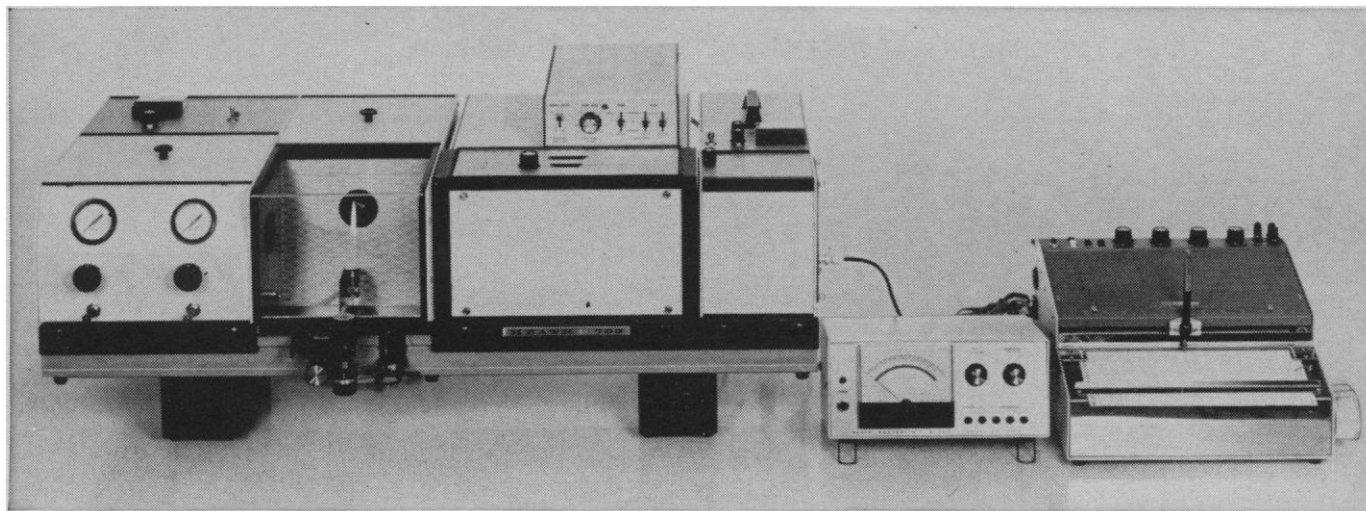


U.S. Patent No. 3450173

SAVANT INSTRUMENTS, INC. ■ 221 PARK AVE., HICKSVILLE, NEW YORK 11801 ■ (516) 935-8774

atomic absorption
atomic fluorescence
atomic flame emission

\$2998*



The New Heath "703" Spectrophotometer Does All Three And More At Lowest Cost

A Versatile High Performance Spectrophotometer . . . ideal for use in research in the instrumental laboratory or for routine analyses. The new Heath "703" System is a departure from classical spectrophotometer design. Each component module has many versatile features that permit easy application to new problems; the monochromator, PM and readout modules can be removed in minutes and used in many other types of spectrophotometers for research or teaching applications; the design is readily adaptable to computer control; the flame module is directly applicable for atomic absorption, flame emission and atomic fluorescence methods. All of these and many more features make the Heath EU-703 by far the best buy in AA-AE-AF spectrophotometers.

EU-700 Monochromator . . . the widely accepted Heath "700" monochromator provides the very high resolution, wavelength accuracy, low scattered light, and versatile wavelength drive that make it ideal as the wavelength isolation device for atomic absorption, emission and fluorescence spectrophotometry. The wavelength scan is by a stepper motor that is adaptable to computer control. Fixed scan rates vary from 0.05 to 20 angstroms/sec. The scan rate is also programmable by an external signal generator.

EU-703-70 Flame Module. Mounted on the front panel of the Flame Module are the needle valves, gauges & controls for the burner system and quick shutoff controls for both fuel and oxidant. A total consumption burner is standard but the large flame compartment will accommodate virtually all types of total consumption and laminar flow burners with the brackets supplied. A precision micrometer adjustment system provides accurate and repeatable X-Y, Y-Z positioning of the flame for optimum performance. Four hollow-cathode lamps can be mounted in the precision rotating turret, and other lamps easily interchange. The hollow-cathode power supply provides optical stability to 0.1% and is designed to handle all high-intensity lamps and most multi-element types. A chopper is built-in for discrimination against background radiation.

EU-701-30 PM Module. One compartment in this module contains a very stable, programmable power supply with output adjustable from 150-1500 volts. The other compartment contains a highly sensitive 1P28A PM tube and shutter assembly. Other photomultiplier tubes can be interchanged for the 1P28A because of the versatile PM tube mounting system used.

EU-703-31 Photometric Readout Module . . . a versatile new instrument applicable to all types of spectrophotometry where photomultipliers, phototubes or other photon-to-current transducers are used. Front panel pushbuttons select the output to be linear in Absorbance in 0-1, 0-2 or 1-2 spans, or 0-100% Transmittance for direct analog readout on a 6" taut-band meter. The Readout Module can be used with either chopped or unchopped input current signals and can function as a current-to-voltage interface between the PM Module and a recorder or DVM such as Heath EU-20 Series chart recorders or the EU-805A DVM. Output accuracy to recorder or DVM terminals is 0.25%.

EU-20V Multi-Speed Chart Recorder features 21 electronically-accurate, switch-selected chart speeds from 12 inches/minute to 1/2 inch/hour. Five input sensitivity ranges—10, 25, 50, 100 and 250 mV full scale, with true potentiometric null-point balance on all ranges. Accuracy better than 1%, with 0.2% or better repeatability. Response is 0.1 second per inch. An auxiliary input to the chart drive circuitry allows electronic synchronization of recorder time base with external events.

The 703-A system is less readout; the 703-B system includes the Photometric Readout Module; the 703-D system includes the Photometric Readout Module and 21-Speed Chart Recorder.

Versatile high performance spectrophotometers don't have to be expensive. Write us for a copy of the Heath Scientific Instrumentation Catalog for complete specifications.

EU-703-A System \$2736.*
EU-703-B System \$2998.*
EU-703-D System \$3278.*

Discrete Modules . . .

EU-700, Monochromator \$1195.*
EU-703-70, AA-AE-AF Flame Module \$1145.*
EU-701-30, PM Module \$ 350.*
EU-703-02, Base, provides accurate references for setting up the complete "703" System with precise optical alignment \$ 190.*
EU-703-31, Photometric Readout Module \$ 275.*
EU-20V, 21-Speed Chart Recorder \$ 295.*

FREE Heath Scientific Instrumentation Catalog



Describes these and other precision instruments for laboratory, engineering, education and R & D applications. Send for your FREE copy now . . . just write on your school or company letterhead.

HEATH COMPANY, Dept. 560-19
Benton Harbor, Michigan 49022



☐ Please send FREE Heath Scientific Instrumentation Catalog

Name _____

Address _____

City _____ State _____ Zip _____

Prices and specifications subject to change without notice.

*Mail Order Prices; F.O.B. Factory

EK-277

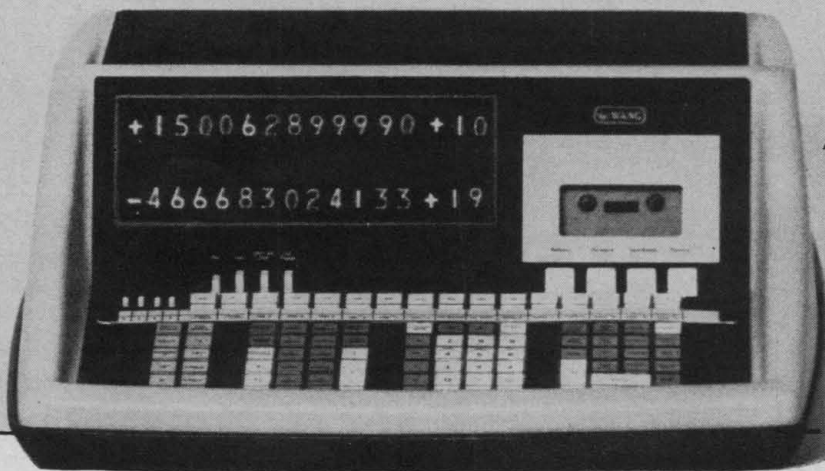
World's most powerful electronic calculator

...awaits your orders

The 700A is in production.

It's available to solve a complex scientific, engineering, statistical, or financial problem instantly, whenever you need it. The 700A can execute 960 core stored program steps and manipulate data in 120 registers. It performs $+$ and $-$ functions in 300 microseconds, \times and \div in 3 to 5 milliseconds, $\log_e X$ and e^x in 17 to 35 milliseconds and trig functions in 250 milliseconds. And it also loops, branches, does subroutines and makes decisions. These are some of the reasons that have created the unprecedented demand for the Wang 700A. And why we're increasing production to make it available sooner to more people. Of course, first come; first served.

WANG 700A



*Made in
America for
the
World
of Numbers*



Dept. 2Q, 836 North St., Tewksbury, Mass. 01876 Tel: (617) 851-7311

☐ Please send information on Wang 700A programmable calculator.

NAME _____ TITLE _____

ORGANIZATION _____

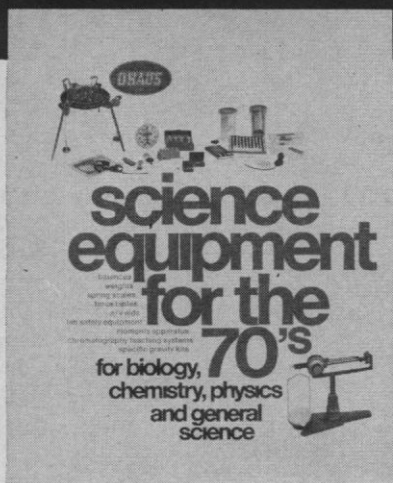
ADDRESS _____

CITY _____ STATE _____ ZIP _____

TEL. _____

Circle No. 46 on Readers' Service Card

SCIENCE EQUIPMENT FOR THE 70's



A new catalog of OHAUS equipment for Biology, chemistry, physics and general science.

In addition to balances, laboratory weights and audio/visual aids.

Bulletin 70 describes the new FORCE TABLES and MOMENTS APPARATUS to be introduced in February. Send for your free copy immediately.



OHAUS SCALE CORPORATION

29 Hanover Road
Florham Park, N. J. 07932
(201) 377-9000

Circle No. 95 on Readers' Service Card

1076

admissions process itself: Some colleges employ such high standards of admissions that even the poorest performers do not "deserve" low grades. (A much better solution to this problem, it seems to me, would be for colleges to abandon the use of local, relative grading schemes and to employ comparable, absolute standards of performance.) In short, rather than obviating the need for evaluation, the use of an open or lottery system in admissions should create a need for more elaborate and improved methods of measuring the student's performance.

The surest way for colleges to avoid any responsibility for *educating* the student is to employ selective admissions: If only the brightest students are admitted at one end, then the high quality of the final product at the other end is virtually guaranteed. What happens in between—the quality of the educational experience itself—need not be of concern since the secondary schools are suitably impressed with the college's high admissions standards, and the employers and graduate schools are suitably impressed with the "high quality of the graduate."

My impression is that professors support selective admissions because they feel that bright kids are more fun (and easier?) to teach. Alumni, legislators, faculty, administrators, and probably many students support it because having only bright students enhances the prestige of the institution. Furthermore, the secondary schools support the track system that results from selective admissions because they see it as a reward or incentive system for motivating their students: "study hard so you can get into a 'good' college." While each of these arguments may have merit, none really has much to do with the *educational* mission of the college. If the principal function of the college is to educate, then the admissions process ought to be designed to sort the students so as to maximize their educational development. Currently, we are woefully ignorant as to how best to do this sorting. If nothing else, even a partial lottery would permit us as scientists to explore the possible advantages of many student-environment combinations other than those that result from current selective admissions policies.

ALEXANDER W. ASTIN
*American Council on Education,
1 Dupont Circle,
Washington, D.C. 20036*

Element 104: What's in a Name?

In regard to the reported hassle between Berkeley and Dubna physicists over the discovery and nomenclature of element 104 (5 Dec., p. 1254), it seems to me that the Berkeley group would have been wiser and more mature in suggesting that element 104's name remain kurchatovium, the Soviet choice, and in congratulating the Dubna group for *envisioning*, albeit mistily, the element and in turn allowing themselves to be congratulated for *proving the element's existence*.

Arguments over nomenclature are often children's arguments, colored with pettiness, jealousy, or politics. To solve the patronymics problem among the nuclear physicists, I would suggest that each reputable nuclear physics group around the world throw into a world hat the names of two persons deserving the honor of having an element named after them, have a supervised drawing (after eliminating duplicates), and thereby determine the name and the order of naming of any newly discovered element.

L. A. PAGE
*National Animal Disease Laboratory,
U.S. Department of Agriculture,
Post Office Box 70, Ames, Iowa*

Civil Defense

I wish to protest against the political tone of the review (28 Nov., p. 1131) of the book *Survival and the Bomb—Methods of Civil Defense*. As its title indicates, the book is mainly concerned with the possibilities and methods of civil defense, and these subjects—the ones which justify the review of the book in *Science*—are dealt with very cursorily by the reviewer. As a matter of fact, he disclaims being an expert on them. Instead, the reviewer devotes more than half his discussion to the first chapter, dealing with the rationale of civil defense. The purpose of the review seems to be to demolish the conclusions of this chapter.

It would be inappropriate to attempt, in *Science*, a detailed refutation of the reviewer's objections to the first chapter (written by the undersigned). I may be permitted, though, to make two points, the first general and the second specific. The first point is that practically all of the reviewer's objections to civil defense apply equally well to all defense measures. In fact, if we listen

Circle No. 22 on Readers' Service Card →

Casebook of a Labeled Chemical

A highly specific document.
Detailed information unique to the
actual lot that you receive
from N.E.N. Similarly detailed
information is supplied with all
 C^{14} and H^3 compounds supplied by
N.E.N. Do your other suppliers tell you
so much, so well?

preparative procedure

handling recommendations

radiochemical
purity —

specific data

NEN
New England Nuclear
575 Albany Street, Boston, Mass. 02118
Telephone: (617) 432-7311 Telex: 094-6582

Radiochemical Specifications

NEC-475 D-ALDOSTERONE-4-C¹⁴

SPECIFIC LOT DATA

Lot Number: _____

Radioactivity: _____ microcuries/package

Specific Activity: _____ millicuries/millimole

Concentration: _____ milligrams in _____ milliliters benzene-ethanol solution

Packaging: Benzene-ethanol solution, 9:1, in an ampoule sealed in *vacuo*.

Stability and Storage Recommendations: Should be stored in the dark in pyrex glassware (see below) at 5 degrees centigrade in *vacuo* or under oxygen-free nitrogen. When degassed and sealed in *vacuo* aldosterone-4-C¹⁴ exhibits less than 5% decomposition in 6 months.

The glassware used for storage should be cleaned thoroughly as follows:

- 1) Rinse first with Versene solution.
- 2) Rinse three times with distilled water.
- 3) Dry thoroughly.

Radiochemical Purity: Greater than _____ by descending paper chromatography using the following solvent systems: _____

- 1) benzene:methanol:water (1:1:1) _____ determined on _____
- 2) butyl acetate:ethyl acetate:water (1:1:1) _____

_____ by descending paper chromatography using the following solvent systems: _____

_____ and the chromatography is run descending for _____

_____ and the chromatography is run for 3 _____

_____ and diacetate derivatives by paper chromatography in the following manner: (1) _____

_____ appears at 0.24* _____

_____ paper using benzene:hexane:methanol:water (3:1:2:1). _____

_____ aldosterone would appear as a less polar impurity. _____

_____ and the product partitioned between dihydroaldosterone and aldosterone. _____

_____ layer is counted and the percentage of counts relative to _____

_____ is a reflection of the amount of aldosterone that may _____

_____ violet spectroscopy in ethanol.

NEN
New England Nuclear
575 Albany Street
Boston, Mass. 02118
Tel (617) 426-7311
Telex: 094-6582

NEN
New England Nuclear
575 Albany Street
Boston, Mass. 02118
Tel. (617) 426-7311
Telex: 094-6582

Equip your lab from the 1970 Nalgene Labware Catalog. 44 pages of illustrations, prices and specifications for more than 180 different products. Every one designed for a specific laboratory application and precision-molded from the proper resin. Every one unbreakable, easy to handle, and easy to clean. The most complete line of plastics products for the laboratory.

Nalgene Graduates and Beakers. Transparent, autoclavable TPX, and durable polypropylene. All with easy-to-read graduations. 10-4000 ml.

Nalgene Laboratory Bottles and Carboys. Over 30 styles for every laboratory application. Leakproof, cylindrical, rectangular, square. With and without handles, spigots, tubulation. Many autoclavable. Polypropylene, polyethylene, PVC, Teflon® FEP, polycarbonate. New spigot for leakproof performance. 1 oz.-13 gal.

Nalgene Pipet Cleaning Equipment. Efficient washer-rinser can't back siphon, has a wide range of speeds and cycles. Pipet jars and baskets are also unbreakable, easy to handle, and resistant to cleaning solutions.

Nalgene Wash Bottles. With new screw closure that makes this universal favorite even more convenient. Polyethylene and Teflon FEP. 30-1000 ml.

New for 1970



Nalgene Labware... better all the time! New designs, new resins and new products continue to make plastics a universal labware material.

150mm Desiccator. New, personal-sized unit. Unbreakable, priced so every bench chemist or student can have his own.

Rectangular Bottles. Saves up to 1/3 in shelf space. Linear polyethylene. 4-32 oz.

Fernbach Culture Flask. 2800 ml capacity provides needed surface area for cultures. Unbreakable, transparent polycarbonate. Autoclavable.

Drop Dispenser Bottle. Always dispenses just one drop at a time. Polyethylene. 15-250 ml.

Unitary Dropping Bottles. New design, delivers only drops at a time, never a stream—no matter how hard you squeeze. Leakproof screw closures. Polyethylene, 125 and 250 ml.

Evaporating and Titrating Dish. 100mm x 42mm, approximate brim capacity, 175 ml. Resists fluoride solutions and HF, can be safely used with infrared heat up to 135° C for evaporations. Polypropylene. Opaque white color provides excellent background for color titrations.

Your best laboratory tool...

Nalgene Labware... better all the time.



Order Nalgene® Labware from our new Catalog. For your free copy, ask your laboratory supply dealer. Or, write Dept. 85141, Nalgene Labware Division, Nalge Company, Rochester, N.Y. 14602.

Circle No. 63 on Readers' Service Card

to Kosygin, we learn that they apply less to civil defense than to most other defense measures. He said, in the early days of the missile defense debate, "I believe that defensive systems, which prevent attack, are not the cause of arms race. . . ."

The specific point which I wish to make expresses surprise that the reviewer considers it incredible that the U.S.S.R. would use nuclear blackmail to force us to evacuate Berlin or to withdraw our protection of the Philippine Islands, and thus risk nuclear retaliation, but he does consider it possible that we might risk nuclear retaliation by interfering in Eastern Europe. As the chapter criticized by the reviewer points out, even when we had a monopoly of nuclear weapons, and no risk of retaliation was involved, we stood by when Czechoslovakia was occupied soon after the conclusion of the Second World War, when the Hungarian peace treaty was broken, Berlin was blockaded, and so on. If, in the 1860's, a book on railroading was to be reviewed, would the editors have chosen someone unfamiliar with railroading methods but passionately opposed to rapid transportation?

EUGENE P. WIGNER

Princeton University,
Princeton, New Jersey

Open Inspection of CBW

An open letter to President Nixon has been signed by 35 participants in the Conference on Cellular Aspects of Growth and Differentiation in the Nervous System. In it, we urge members of the academic and scientific professions to join us in requesting (i) prompt deployment of the President's directive concerning destruction of offensive chemical and biological warfare weapons, (ii) open inspection of governmental defensive CBW research facilities, and (iii) rapid unclassified publication of defensive CBW investigations. Strong support by scientists for these requests will undoubtedly influence public opinion and the news media toward advocating the destruction of existing CBW stocks. Also, we hope that open publication and inspection of CBW laboratories will provide progress toward multilateral disarmament.

