

SCIENCE

22 October 1965

Vol. 150, No. 3695

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



OLD FAITHFUL



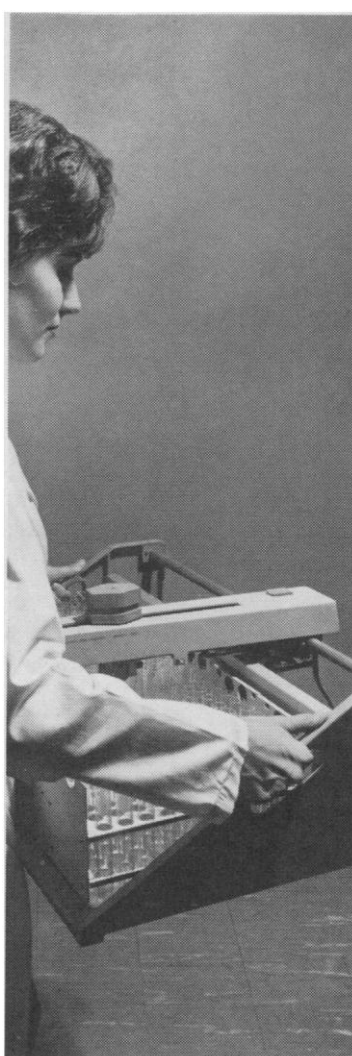
collect confidently

Whatever method of fraction collection you use (time, drop or volumetric), the delivery head of the Beckman 132 Fraction Collector will shut off automatically between tubes—to keep from spilling even a drop of valuable sample. Drip-proof delivery also makes it practical to fill tubes (there are 250 of them) in logical order, from front to back, row by row, for easier identification.



control remotely

The electronic control of this Fraction Collector (an expensive part of any collector) is a separate entity. You can keep it safely out of the way—to avoid damage by accidental spillage when tubes are handled. Equally important, the collector can be cooled completely while the control unit is kept outside the cooling area.



carry handily

Having the control unit separate also allows this Fraction Collector to be carried easily—it has convenient grip-slots on either side.



cool completely

This Fraction Collector has a companion Mobile Refrigeration Unit to save you cold room space. The unit holds fractions at 4° C, and cools an external column. Caster-mounted and easy to move, it permits refrigerated chromatographic analyses to be conveniently made anywhere in the laboratory. For more information about the refrigeration unit and the most advanced of Fraction Collectors, write for Data File 132-5.

it could only be the Fraction Collector from

Beckman®

INSTRUMENTS, INC.

SPINCO DIVISION

PALO ALTO, CALIFORNIA • 94304

INTERNATIONAL SUBSIDIARIES: GENEVA, SWITZERLAND; MUNICH, GERMANY; GLENROTHES, SCOTLAND; PARIS, FRANCE; TOKYO, JAPAN; CAPETOWN, SOUTH AFRICA



Books in MATHEMATICS

SAUNDERS

SAUNDERS MATHEMATICS BOOKS, under the general editorship of Professor Bernard R. Gelbaum, will include works at all levels of undergraduate and graduate mathematics. The main thrust of this publishing effort is to provide books that can serve worthwhile educational purposes.

The books in this area offer sound pedagogy and scholarly depth and breadth . . . backed by the W. B. Saunders Company's 75 years' experience in scientific publishing. The volumes below are fully representative of the high quality that is the prime criterion for publication.

NEW! Chisholm & Morris—

Mathematical Methods in Physics

By J. S. R. CHISHOLM, *Trinity College, Ireland*; and ROSA M. MORRIS, *University College, Cardiff, Wales*

This extraordinary text thoroughly describes the techniques used in applying "pure" mathematics to physical problems—techniques that must be mastered by the student of engineering or physics. Wherever possible, the authors have linked abstract mathematical statements with allied physical, or possibly geometrical conditions they simulate. For example, the discussion of vectors is amplified by material on force and velocity vectors—differential coefficients are associated with rates of change—integrals are associated with areas. Extended treatment is given to matrices, statistics, and probability. A number of exercises accompany each chapter, providing the student with the practice essential for mastery of the mathematical technique under discussion. Answers are provided at the end of the book.

720 pp.—illustrated—\$10.00
New! April, 1965

NEW!

Abian—

The Theory of Sets and Transfinite Arithmetic

By ALEXANDER ABIAN, *Ohio State University*

Here is a remarkably clear text on the theory of sets—based on the axioms of extensionality, replacement, power-set, sum-set, infinity, and choice. Keyed to the level of the advanced undergraduate or the beginning graduate student, the text begins with the most elementary concepts of logic and axiomatics. It then gradually familiarizes the reader with more complex set-theoretical models.

The fundamental concepts of mathematical logic and mathematics are treated with utmost clarity. Topics such as relation, order, equipollence, and similarity are studied in detail. The author utilizes a strong axiomatic approach in covering material on ordinal and cardinal numbers and their arithmetic. The book contains a wealth of illustrative examples, plus summaries and exercises.

406 pp.—illustrated—\$10.00
New! August!

NEW!

Roberts & Kaufman—

Table of Laplace Transforms

By GEORGE ROBERTS, *RCA Victor Company, Ltd.*; and HYMAN KAUFMAN, *McGill University*

This superb reference brings to the mathematician, engineer, physicist, and scientist the most complete collection of Laplace transforms in print today. It contains over 50% more entries than any other single source available.

The authors have included separate tables for both direct and inverse transforms. They have also devised a simple but effective indexing system that enables the user to locate a specific transform with a minimum of effort.

You'll find coverage is broad and up-to-date. Pertinent fields are: the solution of initial and boundary value problems, control and feedback systems, network analysis, etc. The most recent entries found in the literature are included.

About 300 pp.—about \$10.00
New! Ready Early 1966!

Please send and bill me:

- ☐ Chisholm & Morris—MATHEMATICAL METHODS IN PHYSICS \$10.00
☐ Abian—THE THEORY OF SETS AND TRANSFINITE ARITHMETIC \$10.00
☐ Roberts & Kaufman—TABLE OF LAPLACE TRANSFORMS About \$10.00

Name (Affiliation)

Address Zip

SC 10/22/65

W. B. SAUNDERS COMPANY

W. WASHINGTON SQUARE, PHILADELPHIA 19105

22 OCTOBER 1965

22 October 1965
Vol. 150, No. 3695

SCIENCE

LETTERS	After Scopes: <i>T. A. Cowan</i> ; Where Does the Metric System Prevail?: <i>J. Mayer</i> ; Parapsychology and Spontaneous Cases: <i>L. W. Alvarez</i>	435
EDITORIAL	The Profits and Risks of Simplification	439
ARTICLES	Order from Chaos: <i>J. H. Hildebrand</i>	441
	Point Defects in Insulators: <i>C. C. Klick</i>	451
	Information Processing in the Nervous System: <i>D. E. Broadbent</i>	457
NEWS AND COMMENT	1965 Nobel Laureates in Medicine or Physiology: <i>G. S. Stent</i>	462
	R&D Boom: House Report Cites Debits—Air Pollution: Standards May Be in the Offing	464
BOOK REVIEWS	<i>Protozoan Nutrition, Essays in Biochemistry, and Studies in Comparative Biochemistry</i> , reviewed by <i>W. J. van Wagtenonk</i> ; other reviews by <i>C. B. van Niel, H. J. Curtis, R. L. Metzenberg, R. A. Nidey, G. R. Choppin, S. E. Luria, W. S. Benninghoff, M. S. Edmonson, W. E. K. Middleton, L. A. Stauber, M. G. Mayer, I. R. Senitzky</i> ; <i>New Books</i>	469
REPORTS	Paleotemperatures and Chronology at Archeological Cave Site Revealed by Thermoluminescence: <i>W. Dort, Jr., et al.</i>	480
	Transform Faults, Oceanic Ridges, and Magnetic Anomalies Southwest of Vancouver Island: <i>J. T. Wilson</i>	482
	Magnetic Anomalies over a Young Oceanic Ridge off Vancouver Island: <i>F. J. Vine and J. T. Wilson</i>	485
	Radioactivity: Distribution from Cratering in Basalt: <i>N. A. Bonner and J. A. Miskel</i> ..	489
	Exchange of Carbon-Bound Hydrogen Atoms ortho to the Hydroxyl Group in Tyrosine: <i>R. B. Martin and V. J. Morlino</i>	493

BOARD OF DIRECTORS

LAURENCE M. GOULD
Retiring President, Chairman

HENRY EYRING
President

ALFRED S. ROMER
President Elect

JOHN W. GARDNER
H. BENTLEY GLASS

DAVID R. G.
MINA S. REE

VICE PRESIDENTS AND SECTION SECRETARIES

MATHEMATICS (A)
Bernard Friedman
Wallace Givens

PHYSICS (B)
Emilio G. Segrè
Stanley S. Ballard

CHEMISTRY (C)
A. H. Batchelder
Milton Orchin

ASTRONOMY (D)
John W. Evans
Frank Bradshaw V

ANTHROPOLOGY (H)
Albert C. Spaulding
Eleanor Leacock

PSYCHOLOGY (I)
Benton J. Underwood
Frank W. Finger

SOCIAL AND ECONOMIC SCIENCES (K)
Thorsten Sellin
Ithiel de Sola Pool

HISTORY AND PHILOSOPHY OF SCIENCE
C. West Churchman
Norwood Russell Hanson

PHARMACEUTICAL SCIENCES (Np)
John E. Christian
Joseph P. Buckley

AGRICULTURE (O)
R. H. Shaw
Howard B. Sprague

INDUSTRIAL SCIENCE (P)
Allen T. Bonnell
Burton V. Dean

EDUCATION
James Rutledge
Frederic B. I

DIVISIONS

ALASKA DIVISION

Richard M. Hurd
President

George Dahlgren
Executive Secretary

PACIFIC DIVISION

James Bonner
President

Robert C. Miller
Secretary

SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

Aden B. Meinel
President

Marlowe G. And
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 Avenue, Washington, D.C. 20005. Now combined with *The Scientific Monthly*. Second-class postage paid at Washington, D.C. Copyright © 1965 by the American Association for the Advancement of Science. Annual subscriptions \$8.50; foreign postage, \$1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, \$7.10; \$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

Radiolysis of Estrone and Estradiol: <i>O. H. Wheeler and R. Montalvo</i>	493
Earth Tremors Generated by Old Faithful Geyser: <i>J. S. Rinehart</i>	494
Delta-Aminolevulinate Dehydratase Activity in Mice with Hereditary Anemia: <i>F. L. Margolis and E. S. Russell</i>	496
Gibberellic Acid: Action in Barley Endosperm Does Not Require Endogenous Auxin: <i>R. Cleland and N. McCombs</i>	497
Systematic Relationships between Carbon and Oxygen Isotopes in Carbonates Deposited by Modern Corals and Algae: <i>M. L. Keith and J. N. Weber</i>	498
Histones and Basic Polyamino Acids Stimulate the Uptake of Albumin by Tumor Cells in Culture: <i>H. J.-P. Ryser and R. Hancock</i>	501
Nucleoside Phosphatases of Fetal and Maternal Blood Cells: Electron Microscope Study: <i>R. S. Connell and R. L. Bacon</i>	503
Complement Fixation on Cell Surfaces by 19S and 7S Antibodies: <i>T. Borsos and H. J. Rapp</i>	505
Dulcin and Saccharin Taste in Squirrel Monkeys, Rats, and Men: <i>G. L. Fisher, C. Pfaffmann, E. Brown</i>	506
Adrenaline and Noradrenaline: Relation to Performance in a Visual Vigilance Task: <i>J. F. O'Hanlon, Jr.</i>	507
<i>Comments on Reports: Convection-Plume-like Phenomenon: R. E. Drapeau;</i> <i>Contaminants: Addendum: H. A. Kordan</i>	509

ASSOCIATION AFFAIRS	The Natural Environment	510
----------------------------	-------------------------------	-----

MEETINGS	Neurological Mutants of the Mouse: <i>R. L. Sidman, S. H. Appel, J. F. Fuller;</i> Electronic and Atomic Collisions: <i>W. L. Fite and E. Gerjuoy;</i> Forthcoming Events	513
-----------------	---	-----

DEPARTMENTS	New Products	539
--------------------	--------------------	-----

TER ORR ROBERTS ELSTAN F. SPILHAUS	H. BURR STEINBACH JOHN A. WHEELER	PAUL E. KLOPSTEG Treasurer	DAEL WOLFLE Executive Officer
---------------------------------------	--------------------------------------	-------------------------------	----------------------------------

LOGY AND GEOGRAPHY (E) y. Ladd ard H. Mahard	ZOOLOGICAL SCIENCES (F) C. Ladd Prosser David W. Bishop	BOTANICAL SCIENCES (G) Ira L. Wiggins Warren H. Wagner
INEERING (M) ries F. Savage man A. Hall	MEDICAL SCIENCES (N) A. Baird Hastings Robert E. Olson	DENTISTRY (Nd) Lloyd F. Richards S. J. Kreshover
INFORMATION AND COMMUNICATION (T) Robert C. Miller Phyllis V. Parkins	STATISTICS (U) Thornton Fry Morris B. Ullman	

American Association for the Advancement of Science was founded in 1848 and incorporated in 1854. Its objects are to further the work of scientists, to facilitate cooperation among them, to promote 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

Old Faithful erupting on a winter day. Seismic recordings made during the January 1965 expedition to Yellowstone Park can be correlated with geyser activity. Intervals between eruptions do not scatter around a single value, as formerly thought. A bimodal distribution in frequency of intervals occurs. Histogram measurements show the intervals to be about 50 minutes and 70 minutes. See page 494. [John S. Rinehart, U.S. Department of Commerce]

New Nikon attachment equips S-series microscopes for specialized polarization work



Affixed to any S-series Nikon microscope, the new Nikon Polarizing Attachment extends its capabilities to include the observation and study of rocks, minerals, plastics, textiles, chemicals, biological and other materials under polarized light. The outfit consists of a Bertrand lens and analyzer equipped with $\frac{1}{4}$ -wave plate, tint plate and Sénarmont-type compensator;

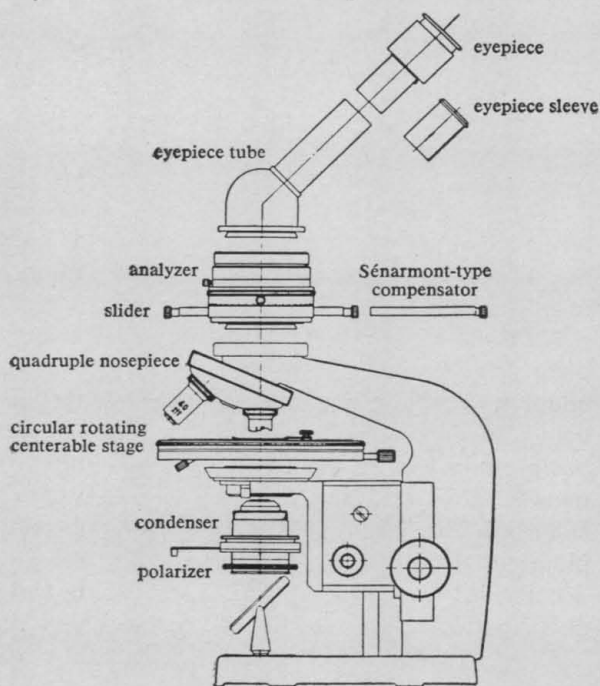
a condenser and polarizer; a calibrated, circular, rotating centerable stage with clips; 5x and 10x wide-field, high-eyepoint oculars; eyepiece micrometer; filters; 4x, 10x and 40x strain-free parfocal objectives; and a hardwood instrument case.

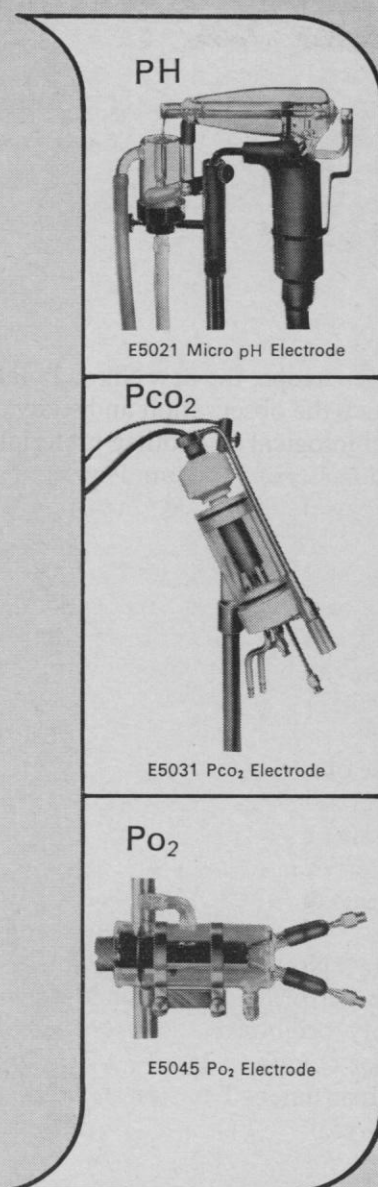
It takes but a few moments to ready an S-series Nikon microscope for polarization work. And it takes no more to revert its use to conventional microscopy.

The use of a Nikon S-series microscope for polarization offers other characteristic advantages: 45° inclined eyepiece tube, revolving quadruple nosepiece, horizontally positioned stage, etc. While these may not relate specifically to the technique under consideration, they offer conveniences generally recognized as desirable.

No less important is the use of Nikon optics, whose performance is immediately perceptible in the quality, brightness and resolution of the visible image.

For complete details, write: Nikon Incorporated, Instrument Division, Garden City, N.Y. 11533. Subsidiary of Ehrenreich Photo-Optical Industries, Inc.





Direct reading with the Radiometer Gas Monitor System

Measurements of the Oxygen-Carbon Dioxide gas exchange in blood are now almost a "must" for any clinical laboratory, as indicators of not only respiratory disorders, but many metabolic abnormalities as well.

The Radiometer Blood Gas Monitor offers a complete and *flexible* system, allowing the user to adapt the instrumentation to his requirements. Initially pH measurements are done on an ultra-micro basis using the Radiometer direct-reading expanded scale meter PHM27 and the capillary blood electrode E5021 along with its proven blood sampling and collection technique.

Later, as the requirements for CO₂ tensions, and/or Oxygen tensions arise, the appropriate electrode

and the Gas Monitor can be added—and as an "extra" the system can be even further adapted to the Astrup Method for *complete* blood gas and acid-base determinations.

Radiometer blood gas electrodes measure gas tensions directly with minimal blood sample requirements.

Complete descriptive literature is available and will be sent to you on request.

THE LONDON COMPANY

811 SHARON DRIVE, WESTLAKE, OHIO

RADIOMETER  COPENHAGEN

In Canada: Bach-Simpson Limited, Box 2484, London

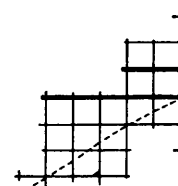
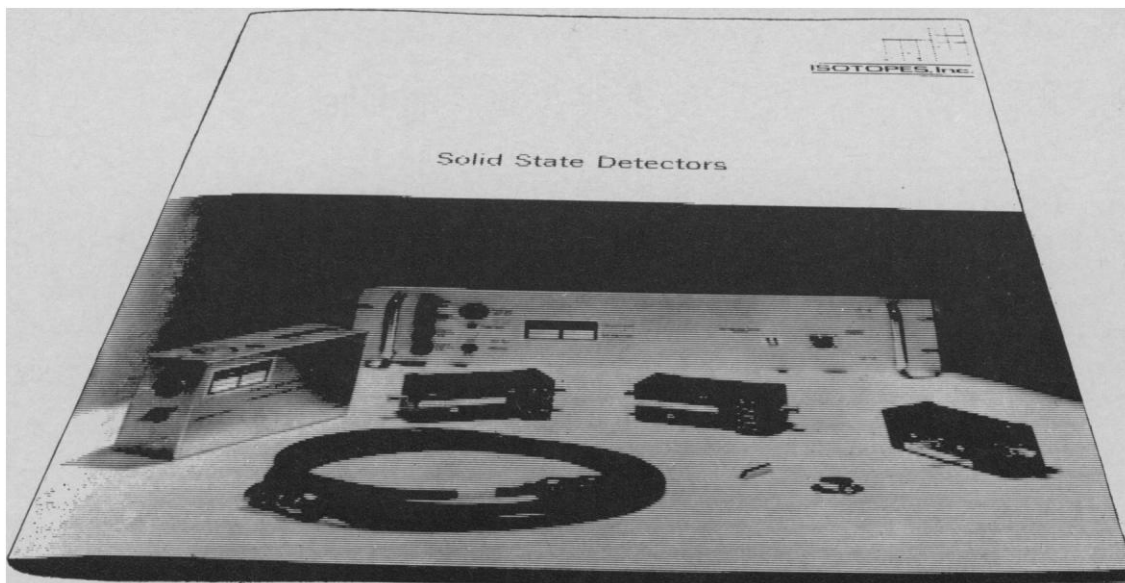
Our gas-filled detectors and scintillation crystals can be used in 90% of all nuclear analyses.

Our solid state detectors cover the other 10%.

Isotopes, Inc. now offers both lithium-drifted silicon and lithium-drifted germanium detectors in a wide range of depletion depths and active areas. The excellent energy resolution, linear response over extended energy ranges, and fast response of these units make them ideally suited for alpha particle spectroscopy, high energy nuclear radiation studies, beta spectroscopy, conversion electron studies, gamma monitoring

and spectroscopy, and complex spectra studies.

Our new catalog gives complete specifications and prices on the solid state detectors as well as full information on the electronic components designed for use with these detectors. For a copy of this catalog, call Bob Adkins at 201-NO4-7070 or write Isotopes, Inc., Instruments and Accessories Division, 124 Woodland Avenue, New Jersey 07675.



ISOTOPES, Inc.

Get a load of our new HF bottle.



New Pour-Out Design

Minimizes accidental spillage. Just invert for a few drops. Most efficient drop dispensing of *any* HF package!



