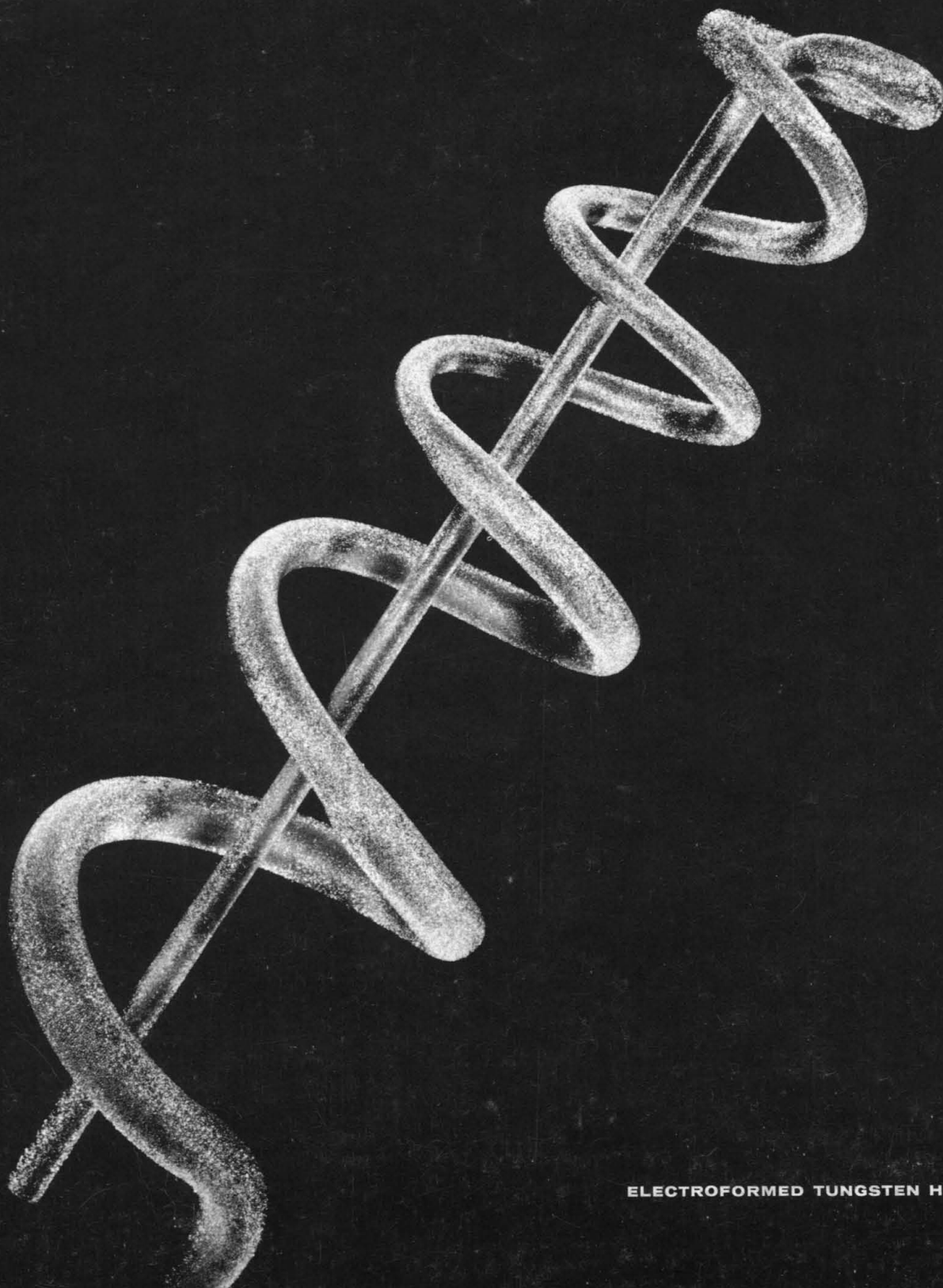


SCIENCE

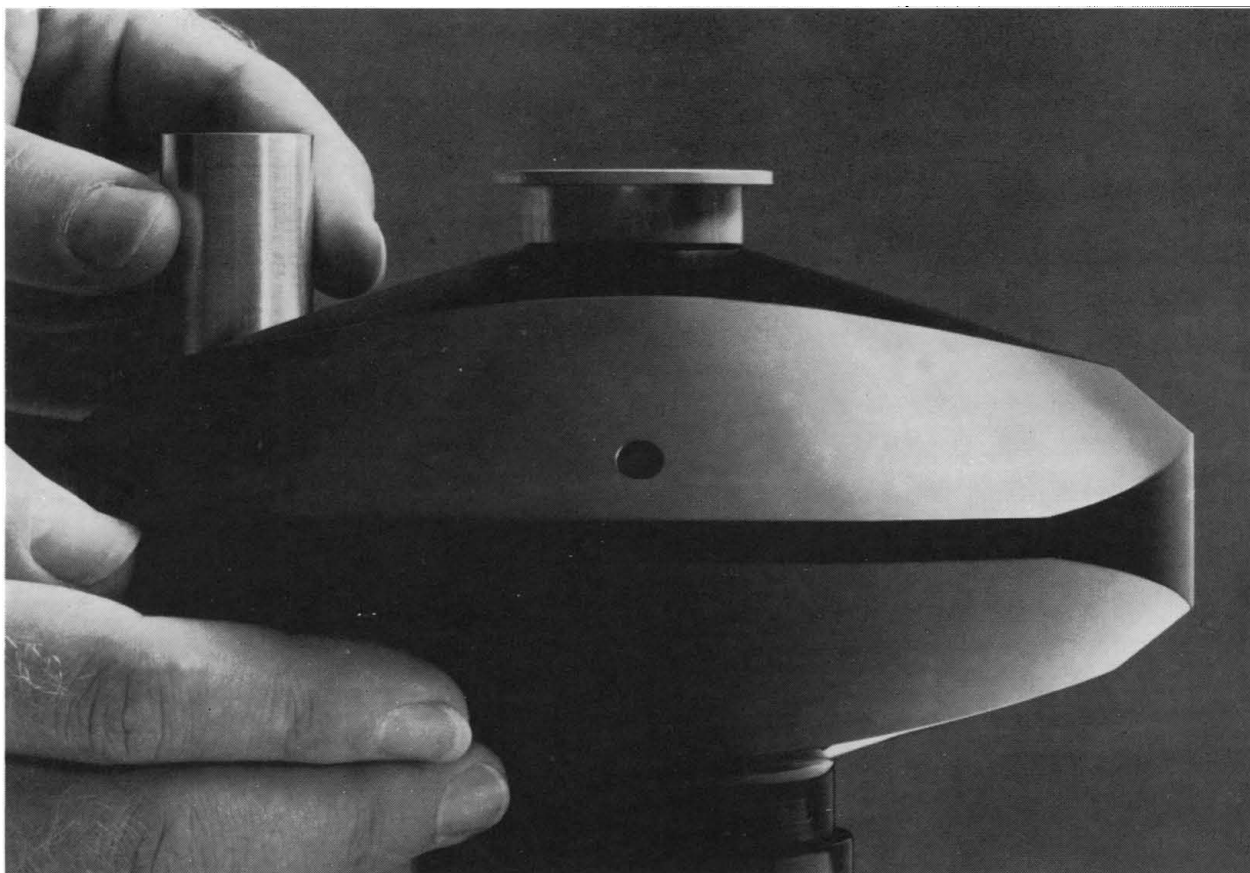
23 September 1966

Vol. 153, No. 3743

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



ELECTROFORMED TUNGSTEN HELIX



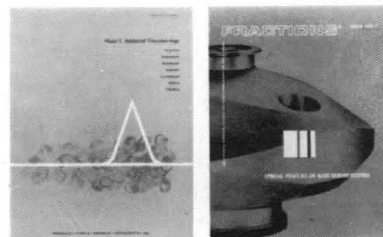
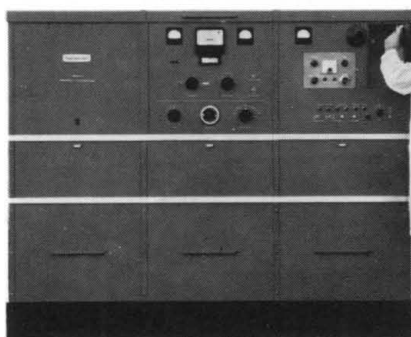
Large molecules and the Analytical Ultracentrifuge

How in touch are you with recent advances in that basic tool for making molecular measurements, the Model E Analytical Ultracentrifuge? Band sedimentation, the short column equilibrium technique, high temperature work with synthetic polymers, the use of computers, direct scanning and recording, higher forces at speeds to 68,000 rpm, lower forces at steady speeds down to 800

rpm for studies of extremely large molecules, new areas of investigation such as the correlation of molecular structure with function—all are steps forward that could very well enable the analytical ultracentrifuge to make a valuable contribution to your research.

Literature Available

If you've not been following the fast-developing field of analytical ultracentrifugation, we'd like to keep you up to date on advances in theory, technique, and instrumentation. One way is to send you the new brochure on the Model E. It reviews applications, measurements, and methodology, and describes the analytical ultracentrifuge of today. Ask for SB-189A.



Another way is to see that you receive *Fractions*®, our quarterly publication sent to users of Beckman instruments for biochemical research; a note on your letterhead to the Editor of *Fractions* will add your name to the distribution list. Extra copies of the two most recent issues are also available: they feature a review of band sedimentation in velocity studies, and a discussion of computers and the ultracentrifuge. Our address: 1117 California Ave., Palo Alto, California.

Beckman

INSTRUMENTS, INC.

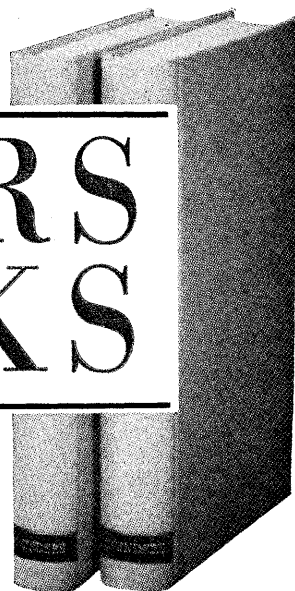
SPINCO DIVISION

PALO ALTO, CALIFORNIA • 94304

INTERNATIONAL SUBSIDIARIES: GENEVA; MUNICH; GLENROTHES, SCOTLAND; TOKYO; PARIS; CAPE TOWN; LONDON; MEXICO CITY

SAUNDERS BOOKS

... texts that arouse student interest
and prompt independent study



New (2nd) Edition!

ORR—

Vertebrate Biology

By **ROBERT T. ORR, Ph.D.**, Associate Director,
California Academy of Sciences, San Francisco,
California.

This *New (2nd) Edition* offers a greatly expanded, thoroughly detailed description of American vertebrates and their ways of life. Anatomical arrangements and functional systems of representative vertebrates in each taxonomic group are vividly described . . . skeletal, muscular, digestive, respiratory, urogenital, sensory, endocrine. Special characteristics of each vertebrate type are fully detailed.

In this beautifully illustrated volume, you'll find explicit discussions covering the full life cycle of the vertebrate. These include: migration—dispersal—sex recognition—competition—mortality—courtship—the territorial concept—etc. Interesting new topics include those on effects of isolation on speciation—the rate of evolution—interspecific competition—numerical taxonomy—invasion—echolocation—hermaphroditism—the tropical zones of the Americas.

This major yet careful revision enlarges the original volume by more than 100 pages. Over 80 new illustrations provide added clarity and effectiveness to this outstanding text.

About 510 pages • About 230 figures • About \$9.00.
New (2nd) Edition—Just Ready!

New!

FLOREY—

An Introduction to General & Comparative Animal Physiology

By **ERNST FLOREY, Ph.D.**, University of Washington, Seattle, Washington.

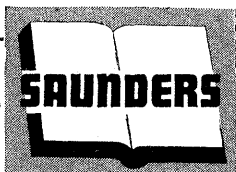
Carefully held to the level of the beginning student, this new text covers the vital terms, concepts, and theories of modern animal physiology. Throughout, equal treatment is given to mammalian and non-mammalian physiology, and the comparative point of view is consistently maintained.

The student is given solid help in relating pertinent principles of general, biological, and physical chemistry to their physiological applications. Separate chapters on these subjects precede the physiologic topics for which they form an indispensable background. For example, chapters on oxidative metabolism, on enzymes, and on the solubility of gases precede the chapter on respiration.

A separate chapter is devoted to the biophysical aspects of bio-electricity and serves as a preparation for chapters on nerve and muscle physiology. New information is included on synaptic transmission, neurosecretion, active transport, and neuropharmacology. Sensory physiology is concisely covered in a single chapter.

713 pages • 481 figures • \$10.00
New—Just Published!

W. B. SAUNDERS COMPANY West Washington Square, Philadelphia, Pennsylvania 19105



Please send and bill me:

- ☐ Orr—Vertebrate Biology About \$9.00
☐ Florey—General and Comparative Animal Physiology \$10.00

SC 9/23/66

Name _____ Address _____ Zip _____

23 SEPTEMBER 1966

1437

23 September 1966
Vol. 153, No. 3743

SCIENCE

LETTERS	A Plea for Clarity: <i>P. I. Richards</i> ; Which Comes First: Money or Brains?: <i>E. Van Cleef</i> ; Reprints: The Situation Abroad: <i>I. Salasoo</i> ; <i>F. C. Greenwood</i> ; Art in Science: Another Protagonist: <i>M. Borne</i> ; Automotive Watchdog: <i>L. E. Fay III</i>	1468
EDITORIAL	<i>Science, and the Scientific Community</i>	1473
ARTICLES	Coherent Coatings of Refractory Metals: <i>S. Senderoff</i> and <i>G. W. Mellors</i>	1475
	Archeology and Its New Technology: <i>F. Rainey</i> and <i>E. K. Ralph</i>	1481
	Structure of Biological Membranes: <i>E. D. Korn</i>	1491
NEWS AND COMMENT	Fluoridation—A Meeting and a Referendum; Soviet Embassy—Out Goes a Science Officer; The Sobell Case—Evidence Assailed; White House—A New Resident Intellectual	1499
BOOK REVIEWS	The Myth of Mental Health: <i>G. M. Carstairs</i>	1513
	<i>The Origin of Cultivated Plants</i> , reviewed by <i>D. I. Rogers</i> ; other reviews by <i>B. L. Welch</i> , <i>L. C. Dunn</i> , <i>Y. K. Pan</i> , <i>D. W. Atchley</i> , <i>L. DS. Smith</i> ; New Books; Conferences and Symposium Reports	1514
REPORTS	Atmosphere of Mars: Mariner IV Models Compared: <i>G. Fjeldbo</i> , <i>W. C. Fjeldbo</i> , <i>V. R. Eshleman</i>	1518
	Infrared Analysis of Rat Bone: Age Dependency of Amorphous and Crystalline Mineral Fractions: <i>J. D. Termine</i> and <i>A. S. Posner</i>	1523
	Electrical Resistivity: Changes in Saturated Rock under Stress: <i>W. F. Brace</i> and <i>A. S. Orange</i>	1525

BOARD OF DIRECTORS	HENRY EYRING Retiring President, Chairman	ALFRED S. ROMER President	DON K. PRICE President Elect	H. BENTLEY GLASS DAVID R. GODDARD	HUDSON HOAGLAND MINA S. REES
VICE PRESIDENTS AND SECTION SECRETARIES	MATHEMATICS (A) Albert W. Tucker Wallace Givens	PHYSICS (B) Allen V. Astin Stanley S. Ballard	CHEMISTRY (C) Alfred E. Brown Milton Orchin	ASTRONOMY (D) Philip C. Keenan Frank Bradshaw Wood	
	ANTHROPOLOGY (H) Cora Du Bois Anthony Leeds	PSYCHOLOGY (I) Robert M. Gagné Frank W. Finger	SOCIAL AND ECONOMIC SCIENCES (K) Kenneth E. Boulding Eugene B. Skolnikoff		HISTORY AND PHILOSOPHY OF SCIENCE (L) Melvin Kranzberg Norwood Russell Hanson
	PHARMACEUTICAL SCIENCES (Np) André Archambault Joseph P. Buckley	AGRICULTURE (O) Nyle C. Brady Ned D. Bayley	INDUSTRIAL SCIENCE (P) Ellis A. Johnson Burton V. Dean		EDUCATION (Q) Clarence H. Boeck Frederic B. Dutton
DIVISIONS	ALASKA DIVISION		PACIFIC DIVISION		SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION
	A. B. Colyer President	Eleanor Viereck Executive Secretary	Daniel G. Aldrich, Jr. President	Robert C. Miller Secretary	Earl D. Camp President
					Marlowe G. Anderson Executive Secretary

SCIENCE is published weekly on Friday and on the fourth Tuesday in November 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 © 1966 by the American Association for the Advancement of Science. Annual subscriptions \$8.50; foreign postage, \$1.50; Canadian postage, 75¢; single copies, 35¢, except **Guide to Scientific Instruments**, which is \$1. School year subscriptions: 9 months, \$7; 10 months, \$7.50. Provide 4 weeks' notice for change of address, giving new and old address and zip numbers. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature**.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Spectrum and Distance of Source Sco XR-1: <i>H. Friedman, E. T. Byram, T. A. Chubb</i>	1527
Sporulation of <i>Minchinia nelsoni</i> (Haplosporida: Haplosporidiidae) in <i>Crassostrea virginica</i> (Gmelin): <i>J. A. Couch, C. A. Farley, A. Rosenfield</i>	1529
Fluorescent-Antibody Studies of Haplosporidian Parasites of Oysters in Chesapeake and Delaware Bays: <i>J. H. Barrow, Jr., and B. C. Taylor</i>	1531
Oxygen as a Primary Species in Radiolysis of Water: <i>M. Daniels and E. Wigg</i>	1533
Phosphorylase Kinase of the Liver: Deficiency in a Girl with Increased Hepatic Glycogen: <i>G. Hug, W. K. Schubert, G. Chuck</i>	1534
Intranuclear Microtubules: <i>O. Behnke and A. Forer</i>	1536
Nature of Seed Dormancy in <i>Phacelia tanacetifolia</i> : <i>S. S. C. Chen and K. V. Thimann</i>	1537
Hemoglobins in Sheep: Multiple Differences in Amino Acid Sequences of Three Beta-Chains and Possible Origins: <i>S. H. Boyer et al.</i>	1539
Ascending and Descending Cholinergic Fibers in Cat Spinal Cord: Histochemical Evidence: <i>D. G. Gwyn and J. H. Wolstencroft</i>	1543
Interaction of Cortex and Superior Colliculus in Mediation of Visually Guided Behavior in the Cat: <i>J. M. Sprague</i>	1544
Long Temporal Gradient of Retrograde Amnesia for a Well-Discriminated Stimulus: <i>R. Kopp, Z. Bohdanecky, M. E. Jarvik</i>	1547
<i>Technical Comments: Insulated Gate Field Effect Transistor Amplifier: R. L. Cechner; "Neutral Hydrogen Survey of Andromeda Galaxy": Addendum: W. D. Brundage and J. D. Kraus; Phyletic Position of Tree Shrews: M. Goodman; Surveyor I Location: E. A. Whitaker; Toxic Impurities in Nalgene Filter Removed: O. Henry; Ozone Dose and Plant Injury: F. D. H. Macdowall, E. I. Mukammal, A. F. W. Cole</i>	1549
MEETINGS <i>Neurospora: R. H. Davis; Forthcoming Events</i>	1553

WALTER ORR ROBERTS ATHELSTAN F. SPILHAUS	H. BURR STEINBACH JOHN A. WHEELER	PAUL E. KLOPSTEG Treasurer	DAEL WOLFLE Executive Officer
GEOLOGY AND GEOGRAPHY (E) Joe Webb Peoples Richard H. Mahard	ZOOLOGICAL SCIENCES (F) Richard B. Roberts David E. Davis	BOTANICAL SCIENCES (G) Charles E. Olmstead Warren H. Wagner	
ENGINEERING (M) Paul Rosenberg Newman A. Hall	MEDICAL SCIENCES (N) Britton Chance Robert E. Olson	DENTISTRY (Nd) C.-A. Ostrom S. J. Kreshover	
INFORMATION AND COMMUNICATION (T) William C. Steere Phyllis V. Parkins		STATISTICS (U) William G. Cochran Roselith Sitgreaves	

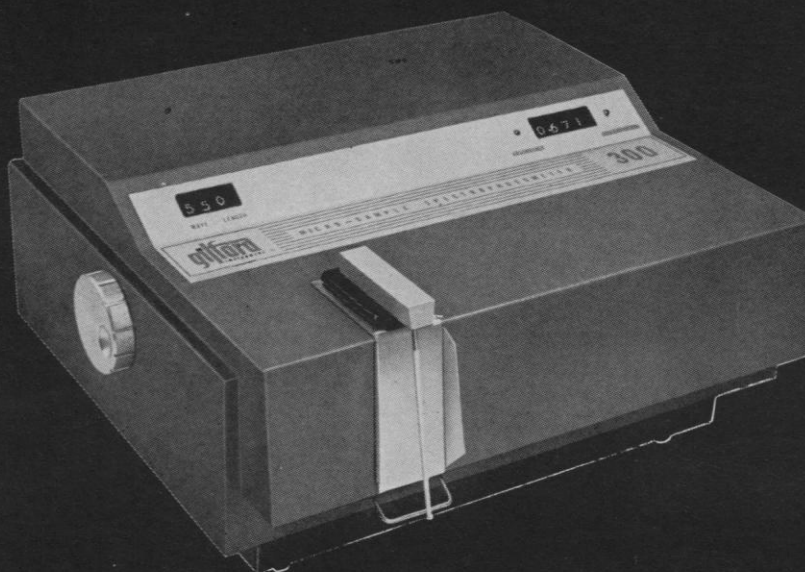
The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding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

COVER

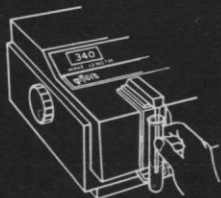
Helix made by electroplating tungsten from a molten fluoride solution onto a substrate of tapered copper tubing and then dissolving the copper with nitric acid. The thickness of the wall of the central tube, in spite of the electrical shielding by the outer helix, demonstrates the exceptional "throwing power" of the process. Because tungsten is brittle, machining such an object would be extremely difficult. See page 1475. [S. Senderoff and G. W. Mellors, Union Carbide Corporation]

**0.001
RESOLUTION**

**throughout
0.000 to 2.000
ABSORBANCE
RANGE**



**WAVELENGTH RANGE
340 to 700 mμ**



SIMPLIFIED SAMPLING



**DIRECT READOUT IN
ABSORBANCE OR
CONCENTRATION**

...with the Gilford Model 300 MICRO-SAMPLE SPECTROPHOTOMETER

This instrument maintains a usable resolution of 0.001 absorbance unit over its entire measurement span of 0.000 to 2.000 A units. Its long term stability is better than 0.005 A per hour, requiring only occasional zero setting on a reference. And it combines this uncommon performance with explicitly simple operation.

The automatic time-impulse sampling system draws in less than 0.5 ml per sample with no handling of cuvettes or pouring of fluids. Touch a bar, and in a few seconds you flush out the previous sample, then introduce the next. The absorbance value appears immediately on the four-digit numerical indicator. Or, after a single calibration setting, you get direct readings of concentration in any convenient units.

Technicians find the compact Model 300 especially easy to use and maintain. Yet, here is a true spectrophotometer with research accuracy and flexibility, filling a realistic need in busy laboratories.

The remarkable sensitivity and stability of the Model 300 is a product of a unique electronic circuit, sophisticated optical and mechanical design and close tolerance manufacturing.

For special applications there are accessories for continuous flow arrangements, use of standard cuvettes and chart recording of absorbance data.

As vital diagnostic and research techniques improve, measurements often require new orders of sensitivity, precision and speed. The Gilford Model 300 is clearly ahead of this trend.

Gilford Instrument Laboratories Incorporated • Oberlin, Ohio 44074
SALES AND SERVICE OFFICES IN PRINCIPAL CITIES THROUGHOUT THE U.S.A.

gilford
INSTRUMENT®

**INSTRUMENTATION FOR
BIOLOGY AND MEDICINE**

Announcing the
1966 Technicon Symposia
New York, Oct. 17, 18, 19
Paris, Nov. 2, 3, 4



A Preliminary Summary of the Technical Sessions

Multiple analysis/data processing

Multiple analytical techniques for patient profile and health screening programs including the SMA-12 multiple analysis system and data processing.

Chromatography

The latest techniques for automated analysis of amino acids, peptides, enzymes and sugars. Experiences described using a semi-automated integrator/calculator.

Immuno/Hematology

Automated techniques for blood typing, simultaneous RBC, WBC, Hemoglobin, and Hematocrit, prenatal antibody evaluation, cell survival studies, etc.

Enzymes

A series of papers will cover new and modified procedures for quantitation and assay of a variety of enzymes including reaction kinetics and automated enzyme chromatography.

Automation in analytical chemistry

Pharmaceutical

Extensive coverage of reports dealing with techniques in research and process and quality control. Included are automated: Kjeldahl nitrogen analysis, microbiological assays, vitamin assay, viral agglutination, fermentation analysis and control.

In-Vivo analysis

A series of papers describing automated in-vivo analysis including artificial kidney studies for measurement of renal function.

General clinical analysis

Automated techniques for the clinical laboratory including a wide range of significant analyses. Fluorometric methods and a new flame photometer will be discussed.

Agricultural chemistry

An extensive discussion of automated procedures for the analysis of tobacco, pesticides, fertilizers, soils, plant tissues and grains, etc.

Pollution, air and water

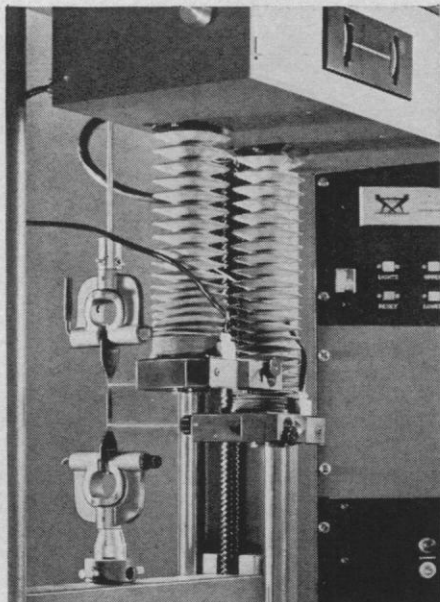
A comprehensive series of papers describing automated methods of analysis for water and air pollution including sea water analysis, waste monitoring and measurement of atmospheric contaminants.

Industrial applications

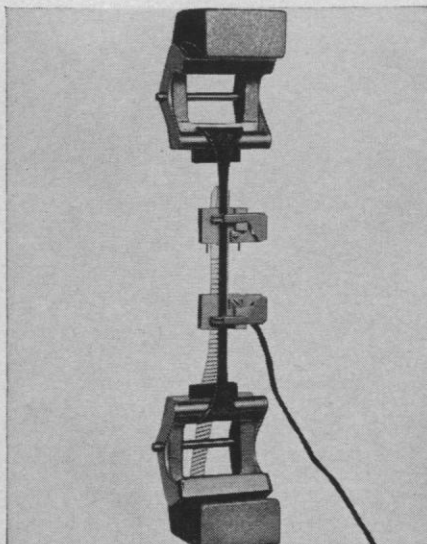
More than twenty reports covering techniques of process and product quality control of textiles, pulp and paper, metallurgical process and quality control, foods and beverages, and others.

Admission, while free, is by pre-registration only. Write to Technicon, Ardsley (Chauncey), New York or phone 914-OW 3-1000.

Three more ways Instron extends your elastomeric testing capability.



Optical: Excellent response characteristics. Permits measurements without physical contact with sample.



Incremental: Attractively priced, can be used in combination with several chart controlling accessories.

Counterbalanced: Allows taking sample to break without disrupting test routine. ►

Instron has extended its line of extensometers. Used in conjunction with Instron's table or floor model testing instruments, the units offer easier, more convenient operation during set up and while accumulating test data. They provide a choice of techniques for measuring strain in a wide variety of elastomeric materials. Provisions for taking the sample to break without damage to the units or test arrangement have been included.

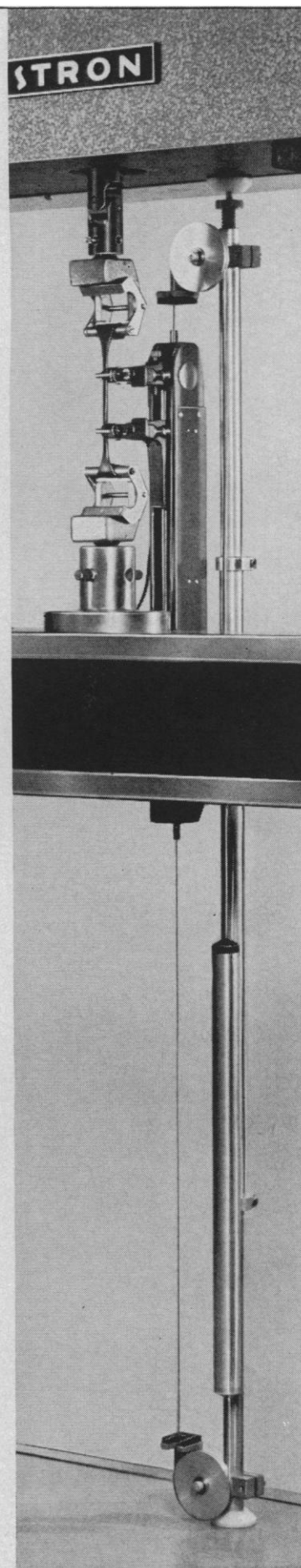
Each Instron unit provides high standards of accuracy and mini-

mizes many of the inconveniences associated with this type of testing. For example, the units virtually eliminate the human error and time consuming routine inherent in visually measuring benchmark separation.

Extensometers like these, added to our continually growing line of strain measuring accessories are part of the reason why Instron remains your best materials testing investment. For detailed information write: **Instron Corporation, Dept. S-33, 2500 Washington St., Canton, Mass. 02021.**



Instron Sales Offices and Demonstration Centers are located at: Boston, Massachusetts • Springfield, New Jersey • Wilmington, Delaware • Cleveland, Ohio • Park Ridge, Illinois • Houston, Texas (Office for Mexico and South America) • Atlanta, Georgia • Long Beach, California.



GAS OR STEAM

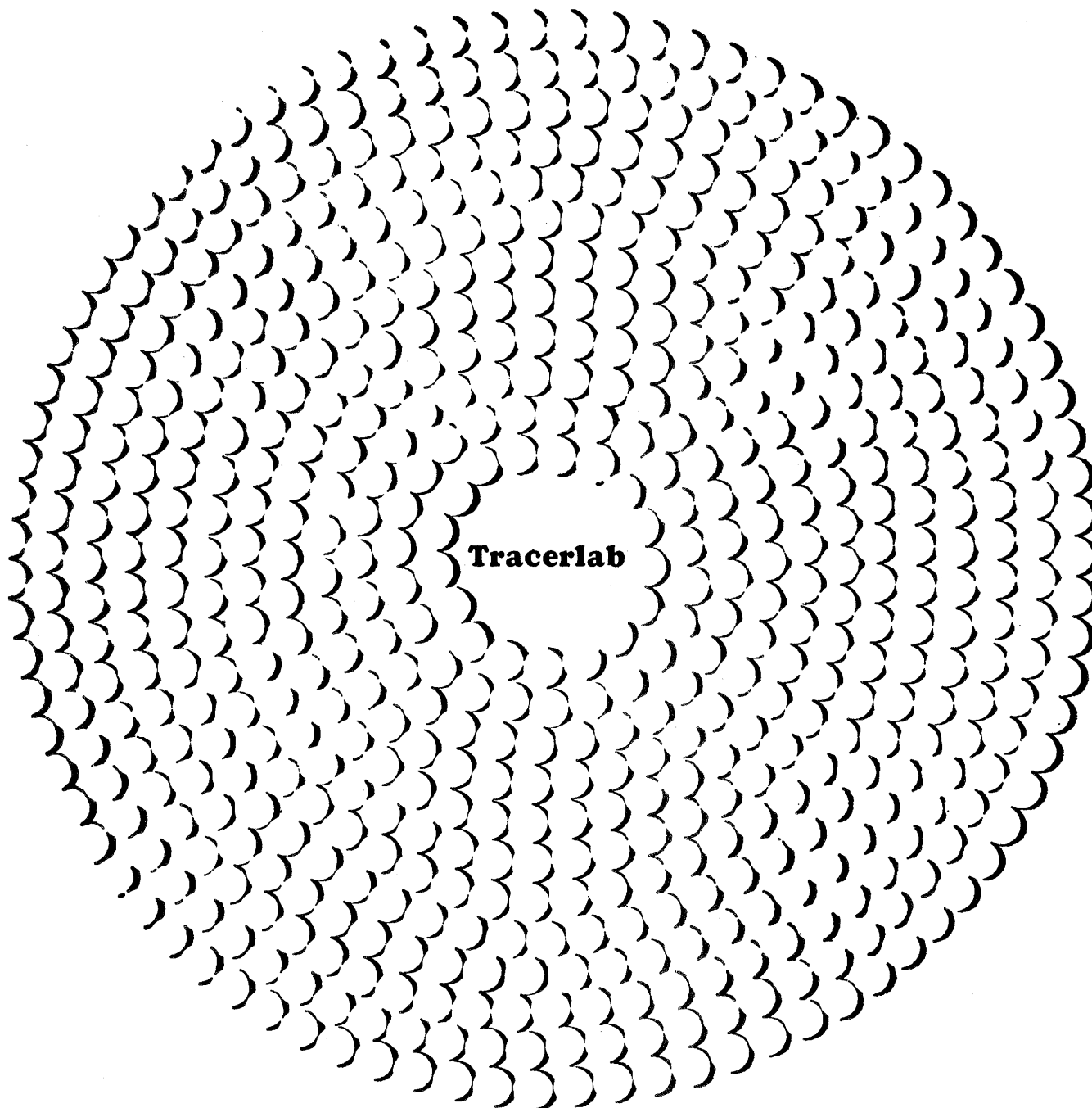
STERILIZERS

FOR SCIENCE AND INDUSTRY



V A C U D Y N E®

VACUDYNE CORPORATION / 375 E. JOE ORR RD. / CHICAGO HEIGHTS, ILL. / PHONE: 312-374-2200



**...your single source for so many radiochemicals
each one guaranteed for purity**

Same-day personal service...overnight delivery
by fastest carrier • low prices throughout...
dependable technical team always available.
For catalog and custom-synthesized compounds,
call Dr. John Leak COLLECT: TW 4-6600, area code 617.