HARVEY R. HERSCHMAN

20774 East Hillside Drive,
Topanga, California 90290

20 FEBRUARY 1970

BIG, BRIGHT DIGITAL READOUT!

(Non-Blinking NIXIE* Numbers)



5-Digit Research Model 112
(readable to 0.001 pH)

Corning DIGITAL 111 and 112 pH METERS

Wait until you see the digital readout on Corning's new 111 and 112 Meters for measuring pH, millivolts or relative millivolts with either pH electrodes or specific ion electrodes! The numbers are bright, clear, non-blinking (easy on the eyes) . . . easily read from almost any viewing angle and under any lighting condition.

Operation is by pushbutton control. Temperature is adjustable from 0°C to 100°C in 2°C divisions *plus* automatic temperature compensator mode. And, thanks to the wide 220-millivolt range of calibration voltages, you can use all types of electrodes — regardless of asymmetry potentials. Electrical specifications are 115/220V, 50/60 Hz, 30 watts.

MODEL 111 (4 Digits): The millivolt range on this *general-purpose* model is -1800 to +1800, readable to 1 mv. The pH range is 0 to 18.00, readable to 0.01 pH. Relative accuracy is ± 0.01 pH; ± 1 mv in relative millivolts. Repeatability is ± 0.01 pH; ± 1 mv. Input impedance? Greater than 10^{13} ohms. Display rate? Adjustable from 1 to 8 samples per second. Calibration? Ten-turn control over ± 220 mv (3.5 pH units). Our catalog number is H-3553-20X. Price \$795.00.

MODEL 112 (5 Digits): This *research model* has a millivolt range of -1800 to +1800, readable to 0.1 mv. The pH range is 0 to 18.000 pH, readable to 0.001 pH. Relative accuracy is ± 0.002 pH; ± 0.2 mv in relative millivolts. Repeatability is ± 0.001 pH; ± 0.1 mv. Input impedance? Greater than 10^{13} ohms. Display rate? Adjustable from 1 to 4 samples per second. Calibration? Coarse and fine adjustments over ± 220 mv (3.5 pH units). Our catalog number is H-3553-40X. Price \$1,095.00.

For details, please ask us for bulletin SI-112-2.

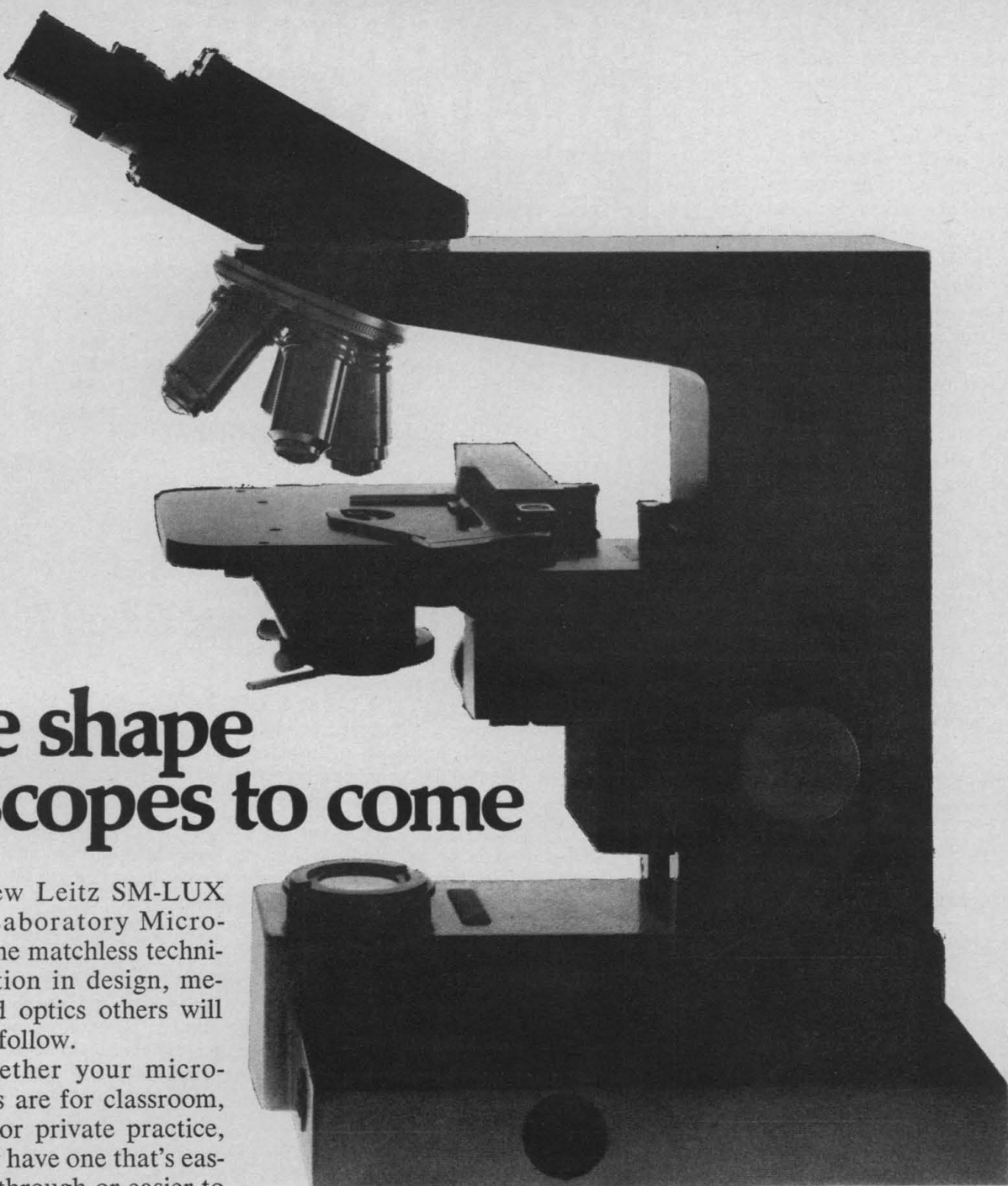
*Trademark of the Burroughs Corp.



LABORATORY...
♦ APPARATUS
♦ INSTRUMENTS
♦ CHEMICALS
♦ GLASSWARE

Branches: Boston Mass. Danbury Conn. Elk Grove Village Ill. Fullerton Calif. Philadelphia Penna. Silver Spring Md. Syracuse N.Y.

Circle No. 33 on Readers' Service Card



The shape of scopes to come

The all new Leitz SM-LUX Medical Laboratory Microscope has the matchless technical innovation in design, mechanics and optics others will soon *try* to follow.

Whether your microscope needs are for classroom, laboratory or private practice, you'll never have one that's easier to look through or easier to look at. And, since a student's scope invariably graduates with him, we considered all the demands of today's (and tomorrow's) medical scene to design an instrument as much at home in professional practice as in the classroom.

A few special features:

- built-in Koehler illumination

system via a high-intensity, low-voltage light source and regulating transformer for adjustable brightness—no extras to carry.

- needle bearing, coarse and fine adjustment that maintains its smoothness and precision over years of hard use.

- new design achromatic objectives that provide crisp, sharp

images at all magnifications.

- *quick transfer* from bright-field to darkfield or phase contrast.

But there's much more to the SM-LUX: Write today for our portfolio containing complete specifications and details on SM-LUX technical features and innovations.

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

1970

GUSTAF O. ARRHENIUS	RICHARD C. LEWONTIN
FRED R. EGGAN	ALFRED O. C. NIER
HARRY F. HARLOW	FRANK W. PUTNAM
MILTON HARRIS	

1971

THOMAS EISNER	NEAL MILLER
AMITAI ETZIONI	BRUCE MURRAY
EMIL HAURY	JOHN R. PIERCE
DANIEL KOSHLAND, JR.	

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher
DAEL WOLFE

Business Manager
HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

Assistant Editors: ELLEN E. MURPHY, JOHN E. RINGLE

Assistant to the Editor: NANCY TEIMOURIAN

News Editor: JOHN WALSH

Foreign Editor: DANIEL S. GREENBERG*

News and Comment: LUTHER J. CARTER, PHILIP M. BOFFEY, JOEL R. KRAMER, ANDREW HAMILTON, NANCY GRUCHOW, SCHERRAINE MACK

Research Topics: ROBERT W. HOLCOMB

Book Reviews: SYLVIA EBERHART

Editorial Assistants: JOANNE BELK, ISABELLA BOULDIN, ELEANORE BUTZ, GRAYCE FINGER, NANCY HAMILTON, CORRINE HARRIS, OLIVER HEATWOLE, ANNE HOLDSWORTH, MARSHALL KATHAN, PAULA LECKY, KATHERINE LIVINGSTON, MARGARET LLOYD, VIRGINIA NUSSLE, PATRICIA ROWE, LEAH RYAN, LOIS SCHMITT, BARBARA SHEFFER, RICHARD SOMMER, YA LI SWIGART, ALICE THEILE, MARLENE TUCKER, MARIE WEBNER

* *European Office:* 22 Mulberry Walk, London, S.W.3, England (Telephone: 352-9749)

Advertising Staff

Director
EARL J. SCHERAGO

Production Manager
KAY GOLDSTEIN

Advertising Sales Manager: RICHARD L. CHARLES

Sales: NEW YORK, N.Y. 10036: Robert S. Bugbee, 11 W. 42 St. (212-PE-6-1858); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); MEDFIELD, MASS. 02052: Richard M. Ezequille, 4 Rolling Lane (617-444-1439); CHICAGO, ILL. 60611: Herbert L. Burkland, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772)

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-1711. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page 7, *Science*, 4 July 1969. **ADVERTISING CORRESPONDENCE:** Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

Long-Term Efforts To Clean the Environment

During the past few months many leaders, ranging from student activists to top industrialists, have spoken in behalf of restoring the environment. In response President Nixon has called for vigorous action and increased expenditures. His recommendations represent a substantial victory for those working for a livable environment. Nevertheless, this is no time to relax, for the fight to attain a decent environment must go on for a long time.

A cursory analysis of efforts to control water pollution illuminates some of the problems. These are both technological and political. Until a few years ago, little effort was devoted to achieving a substantial improvement in methods of treating municipal wastes. The techniques employed were those of 50 years ago. Primary treatment of sewage consisted of mechanical removal of solids. This was followed by a secondary treatment essentially biological which accelerated the oxidation of organic matter. The result was a reduction in "biochemical oxygen demand" by 80 to 95 percent. However, the processes were less effective in reducing the levels of fixed nitrogen, phosphate, and intractable organic chemicals. During the last decade we have come to realize that in many instances reductions in biochemical oxygen demand are not enough. To combat eutrophication, we must also reduce nitrate and especially phosphate. In addition there has been growing concern about the numerous organic chemicals that are finding their way into streams and lakes.

At long last some imaginative engineers have turned their attention to the problem. What can be done under favorable circumstances is illustrated by a new plant at Lake Tahoe.* Processing there results in the reduction by 99.3 percent of biochemical oxygen demand and the removal of 94 percent of phosphate and 99.99+ percent of coliform bacteria. Included among the steps are a flocculation at pH 11.5 to 12.0, with lime; adjustment of pH with carbon dioxide; and a final polishing of the effluent with activated charcoal. The effluent is pumped from the Tahoe basin into another valley where it is stored, for irrigation, in a man-made lake in which trout thrive.

The citizens at Lake Tahoe were highly motivated and were willing to spend heavily to save their beautiful lake. However, citizens elsewhere have not been so effective. Communities have refused to tax themselves to provide benefits for downstream users. Authorities have been reluctant to interfere with industrial pollution, fearing loss of local industry.

The federal government has functioned poorly. After more than 15 years the federal water pollution program has not yet brought about significant improvement in any major water course. A recent government report† states:

Federal grants have been awarded for construction of facilities which provided treatment for only part of the pollutants being discharged into waterways . . . nearby municipalities or industries have continued to discharge untreated or inadequately treated wastes.

With a great show of unanimity and self-praise a Democrat-controlled Congress passed the Federal Water Pollution Control Act of 1965. The act authorized substantial appropriations for grants for cleanup. However, Congress neglected to appropriate more than trifling sums until last year. These funds cover only roughly half the costs of projects and much local foot-dragging can be expected.

Cleaning up the rivers and lakes of this country will require good technology and good politics. It is to be hoped that some of the current fervor about the environment will be channeled into insuring that the needed actions are taken.—PHILIP H. ABELSON

* R. Culp, "Water reclamation at South Tahoe," *Water and Wastes Engineering* (April 1969), pp. 36-39. † *Administration of the Construction Grant Program for Abating, Controlling, and Preventing Water Pollution*, Report to the Subcommittee on Air and Water Pollution of the Committee on Public Works, U.S. Senate, 91st Congress, 1st Session (U.S. Government Printing Office, Washington, D.C., 1969).

The Informer

The new Barnstead Bantam lab demineralizer. It tells you more. More precisely.

You get less sub-standard water and no wasted cartridge capacity.

Bantam holder comes complete for wall or bench mounting, ready to attach to your raw water line. Pedestal, inlet, effluent tubing, cord, plug and UL approval included.



It replaces the old "idiot lights" with a meter. With the flick of a switch you get an instant on-stream effluent read-out in parts per million and ohms resistance.

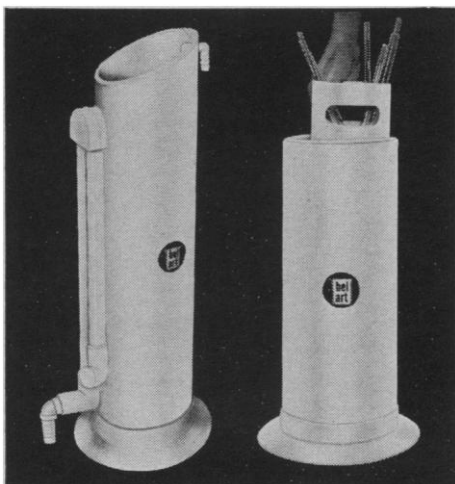
Choose from five different disposable cartridges. For ion exchange (multi-bed and mixed-bed), organic, oxygen or cation removal. Flow rates from 5 to 25 gallons per hour.

Your Barnstead dealer has the information on the entire Bantam series. Give him a call or contact Barnstead Company, 225 Rivermoor Street, Boston, Massachusetts 02132.

BEL-ART

AUTOMATIC PIPETTE RINSER

**With Anti-Syphon feature
and extended base**



Thoroughly redesigned polyethylene pipette rinser has high level water entry which eliminates the possibility of contaminated water being syphoned back into the public system.

Extended base, 9 $\frac{3}{4}$ " in diameter adds stability. Syphon flush tube provides rapid cycling and complete flushing of water through pipettes. Under normal water pressure cycling takes about one minute. Made of heavy $\frac{1}{4}$ " thick unbreakable polyethylene. Cleans pipettes up to 16" long.

MONEY SAVING OFFER

F-17121 the TRIO includes...

- 17101 pipette rinser, 18" long
- 17113 pipette jar, 18" x 6"
- 17106 pipette basket, 23" x 4" **\$55.00**

See your nearest laboratory supply dealer.

Send for 80 page catalog 469.
For your FREE copy write Dept. E-2

BEL-ART PRODUCTS
PEQUANNOCK, N. J. 07440

**The MOST COMPLETE line
of Plastic Laboratory Ware
available from ONE source**

Calendar of Events

Courses

Workshop in Developmental Biology, La Jolla, Calif., 6 July–2 August. This workshop is designed for those engaged in developmental research who wish to become proficient in the use of various molecular and cellular techniques. Applications are invited from established investigators and from pre- and postdoctoral trainees. The participants are limited to 20. The workshop is sponsored by the National Science Foundation which will defray the cost of travel and subsistence for each participant. Persons interested in the program should write for application forms. *Deadline for applications: 1 April.* (Dr. Herbert Stern, Department of Biology, University of California, San Diego, P.O. Box 109, La Jolla 92037)

Research Instrumentation, Brooklyn, N.Y., 25 July–15 August. Is intended for educators, engineers, and scientists from all technical fields who need a working knowledge of electronic instrumentation as applied to problems in research. It will be supported in part by the National Science Foundation under its College Teacher Programs. Attending free of charge will be 26 U.S. college teachers who will receive a stipend from NSF for 3 weeks plus travel allowance. Applicants from business and industry will be accepted on a tuition basis at \$550, covering all laboratory fees and textbooks. The course is open to industrial and academic scientists and engineers from all disciplines. Medical research workers will also find the course valuable. There are no specific prerequisites beyond a basic understanding of college physics. Applicants should secure a place in the course as soon as possible. The final date for consideration of applications for NSF support is 20 April. Industrial participants must file their applications by 15 June. (Prof. Kenneth Jolls, Office of Special Programs, Polytechnic Institute of Brooklyn, 333 Jay St., Brooklyn, N.Y. 11201)

Industrial Applications of Modern Magnet Technology, Cambridge, Mass., 22 June–3 July. This course will attempt to close the technology gap between the art of generating magnetic fields and their application to new areas such as biology, medicine, ore separation, pollution control, fusion containment, power generation, transmission, and conversion. The course will include a review of magnetism and superconductivity and cover such topics as solenoid design, magnetic circuits, cryogenic engineering, superconducting magnets, and their application to practical needs. (Director of the Summer Session, Room E19-356, Massachusetts Institute of Technology, Cambridge 02139)

Physics and Chemistry of Solids under High Pressure, Delft, Netherlands, 2–14 August. This is an advanced study institute under the sponsorship of NATO. Topics to be covered include high-pressure studies on band structure of semiconductors, electron transfer processes, magnetic properties, phonons, equation of state, phase transitions, sound propagation, metals, dielectrics, superconductors, and various

high-pressure techniques. (Prof. S. S. Mitra, Department of Electrical Engineering, University of Rhode Island, Kingston 02881)

Nuclear Magnetic Resonance, Gainesville, Fla., 6–10 April. Designed for those with experience in magnetic resonance, the program aims to provide advanced training and instruction in the mathematical and theoretical aspects of magnetic resonance for individuals working actively in the area. The topics to be covered include analysis of high-resolution spectra, double resonance experiments, relaxation times in high-resolution spectroscopy, NMR spectra of radicals, superconducting magnet spectrometers, rate processes, techniques for spectroscopy of "other nuclei," dynamic nuclear polarization, and molecular conformation in relation to NMR parameters. Enrollment will be limited to about 50 participants. The program will include lectures, exercise sessions, and practice in use of the computer. Laboratory sessions with a Varian 100-Mhz spectrometer with 15-inch magnet system, as well as multiple resonance and noise decoupling accessories, will be conducted as part of the course. Registration fee for academic participants, \$50; for industrial participants, \$125. (Dr. Wallace S. Brey, Jr., NMR Workshop Director, Department of Chemistry, University of Florida, Gainesville, Fla. 32601)

Forthcoming Events

March

16–19. International Assoc. for **Dental Research**, 48th session, New York, N.Y. (A. R. Frechette, Executive Secretary, 211 East Chicago Ave., Chicago, Ill. 60611)

16–20. Symposium on **Fourier Spectroscopy**, Aspen, Colo. (G. Vanasse, Air Force Cambridge Research Laboratory, L. G. Hanscom Field, Bedford, Mass. 01730)

18–19. **Mineral Waste Utilization**, 2nd symp., Chicago, Ill. (M. A. Schwartz, IIT Research Inst., 10 W. 35 St., Chicago, Ill. 60616)

18–21. American **Fertility Soc.**, annual mtg., Washington, D.C. (H. H. Thomas, 944 S. 18 St., Birmingham, Ala. 35205)

19. **Kinetics and Thermodynamics in High Temperature Gases** (attendance by invitation only), Cleveland, Ohio. (R. Mather, NASA Lewis Research Center, Cleveland 44135)

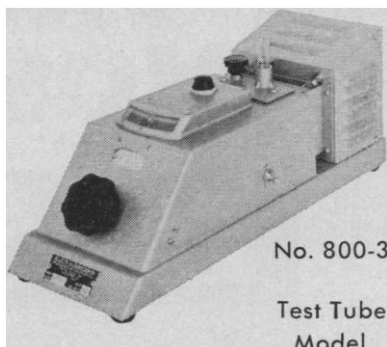
19–22. American Assoc. of **Dental Schools**, New York, N.Y. (B. F. Miller III, AADS, 211 E. Chicago Ave., Chicago, Ill.)