No need to adjust spout for controlled stream. Just squeeze bottle slightly.



New Double Seal

Molded-in projection on screw-cap seals spout for quick, safe opening/closing.

Acid-indicating label

Color changes from—

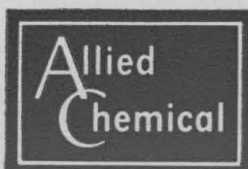
1. Blue to Orange when wet with HF;
2. Orange to Green if HF is rinsed off with water;
3. Green to Blue if HF is flushed off with alkaline solution.

Shatterproof, translucent, lightweight, convenient

Made of flexible polyethylene. Will not become brittle, crack or break. Level of contents visible at a glance. Easy to grasp . . . lessens danger of dropping.

B&A® Hydrofluoric Acid is the purest HF you can buy—in the most convenient package. Comes in 48%, 52% and 60% grades, and in 48% Electronic Grade. Write today for further information.

Baker & Adamson®
Reagents



GENERAL CHEMICAL DIVISION
P.O. Box 353, Morristown, N. J.



We are pleased to Announce
Several Major Improvements in the
Determination of
CPK
CREATINE PHOSPHOKINASE

Probably the Preferred Enzyme in the Diagnosis of
Myocardial Infarction and Muscular Dystrophy (1,2,3,4).

Previously published procedures, such as that of Okinaka⁽⁶⁾, served a valuable purpose in stimulating the study of CPK both clinically and scientifically, but left much to be desired. They were not only cumbersome, but slight variations in reagent purity or technique often yielded erroneous results. Activities were not linear with enzyme concentrations. Although Sigma has been supplying the reagents for this work for over 10 years, we have been reluctant to recommend this determination to any but the most careful

laboratories.

NOW after almost two years of intensive research, we can offer 3 Procedures that appear to be excellent for Clinical Routines and yet precise enough for Research. These procedures are approximately 50 times as sensitive as were earlier methods. As little as 10 lambda of serum can be used in our Colorimetric Procedure No. 520 making it excellent for Pediatric use.

CPK is perhaps more specific for Myocardial Infarction than S-GOT or LDH.
CPK is an excellent diagnostic aid in Muscular Dystrophy.
CPK apparently does not elevate in Liver diseases.

- Ref.: 1. Dreyfus, J. L., Laruelle, P., Schimmel, P., et Michaux, J., "Interesse de l'Etude de la Creatine-Kinase du Serum Chez les Meres de Myopathes," Rev. Fr. Et. Biol. V, 990-994, (1960).
2. Hess, J. W., & MacDonald, R. P., J. Mich. State Med. Soc., 62, 1095, (1963).
3. Hess, J. W., MacDonald, R. P., Frederick, R. J., Jones, R. N., Neely, J., & Gross, D., "Serum Creatine Phosphokinase (CPK) Activity in Disorders of Heart and Skeletal Muscle," Annals of Internal Medicine, 61, 1015, (1964).
4. Duma, R. J., & Siegel, A. L., "Serum Creatine Phosphokinase in Acute Myocardial Infarction," Arch. Intern. Med., 115, 443, (1965).
5. Okinaka, S., Kumagai, H., Ebashi, S., Sugita, H., Momoi, H., Toyokura, Y., Fujie, Y., Arch. Neurol., 4, 520, (1961).

3 PROCEDURES TO CHOOSE FROM:

Sigma Procedure No. 661 (Colorimetric)

In this procedure, Creatine is Phosphorylated to Phosphocreatine. Phosphocreatine is hydrolysed to release Inorganic Phosphorus. The Inorganic Phosphorus is measured per Fiske & SubbaRow. We will continue to offer our older and less sensitive No. 660 Procedures for those who are already using it and do not wish to change over at this time. Uses 2 x 0.3 ml Serum. Time required—approx. 2 hrs.

Kit No. 661-PA—Reagents for approx. 25 Assays\$13.00
Kit No. 661-A—Without Fiske & SubbaRow reagents\$6.00
Kits for 100 assays are also available. Inquire.

Note: Kits do not include TCA which should be obtained locally.

Sigma Procedure No. 520 (Colorimetric)

In this procedure, Phosphocreatine is enzymatically hydrolysed to Creatine. The Creatine is measured Colorimetrically. Entire Procedure can be carried out in one tube (plus a Blank); deproteinization is not required. Uses only ten lambda of Serum (0.01 ml). Time required—approximately 1.5 hrs.

Kit No. 520—Complete for approx. 25 Assays. Tentative price\$20.00
Kit No. 520C—Complete for approx. 100 Assays. Tentative price\$50.00

Sigma Procedure No. 40-UV (Ultraviolet)

In this procedure Creatine is Phosphorylated to Phosphocreatine, while ATP is hydrolysed to ADP. The ADP is recycled back to ATP by Pyruvate Kinase. The Pyruvate is reduced to Lactate by LDH while DPNH is oxidized to DPN. We measure the rate of DPNH oxidation.

Uses 0.2 ml Serum. Time required—approx. 20 minutes.

Kit No. 40-A—Complete for approx. 15 Assays\$25.00
Kit No. 40-B—Complete for approx. 45 Assays\$70.00

All procedures are new and Tentative: Changes in techniques and packaging of reagents may be suggested from time to time.

Remember Sigma is basically a manufacturer and distributor of Biochemicals. We have no desire to "sell" you on any procedure or kit. Regardless of the method you use, you will probably use Sigma Reagents. If you do not like a "Sigma" Procedure, we invite inquiries for reagents for any procedure you prefer.

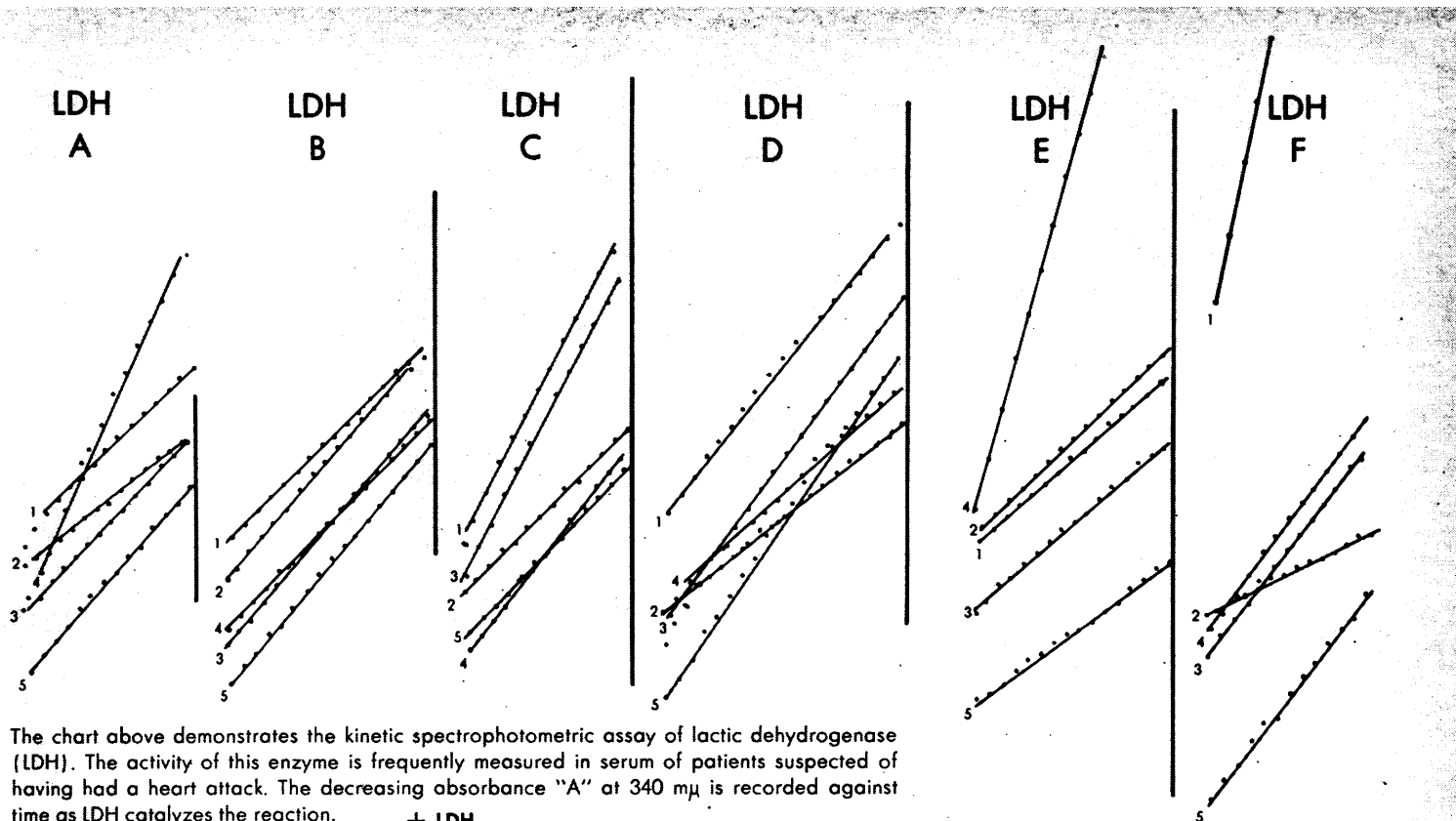
ORDER DIRECT—TELEPHONE COLLECT from ANYWHERE in the WORLD

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-U
TELEGRAM: SIGMACHEM, St. Louis, Missouri

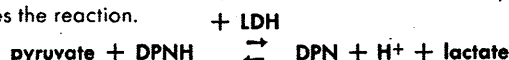


The Research Laboratories of
SIGMA CHEMICAL COMPANY
3500 DE KALB ST. • ST. LOUIS 18, MO. • U.S.A.
MANUFACTURERS OF THE FINEST BIOCHEMICALS AVAILABLE

Distributed in the United Kingdom through
SIGMA LONDON Chem. Co. Ltd. • 12, Lettice St., London, S.W. 6, England Telephone: RENown-5823 (Reverse Charges)



The chart above demonstrates the kinetic spectrophotometric assay of lactic dehydrogenase (LDH). The activity of this enzyme is frequently measured in serum of patients suspected of having had a heart attack. The decreasing absorbance "A" at 340 mμ is recorded against time as LDH catalyzes the reaction.



The rate of this reaction (slope of dA/dt during the initial "O" order portion) is a measure of the enzyme's activity. Extreme slopes and/or deviation from linearity are indicative of an LDH abnormality. 30 production runs in 6 groups are recorded on one chart, at 3 minutes / group.

NEW AUTOMATIC TECHNIQUE REDUCES ENZYME ANALYSIS COSTS

You can do all of your reaction kinetics experiments on this one instrument, and still have a double-beam, scanning UV-Visible Spectrophotometer for bilirubin, barbiturate and salicylate analyses.

The Automatic Multiple Sampling System using Perkin-Elmer's Model 202 Spectrophotometer, saves you vital laboratory

analysis time in clinical serum studies. Kinetic reactions may be studied spectrophotometrically, on a production scale of hundreds of analyses per day, at a minimum cost per analysis.

The analysis proceeds at a fixed wavelength of light. The wavelength you select is held constant while the decrease in absorbance of one of the reactants is recorded as a function of time.

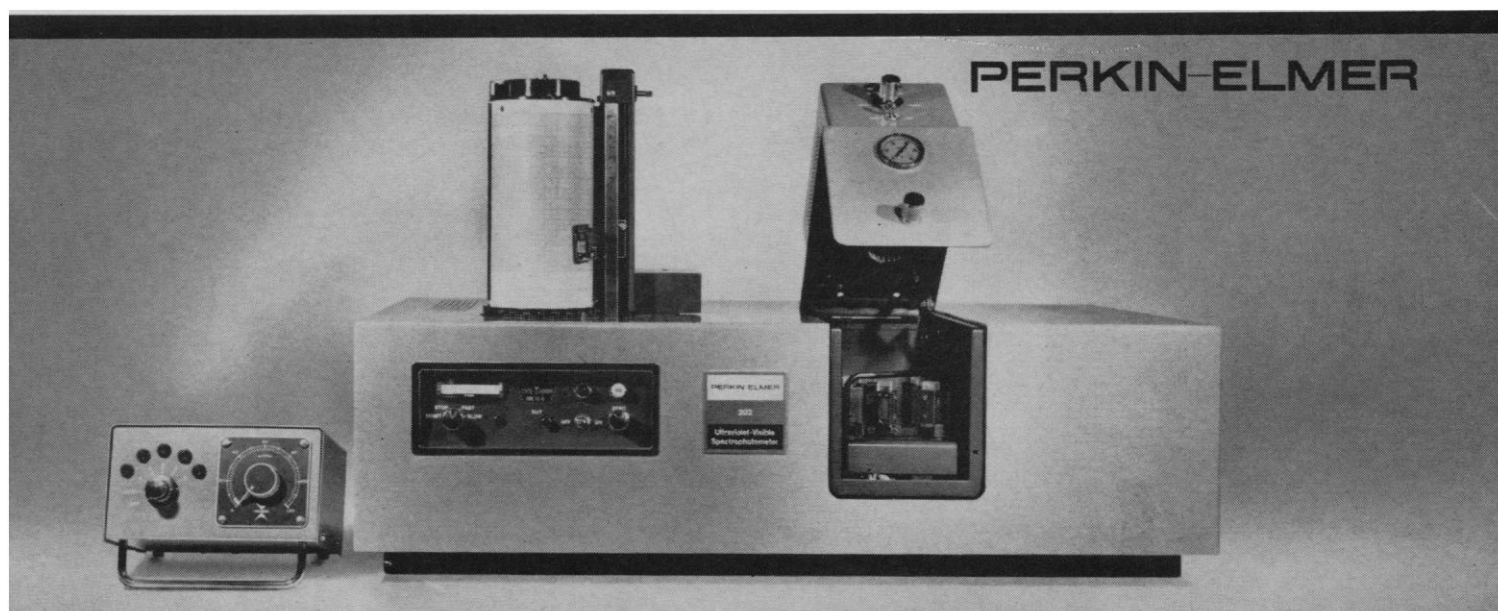
Perkin-Elmer's Automatic Multiple Sampling System features...

- A double beam, direct absorbance recording spectrophotometer with analytical accuracy of $\pm .01$ absorbance units;
- A unique dot readout system that pro-

vides, on one chart, a complete continuous record of absorbance as a function of time for a batch of 5 samples plus a separate reference blank;

- A thermostated sample compartment, with temperature control within $\pm 0.5^\circ\text{C}$ from 20° to 50°C plus automatic sample positioning;
- An adjustable time interval between sample readings of 3 to 120 seconds.

For more information about this new enzyme analysis technique plus details on the Perkin-Elmer Model 202 Spectrophotometer write to: Instrument Division, Perkin-Elmer Corporation, 723 Main Avenue, Norwalk, Connecticut.



WORTH WAITING FOR!

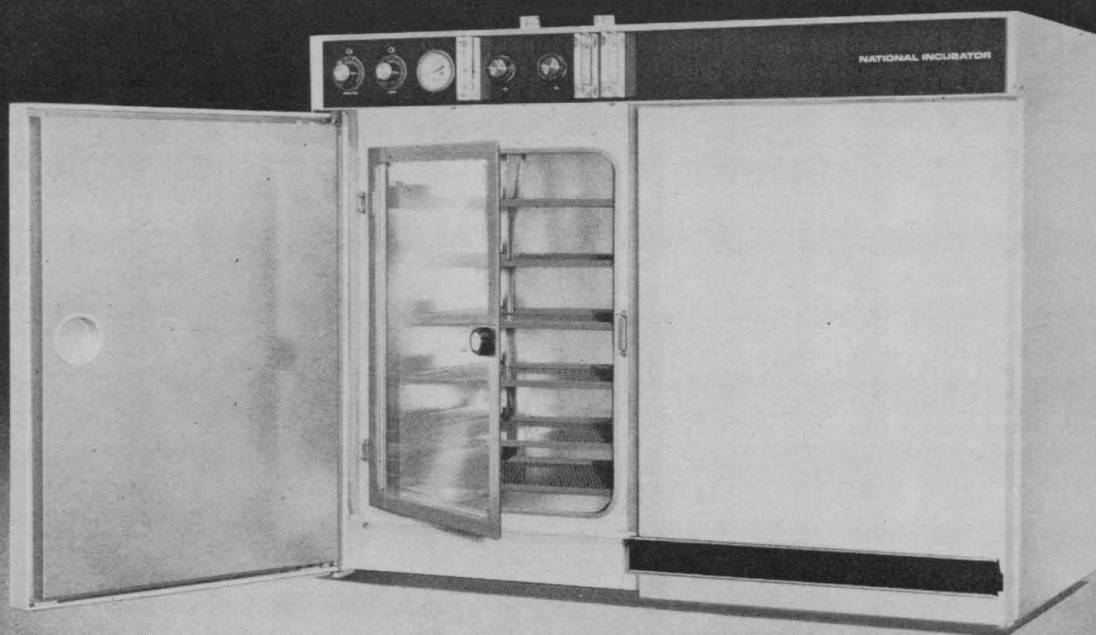
Many buyers waited for NATIONAL's water-jacketed CO₂ Incubator because they wouldn't settle for second best.

Now that production backlogs have been cleared up, your chances of getting one of these truly great Incubators are excellent. Want one now? Just order from your nearest franchised NATIONAL dealer. Rather have more information on why NATIONAL's CO₂ Incubator is tops in its class? Just write or phone for a fully illustrated brochure. No obligation, of course!

And to whet your interest in case you haven't

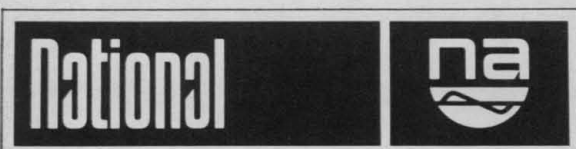
decided, here are some of the many advantages of NATIONAL's CO₂ Incubator:

- Fully water-jacketed for accurate temperature control
- Built-in CO₂ air-mixing device at no extra cost
- Pre-heater for gas mixture to protect your work
- Corrosion-proof construction inside and out
- High humidity without condensation on inner walls
- Exclusive non-magnetic door mechanism . . . won't stick or click!



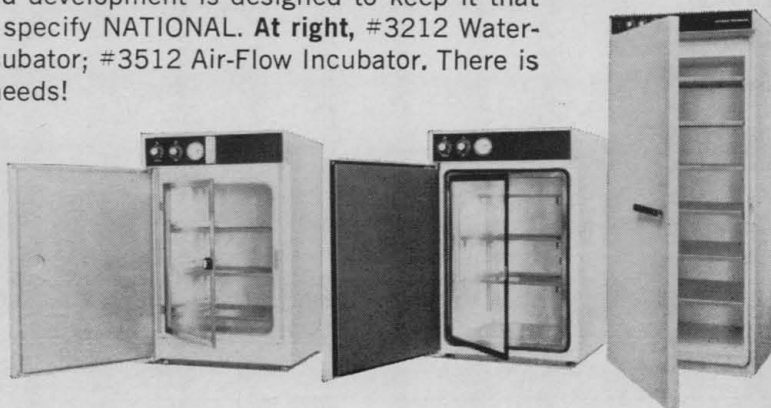
NATIONAL #3321 WATER JACKETED CO₂ INCUBATOR

NATIONAL INCUBATORS and other laboratory apparatus have led the field for more than forty years. Continuing research and development is designed to keep it that way. If **you** won't settle for second best, specify NATIONAL. **At right**, #3212 Water-Jacketed Incubator; #3211 Anhydro Incubator; #3512 Air-Flow Incubator. There is a NATIONAL Incubator tailored to **your** needs!



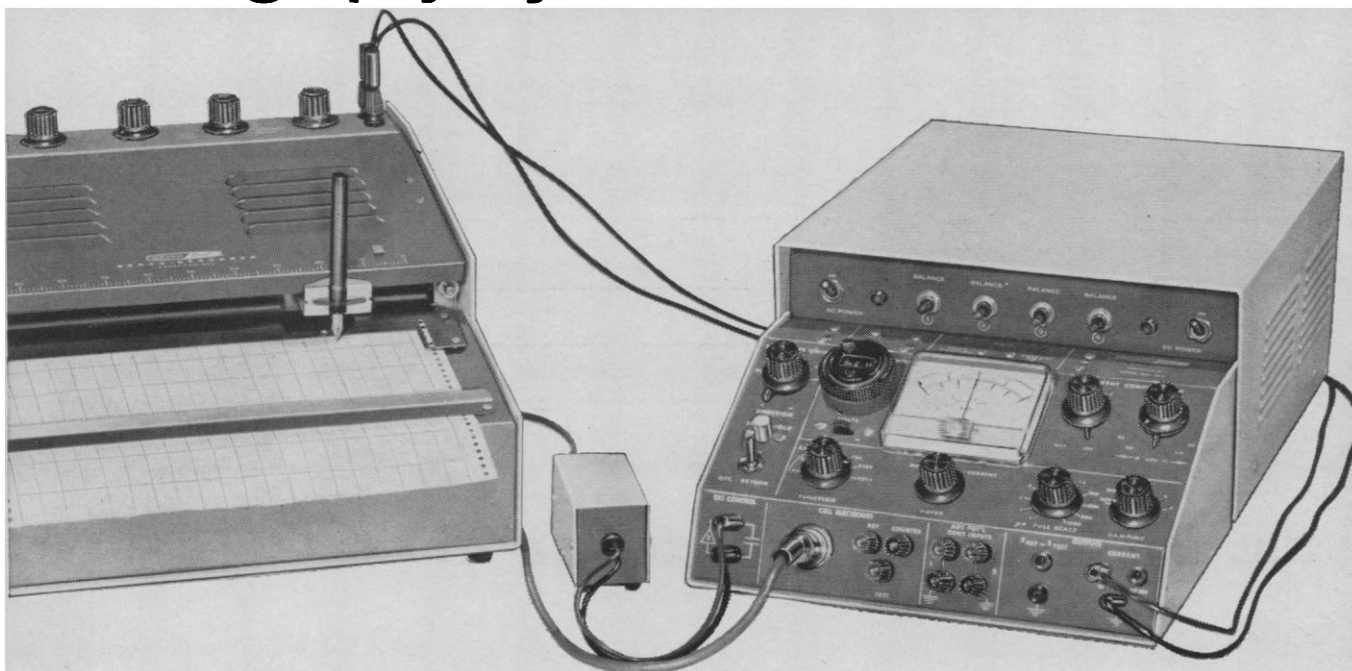
NATIONAL APPLIANCE COMPANY

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



NEW! from HEATH

a Complete Controlled Potential Polarography System For Less Than \$500



... The Heath Malmstadt-Enke EUW-401

Featuring An Electronically Produced Controlled Potential... The Heath Malmstadt-Enke Polarography System produces a precision controlled electronic sweep potential through the combined functions of the EUW-19A Operational Amplifier, and the direct plug-in EUA-19-2 Polarography Module. The sweep potential is adjustable to 6 calibrated rates accurate to $\pm 1\%$. In addition, the Polarography System provides for the measurement of electrode currents from 0.5 to 1000 microamperes full scale, 5 degrees of damping for recording d.m.e. currents, continuously variable initial potential, adjustable electrode current suppression, and adjustable charging current suppression. The circuit includes a very high input impedance follower amplifier to enable use with any reference electrode, and low impedance outputs for recording both current and voltage readout. A panel meter shows electrode current or voltage for manual polarography and amperometric titrations. With appropriate function generators and readout devices supplied by the customer, the Heath Polarography System is adaptable to many additional highly sophisticated polarographic techniques. It features a fast-response potential control section with external control inputs for use with AC, oscillographic, harmonic, phase, and other specialized techniques of polarography. The System is completed by the Heath Malmstadt-Enke EUW-20A Servo Chart Recorder, providing readout for conventional 2-electrode, and 3-electrode polarography.