TRACERLAB

A Division of Laboratory For Electronics, Inc.
WALTHAM, MASSACHUSETTS 02154

Film Badge Service • Health Physics • Bioassays • Sources • Nuclear Instrumentation • Radiochemicals
Radioactive Waste Disposal • Radiation Monitoring Instrumentation • Isotope Applications



At 3 o'clock in the morning who's minding the spores?

Nobody!

In the dead of night, this new MicroFerm fermentor is alive with productivity, working 24 hours a day, day in, day out, with no laboratory supervision. Simply set the precision controls for the desired growth conditions and this bench-top fermentor takes over. MicroFerm makes over 250 control decisions automatically every hour of the day and night, maintaining temperature and agitation with unusual accuracy and dependability.

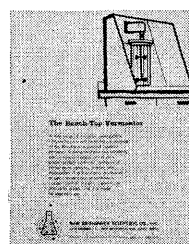
Temperature is regulated electronically to within $\pm 0.25^\circ\text{C}$ by a Thermistor controller which allows cool or heated water to circulate on demand through hollow baffles inside the vessel. Rigid control of agitation is assured by a solid state proportional speed controller that adjusts impeller speed to compensate for changes in viscosity and line voltage. Foam problems are eliminated by a new electronic controller that senses and automatically adds defoaming agent as needed.

MicroFerm permits you to conduct realistic pilot studies in the quiet of your own laboratory. Simply connect the unit to water, air and electric outlets for immediate use around the clock.

Accommodates 4 interchangeable fermentors: 2 liters, 5 liters, 7½ liters or 14 liters. Easy to remove. Designed for repeated sterilization in a 20" autoclave.



New Brunswick Scientific Co., Inc.
1130 Somerset Street, New Brunswick, N.J. 08903
West Coast Office: Box 5606, San Jose, California 95150



Look into MicroFerm.
Write for
Catalog MFS.

We approach

STERILIZATION
STERILIZATION
STERILIZATION
STERILIZATION
STERILIZATION

from many angles...

The Castle Research Laboratories offer a well-equipped, talented group of men from every scientific discipline, each concentrating his specialized knowledge and abilities on a single field—sterilization.

We have the talent, experience and facilities to help you solve your sterilization problem. We'll work

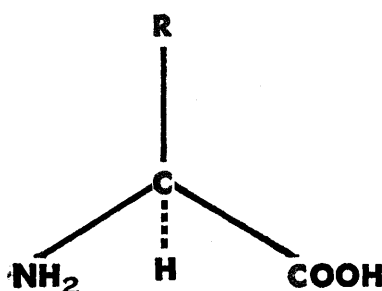
with you on any level—from consultation to the actual design and construction of specialized equipment. Should your needs not justify the expense of special equipment, we offer a complete contract sterilization service.

If your problem pertains to sterilization, decontamination, pyrogen

testing, contamination control techniques, or the measurement of microbial retentive capabilities—chances are we can solve it. Write for our new Research and Development brochure. Wilmot Castle Company, Rochester, N. Y. 14602.

WILMOT CASTLE COMPANY
a division of Ritter Pfaudler Corporation

Radiochemical reference data. Clip and save.



Amino Acids Uniformly Labelled with Carbon-14

COMPOUND	LOW SPECIFIC ACTIVITY		HIGH SPECIFIC ACTIVITY		PRICES Prepaid air shipment included			
	Order No.	Range mc/mM	Order No.	Range mc/mM	50 μ c	0.1 mc	0.5 mc	1.0 mc
L-Alanine-C14 (U)	CFB-7	5-10	CFB-62	75-110	\$32	\$55	\$195	\$375
L-Arginine-C14 (U) monohydrochloride	CFB-8	5-10	CFB-63	150-220	40	70	340	645
L-Asparagine-C14 (U)	CFB-45	4-40	CFB-95	80-120	56	112	560	1000
L-Aspartic-C14 (U) acid	CFB-9	5-10	CFB-64	100-150	32	55	195	375
L-Glutamic-C14 (U) acid	CFB-10	5-10	CFB-65	125-180	32	55	195	375
Glycine-C14 (U)	CFB-11	5-10	—	—	21	26	110	200
Glycine-C14 (U)	—	—	CFB-66	50-70	23	28	115	215
L-Leucine-C14 (U)	CFB-13	5-10	CFB-67	150-220	45	80	375	740
L-isoLeucine-C14 (U)	CFB-14	5-10	CFB-68	150-220	40	70	340	645
L-Lysine-C14 (U) monohydrochloride	CFB-15	5-10	CFB-69	150-220	45	80	375	740
L-Phenylalanine-C14 (U)	CFB-16	5-10	CFB-70	200-320	40	75	355	700
L-Proline-C14 (U)	CFB-17	5-10	CFB-71	125-180	40	75	355	700
L-Serine-C14 (U)	CFB-18	3-10	CFB-72	75-110	40	70	340	645
L-Threonine-C14 (U)	CFB-19	5-10	CFB-73	100-150	40	70	340	645
L-Tyrosine-C14 (U) hydrochloride	CFB-20	5-10	CFB-74	200-320	40	75	355	700
L-Valine-C14 (U)	CFB-21	5-10	CFB-75	125-180	40	70	340	645

Prices shown are F.O.B. destination. Quantity discounts offered on any one compound. Request prices on larger quantities.

Preparation

These amino acids are prepared from *Chlorella*, grown from a small inoculum on bicarbonate-C14 as the sole source of carbon, thus ensuring uniformity of labelling. After separation by ion-exchange chromatography, the acids are further purified by paper chromatography. Each batch, whatever its specific activity, is then crystallized to ensure the highest possible chemical purity and to eliminate D-forms of the acid.

Purity

The radiochemical purity of each batch is determined by reverse isotope dilution analysis, by chromatographic methods, and by paper electrophoresis at two pH levels. Collectively, these methods offer the greatest possible assurance of a true determination of radiochemical purity.

Packaging

Packaging is chosen to give maximum user convenience consistent with greatest stability. Low specific activity amino acids are supplied freeze-dried in an inert atmosphere. High specific activity amino acids are supplied in sterilized aqueous solutions containing 2% ethanol.

Availability

Quantities of C14 uniformly labelled amino acids are normally in stock. Orders received at the Radiochemical Division by 3:30 PM are air-shipped the same day. Data sheets on current batches will be sent on request.

For prices on quantities other than those listed and for technical consultation with one of our radiochemists, please use our direct-line telephone number.

NUC-G-9-259

Direct Telephone Line
312 296-1055
Call Collect

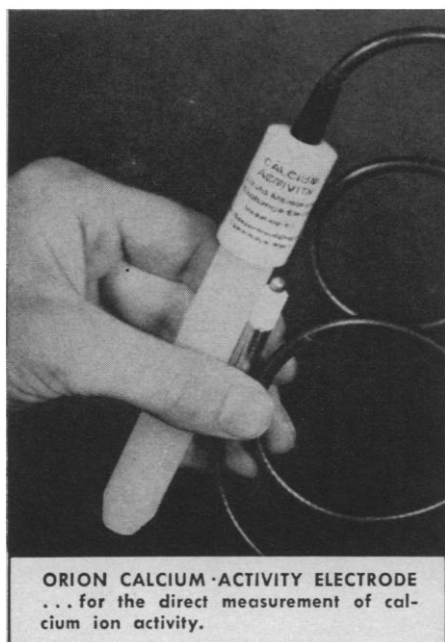


**NUCLEAR-CHICAGO
CORPORATION**

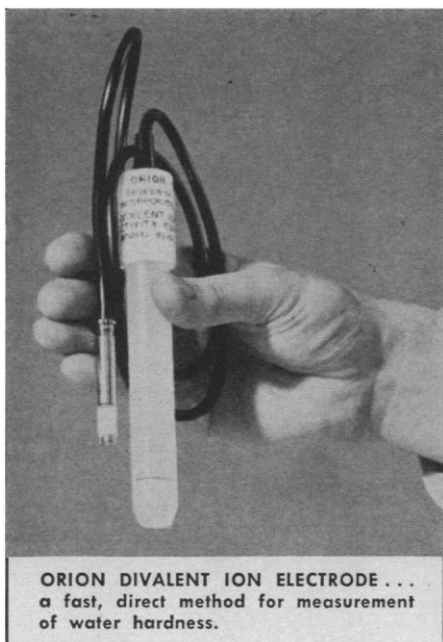
349 East Howard Avenue
Des Plaines, Illinois 60018 U.S.A.
Donker Curtiusstraat 7, Amsterdam W.

NOW ... DIRECT, RAPID, *CONTINUOUS* MEASUREMENT OF ION ACTIVITY

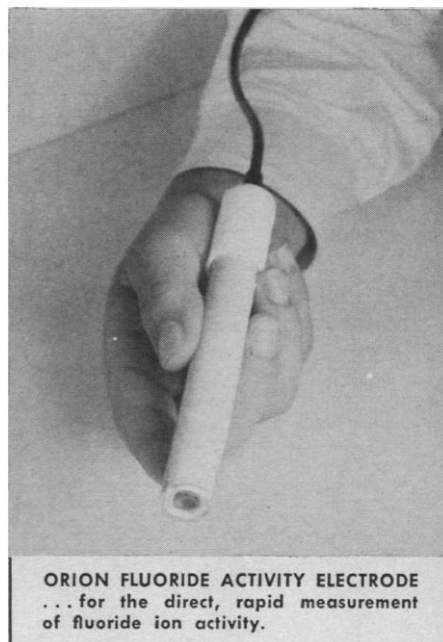
... with any expanded scale pH meter



ORION CALCIUM ACTIVITY ELECTRODE
... for the direct measurement of calcium ion activity.



ORION DIVALENT ION ELECTRODE ...
a fast, direct method for measurement of water hardness.



ORION FLUORIDE ACTIVITY ELECTRODE
... for the direct, rapid measurement of fluoride ion activity.

Orion electrodes operate on a new principle of electro-chemical sensing. Potentials are developed across a membrane containing liquid ion exchangers, in the case of the Calcium Activity Electrode and Divalent Ion Electrode; across a synthetic rare-earth doped single crystal for the Fluoride Activity Electrode. Measurement is direct. Response time

is rapid. Noise and drift are as low or lower than that of conventional pH electrodes. All three new electrodes are for use in aqueous solutions and are designed to be used with any modern expanded scale pH meter. Being made of fluorocarbon plastic, they're unbreakable, corrosion-resistant. Ask us for complete information.

CONDENSED SPECIFICATIONS AND PRICES

Catalog No.	Electrode	Concentration Range	pH Range	Temperature Range	Electrical Resistance	Price
H-5500X	Calcium Activity	From saturated calcium solutions to 10^{-5} moles/liter	5.5 to 11	0 to 50°C	25 megohms at 25°C	\$145.00 per kit*
H-5505-2X	Divalent Ion	From saturated divalent ion solutions to 10^{-5} moles/liter	5 to 11	0 to 50°C	25 megohms at 25°C	\$145.00 per kit*
H-5510X	Fluoride Activity	From above 10^0 down to 10^{-6} moles/liter	1 to 8	-5 to 100°C	25 megohms at 25°C	\$160.00

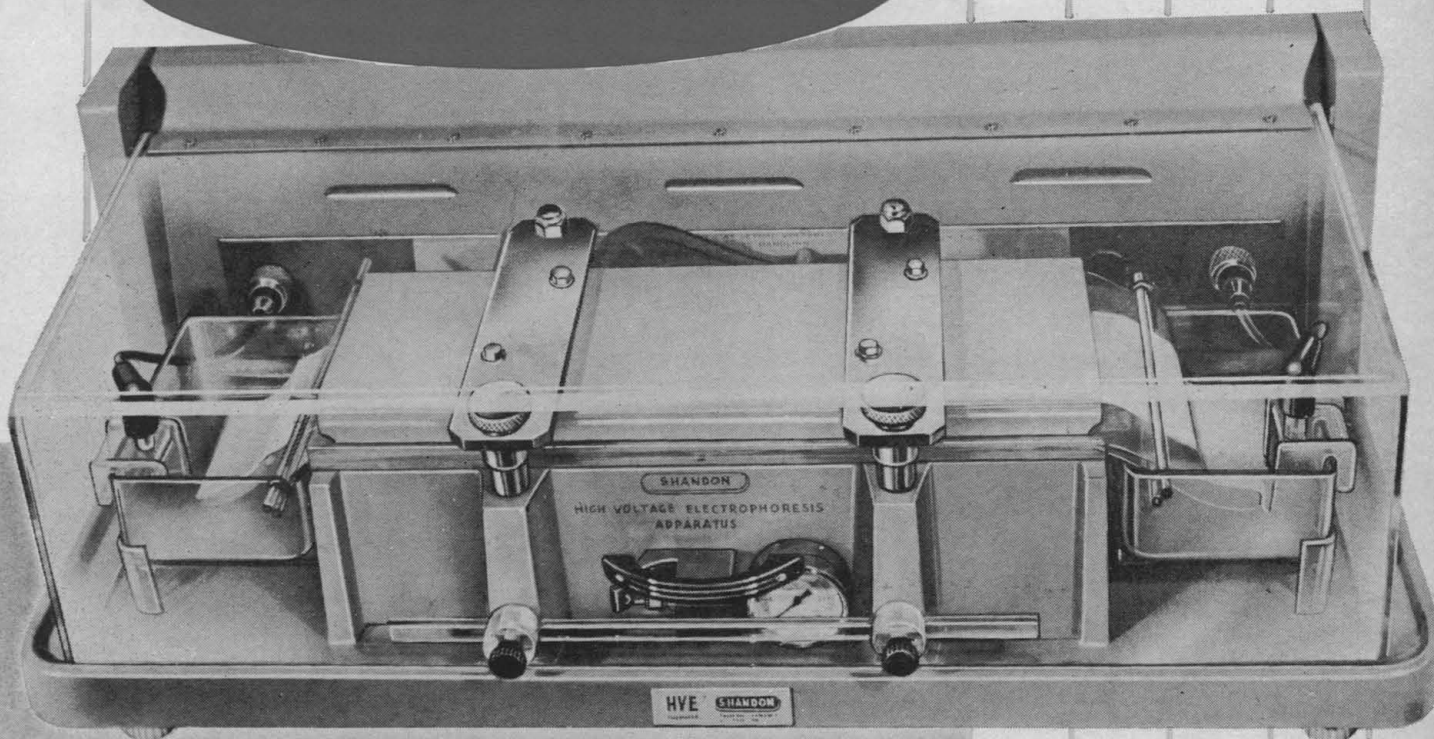
*Kit includes a complete electrode with 30" lead, one vial of ion exchange solution, one vial internal reference solution, two filling syringes, box of 20 membranes, pair of tweezers, set of "O" rings, one micro sample dish, instruction manual, carrying case. Users of the Calcium Ion Electrode can convert to divalent ion measurements by purchasing a replacement kit at \$40.00, and vice-versa.

**SCIENTIFIC
GLASS
APPARATUS
CO. INC.**
BLOOMFIELD, NEW JERSEY

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

Branches: **Boston 16 Mass.** **Danbury Conn.** **Elk Grove Village Ill.** **Fullerton Calif.** **Philadelphia 2 Penna.** **Silver Spring Md.** **Syracuse 2 N. Y.**

New and Highly Versatile!



High Voltage Electrophoresis Apparatus

a **COLAB** product

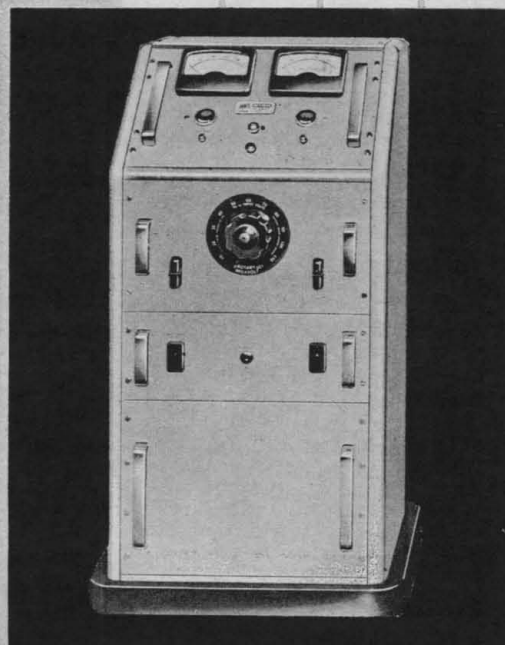
High Voltage Electrophoresis Apparatus

DESIGNED AS MUCH FOR SAFETY AS FOR PERFORMANCE
INSTALLED BY OUR TECHNICIANS

Literature upon Request

COLAB LABORATORIES, Inc.
CHICAGO HEIGHTS, ILLINOIS, U.S.A.

In Canada, order from:
Consolidated Laboratories (Canada) Ltd.
66 Milvan Drive, Weston, Ontario



10,000V Power Supply



New Publications of Value to Researchers

Methods in Cell Physiology

edited by David M. Prescott

University of Colorado Medical Center, Denver

VOLUME II

A compilation of methods and techniques of general usefulness to experimental biologists working on the physiology, biochemistry, and reproduction of the cell.

CONTENTS: Nuclear Transplantation in Amphibia. Techniques for the Study of Lampbrush Chromosomes. Micrurgy on Cells with Polytene Chromosomes. A Novel Method for Cutting Giant Cells to Study Viral Synthesis in Anucleate Cytoplasm. A Method for the Isolation of Mammalian Metaphase Chromosomes. Isolation of Single Nuclei and Mass Preparations of Nuclei from Several Cell Types. Evaluation of Turgidity, Plasmolysis, and Deplasmolysis of Plant Cells. Culture Media for *Euglena gracilis*. General Area of Autoradiography at the Electron Microscope Level. High Resolution Autoradiography. Methods for Handling Small Numbers of Cells for Electron Microscopy. Analysis of Renewing Epithelial Cell Populations. Patterns of Cell Division: The Demonstration of Discrete Cell Populations. Biochemical and Genetic Methods in the Study of Cellular Slime Mold. Author Index-Subject Index.

September 1966, 426 pp., \$17.50

Volume I, 1964, 465 pp., \$16.50

Announcing a New Serial Publication . . .

Current Topics in Bioenergetics

edited by D. R. Sanadi, *Retina Foundation, Boston*

VOLUME I

CONTENTS: Kinetics and Intermediates of the Oxygen Evolution Step in Photosynthesis. Fluorescence Yield in Photosynthetic Systems and Its Relation to Electron Transport. Uncoupling and Energy Transfer Inhibition in Photophosphorylation. The Chemistry of Bioluminescence. Structure and Function of the Contractile Protein Myosin. Energized Calcium Transport and Relaxing Factors. Ion Transport in Mitochondria. Author Index-Subject Index.

September 1966, 308 pp., \$11.50

Introduction to Quantitative Cytochemistry

edited by George Wied, *University of Chicago, Illinois*

Acquaints applied cytologists, analytic cytologists, and others interested in cytology with traditional sets of rules used in disciplines other than their own. This book familiarizes the reader with the latest quantitative cytochemical and histochemical methods used in the evaluation of cytologic material and aids him to select the method which can be best applied to a specific problem.

September 1966, 623 pp., \$25.00

VOLUME I

Advances in High Pressure Research

edited by R. S. Bradley, *The University, Leeds, England*

"Scientists active in high pressure research will find the book extremely valuable, but it should also be of interest to a wider circle of physicists, chemists, geophysicists and geologists."
—*British Book News*

CONTENTS: J. LEES, The Design and Performance of U.H.P. Equipment. An Interim Report on the Tetrahedral Anvil Apparatus. S. D. HAMANN, Effects of Intense Shock Waves. E. WHALLEY, Effect of Pressure on the Refractive and Dielectric Properties of Solids and Liquids. ROBERT C. NEWTON, The Status and Future of High Static-pressure Geophysical Research. MARIO TOSI and TADASHI ARAI, Stability of Solids under Pressure. LINDA S. WHATLEY and ALVIN VAN VALKENBURG, High Pressure Optics. Author Index-Subject Index.

May 1966, 396 pp., \$16.00

The Fungi: An Advanced Treatise

edited by G. C. Ainsworth and Alfred S. Sussman

Review of Volume 1: "The appearance of Volume 1 of this three-volume symposium on the fungi is an event of prime importance in the history of mycological literature, for it is the first time in the present century that the fungi in all their many aspects have been critically reviewed."

"... the most exciting reading that has appeared for many years."—*Science Journal*

VOLUME 2: THE FUNGAL ORGANISM

September 1966, 806 pp., \$27.00, Subscription price \$21.50*

VOLUME 1: THE FUNGAL CELL

1965, 748 pp., \$24.00, Subscription price \$19.50*

* Subscription price valid on orders for the complete set received before publication of the last volume.

Symposia of the Society for Experimental Biology, No. 19

The State and Movement of Water in Living Organisms

1965, 432 pp., \$14.50

The Society for Applied Bacteriology Technical Series No. 1

Identification Methods of Microbiologists

PART A

edited by B. M. Gibbs and F. A. Skinner

May 1966, 146 pp., \$6.00

IN TWO VOLUMES . . .

Biochemistry of Chloroplasts

Proceedings of a NATO Advanced Study Institute held at Aberystwyth

edited by T. W. Goodwin

Volume 1: September 1966, about 500 pp., \$18.00

Volume 2: about 700 pp., in preparation

Advances in Pharmacology

VOLUME 4

edited by Silvio Garattini and Parkhurst A. Shore

September 1966, 370 pp., \$16.00

Immunological Properties of Protein Hormones

edited by Filippo Polvani and Piergiorgio Crosignani

August 1966, about 300 pp., approx. \$12.00

Insect Colonization and Mass Production

edited by Carroll N. Smith

October 1966, 621 pp., \$27.00

Methods in Bremsstrahlung Research

by O. V. Bogdankevich and F. A. Nikolaev,

July 1966, 232 pp., \$9.50

Advances in Nuclear Science and Technology

VOLUME 3

edited by Ernest J. Henley and Paul Greebler

July 1966, 400 pp., \$17.50

1965 International School of Physics "Ettore Majorana"

Recent Developments in Particle Symmetries

edited by A. Zichichi

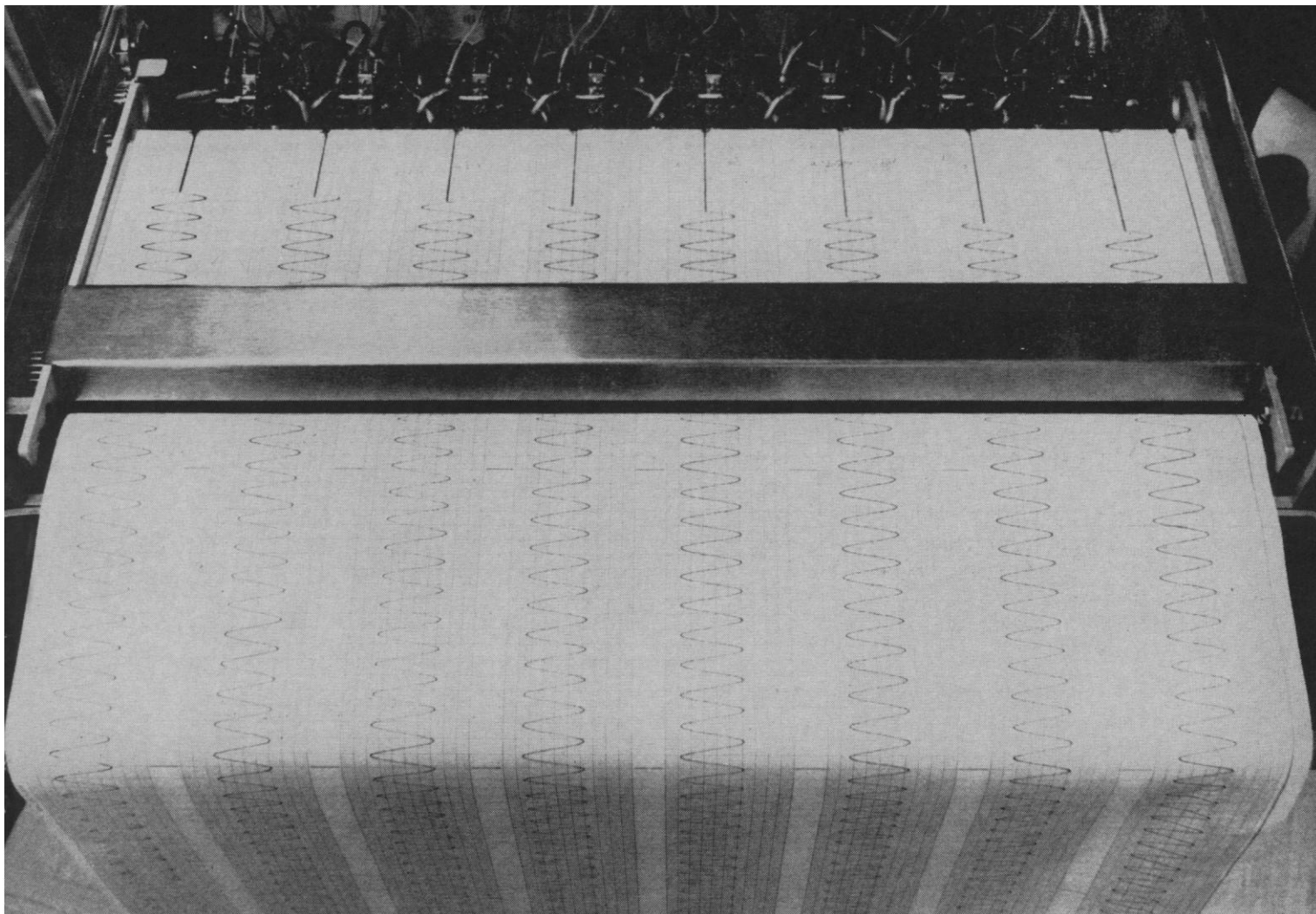
April 1966, 460 pp., \$10.50

ACADEMIC PRESS



NEW YORK AND LONDON

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

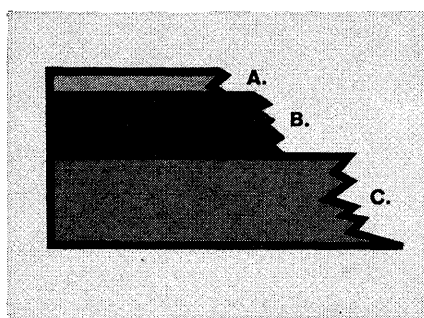


A few lines worth repeating...

Graphic Controls' thermal recording oscillograph charts produce distinct, black, clearly legible trace lines everytime.

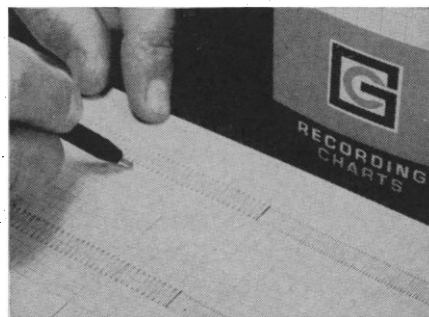
The reason is the unique construction of our paper. We start with a specially processed, high-density undercoating that provides the blackest possible trace. To this we add an unusually sensitive, completely compatible surface coating that lets the stylus glide evenly and smoothly. Many critical areas that are blurred or indistinct on other papers become clear and precise with GC's oscillograph charts. Even the most complex functions and inputs are recorded easily.

Because the surface coating is applied by a new process, there's no variance in thickness from edge-to-edge. The caliper of the paper is constant. Creep is eliminated and uniform paper flow is assured. And at the same cost as the paper you are now using.



A. Thermal-reactant coating
B. Contrast undercoat
C. Substrate

In addition, GC's thermal recording charts are water resistant, durable, yet extremely lightweight. Their con-



sistent performance has been proved in major aerospace, industrial, and scientific research applications.

Check the performance of GC's charts for yourself...and compare them with your present papers. For complete information, contact:



RECORDING CHART DIVISION
GRAPHIC CONTROLS CORPORATION
189 VAN RENSSELAER STREET, BUFFALO, NEW YORK 14210

This is a system. Not to be confused with a camera.

"The system" does what cameras never dreamed of. Because "the system" is just that. A system. A unique and complete system of interchangeable components that gives you greater



*Hasselblad 500 C
with 150 mm lens,
focusing handle,
light meter knob.*

precision, greater versatility than anything called "camera".

Take interchangeable lenses, for instance. "The system" has seven. 50, 80, 120, 120s, 150, 250, and 500 mm. All Zeiss. All with Synchro-Compur shutter, automatic and manual diaphragm



Eye-level pentaprism (left), magnifying hood (right.)

and coupled EVS system. All with resolving powers that permit greater enlargements than any other lenses made.

And take film backs. Ever see a "camera" that lets you switch from black and white to color mid-roll? We think not. But that's "the system" for you. A choice of 4 separate and interchangeable magazines. 3 for roll film. Each in a different format. 1 for cut film. And viewfinders. "Cameras" have them, right? One. "The system"—five. Eye-level prisms,



Left to right: Zeiss 150 mm; 250 mm; 80 mm; and film magazine.

might say that 'the system' is versatile enough to act as an extension of myself. I can't ask for more than that."

Now you know what we mean by "the system". And you know why we cringe when people confuse us with our more limited look-alikes. Let there be no confusion. "Cameras" take pictures, "the system" takes pictures, the resemblance stops there. Write for literature to your dealer or to Paillard Incorporated, 1900 Lower Road, Linden, N. J.