19–24. American **Dermatological Assoc.**, Boca Raton, Fla. (B. Kennedy, Louisiana State Univ., School of Medicine, 1542 Tulane Ave., New Orleans, La.)

20–22. American **Psychosomatic Soc.**, 27th annual, Washington, D.C. (J. W. Mason, 265 Nassau Rd., Roosevelt, N.Y. 11575)

20–22. National **Wildlife Federation**, Chicago, Ill. (T. L. Kimball, The Federation, 1412 16th St., NW, Washington, D.C.)

Klett Summerson Photoelectric Colorimeter

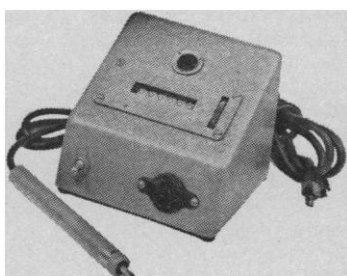


No. 800-3

Test Tube
Model

KLETT COLONY MARKER and TALLY

This instrument takes the drudgery and error out of the counting of bacterial colonies.



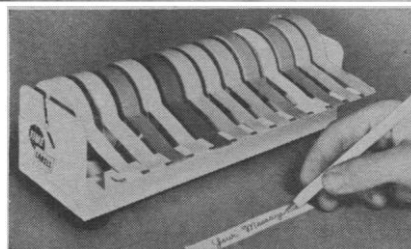
Klett MANUFACTURING CO., INC.,
179 East 87th Street, New York, 28, N.Y.

Circle No. 108 on Readers' Service Card



COLOR CODE & IDENTIFICATION TAPE

- solves the widest range of labeling problems
- bacteriostatic for safer handling
- withstands freezing and autoclaving



Easy-to-use TIME Tape is self-sticking, eliminating hand-to-mouth contact to protect against cross-infection. Available in 17 colors to adapt readily to any color coding system. Its satin-finish vinyl coated surface can be marked on with ball point pen or pencil. Sticks instantly to any surface, removes without messy residue. TIME Tape is waterproof, oil-proof, acid resistant, withstands temperatures from -70°F. to $+250^{\circ}\text{F.}$ Supplied plain or imprinted to your specifications. 5 widths $\frac{1}{2}$ " - 2". Economical TIME Tape is the most versatile labeling agent in the laboratory.



FREE BROCHURE! Write for samples, illustrated brochure, and the name of a dealer near you.

PROFESSIONAL TAPE COMPANY, INC.
365 EAST BURLINGTON ROAD, RIVERSIDE, ILLINOIS 60546

Circle No. 104 on Readers' Service Card



Maternity benefits.

The hamster's short, regular reproductive cycle assures you a steady supply of newborns for virology research.

Virus cultures thrive in hamster tissues. Polio and measles serums were developed from work with hamsters. And now the hamster is proving most helpful in determining a possible link between virus and cancer.

Almost every day has been Mother's Day at Lakeview

since 1949 when Steven Slater introduced sophisticated breeding techniques to a fledgeling industry.

And since then our hamsters have been the best you can buy. Free of most common viruses as demonstrated by continual serological monitoring.

So if your research calls for hamsters, call on us. Let our benefits benefit you.

Lakeview Hamster Colony
P.O. Box 85, Newfield, New Jersey 08344

A WHOLLY-OWNED SUBSIDIARY OF CHARLES RIVER BREEDING LABORATORIES, INC.

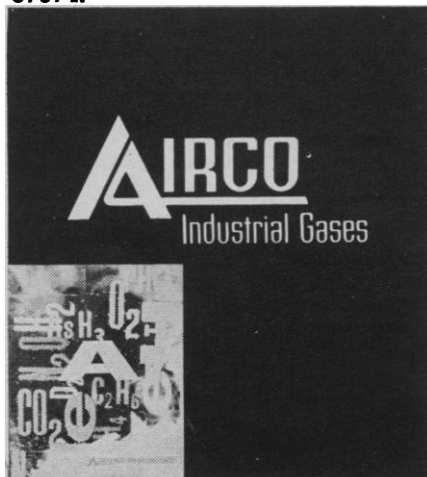


Circle No. 54 on Readers' Service Card

Xenon

Xenon. We have it for you pure and ultra pure. In a variety of pressures and containers.

For this year's catalog, write: Rare and Specialty Gases Dept., Airco Industrial Gases, 575 Mountain Avenue, Murray Hill, N.J. 07974.



Circle No. 77 on Readers' Service Card

22-25. **Environmental Mutagen Soc.**, 1st annual, Washington, D.C. (E. Freese, Chairman, Program Committee, EMS, Building 36, Room 3D02, National Inst. of Health, Bethesda, Md. 20014)

23-26. **American Orthopsychiatric Assoc.**, 4th annual, San Francisco, Calif. (M. F. Langer, 1790 Broadway, New York 10019)

23-26. **American Physical Soc.**, Dallas, Tex. (W. W. Havens, 335 E. 45 St., New York 10019)

24-25. **British Biophysical Soc.**, Brighton, England. (E. M. Bradbury, Biophysics Lab., College of Technology, Portsmouth, PO1 2DZ, England)

24-26. **Engineering Aspects of Magnetohydrodynamics**, 11th symp., Pasadena, Calif. (L. G. Hays, Jet Propulsion Lab., California Inst. of Technology, 4800 Oak Grove Dr., Pasadena 91103)

24-26. **National Industrial Solid Wastes Management Conf.**, Houston, Tex. (H. N. Myrick, Univ. of Houston, 3801 Cullen Blvd., Houston 77004)

25-27. **Fundamental and Practical Aspects of Pest Management**, Raleigh, N.C. (F. E. Guthrie, Dept. of Entomology, North Carolina State Univ., Raleigh)

26-28. **Southern Soc. for Philosophy and Psychology**, Durham, N.C. (W. Blackstone, Dept. of Philosophy, Univ. of Georgia, Athens)

26-28. **Seismological Soc. of America**, Hayward, Calif. (D. Tocher, P.O. Box 826, Berkeley, Calif. 94705)

26-29. **American Philosophical Assoc.**, Berkeley, Calif. (A. Pasch, 117 Lehigh Rd., Univ. of Maryland, College Park 20742)

27-28. **Northwest Scientific Assoc.**, Corvallis, Ore. (G. H. Deitschman, Intermountain Forest and Range Experiment Sta., P.O. Box 469, Moscow, Idaho 83843)

30-4. **American College of Radiology**, Dallas, Tex. (W. C. Stronach, ARC, 20 N. Wacker Dr., Chicago, Ill. 60606)

31-2. **Microwave Research**, intern. symp., New York, N.Y. (J. Fox, Polytechnic Inst. of Brooklyn, 333 Jay St., Brooklyn, N.Y.)

31-3. **American Assoc. of Anatomists**, Chicago, Ill. (R. T. Woodburne, Dept. of Anatomy, Univ. of Michigan, East Medical Bldg., Ann Arbor 48104)

31-3. **Applications of Walsh Function in Communications**, Washington, D.C. (H. F. Harmuth, Dept. of Electrical Engineers, Univ. of Maryland, College Park 20742)

April

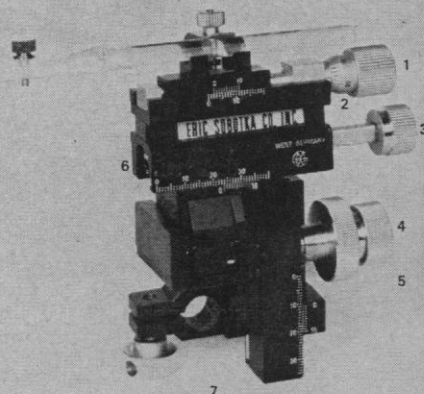
1. **Arkansas Acad. of Science**, Russellville. (G. E. Templeton, Div. of Plant Pathology, Univ. of Arkansas, Fayetteville 72701)

1-3. **National Pollution Control Conf. and Exposition**, San Francisco, Calif. (Natl. Pollution Control Conf. and Exposition, P.O. Box 13116, Houston, Tex. 77019)

1-4. **International Conf. on Combinatorial Mathematics**, New York, N.Y. (L. R. Neville, New York Acad. of Sciences, 2 E. 63 St., New York 10021)

1-4. **National Council of Teachers of Mathematics**, 48th annual, Washington, D.C. (J. D. Gates, Executive Secretary,

THE MOST^{*} (OF EVERYTHING) FOR THE MONEY



MINIATURE MICROMANIPULATOR MM-33 from the Sobotka organization

- 1 Fine motion "X" direction with 20mm range
- 2 Micrometer drum and vernier reading to 0.1mm with an accuracy of 10 microns for each division.
- 3 Coarse motion "X" direction with 40mm range
- 4 Coaxial vertical and horizontal movements, 30mm vertical and 22mm horizontal
- 5 All controls placed in linear plane for ease and convenience
- 6 Ball bearing slideways for no wear, no backlash performance
- 7 Only 18 oz. eliminates swaying on any type stand

*At \$200.00 the MM-33 offers the most in accuracy, convenience, compactness and ultra-precision throughout the instrument.

Write or call for the facts.

eric sobotka company, inc.

Importers and Distributors of Microscopes and Scientific Instruments

Finn Court, Farmingdale, N.Y. 11735 • 516-293-9272

Circle No. 84 on Readers' Service Card

1201 16th St. NW, Washington, D.C. 20036)

1-4. International Conf. on **Thermodynamics**, Cardiff, Wales. (Meetings Officer, Inst. of Physics and the Physical Society, 47 Belgrave Sq., London, S.W.1, England)

2-4. Michigan Acad. of Science, Arts, and Letters, 74th annual, Detroit, Mich. (T. G. Overmire, MASAL, 1721 Washtenaw, Ann Arbor, Mich. 48104)

2-4. Eastern Psychological Assoc., Atlantic City, N.J. (W. W. Cumming, 353 Schermerhorn Hall, Columbia Univ., New York 10027)

2-4. Association of Southeastern Biologists, Lakeland, Fla. (D. C. Bliss, Box 278, Randolph Macon Woman's College, Lynchburg, Va. 24504)

5-10. International Anesthesia Research Soc., 44th congr., Las Vegas, Nev. (B. B. Sankey, 3645 Warrensville Center Rd., Cleveland, Ohio 44122)

6-8. Mineralogical Soc. of Great Britain and Ireland, London, England. (P. Wilkinson, Dept. of Geology, Univ. of Sheffield, Sheffield-S1 3JD, England)

7-8. Society for Experimental Biology, Leicester, England. (A. P. M. Lockwood, Dept. of Oceanography, Univ. of Southampton, Southampton, England)

7-10. American Optical Soc., Philadelphia, Pa. (M. E. Warga, The Society, 2100 Pennsylvania Ave., NW, Washington, D.C. 20006)

8-10. United States Pharmacopoeial Conv., Washington, D.C. (Z. A. Hoffman, 4630 Montgomery Ave., Bethesda, Md. 20014)

8-11. American Acad. of Oral Pathology, San Diego, Calif. (S. M. Standish, c/o Indiana Univ. School of Dentistry, Indianapolis 46202)

9-10. Metabolism and Biological Functions of Polyamines Conf., New York, N.Y. (L. R. Neville, New York Acad. of Sciences, 2 E. 63 St., New York 10021)

9-10. Metal Cleaning Symp., Cleveland, Ohio. (W. M. Mueller, American Soc. for Metals, Metals Park, Ohio 44073)

9-10. National Conf. on Rural Health, 23rd, Milwaukee, Wis. (B. L. Bible, Council on Rural Health, 535 N. Dearborn St., Chicago, Ill. 60610)

9-11. American Assoc. for Cancer Research, Philadelphia, Pa. (H. J. Creech, The Association, 7701 Burholme Ave., Philadelphia 19111)

10-12. American Soc. of Internal Medicine, Philadelphia, Pa. (E. E. Daieske, 525 Hearst Bldg., 3rd at Market, San Francisco, Calif. 94103)

12-17. Biomedical Engineering Soc., 2nd annual, Atlantic City, N.J. (D. S. Gann, Case Western Reserve Univ., Cleveland, Ohio 44106)

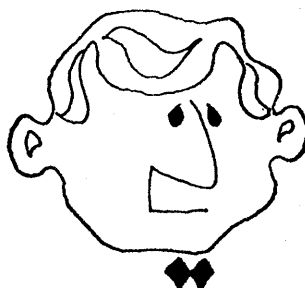
12-17. Federation of American Societies for Experimental Biology, Atlantic City, N.J. (J. F. A. McManus, FASEB, 9650 Rockville Pike, Bethesda, Md. 20014)

12-17. American Soc. of Hospital Pharmacists, Washington, D.C. (J. A. Oddis, ASHP, 4630 Montgomery Ave., Bethesda, Md. 20014)

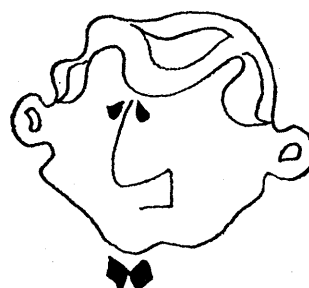
12-17. American Inst. of Nutrition, Atlantic City, N.J. (J. Waddell, 9650 Rockville Pike, Bethesda, Md. 20014)

12-17. American Pharmaceutical Assoc., Washington, D.C. (G. B. Griffenhagen, Div. of Communications, 2215 Constitution Ave., NW, Washington, D.C. 20037)

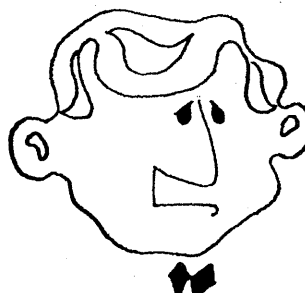
**FIRST THEY TOOK AWAY
MY RUSTY, PITTED,
SCARRED OLD METAL
HOT PLATE**



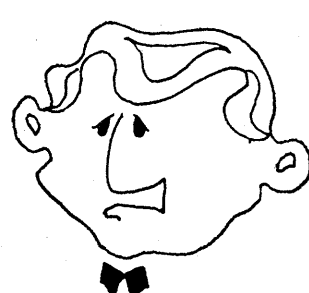
**AND REPLACED IT
WITH A SNOWY WHITE
CORNING®
HOT PLATE**



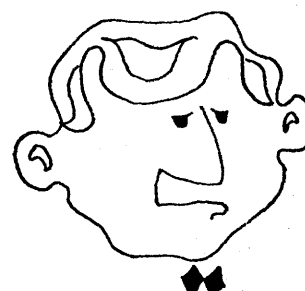
**THEN THEY
TOOK AWAY THE
OLD MIXER
THAT SPLASHED**



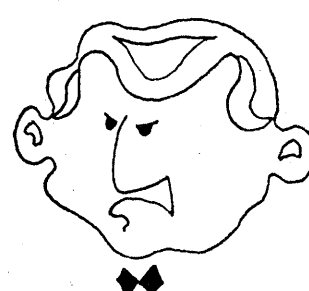
**AND REPLACED IT
WITH A NEW CORNING
LM-2 THAT MIXES
WITHOUT A VORTEX**



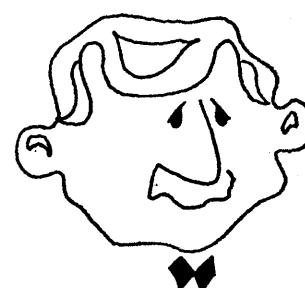
**THEN THEY PUT IN A
NEW, NO-FUSS, COMPACT,
ALL-GLASS CORNING
WATER STILL**



**AND TOOK AWAY
THE TUBING AND THE OLD
BOILER IT TOOK ME
YEARS TO BUILD**



**WHAT
EVER HAPPENED
TO THE OLD
VALUES?**



We've replaced some old values with new standards at Corning. Like hot plates, stirrers, and distillation apparatus that all work far better, look far neater. Call your Corning dealer.

CORNING
LABORATORY PRODUCTS

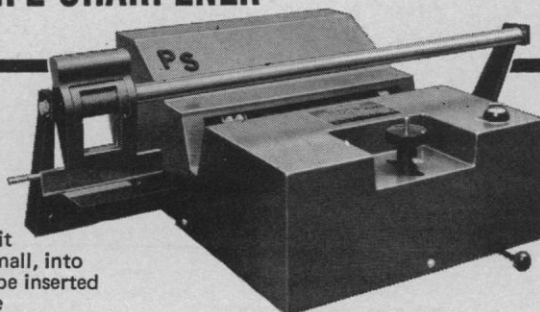
Makers of PYREX® Labware

*Sharpens any blade in only 3 minutes
revolutionary **PERMA-SHARP***

MICROTOME KNIFE SHARPENER

At last!

a machine that quickly transforms any knife, be it badly chipped, large or small, into a condition where it can be inserted directly into a microtome and produce first-class sections.



***IN LESS THAN 3 MINUTES BY
AN UNSKILLED OPERATOR!***

Price \$ 835.00 complete

F.O.B. Fairfield, New Jersey

WRITE FOR BROCHURE

H/I

Hacker Instruments
Box 646, West Caldwell, N. J. 07006 (201) 226-8450

Circle No. 83 on Readers' Service Card

-76°F PERMANENTLY

CryoCool

VAPOR/FREEZING TRAP COOLER

Eliminates the need
for dry ice.

Maintains cold traps
at **-76°F permanently!**

Interested?
Write for complete details.



NESLAB
Instruments, Inc.



871 Islington St.,
Portsmouth, N.H. 03801

Circle No. 96 on Readers' Service Card

13-15. International Symp. on **Very Long Baseline Interferometry**, Charlottesville, Va. (J. W. Findlay, Natl. Radio Astronomy Observatory, Edgemont Rd., Charlottesville 22901)

13-16. American **Industrial Health** Conf., Chicago, Ill. (H. N. Schulz, AIHC, 55 E. Washington St., Chicago 60602)

13-16. American Acad. of **Pediatrics**, Washington, D.C. (G. E. Hughes, 1801 Hinman Ave., Evanston, Ill. 60204)

13-17. American **Physiological** Soc., Atlantic City, N.J. (R. G. Dags, APS, 9650 Rockville Pike, Bethesda, Md. 20014)

13-18. World Congr. of the Intern. Federation of **Gynecology and Obstetrics**, New York, N.Y. (H. C. Taylor, Jr., 630 W. 168 St., New York 10032)

14-16. **Computer Graphics** Intern. Symp., London, England. (M. L. V. Pitteway, Computer Science Dept., Brunel Univ., Uxbridge, Middlesex, England)

14-16. Conference on **Nondestructive Evaluation**, Los Angeles, Calif. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

14-17. International **Geoscience Electronics** Symp., 2nd annual, Washington, D.C. (R. Bernstein, IBM Corp., 18100 Frederick Pike, Gaithersburg, Md. 20760)

15. Idaho Acad. of **Science**, Pocatello. (M. J. Bigelow, Chemistry Dept., Idaho State Univ., Pocatello 83201)

16-18. Symposium of Intern. **Geochemical Exploration**, Toronto, Canada. (R. W. Boyle, Geological Survey of Canada, 601 Booth St., Ottawa, Ont.)