EUA-19-2 Polarography Module (factory assembled & tested).....\$185.00
 EUW-19A Operational Amplifier (factory assembled & tested).....\$135.00
 EUW-20A Chart Recorder (factory assembled & tested).....\$199.00
 EUW-401, Complete Polarography System (consists of EUA-19-2, EUW-19A, EUW-20A)\$499.00

Further educational discounts available.

See the Heath Malmstadt-Enke Polarography System in operation at the American Chemical Society Show, Atlantic City, N. J. Sept. 14, 15, 16, Booths 505 & 507.

With suitable electrodes, burettes, etc., the Heath Malmstadt-Enke Polarography System (EUA-19-2 & EUW-19A combination with direct reading or EUW-20A Servo Chart Recorder readout) enables these modes of operation:

- 2-electrode (conventional) Polarography
- 3-electrode (non-aqueous or high-resistance) Polarography
- Manual Polarography
- Amperometric Titrations

With suitable electrodes, burettes, etc., and specialized function generators & readout devices supplied by the customer, the Heath Malmstadt-Enke Polarography System can be used for these and many more modes of Polarography:

- Coulometry
- Cyclic Polarography
- Harmonic & Phase Polarography
- AC Polarography
- Oscillographic Polarography



FREE 1966 CATALOG!



See the wide array of Heathkit electronic equipment for the laboratory, classroom, and the hobbyist. Many instruments in both kit and assembled form... save up to 50%. Send for your Free Copy Today!

Heath Company, Dept. 37-10, Benton Harbor, Michigan 49023
 In Canada: Daystrom, Ltd., Cooksville, Ontario

☐ Please send FREE 1966 Heathkit Catalog and place me on your permanent educational mailing list.

Name _____

Address _____

City _____ State _____ Zip _____

Prices & Specifications subject to change without notice.

EK-184

NOW...SEPHADEX® G-10 and SEPHADEX® G-15 for fractionation of low molecular weight solutes

PHARMACIA
LEADING
IN DEXTRAN
CHEMISTRY

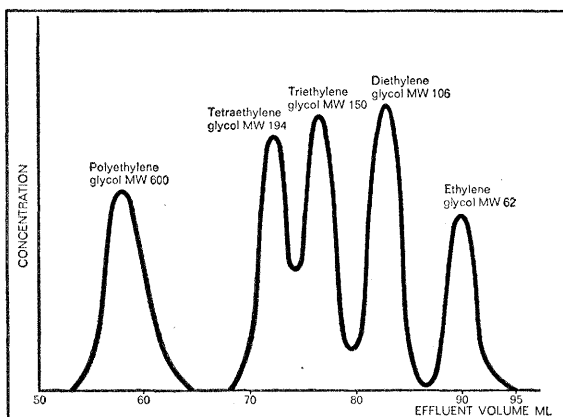


TECHNICAL DATA:

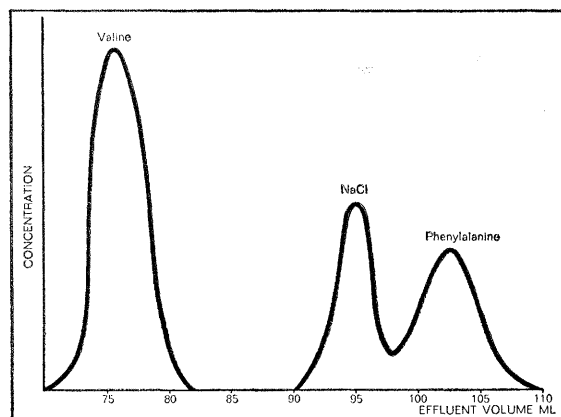
Type	Fractionation range (molecular weight)	Water regain (g H ₂ O/g dry gel)	Particle size (microns)
Sephadex G-10	up to 700	1.0 ± 0.1	40-120 (beads)
Sephadex G-15	up to 1,500	1.5 ± 0.2	40-120 (beads)

Pharmacia Fine Chemicals is continuously expanding its range of separation products—gel filtration media and ion exchangers. The newest additions to the line are Sephadex G-10 and Sephadex G-15. Two distinctive new products help open a whole new area of fractionation of low molecular weight substances by gel filtration.

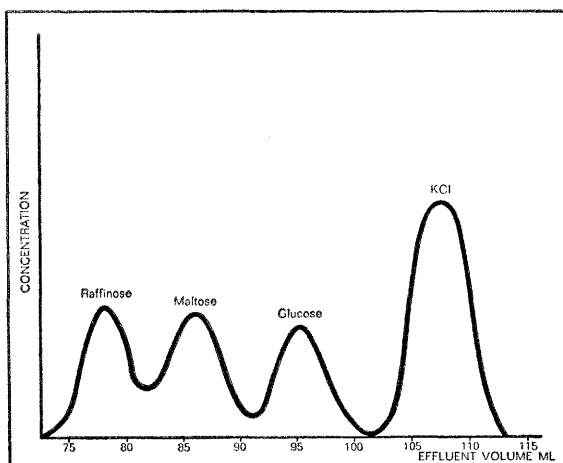
The figures give some examples on the excellent separation properties of these new Sephadex types.



Fractionation of oligomers of ethylene glycols on Sephadex G-10.



Separation of valine, NaCl and phenylalanine on Sephadex G-10.



Desalting of raffinose, maltose and glucose on Sephadex G-15.

Sephadex Laboratory Columns: Columns especially designed for gel filtration with Sephadex are available in four convenient sizes: 1.5 cm x 30 cm and 90 cm. Only the 2.5 cm x 45 cm and 100 cm are available with upward flow adaptors and cooling jackets.

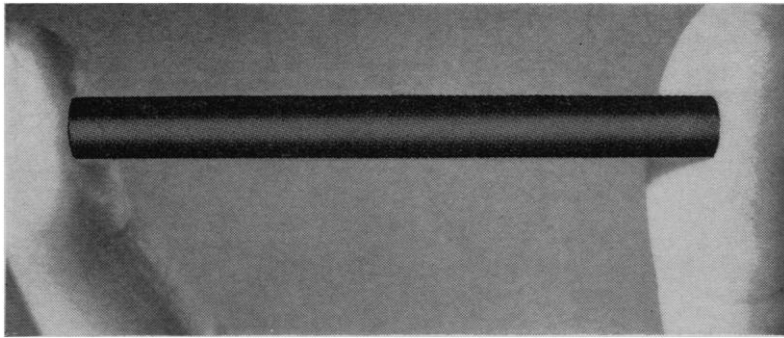
Sephadex Ion Exchange in Bead Form: Sephadex Ion Exchangers are now available in bead form — DEAE —, CM —, and SE — Sephadex. These have high capacities, low nonspecific adsorption and can be repeatedly regenerated. The new spherical shape gives increased mechanical strength for easier column packing. More uniform particles result in improved hydrodynamic properties.

Information Service

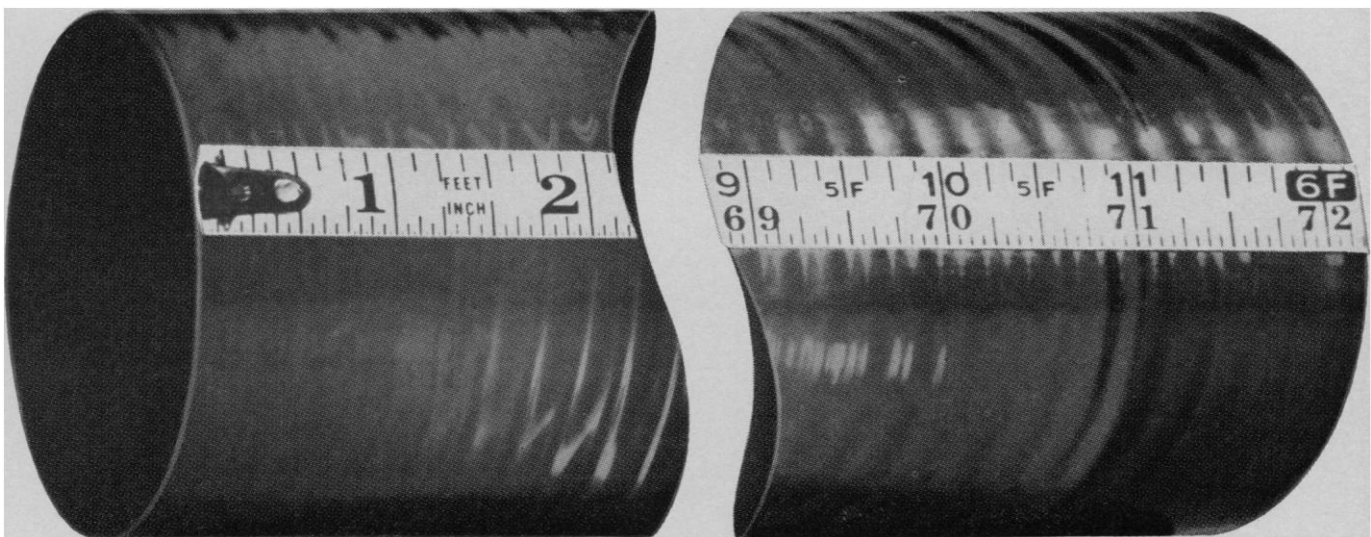
Sephadex G-10 and G-15 literature or information is available on request. Address all inquiries to:

PHARMACIA FINE CHEMICALS INC.
800 Centennial Avenue
Piscataway, New Market, New Jersey 08854

(Inquiries outside North America should be directed to AB PHARMACIA, Uppsala, Sweden.)

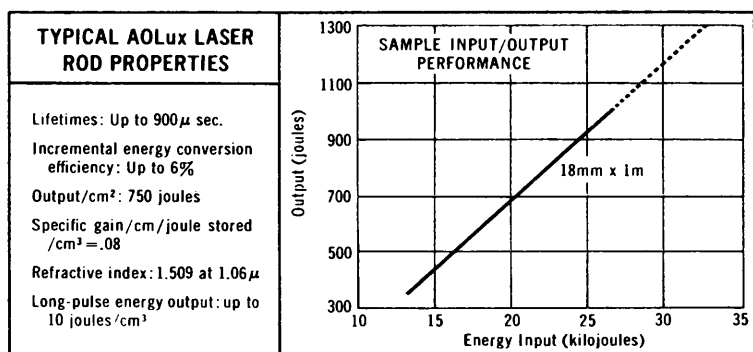


This American Optical AOLux laser rod will increase energy output of most laser systems using your existing power supply. Think of the gain with an AOLux rod this big . . .



and no cryogenic cooling required.

DESCRIBE, ON YOUR LETTERHEAD, the particulars of your laser system so we may recommend the proper AOLux rod geometry for you. With our advances in AOLux rod size, durability and efficiency, we can improve the performance of your laser device. After all, we invented the neodymium-doped glass laser. Write American Optical Company, Space-Defense Division, Dept. S-1, Southbridge, Massachusetts 01551.



AMERICAN OPTICAL COMPANY

SPACE-DEFENSE DIVISION—SOUTHBRIDGE, MASSACHUSETTS

*S-Adenosyl-L-methionine-methyl-C¹⁴ Itaconic-carboxyl-C¹⁴ Acid Tryptophan-7 α -C¹⁴ Allyl-1-C¹⁴ Alcohol Maleic-1-C¹⁴ Hydrazide
 Desoxycholic-carboxyl-C¹⁴ Acid Cholic-carboxyl-C¹⁴ Acid Lithocholic-carboxyl-C¹⁴ Acid p-Chloromercuribenzoic-carboxyl-C¹⁴ Acid Citric-1,5-C¹⁴ Acid
 Carnitine-carboxyl-C¹⁴ δ -Aminolevulinic-4-C¹⁴ Acid S-Methyl-C¹⁴-L-Methionine Cholanic-carboxyl-C¹⁴ Acid Citric-1,5-C¹⁴ Acid
 S-Adenosyl-L-methionine-methyl-C¹⁴ Itaconic-carboxyl-C¹⁴ Acid Tryptophan-7 α -C¹⁴ Allyl-1-C¹⁴ Alcohol Maleic-1-C¹⁴ Hydrazide
 Desoxycholic-carboxyl-C¹⁴ Acid Cholic-carboxyl-C¹⁴ Acid Lithocholic-carboxyl-C¹⁴ Acid p-Chloromercuribenzoic-carboxyl-C¹⁴ Acid Citric-1,5-C¹⁴ Acid
 Carnitine-carboxyl-C¹⁴ δ -Aminolevulinic-4-C¹⁴ Acid S-Methyl-C¹⁴-L-Methionine Cholanic-carboxyl-C¹⁴ Acid Citric-1,5-C¹⁴ Acid*

Wh-o-o-o-o-sh

There it goes... ***another radiochemical shipment from Tracerlab***

Our records show that our current speed record from receipt of order in Waltham, Mass. to delivery in Berkeley, Calif. now stands at 19 hours. The way we're going, it isn't going to stand very long. Speed is just naturally part of the Tracerlab radiochemicals service—along with superlative purity, widest range (more than 900 stock compounds at last count), and friendly, personal attention to your every need.

Prove it to yourself. Call Dr. John Leak at TW 4-6600, area code 617 . . . and help us break a new record in speed and service.



TRACERLAB

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

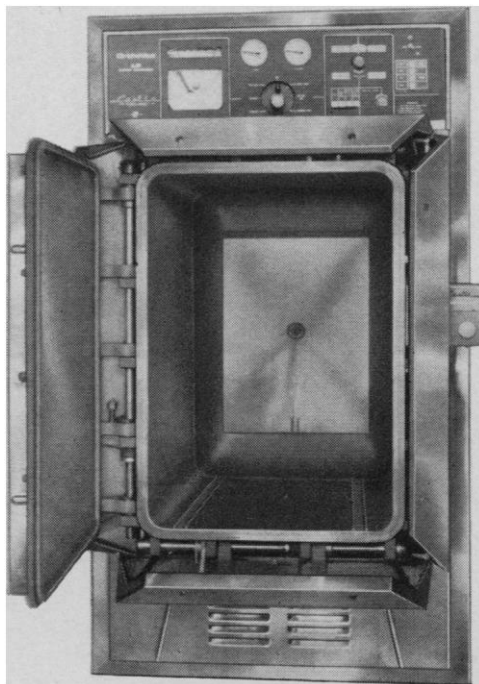
Richmond, California • Houston, Texas • Malines, Belgium • Sales Offices in Principal Cities
Film Badge Service • Health Physics • Bioassays • Sources • Nuclear Instrumentation • Radiochemicals
Radioactive Waste Disposal • Radiation Monitoring Instrumentation • Isotope Applications

**Castle OrthoVac LS is the newest development
in high vacuum sterilization...
simpler, more reliable,
and far more efficient
than any previous technique.**

New Dual Phase Evacuation accomplishes far greater air removal than *any* other system. Result: OrthoVac LS sterilizes the most difficult packages, large or small, up to four times faster than conventional methods.

The exclusive Castle Load Sensor monitors load air concentration—permits completion of sterilization cycle only in the absence of entrapped air.

OrthoVac LS has been engineered to produce maximum performance and reliability from a simple, non-critical system. Why not write us for full details. Wilmot Castle Company, 1710 E. Henrietta Road, Rochester, New York 14602.



WILMOT CASTLE COMPANY
SUBSIDIARY OF RITTER CORPORATION

MORE FOR LESS?

Yes.

You can get more versatility... more features...in a super-speed centrifuge ...and pay less.

With the new

LOURDES BETA-FUGE

You get Larger Capacity

A 3300ml volume rotor is a Lourdes exclusive.

You can centrifuge

3300ml at 14,000 x G.

Also — 1600ml at 27,500 x G.

... and 400ml at 41,300 x G.

Or, 1000ml at 5500 x G

in a swinging bucket rotor.

Wider choice of Rotors

14 different rotors —

swinging bucket, solid angle,

continuous flow

and the new blood bag rotor

give you more capacity —

more versatility.

Programming capacity

Speed and time factors

can be preset and

reproduced to within 1%.

Temperature can be preset

and held to within $\pm 1^\circ$ C.

Fail-safe controls prevent

motor damage during programmed run.

Faster, fully controlled cycling

Accelerates to 18,000 rpm

(400ml volume) in only 1 min. 45 sec.

Decelerates from 18,000 rpm

to full stop in just 4 min. 25 sec. —

with electro-dynamic braking

and special coasting action

— without disturbing interfaces

or pellet structure.

More efficient Continuous Flow facility

It's simpler to install and operate

gives faster separation

— has greater sediment capacity.

Discard temperature conversion charts

A single control maintains true

temperature of material to within $\pm 1^\circ$ C

in all operational phases,

throughout temperature range of

-20 to $+40^\circ$ C.

No motor damage due to brush failure

Exclusive Fail-Safe control signals

when 5 hours of brush life remains.

Unit cannot be started

when brushes are due for replacement.

Complete safety in operation

Rotor CANNOT fly off

due to the independent support shaft

— even if the drive spindle breaks.

Exclusive feature stops the centrifuge

in event of excess vibration.

Heavy steel armor plate provides chamber protection.

Solid state circuitry eliminates short circuits.

Heavy duty motors are never overtaxed.

You pay less too

Check for yourself

with the "competitive" centrifuges —

which do not have all these features.

Lourdes' 20 years of engineering

and production skills

assure you get more —

And, you'll be pleasantly surprised,

to hear how much less the BETA-FUGE costs.

Interested?

Check with any Lourdes franchised dealer —

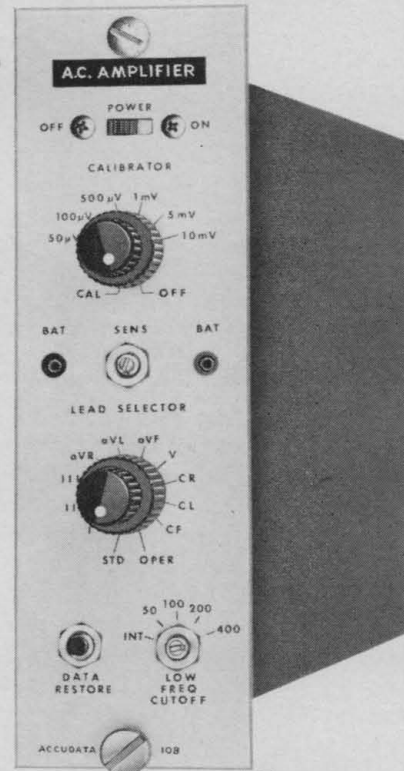
or write for Catalog 70.

LOURDES

656 Montauk Avenue

Brooklyn, N.Y. 11208 • (212) NI 9-2860

This is Honeywell's new solid-state Universal Amplifier. Switch from EKG to EEG, EMG, or PCG just by changing the sensors.



It's small, has its own integral battery power supply, and offers high input impedance with low noise levels.

All common types of EKG, EEG, EMG, and PCG sensors can be used with Honeywell's new Universal Amplifier, the Accudata 108. Yet, despite this versatility and convenience of operation, the instrument is very compact, occupying but one modular space.

Battery power means low-noise operation, and solid state electronics assure long life and reliable service. Other features include: wide range of calibration voltages; 6 hi-pass filter positions; lead selector, and capability to drive electro-damped Visicorder Oscillographic galvanometers directly. In addition, the amplifier can be used in conjunction with an oscilloscope or tape recorder.

High-frequency recording capability is provided by the companion D-C amplifier, the Accudata 109, when even higher output current capability is required.

For more information on this outstanding new Universal Amplifier, please call your Honeywell Representative or mail the coupon for specifications and prices.

Dr. D. C. Sutfin
Mail Station 407 • Honeywell
Denver, Colorado 80217

Please send information on the new Universal Amplifier to:

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Honeywell
ELECTRONIC MEDICAL SYSTEMS

BERKELEY • 132nd AAAS

Order Your General Program

It provides complete, detailed information about all the sessions and symposia scheduled, the Annual Exposition of Science and Industry, and the Science Theatre.

Program Highlights

Moving Frontiers of Science: F. Clark Howell on Significant Advances in Human Evolutionary Studies; Norman F. Ness on A New Look at the Earth's Magnetic Field; Jerome Y. Lettvin on Physiological Basis of Mental Activity; and William M. Fairbank on Some Aspects of Low Temperature Physics.