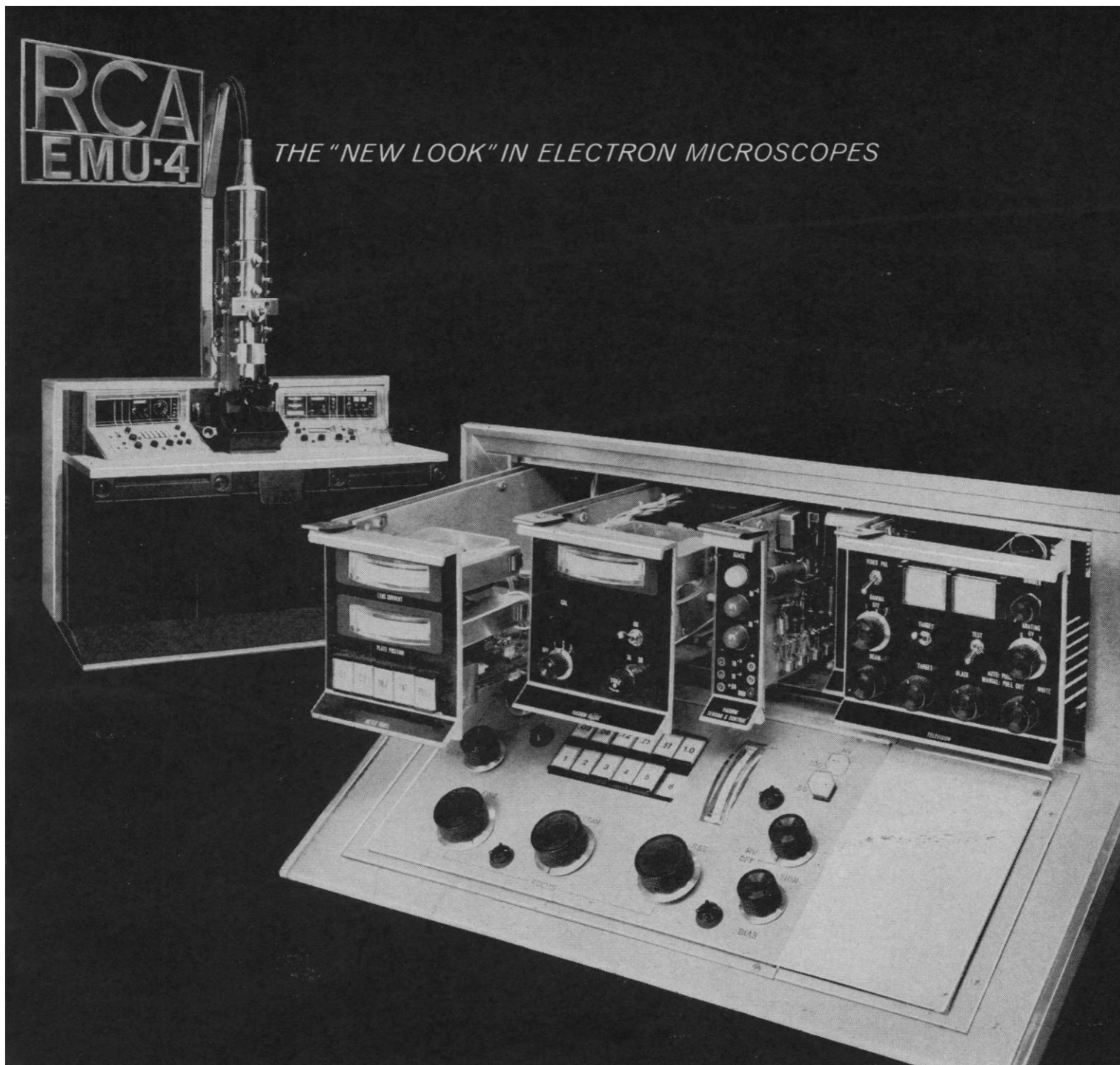


Timothy Galfas, noted New York editorial and fashion photographer, with "the system."



HASSELBLAD
PART OF THE MANNED SPACE PROGRAM

Now you might ask "why the system?" Why an interchangeable everything? We did. We asked Timothy Galfas. His answer: "Versatility. 'The system' lets me do what I want, when I want. I don't find myself wishing for something extra. Or scraping to make do. I know that it will be optically right. You



Interchangeable, plug-in modules provide for future expansion...defy obsolescence

Long, useful life of an instrument depends on how up-to-date its capabilities remain as time accumulates. The entirely-new EMU-4 instrument anticipates yet-unimagined electronic innovations by including internal space and facilities to accept these ideas. These facilities are *modularized* electronics: functional grouping of the various circuits, packaged in plug-in modules. As the new ideas come to light, they'll be packaged in compatible modules. (Some 40 per cent of the module space within the instrument is reserved for future updating or expansion of the electronics.)

Modular construction is exclusive with the EMU-4 instrument

and virtually all of the electronics are transistorized...another innovation in electron microscopes.

Transistorization and modular construction are but two of many innovations that are "standard" for the EMU-4 Microscope: an automatically-sequenced column-pumpdown facility; an exclusive selected-area-diffraction feature; a heated objective aperture that rejects contamination, and others.

For more information, write RCA Scientific Instruments, Building 15-5, Camden, New Jersey 08102. In Canada: RCA Victor Company Ltd., Montreal.

Nationwide service available through
RCA Service Company. Offices in
major cities.



The Most Trusted Name in Electronics

New solid-state pH meters. The only meters you can buy today that will still be guaranteed in 1968.



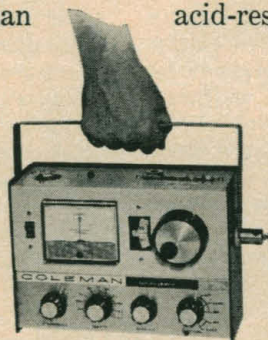
You'll get the industry's first two-year guarantee with your new solid-state Coleman pH meter.

You also get a choice of three attractive new models. Each is 100% solid state. We've simplified the circuitry and eliminated many traditional limitations in design to achieve a better pH meter. We think a better instrument is worth a better guarantee.

More important is what these new Coleman

pH/millivolt meters will *do*.

Model 39 above, shows many of the new Coleman features. It operates without warm-up and provides drift-free readings accurate to ± 0.03 pH. You read from a wide-scale taut-suspension meter with mirrored backing. The tapered rear panel is accessible from the front, and has a new kind of "pop-out" electrode jack for fast electrode changes. All this in a new, acid-resistant case.



Portable Model 37A

provides ± 0.005 pH precision. This is the only precision portable pH meter that operates either from an AC line *or* from a rechargeable battery. You can run it for 40 hours between charges. Model 37A weighs just 8½ lbs., needs only 12" of working space and stores in a drawer (or in its own optional carrying case).

Including—an expanded scale model that presents 1.0 pH across the full width of the meter.



An expanded-scale meter that makes sense. That's the new Coleman Model 38 above.

This meter provides a 1.0 full-scale expansion in any desired 1.0 pH range. For example, when you turn the scale selector to the digit 5, the 5-6 pH range is expanded across the full 7" meter width. No calculations required. You read directly with ± 0.005 pH precision.

Model 38 makes sense in a lot of other ways, too.

You can standardize at one point and make accurate expanded-scale readings in other ranges *without further buffering*. The more complex your pH work gets, the more time this instrument will save.

SEND FOR OUR NEW pH CATALOG SB-289. Precision pH . . . millivolt measurement . . . portable meters . . . solid state . . . expanded scale readings . . . automatic titrations . . . buffers . . . electrodes and accessories . . . for everything from routine control to research applications.



Now one electrode does the work of three.

New Coleman Tri-Purpose Electrodes do general-purpose, high-alkaline and high temperature work. One electrode measures from 0 to 14 pH, at temperatures from 0 to 100° C.

And remember that Coleman Reference Electrodes have money-saving replaceable reservoirs. Save up to \$12 on the replacement cost; when you break a reservoir, you need not replace the entire electrode.



**COLEMAN
INSTRUMENTS
CORPORATION**

MAYWOOD, ILLINOIS 60153
A Subsidiary of The Perkin-Elmer Corporation

ANALOG MONOLOGUE

On Means for Modelling, Measuring, Manipulating, & Much Else

INTENTIONALLY-NONLINEAR ELECTRONIC CIRCUITS

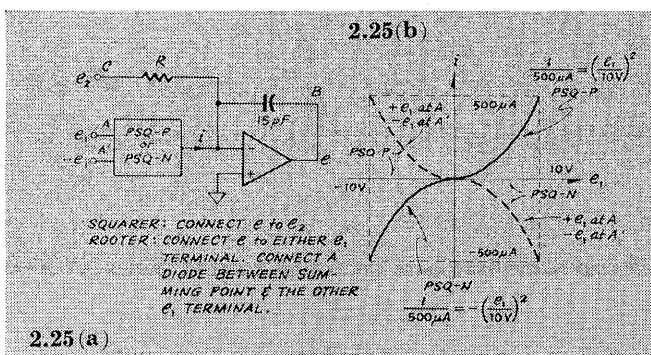
Imagine, for a moment, that your mathematical training had ended somewhere in the first year of Algebra, before you had mastered anything more complicated than a first-order linear equation. Imagine also that you had no knowledge of trigonometry, logarithms, or exponentials. Would such mathematical innocence hamper your present work?

Probably it would — unless your role is supervisory, speculative, or purely empirical. And even then, would you be able to discuss and evaluate the work of others, without a grasp of the everyday mathematical language in which they thought, wrote, and spoke? Of course not.

So it is with electronic measurement and data manipulation . . . for what is measurement, but a form of understanding? (. . . to paraphrase Lord Kelvin.) If the circuits one uses are limited to the handful that are linear in response (useful and powerful as they are), the range of measurement and data processing one can perform with them is correspondingly limited. Fortunately, we need not accept such a crippling restriction; hundreds of practical nonlinear circuits already exist, having been devised and perfected for use in the Analog Computing realm.

The kind of nonlinearity we mean is a deliberate, precisely-controlled relationship in a circuit — for example, a logarithmic input/output response — and *not* the unintentional, unavoidable, and undesired deviation of a nominally-linear circuit from perfect linearity . . . an imperfection to be avoided or minimized by careful design. Useful nonlinearity may be as natural to a circuit as is a linear response, and $y = A(x + B)^2$ may be reproduced with almost as great fidelity as $y = A(x + B)$.

The circuit below, one of more than 200 in the Philbrick *Applications Manual*, shows how the function Ax^2 may be embodied, using an Operational Amplifier and a Quadratic Transconductor. It also indicates the almost trivial circuit change required for square root computations.



Nonlinear circuits are neither as simple conceptually nor as economical as linear adders or voltage-to-current transducers — but, thanks to the creative efforts of workers in many fields, *they are just as easy to use*. Standard hardware, in the form of nonlinear feedback-network packages, is available for the generation of almost any conventional nonlinear higher-order response, whether or not it can be described by a simple equation.

Table 1 indicates (but by no means covers) the range and variety of useful nonlinear functions and operations that may be constructed with standard Philbrick Amplifiers and Transconductors.

Exponential and Root Functions
Multiplication and Division
Linearization of Transducer Outputs
Trigonometric Functions
Coordinate Transformations
Vector Resolution and Composition
Logarithmic Compression and Expansion
True RMS Computation

Table 1

Table 2 lists the most popular of our Transconductors.

(P)PL1	Dual Logarithmic Transconductor(diode or transdiode)
(P)PL2	Quadruple Logarithmic Transconductor (transdiode)
(P)PL3	Quadruple Logarithmic Transconductor (diode)
PPL4	Logarithmic Transconductor temperature compensated
SPL4	Logarithmic Transconductor temperature compensated (built-in control)
SPL4A	Logarithmic Transconductor — temperature compensated (built-in control and amplifier)
SPLR	Log-Ratio Transconductor
SPLRA	Log-Ratio Transconductor (built-in amplifier)
SPLOG	Logarithmic Transconductor
PSQ	Quadratic Transconductor
SPSIN	Sinusoidal Transconductor
SPCOS	Sinusoidal Transconductor
SPFX	Arbitrary Function Fitter (adjustable)

Note: All standard designs, except (P)PL3 are available in either negative or positive polarity.

Table 2

Perhaps this space has been barely sufficient to communicate to you the power of nonlinear instrument circuits. If so, it only serves to underscore our underlying thesis — that the uses of electronic analog technology deserve far greater exposition, and hence appreciation, than they now enjoy . . . despite their many conquests.

You can start today to put more mathematical versatility into your measurements and data processing. Send for our free literature package MBA 2. Better (and faster) yet — call your nearest Philbrick Field Engineer. He'll give you the straight story on nonlinearity. Or write to Philbrick Researches, Inc., 25-S Allied Drive at Route 128, Dedham, Massachusetts. Phone (617) 329-1600.

*A Transconductor is an active or passive network of which the short-circuit output current is a specific, accurately known, often non-linear function of the input voltage.



PHILBRICK

AUTOMATIC PRE-WEIGHING *rah! rah! rah!*



A digital student balance with automatic pre- weighing system for \$550.

Something for both chemistry student and instructors to cheer about (whether they be at Harvard, the State University, Municipal Junior College, or Central High School.) The most advanced analytical weighing technology at a cost consistent with your department budget.

Sartorius Model 2743 is the only all digital student balance with automatic pre-weighing—the fastest, simplest ever developed. You get coarse weight (to the nearest gram)

instantly without time-consuming trial-and-error dialing. Up to 80% faster than conventional single pan balances, any weighing can be completed in less than 15 seconds.

All Sartorius Series 2700 Student Balances offer important features of the latest research instruments: 1000 mg optical range; table-level controls; unobstructed weighing chamber without pan-arrest pin (pan dampened from brake above).

For further information, write to
sartorius student balance model 2743

Division of Brinkmann Instruments, Cantiague Road, Westbury, L. I., New York 11590

September, 1966

FISHER PRODUCT REPORT

News about instruments, apparatus and reagent chemicals that make your work quicker, surer, safer and easier.

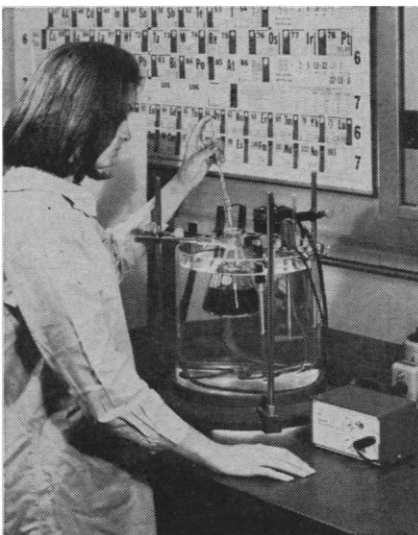
FOR WATER BATHS WITH TEMPERATURE CONTROL YOU CAN COUNT ON... AND FOR INEXPENSIVE, DO-IT-YOURSELF NUMBERS, CHECK FISHER RIGHT AWAY.



FISHER ISOTEMP® BATH

Temperature within a 10-gallon tank is electronically controlled and held to $\pm 0.005^\circ \text{C}$ when water is the medium. With other media, you can have controlled temperatures as high as 107°C or as low as -5°C (with an auxiliary cooling coil). You set the temperature you want with three controls. Once you have the exact setting, you can reproduce the temperature day after day. This reproducibility and close control make the Isotemp bath particularly suited to measuring temperature-sensitive properties, like viscosity and specific gravity, and calibrating thermoregulators and thermometers. The entire bath area is free and clear, because heaters, stirrers and control mechanisms are housed in a central column. The Fisher Isotemp water bath costs \$1200, and our free brochure can help you decide to take the plunge.

(a) ☐



FISHER UNITIZED BATHS

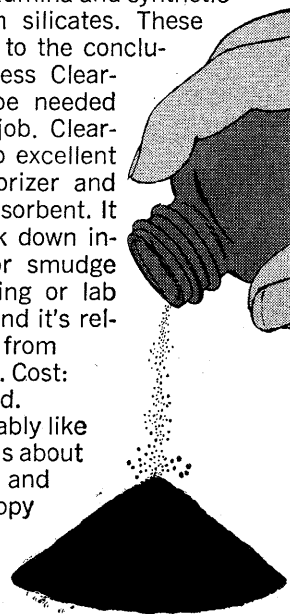
When you're less concerned about very close control, Fisher Unitized baths are the means to low-cost baths suitable for many uses. You buy only the standard components that will give you the capacity and control you need. There's a cast-iron base, with sockets for three support rods; it accepts three sizes of Pyrex® glass bath jar. There are four sizes of immersion heater, three sizes of cooling coil, four types of thermoregulators, a solid-state controller, a selection of stirrers and Castaloy® R clamps, and a fluorescent illuminator. Look up the complete listing in your Fisher apparatus catalog. If you haven't one, make your mark, and we'll reserve a copy of the new edition for you.

(b) ☐

USE LESS FISHER CLEARSORB™ TO DECOLORIZE MORE EFFECTIVELY, MUCH FASTER.

New Clearisorb—fine aluminum oxide particles with an outer layer of vegetable charcoal—combines a high absorptive and adsorptive capacity with a high eluate flow rate. Tests at our Fair Lawn chemical plant prove that when it comes to decolorizing effectiveness and speed, Clearisorb beats charcoal, alumina and synthetic magnesium silicates. These tests point to the conclusion that less Clearisorb will be needed to do the job. Clearisorb is also excellent as a deodorizer and as a gas adsorbent. It won't break down into dust nor smudge skin, clothing or lab surfaces. And it's relatively free from channeling. Cost: \$12 a pound. You'd probably like more details about those tests, and we'd be happy to send our data sheet.

(c) ☐



PLEASE LET US KNOW
what additional information you'd like. Indicate your areas of interest, and then mail this page, along with your name and address, to Fisher Scientific Co., 139 Fisher Building, Pittsburgh, Pa. 15219.

F-570



FISHER SCIENTIFIC CO.

Instruments, Apparatus, Furniture and Chemicals for Laboratories

Complete stocks in all these locations: Atlanta • Boston • Chicago • Cleveland • Houston • New York
Philadelphia • Pittsburgh • St. Louis • Union, N. J. • Washington • Edmonton • Montreal • Toronto • Vancouver

there are
many laboratory
animal cages
for sale,
but...

ONLY ONE ISOSYSTEM^{T.M.}...

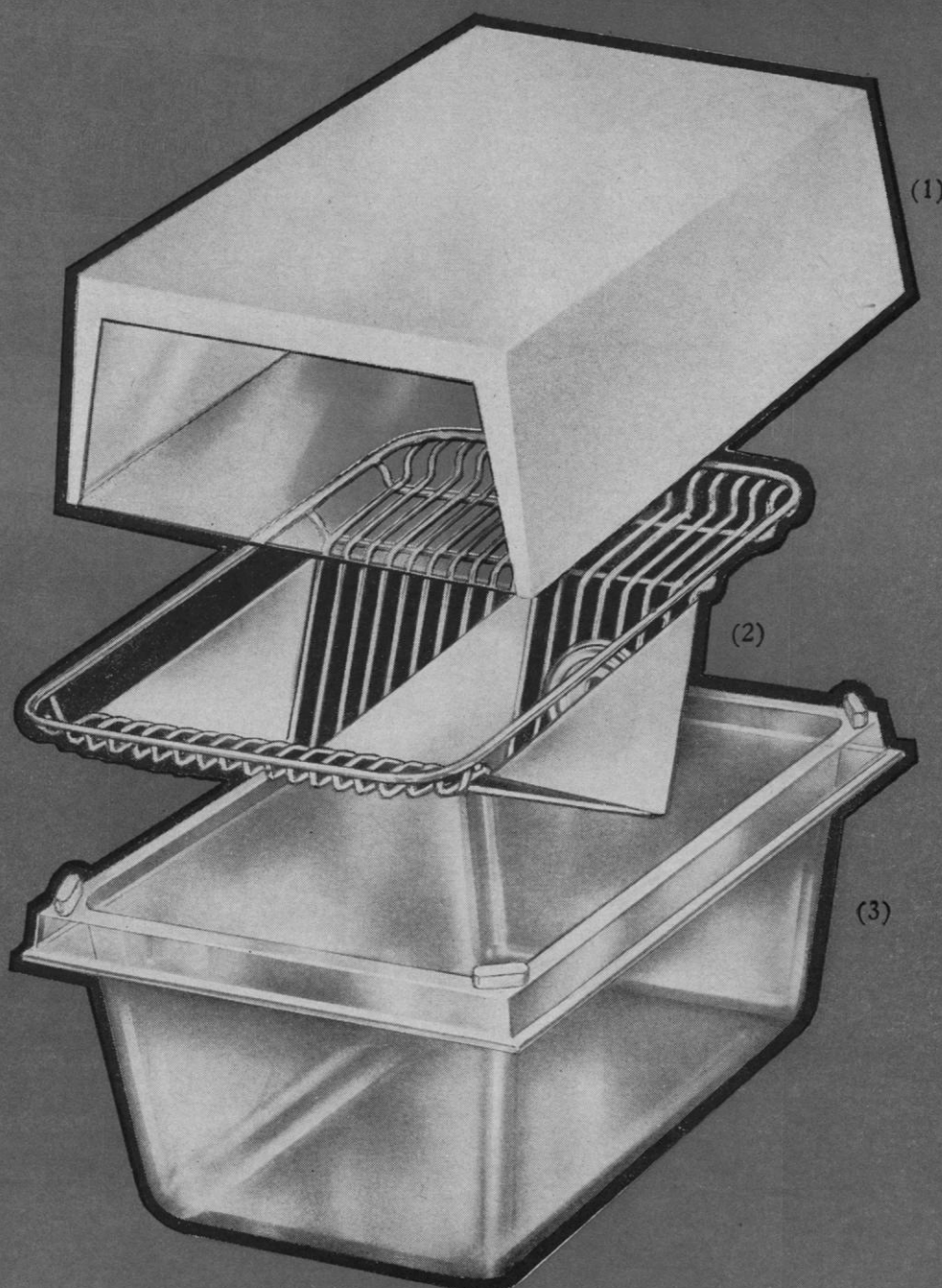
If you're looking for a way to reduce cross-contamination and safeguard experiments, now is the time to try the versatile new **ISOSYSTEM**, animal housing system engineered by Bioquest. **ISOSYSTEM** is the only one ready-made to control the spread of airborne infections. And it is compact and easy to use. Overall dimensions with filter cap in place are only 12¾ x 8 x 8 inches.

This new compact **ISOSYSTEM** coordinates: (1) **ISOCAP***, the disposable efficient filter cap, a fibreglass-plastic web, with clear vinyl end windows; (2) made-to-measure **ISOLID***, laboratory cage lid of stainless steel or chrome plated with divider separating food and water bottle (lids nest for storage); and (3) **ISOCAGE***, featuring the narrow molded flange for snug fit of component systems—in clear polycarbonate, opaque polypropylene or clear styrene acrylonitrile (SAN)—design permits nesting 8 cages to one foot, twice the usual number of plastic cages.

Write or call us for full details: LAB CAGES, INC.
126 John St., Hackensack, N. J. 07602 201-487-6266

lab cages, inc.

SUBSIDIARY OF BECTON, DICKINSON and COMPANY

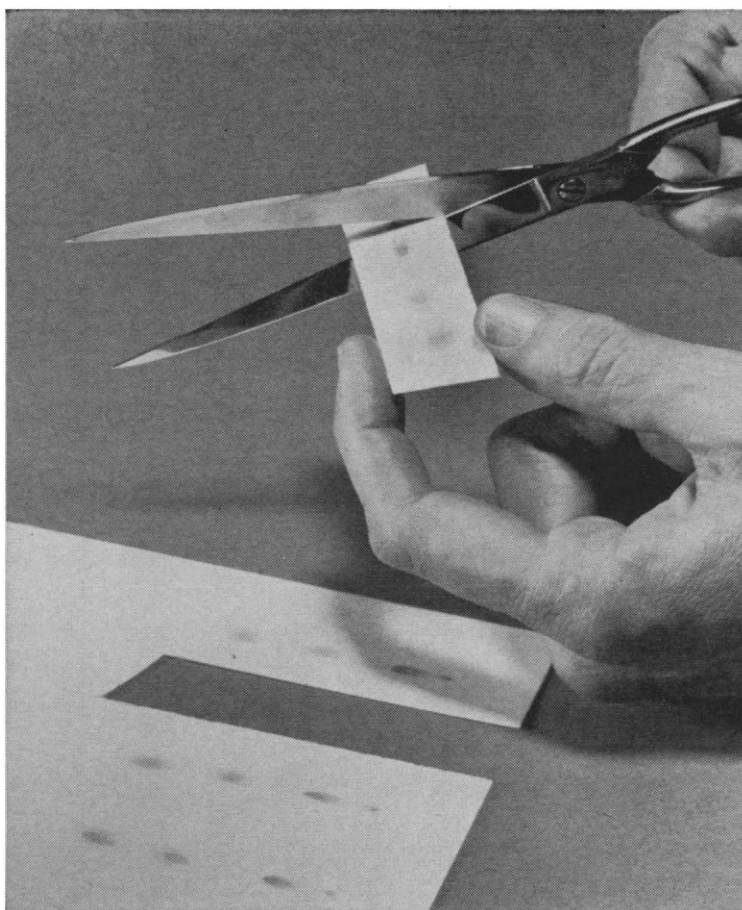


innovations from
bioquest

DIVISION OF
BECTON, DICKINSON
and COMPANY

... solving
today's research
problems
with tomorrow's
technology

*ISOSYSTEM, ISOCAP, ISOLID, and ISOCAGE are trademarks of Becton, Dickinson and Company



Scissors—the sharp-cutting new tool of separations chemistry

(and we don't even make scissors)

W. H. Curtin & Company
Atlanta, Ga., Dallas, Tex.
Houston, Tex., Jacksonville, Fla.
New Orleans, La., Tulsa, Okla.

Fisher Scientific Co.
Atlanta, Ga., Chicago, Ill.
Cleveland, Ohio, Houston, Tex.
King of Prussia, Pa., Medford, Mass.
New York, N.Y., Pittsburgh, Pa.
Silver Spring, Md., St. Louis, Mo.
Union, N.J.

General Chemical Div.
Allied Chemical Corp.
Fairfield, Ala., Philadelphia, Pa.

Howe & French, Inc.
Boston, Mass.

North Strong, Inc.
Rockville, Md.

E. H. Sargent & Co.
Anaheim, Calif., Birmingham, Ala.
Chicago, Ill., Cincinnati, Ohio
Cleveland, Ohio, Dallas, Tex.
Denver, Colo., Detroit, Mich.
Springfield, N.J.

Van Waters & Rogers, Inc.
Denver, Colo., Los Angeles, Calif.
Phoenix, Ariz., Salt Lake City, Utah
San Francisco, Calif., Seattle, Wash.

George T. Walker & Co.
Minneapolis, Minn.

Will Scientific, Inc.
Ann Arbor, Mich., Atlanta, Ga.
Baltimore, Md., Buffalo, N.Y.
Cambridge, Mass., Columbus, Ohio
New York, N.Y., Rochester, N.Y.
South Charleston, W. Va.

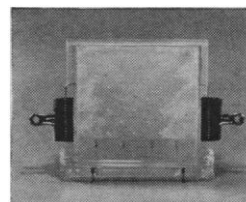
What we do offer is the EASTMAN® CHROMAGRAM® System of thin-layer chromatography—silica gel or alumina—on flexible polyester support. As soon as you start using it, your innovative talents are stimulated. How quickly you learn to think of the quick snip that separates A from B, C, D, and E, or separates what's wanted from what's not wanted!

Yet this is not paper chromatography. It is genuine thin-layer chromatography with all its advantages in resolution, speed, and responsiveness to choice of variables. All that's missing is the messing with powders to coat plates in the first place and to scrape the coating off afterwards when the separated zones need scintillation counting, elution, or further study. Just snip instead. For some materials the scissors even provides an actual separation to affix to the notebook page, supple-



menting the written word with ultimate reality. The tight coating on CHROMAGRAM Sheet resists abrasion to permit this.

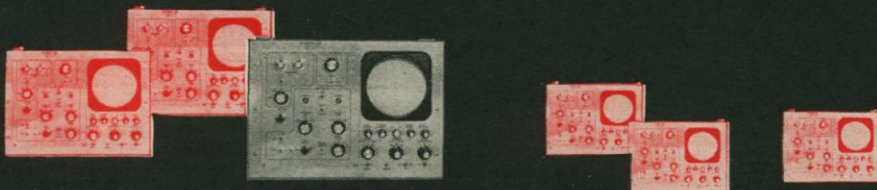
EASTMAN CHROMAGRAM Developing Apparatus assembles in a moment when needed, quickly equilibrates solvent vapor.



Distillation Products Industries
(Division of Eastman Kodak Company) Rochester, N. Y. 14603 (phone 716-458-4080) sells the CHROMAGRAM Developing Apparatus for \$35.50 and CHROMAGRAM Sheet at a new low price of \$17.60 for 20 8"x8" sheets. Send for technical data. Or just ask one of the dealers at left.

Prices subject to change without notice.





BY ALL MEANS **BUY** A SMALL ANALYZER.
BUT GET **BIG** ANALYZER PERFORMANCE.

PIP-400

Multichannel Pulse Height Analyzer

Why compromise . . . On 100, 128, or even 256 channels ?
PIP-400 is the only "small" analyzer that's 400-channels
. . . BIG ! (10^6 -1 count capacity, standard). Parallel, BCD
logic. Transfer and subgrouping. PHA and multi-scale
modes. Rapid 4 MC digitizing rate. Built-in single
channel analyzer, amplifier and Mössbauer input. Serial
or parallel, and analog readout capability. Silicon semi-
conductors used exclusively. 5" CRT live display. Don't
compromise on a small analyzer. You can get the "small"
PIP-400 with the BIG analyzer features.

* Inexpensive, too.

THE VICTOREEN INSTRUMENT COMPANY
5857 West 95th Street • Oak Lawn, Illinois
EUROPEAN SALES OFFICE: GROVE HOUSE, LONDON RD., ISLEWORTH, MIDDLESEX, ENGLAND

TULLAMORE DIVISION
VICTOREEN



National's Water-Jacketed CO₂ Incubator now comes equipped with a purge-recovery unit.

What is a "purge-recovery" unit? (*We're glad you asked!*)

A purge-recovery unit rapidly replaces the CO₂ that is lost when incubator doors are opened, without having to wait for the normal flow rate to build back to the original concentration.

NATIONAL's purge-recovery unit consists of a timer and a button to release a predetermined amount of gas so that the CO₂ tension is quickly built up to the desired level.

It's another good reason why NATIONAL incubators are the logical choice when efficiency and versatility are demanded. Some of the other reasons are:

- Full water jacket for accurate temperature control
- Built-in CO₂ air-mixing device at no extra cost

- Pre-heater for gas mixture to protect work
- Corrosion-proof construction inside and out
- High humidity without condensation on inner walls
- No-stick-no-click non-magnetic door mechanism

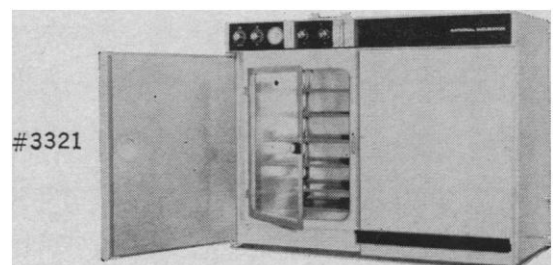
The new purge-recovery unit is a result of the research and development that goes into every NATIONAL product . . . and this is why NATIONAL incubators and other laboratory apparatus continue to lead the field.

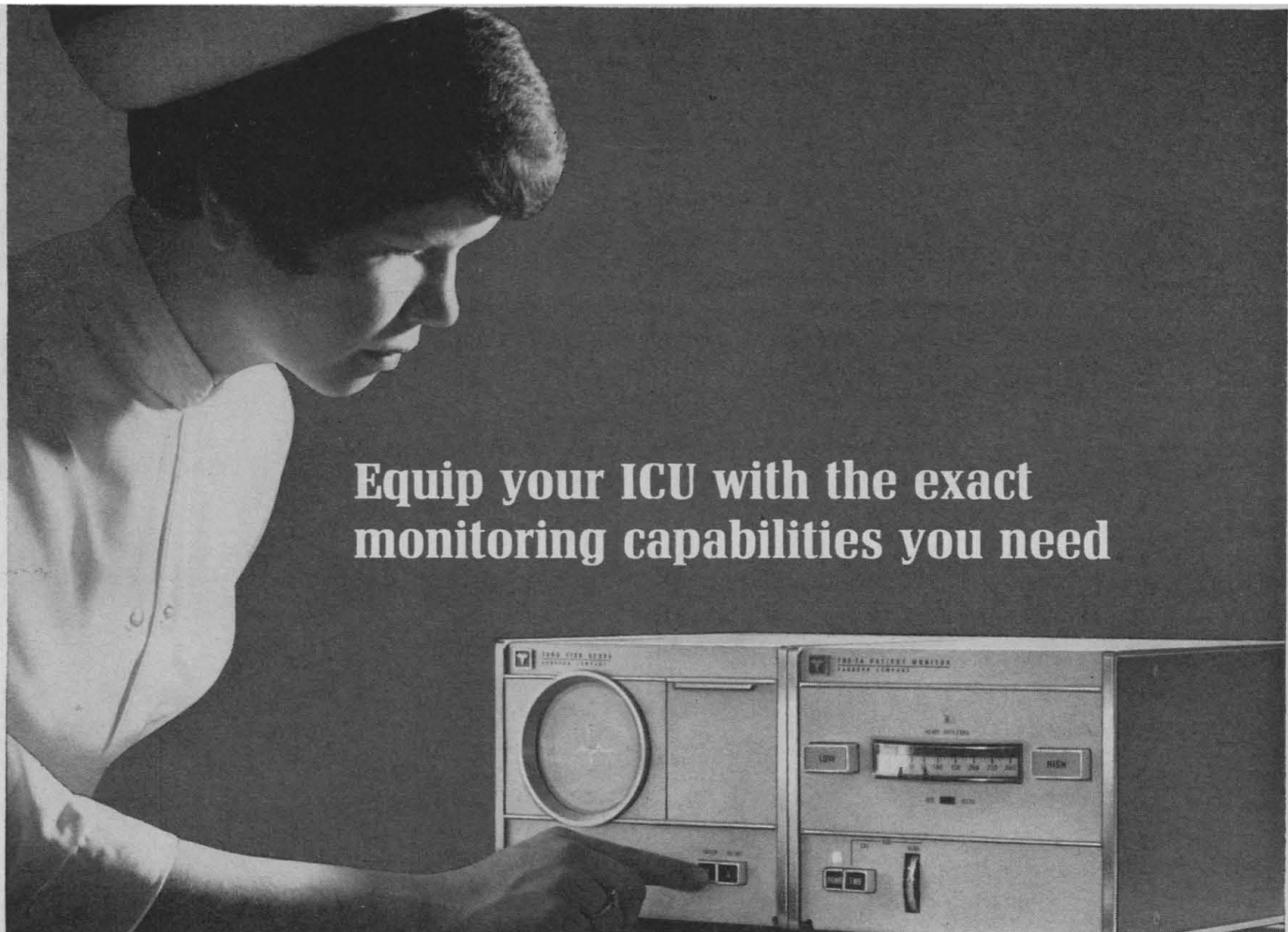
Your franchised NATIONAL dealer can obtain one of these units for you in short order — or, write for a fully illustrated brochure.