16-18. **Nature of the Solid Earth**, Francis Birch Symp., Cambridge, Mass. (E. C. Robertson, U.S. Geological Survey, 8001 Newell St., Silver Spring, Md. 20910)

16-18. Ohio Acad. of **Science**, Wittenberg Univ., Springfield. (J. H. Melvin, 505 King Ave., Columbus, Ohio 43201)

16-18. **Population** Assoc. of America, Atlanta, Ga. (A. F. Ferriss, Russell Sage Foundation, 1755 Massachusetts Ave., NW, Washington, D.C. 20036)

17-19. **Discoveries in Biological Psychiatry** Symp., Baltimore, Md. (Symposium Secretary, Taylor Manor Hospital, Ellicott City, Md. 21043)

19-23. American Assoc. of **Cereal Chemists**, Minneapolis, Minn. (R. J. Tarleton, 1821 University Ave., St. Paul, Minn. 55104)

20-22. Society of **Operations Research**, Washington, D.C. (H. Berger, The Pentagon, Washington, D.C. 20301)

20-23. Southwestern **Surgical** Congr., Dallas, Tex. (J. A. Barney, 301 Pasteur Medical Bldg., Oklahoma City, Okla. 73103)

20-24. American **Geophysical** Union, Washington, D.C. (W. E. Smith, AGU, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

20-24. **Metals Engineering** Conf., Cleveland, Ohio. (A. B. Conlin, Jr., 345 E. 47 St., New York 10017)

21-23. **Aerospace Nuclear Applications**, Huntsville, Ala. (A. D. Smith, American Nuclear Soc., 10102 Redland St., Huntsville 35802)

21-23. Conference on **Stress Corrosion Cracking**, Los Angeles, Calif. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

The Hyperdialyzer*



*A coined word aptly describing our new Model CD-200 which enables you to desalt large volumes—200 ml or more—up to 10 times faster than before, and with unsurpassed economy and convenience. Find out more about this remarkable device by writing to:

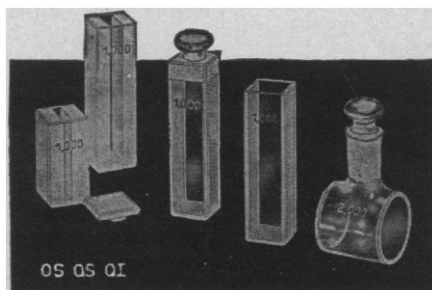
omnivector instruments

4803 Castilla Ave., Richmond, Calif. 94804
Tel. (415) 233-0654

Circle No. 106 on Readers' Service Card

Our Ad is not Perfect.

*but our
CELLS
are. . .
and we have
all types of*



Standard. . .
Flow-through. . .
Constant temperature. . .
Anaerobic. . .
Special design CELLS,
with capacities from macro to ultra-micro.

Also available

ULTRAVIOLET LIGHT SOURCES

Deuterium Lamps
Mercury Vapor Lamps
Hollow Cathode Lamps

write for literature to,

HELLMA CELLS, INC.

Box 544, Borough Hall Station, Jamaica, New York, 11424
Tel. (212) 544-9534

Circle No. 102 on Readers' Service Card

20 FEBRUARY 1970

Seminars for biologists, physicists, & chemists

FOURIER SPECTROSCOPY

Mar. 5 — Los Angeles — \$90

Chairman: Dr. R. T. Hall, The Aerospace Corp.

This meeting will describe the basic physics and math concepts of Fourier Spectroscopy and then compare its merits with those of conventional dispersive spectroscopy. Practical techniques including various computational schemes for using the Fourier method will be presented. Also covered will be specific applications.

SCANNING ELECTRON MICROSCOPY

Apr. 8-9 — Boston — \$180

Chairman: Prof. R. E. Ogilvie, M.I.T.

This symposium will explore the design, construction, and various modes of operation of the SEM, as well as explain the fundamental physics involved. New methods developed to enhance the versatility of the instrument and specific applications will be detailed.



All meetings include panel sessions which enable attendees to discuss their specific problems with the lecturers.

To register, or for further information, contact: Mr. A. M. Collias, TECHNICAL FORUM ASSOCIATES, INC., 545 Technology Square, Cambridge, Mass. 02139. Tel: 617-354-1626.

Circle No. 112 on Readers' Service Card

JOIN THE ANTI- POLLUTION DRIVE!

For continuous colorimetric determination of chlorinated phenols in effluents, use

4-AMINOANTIPYRINE

Winthrop
LABORATORIES

Special Chemicals Department
90 Park Ave., New York, N.Y. 10016



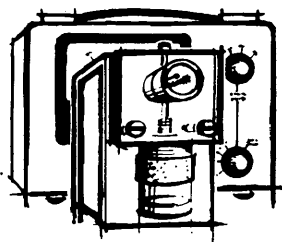
Circle No. 103 on Readers' Service Card

1167

Don't Sweat About Humidity

Measure it quickly,
easily, and accurately
with the YSI Model 90
Electronic Psychrometer.

This modern version
of the old-time sling
psychrometer uses a
battery-powered aspirator
to assure constant air
flow past YSI linear
thermistor sensors, and
reads directly in wet
bulb depression and dry
bulb temperature.



It is portable, the probe
can be used remotely, and
you can operate the
system with one hand.
Full scale meter de-
flexion can be as little
as 5°C wet bulb depression.

Send for details and
learn an easier way to
measure humidity. We'll
also send data on our new
dew point hygrometers.



YELLOW SPRINGS INSTRUMENT CO.
YELLOW SPRINGS, OHIO 45387

Circle No. 92 on Readers' Service Card

1168

22-25. American Assoc. for Child Care
in the Hospital, San Francisco, Calif. (H.
H. Glaser, Stanford Children's Convales-
cent Hospital, Palo Alto, Calif. 94304)

23-25. Illinois State Acad. of Science,
Chicago, Ill. (K. Harmet, Dept. of Biol-
ogy, Northern Illinois Univ., De Kalb)

23-26. Association of Clinical Scientists,
Detroit, Mich. (R. P. MacFate, ACS, 125
N. Rutledge St., Pentwater, Mich. 49449)

24-25. Mississippi Acad. of Sciences,
Clinton. (C. Q. Sheely, Drawer CQ, State
College, Miss. 39762)

24-25. Nebraska Acad. of Science, Lin-
coln. (C. B. Schultz, Univ. of Nebraska,
Lincoln 68508)

24-25. South Carolina Acad. of Science,
Columbia. (L. H. Stevenson, Biology
Dept., Univ. of South Carolina, Columbia
29208)

25-30. American Ceramic Soc., Inc.,
72nd annual mtg., Philadelphia, Pa. (The
Society, 4055 N. High St., Columbus,
Ohio 43214)

26-30. Group Medicine, 1st intern.
congr., Winnipeg, Canada. (R. E. Beam-
ish, Manitoba Clinic, 790 Sherbrook St.,
Winnipeg 2, Man., Canada)

26-1. American Soc. for Microbiology,
Boston, Mass. (R. W. Sarber, 1913 I St.,
NW, Washington, D.C. 20006)

27-29. Frequency Control Symp., 24th
annual, Atlantic City, N.J. (J. M. Stanley,
Electronics Components Lab., Fort Mon-
mouth, N.J. 07703)

27-29. American Surgical Assoc., White
Sulphur Springs, W. Va. (C. G. Shires,
5323 Harry Hines Blvd., Dallas, Tex.
75235)

27-30. National Telemetering Conf.,
Los Angeles, Calif. (A. V. Balakrishnan,
Dept. of Engineering, Univ. of California,
Los Angeles 90024)

27-2. American Acad. of Neurology,
Miami Beach, Fla. (S. A. Nelson, Execu-
tive Director, The Academy, 4005 W. 65
St., Minneapolis, Minn. 55435)

28-30. Blood Coagulation and Hemo-
stasis, Sherbrooke, P.Q., Canada. (R.
Losito, Dept. of Medicine, Univ. of Sher-
brooke, Sherbrooke)

28-30. Conference on the Fatigue Prob-
lem, Los Angeles, Calif. (J. A. Fellows,
American Soc. for Metals, Metals Park,
Ohio 44073)

28-30. Pi Gamma Mu, Denver, Colo.
(E. B. Urquhart, 1719 Ames St., Winfield,
Kan. 67156)

29-1. Instrument Soc. of America, 2nd
education symp., Montreal, Canada. (C.
M. Skillern, The Foxboro Co., Foxboro,
Mass.)

30-1. Kansas Acad. of Science, Wichita.
(R. J. Robel, Div. of Biology, Kansas
State Univ., Manhattan 66502)

May

1. Missouri Acad. of Science, Warrens-
burg. (E. A. McGinnes, Jr., 1-31 Agricul-
ture, Univ. of Missouri, Columbia 65201)

1-2. North Dakota Acad. of Science,
Grand Forks. (B. G. Gustafson, Secretary-
Treasurer, Univ. of North Dakota, Grand
Forks 58201)

1-2. Society for Pediatric Research, At-
lantic City, N.J. (R. E. Greenberg, Dept.
of Pediatrics, Stanford Univ., Stanford,
Calif. 94305)

EMI

$$\lambda = 1,650-8,500 + A^\circ$$

$$EMI = 2 \times 10^{-13} \text{ Im.}$$



The 9558Q Photomultiplier eliminates

...the nuisance of multiple detectors! One
EMI photomultiplier type 9558Q covers UV,
visible and infra red. The 9558Q is a two
inch diameter end window tube with eleven
venetian blind dynodes having highly stable
CsSb secondary emitting surfaces. The
Spectrasil window gives better transmission
of UV than natural quartz. The photocath-
ode is the S-20 (tri-alkali) type employing
unique EMI geometry. The results are high
quantum efficiency (23-25% at peak) and
exceedingly low dark current, (typically
.002uA. at 200 A/L). Where the exact wave-
length is unknown, or the entire spectrum is
under investigation, the 9558Q enables the
work to proceed without changing detectors.

Where the red sensitivity of the tri-alkali
photocathode is most important, and the UV
region is not, the 9558B, with a pyrex win-
dow (but all the other desirable character-
istics of the 9558Q) may be substituted at
much lower cost. Tubes can be specially
selected for difficult astronomical tasks,
laser range finders, red channels of flying
spot scanners, etc.

Write for details on S-20 tubes in a com-
plete range of sizes.

GENCOM DIVISION
varian/EMI

80 EXPRESS STREET, PLAINVIEW, N. Y. 11803
TELEPHONE: (516) 433-5900

Circle No. 82 on Readers' Service Card

SCIENCE, VOL. 167

2-3. American Federation of **Clinical Research**, Atlantic City, N.J. (J. E. Brown, 2011 Eye St., NW, Washington, D.C. 20006)

3-6. European Federation of **Chemical Engineering**, 93rd, Vienna, Austria. (W. F. De Geest, Lijzenstraat 24 Berchem-Antwerp, Belgium)

3-6. Society of Professional **Well Log Analysts**, symp., 11th annual, Los Angeles, Calif. (J. D. Clark, 13507 Tosca, Houston, Tex. 77024)

3-8. International **Radiation Protection Assoc.**, 2nd, Brighton, England. (B. Godbold, Central Electricity Generating Board, 20 Newgate St., London, E.C.1, England)

4-5. **Industrial Electronics and Control Instrumentation Transducer Conf.**, 2nd annual, Gaithersburg, Md. (R. B. Spooner, IMPAC Instrument Service, 201 E. Carson St., Pittsburgh, Pa. 15219)

4-6. Instrument Soc. of America, 8th **Biomedical Sciences Instrumentation Symp.**, Denver, Colo. (L. J. Brannick, E. R. Squibb & Sons, Inc., New Brunswick, N.J. 08901)

4-8. American **Nurses Assoc.**, Miami, Fla. (Mrs. A. R. Warner, Dept. 10, Columbus Circle, New York 10019)

4-8. Society of **Plastics Engineers**, New York, N.Y. (J. H. Hyden, SPE, 656 W. Putnam Ave., Greenwich, Conn. 06830)

4-8. **Veterinary Conf. and Wildlife Disease Assoc.**, joint biennial mtg., Atlanta, Ga. (W. G. Winkler, Program Chairman, Veterinary Science Dept., Univ. of Wisconsin, Madison 53706)

5-6. Institute of **Electrical and Electronics Engineers Appliance Technical Conf.**, 21st annual, Mansfield, Ohio. (W. H. Lynn, Registration Chairman, Tappan Co., 250 Wayne St., Mansfield, Ohio 44906)

5-6. Association of American **Physicians**, Atlantic City, N.J. (J. B. Hickman, Indiana Univ. Medical Center, 1100 W. Michigan St., Indianapolis 46202)

5-7. **Biometric Soc.**, eastern North American regional, Chapel Hill, N.C. (D. G. Gosslee, P.O. Box 713, Oak Ridge, Tenn. 37830)

5-7. Purdue **Industrial Waste Conf.**, 25th, Lafayette, Ind. (D. E. Bloodgood, School of Civil Engineering, Purdue Univ., Lafayette 47907)

5-7. Institute of **Mathematical Statistics**, Chapel Hill, N.C. (L. Katz, Statistical Lab., Michigan State Univ., East Lansing 48823)

5-7. Modern **Welding Techniques Conf.**, Los Angeles, Calif. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

5-8. Virginia **Acad. of Science**, Richmond. (R. C. Berry, The Academy, P.O. Box 9211, Richmond 23227)

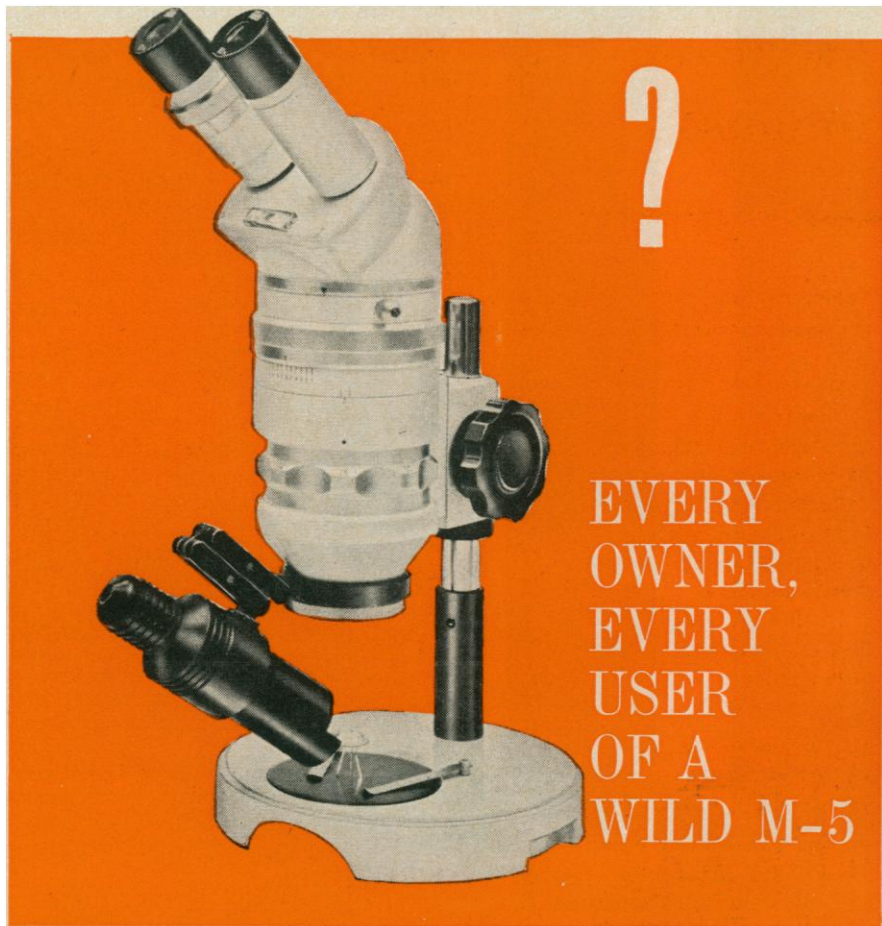
6-8. Society of **Mining Engineers**, Socorro, N.M. (P. H. Johnson, New Mexico State Bureau of Mines and Mineral Resources, Campus Sta., Socorro 87801)

6-9. American Inst. of **Industrial Engineers**, Cleveland, Ohio. (J. J. Jericho, AIIE, 345 E. 47 St., New York 10017)

7-8. National **Information Retrieval Colloquium**, 7th annual, Philadelphia, Pa. (P. Bagley, Information Engineering, 3401 Market St., Philadelphia)

7-9. Northeastern **Anthropological Conf.**, Ottawa, Ont., Canada. (F. G. Vallee, Carleton Univ., Ottawa)

who ever heard of a customer designed stereomicroscope



Customer designed power? With easily interchangeable eyepieces and attachment objectives, you can choose the power range you need, from 2x to 200x.

Customer designed versatility? Specify your requirements in light sources, stages, stands, polarizing, measuring and photographic attachments.

Customer designed flexibility? Change your field of investigation, research, or observation method tomorrow. The M-5 can quickly change, and grow, with your needs. Just one example as illustrated: Your work takes you to dissection. You need adjustable depth of focus to keep specimen, scalpel or forceps in clear focus. You add the new double iris diaphragm, get greatly increased depth of focus, and retain maximum resolving power with a turn of the control ring.

Want to design your own stereomicroscope? Write for Booklet M-5, or for a demonstration.

WILD®
HEERBRUGG

WILD HEERBRUGG INSTRUMENTS, INC.
FARMINGDALE, NEW YORK 11735

WILD OF CANADA, LTD., 881 LADY ELLEN PLACE, OTTAWA 3, ONTARIO
WILD DE MEXICO, SA, LONDRES 256, MEXICO 6, D.F.

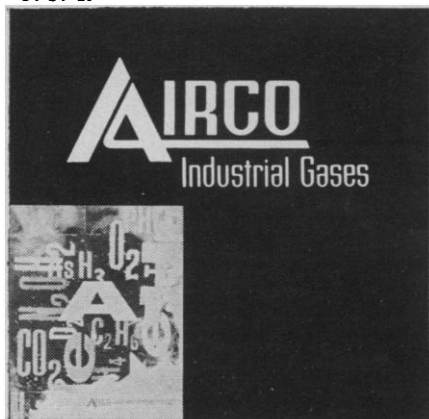
Circle No. 27 on Readers' Service Card

D

doping
gas
mixtures

Doping Gas Mixtures. Arsine, Phosphine, Silane, Diborane in Argon, Helium, Hydrogen, Nitrogen. In various amounts and concentrations.

For this year's catalog, write: Rare and Specialty Gases Dept., Airco Industrial Gases, 575 Mountain Avenue, Murray Hill, N.J. 07974.