AAAS Distinguished Lecture: Genetics and Cultural Change by George W. Beadle, president, University of Chicago.

Interdisciplinary Symposia: Ground-level Climatology; Proteins and Nucleic Acids; Materials Science in Medicine, Dentistry, and Pharmacy; Behavior, Brain, and Biochemistry; Mathematical Bases in Economic Planning.

Special Sessions: AAAS Presidential Address on Antarctica: Continent of International Science by Laurence M. Gould; the Joint Address of Sigma Xi and Phi Beta Kappa by J. Bronowski; the George Sarton Memorial Lecture by Stillman Drake on "The Accademia dei Lincei"; and the National Geographic Society Illustrated Lecture.

AAAS Committees: Special Program of the AAAS Committee on Council Affairs on Civil Defense: Speakers: Eugene Wigner, Wolfgang Panofsky, Owen Chamberlin, Fred Payne, Barry Commoner, Bentley Glass, and Anatol Rapoport, moderator, and Henry Eyring, chairman; Committee on Desert and Arid Zones Research.

Lawrence Hall of Science: Director Harvey E. White will lecture twice on this splendid Center of Science Education, 27 and 29 December.

Sections and Societies: The 20 AAAS Sections and some 92 participating societies are scheduling specialized symposia and papers.

AAAS Science Theatre: The latest foreign and domestic films.

Exhibits: The Annual Exposition of Science and Industry is on the lower level of the ASUC Student Center, AAAS Headquarters.

Advance Registration: By registering in advance, you avoid delay at the Registration Center on arrival; you receive the **General Program** in time to plan your days at the meeting; and your name is posted in the Visible Directory when the meeting opens. Use the coupon below.



AAAS

1515 Massachusetts Ave., NW
Washington, D.C. 20005

(Check 1a or 1b) 1a. ☐—Enclosed is \$5.00 Advance Registration Fee. This brings me the **General Program** and a **Convention Badge**.

1b. ☐—Enclosed is \$3.00 for the **General Program**. (If I attend the meeting, the Badge, which I need to obtain the privileges of the meeting, will cost me \$2.00 more.)

2. FULL NAME (Dr., Miss, etc.)
(Please print or typewrite) (Last) (First) (Initial)

3. OFFICE ☐ OR HOME ☐ ADDRESS
(For receipt of General Program)

CITY STATE ZIP CODE

4. ACADEMIC, PROFESSIONAL, OR
BUSINESS CONNECTION

5. FIELD OF INTEREST

6. CONVENTION ADDRESS
(May be added later, after arrival)

Please mail this coupon and your check or money order for the total amount to the AAAS in Washington, D.C. (address as shown)

MEETING • 26-31 DECEMBER

Make Your Reservations

Make sure you have the sleeping accommodations you prefer. Since this is a campus meeting—and the ASUC Student Center is AAAS headquarters—society headquarters will be mainly in university buildings.

Hotel and Motel Information. A deposit of \$5 is required by all hotels and motels. Deposits are credited toward the final bill, and are refunded if cancellation is received not later than 10 days before the date of your reservation. Make checks payable to the AAAS Housing Bureau.

Residence Hall Information. Accommodations are available for one or two persons per room, for couples, and for children 14 years or older. Hours for room registration at the Hall are 8:00 a.m.–10:30 p.m. daily. The full amount for room, with or without meals, is collected in advance. There is a special charge for overnight 30 December (no meals December 31): \$6.00 single occupancy, \$5.00 per person

double. Parking is 50¢ per 24-hour day. The general deadline for residence hall reservations is 10 December.

For more details on all of the above facilities and services, see the 23 July issue of Science, page 454.

The hotel, motel, and residence hall sleeping accommodations are for your convenience in making your room reservation in Berkeley. **Please use the coupon below and send it and any necessary deposit directly to the AAAS Housing Bureau in Berkeley.** Give a definite date and estimated hour of arrival, and also your probable date of departure. The Housing Bureau will make the assignment and promptly send you a confirmation.

Rates per Day

HOTELS	Single	Double	Twin	Suite	Parking
Claremont (300)	\$11.00	\$15.00	\$15.00		Free
Durant (200)	8.50*		12.00*	\$18.00-22.00	50¢, \$1.00
Shattuck (250)	8.50	11.00	14.00	25.00-35.00	Public

* A few single rooms at \$5.50, twins at \$7.50.

MOTELS

Berkeley House (112)	9.50	13.50	13.50	25.00-28.00
Berkeley Plaza (52)	7.00	8.50	9.50	15.00
Berkeley Travelodge (46)	8.00	10.00	11.00	
California Motel (42)	6.50	7.00	8.00	
Golden Bear (44) (and others)	7.00-8.00	8.00-10.00	10.00-12.00	18.00

RESIDENCE HALLS

Single occupancy—\$7.50 without meals; \$8.50 with breakfast and lunch

Two in a room—\$6.50 each without meals; \$7.50 each with breakfast and lunch

AAAS Housing Bureau
P.O. Box 210
Berkeley, California 94701

Date of Application

Deposit of \$..... enclosed

Please reserve the following accommodations for the 132nd Meeting of the AAAS in Berkeley, 26-31 December 1965

First Choice of Hotel, Motel, or Residence Hall Second Choice

Type of room: Single ☐ Double bed ☐ Double, twin beds ☐ Suite ☐ Rate: Desired Maximum rate.....

Number in party Sharing this room will be:
(List name and address of each person, including yourself. Attach list if space is insufficient.)

DATES: ARRIVAL A.M. P.M. DEPARTURE
(These must be indicated—add approximate hour, A.M. or P.M.)

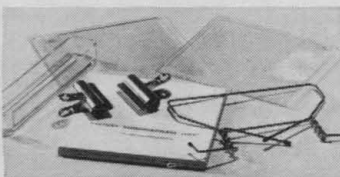
NAME
(Individual requesting reservation) (Please print or type)

ADDRESS
(Street) (City) (State) (ZIP Code)

Mail this coupon now to the AAAS Housing Bureau. Enclose hotel or motel room deposit if needed. Make checks payable to AAAS Housing Bureau. All rooms will be assigned and confirmed in order of receipt of reservation.

The EASTMAN CHROMAGRAM System for thin-layer chromatography consists of EASTMAN CHROMAGRAM Sheet and EASTMAN CHROMAGRAM

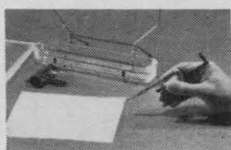
Developing Apparatus.



It makes TLC—once messy

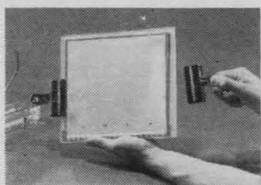
and cumbersome—fast, neat, and uncomplicated. Gone are the bulk and expense of coating equipment and the problems of breakage and siliceous dust. You take EASTMAN CHROMAGRAM Sheet out of a box,

spot it,

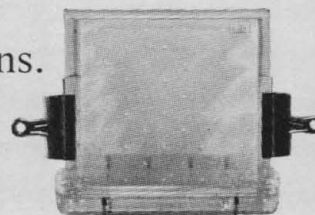


place it in the EASTMAN CHROMAGRAM Developing

Apparatus,



and separation begins.



EASTMAN CHROMAGRAM Sheet comes in two types: Type K301R with fluorescent indicator and Type K301R2 without fluorescent indicator. Both types are inert poly(ethylene terephthalate) with an adsorbent layer of polyvinyl-alcohol-bound silica gel 100 microns thick; over-all thickness is 0.3mm. The 20cm x 20cm sheets are packed 20 to the box. They are easily cut to desired sizes and shapes—you need stock only the one size.

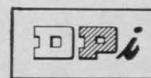
EASTMAN CHROMAGRAM Developing Apparatus comprises two identical 23cm-square plates made with bosses,

ridges, and flats that work together; a solvent trough, an easel, and a pair of spring clips. The apparatus involves no presaturation or lining with solvent-soaked filter paper. It takes little bench space, and that only when in actual use.

You can obtain EASTMAN CHROMAGRAM Sheet and Apparatus from your regular supplier of EASTMAN Organic Chemicals. Also available directly from *Distillation Products Industries*, Rochester, N.Y. 14603, at \$35.50 for the apparatus and \$23.20 per box of sheet (prices are subject to change without notice and do not include transportation).

"CHROMAGRAM" is a trademark.
Patents applied for.

Distillation Products Industries is a division of Eastman Kodak Company





NUCLEAR
DATA
INC

INVOICE

Nº 3054

West Golf Road • P. O. Box 451 • Palatine, Ill. 60067 • Phone (312) 529-4600

SOLD
TO

Dr. John C. [REDACTED]
University of [REDACTED]
[REDACTED] Laboratory
Accounting Office
P. O. Box [REDACTED]
[REDACTED] California [REDACTED]

SHIP TO

SAME AS "SOLD TO" UNLESS OTHERWISE INDICATED.

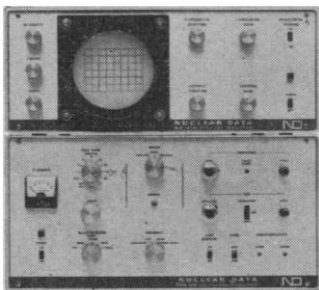
SHIPPING DATE(S)

August 20, 1965

TERMS: 1/2 OF 1% 10 DAYS, NET 30

ITEM NO.		QTY. ORD.	DESCRIPTION	QTY. SHIPPED	UNIT PRICE	AMOUNT
1	1		ND-110 128 Channel Analyzer To include following standard features and specifications: - Amplitude and Multiscaling analysis capabilities with internally generated Multiscaling dwell times by factor of 10 from 1 msec. to 10 sec. - Live Logarithmic display - optional Live Linear display. - Decade calibration lines. - External programming for start-stop analysis and start-stop readout. - Automatic analysis for preset time followed by readout of data. - Low-level, 10 volt, 100 volt, and Mössbauer experiment signal inputs. - Coincidence/Anti-coincidence gating. - Optional battery pack operation. - Digital readout capability to Teletype or Victor printer. - Analog readout capability.		\$3,650.00	\$3,650.00
2	1		- ND-410 Display Monitor		495.00	495.00
TOTAL						\$4,145.00

NO DISCOUNT ALLOWED ON FREIGHT CHARGES



NOW! 30-DAY DELIVERY ON THE ND-110...

in use by more than 100 leading laboratories. This ND-110 128 Channel Analyzer is the lowest priced multi-channel pulse height analyzer available today. Users benefit from long term reliability and important savings in time and money. Call your Nuclear Data Sales Engineer or write for more information.

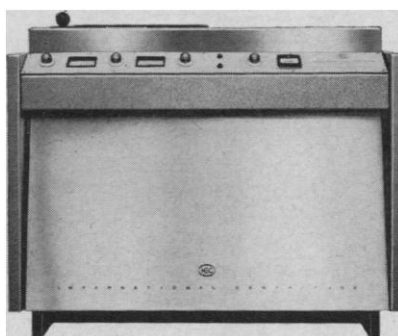
Prices shown are for U.S.A. and Canada: Export prices, add 10%



NUCLEAR DATA INC

120 West Golf Road, Palatine, Illinois 60067

**Can there be a single instrument that is
both a true preparative ultracentrifuge and a
high speed, high volume refrigerated centrifuge?**



The new IEC B-35.

**It provides high-resolution density gradients at
206,200 g in computer-designed long tube rotors.
And spins two full liters at 28,500 g!**

The new B-35 is a unique concept in ultracentrifugation. This single instrument performs a host of tasks you'd assign to a high speed refrigerated centrifuge. At the same time it provides exceptional capabilities in preparative and high-resolution density gradient research work with enzymes, nucleic acids, viruses and subcellular fractions.

Ten new rotors are available for a wide range of work. Due to new metallurgical and design advances they never need to be derated. Temperature is controlled through a precision thermistorized system electronically calibrated to the rotor. An automatic lock-in

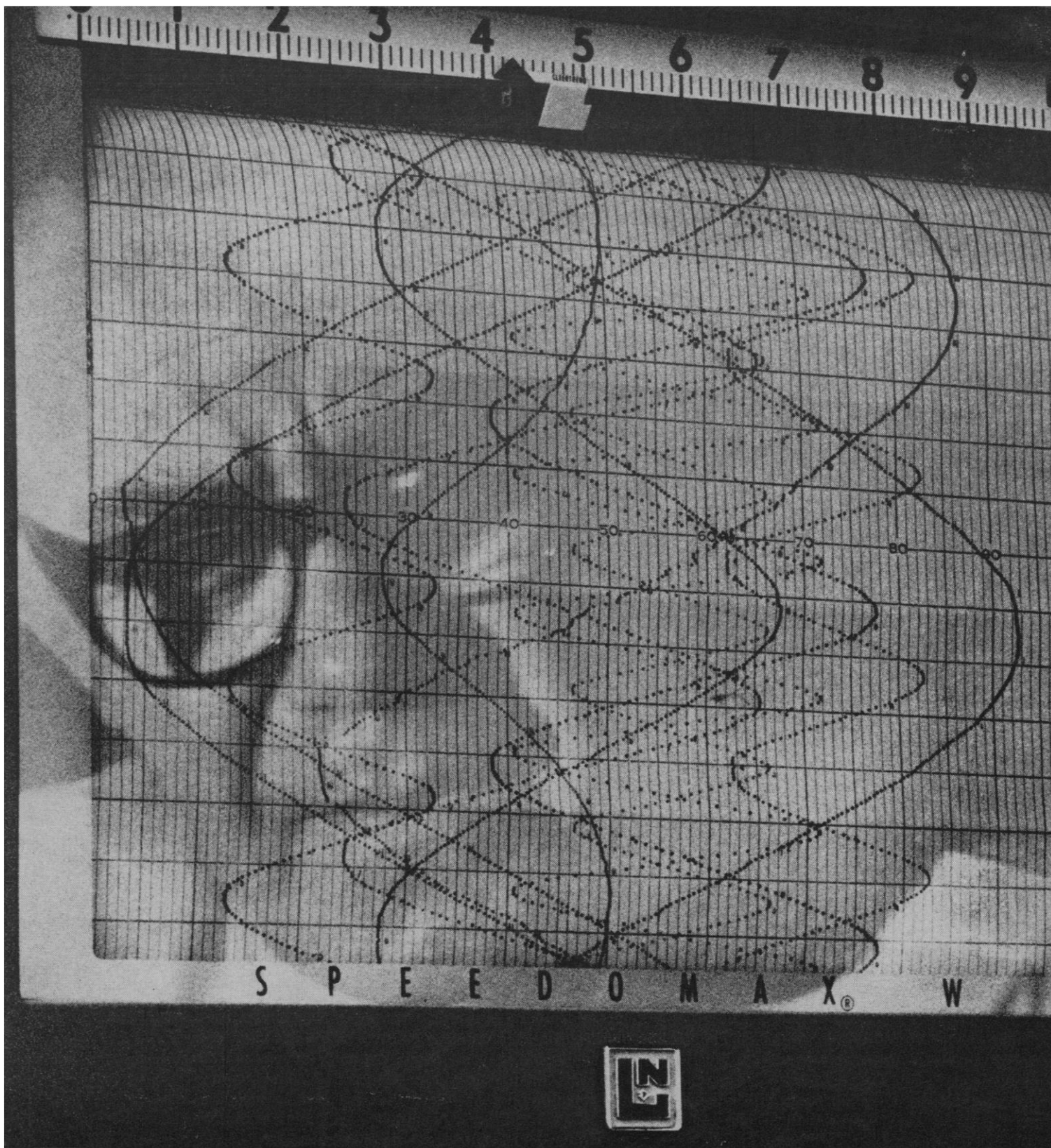
speed control and single programming switch insures precise reproducibility of speed conditions for repetitive experiments. The vacuum system provides an operational level below 50 microns in under 8 minutes. The belt-type flexible drive is inherently balanced, vibrationless and requires only eye-level rotor balancing techniques. At 35,000 rpm the B-35 is whisper-quiet.

If you have space problems in your lab, this one instrument that does the work of two will give you an extra bonus, space conservation.

Write for bulletin B-35.

INTERNATIONAL  EQUIPMENT CO.

300 Second Avenue • Needham Heights, Mass. 02194



Some people can't afford to buy L&N instruments. Some people can't afford not to.

You can tell in a minute which class you belong to.

Say you're interested in taking only an occasional temperature reading—and it's not too critical. Reliability—the kind we build into our Speedomax recorders—would be extravagant. Our instruments earn their reputation by operating on line, second-by-second, 24 hours a day, for years on end.

Or say the readings you want don't

have to be too exact. Why pay the extra cost (even if it is small) for a recorder built to conform to ASA standards? And checked for accuracy with the same care as the lab instruments we make?

Or take your process. It may be so simple that you feel the specialized knowledge of our instrument application engineers can't increase your productivity, improve quality or lower your costs one bit. Yet, when you "buy

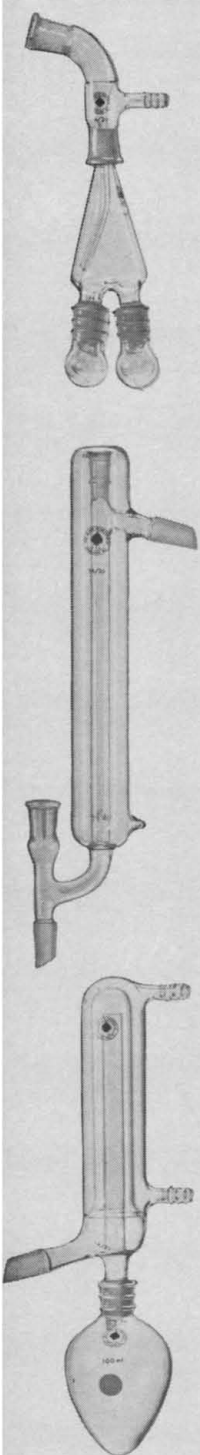
L&N," this wealth of experience is part of the package.

So if you don't need L&N reliability, accuracy or know-how; or if there's no loss to you in system downtime, or malfunction . . .

Your decision is easy. You can't afford an L&N instrument . . . yet.



LEEDS & NORTHRUP
Philadelphia 44 • Pioneers in Precision



Think



Micro!

The reasons for thinking micro or semi-micro are: space saving, lower initial cost, savings on chemicals and *Ace Mini-Lab, the first and original laboratory in miniature!*

Ace Mini-Lab, introduced in 1950, is the first especially designed line of miniature glassware. Our chemists and designers are perfectionists. Each Mini-Lab apparatus was tested until it performed most efficiently.

Result? Success! Today, Mini-Lab is

enthusiastically accepted in laboratories, schools, everywhere!

Ace Mini-Lab, the most complete line of miniature glassware, comes in K 14/20, 19/22 and J 18/9 joints; a full line of components permits endless variations.

Another first! You can get Mini-Lab as self-heating glassware: Ace INSTA-THERM! Mini-Lab also comes in student kits with PolyGard interior! Stop thinking—do! *Send for new Mini-Lab and Instatherm brochures.*



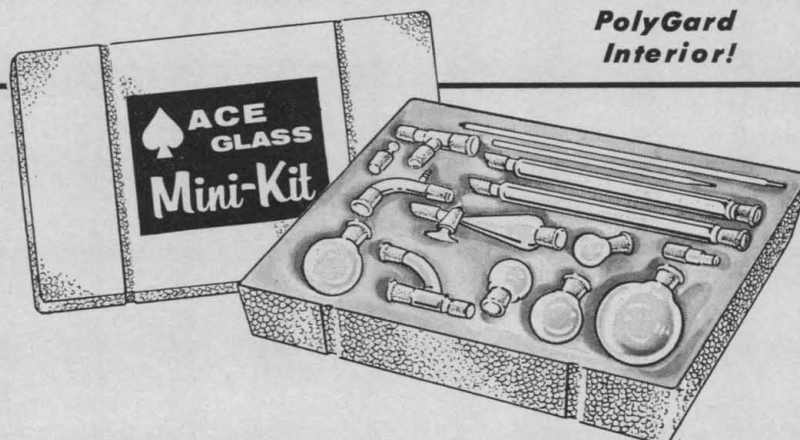
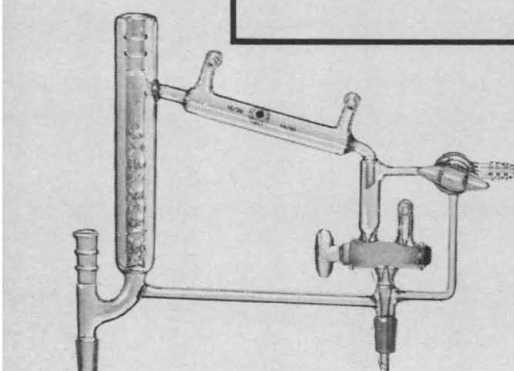
ACE GLASS INCORPORATED

Vineland, New Jersey

LOUISVILLE, Ky.

SPRINGFIELD, MASS.

New Kits!
PolyGard
Interior!





Menu for tissue cultures

REHATUIN N.F.S., Fetal Bovine Serum was developed expressly to meet the nutritional needs of sensitive tissue cultures, providing a specialized diet for optimum tissue growth. Prepared under the strictest laboratory standards, this protein source for microbiological and tissue culture is a non-filtered, sterile media. It provides unaltered serum composition for the best growth conditions without influ-

encing normal cell reproduction in specialized cultures.

A new development, REHATUIN is just one of the fine blood derivatives now available to the biochemist under the Reheis label. Reheis can meet the needs of clinical or commercial labo-

ratories with REHATUIN or with our line of blood derivatives for use in serological testing, enzymatic assays, immunological experiments, prothrombin tests, preparation of fibrin foams and films, and as reagents and in protein standards.

Requests for samples or additional information on REHATUIN or any of our fine blood derivatives will receive prompt attention.