NATIONAL APPLIANCE COMPANY

Home Office and Factory: Box 23008, Portland, Oregon 97223
Eastern Sales Office: Box 3102, Stamford, Connecticut 06905
Midwest Sales Office: 2602 E. Devon Ave., Des Plaines, Ill. 60018





Equip your ICU with the exact monitoring capabilities you need

You can have a system "tailored" to your needs — using standard HP Sanborn monitoring modules — whether it involves a few conditions for a few patients . . . or many patient conditions, eight or more beds, and complete central station alarm/display/recording facilities. Start with 780-series modules for monitoring the ECG and heart rate, for example (shown above), and as needs and budget enlarge, add "780" modules to monitor more functions, more patients or both. (Illustration below shows the addition of temperature, respiration rate, systolic and diastolic pressure monitoring functions, plus pacemaker, to the original two functions.) System suitability, economy, future functional and location adaptability, and rapid staff training are

the continuing benefits of modular "780" systems.

Specific capabilities of these units, in addition to those mentioned, include venous pressure monitoring . . . internal/external DC defibrillation . . . and continuous ECG recording on endless loop magnetic tape units, with automatic readout on alarm of data immediately preceding distress condition. Wall Mount Brackets are available to free space around beds, or two styles of "780" carts give complete instrumentation mobility. For Central Station use, a wide choice of units is available for visual display, audible alarm, signal switching, graphic and tape recording.

When complete cardiac function

monitoring is needed, with automatic ECG recording at selected intervals or on distress, the 780B Viso-Monitor provides it in a single bedside unit. Indicators display heart rate, QRS event, bradycardia, tachycardia, pulse loss and arrest; internal/external pacemaker is built in. Companion unit supplies visual display and audible alarm of all conditions monitored by the Viso-Monitor.

HP/Sanborn field offices can give you valuable help in system planning, installation and staff training — and provide continuing, local service. For details, send the coupon to Hewlett-Packard Company, Sanborn Division, Waltham, Mass. 02154. In Europe, H.P.S.A., 54 Route des Acacias, Geneva.



**HEWLETT
PACKARD**  **SANBORN
DIVISION**
Measuring for Medicine and the Life Sciences

Send detailed data on Sanborn 780 Series Patient Monitoring Systems to:

0-740

(name) (hospital)
(address)
(city) (state) (zip code)

Introducing...

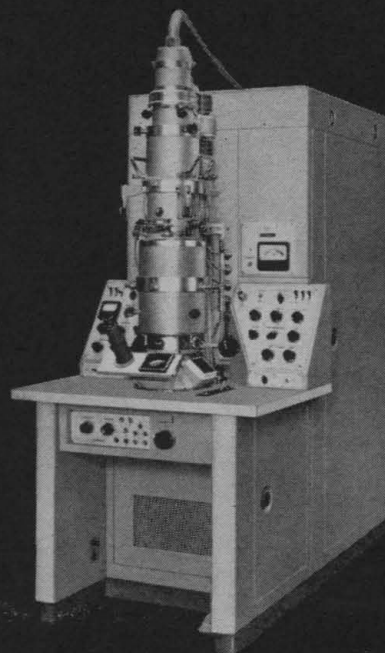


...the JEM-1000

Resolving Power:
Better than 10Å

Accelerating Voltage:
500-750-1000KV

Magnification Range:
X500-150,000



...by the manufacturers of the JEM-7A

The electron microscope which allows simultaneous performance of these accessories:

- Electromagnetic high-resolution dark field
- Heating — tilting
- Anti-contamination cold finger

JEOLCO (U.S.A.), INC.
APPLICATIONS CENTERS AT MEDFORD, MASSACHUSETTS AND BURLINGAME, CALIFORNIA
BRANCH OFFICES AT ATLANTA, CHICAGO AND MONTREAL

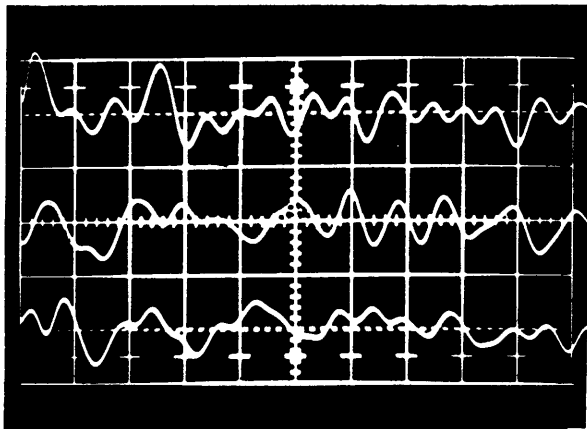


Solve Your Noise Problems...

fish out those elusive weak signals from gooey backgrounds of noise

... Since our first "solve-your-noise-problems" advertisements ran, we've sold a lot of PAR Lock-In Amplifiers and helped to solve a lot of noise problems. But — we couldn't help everybody ...

PHOTO #1

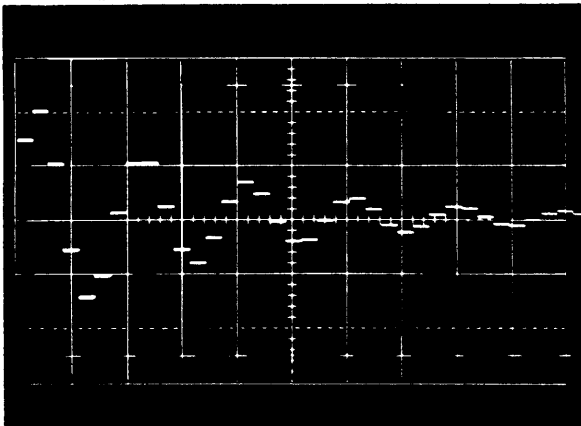


Three traces of a repetitive 50kHz signal buried in noise. Time: 10 μ sec/cm

certain applications require "fishing out" a faithful reproduction of the waveform of the desired signal and the lock-ins just didn't quite do this.

Heretofore — if the frequency was low, and the customer had lots of money, some sort of reproduction could be obtained with Brand X and similar types of complicated and expensive types of signal averaging machines.

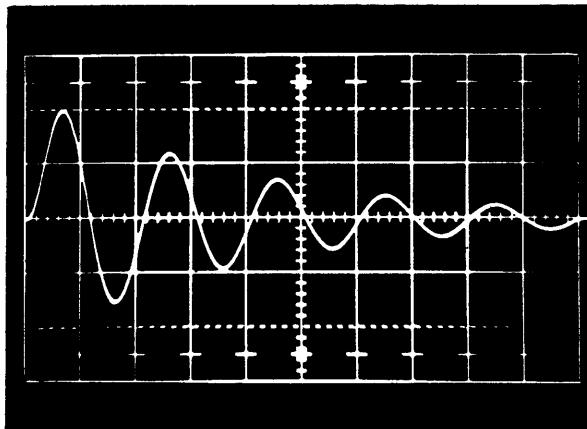
PHOTO #2



Output of Brand X at max. sweep with similar shaped waveform as signal input. As Brand X did not work with the 50 kHz signal, the input frequency had to be reduced to 5 kHz. Time: 100 μ sec/cm

NOW — good news for searchers for small signals — the PAR team has again broken the noise barrier.

PHOTO #3



Output of PAR TDH-9 Waveform Eductor with the noisy 50 kHz signal shown in Photo #1 as input. Time: 10 μ sec/cm

Using an entirely new principle (an old PAR dodge), the PAR TDH-9 Waveform Eductor offers much faster speeds, much higher frequency response, all at a much lower cost! In the Waveform Eductor, special active filters combine the latest in field-effect and high-speed-switching techniques to get information into and out of information storage channels in nanoseconds. Thus, you can put 100 separate channels across one cycle of a 10 kHz signal or, on slower signals, these narrow channels can be used to study portions of the waveform in great detail for unexcelled resolution.

You can purchase a PAR Waveform Eductor for only \$4,200 and, of course get, for free, application help from the world's foremost noisy signal processing specialists.

TDH-9 Specification Summary:

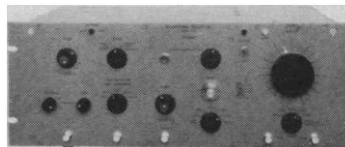
Averaging Time—1 to 100 sec

Averages up to—10⁵ separate scans

Sweep Duration—100 μ sec to 11 sec

Operates from —0.1 Hz to 100 kHz

Outputs—Fixed and variable for oscilloscopes and/or recorders.



PAR Model TDH-9 Waveform Eductor

Write for Bulletin #126 to:

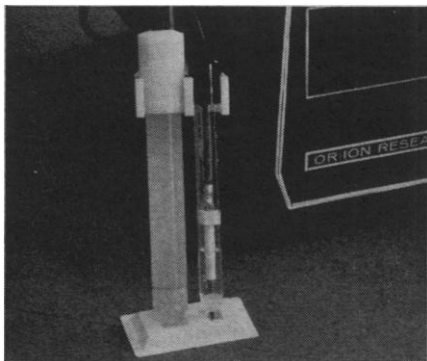
P
A
R

PRINCETON

APPLIED RESEARCH CORP.

Dept. G
Box 565, Princeton, N. J. Tel. (609) 924-6835

Now— measure calcium ion *directly* WITH NEW ORION ELECTRODE



First in a new series of specific ion electrodes, the Calcium Activity electrode of Orion Research Incorporated provides rapid continuous measurement of calcium ion activity in aqueous solutions. It permits direct measurement in solutions with concentrations ranging from saturated to 10^{-5} moles/liter. The electrode is an ideal endpoint detector for EDTA titrations.

ION EXCHANGE PRINCIPLE

The Orion unit detects calcium ion by developing a potential across a thin layer of ion exchanger that is highly selective for calcium. Measurements can be made in a millimolar calcium solution with negligible error despite the presence of a 100-fold excess of sodium or potassium. The electrode is at least 50 times more sensitive to calcium than to magnesium.

INSTRUMENTATION

The electrode can be used with any expanded scale pH meter and a conventional pH reference electrode. Technique is similar to simple pH measurement.

Response and reproducibility are comparable to that of good pH electrodes. Sample requirement, using a special micro sample dish, is only 300 microliters.

The electrode, available through major laboratory supply dealers, is priced at \$145.00.

Use this coupon to request
product literature.

Name

Organization

Street

City

State Zip

Laboratory Supply Dealer

ORION RESEARCH INCORPORATED
11 Blackstone Street, Dept. D
Cambridge, Massachusetts 02139
(617) UN 4-5400

ing several hundred reprint requests to the wastebasket leaves a sense of guilt at frustrating legitimate attempts by scientists to cover the world literature. It is interesting to note that the number of requests per paper correlates with the number of key words in its title and not its length. Please accept this letter as my personal apology for discourtesy engendered by circumstances which may not be peculiar to our Institute.

F. C. GREENWOOD

*Imperial Cancer Research Fund,
Lincoln's Inn Fields,
London, W.C.2, England*

Art in Science:

Another Protagonist

The letters on the subject of art in science (20 May, 11 March, and 10 December) point up the abysmal ruts into which the concept of art is being channeled these days. To equate a mechanically derived photograph of a natural phenomenon with art reveals a basic misconception of what we call art.

We have gone a long way from such narrow opinions as propounded by such men as Aristotle or Tolstoy who held the view that imitation of nature is the highest aim of art, or that a work of art must be sugarcoated to be beautiful. The imitation of an apple or a tree as seen by the naked eye, or the path of an electron in a cloud chamber as revealed by the electron microscope, can never be more than mere facts of nature. The reasons why similarities exist between the appearance of an amoeba or an exploding galaxy and certain forms that appear in abstract paintings are twofold: either the abstract artist became acquainted with certain forms as revealed by the microscope or telescope and used them as raw materials in the same way as the general lines of the human body or as the arrow were used by artists of Paleolithic times; or else, the artists in their search for rhythmically related forms have discovered and predicted the existence of such forms in nature unperceived by the naked eye. In either case, the creative effort consists not in the forms employed but in the design of a rhythmic configuration so organized as to constitute an esthetic unity. The accidental apparent unities which are sometimes found in nature such as driftwood, stone, or photomicrographs,

must never be confused with works of art, which are man's effort to recreate and give meaning to life experience.

The aim that art and science have in common, though they take different paths to accomplish it, is to create order out of chaos. The Albany Exhibit would have been far more instructive and much less confusing to the general public if the mechanically derived works were separated from man's efforts to create works of art. The mechanically derived photographic works could stimulate and inspire artists in their creative efforts and would therefore be of value, especially to those who have little access to scientific journals or books.

I have derived much esthetic pleasure and stimulation from many of the photographs that have appeared in *Science*. To mention a few, I would like to point out the cover designs, Fibrillar Nylon (31 Dec.), Alaskan Island, aerial view (15 April), and Lightning (28 Jan.), the photograph of a particle of interplanetary dust (7 Jan., p. 36), and chemiluminous trails (20 May, p. 1020).

MORTIMER BORNE

107 South Broadway, Nyack, New York

Automotive Watchdog

It is with great surprise that I watch the continuation of the debate on Nader's *Unsafe at Any Speed* (Letters, 21 Jan. and 25 Mar.), especially the letters from scientifically trained readers. . . . anyone who has followed "Uncle" Tom McCahill in *Mechanics Illustrated* for the last 20 years will find nothing new or surprising in *Unsafe at Any Speed*. Other automotive reporters say much the same but without "Uncle Tom's" humor. Year after year McCahill is given access to the automobile company proving grounds and latest model cars. He tests and reports on each, carefully telling what dealer options and private modifications would make the car more safe operationally. He reports statements from engineers who repeatedly show bad sales data on models where engineering took precedence over styling. He is bitterly critical of automobile company management, but admits that they have little choice. An interview with Tom McCahill would be most enlightening.

LOUIS E. FAY III

Bishop's House, Monrovia, Liberia

7.384

ORION RESEARCH

MODEL 801
DIGITAL pH

ACTUAL SIZE

Read to 0.001 pH at 30 feet in pitch darkness

The Orion Model 801 all solid state, digital pH meter gives continuous numerical readings from pH 0.000 to 13.999 — in numerals so large they can be seen at thirty feet in pitch darkness or broad daylight.

Continuous millivolt readings

For potentiometric measurements, the instrument provides automatic polarity indication and continuous coverage from +999.9 to -999.9 mv in 0.1 mv increments. Readings are taken without polarity switching, range selection or scale interpolation.

Research measurements

The instrument's repeatability of ± 0.001 pH makes it ideal

for critical clinical and research pH determinations. Direct reading to 0.1 mv makes possible more accurate specific ion measurements with Orion's new series of membrane and single crystal electrodes.

Computerized circuitry

The Model 801 uses high-reliability, high-speed computer type integrated circuits. A recorder output is provided in addition to a binary coded decimal output for printer or computer interfacing.

Availability

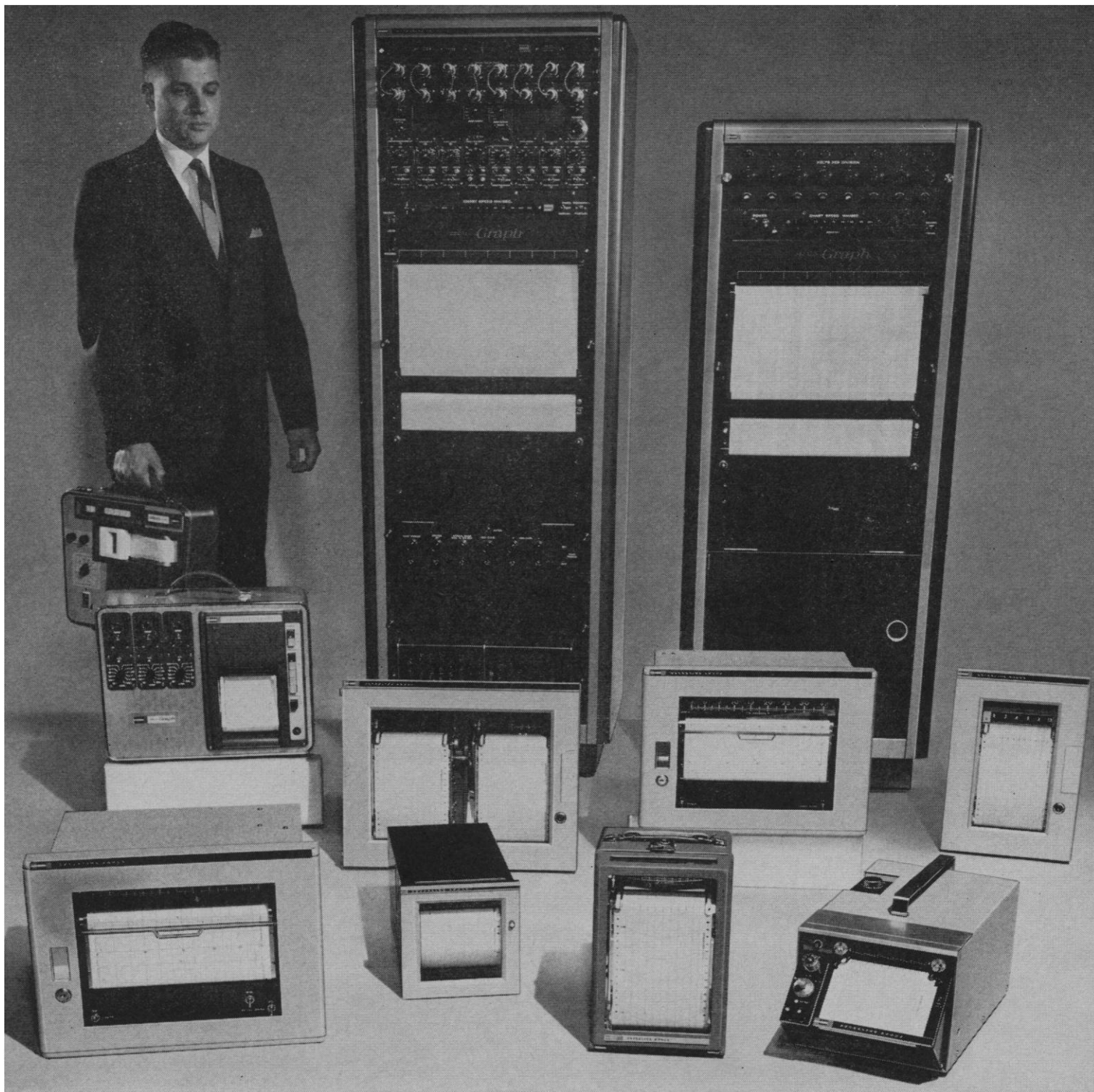
The Orion Model 801, priced at \$895 without electrodes, is available from major laboratory supply dealers. Ask for descriptive literature or a demonstration.



ORION RESEARCH INCORPORATED
Dept. D, 11 Blackstone Street
Cambridge, Mass. 02139/(617) UN 4-5400

- ☐ Please send a copy of the 801 bulletin.
☐ Please arrange a demonstration.

Name _____
Organization _____
Street _____
City _____
State _____ ZIP _____
Laboratory Supply Dealer _____



Esterline Angus doesn't keep handing you the same old line!

We keep developing new graphic recorders and new features to incorporate in established recorders . . . to satisfy your needs.

We've developed a trouble-free servo motor with only one moving part. No pulleys, drive cords or gears. It delivers 2/10 second response over a 10" span and 1/8 second response over a 4 1/2" span.

Our new Multipoint has an exclusive Programmed Printing option. It lets you select points electrically with switches.

You can now order our Permanent-Mag-

net Moving-Coil recorders with magnetic amplifiers (to increase sensitivity) or with power transducers (to measure watts, volts, amperes, vars . . .).

We've designed a Rapid Response (1/10 second) Voltmeter. It records 100 millisecond voltage transients with full accuracy . . . especially valuable in monitoring power supplied to data processing units.

In addition to our best selling Ink Type Event Recorders are new Inkless and High Impedance Event Recorders. The high im-

pedance instrument can be bridged into low power (i.e., telephone) circuits without upsetting their operation.

Want to record more than one channel of information on the same chart? We now have six types of two-channel recorders, plus an Analog-Event Recorder which provides one channel of analog information and eight channels of event information.

Oscillo Graphs? Choose from nine units including portables and cabinet models. All with frequency response above 125 cps.

Write for our full line brochure. You'll discover we make more kinds of graphic recorders than just about anybody else.

Esterline Angus Instrument Co., Inc.
Box 24000L • Indianapolis, Ind. 46224



ESTERLINE ANGUS
EXCELLENCE IN INSTRUMENTATION FOR OVER 60 YEARS

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

ROBERT L. BOWMAN	EVERETT I. MENDELSON
JOSEPH W. CHAMBERLAIN	NEAL E. MILLER
JOHN T. EDSALL	JOHN R. PIERCE
EMIL HAURY	KENNETH S. PITZER
ALEXANDER HOLLAENDER	ALEXANDER RICH
WILLARD F. LIBBY	DEWITT STETTEN, JR.
GORDON J. F. MACDONALD	CLARENCE M. ZENER

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 and Comment: DANIEL S. GREENBERG, JOHN WALSH (European Office, 36A Woodstock Road, Begbroke, Oxfordshire, England), ELINOR LANGER, LUTHER J. CARTER, BRYCE NELSON, MARION ZEIGER, JANE AYRES

Europe: VICTOR K. McELHENY, Flat 3, 18 Kensington Court Place, London, W.8, England (Western 5360)

Book Reviews: SYLVIA EBERHART

Editorial Assistants: ISABELLA BOULDIN, ELEANORE BUTZ, BEN CARLIN, GRAYCE FINGER, NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, KONSLYNNIETTA HUTCHINSON, KATHERINE LIVINGSTON, DIRGHAM SALAH, BARBARA SHEFFER

Advertising Staff

Director

EARL J. SCHERAGO

Production Manager

ROSE MARIE ROMAGNOL

Advertising Sales Manager: RICHARD L. CHARLES
Sales: New York, N.Y., 11 W. 42 St. (212-PE-6-1858): ROBERT S. BUGBEE

Scotch Plains, N.J., 12 Unami Lane (201-889-4873): C. RICHARD CALLIS

Medfield, Mass. 02052, 4 Rolling Lane (617-359-2370): RICHARD M. EZEQUELLE

Chicago, Ill. 60611, 919 N. Michigan Ave., Room 426 (312-DE-7-4973): HERBERT L. BURKLUND

Los Angeles 45, Calif., 8255 Beverly Blvd. (213-653-9817): WINN NANCE

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

Science, and the Scientific Community

In an age of narrowly specialized scientific journals, *Science* publishes an unusually broad collection of material. As a weekly magazine presenting important late developments, we face the same deadlines and experience the same pressures as the great news magazines. Yet we must seek to maintain the high standards of technical quality expected of a scientific journal.

In the work of producing *Science* we are especially grateful for the warm response of the scientific community. This response is manifested in the growth of circulation and in the devoted efforts of the thousands of scientists who make most of the judgments that determine the content of the journal.

Science continues to experience increasing and broad acceptance by an audience of high quality. During the past 4 years readership has grown by more than 60 percent, and it has now reached 126,000 paid subscriptions. The highest growth rate has been in foreign circulation, now over 11,000. The educational level of readers is high; about 60 percent have either a Ph.D. or an M.D. degree. All disciplines are represented, including the physical sciences. Among chemists, circulation of *Science* is greater than that of the *Journal of the American Chemical Society*.

Because of this broad and large audience, many contributors are attracted to *Science*. Pressure for space is especially great in areas of biology, medicine, psychology, and the earth sciences where publication is slow and journal circulation is often small. In some of these areas, we receive five times as many research reports as we can publish. In other areas we receive very few manuscripts. To improve the balance of content, some papers, particularly articles, are invited. Such material is sought on the basis of suggestions made by the Editorial Board supplemented by suggestions from hundreds of additional advisers. Currently we receive over 3000 articles and reports a year, besides 1500 other contributions—technical comments, letters, book reviews, and meeting reports. Most of the manuscripts submitted are of publishable quality. If all were printed, *Science* each week would be as thick as a metropolitan telephone book. This would be impractical financially, and such a mass of material would be burdensome to readers.

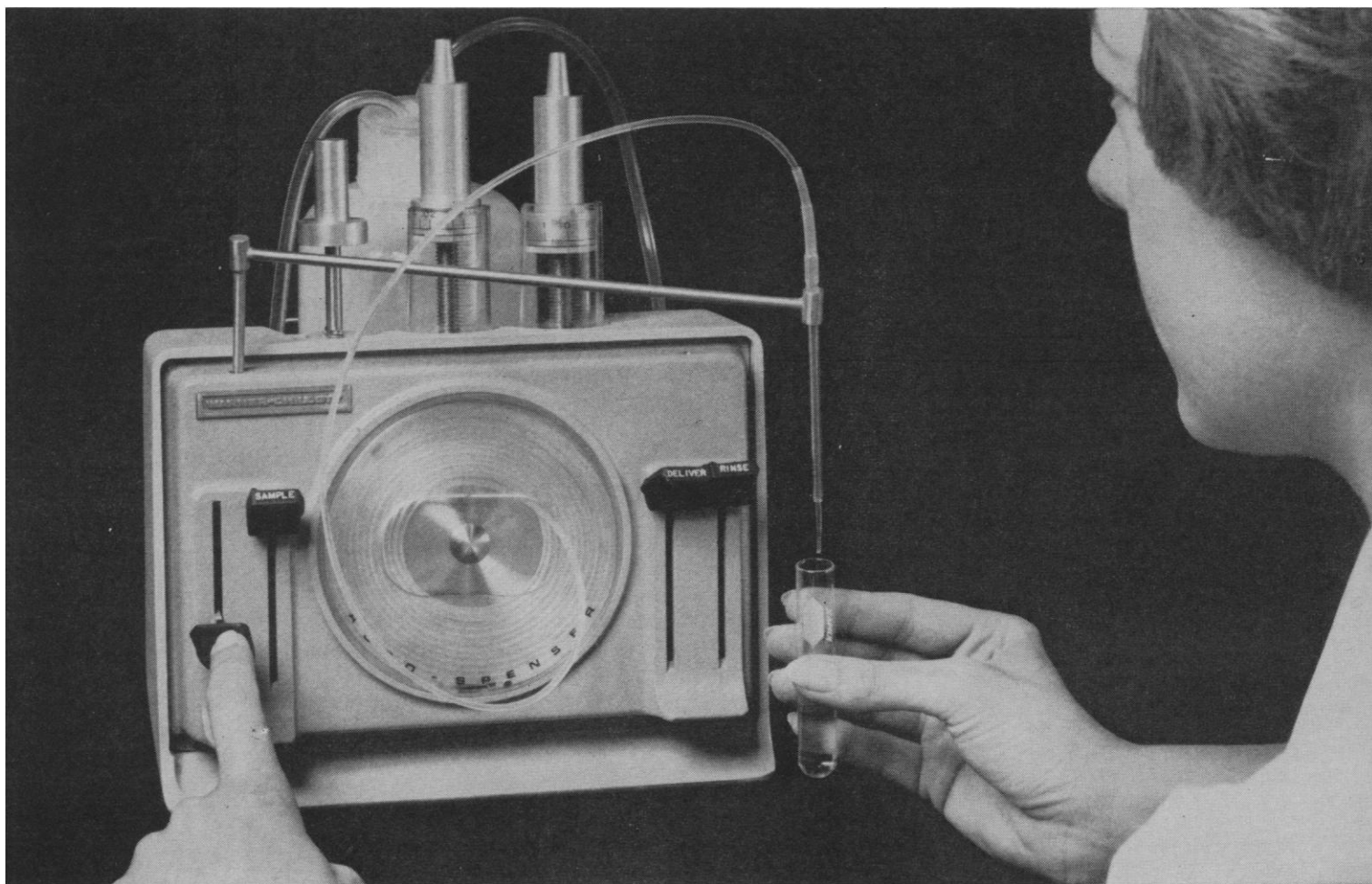
The problem of selection from among many deserving manuscripts is extraordinarily difficult. The diversity of the subject content makes it unfeasible for a small editorial staff or even a moderate-sized editorial board to do justice to the task. Selection of material for *Science* is a major effort that involves 4000 reviewers.

With rare exceptions, all scientific material, including invited articles, that appears in *Science* has been approved by at least two reviewers. Reviewers' comments are essential to sound staff judgment; the comments usually lead, also, to improvements in manuscripts. Most of the reviewers are very conscientious. In some instances constructive comments concerning a manuscript have exceeded the manuscript itself in length.

In the production of *Science* the staff of 35 is but a tiny fraction of the host of participants. The real work of *Science* is done by some of the best elements of the scientific community. Given their continued generosity and professional pride, the stature and value of *Science* will continue to increase.—PHILIP H. ABELSON



It's really a lot faster this way.



Warner-Chilcott's Auto-Spenser™—a precision laboratory instrument for fast, accurate and reproducible repetitive pipettings.

It takes only 15 seconds—or less—to pipette, add a reagent or diluent, and dispense, with Warner-Chilcott's Auto-Spenser.™ It's not only faster and safer than manual methods, but far simpler—you simply depress a lever. No pipettes to wash. You just depress a lever for that, too, and your Auto-Spenser rinses itself. Add to this the high accuracy and reproducibility of the instrument, and you'll see why we feel the Auto-Spenser belongs in every laboratory that performs repetitive pipettings. Time saved will quickly pay for its modest \$195 cost!

Versatile, Trouble-Free

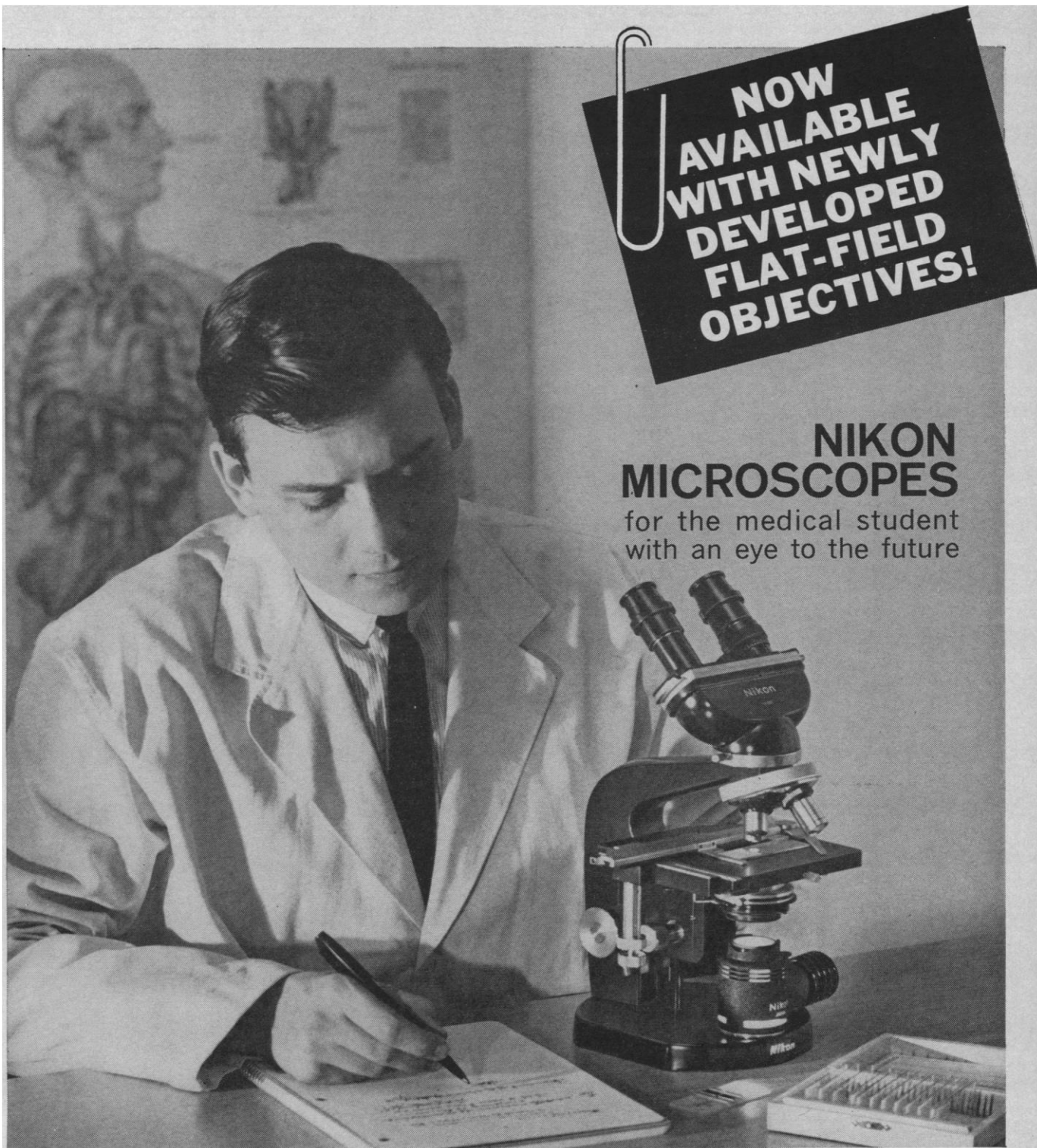
You can use your Auto-Spenser for pipetting, diluting, or dispensing. The self-wash feature lets you change reagents in seconds. Two micrometer-controlled pumps handle a wide range of sample and reagent volumes. It's easy to set and read sample volumes to one-half microliter—with no visual checking of liquid levels. The compact, rugged Auto-Spenser is completely mechanical. There's no electrical power needed, virtually nothing to break or replace, and no way for sample or reagent to enter the mechanism. It's practically foolproof!