Circle No. 81 on Readers' Service Card

1170

7-9. **International Communication Assoc. Conf.**, 18th annual, Minneapolis, Minn. (R. W. Pace, Communication Program, Univ. of Montana, Missoula 59801)

8-10. **Society of Biological Psychiatry**, San Francisco, Calif. (C. Shagass, Eastern Pennsylvania Psychiatric Institute, Henry Ave. and Abbottsford Rd., Philadelphia 19129)

8-11. **American Psychoanalytic Assoc.**, San Francisco, Calif. (H. Fischer, Executive Secretary, APA, 1 E. 57 St., New York 10022)

10. **Association for the Advancement of Psychotherapy, Inc.**, 9th natl. conf., San Francisco, Calif. (S. Lesse, 15 W. 81 St., New York 10024)

10-12. **American Assoc. of Plastic Surgeons**, Colorado Springs, Colo. (C. W. Monroe, 715 Lake St., Oak Park, Ill. 60301)

10-14. **Metallurgical Soc.**, Las Vegas, Nev. (J. V. Richard, Secretary, The Society, 345 E. 47 St., New York 10017)

10-15. **Chemical Vapour Deposition**, 2nd intern. conf., Los Angeles, Calif. (W. W. Smeltzer, Dept. of Metallurgy and Metallurgical Engineering, McMaster Univ., Hamilton, Ont., Canada)

10-15. **Electrochemical Soc.**, Los Angeles, Calif. (E. G. Enck, Executive Secretary, The Society, 30 E. 42 St., New York 10017)

11-12. **Council of Biology Editors**, Ottawa, Ont., Canada. (K. Heumann, 9650 Rockville Pike, Bethesda, Md. 20014)

11-13. **Instrument Soc. of America**, 16th **Aerospace Instrumentation Symp.**, Seattle, Wash. (J. M. Taylor, 3246 116th S.E., Bellevue, Wash. 98004)

11-13. **American Soc. for Quality Control Technical Conf. and Exhibit**, 24th annual, Pittsburgh, Pa. (R. W. Shearman, Administrative Secretary, The Society, 161 W. Wisconsin Ave., Milwaukee, Wis. 53203)

11-13. **Television Measuring Techniques Conf.**, London, England. (R. Larry, Institution of Electronic and Radio Engineers, 8-9, Bedford Sq., London, W.C.1, England)

11-14. **International Microwave Symp.**, Newport Beach, Calif. (R. H. Duhamel, Granger Assoc., 1601 California Ave., Palo Alto, Calif. 94304)

11-15. **High Pressure**, 3rd intern. conf., Aviemore, Invernesshire, Scotland. (J. Schoeffler, Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1, England)

11-15. **American Industrial Hygiene Assoc.**, Detroit, Mich. (G. D. Clayton, AIHA, 25711 Southfield Rd., Southfield, Mich. 48075)

11-15. **American Psychiatric Assoc.**, San Francisco, Calif. (B. W. Hogan, APA, 1700 18th St., NW, Washington, D.C. 20009)

12-14. **Metal Matrix Composites Conf.**, San Francisco, Calif. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

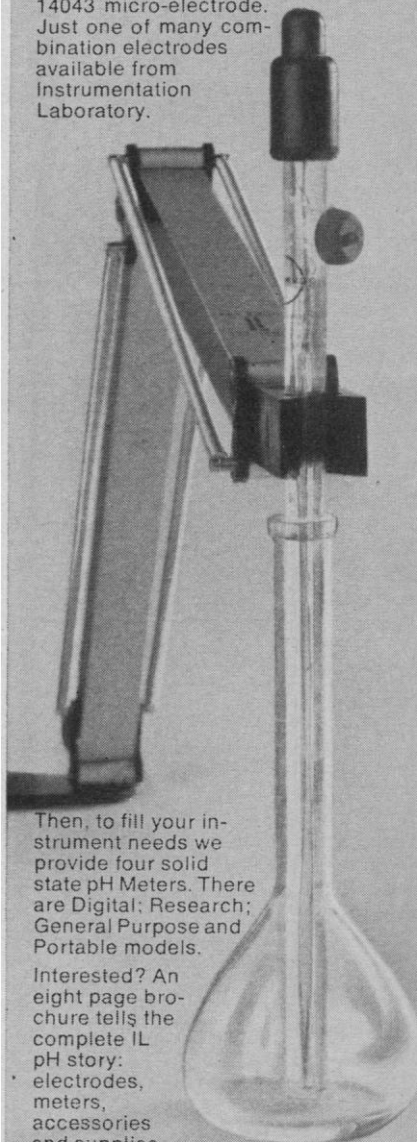
13-15. **Electronics Components Conf.**, Washington, D.C. (D. Burks, Sprague Electric Co., North Adams, Mass. 01247)

14. **Modern Methods of Analyses of Surfaces Symp.**, Murray Hill, N.J. (J. D. Levine, Symp. Chairman, RCA Labs, Princeton, N.J.)

IL gives you fits

And on purpose, too!

We make a thin combination pH electrode that fits just about anywhere there is a measurement to be made. In addition its rugged flat tip provides quick pH determinations in micro-titration vessels, petri dishes or even on a wet surface. A half drop provides more sample than is needed. It is the IL 14043 micro-electrode. Just one of many combination electrodes available from Instrumentation Laboratory.



Then, to fill your instrument needs we provide four solid state pH Meters. There are Digital; Research; General Purpose and Portable models.

Interested? An eight page brochure tells the complete IL pH story: electrodes, meters, accessories and supplies.

Send today for your copy. Whatever your need IL has the pH equipment that fits.

P.S. All IL pH electrodes (and our 83020 MULTI-flex™ Electrode Arm, too) can be used with any pH meter. No need to wait. Just tell us the model you are using.



Instrumentation Laboratory Inc.
113 Hartwell Avenue
Lexington, Massachusetts 02173

Circle No. 91 on Readers' Service Card

SCIENCE, VOL. 167

14-15. **Materials Selection Symp.**, Cleveland, Ohio. (W. M. Mueller, American Soc. for Metals, Metals Park, Ohio 44073)

14-15. **Southern Textile Research Conf.**, 10th annual, Hilton Head Island, S.C. (D. W. Snyder, Crompton Shenandoah Co., Drawer 907, Waynesboro, Va. 22980)

14-16. **Cardiovascular Diseases**, 6th annual symp., Hartford, Conn. (R. M. Jersaty, Section of Cardiopulmonary Medicine, St. Francis Hospital, Hartford)

14-16. **American Inst. of Chemists**, Pittsburgh, Pa. (P. B. Slawter, 79 Madison Ave., New York 10016)

15-19. **International Assoc. of Professional Numismatists**, 19th general assembly, Scheveningen, The Hague, Netherlands. (A. Cronheim, Director, Holland Organizing Centre, 16 Lange Voorhout, The Hague)

17-20. **American Inst. of Chemical Engineers and Puerto Rican Inst. of Chemical Engineers**, 3rd joint mtg., San Juan, Puerto Rico. (P. Santiago, Caribbean Gulf Refining, San Juan)

17-30. **International Electrotechnical Commission**, Washington, D.C. (D. Hogan, U.S.A. Standards Inst., 10 E. 40 St., New York 10016)

18-20. **National Aerospace Electronics Conf.**, Dayton, Ohio. (Inst. of Electrical and Electronics Engineers, Dayton Office, 134 E. Monument St., Dayton 45402)

18-20. **American Gastroenterological Assoc.**, Boston, Mass. (H. D. Janowitz, Mt. Sinai Hospital, 11 E. 100 St., New York 10029)

18-20. **Neonatal Enteric Infections Caused by *Escherichia coli***, Conf., New York, N.Y. (L. R. Neville, New York Acad. of Sciences, 2 E. 63 St., New York 10021)

18-20. **Instrument Soc. of America, Power Instrumentation Symp.**, 13th, Kansas City, Mo. (R. A. Russell, Box 8405, Kansas City 64114)

18-20. **Steels for Dynamic Loading**, Cleveland, Ohio. (W. M. Mueller, American Soc. for Metals, Metals Park, Ohio)

18-22. **Air Force Materials Symp.** '70, Miami Beach, Fla. (J. Shipp, Executive Director, AFMS '70, P.O. Box 38, Dayton, Ohio 45420)

18-22. **Medical Library Assoc.**, New Orleans, La. (H. B. Schmidt, Executive Secretary, MLA, 919 N. Michigan Ave., Chicago, Ill. 60611)

19-20. **International Conf. on Magnet Technology**, Hamburg, Germany. (W. Jentschke, German Hamburg Electron Synchrotron, Notkeskieg 1, D-2, Hamburg 52)

19-22. **Society for Experimental Stress Analysis**, Huntsville, Ala. (B. E. Rossi, 21 Bridge Sq., Westport, Conn. 06880)

20-22. **Conference on Fracture Control: Theory and Application**, Chicago, Ill. (A. M. Mueller, American Soc. for Metals, Metals Park, Ohio 44073)

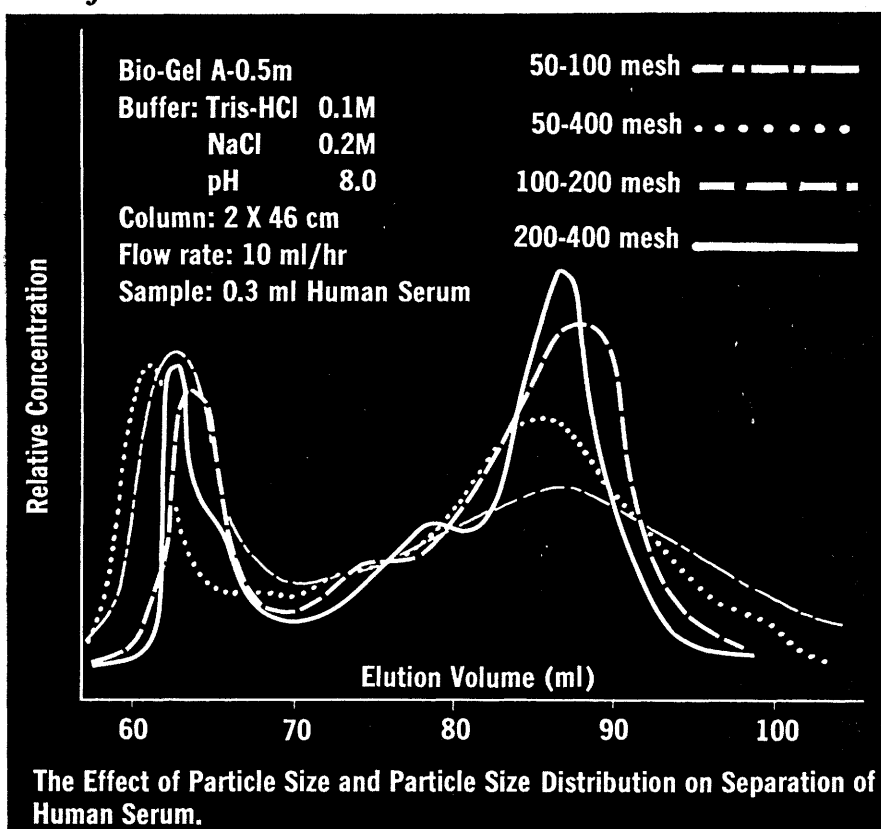
20-22. **Teratology Soc.**, 10th annual, Annapolis, Md. (R. W. Miller, 402 Wisconsin Bldg., Bethesda, Md. 20014)

22-29. **International Cancer Congr.**, 10th, Houston, Tex. (M. M. Copeland, Univ. of Texas, P.O. Box 20465, Houston 77025)

24-28. **Institute of Food Technologists**, San Francisco, Calif. (C. L. Willey, IFT, 221 N. LaSalle St., Chicago, Ill. 60601)

20 FEBRUARY 1970

one of a series on...



WHAT REALLY COUNTS IN GEL FILTRATION?

When using agarose gels for separations over 400,000 molecular weight, choosing the proper porosity and mesh size really counts.

And who offers the widest selection of porosities and mesh sizes in agarose gels?

Bio-Rad does with **Bio-Gel A**...which competes head-on with Pharmacia's Sepharose®

The materials are identical. But **Bio-Gel A** comes in six porosities with your choice of 1, 2, 4, 6, 8 and 10% agarose in gel. And three mesh sizes 50-100, 100-200, and 200-400.

As of this writing, Sepharose® is offered in just three porosities with 2, 4 and 6% agarose. And just two mesh sizes, 60-250 and 40-190.

Doesn't it make sense to choose **Bio-Gel A**—more of a match for your molecules?

This is but one example of Bio-Rad's broader capability in gel filtration. To learn of others, please contact

BIO-RAD *Laboratories*

Dept. S-9
 32nd and Griffin Avenue, Richmond, California 94804

More for gel filtration

Circle No. 28 on Readers' Service Card

Our Breed-in.

They're the class of '70. Inbred mouse strains developed and maintained by Dr. Leonell C. Strong.

These strains of mice have been the most generally accepted in cancer research. And in other studies requiring inbred mice. Recently, they've been the toast of the Continent through a limited marketing program by Charles River France. Now, we'll produce them commercially this Spring for the first time in the U.S. DBA/2, C57BL/6, C3H, A and BALB/c. And from these, appropriate hybrid lines.

All foundation and expansion colonies have been Caesarean-derived and maintained in germfree isolaters. All of your inbred mice will be produced under our COBS® system. Nearly all strains will also be available in germfree. In all, the same top quality you've received in our rambred mice.

We'd be happy to make your research effort a Strong one. Call or write Charles River Breeding Laboratories, Wilmington, Mass. 01887 or Charles River France in Elbeuf.

Charles River
BREEDING LABORATORIES, INC.
WILMINGTON, MASSACHUSETTS 01887

FROM THE
HAND OF THE
VETERINARIAN
TO RESEARCH



Circle No. 34 on Readers' Service Card

24-28. International Congr. of **Social and Preventive Medicine**, 3rd, Venice, Italy. (S. Vanasia, General Secretary, The Congress, 71, via M. Macchi, Milan, Italy)

24-29. Chemical Inst. of Canada / Canadian Soc. for **Chemical Engineering**, Toronto, Ont. (W. M. Campbell, Ontario Research Foundation, Sheridan Park, Ontario, Canada)

25-26. Symposium on **Biochemistry of Brain and Memory**, Kenosha, Wis. (S. P. Datta, Univ. of Wisconsin-Parkside, Kenosha 53140)

25-29. European Conf. on **Psychosomatic Research**, 8th, Knokke, Belgium. (M. E. Houben, Universitaire St. Jozefkliniek voor Psychiatrie, 3070 Kortenberg, Belgium)

26-29. **Textile Institute Conf.**, 5th annual, London, England. (Textile Inst., 10 Blackfriars St., Manchester 3, England)

27-29. **Alcohol and Drug Addiction** Foundation Symp., Toronto, Canada. (R. M. Gilbert, Addiction Research Foundation, 344 Bloor St. W., Toronto 179, Ont.)

30-1. Pan American **Cancer Cytology** Congr., Jamaica, B.W.I. (J. E. Ayre, Westbury Quadrangle, 113 S. Service Rd., Jericho, N.Y. 11753)

June

1-5. Symposium on Use of **Computers for Automatic Control of Traffic**, Versailles, France. (G. Ruppel, Intern. Federation of Automatic Control, Postfach 1139, Dusseldorf 1, Germany)

1-6. International **Mineral Processing** Congr., 9th, Prague, Czechoslovakia. (U. P. Vyskus Rud, Modranska 23, Prague 4)

1-6. World **Mining** Congr., 6th, Madrid, Spain. (A. G. Readett, Natl. Coal Board, Hobart House, Grosvenor Pl., London, S.W.1, England)

1-6. World Congr. of **Occupational Therapists**, 5th, Zurich, Switzerland. (G. Stauffer, Kraftstr 22, 8044, Zurich)

2-4. Conference on **Stress Corrosion Cracking**, New Orleans, La. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

2-5. Mid-American Symp. on **Spectroscopy**, 22nd, Chicago, Ill. (W. A. Loseke, IIT Research Inst., 10 W. 35 St., Chicago 60616)

3-5. American **Chemical** Soc., Central regional, 2nd, Columbus, Ohio. (R. W. Bird, 2540 Olentangy River Rd., Columbus 43210)

4-5. **Environmental and Water Resources Engineering** Conf., 9th annual, Nashville, Tenn. (E. L. Thackston, Vanderbilt Univ., Box 133, Sta. B, Nashville 37203)

4-5. **Molecular Biology**, 4th intern. symp., New York, N.Y. (E. G. Bassett, Research Products Div., Miles Laboratories, Inc., Elkhart, Ind. 46514)

7-9. **Computer Applications in the Earth Sciences**, 8th colloquium, Lawrence, Kans. (D. F. Merriam, Kansas Geological Survey, Univ. of Kansas, Lawrence 66044)

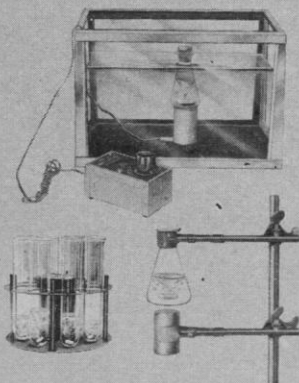
7-10. American Soc. of **Mechanical Engineers**, Boston, Mass. (A. B. Conlin, Jr., 345 E. 47 St., New York 10017)

8-9. Choice Criteria and **Management**

Only From TRI-R

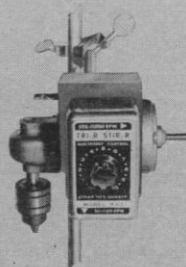
Micro-Submersible Magnetic Stirrer

Famous for a reason. You can stir at any angle in open or closed vessels, even under water. Optionally, will stir up to 8 test tubes. Mounted or bench top . . . and will stir under vacuum or pressure.



The Stir-R

Options abound with this electronically controlled, popular laboratory stirrer. Fan cooled motor, 1/12 H.P., constant torque electronic control, key type adjustable chuck. The high speed shaft runs from 500 to 11,000 rpm. Single or double shaft models. And, it's the lowest priced model with all of these features.



Electronic Thermometer

Rapid response and high accuracy are yours with this Tri-R Electronic Thermometer. Direct reading in both °C and °F. Leads to 1000 ft. Battery or line operated in eight ranges from -35 to 100°C. Low, low cost, less than \$100.



Tri-R products are sold only from Tri-R. Send for catalog or individual data sheets. Low prices, high quality, guaranteed satisfaction . . . and, only from Tri-R.



TRI-R INSTRUMENTS, INC.

48 Merrick Road Rockville Centre, New York 11570

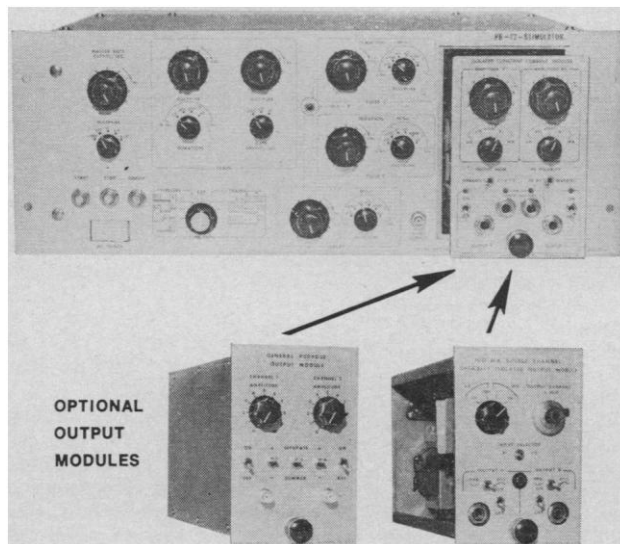
(516) 766-5134

Circle No. 60 on Readers' Service Card



THE PB 72 CONSTANT CURRENT STIMULATOR

An advanced model research stimulator with multiple phase functions, dual outputs.



Choice of output modules—Dual Channel 10MA Isolated Output Module; Single Channel 100MA Isolated Module; General Purpose Voltage Module; Microelectrode Isolated Module.

- **OPTICAL ISOLATION SYSTEM.** A new concept featuring light beam isolation.
- **SILICON SOLID STATE CIRCUITRY** for greater accuracy, repeatability and prolonged instrument life.
- **CAN BE PROGRAMMED BY COMPUTER OR BEHAVIORAL EQUIPMENT.** All functions can be triggered through a connector on the back panel by means of an or gate input to the circuit. They can also be controlled on any range by an external voltage.



PHIPPS & BIRD, INC.

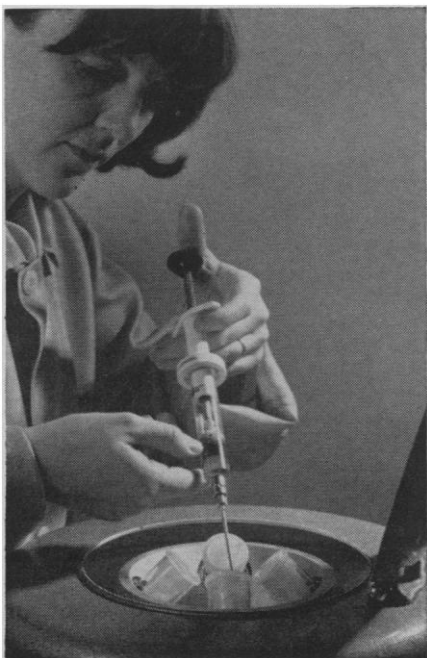
SCIENTIFIC INSTRUMENT MANUFACTURING DIVISION

SIXTH AT BYRD STREETS • P. O. BOX 2V • RICHMOND, VA. 23205 • (703) 644-5401

Circle No. 53 on Readers' Service Card

1173

Use your lab centrifuge for molecular separations!



In minutes, CENTRIFLO® membrane cones produce protein-free filtrates and/or protein concentrates from dilute solutions without denaturation or change in micromolecular environment. You can concentrate 5 ml urine or CSF 5-fold in 2 minutes, 10-fold in 7 to 10 minutes.

CENTRIFLO cones are uniquely suited for microsoluble binding studies and to determine free species in biological fluids.

Simply place CENTRIFLO units into your centrifuge, insert up to 7 ml in each, and let centrifugally-accelerated ultrafiltration do the work. Species above 50,000 MW are retained, others collect below the filter.

This simple and reliable device now saves many hours in hundreds of laboratories. As little as 90¢ per reusable cone. Send for free Applications Guide!

amicon

Scientific Systems Div., Dept. D16
AMICON CORPORATION
21 Hartwell Ave., Lexington, Mass. 02173
Please send Free Applications Guide.