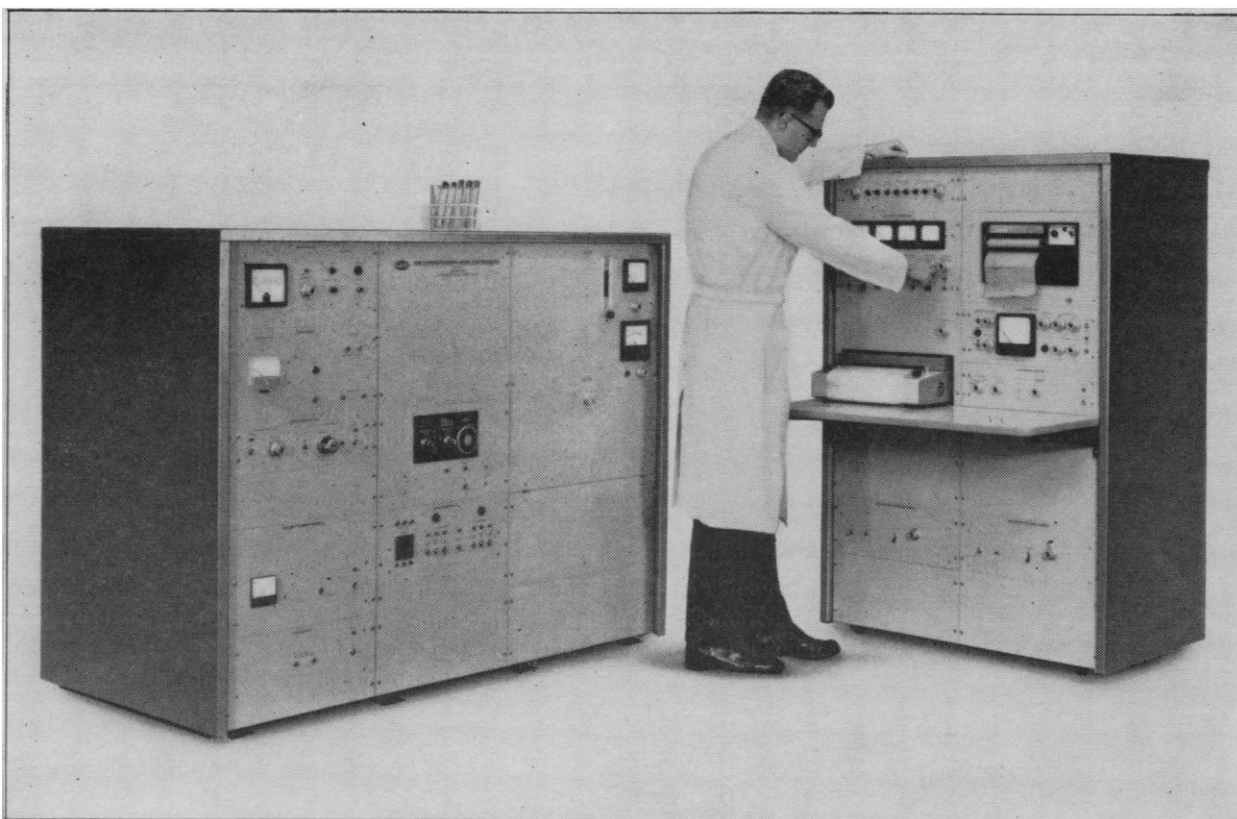


REHEIS CHEMICAL COMPANY

Division Of Armour Pharmaceutical Company

401 North Wabash Ave., P.O. Box 1022, Chicago, Illinois 60690

Producers of aluminum compounds, antacids, antiperspirants, blood and glandular derivatives, enzyme and hormone preparations and other fine chemicals.



Introducing the LKB 9000 Gas chromatograph-mass spectrometer

The LKB Model 9000 is a fully equipped, combination instrument which provides simple, reliable and flexible operation for the routine mass spectrometric analysis of organic substances purified by the built-in gas chromatograph. It utilizes the most advanced and sophisticated methods and instrumentation for each of its important unit operations, from sample introduction into the gas chromatograph to recording of a mass spectrum. Other inlet systems are provided for operation of the mass spectrometer with previously purified liquids and solids. We are justly proud of its performance, which is eminently suited for biochemical analysis, determination of trace constituents in complex mixtures, molecular structure elucidations, and studies of isotope abundance.

Gas Chromatography for the preliminary purification of organic compounds in complex mixtures is achieved with coiled columns housed in a compact oven. A circulating air bath assures accurate temperature regulation in isothermal or temperature-programmed operation.

Sample Enrichment in a unique patented molecule separator (per Becker and Ryhage) is carried out by the preferential removal of carrier gas from the effluent stream of the gas chromatograph.

Ionization is achieved by electron impact. Automatic regulation of electron energy provides optimal levels of ionization during operation of the ion source as a gas chromatographic detector and for the reproducible production of an array of fragment ions during re-

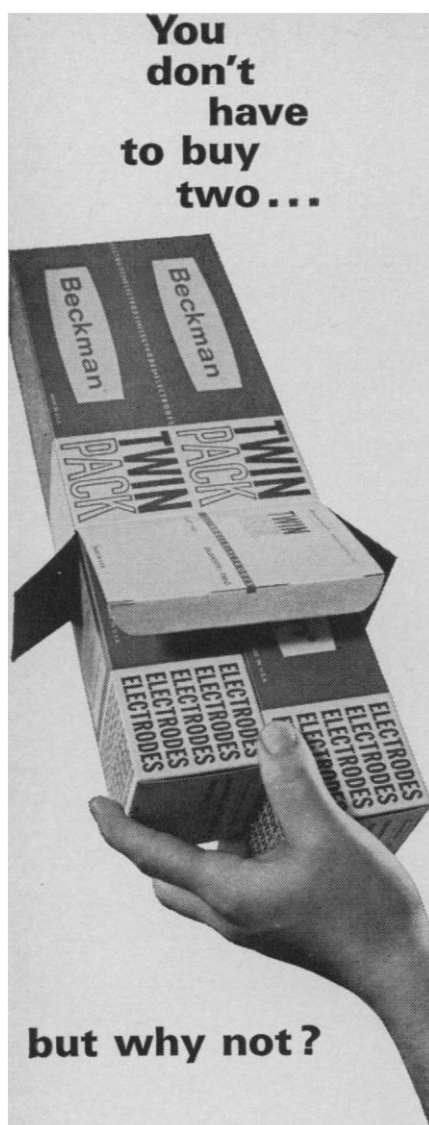
cording of a mass spectrum.

Mass Spectra are obtained with a rapid-scanning, single-focussing magnetic sector analyzer with sufficient resolving power for operation with compounds in a molecular weight range up to 1200. Optimal resolving power under different operating conditions with externally variable ion source and collector slits.

Components for the GLC inlet are designed to provide optimal performance with the most demanding chromatographic conditions. Minimum dead volume and effective, uniform temperature control of all parts assures symmetrical peaks with no loss of effective column efficiency, even with capillary columns and long packed columns. Write for brochure 9000S10 and list of satisfied users.



LKB INSTRUMENTS, INC., 12221 Parklawn Drive, Rockville, Maryland 20852
© LKB-PRODUKTER AB, P.O. Box 76, Stockholm-Bromma 1, Sweden.



Beckman pH Electrodes now come in a Twin Pack. When you order one electrode, why not order two? It saves ordering so often. It avoids delays during important determinations. You've always got a spare.

Most Beckman Electrodes can be ordered in Twin Packs that protect them better than ever. Twin Pack's protective, expanded polystyrene insert does double duty around the lab, too. It conveniently holds electrodes, test tubes, pencils, and other small items. For your electrode needs contact your local Beckman Sales Engineer, or write for Electrode Catalog 86.

Beckman INSTRUMENTS, INC.

SCIENTIFIC AND PROCESS
INSTRUMENTS DIVISION
FULLERTON, CALIFORNIA • 92634

INTERNATIONAL SUBSIDIARIES: GENEVA, SWITZERLAND;
MUNICH, GERMANY; GLENROTHES, SCOTLAND; PARIS,
FRANCE; TOKYO, JAPAN; CAPE TOWN, SOUTH AFRICA

metric units are permitted by law but are little used.

In 45 countries, total population 1775 million, neither system predominates. China and India make up almost two-thirds of this population. In all these countries, indigenous systems are in wide use; English units are also used to a considerable extent; the metric system has been introduced but has made little headway.

Thus out of a population of 3030 million (97 percent of the world's population in 1962), the metric system is used predominantly by 22 percent; the English system by 19 percent; indigenous systems or a mixture of systems by 59 percent. The main conclusion to be drawn from these figures is that unless the metric system is made mandatory (not just permissible) by law, it makes little headway. In short, for the most part metric conversion means compulsion. . . .

JOSEPH MAYER

Chestnut Lane, Oxford, Ohio

Reference

1. Based upon *World Weights and Measures* (United Nations Statistical Office, New York, 1955), pp. 23-147. Countries with less than 100,000 population are omitted. The population figures are for midyear 1962 and are taken from *Demographic Yearbook 1963* (United Nations, New York, 1964), pp. 148-161.

Parapsychology and Spontaneous Cases

J. B. Rhine and Charles G. Morris wrote independent letters ("Parapsychology not guilty," 27 Aug., p. 910) in response to my letter entitled "A pseudo experience in parapsychology" (18 June, p. 1541). Morris apparently endorsed my conclusions in his first paragraph, but then, like Rhine, chided me for taking a typical story from the "popular parapsychological literature" rather than from the "more serious parapsychological literature." He concluded that the latter "would be the more appropriate and worthwhile for the inquiring scientist." (In the following quotations, all emphasis has been added by me.)

Rhine concluded his letter with the following two sentences: "*In my 40 years of work in parapsychology I have not come upon any attempt to base a serious conclusion upon spontaneous case material even when such material does belong to the parapsychological category, as that cited by Alvarez does not.* [Rhine apparently missed the point

of my example, which was that *no one* could believe that it had parapsychological content.] If Alvarez or anyone else wishes to become acquainted with the parapsychological literature to which he refers, a request for a reference list will be promptly filled."

Naturally, I consider myself to be an inquiring scientist, and I do not wish to be unfair to Rhine. So I visited our Psychology Library and took down the latest bound volume of the *International Journal of Parapsychology*. Its table of contents listed a paper entitled "Approaches to the study of spontaneous cases." I confirmed the fact that spontaneous cases are those of the type I used as my model; they are sent to parapsychology laboratories by people who have had unusual experiences of the kind I tried to show might well be explained as coincidental. One of the references cited in this paper was an article by Louisa E. Rhine, of the Duke University Parapsychology Laboratory, entitled "Conviction and associated conditions in spontaneous cases" [*J. Parapsychol.* 15, 164 (1951)]. This volume was on the shelf directly below the volume I had just been examining, so it took me only 5 minutes after entering the library to locate Louisa E. Rhine's article.

L. E. Rhine's article is based on a study of 1600 spontaneous cases on file at Duke. She abstracts 19 of the cases in sufficient detail that one can be convinced she is dealing with examples of the type I referred to in the first paragraph of my note. Her concern is with the degree of conviction felt by the subject that his revelation was authentic and not merely coincidental. The last page of her "Discussion" starts with this paragraph:

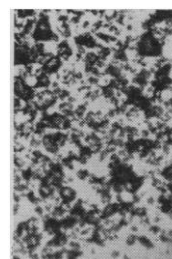
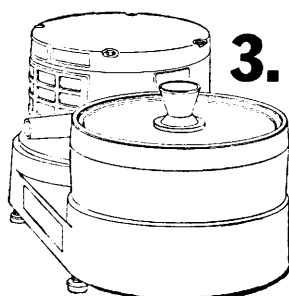
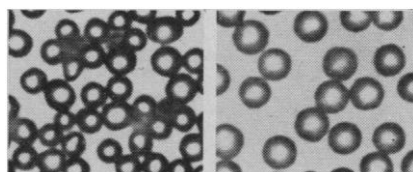
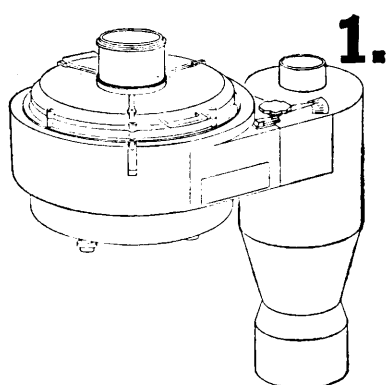
This case study has shown first that conviction occurs with considerable frequency in spontaneous psi experiences. It is reported from widely different sources and, although in varying proportions, in all types of cases. It is therefore a natural phenomenon to be studied by appropriate research methods and should no longer be overlooked by parapsychological experimenters.

The fact that I was able to discover, in 5 minutes, an example of an "*attempt to base a serious conclusion upon spontaneous case material,*" whereas J. B. Rhine was unsuccessful in 40 years of similar search, may of course be attributable to "luck" on my part.

LUIS W. ALVAREZ

Physics Department,
University of California, Berkeley

Our Particle Classifier separates subsieve particles with ± 2 micron accuracy (or better) at the twist of a dial.



100-X

1. The Vortec C-1 Particle Classifier is the first machine on the market that can classify particle bands in the subsieve range with a ± 2 micron accuracy (or better). It also provides an instantly adjustable separation point without manual machine changes. Merely turn a dial which controls the air flow separation system. The C-1 handles low density materials such as talc, limestone, and diatomite or high density materials such as tungsten and nickel powder.

Vortec's particle classifier is designed for small production runs, pilot plant operation, research and development, and particle size distribution analysis for production control. Its output ranges from a few grams to 750 pounds per hour. Vortec particle classifiers can also run in tandem or closed circuit with the versatile Vortec impact mill.

Vortec C-1 Particle Classifier: \$5,280, including cyclone air cleaner.

2. At left: Attempt to obtain tungsten powder in the 7 to 8 micron range with conventional separation causes high scatter of sizes.

At right: Vortec separation provides the desired uniform particle band.

3. The Vortec M-1 Impact Mill, utilizing a single-impact to produce fresh sharp-edged surfaces, blasts materials onto tungsten carbide targets at over 600 m.p.h. Adjust the rotor speed of our unique system and you can get particle sizes from coarse grinds to an extra-fine grind in the subsieve range (-325 mesh).

The M-1 handles abrasive materials such as silicas and aluminum oxides as well as soft materials such as talc and limestone. The M-1 Impact Mill is non-clogging, easy-

to-clean, and self-cooling. Output ranges up to 2,000 pounds per hour, and the end product is not affected even by drastic changes in the feed rate.

Vortec M-1 Impact Mill: \$5,470.

4. These Ottawa silica particles were reduced from 100% above 600 microns to 70% below 44 microns in a single run through the M-1 mill.

For more detailed information or brochures on the C-1 and M-1, or if you require classifying or milling equipment with capacities to 50 tons per hour, write or call Mr. T. A. Partridge:

VORTEC
PRODUCTS COMPANY

A Division of DOUGLAS Aircraft Company, Inc., 1414 West 190th Street, Torrance, California 90503. Area Code 213, 775-2623.

M-1 IMPACT MILL—U.S. PATENTS 3149790 AND FOREIGN PATENTS C-1 PARTICLE CLASSIFIER—U.S. AND FOREIGN PATENTS PENDING



QUANTITATIVE ULTRAVIOLET MONITORING

FOR
\$845⁰⁰

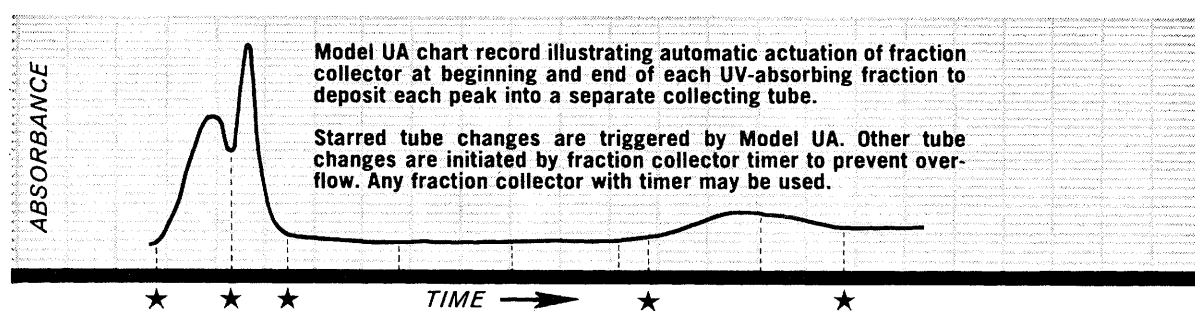
- Built-in recorder monitors true linear absorbance in two ranges; 0 to 0.5 and 0 to 2.5.
- Unique design eliminates need for base line compensation.
- Automatically controls a fraction collector to deposit each UV-absorbing fraction into a separate collecting tube. See graph below.

The ISCO Model UA is the only UV monitor with a bandwidth so narrow that it conforms rigorously to Beer's absorption law, and does it without changing wave lengths!

Bandwidth is so narrow* that precise quantitative results will be obtained if the flow stream absorbs *any* light at 254 m μ , regardless of the wavelength of maximum absorp-

tion. Other ultraviolet analyzers operating at a fixed wavelength have so wide a bandwidth (even though more than 95% of their light may be at 254 m μ) that they shift their maximum response to other wavelengths at higher absorbances. They can only detect the presence, not the quantity, of UV absorbing fractions.

*0.6 m μ at one thousandth peak intensity.



For more information, send for brochure UAI7J or complete catalog.

ISCO

INSTRUMENTATION SPECIALTIES COMPANY, INC.

5624 SEWARD AVE. • LINCOLN, NEBRASKA 68507, U.S.A. • PHONE (402) 434-8265 • CABLE ADDRESS: ISCOLAB LINCOLN

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	WILLARD F. LIBBY
MELVIN CALVIN	GORDON J. F. MACDONALD
JOSEPH W. CHAMBERLAIN	EVERETT I. MENDELSON
FARRINGTON DANIELS	NEAL E. MILLER
JOHN T. EDSALL	JOHN R. PIERCE
DAVID R. GODDARD	COLIN S. PITTENDRIGH
EMIL HAURY	KENNETH S. PITZER
ALEXANDER HOLLAENDER	ALEXANDER RICH
ROBERT JASTROW	DEWITT STETTIN, JR.
EDWIN M. LERNER, II	EDWARD L. TATUM
CLARENCE M. ZENER	

Editorial Staff

Editor

PHILIP H. ABELSON

<i>Publisher</i>	<i>Business Manager</i>
DAEL WOLFLE	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, ELINOR LANGER, LUTHER J. CARTER, MARION ZEIGER, JANE AYRES

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

Book Reviews: SARAH S. DEES

Editorial Assistants: ISABELLA BOULDIN, ELEANORE BUTZ, BEN CARLIN, SYLVIA EBERHART, GRACEY FINGER, NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, ELLEN KOLANSKY, KATHERINE LIVINGSTON

Advertising Staff

<i>Director</i>	<i>Production Manager</i>
EARL J. SCHERAGO	RAYMONDE SALAMA

Sales: New York, N.Y., 11 W. 42 St. (212-PE-6-1858): RICHARD L. CHARLES, ROBERT S. BUGBEE
Scotch Plains, N.J., 12 Unami Lane (201-889-4873): C. RICHARD CALLIS

Chicago, Ill., 6 W. Ontario St. (312-DE-7-4973): HERBERT 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.

The Profits and Risks of Simplification

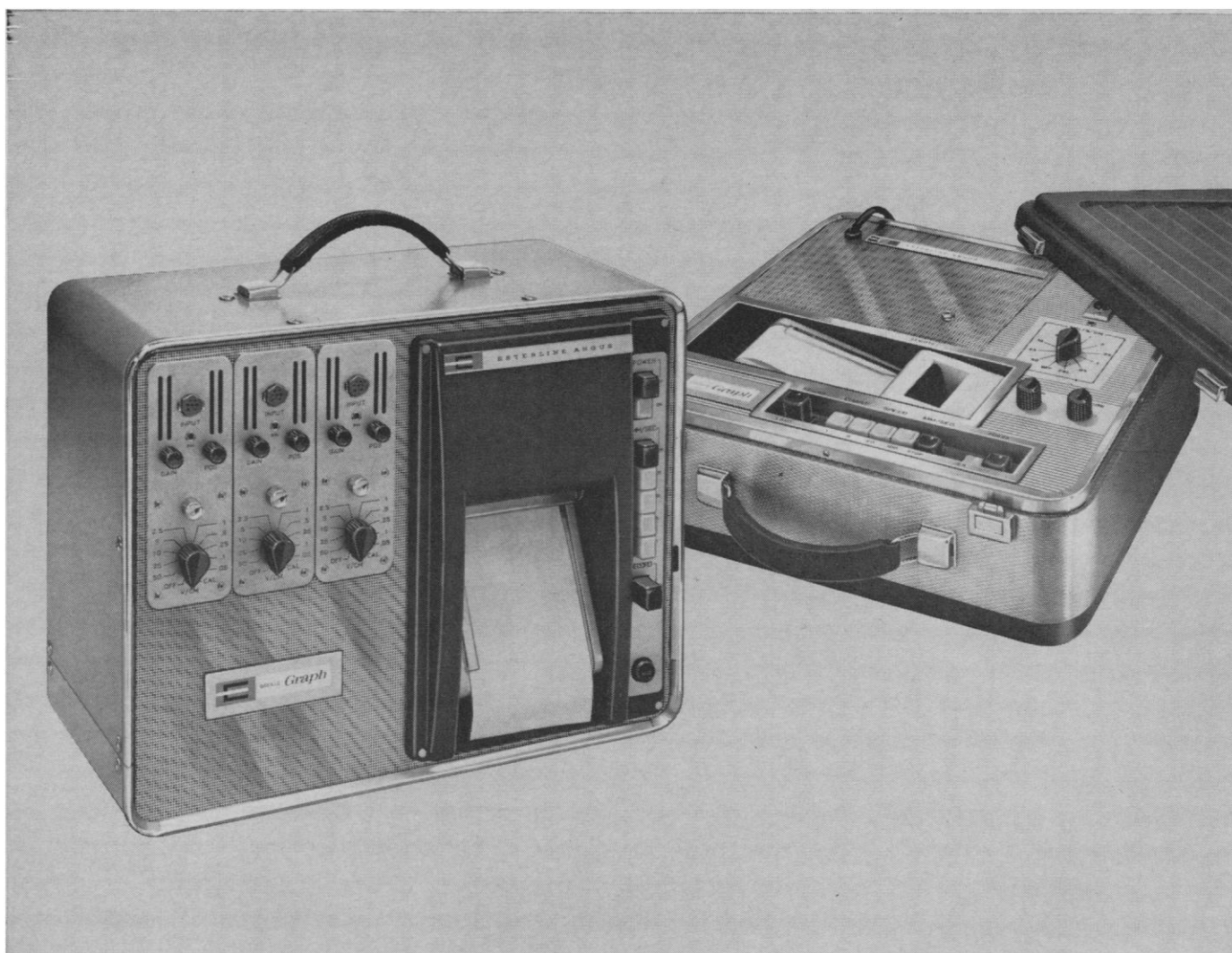
Curious circumstances trigger trains of thought. Glancing across an airplane aisle recently I read the headline "The Lure of False Doctrine." The student reading the article was evidently intrigued by this headline, for he turned repeatedly to the title page. I have no idea what was in the article but I would like to read what Bruno, Galileo, Joan of Arc, and all the other victims of organized violence, both ancient and modern, would have written under the same title. What a monstrous, melancholy medley of misunderstanding it would make. This setting of individuals and peoples on a collision course ordinarily arises from ideological conflicts growing out of uncritical acceptance of half truths. "The Rescue of the Holy Sepulcher," "Death to the Infidel," and "Workers Unite" are slogans each of which conjures up its own special nightmare.