Brief Specifications

Practical Volume Ranges: Sample, 20-250 μ l; Reagent, 0.5-5.0 ml. Sampling Reproducibility: $\pm 0.5 \mu$ l or $\pm 1\%$, whichever greater. Reagent Delivery Reproducibility: ± 0.005 ml or $\pm 0.5\%$, whichever greater.

Please write for details on Model 26500 Auto-Spenser. Address Warner-Chilcott Laboratories Instruments Division, 200 South Garrard Blvd., Richmond, California 94804

**WARNER-CHILCOTT LABORATORIES
INSTRUMENTS DIVISION**
Richmond, California



**NOW
AVAILABLE
WITH NEWLY
DEVELOPED
FLAT-FIELD
OBJECTIVES!**

NIKON MICROSCOPES

for the medical student
with an eye to the future

There are no Nikon *student* microscopes, in the sense of limited quality or usefulness. They are all professional units built around the same basic system, and differ only in the type of stage and eyepiece employed. Complete interchangeability of these components, and other attachments,

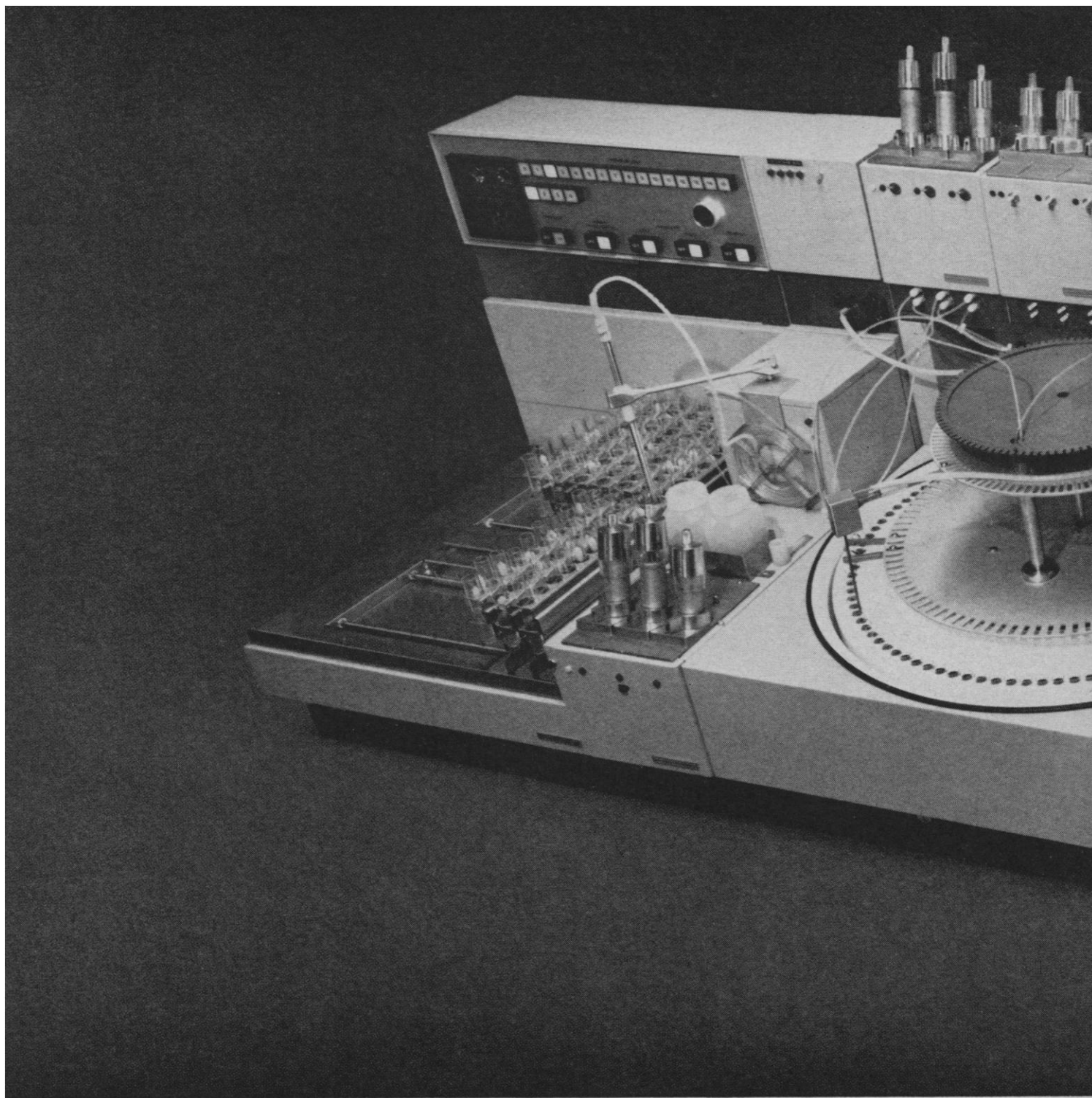
give each instrument a flexibility capable of serving the most specialized requirements of professional use long after it has served the student's needs at medical school. The flat-field objectives, newly developed by Nikon, further enhance this versatility. They achieve extreme flatness-of-field without impairment

of image quality or resolution. Moreover, they can be used with any Nikon microscope without modification or change in the instrument. The SBR, shown above, is one of the models most favored by medical students. It is a sophisticated unit, widely used in schools, hospitals and research laboratories.

For medical student microscope catalog, write:

Nikon Inc., Instrument Div., Garden City, N. Y. 11533, Subsidiary of Ehrenreich Photo-Optical Industries, Inc.

Visit Nikon Booth #76—NIH Show

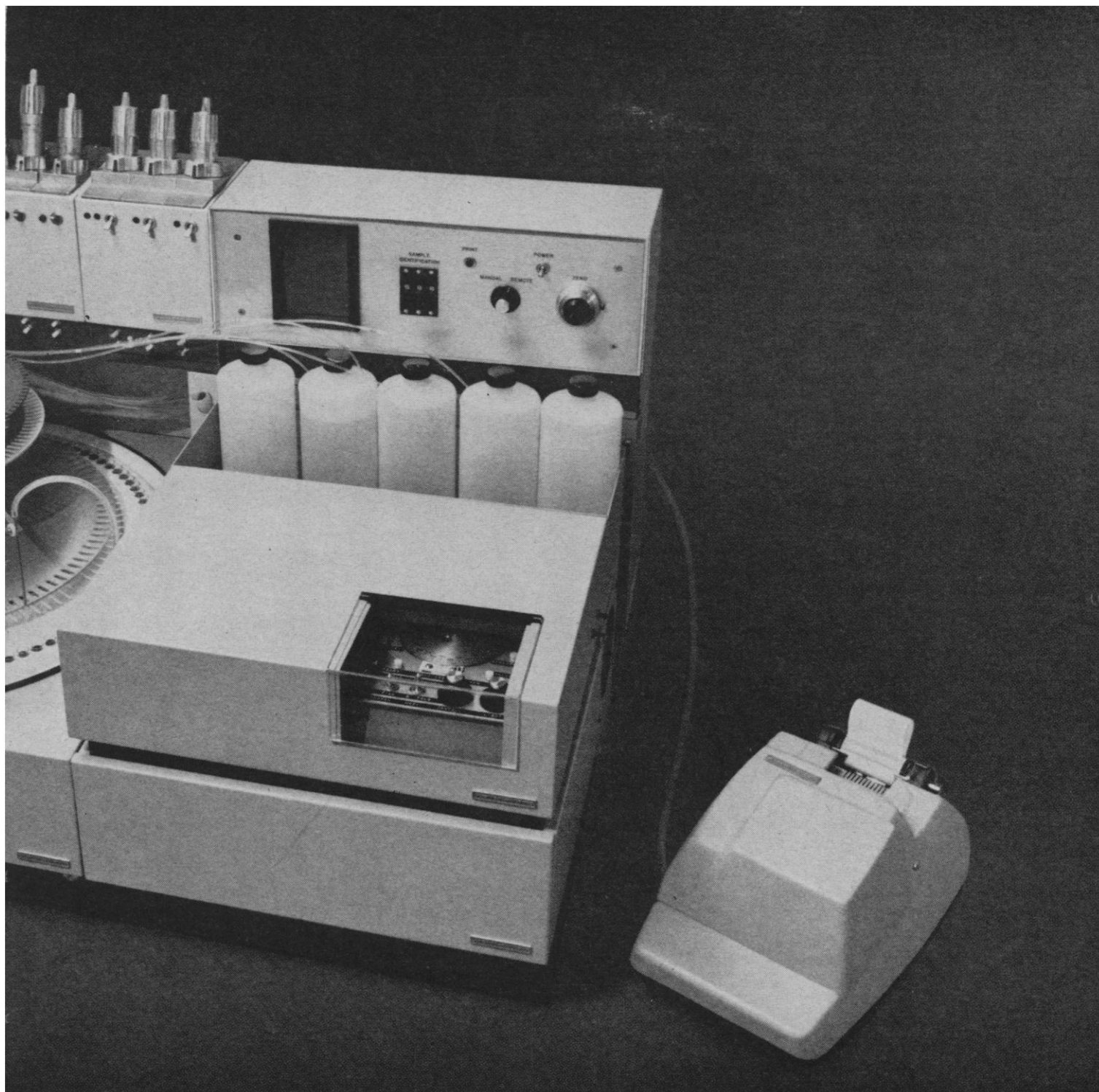


What your chemists should know about our chemist.

This is Warner-Chilcott's new Robot Chemist—The Automated Test Tube. If you're a believer in automation, you should know that:

The Robot can automate up to 120 repetitive wet chemical analyses per hour. That's far more work than any other automated system can turn out!

Equally important, the Robot's micrometer dispenser pumps and dual-beam spectrophotometer—combined with discrete sampling which virtually eliminates cross contamination—give you high accuracy and reproducibility. If you need dependable data, put your money on the Robot.



MEET THE AUTOMATED TEST TUBE

Just what is this newest workhorse for bioanalytical laboratories?

The Robot Chemist is an instrument that behaves like a chemist. It samples, dilutes, adds and mixes reagents, incubates, reads, and prints out a test result. Then, it rinses, washes, dries itself, and gets ready for the next sample. All at your command.

You can pick up samples from 20 μ l to 5 ml with 1% accuracy; add up to 7 reagents with 0.5% accuracy; incubate for precise periods of time with a thermal stability of $\pm 0.1^\circ\text{C}$ at 37°C or $\pm 0.5^\circ\text{C}$ up to 95°C ; and, measure through a spectrophotometer range of 340 to 1000

nanometers. It's ideal for enzyme and other analyses that require precise control of variables!

COUPLE THE ROBOT CHEMIST'S RESULTS TO A COMPUTER

When you're running the Robot Chemist at full capacity, you'll get a printed test result every 30 seconds in **digital form**—along with positive sample identification. Computer compatibility? Yes.

Get a hard worker like the Robot Chemist for your laboratory! For more information, please fill out the coupon.

**WARNER-CHILCOTT LABORATORIES
INSTRUMENTS DIVISION**
200 South Garrard Boulevard
Richmond, California 94804

Gentlemen: Please send me details on your Robot Chemist, including price and delivery.

Name _____

Title _____

Company/Institution _____

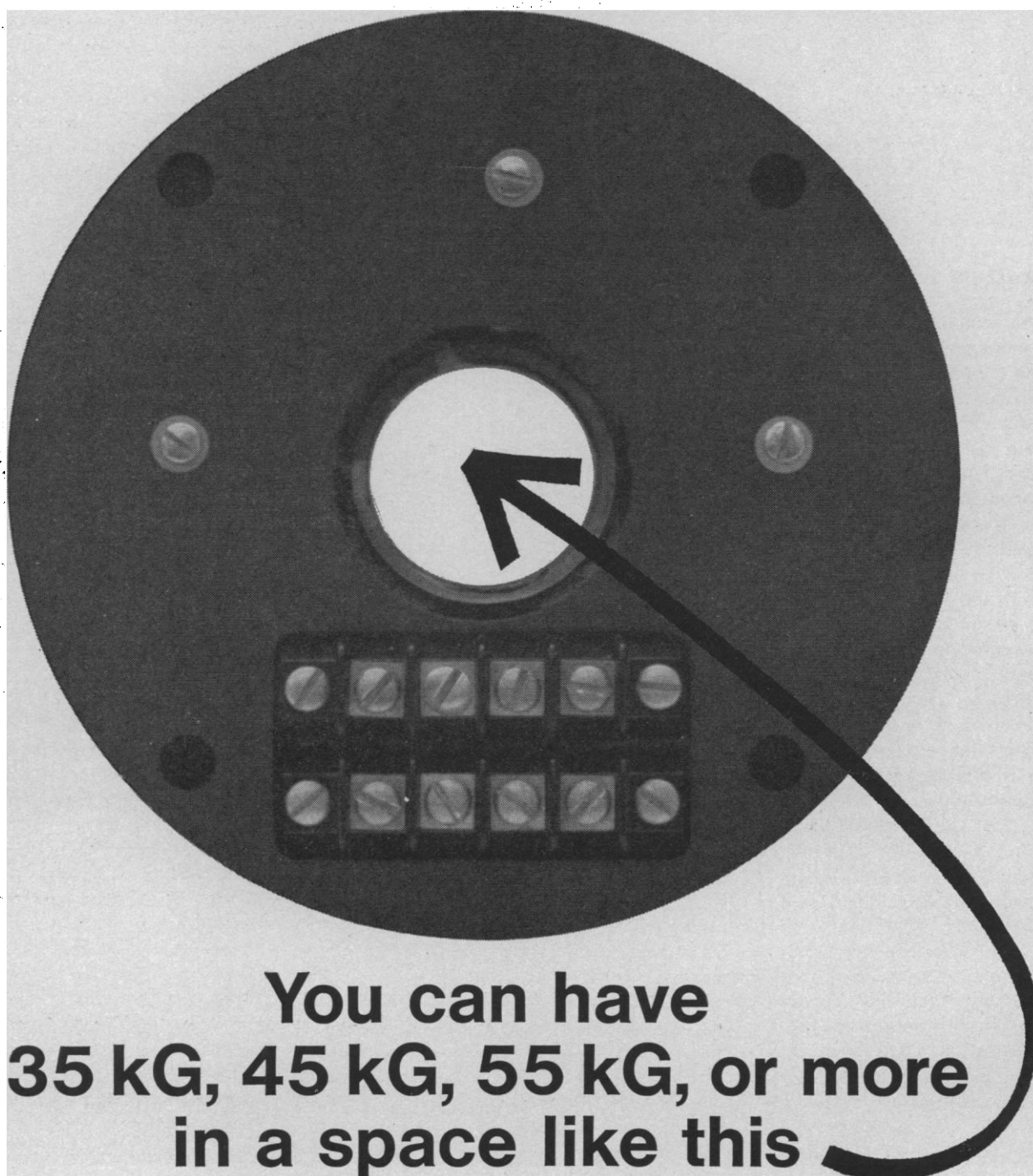
Street _____

Phone _____

City _____

State _____ Zip _____

My application is _____



**You can have
35 kG, 45 kG, 55 kG, or more
in a space like this**

That's just another way of saying you can have intense magnetic fields with large working volumes—without investing in a lot of heavy, bulky equipment. How? With one of Varian's superconducting magnet systems. Today they're at the heart of some of the most exciting work being done in the fields of solid-state physics and organic chemistry—and are of interest wherever intense magnetic fields are needed for extreme research environments.

You already have a magnet system? If it's not super-

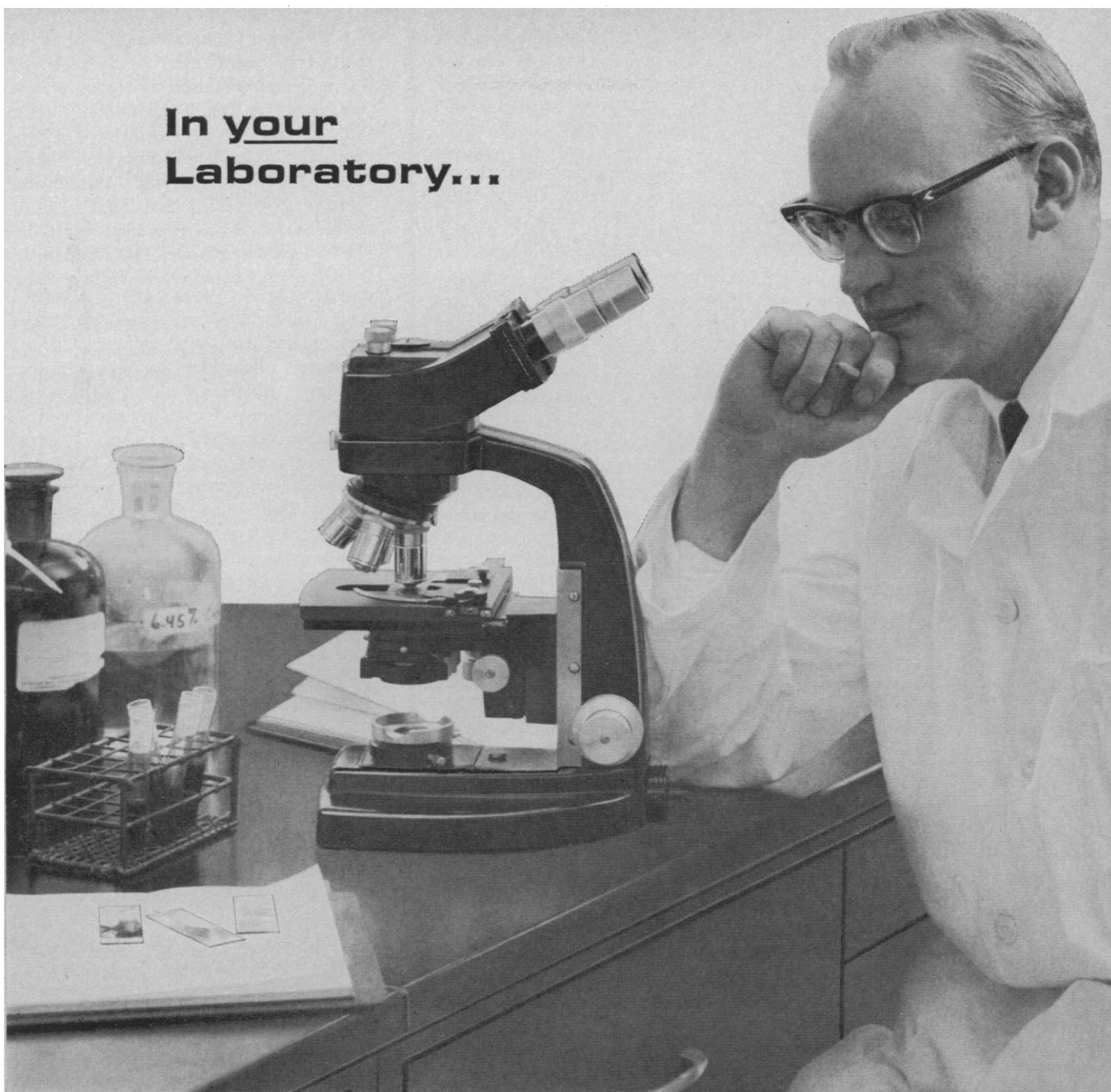
conducting, ask yourself this question: What would happen to your results if you could double or even triple your field without sacrificing quality? Well, you'd be getting better, more meaningful data.

Varian can supply you with a complete superconducting magnet system and all the support equipment you need. Performance guaranteed.

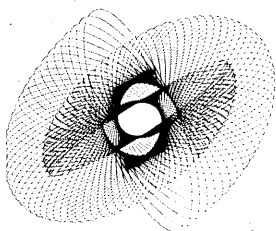
For more information on systems or applications drop us a line.

VARIAN ANALYTICAL INSTRUMENT DIVISION
ASSOCIATES PALO ALTO, CALIF. • ZUG, SWITZERLAND

**In your
Laboratory...**



Photograph taken in Strassenburgh Pharmaceuticals Research Center,
Division Wallace & Tiernan Inc., Rochester, N.Y.



LET YOUR OWN EYES DECIDE

You have to see a Bausch & Lomb Flat Field Dynazoom® Microscope perform to get the full impact of its two new optical systems.

The Dynazoom Achromatic Flat Field System gives you focal plane sharpness center to edge with all objectives. When you focus with your Flat Field objective the whole field of view is crisp, clear and sharp.

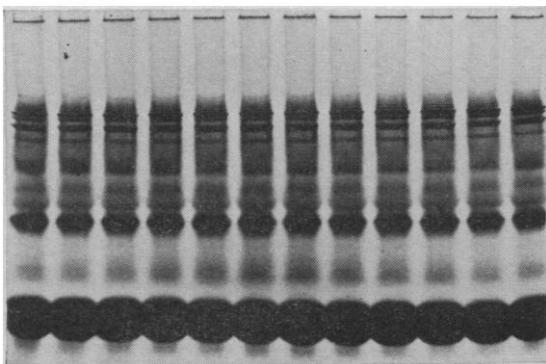
Continuously Variable Zoom Magnification lets you select the power just right for your own eyes and specimen. While changing magnification with Dynazoom you maintain constant, in-focus, visual contact with the specimen.

The sum of Bausch & Lomb Dynazoom and the Flat Field system is the perfect answer to the most demanding laboratory microscope challenge. Give Dynazoom a chance to prove its value. Then you will fully appreciate what Bausch & Lomb means when we say "For Better Microvision—Flat Field Dynazoom".

Ask for a demonstration. Send for brochure 31-185. Write Bausch & Lomb, 64233 Bausch St., Rochester, New York 14602.

BAUSCH & LOMB 

**if discontinuous
electrophoresis means
something to you...
so will our E-C 470
vertical gel cell.**



The discontinuous ("Stacked Gel") method showing 12 separations of the same serum.

The discontinuous, or "Stacked Gel" method rounds out the E-C 470 as the most versatile apparatus in its field.

- Separates 12 samples simultaneously on the same gel. Flat gel eliminates difficulties of cylindrical form for densitometer readings.
- Preparative separations are easily eluted.
- True two-dimensional gel electrophoresis for even greater resolution.
- Rapid separations for screening of hemoglobins or serum proteins with fully developed techniques.
- Favored in specialized research on lipoproteins, histones, and enzyme systems.

CIRCLE READER SERVICE
CARD FOR
"Total Electrophoresis System"
"Stacked Gel Electrophoresis"

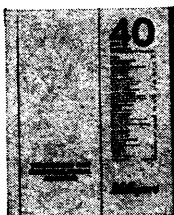
E-C APPARATUS CORPORATION
ELECTROPHORESIS & COUNTERCURRENT
220 S. 40th Street • Philadelphia, Pa. 19104

For seminar dates, call our applications laboratory: 215-382-2204

**Technical Manual
explains in detail
how to use
Millipore Filters
for microbiological
analysis of:**

Aerosols
Clinical Fluids
Drinking Water
Rinse Waters
Pasteurized Milk
Beer
Wine
Soft Drinks
Syrups
Sugar Products
Fuels and Oils
Surfaces
Floors
Utensils

36 pages of illustrated procedures in ADM-40 "Techniques for Microbiological Analysis" available free of charge from



SEND FOR
FREE COPY

Millipore®

FILTER CORPORATION
145 Ashby Rd., Bedford, Mass. 01730

versatility!

**COMPACT
INFUSION PUMP**

Model 975 accepts glass or plastic syringes from 100 to 5 ml, which are held in snap-on holders. 30-speed gearbox permits selection of synchronous speeds over a 17,000-1 range. Rates are 0.00046-154.8 ml./min.; weight is 12 lbs.

ASK FOR YOUR FREE
COPY OF BULLETIN 975

**HARVARD
APPARATUS CO., INC.**
Dept. A-85, Post Office Box 17
Dover, Massachusetts 02030

ler) will aid considerably in the description of these phenomena in eucaryotes in general. Kappy (University of Wisconsin) noted that an "uptake" mutant resistant to ethionine had a weaker cell membrane, as indicated by osmotic treatments of protoplasts. DeBusk (Florida State University) reported that conidia normally contain transport systems for all amino acids except proline. Several workers were able to lend confirmation to Wiley's (Batelle-Northwest Laboratory) suggestion that the maintenance of active uptake systems is strongly dependent upon continued protein synthesis.

Travel funds for some participants, including the foreign visitors, were generously provided by the National Science Foundation through a grant (NSF-GB4471) to the University of Michigan. Planning and operating expenses were defrayed in part by an allocation from the Institute of Science and Technology, University of Michigan, and the host institution, the Biology Division of the Oak Ridge National Laboratory, provided essential facilities, space for the last session, and a reception for the participants.

A more definitive report of the conference has been published in *Neurospora Newsletter*, Number 9, June 1966.

ROWLAND H. DAVIS

Department of Botany, University of Michigan, Ann Arbor

Forthcoming Events

October

23. **Research in Medical Education**, 5th annual conf., Assoc. of American Medical Colleges, San Francisco, Calif. (P. J. Sanazaro, Div. of Education, Assoc. of American Medical Colleges, 2530 Ridge Ave., Evanston, Ill. 60201)

23-25. **Vacuum Microbalance Techniques**, 6th informal conf., Newport Beach, Calif. (7500 Jefferson St., Paramount, Calif. 90723)

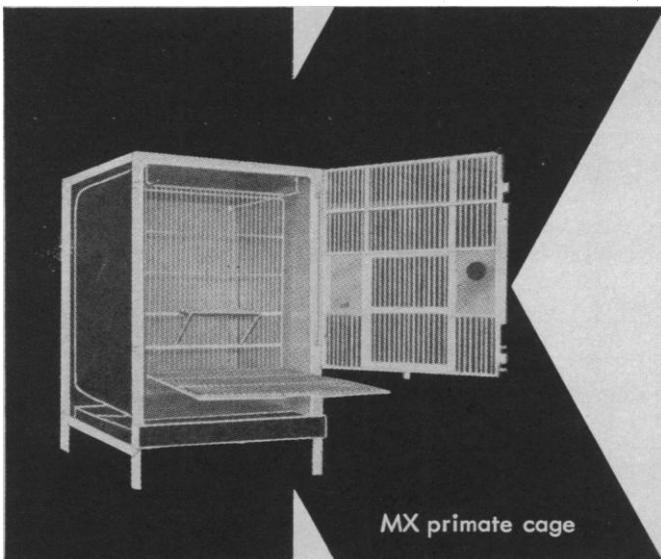
23-29. **Cancer 9th intern. congr.**, Tokyo, Japan. (Secretariat, Cancer Inst., Nishisugamo, Toshima-ku, Tokyo)

24. **American Assoc. of Poison Control Centers**, 9th annual mtg., Chicago, Ill. (M. S. McIntire, The Association, 44th and Dewey Ave., Omaha, Nebr. 68105)

24-26. **Canadian Assoc. for Applied Spectroscopy**, natl. mtg., Montreal, Que. (S. Barabas, Research Center, 240 Hymus Blvd., Pointe Claire, Que.)

24-26. **Medical Education**, symp., Beirut, Lebanon. (B. Thurston, American Univ. of Beirut, Beirut)

24-27. **Instrument Soc. of America**, 21st annual conf., New York, N.Y. (ISA, 530 William Penn Pl., Pittsburgh, Pa.)



dog & primate cages

Molded seamless construction of rugged fiber glass reinforced plastics... minimum effort required to clean and disinfect... maximum animal comfort... extremely strong doors with fool proof catches... economical to purchase and maintain... For further information

write:
Department KS

Kirschner
MANUFACTURING COMPANY

Vashon, Washington

BACTO-LATEX

0.81 MICRON

¶ Bacto-Latex 0.81 micron is characterized by uniform particle size, batch reproducibility and biological inertness.

¶ An inert carrier for use in clinical and investigational tests including

RHEUMATOID ARTHRITIS

INFLAMMATORY DISEASES

TRICHINOSIS

LEPTOSPIROSIS

¶ Recommended for Rheumatoid Arthritis Tests of Singer and Plotz and modifications.

Literature available on request

DIFCO LABORATORIES
DETROIT 1 MICHIGAN USA
LABORATORY PRODUCTS

BIOLOGICS

CULTURE MEDIA

REAGENTS



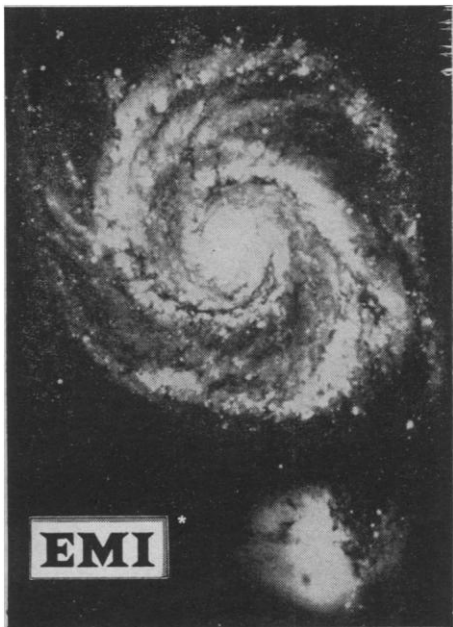
***If you're going to
dedicate a period of
your life to it—
make sure you get
the most from it.***



ENVIRONMENTAL DIVISION



We manufacture a variety of controlled environment laboratories—from bench chambers to walk-in rooms. Our experience in working with leading universities and government agencies, plus the options available in control selection, enables us to assist you in getting the *right* unit for your research program. Write us today for more information. Dept. 3 Sherer-Gillett Co., Marshall 1, Mich. 49068



Measuring low light levels

...requires extremely low dark currents coupled with maximum useful sensitivity. The EMI 6256, a 13-stage venetian blind 2" photomultiplier tube has the essential characteristics that are necessary for low light level applications. The unique 10mm cathode-DI geometry, together with the ultra-stable EMI venetian blind design, has resulted in its widely successful use in astronomy, biology and spectrophotometry. The EMI 6256B has a quartz window and the S-11 cathode (S-13) which has a peak quantum efficiency of 17% at 4,200 Å. The EMI type 6256S has 5 to 10 times lower dark current than the 6256B, and should be used when system performance is dark current limited. This type is also available for visible light applications as 9502B/9502S, or with 11 dynodes as 6094B/6094S. Many other EMI photomultiplier tubes are available for special applications from stock in sizes from 1" to 12". EMI photomultiplier tubes are available through qualified engineering representatives located in major marketing areas throughout the United States. A request on your company letterhead will bring you the name of your nearest representative as well as a copy of our latest catalog.



Whittaker
CORPORATION
GENCOM DIVISION

80 Express St., Plainview, L. I., N. Y.
516-433-5900 TWX 516-433-8790
*EMI ELECTRONICS, LTD.

24-27. **Oak Ridge** Inst. of Nuclear Studies, Medical Div., 10th medical symp., "Compartments, Pools, and Spaces," Oak Ridge, Tenn. (Chairman's Office, Medical Division, ORINS, Oak Ridge, Tenn.)

24-28. **Botany**, 3rd Mexican congr., Botanical Soc. of Mexico, Mexico City. (J. Sarukhan K., P.O. Box 19140, Mexico 19, D.F.)