Name _____
Institution _____
Department _____
Street _____
City _____
State _____ Zip Code _____

Circle No. 89 on Readers' Service Card

1174

Systems for Estuarine Resources Conf., Charleston, S.C. (J. C. Hite, Dept. of Agricultural Economics, Clemson Univ., Clemson, S.C. 29631)

8-10. International Conf. on **Communications**, San Francisco, Calif. (A. M. Peterson, Stanford Research Inst., Menlo Park, Calif. 94025)

8-10. Association for **Gnotobiotics**, Notre Dame, Ind. (M. Pollard, Dept. of Microbiology, Univ. of Notre Dame, Notre Dame 46556)

8-10. Conference on **Power Metallurgy**, Detroit, Mich. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

8-12. International **Gas** Conf., 11th, Moscow, U.S.S.R. (R. H. Tonwaide, General Secretary, Intern. Gas Union, 4 Av. Palmerston, Brussels 4, Belgium)

8-12. International Symp. on **Plant Protein: Their Improvement through the Application of Nuclear Techniques**, Vienna, Austria. (J. H. Kane, U.S. Atomic Energy Commission, Washington, D.C. 20545)

9-12. American **Astronomical** Soc., Boulder, Colo. (H. M. Gurin, 211 Fitz Randolph Rd., Princeton, N.J. 08540)

9-12. Canadian Federation of **Biological** Societies, 13th annual, Montreal. (K. K. Carroll, Dept. of Biochemistry, Univ. of Western Ontario, London 72, Canada)

10-12. **Low Energy X- and Gamma Ray Sources and Applications**, 3rd symp., Boston, Mass. (J. W. Hitch, Div. of Isotopes Development, U.S. Atomic Energy Commission, Washington, D.C. 20545)

11-13. **Endocrine** Soc., St. Louis, Mo. (N. L. Mattox, Suite 304, 1211 N. Sharel, Oklahoma City, Okla. 73103)

12-14. Society of **Biological Psychiatry**, Atlantic City, N.J. (G. N. Thompson, 2010 Wilshire Blvd., Los Angeles, Calif. 90057)

13-14. American **Diabetes** Assoc., St. Louis, Mo. (J. R. Connelly, 18 E. 48th St., New York, N.Y. 10017)

14-18. American **Nuclear** Soc., Los Angeles, Calif. (O. J. Du Temple, 244 E. Ogden Ave., Hinsdale, Ill. 60521)

14-18. National **Plastics** Exposition and Conf., Cleveland, Ohio. (L. P. Williams, 250 Park Ave., New York 10017)

14-19. **Air Pollution Control** Assoc., 63rd annual, St. Louis, Mo. (A. Arch, 4400 Fifth Ave., Pittsburgh, Pa. 15213)

14-19. **Mass Spectrometry and Allied Topics**, 18th annual conf., San Francisco, Calif. [J. M. McCrea, Applied Research Lab. (73), U.S. Steel Corp., Monroeville, Pa. 15146]

14-19. Canadian Assoc. of **Pathologists**, Winnipeg, Man. (C. W. Penner, Winnipeg General Hospital, Winnipeg 3)

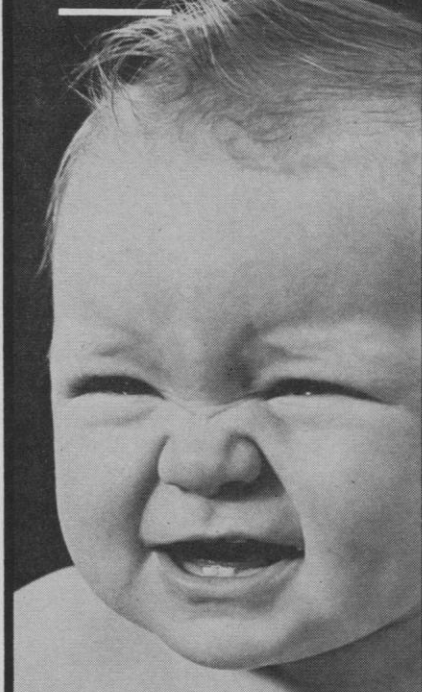
15-16. **Catalytic Hydrogenation and Analogous Pressure Reactions**, 3rd conf., New York, N.Y. (L. R. Neville, New York Acad. of Sciences, 2 E. 63 St., New York 10021)

15-17. American **Neurological** Assoc., 95th annual, Atlantic City, N.J. (S. A. Trufant, Cincinnati General Hospital, Cincinnati, Ohio 45229)

15-18. American Soc. for **Engineering Education**, Columbus, Ohio. (W. L. Collins, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

15-18. American **Meteorological** Soc. Symp., Boulder, Colo. (J. London, Dept. of Astro-Geophysics, Univ. of Colorado, Boulder 80302)

"one part per
what?..."



"million, baby...
million!"

Vacuum/Atmospheres Company specializes in standard and custom controlled inert atmosphere recirculating gas purification systems for space age R & D and production. Atmosphere purity of one part per million or less of O₂ and H₂O is maintained with optional N₂ removal capability. Vacuum/Atmospheres Company is recognized throughout the world as a primary source for ultra pure inert atmosphere systems and is continuously exploring new avenues to advance the present state-of-the-art.



write or call today for complete literature and specifications
**VAC VACUUM
ATMOSPHERES
COMPANY**
W ALLEN-JONES ELECTRONICS
DIVISION OF WEMS, INC.
4652 W. ROSECRANS AVENUE
HAWTHORNE, CALIFORNIA 90250
PHONE (213) 644-0251

Circle No. 76 on Readers' Service Card

SCIENCE, VOL. 167

15-18. **Tissue Culture** Assoc., 21st annual, Washington, D.C. (V. P. Perry, American Foundation for Biological Research, 11125 Rockville Pike, Rockville, Md. 20853)

15-19. International Symp. on **Information Theory**, Noordwijk, Netherlands. (P. E. Green, Jr., M.I.T. Lincoln Lab., Lexington, Mass. 02173)

15-19. **Nuclear Data for Reactors**, 2nd intern. conf., Helsinki, Finland. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

15-19. **Vacuum Metallurgy**, intern. conf., Anaheim, Calif. (E. L. Foster, Battelle Memorial Inst., 505 King Ave., Columbus, Ohio 43201)

16-18. Conference on **Cold Forming of Metal Parts**, Cleveland, Ohio. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

16-18. American **Helicopter** Soc., 26th annual natl. forum, Washington, D.C. (H. M. Lounsbury, 30 E. 42 St., New York 10017)

16-19. Canadian **Psychiatric** Assoc., 20th annual, Winnipeg, Man. (W. A. Blair, 225 Lisgar St., Ottawa, Ont., Canada)

17-18. European **Dialysis and Transplant** Assoc., 7th annual, Barcelona, Spain. (W. Drokker, 75 de Lairesestraat, Amsterdam, Netherlands)

17-19. **Cryogenic Engineering** Conf., Boulder, Colo. (J. L. Smith, Jr., Rm. 41-204, Massachusetts Inst. of Technology, Cambridge, Mass. 02130)

17-20. American **Rheumatism** Assoc., Detroit, Mich. (M. M. Walsh, 1212 Avenue of the Americas, New York 10036)

17-21. American **Therapeutic** Soc., Chicago, Ill. (R. T. Smith, 37 Narbrook Pk., Narberth, Pa. 19072)

17-24. **Chemical Engineering** and Congr. of **Chemical Engineers**, Frankfurt-am-Main, Germany. (J. Dohent, Natl. Chemical Exposition, 86 E. Randolph St., Chicago, Ill. 60601)

18-20. **Bibliographical** Soc. of America, Philadelphia, Pa. (W. H. Bond, Houghton Library, Harvard Univ., Cambridge, Mass. 02138)

18-20. American Assoc. of **Bioanalysts**, New York, N.Y. (D. Birenbaum, 802 Ambassador Bldg., St. Louis, Mo. 63101)

20-25. American Soc. of **Radiologic Technologists**, Miami Beach, Fla. (G. J. Eilert, 527 S. Main St., Fond du Lac, Wis. 54935)

21-24. American **Dairy Science** Assoc., 65th annual, Gainesville, Fla. (C. Cruse, 903 Fairview Ave., Urbana, Ill. 61801)

21-24. American **Leather Chemists** Assoc., Lake Placid, N.Y. (M. T. Roddy, c/o Tanners Council Research Laboratories, Univ. of Cincinnati, Cincinnati, Ohio 45221)

21-25. American **Medical** Assoc., Chicago, Ill. (W. E. Burmeister, 535 N. Dearborn St., Chicago, Ill. 60610)

21-25. American **Veterinary Medical** Assoc., Las Vegas, Nev. (D. A. Price, 600 Michigan Ave., Chicago, Ill. 60605)

21-26. American Soc. for **Testing and Materials**, Toronto, Ont., Canada. (T. A. Marshall, Jr., ASTM, 1916 Race St., Philadelphia, Pa. 19103)

22-24. International Conf. on the Role of **Tryptophan Metabolism in Biochem-**

try this for
reliability... the
BRONWILL CTC*
accepted
as the ultimate
in constant
temperature
control

model
20

Go ahead and try it
in your own lab.
Converts any
container into
a constant
temperature bath.

The CTC has a range
of 0-100°C, with a
uniformity of $\pm 0.01^\circ\text{C}$,
a long life brushless
motor, and a double
transistor relay
circuit for absolute
dependability. And
you can circulate
or pump up to 12
liters/minute through
an external accessory.

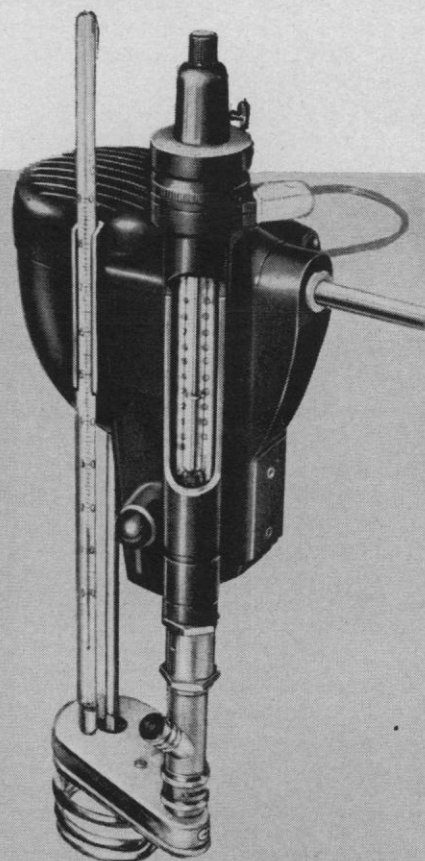
See this compact,
portable CTC at
work — in your own lab. Call your Bronwill
dealer — or write directly to us — for a demonstration.

*Constant Temperature Circulator



BRONWILL SCIENTIFIC, INC.

A leader in thermostatic instrumentation
Box 7824 — Rochester, New York 14606



The new Mini-Pherograph lets you do refrigerated, high-voltage electrophoretic separations on a table-top.



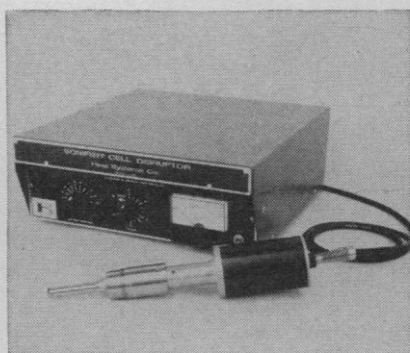
Compactness is but one advantage of the new Brinkmann Mini-Pherograph. Here are some others: high and low voltage systems (3000V/500V) in the same instrument; built-in refrigeration with temperature control to 0°C (uniformity to $\pm 0.25^{\circ}\text{C}$), eliminating the need for external liquid accessories; no diffusion problems due to "free water"; 350 x 400 mm developing chamber; platinum ribbon electrodes. All this adds up to an instrument producing separations whose quality is hard to equal. To find out more about the new Mini-Pherograph and full-size Pherographs, get our free catalog. Just write: Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590. In Canada, write: Brinkmann Instruments (Canada) Ltd., 50 Galaxy Boulevard, Rexdale (Toronto), Ontario.

Brinkmann Pherographs



Circle No. 87 on Readers' Service Card

THE SONIFIER[®] disruptor breaks all CELLS



Model W-140-E—\$880; Model W-185-E—\$975

... FAST!

- Wattmeter Output
- Automatic Tuning
- No Fan in Converter

HEAT SYSTEMS-ULTRASONICS, INC.
42 East Mall, Plainview, N.Y. 11803
516-694-9555

Exclusive distributors for Branson Instruments
Sonifier disruptors

© Reg. T.M. Branson Instr.

Circle No. 99 on Readers' Service Card

INSTANT CLEAN!

clean glassware,
pipettes and mechanisms
thoroughly
in just a few
seconds

sonic 5x5 \$50.00



HEAT SYSTEMS-ULTRASONICS, Inc.
42 EAST MALL, PLAINVIEW, NEW YORK 11803
516/694-9555

Circle No. 100 on Readers' Service Card

istry and Pathology, Madison, Wis. (T. C. Meyer, Univ. of Wisconsin, Madison 53706)

22-25. **Canadian Soc. of Agronomy**, Ottawa, Ont. (R. Loiselle, Ottawa Research Sta., Central Experimental Farm, Ottawa)

22-25. **Symposium on Bioinorganic Chemistry**, Blacksburg, Va. (R. E. Dessy, Dept. of Chemistry, Virginia Polytechnic Inst., Blacksburg 24061)

22-25. **Canadian Soc. of Horticultural Science**, Ottawa, Ont. (E. C. Lougheed, Dept. of Horticulture, Univ. of Guelph, Guelph, Ont.)

22-25. **American Assoc. of Petroleum Geologists**, Calgary, Canada. (J. M. Browning, Tenneco Oil and Minerals, P.O. Box 1051, Calgary, Alta.)

22-25. **Canadian Soc. of Soil Science**, Ottawa, Ont. (A. R. Mack, Central Experimental Farm, Ottawa)

22-25. **Thyroid Conf.**, 6th annual, Vienna, Austria. (R. Hofer, c/o Wiener Medizinische Akademie, Alserstrasse 4, A-1090, Vienna)

22-26. **American Assoc. of Avian Pathologists, Inc.**, Las Vegas, Nev. (G. H. Snoeyenbos, Univ. of Massachusetts, Amherst 01002)

22-27. **Mathematical Statistics and Probability**, 6th, Berkeley, Calif. (E. L. Scott, Dept. of Statistics, Univ. of California, Berkeley 94720)

23-26. **State of the Art in Corrosion Testing Methods Symp.**, Toronto, Canada. (W. H. Ailor, American Soc. for Testing and Materials, Reynolds Metals Co., 4th and Canal Sts., Richmond, Va. 23218)

24-26. **American Automatic Control Conf.**, Atlanta, Ga. (D. Lyons, Dept. of Textiles, Clemson Univ., Clemson, S.C. 29631)

24-26. **Canadian Wood Chemistry Symp.**, 3rd, Vancouver, B.C. (D. A. I. Goring, Pulp and Paper Research Inst. of Canada, 570 St. John's Rd., Pointe Claire, P.Q.)

24-27. **Drugs and Cerebral Function Symp.**, 2nd annual, Denver, Colo. (M. L. Smith, Suite 1120, 2045 Franklin, Denver 80205)

24-27. **Hydrobiology**, natl. symp., Miami Beach, Fla. (J. C. Warman, Water Resources Research Inst., Auburn Univ., Auburn, Ala. 36830)

24-1. **International Symp. on Mechanical Properties and Processes of the Mantle**, Flagstaff, Ariz. (L. R. Sykes, Columbia Univ., Palisades, N.Y. 10964)

25-27. **Conference of Immunologists**, San Diego, Calif. (W. O. Weigle, Scripps Clinic and Research Foundation, La Jolla, Calif. 92037)

25-27. **Leukocyte Culture Conf.**, 5th, Ottawa, Canada. (J. Harris, Ottawa General Hospital, Ottawa 2)

28-2. **Health Physics Soc.**, 15th annual, Chicago, Ill. (W. J. Blair, Biology Dept., Battelle Northwest, Richland, Wash. 99352)

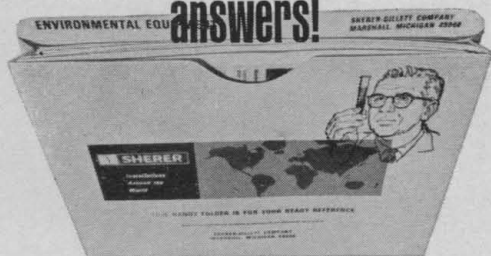
28-4. **American Library Assoc.**, Detroit, Mich. (D. H. Clift, Executive Director, The Association, 50 E. Huron St., Chicago, Ill. 60611)

28-4. **American Optometric Assoc.**, 73rd annual congr., Honolulu, Hawaii. (G. Allen, Jr., 7000 Chippewa St., St. Louis, Mo. 63119)

Controlled environment equipment?

Got a
pile
of
questions?

Get a
file
of
answers!



Let Sherer—leading manufacturer of controlled environment equipment—send you their complete product file. FREE!

Just write to



ENVIRONMENTAL DIVISION, SHERER-GILLETT COMPANY, Marshall 3, Mich. 49068

Circle No. 107 on Readers' Service Card



INSIST ON
"THE ORIGINAL"
MINIATURE
MICRO-MANIPULATOR

MM-3 from **NARISHIGE
TOKYO**

Implants electrodes and other devices with extreme accuracy & reproducibility. Precise movements in three directions without backlash.

Complete with metal rod assembly and electrode carrier\$150
With magnetic stand as illustrated\$175

Labtron
SCIENTIFIC CORPORATION

100 Smith Street
Farmingdale, L.I., New York 11735
(516) 293-4898

Circle No. 110 on Readers' Service Card

Continuous-Duty Water Bath Shaker— Put it on your bench and SHAKE IT!



- Heavy Duty Triple-Eccentric Gyrotory® Drive System.
- Extra Wide Speed Range from 20 to 400 rpm.
- New Solid State Speed Control.
- Temperature control from ambient to 100°C within $\pm 0.5^\circ\text{C}$.
- Below-ambient temperatures with cooling coil accessory.
- Safety thermostat protects against overshooting.
- Recessed right-angle mercury thermometer easy-to-read at a glance.
- Adjustable Water Level Control.
- Wide Assortment of platforms for test tubes, beakers and flasks.
- Selection of Gassing Hoods, Gable Covers and Mobile Carts.
- Models for Gyrotory or Reciprocating Shaking.

Send For Bulletin GT6-S/2200



NEW BRUNSWICK SCIENTIFIC CO., INC.
1130 SOMERSET ST. • P.O. BOX 606, NEW BRUNSWICK, NEW JERSEY 08903

58

Circle No. 56 on Readers' Service Card



APPLIED SOLID STATE SCIENCE:

Advances in Materials and Device Research

Volume 1

edited by **RAYMOND WOLFE**, *Bell Telephone Labs, Murray Hill, New Jersey*, and Consulting editor, **C. J. KRIESSMAN**, *Ferroxcube Corporation of America, Saugerties, New York*

This new publication is devoted to reviews of current work in applied solid state science. Each article deals with a specific aspect of solid state device research, with emphasis on the basic physics or material science on which each device is based rather than on engineering details or applications. The first volume contains comprehensive and up-to-date reviews on such topics as Junction Electroluminescence, Electron Transfer Through Insulation Thin Films, Metal - Insulator - Semiconductor Physics, and Ion Implantation in Semiconductors.

1969, 390 pp., \$20.00

CURRENT INJECTION IN SOLIDS

by **MURRAY A. LAMPERT**, *Department of Electrical Engineering, Princeton University, Princeton, New Jersey*, and **PETER MARK**, *Department of Electrical Engineering, Princeton University, Princeton, New Jersey*

The intent of this book is to provide a thorough exploration of the bulk-controlled behavior of injection currents in solids, with emphasis on the underlying physics. The subject matter is covered at several levels, ranging from the purely phenomenological to the purely analytical. The subject matter is divided into two parts. The first part describes the one-carrier injection current which are necessarily space-charge-limited, and the second part covers the two-carrier injection current in which recombination, as well as space charge, can play an important role.