Interestingly enough, scientists are galvanized into action by similar slogans. The crash program on the atomic bomb grew out of groundless fears that our antagonists would get the atomic bomb first. The vast sums being spent at present on a crash program for an early landing on the moon have their own somewhat obscure, psychological basis. If the moon program is really the most effective means of staving off all-out war, expensive as it is, it is still a bargain. On the other hand, the attempts which are sometimes made to sell the moon program on its scientific merits alone, in competition with other scientific uses of the money, are less convincing. The charitable conclusion is that in public affairs it is deemed necessary to oversimplify actual objectives so that the general public will best serve its own interests for the wrong reasons. This oversolicitude is probably neither necessary nor desirable.

Oversimplification also plays a conspicuous role in many scientific matters. Anyone who would start a course in valence theory by listing all the exceptions to the rules of valence before first developing the rules themselves would deserve the adverse criticism he would surely get. On the other hand, the doctrine that atoms with filled shells, such as the rare gases, are chemically inert was a simplification too well learned. People hesitated to do experiments running counter to such a self-evident truth. Equally slow to die was the dictum that coupled oscillators are always necessary to make a molecule optically active; this dictum had adherents even after the optical activity of single electrons had been clearly demonstrated. In fact, one of the greatest hindrances to scientific discovery is the necessary preliminary uprooting of the hallowed simplifications that everyone knows but that just happen to be untrue. After all, Aristotle said that it took force to keep a body moving at a steady rate. Why then should one accept the contradictory experiments of Galileo, who showed that force is necessary only when a body is to be accelerated?

If scientific progress is to be made, one must invent scientific models using those simplifications which make the best compromise between the infinite detail of reality and the present limits of tractability. It really isn't too bad that, after 250 years, Newtonian mechanics was amended by a Planck and an Einstein. Ultimate scientific rigor, like the pot of gold at the end of the rainbow, always lies over the ridge, fortunately.

—HENRY EYRING, *University of Utah, Salt Lake City*



90 cps full scale response
+
3 channels } = your best Oscillo Graph buy

Take your choice—the only Three-channel Portable Oscillo Graph available, or Two or One-channel Oscillo Graphs.

All feature exceptional frequency response . . . flat to 90 cps at 30 mm peak-to-peak. It's down only 3 db at 125 cps. Other features:

- Balanced differential amplifier in modular form for Two and Three-channel Recorders. Same amplifier is built into the Single-channel Recorder.
- Four push-button controlled chart speeds—1, 5, 20 and 100 mm per second.
- Stylus motor uses no permanent magnets. Eliminates the clutter of brushes, slip rings, armature leads and linkages found in other stylus drive mechanisms.

Like cabinet model Esterline Angus Oscillo Graphs, portables employ the exclusive inkless, heatless Direct-Carbon-Transfer writing method. Advantages of D-C-T?

- Finest trace provides greatest resolution. 0.005 inch trace occupies only 1/2% of full scale. Competitive oscillographs produce a trace which is three times wider.
- No pens to clog or ink to splatter.
- Chart paper at half the cost of heat sensitive paper.
- No stylus temperature adjustments to bother with.
- Chart requires no special handling and is unaffected by light, humidity or temperature.

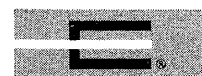
For trouble-free writing, economy and unequalled response, investigate Esterline Angus Oscillo Graph Recorders.

Write for colorful Series "L" catalog.

ESTERLINE ANGUS INSTRUMENT COMPANY, INC.
Box 24000L • Indianapolis, Indiana 46224

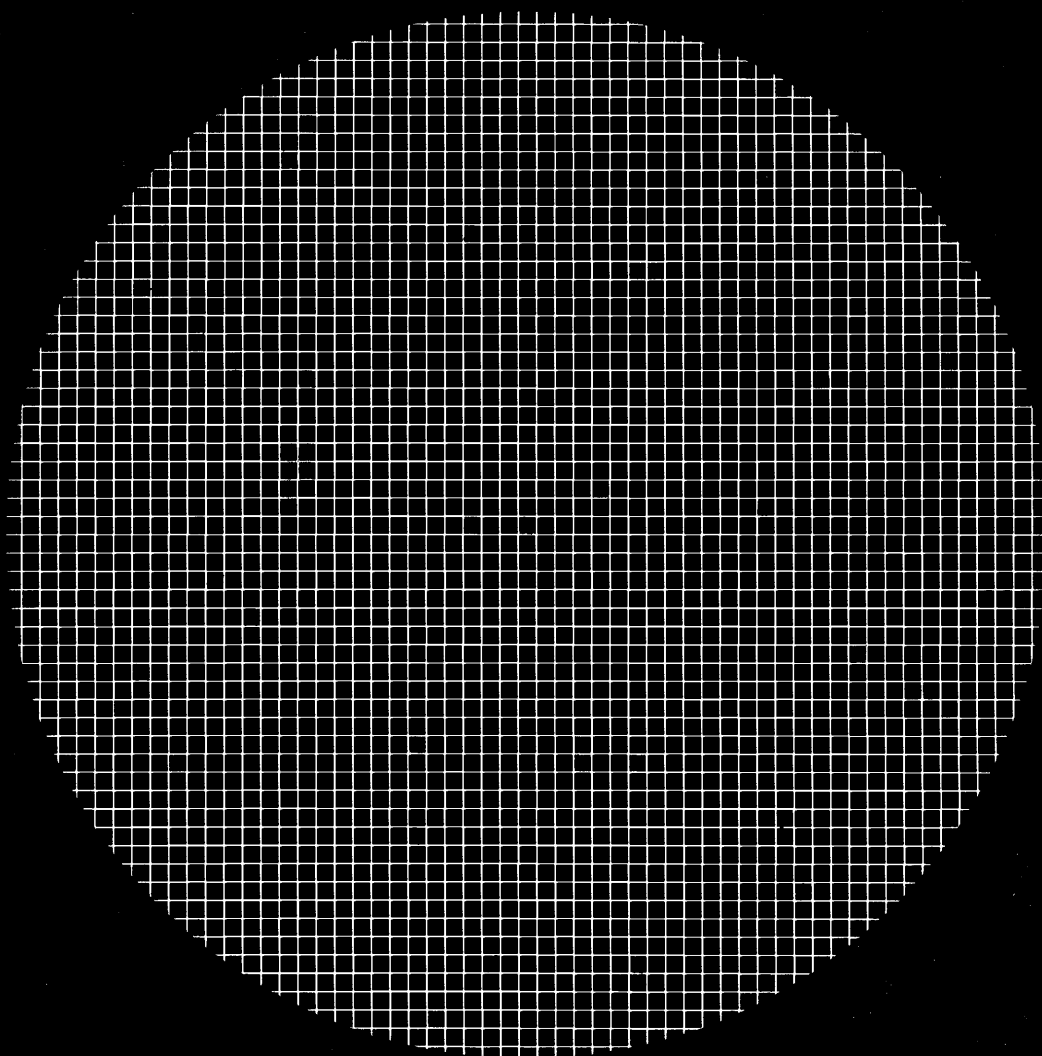
ESTERLINE ANGUS

Excellence in instrumentation for over 60 years





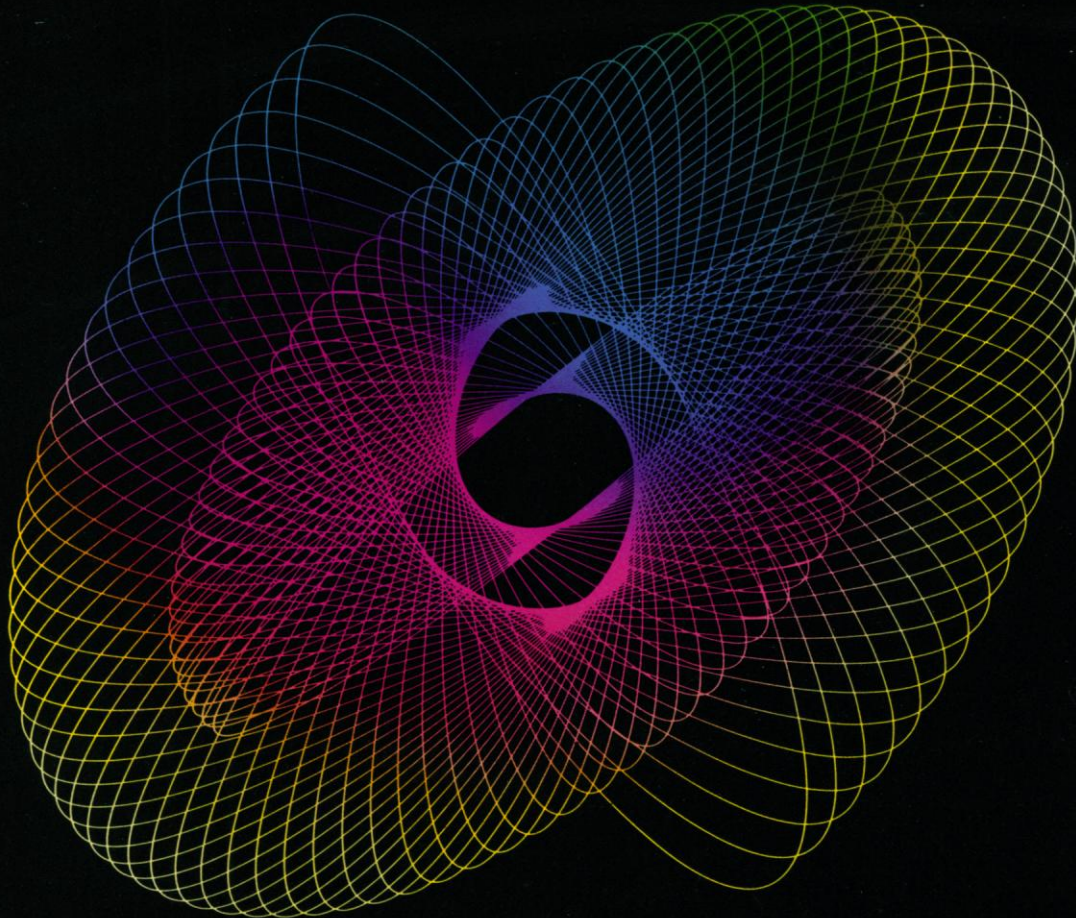
**ENTER A NEW ERA
OF ADVANCED MICROVISION...**



COMBINING UNIQUE BAUSCH & LOMB FLAT FIELDS...

The superiority of modern flat field over conventional microscopy is unquestioned. Flat field cost has been the deterrent . . . and now Bausch & Lomb has taken care of that. This exclusive system is completely integrated, available in the full range of laboratory microscope magnifications. Regardless of the power chosen, the resultant image is *flat*—from center to edge. The specimen under investigation is sharply focused, no matter where you look. You'll never have to sacrifice numerical aperture and, hence, resolution, to get flat fields.

BAUSCH & LOMB 



WITH EXCLUSIVE BAUSCH & LOMB ZOOM OPTICAL SYSTEM...

The continuously variable magnification of Dynazoom® frees you from the limitations of fixed powers. There are no blind spots within the zooming ranges. All the details that tell the full story are revealed. Only Dynazoom lets you find the setting that's best for your own eyesight. As a result, you get many other benefits—greater working distance, field of view, depth of focus and image brightness. Dynazoom allows you a new freedom of choice, a freedom to select the particular viewing conditions optimum for the application at hand.

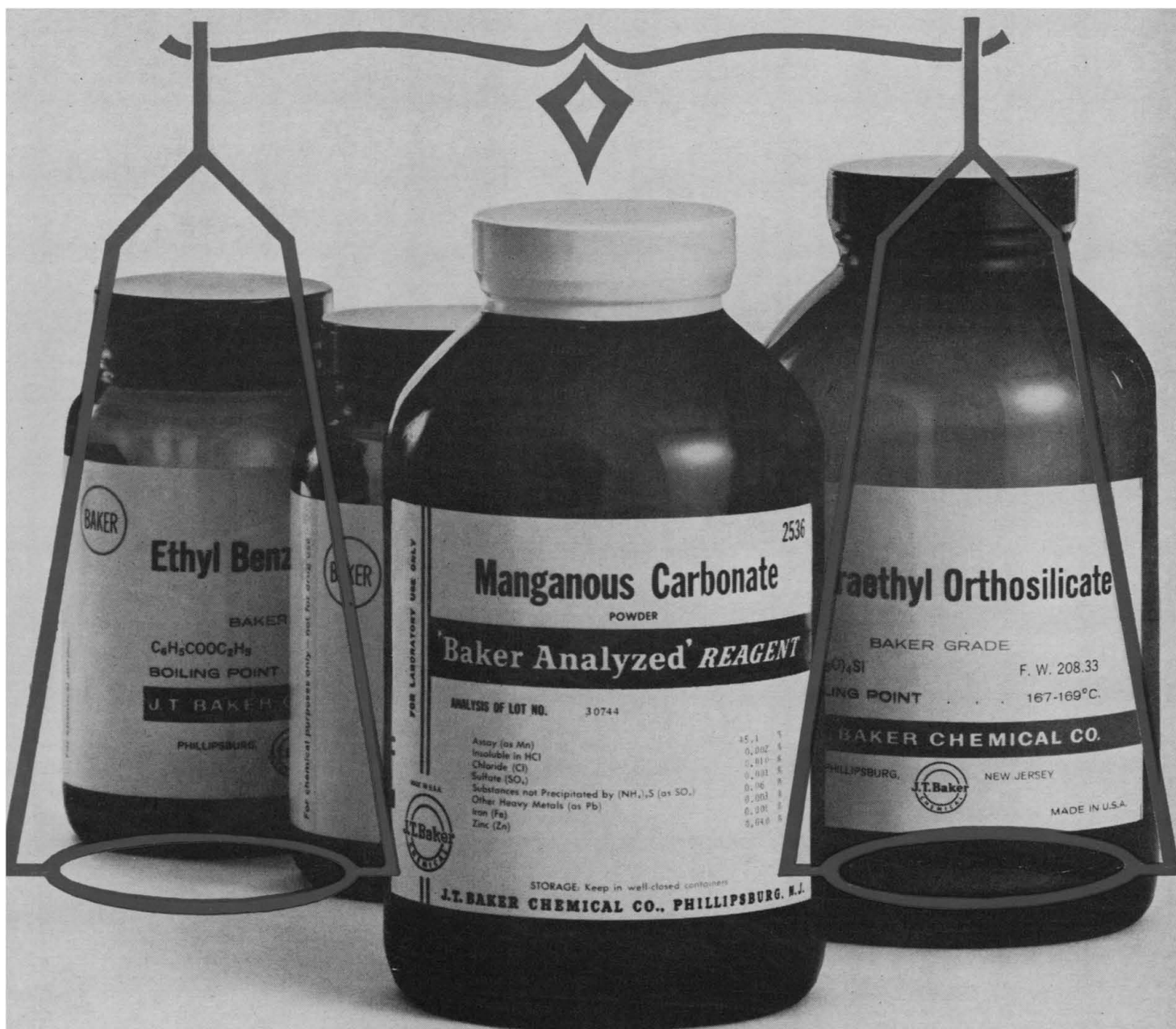


PRESTIGE . . . THROUGH RECOGNITION OF INIMITABLE QUALITY IN MICROVISION

...LET YOUR OWN EYES DECIDE


We believe Dynazoom and our Flat Field System fulfill the most critical requirements of advanced microscopy. We want you to try one of these new microscopes in your laboratory—compare it with any other make, at any other price. Write today for our new Laboratory Microscope Catalog-Modelmaker, No. 31-185 and/or an opportunity to work with a Dynazoom. There is no obligation.
Bausch & Lomb, 20722 Bausch Street, Rochester, N. Y. 14602.

BAUSCH & LOMB 



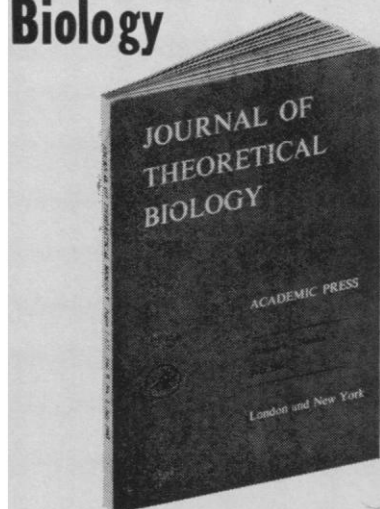
Exact measurement of purity

No if's, and's or but's about purity. 'Baker Analyzed' Reagents meet highest specifications and carry actual analytical data on the label. Our Laboratory Organics are in three distinct purity grades that give you the organic chemical clearly best for your specific application. Consolidate your purchases with our line of over 5,000 inorganic and organic chemicals for added economy. Fast delivery too. Write for catalogs. Address J. T. Baker Chemical Co., Phillipsburg, N. J.

J. T. Baker Chemical Co. 

'BAKER ANALYZED' REAGENTS • LABORATORY ORGANICS • SPECIALTY GASES

Journal of Theoretical Biology



Chief Editor: **J. F. Danielli**
Editorial Assistant: **L. Wolpert**

The *Journal of Theoretical Biology* is intended to be a central publishing medium for theoretical work in all fields of biology including generalized theories; theories of specific processes or phenomena, e.g. crossing over, learning, active transport, photosynthesis, carcinogenesis; theoretical discussion of specific projects, e.g. selective mutation, drug design, electronic models; theoretical discussion of methods, e.g. cytochemical methods and instrumentation, amplification techniques.

CONTENTS OF VOLUME 8, NUMBER 3, MAY 1965:

- W. R. STAHL, Algorithmically Unsolvable Problems for a Cell Automaton.
- D. A. MAELZER, Environment, Semantics, and System Theory in Ecology.
- C. J. DUNCAN, Cation-Permeability Control and Depolarization in Excitable Cells.
- V. BRAITENBERG, What Can Be Learned from Spike Interval Histograms about Synaptic Mechanisms.
- J. T. ENRIGHT, The Search for Rhythmicity in Biological Time-Series.
- F. M. SNELL, Facilitated Transport of Oxygen through Solutions of Hemoglobin.
- U. N. SINGH, Rapidly Turning Over RNA as a Limiting Factor in Protein Synthesis: Effect of Actinomycin D.
- S. A. ALTMANN, Sociobiology of Rhesus Monkeys. II. Stochastics of Social Communication.

Index for Volume 8.

Subscription Information:

Volumes 10-12, 1966 (bimonthly), \$16.00 per volume \$48.00 per year, plus \$1.80 postage.

ORDER FORM
ACADEMIC PRESS, INC.
111 Fifth Avenue, New York, N.Y. 10003



PLEASE SEND:
JOURNAL OF THEORETICAL BIOLOGY

- ☐ Volume 10, \$16.60
- ☐ Volume 11, \$16.60
- ☐ Volume 12, \$16.60
- ☐ Volumes 10-12, \$49.80
- ☐ SEND SAMPLE COPY

Name
Affiliation
Address
City State Zip
Remittance enclosed ☐ Bill me ☐

the immature nervous system to disease. He offered a classification of developmental disorders based on two main variables, developmental stage of onset and disease agent. A classification, supported by experimental data, must precede comprehension of mental retardation, epilepsy, and other groups of diseases.

The conference was sponsored by the Jackson Laboratory. In lieu of published proceedings of the conference, a detailed checklist and bibliography of neurological mutants in the mouse will be published by the Harvard University Press, Cambridge, Massachusetts.

R. L. SIDMAN

*Harvard Medical School,
Boston, Massachusetts*

S. H. APPEL

*University of Pennsylvania Hospital,
Philadelphia*

J. F. FULLER

*Jackson Laboratory
Bar Harbor, Maine*

Electronic and Atomic Collisions

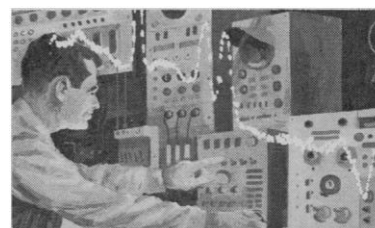
When activity in the field of atomic collision physics (along with extra-nuclear atomic physics generally) went into its decline three decades ago, it was widely felt that the field was completely understood in principle and that a limited number of then impossible experiments and calculations would tie up the entire matter. The 4th international conference on the physics of electronic and atomic collisions, held at Laval University in Quebec, Canada, 2-6 August 1965, disclosed that assessment to be far from adequate.

The "impossible" experiments have disclosed an incredible richness of phenomena in atomic and electronic collision physics, of importance to space, atmospheric, and plasma physics and to gas-phase chemistry; the computer-aided theoretical work has brought to light at least as many new problems as it has solved.