24-28. **Synthesis and Characteristics of Organic Radicals**, symp., Mittenwald, West Germany. (W. Fritsche, Gesellschaft Deutscher Chemiker, Postfach 9075, 6 Frankfurt am Main)

24-28. **Surgery, Orthopedics, and Traumatology**, intern. conf., Budapest, Hungary. (V. Hönig, Országos Traumatological Intézet, Mező Imre út 17, Budapest 8)

25-28. **American Assoc. of Blood Banks**, 19th annual mtg., Los Angeles, Calif. (The Association, 30 N. Michigan Ave., Chicago, Ill. 60602)

25-30. **Plant Stimulation**, symp., Sofia, Bulgaria. (C. I. Popoff, M. Popoff Inst. of Plant Physiology, Bulgarian Acad. of Sciences, 2 Latinka str., Sofia 13)

26-28. **Electron Devices**, intern. mtg., Inst. of Electrical and Electronics Engineers, electron devices group, Washington, D.C. (J. F. Hull, Litton Industries, 960 Industrial Rd., San Carlos, Calif.)

26-28. **Switching and Automata Theory** symp., Univ. of California, Berkeley. (Engineering Extension, Univ. of California, Berkeley)

26-28. **American Vacuum Soc.**, 13th annual symp., San Francisco, Calif. (E. E. Donaldson, Dept. of Physics, Washington State Univ., Pullman 99163)

26-29. **Society of Photographic Scientists and Engineers**, intern. colloquium on **Photographic Interaction Between Radiation and Matter**, Washington D.C. (W. S. Dempsey, Huston Fearless Corp., 1413 K St., NW, Washington 20005)

27-28. **Educational Records Bureau**, 31st annual conf., New York, N.Y. (W. S. Litterick, Educational Records Bureau, 21 Audobon Ave., New York 10032)

27-28. **Growth Hormone**, conf., New York Acad. of Sciences, New York. (E. M. Miner, The Academy, 2 E. 63 St., New York 10021)

27-29. **American Chemical Soc.**, southeastern regional mtg., Louisville, Ky. (G. L. Shoemaker, Dept. of Chemistry, Univ. of Louisville, Belknap Campus, Louisville, Ky. 40208)

28-29. **Society for Scientific Study of Religion**, annual mtg., Univ. of Chicago, Chicago, Ill. (S. Z. Klausner, The Society, 1200 17th St., NW, Washington, D.C. 20036)

29-30. **Liver Regeneration**, intern. conf., Montecatini-Terme, Italy. (M. Messini, Postgraduate School for Liver Diseases, Univ. of Rome, Rome, Italy)

30-3. **Metallurgical Soc. of AIME**, fall mtg., Chicago, Ill. (American Inst. of Mining, Metallurgical, and Petroleum Engineers, 345 E. 47th St., New York, N.Y. 10017)

31-3. **American Soc. for Metals**, 48th annual congr. and natl. metal exposition, Chicago, Ill. (The Society, Metals Park, Ohio 44073)

31-4. **American Public Health Assoc.**, 94th annual mtg., San Francisco, Calif. (The Association, 1790 Broadway, New York, N.Y. 10019)

What's so great about DigiBit solid state logic modules?

Simplicity,
Guarantee,
Dependability,
Flexibility, Accuracy,
Economy, Stability,
Performability . . .
(plus a few more that don't rhyme)

BRS, digital logic equipment, known as DigiBits, has added real meaning to the advantages of solid state electronics. Researchers in psychology, toxicology, pharmacology and other disciplines are finding DigiBits can put electronics to work in ways never before possible. Parameters have been expanded, resolutions narrowed and complex experiments made feasible where electro-mechanical devices could not perform satisfactorily. In many fields the answers once considered conclusive are now subject to reappraisal.

Regardless of your research application, if there is a need to program, record and analyze data, DigiBit logic modules can do it better. The full capacity of technical achievement is here to serve you. The limit of its versatility is restricted only by your imagination and your experiment requirements.

And DigiBit solid state modules mean long equipment life. In fact, BRS puts it in writing that **all units are guaranteed to operate for an unlimited period of time when used in accordance with published specifications.**

There's a lot more to the BRS story. Enough to make a thorough investigation worthy of your serious consideration. Your questions are invited or if you have specific requirements let us know and we will tell you exactly how a system can be designed to do the job.

BRS electronics

DEPT. 505
5451 HOLLAND DRIVE
BELTSVILLE, MARYLAND 20705

NEW BOOKS

(Continued from page 1517)

Being Mentally Ill: A Sociological Theory. Thomas J. Scheff. Aldine, Chicago, 1966. 222 pp. Illus. \$5.75.

Jac. Berzelius: His Life and Work. J. Erik Jorpes. Translated from the Swedish manuscript by Barbara Steele. Almqvist and Wiksell, Stockholm, 1966. 156 pp. Illus.

A Bibliography in Neuropsychology: Review and Books 1960-1965. Prepared by Richard T. Louttit. U.S. Department of Health, Education, and Welfare, Natl. Institutes of Health, Bethesda, Md., 1966. 28 pp. Paper.

The Birth of Language: The Case History of a Non-verbal Child. Shulamith Kastein and Barbara Trace. Thomas, Springfield, Ill., 1966. 192 pp. Illus. \$6.75.

Catalogue of Technical and Scientific Films. Edited by the Film Section of the Information Service of OECD. Organisation for Economic Co-operation and Development, Paris, 1966. 355 pp. Contains a section on film data and description, a title index, a subject index, and a list of national film centers in various countries; lists over 4500 films.

The Cautionary Scientists: Priestley, Lavoisier, and the Founding of Modern Chemistry. Kenneth S. Davis. Putnam, New York, 1966. 256 pp. Illus. \$5.75.

Civil War Medicine. Stewart Brooks. Thomas, Springfield, Ill., 1966. 160 pp. Illus. \$6.

Climates of the World and Their Agricultural Potentialities. J. Papadakis. The Author, Av. Cordoba 4564, Buenos Aires, Argentina, 1966. 184 pp. Illus. Paper.

Clinical Epidemiology. John R. Paul. Univ. of Chicago Press, Chicago, ed. 2, 1966. 325 pp. Illus. \$7.50.

Communication Switching Systems. Murray Rubin and C. E. Haller. Reinhold, New York, 1966. 400 pp. Illus. \$16.50.

Ecuador. Betty J. Meggers. Praeger, New York, 1966. 220 pp. Illus. \$7.50.

The Education of Catholic Americans. Andrew M. Greeley and Peter H. Rossi. Aldine, Chicago, 1966. 390 pp. Illus. \$8.95.

Electronics: A Bibliographical Guide. vol. 2. C. K. Moore and K. J. Spencer. Plenum Press, New York, 1965. 385 pp. \$18. Covers the literature between 1959 and 1964.

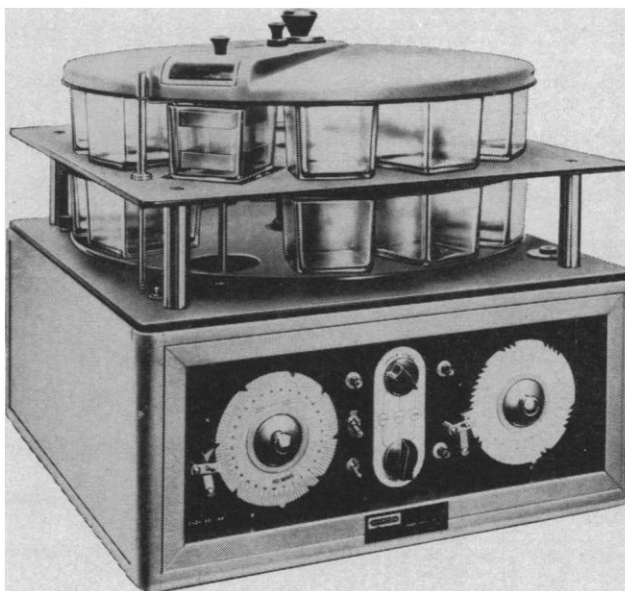
Engineer: Ingenious Contriver of the Instruments of Civilization. S. C. Hollister. Macmillan, New York, 1966. 155 pp. \$3.95. Career Book Series.

Evaluating Development Projects. Samuel P. Hayes, Jr. Unesco, Paris, ed. 2, 1966 (order from Unesco Publications Center, New York). 116 pp. Illus. Paper, \$2.50.

The Focal Encyclopedia of Photography. vols. 1 and 2. L. A. Mannheim et al., Eds. Focal Press, New York, ed. 2, 1966. vol. 1, 864 pp.; vol. 2, 891 pp. Illus. \$39 set. More than 2400 articles contributed by 281 authors.

The Forests of the U.S.S.R. V. P. Tseplyaev. Translated from the Russian edition (Moscow, 1961) by A. Gourevitch. Israel Program for Scientific Translations, Jerusalem, 1965; Davey, New York, 1966. 527 pp. Illus. \$19.

Improve the performance of your lab staff... **AUTOMATICALLY**



This is the Shandon-Elliott 23-station automatic slide staining machine. With it you are assured an extremely high degree of reproducibility when preparing Pap stains, blood films, bone marrow spreads and tissue sections. It is equally well suited for routine slide staining or where absolute quality from slide to slide is required. Automatic slide staining improves the performance of your lab staff by releasing skilled technicians to do other important work.

The Shandon-Elliott 23-station slide staining machine, which holds up to 54 slides, is actually three machines in one. It acts as two separate machines operating simultaneously on different cycles, or as two separate units operating on the same staining cycle at the same time, or as one machine operating at all 23 staining positions. Cost: \$2200.

Other slide staining machines include 8-station model at \$1250 and 12-station model at \$1460. Also available is a Shandon-Elliott coverslip staining machine with a capacity of 72 coverslips at \$1250.

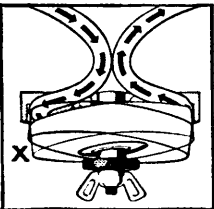
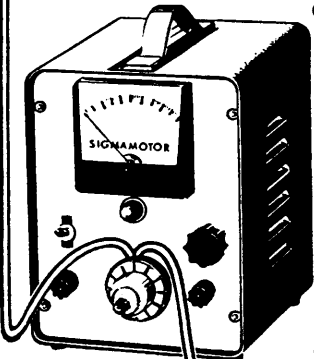
For more information on Shandon-Elliott slide and coverslip staining machines and other quality scientific tools, contact Shandon Scientific Company, Inc., 515 Broad Street, Sewickley, Pa. 15143 (Pittsburgh District).

SHANDON

INFINITELY VARIABLE
MICRO PUMP

**NO VALVES • NO CONTAMINATION
NO CORROSION • NO CLEANING**

In Sigmamotor AL Pumps a loop of plastic tubing is placed in back of plate "X". A rotating eccentric shaft tilts this plate in a nutating manner compressing the tubing and forcing liquid or slurry around the loop. Speed of DC Motor is varied by a solid state converter operating on regular 115 Volt AC. Flow rate can be recorded and repeated exactly. Set-up and calibration is quick and easy.

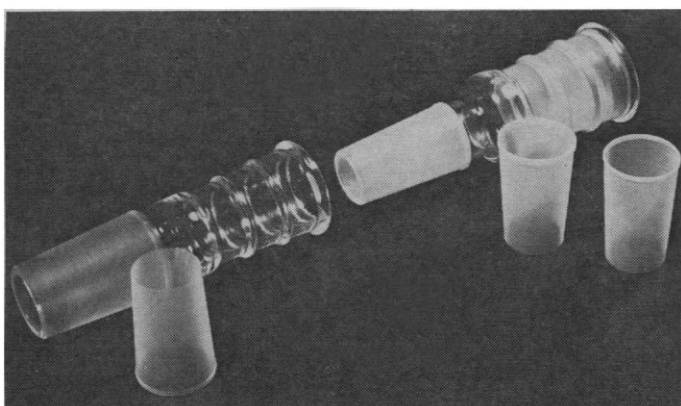



- Column Chromatography
- Feeding-Sampling
- Drug Infusion

CAPACITIES:
AL-2E, 1.5 to 120 ML Hr. \$285;
AL-4E, 10 to 900 ML Hr. \$295

**SIGMAMOTOR
INCORPORATED**
68 North Main St. • Middleport, N. Y.

TEFLON® SLEEVE, high porosity



Sleeve is 5 ml thick, thin wall, full and medium length, pure TEFLON, fits any tapered joint of laboratory glassware, rim reinforced, maximum expansion and return to original dimension; no greasing; no contamination; eliminates fusing of glass. Protects against hazards when working with corrosive materials.

CONTACT YOUR WHOLESALER FOR DETAILS

Write for sample of your size.

Scientific Machine and Supply Co.
700 Cedar Avenue
Middlesex, N.J. 08846
356-1553

SMS Cat #301.

® Du Pont Reg.

1560

**-55°C to +120°C
±.03°C control stability**

Tenney's new mechanically refrigerated, multi-range bath is ideal for instrument calibration, biochemical work, checking critical components and ASTM tests. Additionally, the fluid may be circulated to cooling condensers, refractometers, spectrophotometers and special systems.

For complete information, write to:

**Tenney
ENGINEERING, INC.**
1090 SPRINGFIELD ROAD, UNION, N.J.
Western Div.: 15700 S. Garfield Ave.
Paramount, Calif. 90723



New Tenney MR-1
Multi-Range Precision
Temperature Bath

334

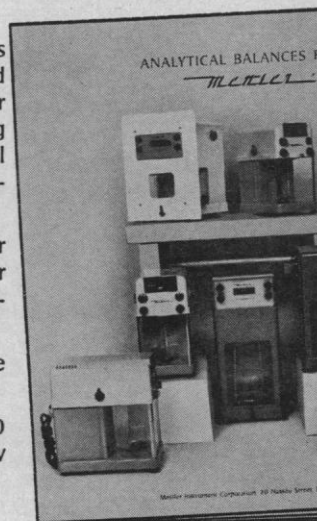
JUST PUBLISHED... New Catalog of Mettler Analytical Balances

This 24-page catalog contains complete descriptions and specifications on all Mettler analytical balances - including versatile H balances, classical B balances and specialized micro and ultramicro balances.

All are available from major laboratory supply dealers, for demonstration, trial or immediate delivery.

Request your own copy of the new catalog today.

Mettler Instrument Corp., 20
Nassau Street, Princeton, New
Jersey 08540.



Mettler®

SCIENCE, VOL. 153

Gas Chromatography Abstracts, 1965. C. E. H. Knapman, Ed. Published by the Institute of Petroleum, London. Elsevier, New York, 1966. 314 pp. \$12.

General Physical Geography. Pierre Birot. Translated from the French edition (1959) by Margaret Ledésert. Wiley, New York, 1966. 360 pp. Illus. \$8.50.

Group Practice and Prepayment of Medical Care. William A. MacColl. Public Affairs Press, Washington, D.C., 1966. 267 pp. Paper, \$2.50; cloth, \$4.50.

Hands on the Past: Pioneer Archaeologists Tell Their Own Story. C. W. Ceram, Ed. Knopf, New York, 1966. 434 pp. Illus. \$8.95. Contributors are J. M. Allegro, G. B. Belzoni, T. G. Bibby, H. Bingham, H. Bossert, P. E. Botta, R. L. S. Bruce-Mitford, E. A. Budge, J. L. Burckhardt, H. Carter, J. Y. Cousteau, O. G. Crawford, E. Curtius, G. Dennis, D. V. Denon, F. K. Dörner, A. Edwards, A. J. Evans, N. Glueck, A. Goldsmidt, Z. Goneim, H. V. Hilprecht, C. Humann, A. Kircher, R. Koldewey, A. H. Layard, C. M. Lerici, P. Mackendrick, A. F. Mariette, G. C. Maspero, L. Matouš, W. F. Petrie, A. Posnansky, H. C. Rawlinson, C. J. Rich, A. Ruz, C. F. Schaeffer, H. Schliemann, E. Seler, H. Sloane, G. Smith, G. Elliott Smith, C. P. Smyth, J. L. Stephens, C. Tarral, W. Taylour, T. H. Turner, V. W. von Hagen, A. von Humboldt, J. M. Waldeck, H. Walpole, H. Winckler, C. L. Woolley, and W. Wright.

High-Speed Photography. R. F. Saxe. Focal Press, New York, 1966. 137 pp. Illus. \$15.

An Historical Outline of Architectural Science. Henry J. Cowan. Elsevier, New York, 1966. 185 pp. Illus. Paper, \$5.75. Elsevier Architectural Science Series, vol. 1.

History of Analytical Chemistry. Ferenc Szabadvary. Translated from the Hungarian edition (Budapest, 1960) by Gyula Svehla. Pergamon, New York, 1966. 429 pp. Illus. \$18.50. International Series of Monographs in Analytical Chemistry, vol. 26.

A History of Space Flight. Eugene M. Emme. Holt, Rinehart, and Winston, New York, 1966. 224 pp. Illus. \$2.95.

Hortulus. Walahfrid Strabo. Translated from the 9th century manuscript by Raef Payne. Commentary by Wilfrid Blunt. Hunt Botanical Library, Pittsburgh, Pa., 1966. 103 pp. Illus. \$12.

The Human Body in Equipment Design. Albert Damon, Howard W. Stout, and Ross A. McFarland. Harvard Univ. Press, Cambridge, Mass., 1966. 380 pp. Illus. \$11.95.

In the Name of Science. H. L. Nieburg. Quadrangle Books, Chicago, 1966. 443 pp. \$7.95.

Index Kewensis: Plantarum Phanogamarum. Supplement 13. Compiled by George Taylor. Oxford Univ. Press, New York, 1966. 153 pp. \$18.50. Covers the data between 1956 and 1960.

Indian Culture and European Trade Goods. The archaeology of the historic period in the western Great Lakes region. George Irving Quimby. Univ. of Wisconsin Press, Madison, 1966. 231 pp. Illus. \$5.

Insects and Their World. Harold Oldroyd. British Museum (Natural History), London, ed. 2, 1966. 152 pp. Illus. Paper, 7s 6d.

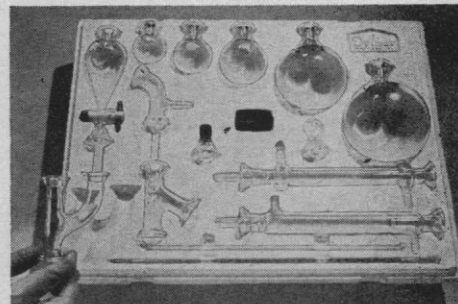
23 SEPTEMBER 1966

DELMAR MITE-O-WARE™ PREP-KIT

Makes any glassware set-up faster, easier, safer . . .

- no grease — uses O-ring joints and Teflon stopcocks — eliminates standard taper joints. Will not contaminate volatile agents.
- easily assembled—and dis-assembled
- convenient semi-micro size, for 15 mm tubing, micro and macro sizes also available

The Prep-Kit offers new speed, convenience and student comprehension in academic use . . . and its rugged practicality makes it ideal for commercial laboratories. Positive O-ring joints are superior to greased joints for high or low pressures over wide temperature range.



PREP-KIT, complete with Separatory Funnel, Claissen Adapter, Connecting Adapter, Vacuum Take-off, Condensers, Flasks, Thermometer, Buna-N O-rings, Clamps, etc. Price—only \$72.00. Quantity prices on request.



Delmar

SCIENTIFIC LABORATORIES, INC.
317 Madison Street, Maywood, Illinois 60153

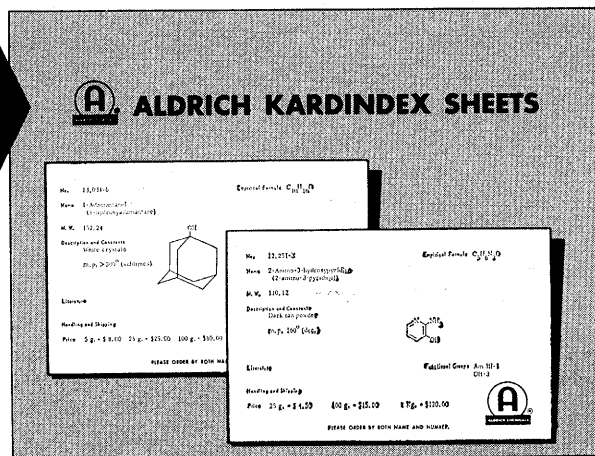
WRITE FOR
BULLETIN DB-25BS

A SUBSIDIARY OF COLEMAN INSTRUMENTS CORPORATION

Are You Up On The Latest In Available ORGANIC RESEARCH CHEMICALS?

Receive these
free supplements to our
1966 catalog
which already
lists over 8000
chemicals!

Detailed descriptions
of exciting new additions
to our rapidly
expanding product
line are sent to you
quarterly, keeping
you up-to-date on the
latest in organic, analytical and biochemical
tools.



For your FREE subscription to our Kardindex Service, simply fill in
the coupon and mail to one of the offices shown below.

KARDINDEX	NAME	POSITION
	COMPANY	
	ADDRESS	
	CITY	STATE ZIP



ALDRICH CHEMICAL CO., INC.

Main Offices and Labs
2365 North 30th Street
Milwaukee, Wis. 53210

Eastern Office
78 Clinton Road
Fairfield, N. J. 07006

West Coast Distributor
Wilshire Chemical Co., Inc.
15324 So. Broadway
Gardena, Calif. 90247

1561

TRG's new 104A laser system



Rugged • Reliable • Versatile • Economical

TRG's new 104A laser system has been designed specifically to meet the needs of the scientific researcher and the industrial laser technologist. A medium-power, economical laser system that is capable of operation under a wide range of conditions — including those outside a laboratory environment — the TRG 104A can be used for many applications, such as: Atmospheric Studies; Ballistic Research; Chemical Research; High-speed Photography; Medical and Biological Research; Optical Ranging; Vacuum Evaporation of Thin Films; Microwelding.

Special Features

- Maintenance-free operation in excess of 25,000 cycles
- Flashlamp replacement does not require realignment of optics
- Simple function switch permits rapid selection of either normal pulse or Q-switched operation
- Optical alignment is maintained under normal operating conditions of shock and vibration

Accessories

- 104A-4 — Second Harmonic Generator
- 104A-5 — Liquid Q-switch
- 109A — Daly-Slms Single-Pulse Accessory
- 109-4A — Baseplate for mounting laser, Q-switch, and 109A accessory.

Specifications

	Output
Normal mode3 to 5 joules
Q-switched mode1 to 1.5 joules
Wavelength6943Å
Minimum Recycle Time	...15 seconds

For more complete information write: TRG Inc., Section , Route 110, Melville (Long Island), New York 11746, Tel. (516) 531-6343.



TRG | A SUBSIDIARY OF CONTROL DATA CORPORATION

Intelligence in the Universe. Roger A. MacGowan and Frederick I. Ordway, III. Prentice-Hall, Englewood Cliffs, N.J., 1966. 416 pp. Illus. \$13.50.

International Politics since World War II: A Short History. Charles L. Robertson. Wiley, New York, 1966. 397 pp. Paper, \$3.95; cloth, \$6.95.

Into Work. Michael Carter. Penguin Books, Baltimore, 1966. 239 pp. Paper, \$1.25.

Is Reality Meaningful? Kelvin Van Nuys. Philosophical Library, New York, 1966. 624 pp. \$10.

Land under the Pole Star: A Voyage to the Norse Settlements of Greenland and the Saga of the People That Vanished. Helge Ingstad. Translated from the Norwegian edition (1959) by Naomi Walford. St. Martin's Press, New York, 1966. 381 pp. Illus. \$10.

Law and Administration. Jerry L. Weinstein, Ed. Pergamon, New York, 1966. 426 pp. \$15. Progress in Nuclear Energy Series, vol. 4. Nine papers: "The Vienna International Conference on Civil Liability for Nuclear Damage" by Karlfritz Wolff; "The Paris Supplementary Convention" by Raffaello Fornasier; "International Conventions on Civil Liability and Latin American Legislations" by Enrique Zaldívar; "Liability Legislation in Japan" by Shunji Shimoyama; "Some factors influencing the regulation of nuclear health and safety" by Ian Williams; "Reactor sites and safety" by C. Rogers McCullough; "Private ownership of special nuclear material in the United States" by Gerald Charhoff; "Legal and administrative problems arising from the implementation of International Atomic Energy Agency safeguards" by Paul C. Szasz; and "Liability of operators of nuclear ships: The 1962 Brussels Convention and its alternatives" by Peider Könz. There are 13 appendices containing the texts of the conventions and various documents.

Lectures on Geology: Including Hydrography, Mineralogy, and Meteorology with an Introduction to Biology. John Walker. Harold W. Scott, Ed. Univ. of Chicago Press, Chicago, 1966. 326 pp. Illus. \$8.50. Most of the papers are dated between 1782 and 1796.

The Living World of the Sea. William J. Cromie. Prentice-Hall, Englewood Cliffs, N.J., 1966. 349 pp. Illus. \$6.95.

Mariner IV to Mars. Willy Ley. New American Library, New York, 1966. 157 pp. Illus. Paper, 60¢.

Mathematics for Everyone. F. Klinger. Based on a translation of the French edition. Philosophical Library, New York, 1966. 207 pp. Illus. \$4.75.

Medical Practice in Modern England: The Impact of Specialization and State Medicine. Rosemary Stevens. Yale Univ. Press, New Haven, Conn., 1966. 415 pp. Illus. \$10.

Medicine in America: Historical Essays. Richard Harrison Shryock. Johns Hopkins Press, Baltimore, 1966. 366 pp. \$7.50.

Medicine in Modern Society. Medical planning based on evaluation of medical achievement. Thomas McKeown. Hafner, New York, 1966. 234 pp. Illus. \$5.25.

Men, Machines and History. The story of tools and machines in relation to social progress. S. Lilley. International Publishers, New York, 1966. 366 pp. Illus. \$7.50.

Mind and Cosmos. Essays in contemporary science and philosophy. Robert C. Colodny, Ed. Univ. of Pittsburgh Press, Pittsburgh, Pa., 1966. 380 pp. Illus. \$8. Ten essays by Herbert A. Simon, Dudley Shapere, Sylvain Bromberger, Carl G. Hempel, Wesley C. Salmon, Joseph T. Clark, Thomas Gold, and Henry Margenau.

Multilingual Dictionary of Important Terms in Molecular Spectroscopy. Prepared by the Subcommittee on Units and Terminology. Gerhard Herzberg, chairman. Commission on Molecular Structure and Spectroscopy, National Research Council of Canada, Ottawa, 1966. 227 pp. Illus. Paper. Available free to spectroscopists, librarians, and other interested scientists on request to the Secretary, National Research Council of Canada. The dictionary is divided into five sections, English, French, German, Japanese, and Russian, with the equivalent of each word or phrase given in the other four languages.

Mycenae and the Mycenaean Age. George E. Mylonas. Princeton Univ. Press, Princeton, N.J., 1966. 340 pp. Illus. Plates. \$18.50.

The New Field Book of Freshwater Life. Elsie B. Klots. Putnam, New York, 1966. 398 pp. Illus. \$4.95.

New Light on Prehistoric China. Cheng Te-K'un. Heffer, Cambridge, England; Univ. of Toronto Press, Toronto, 1966. 63 pp. Illus. \$5. Archaeology in China, supplement to vol. 1.

The New Technology and Human Values. John G. Burke, Ed. Wadsworth, Belmont, Calif., 1966. 416 pp. Paper, \$3.95; cloth, \$5.25. Sixty-two papers on the following topics: Science, Technology, and Society (19 papers); Automation—A Creation of the New Technology (13 papers); The New Technology and Emerging Issues (16 papers); and Science, Technology, and the Policy-Making Process (14 papers).

New Universities in the Modern World. Murray G. Ross, Ed. Macmillan, London; St. Martin's Press, New York, 1966. 200 pp. Illus. \$5. Eleven papers.

Our World and the Universe Around It. vols. 1 to 4. vol. 1, *The Universe* (167 pp.); vol. 2, *The Earth* (169 pp.); vol. 3, *Matter and Energy* (136 pp.); vol. 4, *Life* (141 pp.). Ginestra Amaldi. Translation based on the Italian edition by Norman Rudnick. Abradale Press, New York, 1966. Illus. \$40 set.

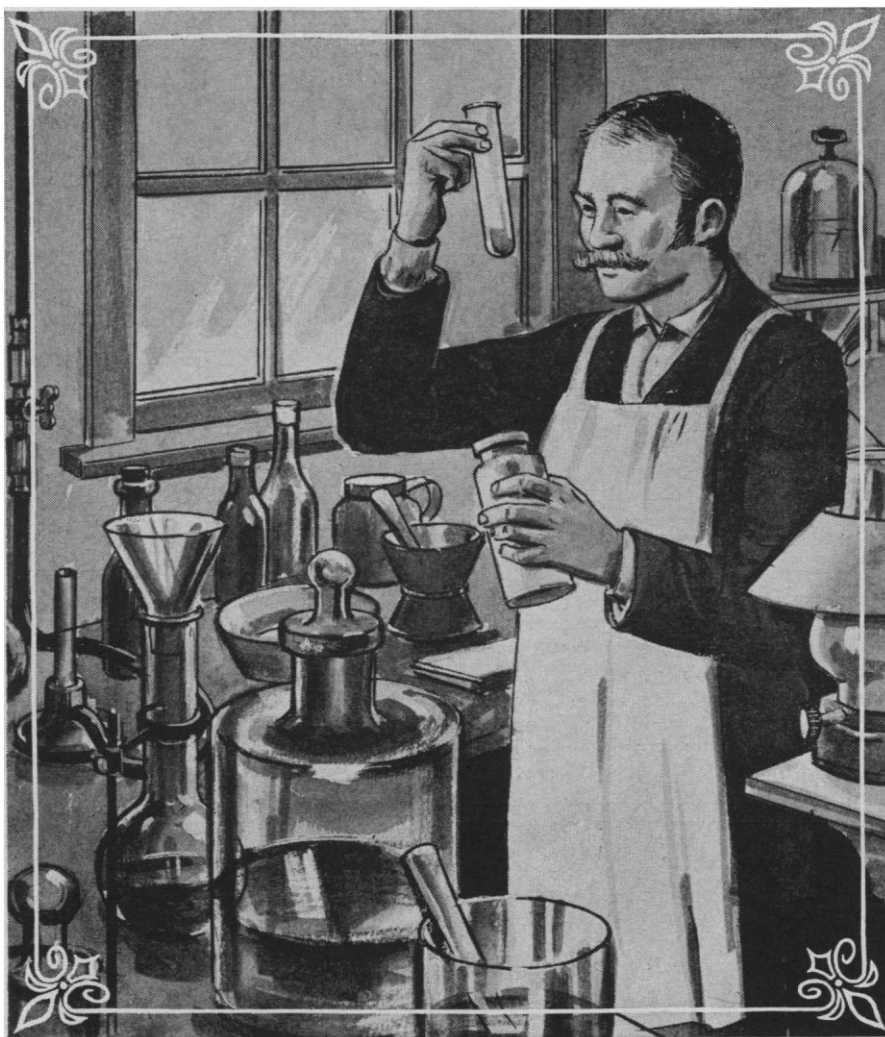
Pastoral Plants of the Riverine Plain. J. H. Leigh and W. E. Mulham. Jacaranda Press, Brisbane, Australia, 1966. 186 pp. Illus. \$10.50.

Patterns of Life: The Unseen World of Plants. William M. Harlow. Harper and Row, New York, 1966. 128 pp. Illus. \$6.95.

Peabody Museum Papers, vol. 57, No. 1, Craniometry and Multivariate Analysis: The Jomon Population of Japan, A Study by Discriminant Analysis of Japanese and Ainu Crania, W. W. Howells; A Multiple Discriminant Analysis of Egyptian and African Negro Crania, J. M. Crichton. Peabody Museum, Cambridge, Mass., 1966. 75 pp. Illus. Paper, \$3.50.

Percentage Baseball. Earnshaw Cook. M.I.T. Press, Cambridge, Mass., ed. 2, 1966. 431 pp. Illus. \$9.95.

M. RMgX



M. Victor Grignard never had it so good. *l'Homme Pauvre!* He still had to make his own Grignard reagents, even after he invented them. Maybe you're still making your own, too. *Tres triste!* Mais, *voila*—MC&B has M. Grignard's reagents already prepared. *Prodigieux!* Stability and quality preserved in safe screw-capped, tinned containers. *Merveilleux!* Exact lot molarity on the label. These, for instance, are available from stock:

			Molar Concentration	500 ml
EX703	9882	Ethylmagnesium Bromide	2.0	(1.0 mole)
PX806	9883	Phenylmagnesium Bromide	2.0	(1.0 mole)
CX2396	9884	Cyclohexylmagnesium Chloride	2.0	(1.0 mole)
BX1997	9885	tert-Butylmagnesium Chloride	2.0	(1.0 mole)
MX1146	9886	Methylmagnesium Chloride	2.0	(1.0 mole)
PX1926	9887	iso-Propylmagnesium Chloride	2.0	(1.0 mole)

Others may be had on a custom basis. Write for our brochure describing these versatile reagents, along with bibliography.

Division of The Matheson Co., Inc. **MC&B**
Norwood (Cincinnati), Ohio; East Rutherford, N. J.; Los Angeles

*A clear, direct and practical presentation
of microtechnical procedures—*

ESSENTIALS OF PRACTICAL MICROTECHNIQUE

by the Late **ALBERT E. GALIGHER**
and **EUGENE N. KOZLOFF, Ph.D.**, Professor of Biology,
Lewis and Clark College, Portland, Oregon.