April, 1970, about 309 pp., in preparation

ELECTROMAGNETISM AND QUANTUM THEORY

by **DALE M. GRIMES**, *Department of Electrical Engineering, University of Michigan, Ann Arbor, Michigan*

This book provides a unified method of presenting modern physics as a potentially deterministic science. It develops the equations of special relativity from a single, deterministic viewpoint, deductively obtains from them classical mechanics and electrodynamics, and in turn inductively obtains from these the equations of quantum theory. Included in this work are the effects of reactive electromagnetic fields about accelerating charges.

1969, 151 pp., \$9.00



Circle No. 98 on Readers' Service Card

1178

BOOKS RECEIVED

(Continued from page 1118)

Air Quality Criteria for Particulate Matter. National Air Pollution Control Administration, U.S. Department of Health, Education, and Welfare, Washington, D.C., 1969. xviii + 442 pp., illus. Paper, \$1.75. National Air Pollution Control Administration Publication No. AP-49.

Anatomy of the Monocotyledons. C. R. Metcalfe, Ed. Vol. 4, Juncales. D. F. Cutler. Clarendon (Oxford University Press), New York, 1969. xii + 360 pp., illus. \$14.

Annual Progress in Child Psychiatry and Child Development 1969. Stella Chess and Alexander Thomas, Eds. Brunner/Mazel, New York, 1969. xii + 700 pp., illus. \$15.

Annual Review of Genetics. Vol. 3. Herschel L. Roman, Laurence M. Sandler, and Allan Campbell, Eds. Annual Reviews, Palo Alto, Calif., 1969. viii + 588 pp., illus. \$8.50.

Applied Genetics. The Technology of Inheritance. David Paterson. Doubleday, Garden City, N.Y., 1969. 192 pp., illus. \$5.95. Doubleday Science Series.

Asian Dilemma: United States, Japan and China. Based on a conference, Santa Barbara, January 1969. Elaine H. Burnell, Ed. Center for the Study of Democratic Institutions, Santa Barbara, Calif., 1969. xviii + 238 pp., illus. Paper, \$2.25. A Center Occasional Paper.

Atmospheric Circulation Systems. Their Structure and Physical Interpretation. E. Palmén and C. W. Newton. Academic Press, New York, 1969. xviii + 606 pp., illus. \$26. International Geophysics Series, vol. 13.

Aviation and Space Medicine. Proceedings of the 17th international congress, Oslo, August 1968. Birger Hannisdahl and Carl Wilhelm Sem-Jacobsen, Eds. Universitetsforlaget, Oslo, 1969 (U.S. distribution office, P.O. Box 142, Boston. 400 pp., illus. \$33.40).

Basic Exercises in Immunochemistry. A Laboratory Manual. A. Nowotny. Springer-Verlag, New York, 1969. viii + 200 pp., illus. \$9.50.

Biochemical Microcalorimetry. Harry Darrow Brown, Ed. Academic Press, New York, 1969. xiv + 338 pp., illus. \$16.

Biomechanics. Proceedings of a symposium, Rock Island, Ill., April 1967. David Bootzin and Harry C. Muffley, Eds. Plenum, New York, 1969. viii + 200 pp., illus. \$15.

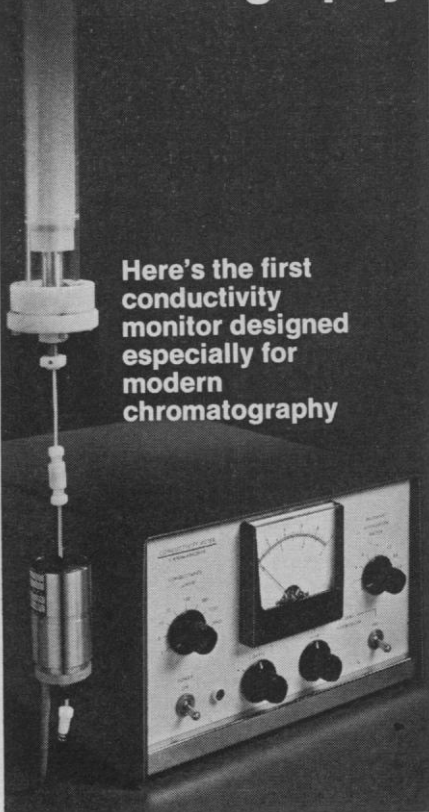
Black Suicide. Herbert Hendin. Basic Books, New York, 1969. xii + 180 pp., illus. \$5.95.

The Brain of the Opossum (Didelphis marsupialis). A Cytoarchitectonic Atlas in Stereotaxic Coordinates. E. Oswaldo-Cruz and C. E. Rocha-Miranda, with the technical assistance of Raymundo F. Bernardes. Instituto de Biofísica, Universidade Federal do Rio de Janeiro, Brazil, 1968 (U.S. distributor, Williams and Wilkins, Baltimore). x + 102 pp. \$30.25.

Brother Animal. The Story of Freud and Tausk. Paul Roazen. Knopf, New York, 1969. xxii + 234 pp. + plates. \$5.95.

Catalogue of the Type Specimens of

New tool for chromatography



Here's the first conductivity monitor designed especially for modern chromatography

This new monitor detects conductivity as low as .001 μ mho (.01 ppm NaCl) using a flow-through cell with only 1.5 microliters volume. Response is linear at the recorder output over a million-to-one range from .001 to 1000 μ mhos.

The monitor aids preparative chromatography by accurately detecting the salt peak in gel infiltration—so you can check column performance or control sample injection, fraction collection, and recycling.

The monitor is ideal for analytical chromatography of inorganic solutes. It will quantify trace components—even in conductive solvents, since the meter has zero suppression.

People doing research on chromatography will find the monitor valuable for studying gradients, step elution changes, and zone spreading.

Chromatronix also offers a new ultrasensitive, wide-range UV detector. Inquiry will bring you literature on it as well.



CHROMATRONIX

Chromatronix, Incorporated, 2743 Ninth St. Berkeley, Calif. 94710. Phone (415) 841-7221.

Circle No. 90 on Readers' Service Card

Microlepidoptera in the British Museum (Natural History) Described by Edward Meyrick. Vol. 6, Glyphipterigidae Gelechiidae (A-C). J. F. Gates Clarke. Trustees of the British Museum (Natural History), London, 1969. vi + 538 pp., illus. £15. Publication No. 678.

Cellular Recognition. A Developmental Immunology Workshop, Sanibel Island, Fla., February 1968. Richard T. Smith and Robert A. Good, Eds. Appleton-Crofts, New York, 1969. xviii + 334 pp., illus. \$18.

The Chemistry and Biology of Viruses. Heinz Fraenkel-Conrat. Academic Press, New York, 1969. x + 294 pp., illus. \$9.

The Chi-squared Distribution. H. O. Lancaster. Wiley, New York, 1969. xvi + 368 pp. \$14.95. Wiley Series in Probability and Mathematical Statistics.

Colloquium on Forest Fertilization. Proceedings of the 5th Colloquium of the International Potash Institute, Jyväskylä, Finland, 1967. International Potash Institute, Berne, Switzerland, 1969. 380 pp., illus.

Comparative Mammalian Cytogenetics. An international conference, Hanover, N.H., July-August 1968. Kurt Benirschke, Ed. Springer-Verlag, New York, 1969. xxii + 474 pp., illus. \$24.80.

Complexometric Titrations. Gerold Schwarzenbach and Hermann Flaschka. Second English edition, translated and revised in collaboration with the authors by H. M. N. H. Irving. Methuen, London, 1969 (U.S. distributor, Barnes and Noble, New York). xxii + 490 pp., illus. \$14.50.

Computers for Engineers. Introduction to Computing Machines and Programming. Bartow Hodge. McGraw-Hill, New York, 1969. xii + 212 pp., illus. \$11. McGraw-Hill Series in Continuing Education for Engineers.

Computers in Medicine. Proceedings of a symposium, Blackburn College of Technology and Design, February 1968. J. Rose, Ed. Churchill, London, 1969. viii + 152 pp., illus. Paper, 30s.

Correlation Effects in Atoms and Molecules. An advanced summer institute, Frascati, Italy, July 1967. R. Lefebvre and C. Moser, Eds. Interscience (Wiley), New York, 1969. x + 546 pp., illus. \$29.95. Advances in Chemical Physics, vol. 14.

Creep Problems in Structural Members. Yu. N. Rabotnov. Translated from the Russian edition (Moscow, 1966). F. A. Leckie, Transl. Ed. North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xvi + 824 pp., illus. \$39. North-Holland Series in Applied Mathematics and Mechanics, vol. 7.

Criteria for Scientific Development: Public Policy and National Goals. A Selection of Articles from *Minerva*. Edward Shils, Ed. M.I.T. Press, Cambridge, Mass., 1969. xvi + 208 pp. Paper, \$2.95.

Diagnostic Biochemistry. Ronald L. Searcy. Blakiston (McGraw-Hill), New York, 1969. xii + 660 pp., illus. \$30.

Diffusion and Heat Transfer in Chemical Kinetics. David A. Frank-Kamenetskii. Translated from the second Russian edition (Moscow, 1967). John P. Appleton, Transl. Ed. Plenum, New York, 1969. xxvi + 574 pp., illus. \$32.50.

Doctors on Horseback. Pioneers of American Medicine. James Thomas Flex-

HADRON

Hadron's *LPM* Series represents a unique solution to the laser applications problem — its modular construction and easily exchangeable work fixtures make it equally useful for various industrial applications as well as for general laboratory applications. The versatile, reliable *LPM* is a fully integrated system, where the laser head, optics, and power supply are all contained in one small (24" x 18" x 12"), lightweight (125 pounds) unit. The interlocking of work fixtures minimizes radiation hazards in industrial applications. Closed-circuit television provides for viewing and setting up where required. Q-switched operation provides for synchronization.

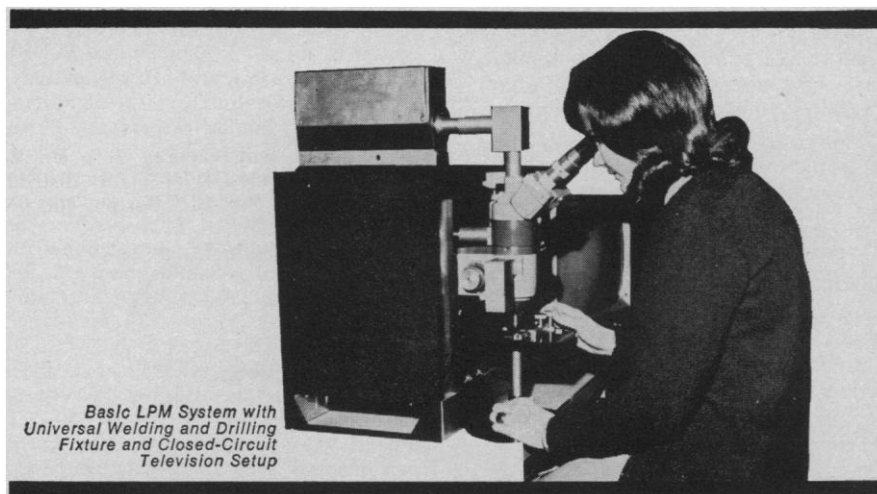
Engineered to meet precision production tool standards, special emphasis has been placed on:
Reliability • Low Operating Cost • Compactness • Simple Operation • Ease of Maintenance • Adaptability • Safety • Versatility

Available in Q-switched as well as normal mode configurations, the *LPM* system is a proven tool not only for precision microfabrication but also for the balancing of small gyros, motor rotors, as well as watch balance wheels.

In the research laboratory, Hadron's *LPM* Series fulfills the exacting requirements of the scientist in such areas as fluorescence analyses, radiation studies, material evaluations, as well as general laboratory applications.

A rugged easily removable laser head provides for long maintenance-free operating life. Flashlamp replacement does not necessitate optics realignment.

The water-cooled *LPM* laser provides an energy up to 5 joules, a pulse width of 800 microseconds, and a repetition rate up to 1 pulse per second.



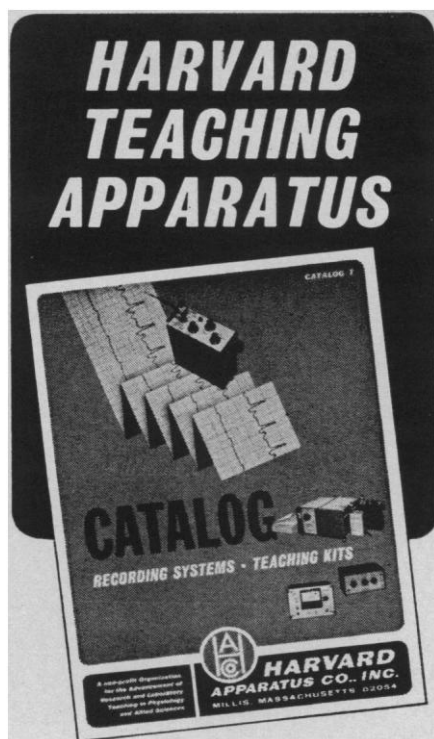
THE NEW CONCEPT IN LASERS

For complete specifications, price, and delivery information, call or write:

HADRON

800 Shames Drive
 Westbury, New York 11590
 (516) 334-4402

Circle No. 32 on Readers' Service Card



For Student Laboratories in

- PHYSIOLOGY
- BIOLOGY
- ZOOLOGY
- PSYCHOLOGY
- PHYSICAL EDUCATION

This Catalog features a complete range of apparatus for recording such phenomena as breathing patterns, pulse and fatigue in human subjects; heart and nerve-muscle contraction in laboratory animals. Includes modular recording systems for mechanical and electronic monitoring as well as traditional kymograph equipment.

All equipment is ruggedly constructed to withstand student use and is identical to that used in medical schools. The apparatus is listed individually and in convenient kit form. Versatility of equipment encourages student and teacher alike to plan and execute a wide variety of experiments and demonstrations.

HARVARD APPARATUS

Dept. E-19, P.O. Box 24
Millis, Mass. 02054

Please send free Catalog T.

NAME

DEPARTMENT

INSTITUTION

CITY

STATE ZIP

Circle No. 86 on Readers' Service Card

ner. Dover, New York, 1969. xx + 340 pp., illus. Paper, \$2.50. Reprint of the 1937 edition.

Electrochemical Techniques for Inorganic Chemists. J. B. Headridge. Academic Press, New York, 1969. viii + 124 pp., illus. \$5.50.

Electron Spin Resonance of Metal Complexes. Proceedings of a symposium, Cleveland, March 1968. Teh Fu Yen, Ed. Plenum, New York, 1969. x + 206 pp., illus. \$17.50.

Electronic Transitions in Organometallics. Brian G. Ramsey. Academic Press, New York, 1969. xii + 300 pp., illus. \$16. Organometallic Chemistry.

The Encyclopedia of Marine Resources. Frank E. Firth, Ed. Van Nostrand Reinhold, New York, 1969. xii + 740 pp., illus. \$25.

Environment, Heredity, and Intelligence. Compiled from the *Harvard Educational Review*. Cambridge, Mass., 1969. iv + 248 pp., illus. Paper, \$4.95. Reprint Series No. 2.

Essays in Toxicology. Vol. 1. Frank R. Blood, Ed. Academic Press, New York, 1969. xii + 172 pp., illus. \$7.50.

Evolution of the Vertebrates. A History of the Backboned Animals through Time. Edwin H. Colbert. Wiley, New York, ed. 2, 1969. xviii + 542 pp., illus. \$12.95.

Explorations in Science. A Book of Basic Experiments. Harry Milgrom. Illustrated by Ann Marie Jauss. Dutton, New York, 1969. 128 pp. Paper, \$1.25. Reprint of the 1961 edition.

The Focal Encyclopedia of Film and Television Techniques. Hastings House, New York, 1969. xxiv + 1100 pp., illus. \$37.50.

General Properties of Matter. B. Brown. Plenum, New York; Butterworths, London, 1969. viii + 292 pp., illus. \$12.50.

A Guide to Practical Histochemistry. J. Chayen, R. G. Butcher, Lucille Bitensky, and L. W. Poulter. Lippincott, Philadelphia, 1969. xii + 262 pp., illus. \$11.

A Guide to the Human Adaptability Proposals. J. S. Weiner. With a contribution by Paul T. Baker. Published for the International Biological Programme by Blackwell Scientific Publications, Oxford, England, ed. 2, 1969 (U.S. distributor, Davis, Philadelphia). x + 70 pp. Paper, \$3. IBP Handbook No. 1.

The Harvey Lectures. Delivered under the Auspices of the Harvey Society of New York, 1967-1968. Walsh McDermott, Renato Dulbecco, Jacob Furth, Lewis Thomas, Harold A. Scheraga, Alton Meister, G. J. V. Nossal, M. F. Perutz, and R. S. Edgar. Academic Press, New York, 1969. xvi + 328 pp., illus. \$9.50. Series 63.

A History of the Conic Sections and Quadric Surfaces. Julian Lowell Coolidge. Dover, New York, 1968. x + 214 pp., illus. Paper, \$2.75. Reprint of the 1945 edition.

Hutchinson's Food and the Principles of Nutrition. Hugh M. Sinclair and Dorothy F. Hollingsworth. Arnold, London, ed. 12, 1969 (U.S. distributor, Williams and Wilkins, Baltimore). viii + 644 pp. \$18.25.

The Influenza Viruses. L. Hoyle. Springer-Verlag, New York, 1968. iv + 376 pp., illus. \$27. Virology Monographs, vol. 4.

plenum
PUBLISHING CORPORATION

MOLECULES AND LIFE

An Introduction to Molecular Biology

by Mikhail V. Vol'kenshtein

Institute of Molecular Biology, Academy of Sciences of the USSR, Moscow, USSR

Translated from Russian by Serge N. Timasheff
Graduate Department of Biochemistry, Brandeis University, Waltham, Massachusetts

This introduction to biophysics deals principally with the structure and properties of the most important biopolymers, namely, proteins and nucleic acids. Their examination is based upon a unifying general concept of cooperative conformational transformations as the foundations of phenomena studied by molecular biophysics. This textbook will serve as a framework for presenting the often enigmatic yet vital aspects of the fundamental phenomena of life.

CONTENTS: PHYSICS AND BIOLOGY: Physics and life • Molecular physics • Molecular biophysics • Thermodynamics and biology • Information theory • **CELLS, VIRUSES, AND HEREDITY:** The living cell • Cell division • Viruses and bacteriophages • Basic laws of genetics • Mutations and mutability • Genetics of bacteria and phages • **BIOLOGICAL MOLECULES:** Amino acids and proteins • Asymmetry of biological molecules • Primary structure of proteins • Nucleic acids • Some biochemical processes in the cell • **PHYSICS OF MACROMOLECULES:** Physical properties of macromolecules • Rotational-isomeric theory of macromolecules • Macromolecules-cooperative systems • Crystalline polymers • Methods for studying macromolecules in solution • Polyelectrolytes • **THE PHYSICS OF PROTEINS:** Secondary structure of proteins • Tertiary and supermolecular structures of proteins • Interactions which determine the three-dimensional structure of proteins • Conformational transitions of proteins • Theory of helix-coil transitions • Optical properties of proteins and polypeptides • Optical activity of polypeptide chains • **THE PHYSICS OF NUCLEIC ACIDS:** Biological role of nucleic acids • Secondary structure of DNA, RNA and polynucleotides • Denaturation of DNA • Denaturation of DNA and forces which stabilize the double helix • DNA reduplication • Statistical physics and kinetics of DNA reduplication • **PROTEIN SYNTHESIS:** Problems of the genetic code • Matrix synthesis of proteins • The genetic code • Point mutations • Problems of regulation • **BIOLOGICAL SPECIFICITY AND STRUCTURE OF MOLECULES:** Immunity • Antibodies and antigens • Enzyme reactions • Nature of enzymatic action • Allosterism and oxygenation of hemoglobin • Nucleoproteins and synthesis of chromosomes • **MECHANOCHEMICAL PROCESSES:** The nature of mechanochemical processes • Muscle action • Molecular theories of muscle action • Motion of cells and myotaxis • **PROBLEMS OF MOLECULAR BIOPHYSICS:** Macromolecules and biology • Molecular biophysics and quantum mechanics • Conclusion.