Typical of the new areas is the matter of "resonances" in scattering. As presently used, the term "resonance" refers to observation of energy-dependent structure in electron collision cross sections. This structure appears to be well fitted by the Breit-Wigner resonance formula much used in nuclear physics; moreover, theoretical calculations, especially in *e*-H scattering, have predicted the observed structure and

Pulse Height Analysis
Multichannel Scaling
Mössbauer Operation
256 Channels
128 Channel Subgroups
Data Transfer
5" Cathode Ray Tube
100,000 Count Capacity
"Live" Log Display
Size: Approx. 1½ Cu. Ft.
Rack-Mounted (optional)
110, 220 Volts, 50-60 Cy.

NS-4995
601 domestic price F.O.B. Madison, Wis.
\$5845 with NS-101 Teletype Page Printer



**low-cost,
high-performance
pulse height analyzer**

Advanced design and circuitry of the NS-601 Pulse Height Analyzer combines the seemingly incompatible feature of low cost with accuracy and reliability. Its low cost brings it within range of the most limited budget, yet it performs all studies with utmost laboratory precision—and its operational versatility and simplicity make it highly efficient for classroom demonstrations.

The NS-601, like all Northern Scientific instruments, utilizes silicon semiconductors exclusively. Their greater reliability (factor of two) helps avoid "down" time during critical studies, adding to the value of this complete system for analysis of signal amplitude distribution. Write or phone (608-238-4741) for additional information on the NS-601.



**NORTHERN
SCIENTIFIC/INC.**

P. O. Box 4247 • Madison, Wisconsin 53711

have shown that it is associated with the rapid energy variation of individual phase shifts.

Papers on resonances, given by P. G. Burke (England), A. Herzenberg (England), and E. Holøien (Norway), made it clear that the techniques of predicting resonances have steadily improved since 1963. In particular, a means of projecting out the coupling to the continuum, and thereby of associating the complex energy eigenvalue responsible for a resonance with a real eigenvalue computable by the Rayleigh-Ritz minimum principle, has been developed. Moreover, a variational (nonminimal) principle for the complex eigenvalues has been shown to have great promise. Thus accurate predictions of resonances in not-too-complicated electron-molecule reactions (for example, $e + H^2$ collisions) soon should be forthcoming.

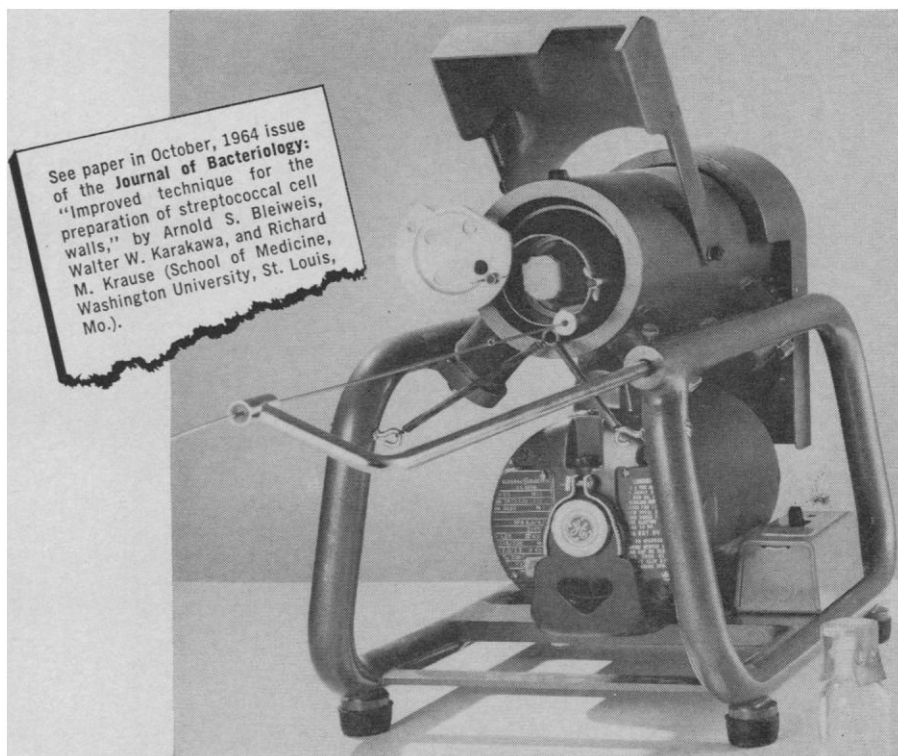
The theoretical advances in resonances have been well matched by advances in experiments. Particularly striking were the new measurements on the H atom resonance reported by H. Kleinpoppen (Germany); these measurements verify and are an improvement on the earlier measurements of G. J. Schulz (U.S.A.). Also noteworthy were the studies by H. Ehrhardt and G. Meister (Germany) on the angular distribution of electrons scattered by helium in the vicinity of the resonance first predicted by Gerjuoy and Baranger (U.S.A.) and previously observed by G. J. Schulz, J. Arol Simpson, and C. E. Kuyatt (U.S.A.).

Among the other experiments which employed high-resolution electron techniques and which were particularly interesting for development of theory were those of Kuyatt, Simpson, and Mielczarek. Their electron scattering experiment displayed the vibrational level structure in H_2 . In the experiments of McGowan and Fineman (U.S.A.) the ionization of H_2 curves displayed structure due to rotational excitation.

The question of resonances in electron scattering is closely related to the existence of states of atoms and molecules with excitation energies in excess of the first ionization potential (so that autoionization can occur) and to the existence of unstable, compound negative ions. Techniques to map out the energy levels of these super-excited states have been developed.

Related to the question of these super-excited states is the matter of characteristic energy losses in ionizing collisions between ions and atoms.

BRONWILL PRESENTS THE MSK...



THE INTERNATIONALLY ACCLAIMED BRAUN MECHANICAL CELL HOMOGENIZER

The outstanding Braun MSK cell homogenizer, fully adapted for use in this country, prepares cell-free extracts for enzyme studies . . . homogenizes yeast, bacteria, tissue cultures or organs . . . pulverizes coarse particles (such as pigments or plastics), in either dry or suspended states . . . and yields intact subcellular particles (for example, yeast mitochondria and bacterial cell walls), ready for study.

Biochemists, microbiologists and other research scientists now have at their disposal this extremely efficient, highly effective and speedy tool for use with material either in the dry state or in suspension.

- With yeast, 90% disruption of 10 grams is achieved in only 30 seconds at 4000 rpm—99% in 60 seconds!

- Most bacterial cells show 99% breakdown in 2 minutes!

- Intact yeast mitochondria take just 20 to 30 seconds for preparation!

The remarkably short disruption time of the Braun MSK allows the processing of a series of batches, if necessary, in a relatively short period.

The Braun MSK features two-speed, circular shaking action. Cell walls are broken down by violent tumbling action of tiny glass beads. The sample may be cooled with CO_2 and kept below $5^\circ C$.

If the Braun MSK would be useful in your work, drop us a note and we'll send you all the details.

Exclusive Representation of B. Braun, Germany



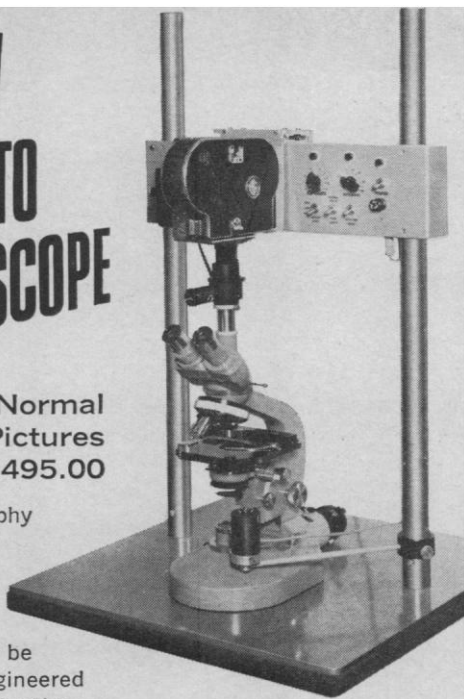
BRONWILL SCIENTIFIC
A DIVISION OF WILL SCIENTIFIC, INC.
277 N. GOODMAN ST., ROCHESTER, N.Y. 14601

ADD A NEW DIMENSION TO YOUR MICROSCOPE

Time Lapse and Normal
Speed Motion Pictures
for Only \$1495.00

Now—a complete cinephotomicrography system that takes only 21"x21" of table-top space. The Sage Model 500 is simpler to operate than a laboratory microscope—lets you get excellent results from the start. It can be used with any upright microscope. Engineered to isolate both external and internal vibrations. Provides sharp, clear pictures at high magnifications.

Send for technical data, or let us arrange a demonstration in your laboratory.



SAGE INSTRUMENTS, INC.

2 Spring Street, White Plains, N. Y. 10601 • 914 WH 9-4121

All On-Going Research in Bio-Medicine . . . Now

for less than \$2.00 a week!

You can now get reports with *depth* and *speed* from one monthly publication devoted exclusively to the field of biomedicine . . . "Who's Doing What in Biomedicine."

WDW gives you up-to-the-minute information on:

- Current Meetings
- Government Grants
- Progress Reports
- Private Research

Using almost 500 separate sources, "Who's Doing What" also provides an annual cumulative index . . . all at a subscription rate of only \$100.00

Be Sure to Include "Who's Doing What" in Your Subscription Renewal Plans for 1966

Center for Information Resources, Inc.
Division of Herner and Company
2431 K Street, N.W., Dept. (S 100)
Washington, D. C. 20037

Name (print).....
Position.....
Address.....
Organization.....

for
more
information
on...

**WHO'S
DOING
WHAT**

**IN
BIOMEDICINE**

Such energy losses have been studied by coincidence methods in the laboratories of N. V. Fedorenko (U.S.S.R.) and E. Everhart (U.S.A.). It now appears that at small impact parameters any ionization process is correlated with the excitation of one of the characteristic energy losses and that these energy losses are evidently associated with ionization and excitation from the inner shells of the colliding heavy particles. The finding by M. E. Rudd and D. V. Lang (U.S.A.) that the energy spectrum of the electrons produced in ion-atom collisions show well-defined, sharp structure further supports the view that ionization in heavy particle collisions proceeds in part through excitation to super-excited states, followed by autoionization.

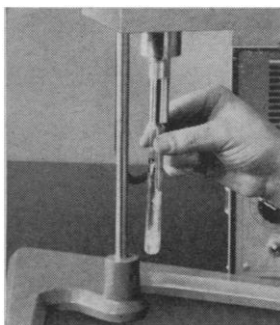
Classical (that is, nonquantum) methods for computing cross sections were discussed by a panel consisting of M. Gryzinski (Poland), A. Burgess (England), I. C. Percival (England) and L. Vriens (Netherlands) in perhaps the most spirited and controversial session of the conference. The use of classical theory to compute atomic cross sections dates back to J. J. Thomson in 1912. Recently, however, as a result of Gryzinski's demonstration that Thomson's formula for ionization of an atom by electron impact could be improved by taking into account the actual velocity distribution of the atomic electrons, the possibility of estimating atomic collision cross sections classically has attracted widespread interest. In general, the panelists thought that the remarkable successes of these classical calculations stem from the "accidents" that atomic interactions involve Coulomb forces and that scattering of a pair of otherwise isolated charged particles is independent of Planck's constant, that is, the scattering is the same whether calculated classically or quantum mechanically. Gryzinski appears to believe that atomic collision cross sections ultimately can be predicted accurately without reference to quantum concepts.

Among the outstanding of the 72 theoretical contributions was the work of F. T. Smith and R. P. Marchi (U.S.A.). They showed that the oscillations in the $\text{He}^+ + \text{He}$ charge-transfer cross sections could be accounted for in detail; indeed it should be possible to infer the $\text{He}^+ - \text{He}$ interaction potential from the oscillations observed. Also, G. F. Drukarev and Yu. M. Demkov (U.S.S.R.) contributed a very interesting and novel paper on the distribution of poles and zeros of the scattering

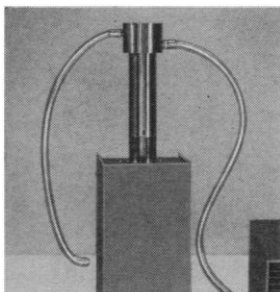


Blackstone Probes with Expanded Power, Open New Applications of Ultrasonics in Biological Research

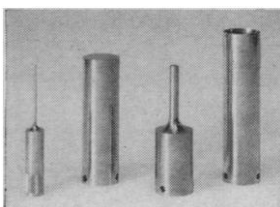
Since 1960, laboratory demand for Blackstone Ultrasonic Probes has grown daily. Now, Blackstone introduces a new series of probes with power up to 1000 watts output. This widens the research and production potential for cell disruption, dispersion, fluidization, disintegration, cleaning and emulsification. Increased power extends ultrasonic capability even with such difficult cells as yeast and spores.



$\frac{1}{8}$ " Diam. Tip is ideal for processing small volumes.



Chamber for batch processing of micro-quantities; includes cooling jacket. A larger continuous-flow sealed chamber is also available.



The new Blackstone BP-Series offers power outputs of 100, 200, 300, 500 and 1000 watts. Blackstone probes are noted for their ruggedness. The patented magnetostrictive transducers are practically indestructible. Operation is at 20 kc. and requires no sound-shielding. Transducers are matched with either solid state or continuous wave generators as required for power levels wanted.

Accessories include various size tips, sealed processing chambers and cups with cooling arrangements for processing pathogenic and non-pathogenic organisms by batch or continuous flow. All accessories are 316 stainless steel and may be autoclaved. Ultrasonic energy is transferred to the sample or work-piece mechanically or by immersion.

BP Probes are portable. Equipped with integral clamps and rubber feet, they may be mounted on the support stand (supplied) or used in a freestanding vertical position with certain accessories.

Since both time and intensity are under the operator's control, an almost limitless range of effects can be achieved. When a process has been confirmed, automatic controls can easily be added.

Since each organism, percentage of suspension and desired percentage of disruption may require a different combination of time and intensity, the researcher will recognize the advantages of 0 to 100% power control.

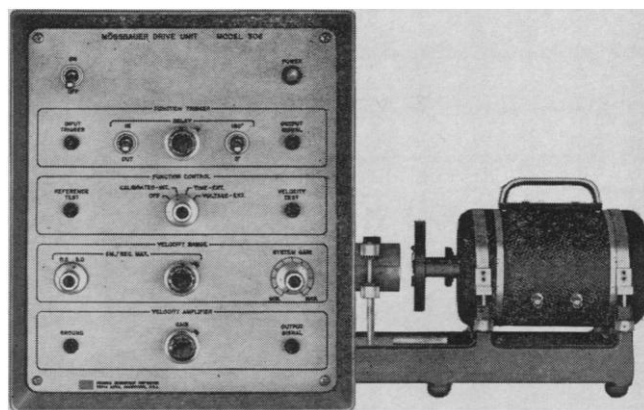
Your inquiry is invited on "BP-Series Probes".



BLACKSTONE ULTRASONICS, INC.

600 Howard Street, Sheffield, Pennsylvania

instant Mössbauer



For the first time... a complete system specifically designed for Mössbauer effect studies... with nothing to add, no modifications to make, no interfacing problems to solve. TMC supplies everything you need, complete and ready to use.

Shown above are the basic elements of the system. The high-performance Model 305 Transducer — with provisions for source or absorber modulation — and the versatile Model 306 Drive Unit with built-in function generator and delayed sweep trigger.

Precise and versatile enough for advanced research, the system is also simple and rugged enough for classroom experiments and demonstrations. System linearity is better than 1% over 90% of the half-period. Velocity range is adjustable from 0-0.3 cm./sec. to 0-5.0 cm./sec. and reproducible within 0.25%.

There never has been a simpler or less expensive means for getting into Mössbauer investigations. For complete specifications on the TMC Mössbauer system, fill in and mail the coupon below.



Nuclear Division
Technical Measurement Corporation
441 Washington Avenue
North Haven, Connecticut 06473

Please send more information on the Mössbauer system.

Name Title

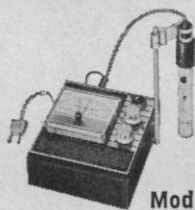
Company

Address

City State Zip

A PHOTOVOLT pH METER FOR EVERY PURPOSE

ROUTINE



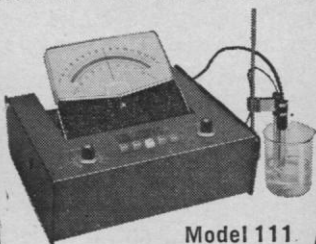
Model 85

GENERAL PURPOSE



Model 115

HIGH-PRECISION PUSHBUTTON



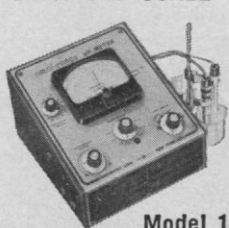
Model 111

RUGGED PORTABLE



Model 126

EXPANDED SCALE



Model 180

Stocked by laboratory supply houses

PHOTOVOLT

CORPORATION

1115 Broadway • New York, N.Y. 10010
write for bulletin

matrix on the imaginary axis in the complex wave number plane. The positions of these poles and zeros largely determine the energy dependence of the cross section. It was extremely regrettable that neither Drukarev nor Demkov was able to be present for the discussion of their interesting work.

Turning to but a few of the "non-resonant" experimental highlights of the conference, one can point first to recent experimentation on the free hydrogen atom. S. J. Smith (U.S.A.) reported a new measurement for electron-impact excitation of Lyman alpha which confirms the earlier results of Fite (U.S.A.) that the "best" quantum theory as of present (the close coupling approximation) is indeed in error at lower energies. H. B. Gilbody (England) has extended the energy range for charge transfer between protons and hydrogen atoms by a factor of three over previous measurements.

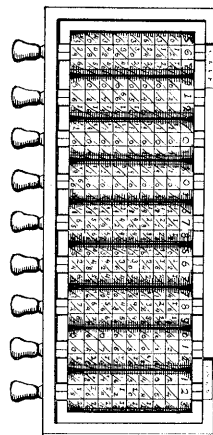
H. Kleinpoppen (Germany) reported some beautiful results concerning the effect of nuclear spin on polarization of optical radiation. His work goes far toward testing the predictions of Percival and Seaton made in 1958. In the experiment, atoms of Li^6 , Li^7 , and Na^{23} were excited by electron impact; the polarization of the first resonance line was measured as a function of electron energy. These three isotopes represent cases where the hyperfine separation compared to the level width of the excited state is small, comparable, and large, respectively. It was found that although the transitions are the same electronically, the polarization fractions near threshold were 40, 21, and 15 percent in good agreement with theoretical prediction.

The first experiment on two-photon absorption by negative ions, combining laser and crossed beam techniques, was reported by Hall, Robinson, and Branscomb (U.S.A.). Extremely elegant experiments on the interaction of electrons and ions, particularly enlightening for theory development and for plasma physics, were reported both by Dance, Harrison, and Smith (England) and by Dunn, van Zyl, and Zare (U.S.A.).

The question of the effect of internal excitation on measured cross sections in ion-neutral collisions has begun to be evaluated. Perhaps the most definitive experiments reported were those of Turner, Stebbings, and Fine-man (U.S.A.). Initial ions were produced in various states of excitation, and variations of cross sections were

1617: "Napier's Bones"

an inspiration for a
calculating tool . . .



. . . to perform $A \times B$ — probably invented to save time and reduce error in compiling his 8-place tables of $\ln(X)$. These famous tables opened new realms in arithmetical computations. Even to the modern scientist, Napier's contributions are mathematical tools of fundamental significance.

1965: the LOCI*

an inspiration for a
desk-top digital computer . . .



* LOCI — LOGarithmic Computing Instrument

. . . to perform $A \times B$, as some do, and $\sqrt{A + B \times C/D}$, as others do, and even $\ln(X)$ and e^X (X is any real number). For the modern scientist, only LOCI opens such new realms of mathematical analysis at his desk — with the response of larger computers and the convenience of simple calculators.

PRICE RANGE: \$2750-\$8450



Wang Laboratories, Inc.

836 North Street • Tewksbury, Mass. 01876
Telephone (617) 851-7311

studied. From such studies it seems clear that much of the disagreement between different laboratories in earlier measurements originated from differences in state population of beams from different ion sources.

In the thermal energy range, the methods involving flowing pulsed, after-glow, which were devised by E. E. Ferguson and his associates (U.S.A.), were particularly impressive. Also impressive was their tabulation of a large number of measured rates for processes occurring in the upper atmosphere.

Numerous experiments delved into less well-defined problem areas relating to excitation, ionization, and heavy particle collisions. The supply of entirely unexpected observations reported is ample to keep the theoreticians hard at work for a number of years.

The conference was invited by N. V. Fedorenko to meet next in Leningrad in 1967, a proposal which was accepted with great enthusiasm.

W. L. FITE
E. GERJUOY

*Department of Physics and
Space Research Coordination Center,
University of Pittsburgh,
Pittsburgh, Pennsylvania*

Forthcoming Events

October

30-2. American Speech and Hearing Assoc., Chicago, Ill. (K. O. Johnson, 1001 Connecticut Ave., NW, Washington, D.C.)

31-4. American Soc. of Agronomy, 57th annual, Columbus, Ohio. (ASA, 677 South Segoe Rd., Madison, Wis. 53711)

31-5. Society of Motion Picture and Television Engineers, 98th technical conf., Montreal, P.Q., Canada. (SMPTE, 9 E. 41 St., New York 10017)

31-5. American Soc. for Testing and Materials, 5th Pacific area natl., Seattle, Wash. (H. H. Hamilton, ASTM, 1916 Race St., Philadelphia, Pa. 19103)

November

1-3. Development of the Lung, Ciba Foundation symp., London, England. (Ciba, 41 Portland Pl., London, W.1)

1-3. American Physical Soc., southeastern section, Charlottesville, Va. (H. Carr, Auburn Univ., Auburn, Ala.)