1964 484 Pages 60 Illustrations \$10.00

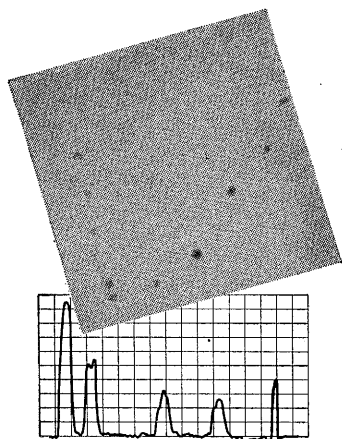
This book provides detailed explanations of the procedures commonly used in preparing material for microscopic study. All methods are introduced by clearly worded discussions of the principles involved, what each preparation should show, and how to obtain the best results. Techniques for vertebrates and invertebrates, including parasites, are covered in this text which numbers or letters consecutively the actual steps to be taken, and indicates pitfalls to be avoided. Contents include the use of the microscope; organization of the laboratory; methods for the study of living and fresh material; fixation; staining; paraffin, nitro-cellulose, and freezing and grinding methods; metallic impregnation; permanent mounting media; a summary of procedures recommended for various types of material used in teaching and research laboratories; and a table of weights and measures. "Gives the student the basis for logical and intelligent application of the various techniques."

Examination Copies Sent to Teachers on Approval

Washington
Square

LEA & FEBIGER

Philadelphia
Pa. 19106



**don't hesitate
automate**

**TLC
analysis
with the
PHOTOVOLT
Densitometer**

Write for bulletin

PHOTOVOLT

1115 Broadway, New York 10, N. Y.

Philosophy of Natural Science. Carl G. Hempel. Prentice-Hall, Englewood Cliffs, N.J., 1966. 128 pp. Paper, \$1.75. Foundations of Philosophy Series.

The Physiological Basis of Habituation. E. M. Glaser. Oxford Univ. Press, New York, 1966. 112 pp. Illus. Paper, \$3.50.

Prehistoric and Primitive Man. Andreas Lommel. McGraw-Hill, New York, 1966. 176 pp. Illus. \$5.95.

Probability, Confirmation, and Simplicity. Readings in the philosophy of inductive logic. Marguerite H. Foster and Michael L. Martin, Eds. Odyssey Press, New York, 1966. 480 pp. Illus. \$7.25. Thirty-six papers on the following topics: The Meaning of Probability (12 papers); Problems of Confirmation Theory (5 papers); Simplicity (6 papers); and The Justification of Induction (13 papers).

A Proposed Model for Visual Information Processing in the Human Brain. Matthew Kabrisky. Univ. of Illinois Press, Urbana, 1966. 112 pp. Illus. \$6.75.

Recommendations of the International Commission on Radiological Protection. Published for The International Commission on Radiological Protection. Pergamon, New York, 1966. 31 pp. \$1.75.

Report of the International Clearing-house on Science and Mathematics Curricular Developments. Compiled under the direction of J. David Lockard. American Assoc. for the Advancement of Science and Science Teaching Center, Univ. of Maryland, College Park, 1966. 311 pp. Paper. Available free from J. D. Lockard, Science Teaching Center.

Roman Africa in Color. Mortimer Wheeler. McGraw-Hill, New York, 1966. 160 pp. Plates. \$25.

Russian-English Dictionary of Prestressed Concrete and Concrete Construction. Ben C. Gerwick, Jr., and Peter V. Peters, Eds. Gordon and Breach, New York, 1966. 119 pp. \$20.

Science and the Modern World. Lectures presented at Georgetown University, Washington, D.C. on the occasion of its 175th anniversary, October 1963-May 1964. Jacinto Steinhardt, Ed. Plenum Press, New York, 1966. 235 pp. Illus. \$7.50. Ten papers: "New developments in our knowledge of the universe" by G. C. McVittie; "Biological evolution and human equality" by Theodosius Dobzhansky; "Limits of scientific enquiry" by Ernan McMullin; "The socialization of science" by James McCormack; "Practical uses of atomic energy" by Arthur E. Ruark; "Population trends and population control" by Ansley J. Coale; "The impact of new materials and new instrumentation on our foreseeable technology" by E. R. Piore; "Design for a brain" by Philip M. Morse; "The revolution in biology and medicine" by Bentley Glass; and "Is there life on other worlds?" by Carl C. Kiess.

The Science of Science. Maurice Goldsmith and Alan MacKay. Penguin Books, Hammondsworth, England, ed. 2, 1966. 317 pp. Illus. Paper, 6d. Sixteen papers contributed by C. P. Snow, E. H. S. Burhop, P. M. S. Blackett, Gerard Piel, C. F. Powell, Herbert Coblans, Peter Kapitsa, Alexander King, Joseph Needham, J. B. S. Haldane, N. W. Pirie, R. L. M. Synge, Maurice Korach, D. J. de S. Price, Stevan Dedijer, and J. D. Bernal.

FREE

specification
and application
information



NEW!
ULTRA LOW
TEMPERATURE
FACT FILE

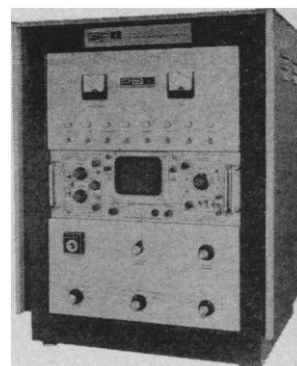
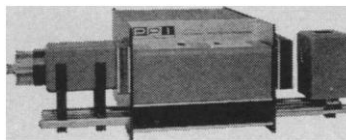
Featuring cabinets from 1½–24
cu. ft. Pulldowns from ambient to
–140°F. (–96°C).

Revco cabinets are used the world over for
industrial, medical and scientific research
projects. Send for this **FREE** line and fact
folder today. Chances are there's a Revco cabi-
net just right for your next job application!

-140°F

REVCO INC. Dept. 2896
Industrial Products Division • Deerfield, Michigan

**NOW!!! first with
FIRST DERIVATIVE SPECTRA
CAPABILITY!**



THE NEW PHOENIX SCANNING DUAL WAVELENGTH SPECTROPHOTOMETER *

WANT TO MEASURE ABSORPTION CHANGES OF 3×10^{-3} O.D. UNITS IN TURBID MEDIA? Conventional spectrophotometers are not satisfactory under these stringent conditions, so we've provided an unconventional spectrophotometer for this purpose. It is a single instrument capable of operation both in a dual wavelength mode and as a high sensitivity scanning double beam spectrophotometer. Although it is primarily intended for studies in enzyme kinetics, oxidative phosphorylation and photosynthesis, it is expected to have application in other areas where small O.D. differences have to be measured in optically dense media. For complete technical details write for Bulletin PMD-1000.

*PATENT APPLIED FOR



PHOENIX PRECISION INSTRUMENT CO.
A Subsidiary of CENCO INSTRUMENTS CORP.
3803-05 N. 5th Street, Phila., Penna. 19140, U.S.A.
World Wide Sales and Service

NEW HYLAND PPLO TEST

Isolation and identification of PPLO (pleuropneumonia-like organisms) are now simplified when you use this new PPLO TEST. The test's medium is formulated to stimulate the growth of mycoplasmas and to prevent development of pseudocolonies (composed of crystalline aggregates of calcium and magnesium soaps) that mimic mycoplasmas. This is made possible by the incorporation of Agamma Horse Serum, a reagent exclusive with Hyland. Hyland's PPLO growth medium also incorporates fresh yeast extract, another requirement for isolation of mycoplasmas.

To meet additional cultivation requirements of certain PPLO strains, the Hyland growth medium contains a high concentration of diphosphopyridine nucleotide (DPN). Bacterial and fungal inhibitors include penicillin-G potassium, thallium acetate and amphotericin-B.

Hyland PRE-MED™ PPLO TEST is supplied as a complete kit containing ten 50 mm PPLO agar plates, five 10 ml tubes PPLO broth, one 5 ml bottle Dienes' Special Stain.

HYLAND LABORATORIES
4501 Colorado Blvd., Los Angeles, Calif. 90039



Components are also available separately as follows: PPLO agar in 50 mm disposable plates (package of 10 plates); Agamma Horse Serum (100 ml and 500 ml); Dienes' Stain (10 ml and 50 ml).

Send this coupon NOW to:

HYLAND LABORATORIES

P. O. Box 39672, Los Angeles, Calif. 90039

Please send:

_____ Information on PPLO TEST

_____ The new Hyland Tissue Culture Catalog

Name _____

Organization or Firm _____

Street _____

City _____ State _____ Zip _____



FREEZE DRYERS

LABORATORY MODELS



FOR DRYING: micro organisms, biological tissues and fluids in enzyme systems studies, storage of organisms, small scale experimental food drying. Of all the drying processes currently practiced, freeze drying causes the minimum of mechanical and chemical changes in the material being dried.

- Front access to all internal parts and drains
- Large, stainless steel table top work area
- Vacuum pump can be mounted inside cabinet
- Integral drying chamber and condenser which:
 - allow free access to condenser for easy housekeeping
 - permit use of condenser as low temperature liquid bath
- Hermetically sealed refrigeration unit.

3 MODELS AVAILABLE: Capacities from $\frac{3}{4}$ to 4 liters. Larger models can accommodate 21 flasks. Manifold accessories can hold 48 vials or ampoules.

Write for additional information



**INSTRUMENTATION
ASSOCIATES INC.**

17 West 60th Street • New York 23, N. Y.



More "Firsts" for Sigma—

DEAMINO TPN DEAMINO DPNH

GUANOSINE-2', 3'-CYCLIC MONOPHOSPHATE

Soluble Tributylamine Salt

DEAMINO TPN

Grade I, Disodium
Approx. 95% pure.

250 mg	\$ 90.00
500 mg	150.00
10 mg	8.20

DEAMINO DPNH

Grade I, Trisodium Salt
Approx. 95% pure.
Enzymatically reduced

10 mg	\$ 7.40	250 mg	\$ 82.50
25 mg	14.80	500 mg	138.00
100 mg	41.25	1 gm	230.00

GUANOSINE-2', 3'-CYCLIC MONOPHOSPHATE

Tributylamine Salt
Approx. 98% pure.

1 gm	\$90.00
100 mg	16.00
25 mg	5.75

For TLC Plates—

We now offer—

SIGMACELL®

Microcrystalline Cellulose

Recent reports indicate that excellent separation of numerous closely related compounds can be quickly obtained using this interesting new microcrystalline cellulose. Thin Layer Chromatography Plates are easily prepared simply by blending in water, coating, and drying. No special desiccation of activation is needed. Coating adheres tenaciously without binders.

Grade I		50 gm	\$ 2.00
Av. Particle Size	— 38 microns	100 gm	3.25
		500 gm	8.75
Grade II		1 Kilo	15.00
Av. Particle Size	— 19 microns	Postage Paid Anywhere	

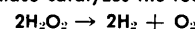
We also offer—

CATALASE

Crystalline

Made by Sigma in the U.S.A.!

Catalase catalyzes the reaction:



Type C-100, Crystalline, from Beef Liver	50 mg	\$ 1.95
Activity: 30,000-40,000 Sigma Units per ml.	500 mg	16.25
(Probably the highest activity in the World.)	1 gm	27.00

ORDER DIRECT **TELEPHONE COLLECT**

from **ANYWHERE** in the **WORLD**

Day, Station to Station, PRospect 1-5750

Night, Person to Person,

Dan Broida, WYdown 3-6418



TWX (Teletype) Day or Night: COLLECT-314-556-0594

TELEGRAM: SIGMACHEM, St. Louis, Missouri

The Research Laboratories of
SIGMA CHEMICAL COMPANY
3500 DE KALB ST. • ST. LOUIS 18, MO. • U.S.A.
MANUFACTURERS OF THE FINEST BIOCHEMICALS AVAILABLE

Distributed in the United Kingdom through
SIGMA LONDON Chem. Co. Ltd., 12, Lettice St., London, S.W.6, Eng.
Phone RENown 5823 (Reverse Charges)

The Sciences and the Humanities: Conflict and Reconciliation. W. T. Jones. Univ. of California Press, Berkeley, 1965. 294 pp. Illus. \$6.50.

Scientific and Managerial Manpower in Nuclear Industry. James W. Kuhn. Columbia Univ. Press, New York, 1966. 229 pp. \$7.50.

Selected Logic Papers. W. V. Quine. Random House, New York, 1966. 260 pp. Illus. \$6.95. Contains 23 papers written between 1934 and 1960.

Seven States of Matter. Milton Gootlieb, Max Garbuny, and Werner Emmenrich. Walker, New York, 1966. 255 pp. Illus. \$5.95.

Shell Collecting: An Illustrated History. S. Peter Dance. Univ. of California Press, Berkeley, 1966. 378 pp. Illus. \$10.

A Social History of Engineering. W. H. G. Armytage. M.I.T. Press, Cambridge, Mass., 1966. 378 pp. Illus. \$10.

La Soif du Monde et le Dessalement des Eaux. Cyril Gomella. Presses Universitaires de France, Paris, 1966. 245 pp. Illus. Paper, F. 16. La Science Vivante Series.

Solid State Chemistry: Whence, Where and Whither. J. Arvid Hedvall. Elsevier, New York, 1966. 108 pp. Illus. \$6.50.

Le Solutréen en France. Philip E. L. Smith. Laboratory of Prehistory, Univ. of Bordeaux, Bordeaux, France, 1966. 465 pp. Illus. Paper, F. 120.

The Territorial Imperative. A personal inquiry into the animal origins of property and nations. Robert Ardrey. Atheneum, New York, 1966. 404 pp. Illus. \$6.95.

The Thread of Life. An introduction to molecular biology. John C. Kendrew. Harvard Univ. Press, Cambridge, Mass., 1966. 142 pp. Illus. \$4.

The Travel Diaries of Thomas Robert Mathus. Patricia James, Ed. Cambridge Univ. Press, New York, 1966. 332 pp. Illus. \$8.50.

Treatise on Invertebrate Paleontology. pt. U, *Echinodermata* 3, vols. 1 and 2. Raymond C. Moore, Ed. Geological Soc. of America, New York; Univ. of Kansas Press, Lawrence, 1966. vol. 1, 396 pp.; vol. 2, 331 pp. Illus. \$18.50 set.

Ultraviolet and Visible Absorption Spectra: Index for 1960-1963. Including also references to optical rotatory dispersion and circular dichroism spectra. Herbert M. Hershenson. Academic Press, New York, 1966. 245 pp. \$14.

United States Government Organization Manual, 1966-1967. Office of the Federal Register, General Services Administration, Washington, D.C., 1966 (order from Superintendent of Documents, Washington, D.C.). 819 pp. Paper, \$2.

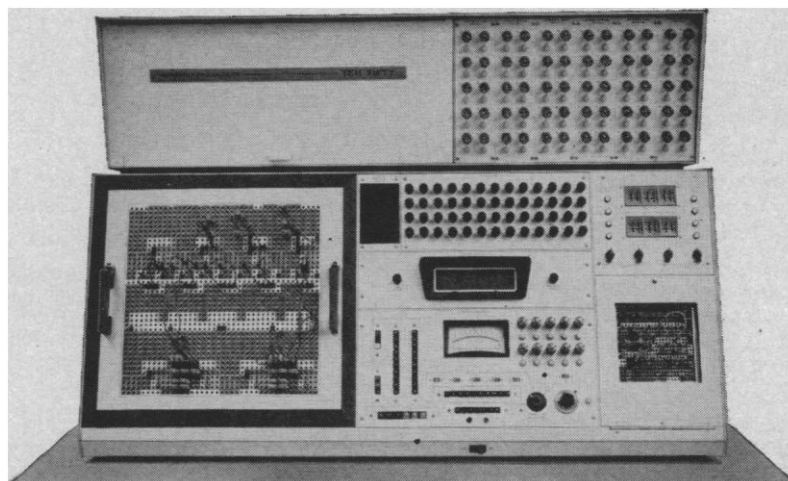
United States Merchant Shipping Policies and Politics. Samuel A. Lawrence. Brookings Institution, Washington, D.C., 1966. 419 pp. \$8.75.

The Use of Computers in Business Organizations. Frederic G. Withington. Addison-Wesley, Reading, Mass., 1966. 253 pp. Illus. \$7.95.

The Validity of Occupational Aptitude Tests. Edwin E. Ghiselli. Wiley, New York, 1966. 165 pp. Illus. \$7.95.

World List of Scientific Periodicals. Scientific medical and technical entries from the British Union Catalogue of Periodicals. Kenneth I. Porter, Ed. Butterworth,

What in heaven's name makes Computer Products think it's going to get anywhere in the tough analog computer business?



Just this... the new Ten-Fifty

We have to be honest about it. The world just doesn't need another analog computer. So when we designed the new Ten-Fifty, we made a value analysis of every major machine in its class. Look at the results:

Capacity. 43% more computing capacity at any one time — 86 modules. 47% more patching terminals — 2040. 200% more peripheral trunks — 126.

Performance. Repetitive solutions up to 1000 per second. Simultaneous real time and fast time operation. Patented two or three mode electronic switching. Switching times less than 500 nanoseconds. High accuracy multipliers — zero error 0.05%. 500 KC solid state amplifiers.

Hybrid operation is integral — logic is built-in. You get a separate 440 hole patch panel. Individual integrator controls. High speed electronic comparators and analog switches. The Ten-Fifty is fully compatible with major digital computers.

Dependability. Patch panel is solid aluminum with coaxial terminals and fully gold plated wiping contacts, which are undisturbed during patching. Patch cords and wiring are shielded for low cross-talk. Short-circuit proof construction. Circuits are conservative in design and fully field-proven. Entire computer is factory wired and tested for full expansion.

Convenience. Pushbutton readout of amplifiers, pots and trunks. All amplifiers are uncommitted. Three built-in electronic timers — simultaneous operation. Thumbwheel time adjustments. Patch panel is color coded and lettered for full complement. All expansions simply plug-in. Expansion is by addition — not substitution.

Economy. Your first cost is low. Your expansion cost is low. There are no hidden extras. The Ten-Fifty is Value Engineered to give you the most computational capability per dollar invested. No computer in its class can match it.

Judge for yourself. Send for free comparison chart that shows you point by point where the value lies in analog computers.



COMPUTER PRODUCTS, INC.

55 Chapel Street, Newton, Mass. 02158 Tel. (617)-244-7575

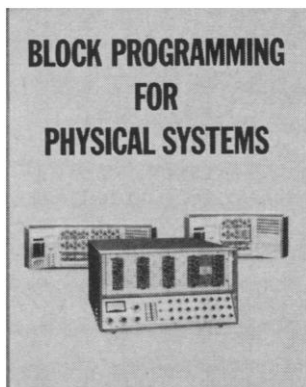
Electronic simulation without equations



You can simulate complex electrical, mechanical and thermal systems on an analog computer without writing the descriptive differential equations beforehand. Systron-Donner's free programming guide shows how. Diagrams show complete computer circuits representing L-C-R networks, transformers, spring action, viscous damping, mass displacement, heat capacity, and heat transfer by radiation and conduction. And the guide shows how to simulate complex systems by interconnecting circuit blocks representing the simpler elements.

Systron-Donner produces desk-top analog computers superbly designed for this type of work. Solid-state designs with capacities from 10 to 80 amplifiers, these computers feature ± 100 -volt computing range, built-in digital logic, a removable patchboard coded to match textbook diagrams, and facility for progressive expansion by simply adding modules.

SEND FOR YOUR FREE COPY



SYSTRON  **DONNER**

Systron-Donner Corporation
888 Galindo Street, Concord, California

1570

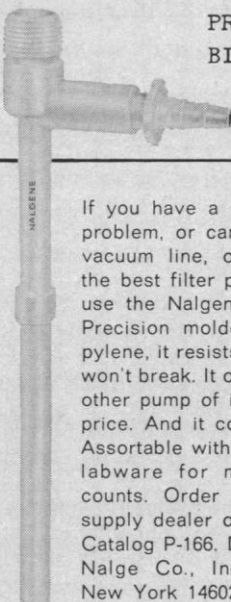
FAN MAIL

for the

NALGENE[®] FILTER PUMP

"...you requested information as to the efficiency of this aspirator. The Nalge filter pump has been the only one, of many that I have attempted to use, that was able to produce a suction which will aid in the evaporation of butanol in a flash evaporator. The low water pressure on the fourth floor of our basic science building has made it impossible to use a water aspirator prior to the use of your product."

PROFESSOR OF
BIOCHEMISTRY



If you have a water pressure problem, or can't hook into a vacuum line, or simply want the best filter pump available, use the Nalgene Filter Pump. Precision molded of polypropylene, it resists corrosion and won't break. It outperforms any other pump of its kind, at any price. And it costs a lot less. Assortable with other Nalgene labware for maximum discounts. Order from your lab supply dealer or write for our Catalog P-166, Dept. 21331 The Nalge Co., Inc., Rochester, New York 14602.

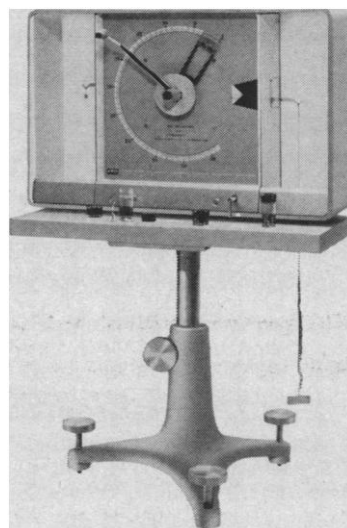
Another Product of
Nalge Research.



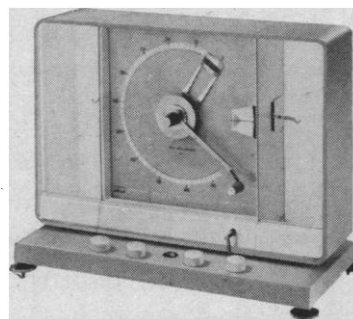
**NALGENE
LABWARE**

THE NALGE CO., INC.
a subsidiary of Ritter Pfaudler Corporation

A Tensiometer



and a precision balance



all in one... and only \$460!

The Rosano™ Surface Tensiometer, by Roller Smith: the most versatile instrument of its kind! Employing the Wilhelmy Plate principle, it is built around a 500 mg (98 dynes/cm) Precision Balance. Thus, it may be utilized as either a tensiometer or a precision balance! Ideal for both research and teaching.

As a Tensiometer, it is useful for rapid, accurate measurement of the surface tension of liquids, the static interfacial tension at the interface of two liquids, and surface pressure. Basically, a thin wettable blade (Wilhelmy Plate) is suspended by a thread, immersed in the test liquid and withdrawn... the vertical force being measured. As such, no buoyancy correction is needed. As a Balance simply remove the thread and wettable blade. The device then becomes a versatile 500 mg. Precision Balance with a tared capacity of three extending the range to 1500 mg. without loss at accuracy ($\pm \frac{1}{2}$ of 1%).

This remarkable 2-in-1 instrument is also a remarkable *value*... another step forward by Roller Smith!

FPE **ROLLER SMITH
PRECISION BALANCES**

Federal Pacific Electric Co., 50 Paris Street, Newark, N. J.

SCIENCE, VOL. 153

Washington, D.C., 1966. 212 pp. \$24. Records new periodical titles for the period in and after 1960.

Conference and Symposium Reports

Acquisition of Skill. Proceedings of a conference (New Orleans, La.), March 1965. Edward A. Bilodeau, Ed. Academic Press, New York, 1966. 555 pp. Illus. \$12.50. Ten papers: "A brief history of research on the acquisition of skill" by Arthur L. Irion; "Selective learning" by Clyde E. Noble; "Individual differences" by Marshall B. Jones; "Some mechanisms of motor responding: An examination of attention" by Jack A. Adams; "Facilitation and interference" by William F. Battig; "Information feedback" by Ina McD. Bilodeau; "Retention" by Edward A. Bilodeau; "Tracking behavior" by E. C. Poulton; "Cybernetic theory and analysis of learning" by Karl U. Smith; and "Motor-skills learning and verbal learning: Some observations" by Benton J. Underwood.

Advances in X-Ray Analysis. vol. 9. Proceedings of the Fourteenth Annual Conference on Applications of X-ray Analysis (Denver, Colo.), August 1965. Gavin R. Mallett, Marie Fay, and William M. Mueller, Eds. Plenum Press, New York, 1966. 554 pp. Illus. \$22.50. Forty-seven papers.

Aspects of Comparative Ophthalmology. Proceedings of a symposium organized by the British Small Animal Veterinary Association (London), June 1965. Oliver Graham-Jones, Ed. Pergamon, New York, 1966. 357 pp. Illus. \$13. Twenty-seven papers.

Biological Membranes: Recent Progress. (*Ann. N.Y. Acad. Sci.* 137). Edward M. Weyer, Ed. New York Academy of Sciences, New York, 1966. 646 pp. Illus. Paper, \$12. Forty-six papers presented at a conference held in October 1965.

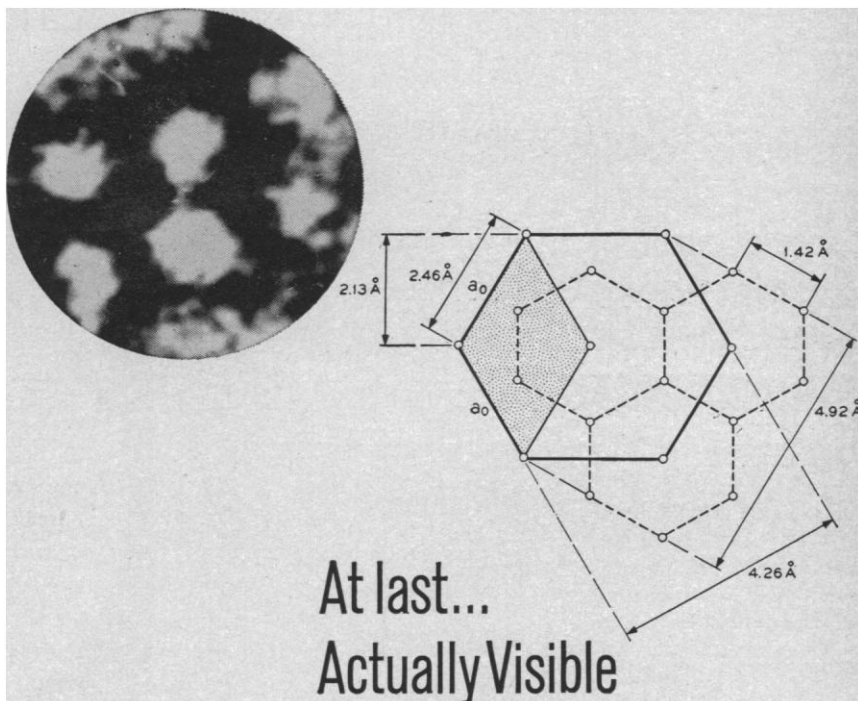
Biosynthesis of Aromatic Compounds. vol. 3. Proceedings of the Second Meeting of the Federation of European Biochemical Societies (Vienna), April 1965. G. Billek, Ed. Pergamon, New York, 1966. 152 pp. Illus. \$4.50. Thirteen papers.

Breeding Pest-Resistant Trees. Proceedings of a N.A.T.O. and N.S.F. Advanced Study Institute (University Park, Pa.), August-September 1964. H. D. Gerhold, R. E. McDermott, E. J. Schreiner, and J. A. Winieski, Eds. Pergamon, New York, 1966. 515 pp. Illus. \$24. Fifty-eight papers.

Cell Differentiation and Morphogenesis. International Lecture Course (Wageningen, The Netherlands), April 1965. W. Beermann, R. J. Gautheret, P. D. Nieuwkoop, C. W. Wardlaw, V. B. Wigglesworth, E. Wolff, and J. A. D. Zeevaart. North-Holland, Amsterdam; Interscience (Wiley), New York, 1966. 217 pp. Illus. \$9.75.

Chromosome Manipulations and Plant Genetics. Contributions to a symposium held during the Tenth International Botanical Congress (Edinburgh), August 1964. Ralph Riley and K. R. Lewis, Eds. Plenum Press, New York, 1966. 131 pp.

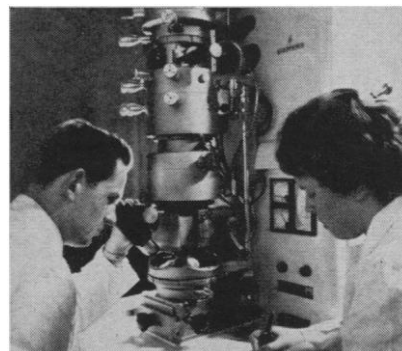

SIEMENS



For the first time, the hexagonal structure of graphite has been seen, with the Siemens Elmiskop. A 6-sided carbon cell of 5 Å diameter, made up of 3 carbon crystal cells, or only 10 atoms, was photographed by R. D. Heidenreich of Bell Telephone Laboratories in New York and H. Fernandez Moran of the University of Chicago. Although this form of carbon is well known by x-ray and electron diffraction, this is indeed the first time that the structure had been actually visible. The visibility of the hexagonal cells, using axial illumination, indicates that a point to point resolution of 2 Å can be obtained with the Elmiskop I A, due to its short objective focal length of 2.2 mm. Another example of Siemens performance.

Electron Microscope Elmiskop I A

Siemens Elmiskop Electron Microscopes have won a worldwide reputation for highest resolution, stability and reliability. Over 800 Elmiskops are already in service at leading universities, medical centers and industrial laboratories.



**VISIT BOOTHS 5-6-7
EMSA MEETING**

SIEMENS AMERICA INCORPORATED

350 Fifth Avenue, New York, N.Y. 10001

SIEMENS CANADA LIMITED

407 McGill Street, Montreal 1, P.Q.

Corporations of THE SIEMENS GROUP IN GERMANY • Berlin • Munich • Erlangen

Check

this list of
laboratory glassware
essentials available
to you at substantial
savings made by
reliable Mercer
Glass Works Inc.

- BEADS, GLASS ☐
- BOTTLES, ASPIRATOR ☐
- BOTTLES, BALSAM ☐
- BOTTLES, DROPPING ☐
- BOTTLES, EYE FLUSHING ☐
- BOTTLES, GLASS STOPPERED ☐
- BOTTLES, NURSING ☐
- BOTTLES, PRESCRIPTION ☐
- BOTTLES, SADDLE BAG ☐
- BOTTLES, URINE SPECIMEN ☐
- BOTTLES, VARNISH ☐
- BOTTLES, ZEISS ☐
- CHAMBERS, HEMACYTOMETER ☐
- CYLINDERS, GRADUATED ☐
- DESICCATORS ☐
- DISHES, CRYSTALLIZING ☐
- DISHES, DAPPEN ☐
- DISHES, EVAPORATING ☐
- DISHES, PETRI ☐
- DISHES, PREPARATION ☐
- DISHES, STAINING ☐
- DISHES, STENDER ☐
- DROPPERS, MEDICINE ☐
- FUNNELS ☐

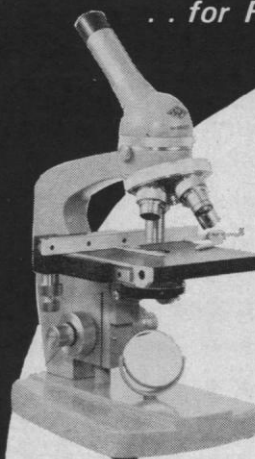
- GAS GENERATORS ☐
- GRADUATES, PHARMACEUTICAL ☐
- JARS, BELL ☐
- JARS, MUSEUM ☐
- JARS, SPECIMEN ☐
- JARS, STAINING ☐
- JARS, STERILIZING ☐
- JARS, STORAGE ☐
- JARS, THERMOMETER ☐
- JARS, URINOMETER ☐
- MORTARS AND PESTLES ☐
- PERCOLATORS ☐
- PIPETTES, DISPOSABLE, PASTEUR ☐
- SLIDES, CONCAVITY ☐
- SLIDES, MICROSCOPE ☐
- THERMOMETERS ☐
- TUBES, TEST ☐
- TUBES, CULTURE ☐
- URINALS ☐
- URINOMETERS ☐
- VIALS, APPLICATOR ☐
- VIALS, CAPSULE ☐
- VIALS, DROPPER ☐
- VIALS, PATENT LIP ☐
- VIALS, SCREW CAP ☐
- VIALS, SHELL ☐

FOR
Free
CATALOG WRITE TO
MERCER
GLASSWORKS INC.

725 Broadway, New York 3, N. Y.

Manufacturers and Importers of
over 5000 laboratory, educational
and research essentials.