518 PAGES

FEBRUARY 1970

\$15.00

plenum press/consultants bureau

Divisions of Plenum Publishing Corporation

114 Fifth Avenue, New York, N.Y. 10011

Circle No. 85 on Readers' Service Card

An Introduction to the Principles of Plant Physiology. Walter Stiles. Third edition, in collaboration with E. C. Cocking. Barnes and Noble, New York; Methuen, London, 1969. xii + 636 pp., illus. \$27.50.

Lepidoptera Pupae. Five Collected Works on the Pupae of North American Lepidoptera. Edna Mosher. Entomological Reprint Specialists, East Lansing, Mich., 1969. Illus. \$9.95.

Mathematical Geodesy. Martin Hotine. Environmental Science Services Administration, U.S. Department of Commerce, Washington, D.C., 1969 (available from the Superintendent of Documents, Washington, D.C.). xvi + 416 pp., illus. \$5.50.

The Mathematical Sciences. A Collection of Essays. Edited by the National Research Council's Committee on Support of Research in the Mathematical Sciences (COSRIMS), with the collaboration of George A. W. Boehm. Published for the National Academy of Sciences-National Research Council by M.I.T. Press, Cambridge, Mass., 1969. xii + 276 pp., illus. Paper, \$3.95.

Mathematics for Biologists. Alan Crowe and Angela Crowe. Academic Press, New York, 1969. x + 306 pp., illus. \$8.50.

Medical Neurology. John Gilroy and John Stirling Meyer. Illustrated by Geraldine E. Fockler. Macmillan, New York; Collier-Macmillan, London, 1969. xiv + 722 pp. \$16.

Mental Health Research in Asia and the Pacific. A conference, Honolulu, March-April, 1966. William Caudill and Tsung-yi Lin, Eds. East-West Center Press, Honolulu, 1969. xvi + 488 pp., illus. \$12.50.

Mental Imagery. Alan Richardson. Springer, New York, 1969. xii + 180 pp. \$5.75.

Methods of Experimental Physics. Vol. 8, Problems and Solutions for Students. L. Marton and W. F. Hornyak, Eds. Academic Press, New York, 1969. xii + 284 pp., illus. \$14.50.

Mineral Metabolism. An Advanced Treatise. C. L. Comar and Felix Bronner, Eds. Vol. 3, Calcium Physiology. Academic Press, New York, 1969. xvi + 552 pp., illus. \$24.50.

Modernizing Peasant Societies. A Comparative Study in Asia and Africa. Guy Hunter. Published for the Institute of Race Relations, London, by Oxford University Press, New York, 1969. xii + 324 pp. Cloth, \$6.50; paper, \$2.50.

Molecular Processes on Solid Surfaces. Battelle Institute Materials Science Colloquium, Kronberg, Germany, May 1968. Edmund Drauglis, Ronald D. Gretz, and Robert I. Jaffee, Eds. McGraw-Hill, New York, 1969. xviii + 654 pp., illus. \$37.50. McGraw-Hill Series in Materials Science and Engineering.

Named Organic Reactions. Ronald C. Denney. Plenum, New York; Butterworths, London, 1969. viii + 252 pp., illus. Paper, \$9.95.

The Native Cacti of California. Lyman Benson. Stanford University Press, Stanford, Calif., 1969. xii + 244 pp. + plates. \$7.95.

The Oppenheimer Case: Security on Trial. Philip M. Stern. With the collaboration of Harold P. Green. Special commentary by Lloyd K. Garrison. Harper and Row, New York, 1969. xiv + 594 pp. \$10.

20 FEBRUARY 1970



Quick as a wink...
you get the
exact magnification
you need!

You will save time, improve inquiry results if your biology classes use Bausch & Lomb Zooming Microscopes. These modern instruments zoom instantly to the proper magnification. With them, tyros perform like seasoned experts. They can survey the full slide at low magnification and instantly zoom in on specific detail without losing visual contact with the specimen at any time.

If you want to check their work, a teacher's eyepiece lets you look, too. Fine focusing with the Harmonic Drive is a breeze. The retractable objective saves slide damage.

There's a broad range of sturdily built models with measuring pointers, teachers's eyepieces, in-base illuminators or mirrors. Plus a full line of advanced full image flat field objective models.

They're all in our catalog 31-2172. Write for it and our free demonstration offer today.

BAUSCH & LOMB 
SCIENTIFIC INSTRUMENT DIVISION

87826 Bausch Street, Rochester, N.Y. 14602
Circle No. 57 on Readers' Service Card

Oxford



Dictionary of Organic Compounds

THE CONSTITUTION AND PHYSICAL, CHEMICAL, AND OTHER PROPERTIES OF THE PRINCIPAL CARBON COMPOUNDS AND THEIR DERIVATIVES, TOGETHER WITH RELEVANT LITERATURE REFERENCES, FOURTH EDITION; FIFTH AND CUMULATIVE SUPPLEMENT

Edited by R. STEVENS F.R.I.C. This Fifth Supplement is a cumulative volume. In addition to new entries derived from papers published during 1968, it contains all the entries from the first four Supplements revised and brought up to date in the light of more recent literature. \$48.00

The Virial Coefficient of Gases

A CRITICAL COMPILATION

By J. H. DYMOND, *Oxford University*; and E. B. SMITH, *St. Catherine's College, Oxford*. This collection of tables is an enlarged edition of revised and extended tables produced at the Physical Chemistry Laboratory, Oxford. They have been brought up to date and critically reviewed to present readily available accurate gas imperfection data. Material published up to 1968 is included, and numerous calculations have been carried out so that the data can be presented in the same units. (*Oxford Science Research Papers*, No. 2.) Paper, \$6.25

Anatomy of the Monocotyledons

VOLUME I: GRAMINEAE

By C. R. METCALF, *Jodrell Laboratory Royal Botanic Gardens, Kew*.

\$16.80

VOLUME II: PALMAE

By P. B. TOMILSON, *University of Leeds*; edited by C. R. METCALF.

\$12.00

VOLUME III: COMMELINALES-ZINGIBERALES

By P. B. TOMLINSON; edited by C. R. METCALFE.

\$14.75

VOLUME IV: JUNCALES

By D. F. CUTLER, *Royal Botanic Gardens, Kew*.

\$14.00

OXFORD
UNIVERSITY
PRESS

200 Madison Avenue,
New York, N.Y. 10016

Pfaff's Problem and Its Generalizations. J. A. Schouten and W. v. d. Kulk. Chelsea, New York, 1969. xvi + 542 pp. \$12. Reprint of the 1949 edition.

Photography. A Study in Versatility. Peter J. Hillson. Doubleday, Garden City, N.Y., 1969. 192 pp., illus. \$6.95. Doubleday Science Series.

Pictorial Astronomy. Dinsmore Alter, Clarence H. Clemminshaw, and John G. Phillips. Crowell, New York, ed. 3, 1969. viii + 328 pp., illus. \$10.

Pion-Nucleon Scattering. A conference, Irvine, Calif., December 1967. Gordon L. Shaw and David Y. Wong, Eds. Wiley-Interscience, New York, 1969. xxii + 234 pp., illus. \$16.50.

Plastics Film Technology. W. R. R. Park, Ed. Van Nostrand Reinhold, New York, 1969. xii + 212 pp., illus. \$10.95.

Political Violence. The Behavioral Process. H. L. Nieburg. St. Martin's, New York, 1969. viii + 184 pp. Cloth, \$5.95; paper, \$2.50.

Poverty and Discrimination. Lester C. Thurow. Brookings Institution, Washington, D.C., 1969. xiv + 214 pp., illus. \$6.75. Studies in Social Economics.

Preparation for the Study of Medicine. Proceedings of a conference, Chicago, April 1967. Robert G. Page and Mary H. Littlemeyer, Eds. University of Chicago Press, Chicago, 1969. viii + 288 pp. \$4.95.

Principles of X-Ray Metallurgy. T. Kovacs. Plenum, New York, 1969. 188 pp., illus. \$9.50.

Problems in Systematics of Parasites. Proceedings of a symposium. Gerald D. Schmidt, Ed. University Park Press, Baltimore, 1969. vi + 136 pp., illus. \$7.95.

Progress in Heat and Mass Transfer. Vol. 1. U. Grigull and E. Hahne, Eds. Pergamon, New York, 1969. viii + 472 pp., illus. \$32. Monograph Series of the International Journal of Heat and Mass Transfer.

Progress in Materials Science. Incorporating Progress in Metal Physics Volumes 1-8. Vol. 13. Bruce Chalmers and W. Hume-Rothery, Eds. Pergamon, New York, 1968. x + 406 pp., illus. \$17.

Progress in Optics. Vol. 7. E. Wolf, Ed. North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xii + 436 pp., illus. \$21.

Proof Techniques in Graph Theory. Proceedings of a conference, Ann Arbor, Mich., February 1968. Frank Harary, Ed. Academic Press, New York, 1969. xviii + 334 pp., illus. \$14.50.

Psychotropic Drugs and Dysfunctions of the Basal Ganglia. Proceedings of a multidisciplinary workshop, Bethesda, Md., October-November 1968. George E. Crane and Russell Gardner, Jr., Eds. Psychopharmacology Research Branch, National Institute of Mental Health, Chevy Chase, Md., 1969 (available from the Superintendent of Documents, Washington, D.C.). x + 182 pp., illus. Paper, \$1.75. Workshop Series of Pharmacology Section, NIMH, No. 3.

Quality and Stability of Frozen Foods. Time-Temperature Tolerance and its Significance. Wallace B. Van Arsdel, Michael J. Copley, and Robert L. Olsen, Eds. Wiley-Interscience, New York, 1969. xvi + 384 pp., illus. \$19.95.

Quantum Electronics. V. M. Fain and Ya. I. Khanin. Translated from the Rus-

sian edition (Moscow, 1965) by H. S. H. Massey. J. H. Sanders, Ed. Vol. 1, Basic Theory (xx + 316 pp. \$16.50); vol. 2, Master Amplifiers and Oscillators (xx + 312 pp., illus. \$16.50). International Series of Monographs in Natural Philosophy, vols. 13 and 14.

Quaternary Geology and Climate. Vol. 16 of the Proceedings of the Seventh Congress of the International Association for Quaternary Research, Boulder, Colo., 1965. H. E. Wright, Jr., Ed. National Academy of Sciences, Washington, D.C., 1969. x + 166 pp., illus. Cloth, \$18.25; paper, \$15.75. NAS Publication No. 1701.

The Raw and the Cooked. Introduction to a Science of Mythology: I. Claude Lévi-Strauss. Translated from the French edition (Paris, 1964) by John and Doreen Weightman. Harper and Row, New York, 1969. xvi + 394 pp., illus. \$10.

Recent Advances in Immunopathology and Blood Transfusion. Conference in Commemoration of the 25th Anniversary of the Central Laboratory of the Netherlands Red Cross Blood Transfusion Service, Amsterdam, May 1968. Karger, Basel, 1969 (U.S. distributor, Phiebig, White Plains, N.Y.). Illus. Paper, \$6. Vox Sanguinis, vol. 16, Nos. 4 and 5, pp. 241-448.

Recent Progress in Hormone Research. Proceedings of the Laurentian Hormone Conference, Mont Tremblant, Quebec, August 1968. Vol. 25. E. B. Astwood, Ed. Academic Press, New York, 1969. viii + 696 pp., illus. \$32.50.

Reflectance Spectroscopy. Principles, Methods, Applications. Gustav Kortüm. Translated from the German by James E. Lohr. Springer-Verlag, New York, 1969. vi + 368 pp., illus. \$19.50.

A Review of the Lower Cretaceous Algae. J. Harlan Johnson. Colorado School of Mines, Golden, 1969. xvi + 180 pp., illus. Paper, \$6. Professional Contributions of the Colorado School of Mines, No. 6.

Rheological Aspects of Soil Mechanics. L. Šuklje. Wiley-Interscience, New York, 1969. xx + 572 pp., illus. \$33.

The Ribosome. A. S. Spirin and L. P. Gavrilova. Springer-Verlag, New York, 1969. x + 164 pp., illus. \$14.90. Molecular Biology, Biochemistry, and Biophysics, vol. 4.

Rubidomycin. A New Agent against Cancer. J. Bernard, R. Paul, M. Boiron, Cl. Jacquillat, and R. Maral, Eds. Springer-Verlag, New York, 1969. xiv + 184 pp., illus. \$13.20. Recent Results in Cancer Research, vol. 20.

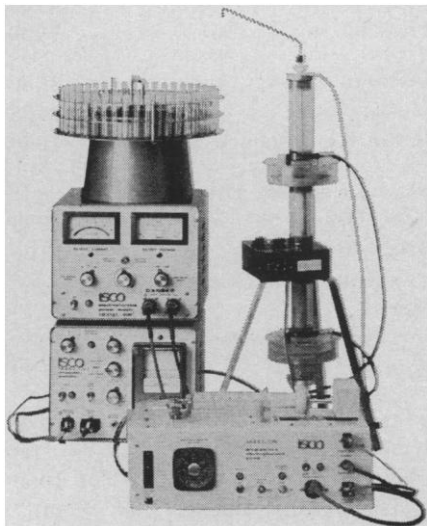
Rutherford and Boltwood. Letters on Radioactivity. Lawrence Badash, Ed. Yale University Press, New Haven, Conn., 1969. xxii + 378 pp., illus. \$12.50.

Sahara. Christoph Krüger, Ed., in collaboration with Alfons Gabriel, Peter Fuchs, Théodore Monod, and M. Kassas. Putnam, New York, 1969. 184 pp., illus. \$15.

Science and Society. Hilary Rose and Steven Rose. Allen Lane the Penguin Press, London, 1969. xviii + 294 pp. £2.50, 50s.

Science, Conflict and Society. Readings from *Scientific American*. With introductions by Garrett Hardin. Freeman, San Francisco, 1969. viii + 384 pp., illus. Cloth, \$10; paper, \$5.75.

Scanning Density Gradient Electrophoresis



Easy determination of electrophoretic mobilities as well as physical separation of mixtures and quantitative microanalytical results can be obtained with the ISCO Model 210 Density Gradient Electrophoresis apparatus. Microgram size samples can readily be separated. Low sample concentration permits the use of dilute buffers, allowing a wide operational temperature range of from 0 to 25° C.

Between preset periods during which the density gradient column is subjected to an electric field, the column is automatically raised and lowered past a narrow bandwidth UV absorbance scanning monitor. Quantitative results can be obtained from these scans or from a final chart record made automatically at the conclusion of migration as separated specimen components are discharged into a fraction collector for further assay.

For more information please request Brochure E37.



INSTRUMENTATION
SPECIALTIES CO., INC.
4700 SUPERIOR LINCOLN, NEBRASKA 68504
PHONE (402) 434-0231 CABLE ISCOLAB LINCOLN

Circle No. 93 on Readers' Service Card

20 FEBRUARY 1970

Separation Methods in Organic Chemistry and Biochemistry. Frank J. Wolf. Academic Press, New York, 1969. viii + 240 pp., illus. \$11.50.

Thin-Film Optical Filters. H. A. Macleod. Elsevier, New York, 1969. xii + 332 pp. + plates. \$22.

Think. A Biography of the Watsons and IBM. William Rodgers. Stein and Day, New York, 1969. 320 pp. + plates. \$7.95.

Topics in Basic Immunology. Michael Sela and Moshe Prywes, Eds. Academic Press, New York, 1969. viii + 180 pp., illus. \$13.50.

Topics in Heterocyclic Chemistry. An international congress, Albuquerque, June 1967. Raymond N. Castle, Ed. Wiley-Interscience, New York, 1969. xii + 276 pp., illus. \$14.95.

Topics in Stereochemistry. Vol. 4. Ernest L. Eliel and Norman L. Allinger. Wiley-Interscience, New York, 1969. x + 278 pp., illus. \$18.50.

Toxicology of Drugs and Chemicals. William B. Deichmann and Horace W. Gerarde. Academic Press, New York, 1969. xviii + 806 pp. \$29.50.

Transport Phenomena in Membranes. N. Lakshminarayanaiah. Academic Press, New York, 1969. xiv + 522 pp., illus. \$22.

Tumor Specific Transplantation Antigen. Pavel Koldovsky. Springer-Verlag, New York, 1969. viii + 80 pp., illus. \$6.60. Recent Results in Cancer Research, vol. 22.

Tunneling in Solids. C. B. Duke. Academic Press, New York, 1969. xii + 356 pp., illus. \$16. Solid State Physics, Supp. 10.

The Ultimate Folly. War by Pestilence, Asphyxiation, and Defoliation. Richard D. McCarthy. Knopf, New York, 1969. xiv + 178 pp. \$5.95.

Ultra Micro Weight Determination in Controlled Environments. S. P. Wolsky and E. J. Zdanuk, Eds. Interscience (Wiley), New York, 1969. x + 518 pp., illus. \$19.95.

The Uneasy Partnership. Social Science and the Federal Government in the Twentieth Century. Gene M. Lyons. Russell Sage Foundation, New York, 1969. xviii + 396 pp. \$8.50.

The Use of Data Mechanization and Computers in Clinical Medicine. A conference, New York, January 1968. E. R. Gabrieli, Ed. New York Academy of Sciences, New York, 1969. Illus. Paper, \$21.50. *Annals of the New York Academy of Sciences*, Vol. 161, Art. 2, pp. 371-830.

Weather Modification. Tenth Annual Report for Fiscal Year Ended June 30, 1968. National Science Foundation, Washington, D.C., 1969 (available from the Superintendent of Documents, Washington, D.C.). vi + 142 pp., illus. Paper, 65¢.

The World Electric Power Industry. N. B. Guyol. University of California Press, Berkeley, 1969. xviii + 366 pp., illus. \$20.

Year Book of the Royal Society of Edinburgh 1969. (Session 1967-1968). Royal Society of Edinburgh, Edinburgh, Scotland, 1969. 172 pp. Paper.

Zinacantan. A Maya Community in the Highlands of Chiapas. Evon Z. Vogt. Belknap (Harvard University Press), Cambridge, Mass., 1969. xxxii + 736 pp., illus. \$25.

Oxford



The Quantum Physicists:

AND AN INTRODUCTION TO THEIR PHYSICS

By WILLIAM H. CROPPER, *St. Lawrence University*. "This book is unique in combining the history of quantum mechanics with its factual presentation. Its pages are enlivened by sketches of living or once living physicists, and there is evident a strong concern for fundamental matters which most textbooks ignore."—Henry Margenau, Yale University
1970 272 pp. paper \$4.00

Physics:

AN INTRODUCTION (Poets' Physics)

By ERNEST C. POLLARD, *The Pennsylvania State University*, and DOUGLAS C. HUSTON, *Skidmore College*. "This is an absolutely beautiful book without benefit of photographs and multi-colored marginal notes. It is authoritative, fascinating, excellently written, with proper respect for the intelligence of the student."—Kenneth W. Ford, University of California at Irvine
1969 416 pp. illus. \$8.50

Evolution of Man

Edited by LOUISE B. YOUNG, *Science Editor, American Foundation for Continuing Education*. "A truly inspired choice of readings that ought to be required reading for every college student, every voter, every legislator, every clergyman."—Robert G. Fossland, Wisconsin State University, Eau Claire
1970 664 pp. illus. cloth \$10.00
paper \$5.50

Psychiatric Dictionary

FOURTH EDITION

By LELAND E. HINSIE, M.D., and ROBERT J. CAMPBELL, M.D., *St. Vincent's Hospital and Medical Center of New York*. In this Fourth Edition some 9,700 listings emphasize such areas as community and social psychiatry; fundamental genetics extending into mental retardation; new knowledge of protein chemistry and of enzyme action and immunity; neurophysiology of sleep, dreaming, learning, and memory; and psychopharmacology.
1970 928 pp. \$19.50

OXFORD
UNIVERSITY
PRESS

200 Madison Avenue,
New York, N.Y. 10016

Circle No. 79 on Readers' Service Card

1183