New Coaxial-Drive ROTATABLE-HEAD MICROSCOPE ... for RESEARCH or SCHOOL



- Rack drive, low coaxial, graduated mechanical stage
- Quadruple ball bearing nosepiece
- All objectives achromatic, low-reflection coated, parcentered and parfocal within half-turn of fine focus
- NA 1.3 condenser on rack and pinion with iris diaphragm
- Velvet-smooth coaxial focus controls
- Fully rotatable head with locking screw



Student-proof features include: a locked-in, in-base mirror fork or (optional at extra cost) locked-in, in-base illuminator or built-in illuminator base; focus control rack stop to prevent objective or slide damage. Model 1818 shown, \$240.00. Send for free catalog and name of nearest SPI dealer. Same stand available as binocular (1820) or trinocular (1821).

SOUTHERN PRECISION INSTRUMENT CO.
710 Augusta • San Antonio, Texas 78215 • CApitol 2-1258

measure smooth muscle
contraction with the
PHIPPS & BIRD

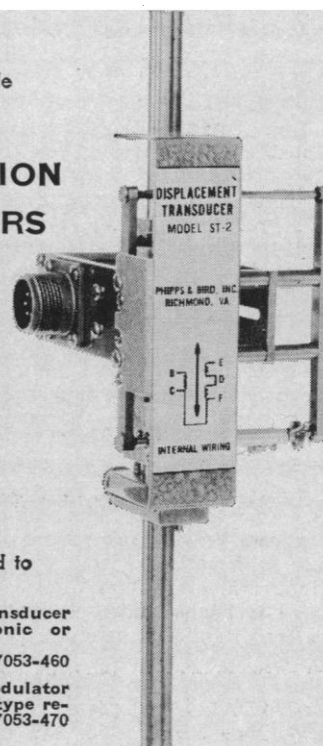
LINEAR MOTION TRANSDUCERS

FEATURES

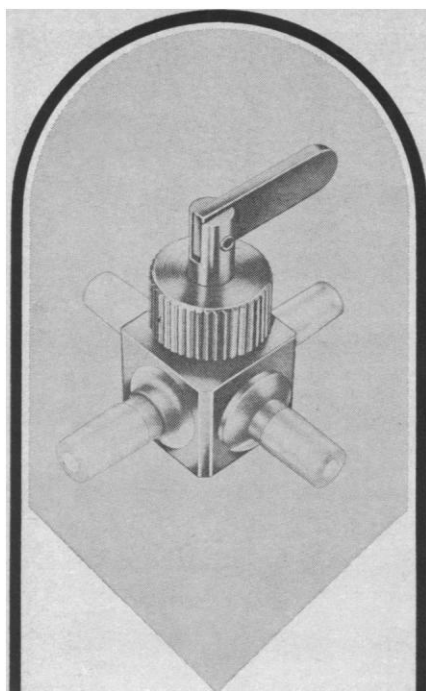
1. Allows linear recording of motion
2. Ideal for measuring a minimum of motion at low frequency
3. Low friction (50 mgcm)
4. High sensitivity
5. Reliable and accurate
6. The ST2 can be connected to any suitable recorder

ST2 Linear Motion Transducer without micrometer—Isotonic or Isometric Measurement
Cat. No. 7053-460

Converter—An exciter-demodulator for use with D.C. or Servo type recorders
Cat. No. 7053-470



PHIPPS & BIRD, INC.
Manufacturers & Distributors of Scientific Equipment
6th & Byrd Streets — Richmond, Virginia



Now...
a
miniature
Teflon
Valve

Here's a small ($\frac{7}{16}$ " x 1") valve constructed of Teflon and Kel-F in a sturdy metal housing. It is gas-tight and essentially inert, and is ideal for controlling gases or liquids in a miniature piping system. Available with two, three, or four ports, and a variety of standard luer fittings.

Write for Valve Brochure

HAMILTON
HAMILTON COMPANY
P.O. Box 307-K,
Whittier, Calif.

23 SEPTEMBER 1966

Illus. \$8. Nine papers: "Some experimental applications of aneuploidy in *Nicotiana*" by D. R. Cameron; "Chromosome engineering in *Lycopersicon*" by Charles M. Rick and Gurdev S. Khush; "Haploidy as a new approach to the cytogenetics and breeding of *Solanum tuberosum*" by S. J. Peloquin, R. W. Hougas, and A. C. Gabert; "Nullisomic-tetrasomic combinations in hexaploid wheat" by E. R. Sears; "Estimates of the homoeology of wheat chromosomes by measurements of differential affinity at meiosis" by Ralph Riley and Victor Chapman; "Biometrical analysis using chromosome substitutions within a species" by C. N. Law; "Establishing a monosomic series in *Avena sativa* L." by R. C. McGinnis; "Attributes of intra- and inter-specific aneuploidy in *Gossypium*" by Meta S. Brown; and "Aspects of chromosome manipulation: a résumé" by D. U. Gerstel and T. J. Mann.

Civil Defense. A symposium. AAAS Publication No. 82. Henry Eyring, Ed. AAAS, Washington, D.C., 1966. 144 pp. Paper, members, \$3.50; others, \$4. Seven papers: "The basic case for civil defense" by Fred A. Payne; "Civil defense as insurance and as military strategy" by Wolfgang K. H. Panofsky; "The effect of civil defense on strategic planning" by Owen Chamberlain; "The possible effectiveness of civil defense" by Eugene P. Wigner; "Medical aspects of civil defense" by Victor W. Sidel; "The agricultural problems in civil defense" by John H. Rust; and "Feasibility of biological recovery from nuclear attack" by Barry Commoner.

The Cnidaria and Their Evolution. Proceedings of a symposium (London), March 1965. W. J. Rees, Ed. Published for the Zoological Society of London. Academic Press, New York, 1966. 467 pp. Illus. \$17.50. Eighteen papers.


Data/Information Availability. Papers presented at an institute under the auspices of the Center for Technology and Administration, American University (Washington, D.C.). Ralph I. Cole, Ed. Thompson, Washington, D.C., 1966. 199 pp. Illus. \$8.50. Thirteen papers.

Diagnostic Ultrasound. Proceedings of the First International Conference (Pittsburgh, Pa.), 1965. Charles C. Grossman, Joseph H. Holmes, Claude Joyner, and Edward W. Purnell, Eds. Plenum Press, New York, 1966. 533 pp. Illus. \$11.50. Thirty-three papers.

The Earth-Moon System. Proceedings of an international conference (New York), January 1964. B. G. Marsden and A. G. W. Cameron, Eds. Plenum Press, New York, 1966. 302 pp. Illus. \$12.50. Sixteen papers.

The Economics of Air Pollution. A symposium. Harold Wolozin, Ed. Norton, New York, 1966. 318 pp. Illus. \$5. Nine papers: "Air pollution—General background and some economic aspects" by Allen V. Kneese; "Economic incentives in air-pollution control" by Edwin S. Mills; "Risks versus costs in environmental health" by Leslie A. Chambers; "The structuring of atmospheric pollution control systems" by Thomas D. Crocker; "Strategies for measuring the cost of air pollution" by Ronald G. Ridker; "The

● At laboratory
supply houses
everywhere



TYGON[®]
plastic
TUBING

224-H

- ▶ Flexible
- ▶ Glass-clear
- ▶ Chemically inert
- ▶ 73 Standard sizes

Plastics & Synthetics Division



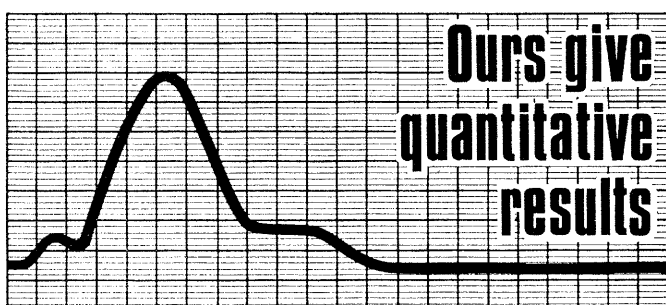
U. S. STONEWARE

AKRON, OHIO 44309

A SUBSIDIARY OF



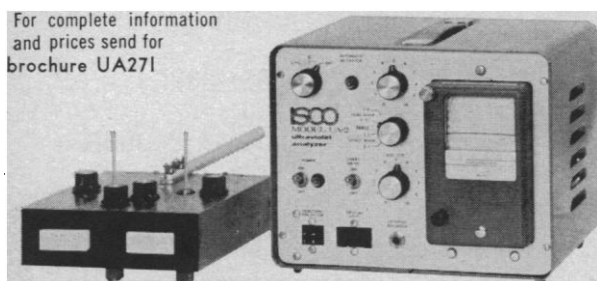
1573



The quantitative peaks we refer to are those recorded by our ultraviolet flow stream monitors. ISCO's monochromatic Model UA-2 and Model 222 are the only low cost UV monitors which conform rigorously to Beer's absorption law. Other analyzers are sensitive to adjacent mercury vapor spectral lines but with ISCO analyzers precise quantitative results will be obtained if the flow stream absorbs any light at 254 mμ, regardless of the wavelength of maximum absorption.

The Model UA-2 has a built-in recorder which monitors true linear absorbance (not percent transmittance) at 254 mμ in two ranges; 0 to 0.5 and 0 to 2.5. An interchangeable dual-beam optical unit operates at both 254 and 280 mμ. The Model UA-2 will also actuate an associated fraction collector at the beginning and end of each UV-absorbance peak, depositing each UV-absorbing fraction in a separate collecting tube.

Prices for a complete ISCO absorbance monitoring, narrow bandwidth analyzer start at \$650.00.



ISCO INSTRUMENTATION SPECIALTIES COMPANY, INC.

5624 SEWARD AVE.
LINCOLN, NEBRASKA 68507, U.S.A.

PHONE (402) 434-8265
CABLE ADDRESS: ISCOLAB LINCOLN

GALILEO SCIENTIFIC INSTRUMENTS

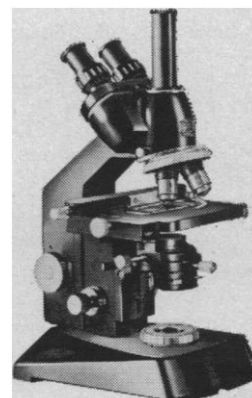
RESEARCH MICROSCOPE AT LABORATORY INSTRUMENT PRICE



The Model LN microscope has a pre-aligned 6V-15W illumination system built into the base. The inclined binocular head is an integral part of the arm assuring alignment at all times. A straight tube is provided for observation or photography and accepts cameras of different types.

Standard optics are: Achromatic objectives 3X, 10X, 40X and 100X corrected for flatness of field and high resolution. Paired Huyghenian compensated eyepieces 5X and 10X.

Optical accessories available for phase contrast, dark field illumination, polarization, fluorescent microscopy and photomicroscopy.



\$680.00 F.O.B. New York

Some territories available for sales representatives

Write for catalog S-7

Known world-wide since 1866
for precision scientific instruments

GALILEO CORPORATION OF AMERICA

18 East 53rd Street • New York, N.Y. 10022

New AAAS Symposium Volume ENVIRONMENTAL VARIABLES IN ORAL DISEASE

Editors, Seymour J. Kreshover and F. J. McClure, 328 pp., illus., bibliography index, 1966. Price: \$8.75. AAAS members' cash orders: \$7.75.

Recent research on the role of environmental factors in oral disease is reported in this collection of papers from a symposium held at the AAAS meeting in Montreal, December 1964.

Twenty-four distinguished scientists present their findings in 17 chapters under four general headings:

Geographical and clinical consideration.
Nutrition and dental caries.

Experimental considerations in oral soft tissue lesions.

Prenatally induced oral anomalies.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

1515 Massachusetts Ave., N.W.
Washington, D.C. 20005

use of government statistics in air-pollution control" by Edward T. Crowder; "The use of consumer-expenditure data in air-pollution control" by Helen H. Lamale; "Air-pollution control in the metropolitan Boston area: A case study in public policy formation" by Lester Goldner; and "Setting criteria for public expenditures on air-pollution abatement: Theoretical foundations and limitations" by Harold Wolozin.

The Economics of Education. Proceedings of a conference held by the International Economic Assoc. (Menthon-St.-Bernard, France), 1963. E. A. G. Robinson and J. E. Vaizey, Eds. Macmillan, London; St. Martin's Press, New York, 1966. 800 pp. Illus. \$16. Twenty-four papers on the following topics: General Problems of Education (3 papers); Education and Economic Progress (7 papers); Demand and Supply (3 papers); The Cost and Financing of Education (4 papers); Balance Between Different Forms of Education (5 papers); International Aid in Education (2 papers); and a Report on the Proceedings.

The Education of a Physicist. An international conference (London), July 1965. Sanborn C. Brown and Norman Clarke, Eds. M.I.T. Press, Cambridge, Mass., 1966. 195 pp. Illus. \$7.50. Fifteen papers on the following topics: First-Degree Courses (4 papers); Special Problem Areas (5 papers); Practical Work, Films, and Television (2 papers); Technical Universities (1 paper); and Relationships Between Government, Industry, and the University (3 papers).

Electron Spin Resonance and the Effects of Radiation on Biological Systems. Proceedings of a conference (Gatlinburg, Tenn.), May 1965. Wallace Snipes, Ed. Natl. Acad. of Sciences-Natl. Research Council, Washington, D.C., 1966. 206 pp. Illus. Paper, \$4. Eight papers: "Summary of electron spin resonance technique as applied to radiation-produced radicals" by Ralph Livingston; "Radiation-produced electron spin resonance signals in nucleic acids" by Adolph Müller; "Electron spin resonance of irradiated deoxyribonucleic acid" by R. G. Shulman, R. O. Rahn, P. S. Pershan, J. W. Longworth, and J. Eisinger; "Electron spin resonance signals in irradiated proteins" by Thormod Henriksen; "Radiation chemistry of proteins in the dry state" by Bert M. Tolbert; "Contributions of electron paramagnetic resonance techniques to the understanding of radiation biology" by E. L. Powers; "The significance of electron spin resonance measurements on irradiated biological macromolecules" by Peter Alexander; and "Biological damage and free radicals in irradiated seeds" by Alan D. Conger.

The Evolution of Canada's Flora. A colloquium commemorating the founding meeting of the Canadian Botanical Association (Ottawa), May 1965. Roy L. Taylor and R. A. Ludwig, Eds. Univ. of Toronto Press, Toronto, 1966. 145 pp. Illus. \$5.50. Eight papers: "Personal recollections of Frère Marie-Victorin" by Marcel Raymond; "Phytogeographic zonation: An ecological appreciation" by J. S. Rowe; "Evolutionary and phytogeographic patterns in the Canadian moss flora"

23 SEPTEMBER 1966

LAB-LINE ENVIRONEERS

introduces the new

V.I.P. "fifty-six"

CONTROLLED ENVIRONMENTAL ROOMS

Trend-setting "firsts" in Environmental Lab-Rooms!

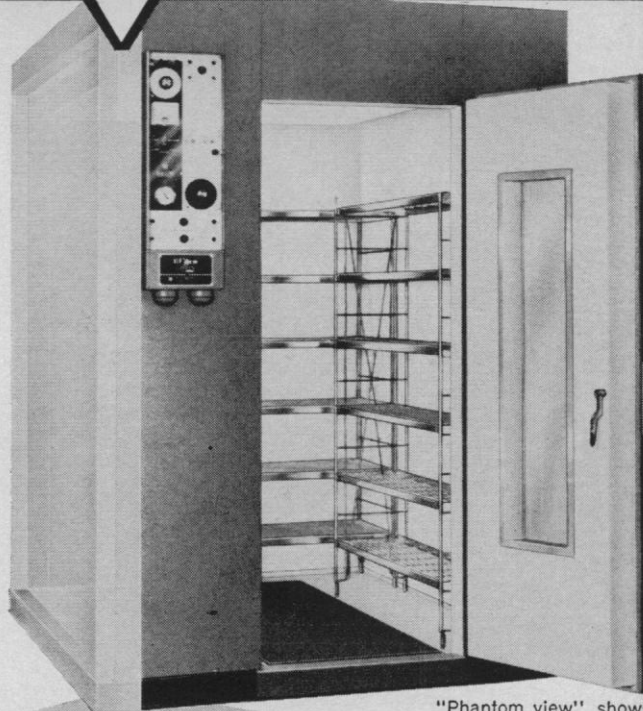
*Patents Pending

35
walk-in models

7
temperature
ranges

Certified Performance

A signed Certificate accompanies each room shipped... your assurance of satisfaction



"Phantom view" shows 8" additional room width

full 56-inch inside width provides 25% more shelf space!

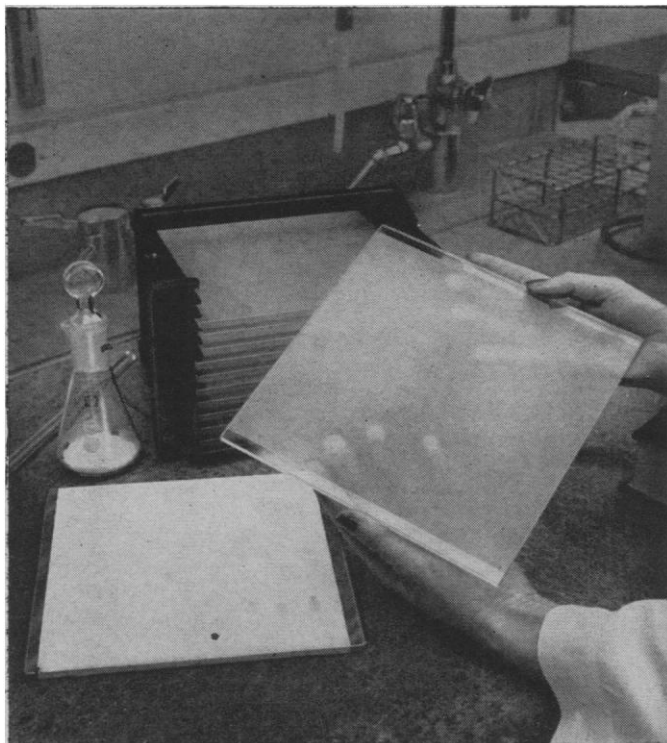
Space Age convenience! . . . only 8-inches of extra width gives 25% more shelf space than conventional 48-inch wide rooms. Features the exclusive, translucent "Lumen-Aire"*, the combination conditioning and lighting plenum. Ceiling-mounted, it provides the most uniform room temperature and lighting possible . . . plus, V.I.P. Control Console with solid state temperature controls; choice of humidity range, lighting, shelving, and a host of other features that you'll want to know more about. Write for Free 16-page Bulletin 283.1



LAB-LINE ENVIRONEERS INC.

ENVIRONMENTAL DIVISION / LAB-LINE INSTRUMENTS, INC.
MELROSE PARK, ILLINOIS

The world's oldest and largest manufacturer of walk-in, controlled environmental rooms!



Introducing the "unflat" TLC plate.

This TLC plate is not a conventional flatglass plate. We say it's "unflat" because we've precision-ground the channel for the adsorbent beds into the plate. This Kontes innovation provides an easy, accurate, and reproducible technique for thin layer preparation.

And there's a variety of channel depths for quantitative and preparative scale techniques.

No more tapes and feeler gauges, troublesome applicators and cumbersome mounting boards. With the new Kontes Chromaflex® TLC plates, you just pour the slurry, then even it with the precision-ground applicator rod. The channel in the plate and the unground guiding edges control the depth—evenly. The slurry adheres better and you use less of it.

Standard Chromaflex plates are 200 x 200 mm overall with a 180 mm channel and two reference edges. Channel depths are available in 125, 250, 500, 750, and 1,000 microns—edges are permanently marked with the proper depth designation.

(There's also a wedge-type plate with a graded depth that decreases from 1,000 to 125 microns, and a narrow plate with a 30 mm-wide channel.)

These new Chromaflex plates can be fully integrated with our developing tanks, spotting hoods and pipets, recovery tubes, sprayers, sandwich technique apparatus, storage racks—everything you need for a complete TLC system.

Find out more about the TLC system with the precision-channel plates. Contact your Kontes representative or write for our TLC Catalog (TLC-1).

©Trademark of Kontes Glass Company

KONTES 
Vineland, New Jersey

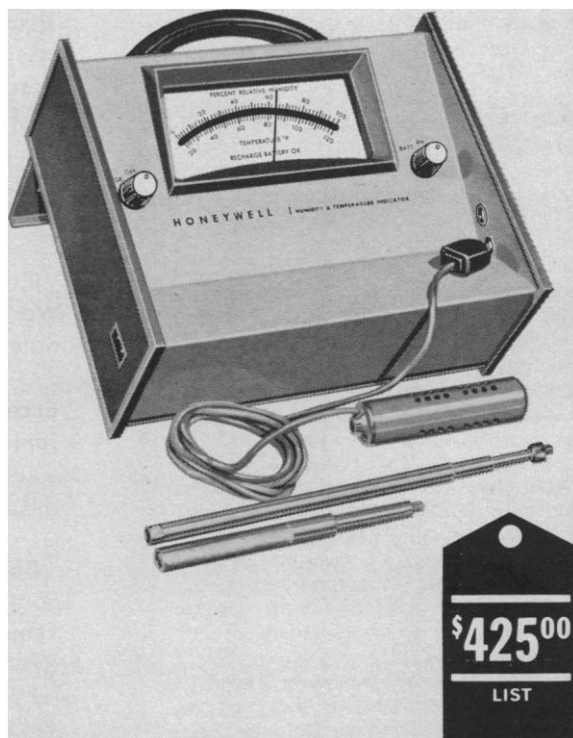
Regional Distributors: KONTES OF ILLINOIS, Franklin Park, Ill. • KONTES OF CALIFORNIA, Berkeley, Cal.

1576

FOR LABORATORY OR FIELD USE:

NEW PORTABLE INSTRUMENT LETS YOU SPOT-CHECK RH OR TEMPERATURE ANYWHERE!

Honeywell's new W809 Relative Humidity and Temperature Meter is a precision instrument. Accurate to $\pm 2\%$ RH; linear scale with a complete range of 7%-95% RH. Large $4\frac{1}{2}$ " mirrored scale for easy accurate reading. Accurate to $\pm 1^\circ\text{F}$. through a temperature range of $20^\circ\text{--}120^\circ\text{F}$. utilizing resistance thermometer sensing. RH sensor is integrated with resistance thermometer for automatic temperature compensation. Sensor can be attached to spring-loaded extension handles for reaching high places. Completely portable. Operates on rechargeable batteries in the field, or from the line in a laboratory. Compact, lightweight, attache-type carrying case of anodized aluminum. Case converts to self-contained easel stand. Solid state construction. A true laboratory-type instrument, which is rugged enough to stand hard work in the field, at an economical price. To order or for more information call the Industrial Sales Manager at your nearest Honeywell office. Or write: Honeywell, Apparatus Controls, Minneapolis, Minn. 55408. S-9-29



Honeywell

HONEYWELL IS WORLDWIDE: Sales and service offices in principal cities of the world.

SCIENCE, VOL. 153

by Howard Crum; "Reproductive specialization as a factor in the evolution of the Canadian flora" Theodore Mosquin; "Aspects of the late-Pleistocene history of the Canadian flora" by J. C. Ritchie; "Movement of plants under the influence of man" by Jacques Rousseau; "Development of marine benthic algal communities on Vancouver Island, British Columbia" by Robert K. S. Lee; and "Vegetative propagation in relation to the aggressiveness of species" by T. A. Steeves, R. T. Coupland, and M. V. S. Raju.

The Evolving Society. Proceedings of the First Annual Conference on the Cybercultural Revolution—Cybernetics and Automation. Alice Mary Hilton, Ed. Institute for Cybercultural Research, New York, 1966. 424 pp. Illus. \$8.95. Twenty-nine papers on the following topics: Basic Assumptions (4 papers); Computing Machines and Cybernated Systems (6 papers); The Evolving Society (8 papers); The Future Society—Concepts (7 papers); The Future Society—Reasons for Hope and Causes for Fear (4 papers).

First International Congress of Parasitology, Proceedings (Rome), September 1964. vols. 1 and 2. Augusto Corradetti, Ed. Tamburini Editore, Milan; Pergamon, New York, 1966. vol. 1, 656 pp.; vol. 2, 496 pp. Illus. \$45 set. The papers are in various languages.

Full Cycles of High Temperature Gas-Cooled Reactors. Proceedings of a conference (Brussels), June 1965. D. Tytgat, Ed. European Atomic Energy Community, Brussels, 1965. 662 pp. Illus \$12. Twenty-six papers.

Head Injury. Proceedings of a conference (Chicago), February 1966. William F. Caveness and A. Earl Walker, Eds. Lippincott, Philadelphia, 1966. 589 pp. Illus. \$15. Forty papers.

Heat Flow Below 100°K and Its Technical Applications. Proceedings of the International Institute of Refrigeration (Grenoble, France), June 1965. Louis Weil, Ed. Pergamon, New York, 1966. 364 pp. Illus. \$12. Thirty-two papers on the following topics: Heat Transfer in Solids (11 papers); Heat Transfer in Liquids (1 paper); Heat Transfer in Powders (1 paper); Heat Transfer to Liquid Nitrogen and Hydrogen (4 papers); Heat Transfer in Missiles and Space Operations (3 papers); Heat Transfer to Liquid Helium (8 papers); and miscellaneous (4 papers). Papers are in English or French, with a summary of each in both French and English.

How to Collect Shells. Based on symposia given at meetings of the American Malacological Union during the last 25 years. American Malacological Union, Marinette, Wis., ed. 3, 1966. 105 pp. Illus. Paper, \$2. Twenty-five papers.

Insect Behaviour. A symposium (London), September 1965. P. T. Haskell, Ed. Royal Entomological Society, London, 1966. 121 pp. Illus. £2 5s. Eight papers: "Orientation behaviour in insects and factors which influence it" by G. Birukow; "The role of rhythms in insect behaviour" by P. S. Corbet; "Flight behaviour" by P. T. Haskell; "Feeding behaviour" by V. G. Dethier; "Sexual behaviour" by A. Manning; "Insect communication" by J. D. Carthy; "Behaviour

Self Sticking **TIME** TAPES & LABELS

(we make them)

You can

**WRITE ON THEM • PRINT
ON THEM • COLOR THEM
• NUMBER THEM**



Write for complete information
about our full line of Laboratory
Tapes and Labels

PROFESSIONAL TAPE COMPANY, INC.
365 East Burlington Road, Riverside, Ill. 60546

SPORES FERNS MICROSCOPIC ILLUSIONS ANALYZED, VOL. 1

C. S. HIRES

580 pages, approx. 1150
illustrations, 14 color.
Word and name indices.
Simpler more accurate terms.

Exceptional fern photos,
enlarged fertile areas,
cell structure, glands
and projections.

Basic concepts of 3-D
spore and tetrad structure.
Line drawings of wall
arrangements at all angles
and focal levels, organized
for easy reference. Fine
detail.

MISTAIRE LABORATORIES
152 GLEN AVENUE
MILLBURN, N.J. 07041

DISPENSE ACIDS & SOLVENTS WITH

mini-pet™

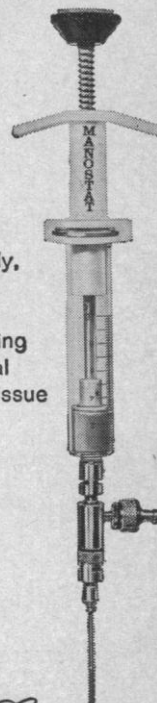
non-sticking
syringe-type, repeating
dispenser

Chloroform, toluene,
xylol... a wide variety of
acids... **MINI-PET**
dispenses them all quickly,
simply, with one-handed
ease. And **MINI-PET's**
Teflon plunger and "O" ring
eliminate "freezing." Ideal
for automatic pipetting, tissue
culture dispensing from
remote containers:
completely autoclavable,
easily disassembled.
Interchangeable syringe
barrel to federal
specification.
From \$21.50 complete.
Available in 1 cc, 2 cc,
and 10 cc sizes.



MANOSTAT Corporation

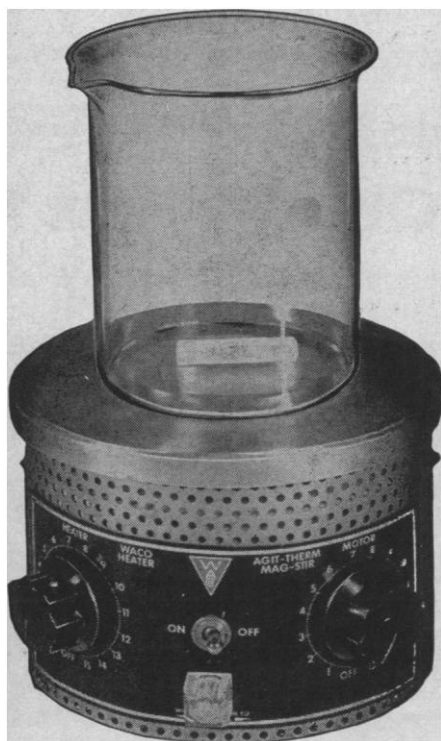
Available through your laboratory supply dealers
20 N. MOORE ST., DEPT. 524, N.Y. 13, N.Y.





NEW
DOUBLE
DUTY
INSTRUMENT

AGITHERM



ONLY **\$67⁵⁰**

Hot Plate— —Magnetic Stirrer

**New low cost plus
advanced design features**

Now you can heat and stir simultaneously with WACO AGITHERM. Heavy-duty individual controls allow use of either stirrer or hot plate independently when desired.

The 500 watt hotplate can be set thermostatically at any temperature up to 600° F. Pilot light indicates when heat is on. The perforated stainless steel case assures cool operation of motor. Compact design, 6½" diameter by 5" high.

No. F-84500 Agitherm Stirrer Hot Plate, complete with one each glass and Teflon covered stirring bars ¾" x 1¼", for 115 volt, 60 cycle, A. C.\$67.50.

ORDER NOW

LABORATORY SUPPLIES AND EQUIPMENT

WILKENS-ANDERSON CO.

4525 W. DIVISION ST. CHICAGO 51, ILL.

New instrument measures voltages of standard cells

Voltage of standard cell can be read reliably to 0.1μv through in-line windows

No computations...no watching two meters at once...no switching leads...no guessing about the final digit.

Instead, after L&N's new 7565 Standard Cell Comparator is set up and standardized, voltages of standard cells can be found as fast as four dials can be sequenced to the null point.

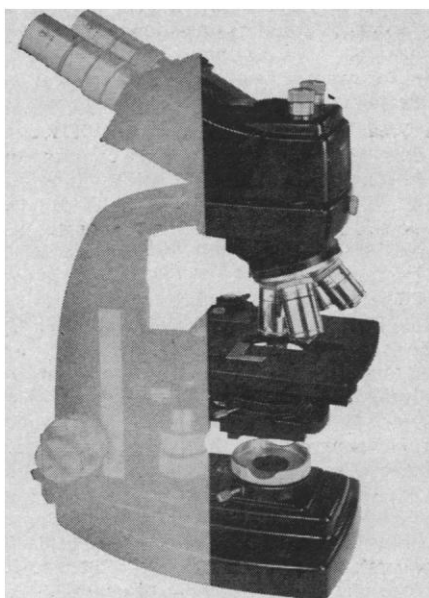
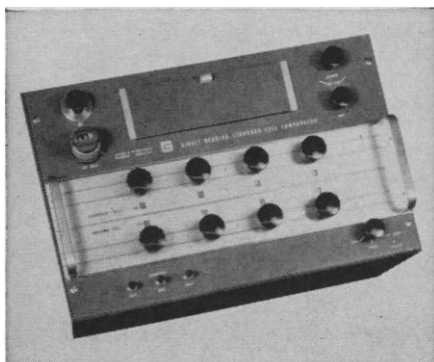
Readout is direct, thermals are "tuned out," and accuracy depends mostly on your reference cell.

In this new Comparator, twin Kelvin-Varley circuits provide the voltage stability and low output resistance needed for optimum detector sensitivity.

The comparator is available for benchtop or 19"-rack mounting; also in a facility console with null detector and auxiliary cell. Full details on Data Sheet A11.1131 from your nearby L&N office or from 4924 Stenton Avenue, Philadelphia, Pa. 19144.



LEEDS & NORTHRUP
Pioneers in Precision

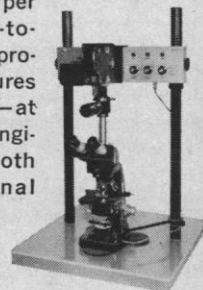


*only HALF
effective...*

.....without a
**SAGE SERIES 500
TIME LAPSE UNIT**

If you're not using Sage Low Cost Cinemicrography techniques for time lapse and normal speed motion pictures through your microscope...you're getting about half the mileage a modern-day microscope should bring you.

Just \$1495.00 adds the dimension of TIME to your work—you can use time lapse techniques to record slow-moving or long-term experiments. Sage Series 500 will take motion pictures at 12 to 48 frames per second to photograph specimens in real time or at time lapse speeds of 1 to 120 frames per minute. This easy-to-operate equipment produces excellent pictures right from the start—at all magnifications. Engineered to isolate both external and internal vibrations.



Send for complete data.

SAGE INSTRUMENTS, INC.

2 Spring Street, White Plains, N. Y. 10601
914 949-4121