1-3. Industrial Static Power Conversion, conf., Philadelphia, Pa. (L. W. Morton, General Electric Co., Bldg. #2, Schenectady 5, N.Y.)

1-3. Information Processing in Sight Sensory Systems, California Inst. of Technology, Pasadena. (E. D. Johnson, 208 Booth Computing Center, California Inst. of Technology, Pasadena 91109)

1-3. Systems, intern. meeting, Chicago,

22 OCTOBER 1965

**Van
Nostrand**

Princeton,
New Jersey 08540

ELEMENTS OF PHYSICS

Robert F. Kingsbury, *Bates College*

This text is intended for science and engineering students and designed for a two-year or three-semester physics sequence with previous or concurrent study of the calculus. Taking the student well beyond the stage of the usual introductory college text, it prepares him for advanced courses in physics. To this end, the author presents subjects not usually included in basic courses, but which are important because of their applications in modern physics and their use in advanced courses. The result is a logically coherent text, not an encyclopedic one. Progressively sophisticated treatment of physics, particularly with regard to the necessary mathematical understanding, is the hallmark of this work. Optics is studied first, enabling the student to gain facility with the calculus and introducing him to the interplay of theory and experiment that is science. As the student's facility with the calculus increases, the author develops the kinematics, mechanics, and thermodynamics.

MOMENTUM BOOKS

Published for the Commission on College Physics

Edited by Walter C. Michels

New . . .

RADIOACTIVITY AND ITS MEASUREMENT #10
Wilfred B. Mann and S. B. Garfinkel

PLASMAS—LABORATORY AND COSMIC #11
Forrest I. Boley

INFRARED RADIATION #12
Ivan Simon

Current . . .

Frisch—ELEMENTARY PARTICLES #1

**Smith and Carr—
RADIO EXPLORATION OF THE UNIVERSE** #2

**Anderson—THE DISCOVERY OF THE ELECTRON: THE
DEVELOPMENT OF THE ATOMIC CONCEPT OF
ELECTRICITY** #3

Waldron—WAVES AND OSCILLATIONS #4

**Wood—CRYSTALS AND LIGHT: AN INTRODUCTION TO
OPTICAL CRYSTALLOGRAPHY** #5

**Zemansky—
TEMPERATURES VERY LOW AND VERY HIGH** #6

Shurcliff & Ballard—POLARIZED LIGHT #7

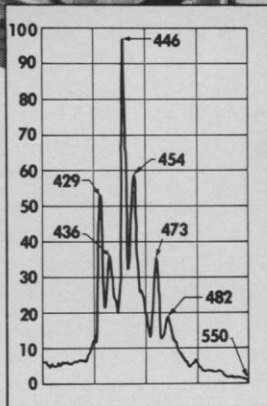
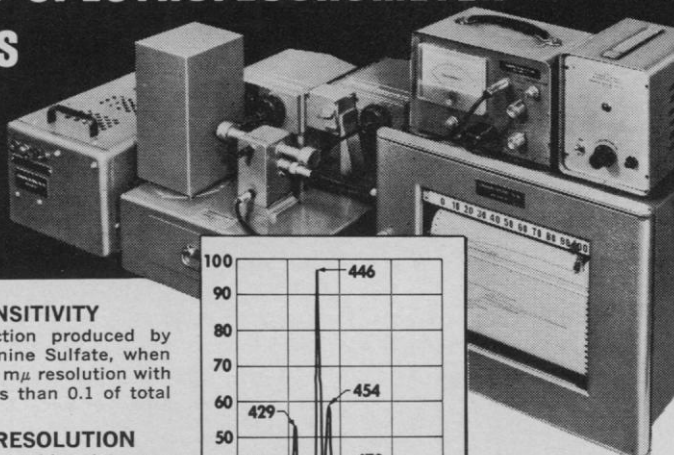
Cook—STRUCTURE OF ATOMIC NUCLEI #8

**Katz—AN INTRODUCTION TO THE SPECIAL THEORY
OF RELATIVITY** #9

FOCUS ON THESE FARRAND SPECTROFLUOROMETER FEATURES

...for
greater
analytical
accuracy

- **SUPERIOR SENSITIVITY**
Full scale deflection produced by .0001 mg/ml Quinine Sulfate, when operating with 20 mμ resolution with noise level of less than 0.1 of total signal
- **SIGNIFICANT RESOLUTION**
1 mμ capability provides data normally obscured
- **MODULAR DESIGN**
Complete accessibility and component interchangeability
- **OPTICAL PRECISION**
Farrand Master Grating replicas ... F/3.5 optical beam throughout



SPECTRO-FLUOROMETER GRAPH
Fluorescence Spectra,
1 mμ resolution.
Coronene in Benzene
10⁻⁷ molar (0.03
micrograms/ml).

Compare before you buy. Send your sample for free comparative analysis.

Farrand OPTICAL CO., INC.

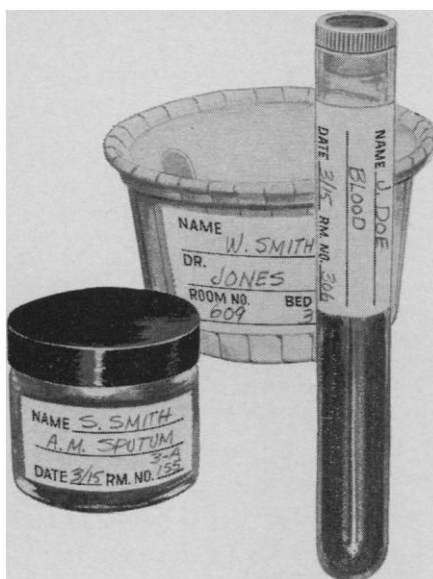
4405 Bronx Blvd. at E 238th St.
Bronx, N. Y. 10470 • 212 FA 4-2200

Think of Farrand first... for the finest scientific instruments

MINIMUM CONTACT—MAXIMUM SAFETY

with self-sticking
TIME LABORATORY
TAPES and LABELS

Self-sticking tapes and labels eliminate a direct source of personal contamination in laboratories. Pre-printed or plain tapes and labels provide a quick means of marking laboratory equipment. Just write necessary data on label (use pencil, pen or grease marker) and place it on any surface—glass, metal or plastic. Labels stick tight through autoclave (up to 250°), deep freeze (to -70°), or water bath. When no longer needed these tapes and labels can be quickly removed leaving no sticky residue. Vinyl Coated—available in white or colors.



See your laboratory or hospital supplier for a complete selection of Time Tapes and Labels.

PROFESSIONAL TAPE CO., INC.
365 E. Burlington Avenue • Riverside, Illinois 60546

Ill. (R. L. Irwin, Systems and Procedures Assoc., 7890 Brookside Dr., Cleveland, Ohio 44138)

1-4. American Soc. of Agronomy, Columbus, Ohio. (M. Stelly, ASA, 677 S. Segoe Rd., Madison, Wis. 53711)

1-4. **Radioactive Pharmaceuticals**, symp., Gatlinburg, Tenn. (Chairman's Office, Medical Div., Oak Ridge Inst. of Nuclear Studies, Oak Ridge, Tenn. 37831)

1-5. American Dietetic Assoc., 48th annual, Cleveland, Ohio. (ADA, 620 North Michigan Ave., Chicago, Ill. 60611)

The following meetings will be held under the **U.S.-Japan Cooperative Science Program** for November. Information is available from N. P. Neureiter, Office of International Activities, National Science Foundation, Washington, D.C.

1-5. **Congenital Malformations and Cancer**, planning meeting, Tokyo, Japan.

4-5. **Range of Deviation among Cancer Cells**, conf., Kyoto, Japan.

15-18. **Bulk Sampling**, seminar, Tokyo, Japan.

1-7. **Military Medicine and Pharmacy**, 18th intern. congr., Bangkok, Thailand. (J. Voncken, Intern. Committee of Military Medicine and Pharmacy, 79, rue Saint-Laurent, Liege, Belgium)

2-4. New England **Research and Engineering Meeting (NEREM)**, Boston, Mass. (IEEE Boston Office, 313 Washington, Newton, Mass.)

2-4. **Space Electronics**, intern. symp., Inst. of Electrical and Electronics Engineers, Miami Beach, Fla. (A. J. Wood, Office of Information, Public Information Div., Patrick Air Force Base, Fla.)

2-5. Use of the **Baboon as an Experimental Animal**, 2nd intern. symp., San Antonio, Tex. (L. R. Smith, Southwest Foundation for Research and Education, P.O. Box 2296, San Antonio 78206)

2-6. American Soc. of **Oral Surgeons**, annual, Denver, Colo. (G. A. Malecki, ASOS, 919 North Michigan Ave., Chicago, Ill.)

3-4. **Automation**, conf., Oslo, Norway. (Studieselskapet Forkninsveien, Oslo 3)

3-4. American College of **Clinical Pharmacology and Chemotherapy**, Chicago, Ill. (D. E. Hutcheon, The College, 7 E. 82 St., New York 10028)

3-5. **Data Processing**, intern. fall conf., Dallas, Tex. (Conference Registrar, P.O. Box 2665, Dallas 75221)

3-5. **Diffraction**, 23rd Pittsburgh conf., Pittsburgh, Pa. (B. R. Banerjee, Crucible Steel Co., 234 Atwood, Pittsburgh 15213)

3-5. Society of **Engineering Science**, 3rd technical, Univ. of California, Davis. (A. C. Eringen, School of Aeronautics, Astronautics and Engineering Sciences, Purdue Univ., Lafayette, Ind. 47907)

3-5. American Soc. of **Tropical Medicine and Hygiene**, New Orleans, La. (G. M. Jeffrey, P.O. Box 295, Kensington, Md.)

3-6. **Acoustical Soc. of America**, St. Louis, Mo. (W. Waterfall, American Inst. of Physics, 335 E. 45 St., New York 10017)

3-8. French Soc. of **Orthopedics and Traumatology**, 40th annual, Paris. (D. P. Masse, FSOT, Pavillon Ollier, Hôpital Cochin, 27 rue du Faubourg Saint-Jacques, Paris 14^e)

3-12. Intergovernmental **Oceanographic Commission**, 4th session, Paris, France. (Office of Oceanography, UNESCO, Pl. de Fontenoy, Paris 7^e)

NUCLEAR-CHICAGO RESEARCH QUALITY RADIOCHEMICALS

LIQUID SCINTILLATION STANDARDS

Four sets, two individual scintillation standards, and two standardized solutions for internal calibrating are available.

SCINTILLATION STANDARDS SETS

Consist of calibrated samples containing PPO and POPOP in toluene. Volume of each standard is 15 ml, sealed in a 20 ml low-activity glass vial. Packaged in foamed-plastic holders which double as storage racks. Stated activities within $\pm 3\%$ of true values. Certification of each standard supplied with each set.

Unquenched C^{14} and H^3 Set. Consists of unquenched samples of carbon-14 and tritium labeled toluene plus a toluene blank. Model 180040 Set, complete. \$65.00

Quenched H^3 and C^{14} Sets. Accurately assayed standards. Each has different counting rate due to quenching.

Model 180050 Tritium Set (5 standards, 1 x 10^4 dpm nominal each) \$65.00

Model 180060 Carbon-14 Set (6 standards, 2 x 10^5 dpm nominal each) \$ 75.00

Model 180070 (both sets) \$125.00

Quenched S^{35} Set. Six accurately assayed quenched standards.

Model 180080 Sulfur-35 Set (6 standards, 4 x 10^5 dpm nominal each) \$80.00

INDIVIDUAL STANDARDS

P^{32} and S^{35} Scintillation Standards. Furnished in flame-sealed, 20 ml low-activity glass vials. Stated activities within $\pm 4\%$ of true values. Individual certification supplied with each standard.

Model 188350 Phosphorus-32 (15 ml, 2 x 10^6 dpm nominal) \$40.00

Model 188240 Sulfur-35 (15 ml, 4 x 10^5 dpm nominal) \$30.00

Standardized Solutions of Toluene- C^{14} and Toluene- H^3 . For internal calibration in liquid scintillation counting. Supplied in flame-sealed glass ampoules. Stated activities are within $\pm 2\%$ of true values. Individual certification supplied with each standard.

Model 188270 Toluene- C^{14} (5 ml, 3 x 10^4 dpm nominal) \$20.00

Model 188280 Toluene- H^3 (5 ml, 5 x 10^6 dpm nominal) \$20.00

Detailed specifications are available on request, as are current schedules containing complete radiochemical listings and information. Please write, or call 312 827-4456 collect.

NUC-G-4-271



NUCLEAR-CHICAGO

A DIVISION OF NUCLEAR-CHICAGO CORPORATION
349 Howard Avenue, Des Plaines, Illinois 60018

4-5. **Operations Research Soc. of America**, Houston, Tex. (N. E. Miller III, Mt. Royal and Guilford Aves., Baltimore, Md. 21202)

4-5. **Rheumatology**, Czechoslovak-Polish meeting, Prague, Czechoslovakia. (F. Lenoch, Na Slupi 4, Prague 2)

4-6. **American Soc. of Cytology**, 13th annual scientific. New York, N.Y. (W. R. Lang, 1012 Walnut St., Philadelphia, Pa. 19107)

4-6. **Society of Economic Geologists**, Kansas City, Mo. (J. O. Kalliokoski, Dept. of Geology, Princeton Univ., Princeton, N.J. 98540)

4-6. **Geological Soc. of America**, Kansas City, Mo. (R. C. Becker, GSA, 231 E. 46 St., New York 10017)

4-6. **National Assoc. of Geology Teachers**, Kansas City, Mo. (M. B. Rosalsky, Dept. of Geology, City College of New York, New York 10031)

4-6. **Southwestern Medical Assoc.**, 47th annual, El Paso, Tex. (S. Heinemann, 310 N. Stanton, El Paso)

4-6. **Paleontological Soc.**, Kansas City, Mo. (R. L. Langenheim, Jr., Dept. of Geology, Univ. of Illinois, Urbana)

5-6. **Cancer of the Gastrointestinal Tract**, 10th annual clinical conf., Univ. of Texas M. D. Anderson Hospital and Tumor Clinic, Houston. (R. L. Clark, M. D. Anderson Hospital and Tumor Inst., Univ. of Texas, Houston 25)

5-6. **Society for Psychosomatic Research**, London, England. (C. J. Lucas, Student Health Centre, 17 Gordon St., London W.C.1)

5-7. **American Translators Assoc.**, natl. conv., Washington, D.C. (Suite 2157, 630 Fifth Ave., New York 10020)

6-7. **American Soc. for Colposcopy and Colpomicroscopy**, annual, New York, N.Y. (D. Schildwaechter, 4219 Chester Ave., Philadelphia, Pa.)

6-7. **International College of Dentists**, Las Vegas, Nev. (H. O. Westerdahl, 4829 Minnetonka Blvd., Minneapolis, Minn. 55416)

6-20. **International Federation of Thermalism and Climatism**, Israel. (A. Schirmer, Fédération Intern. du Thermalisme et du Climatisme, Stadtbachstr. 12, Baden, Switzerland)

7. **American College of Dentists**, Las Vegas, Nev. (O. W. Brandhorst, 4236 Lindell Blvd., St. Louis, Mo.)

7-9. **American Science Film Assoc.**, annual, Washington, D.C. (ASFA, 1319 F St., NW, Washington 20004)

7-10. **Automation**, British conf., Eastbourne, England. (Inst. of Production Engineers, 10 Chesterfield St., Mayfair, London, W.1)

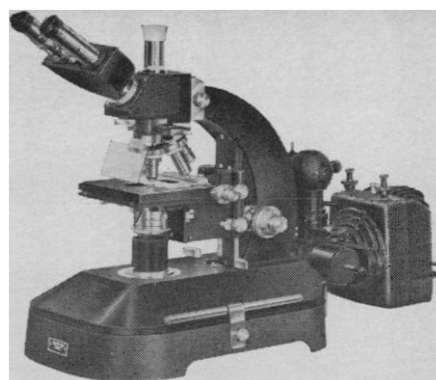
7-11. **American Soc. of Mechanical Engineers**, winter annual mtg., Chicago, Ill. (ASME, 345 East 47 St., New York)

7-12. **Anatomical Pathology**, 5th Latin American congr., Lima, Peru. (J. J. Andujar, P.O. Box 118, Fort Worth, Tex.)

7-13. **Paediatrics**, 11th intern. congr., Tokyo, Japan. (K. Nakamura, Dept. of Pediatrics, Univ. of Tokyo, P.O. Box 18, Hongo, Tokyo)

7-14. **Vienna Univ. of Technology**, 150th anniversary celebration, Vienna, Austria. (Technische Hochschule, Guss-hausstr. 23, Vienna 4)

8-9. **Engineering in the Practice of Medicine**, Philadelphia, Pa. (S. Rosen,



SIMULTANEOUS CONTRAST FLUORESCENCE MICROSCOPY

exclusively with the

REICHERT
Zetopan

This unique new approach may very well become instrumental in solving some of your intricate microbiological research problems. It can be accomplished with the ingeniously designed Reichert "ZETOPAN" by simultaneous application of white light and ultra-violet illumination supplemented by a newly developed fluorescence contrast condenser.

The combined advantages of Phase or Anoptral Contrast and the fluorescent techniques now appear simultaneously in the microscopic image.

Our constant, self-regulating Power Supplies for operation of the fluorescent light source prolong the lifetime of the Osram burner and insure a steady arc and increased light.

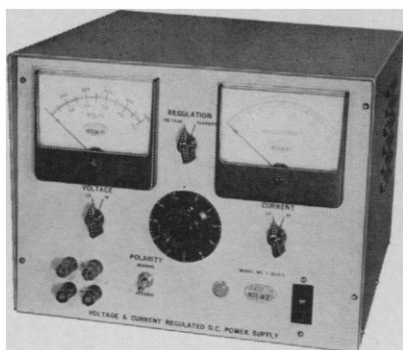
The "ZETOPAN" is a versatile instrument for all microscopic investigations of transmitted, reflected, and mixed illumination. It is a truly universal research microscope.

Hacker

For particulars or demonstration, write to:
WILLIAM J. HACKER & CO., INC.
Box 646, W. Caldwell, N.J., CA 6-8450 (Code 201)

BUCHLER D. C. POWER SUPPLIES

for electrophoresis applications



Contain Many Features
Found Only In
Higher Priced Models

Regulated Power Supply #3-1014A

Regulated Model

- Constant Voltage to 1000VDC ($\pm 1\%$) maximum
- Constant Current to 200 ma ($\pm 1.5\%$) maximum
- Ripple current/voltage of 1%
- Solid State Circuitry
- Short Circuit and Overload Protection
- Polarity Reversing Switch
- Line Transient Immunity

... only \$486.00

Unregulated Model

- Voltage range to 1000VDC maximum
- Current range to 200 ma maximum
- Low ripple factor
- Only slight voltage and current changes over large load variations
- Polarity Reversing Switch

Model #3-1008: Range 0-500-VDC and 0-200 ma \$150.00

Model #3-1009: Range 0-1000-VDC and 0-200 ma \$175.00

Request Bulletin S3-1014



BUCHLER INSTRUMENTS, INC.

1327 16th Street, Fort Lee, New Jersey 07025

Circle 524-1 on Readers' Service card for further information.

*Designed for Terminal Courses in Biology
for the Non-Science Major*

LABORATORY EXERCISES FOR BIOLOGICAL SCIENCE

by OLWEN WILLIAMS, Ph.D., ERIK K. BONDE, Ph.D.,
University of Colorado, Boulder;
and NEWELL A. YOUNGREN, Ph.D., University of Arizona, Tucson
2nd Printing, September 1964. 189 Pages, Wirebound \$3.50

This book represents a series of carefully developed exercises designed especially for the use of living or freshly killed material such as bean plants, pea plants, frogs, fruit flies and locally obtainable pond organisms. Where such specimens are unobtainable or too difficult for students to handle, the authors have developed exercises using prepared slides for study of the woody stem, preserved specimens for dissection of the fetal pig, sheep's brain and eye, and inner ear of the shark. The contents include a study of organization and maintenance in cells, higher plants and vertebrates; vertebrate reproduction; plant and animal genetics; diversity of organization, maintenance and reproduction in major plant and animal groups; taxonomic relationships; and a consideration of the relationship of organisms to their environment.

Washington
Square

LEA & FEBIGER

Philadelphia
Pa. 19106

Dept. of Medicine, Hahnemann Medical College, 230 N. Broad St., Philadelphia 19102)

8-11. American Dental Assoc., Las Vegas, Nev. (H. Hillenbrand, 222 E. Superior St., Chicago, Ill. 60611)

8-11. Insecticide and Fungicide, 3rd British conf., Brighton, England. (Secretary, 140 Bensham Lane, Thornton Heath, Surrey, England)

8-11. Nutrition, Western Hemisphere congr., Chicago, Ill. (Dept. of Foods and Nutrition, American Medical Assoc., 535 North Dearborn, Chicago 60610)

8-11. Quality Control, intern. congr., Tokyo, Japan. (Union of Japanese Scientists and Engineers, c/o Sakata Bldg., 3 Muromachi 4-chome, Nihombashi, Chuo-ku, Tokyo)

8-13. Austrian Medical Congr., 19th annual, Vienna. (M. Schnardt, Österreichische Ärztekammer, Referat für Ärztliche Fortbildung, Weihburggasse 10-12, Vienna I)

9-12. Seismic Models, symp., Prague, Czechoslovakia. (V. Karnik and J. Vanek, Inst. of Geophysics, Czechoslovak Acad. of Sciences, Bocni II, Prague 13-Sporilov)

9-13. Asociación Médica de Puerto Rico, Santurce. (J. A. Ramirez, 13-5 Fernandez Juncos Ave., Santurce)

10-11. Power Applications of Controllable Semiconductor Devices, conf., London, England. (Secretary, Inst. of Electrical Engineers, Savoy Pl., London, W.C.2)

10-12. American Soc. for Cell Biology, 5th, Philadelphia, Pa. (M. J. Moses, Box 2982, Duke Univ. Medical Center, Durham, N.C. 27706)

10-12. Engineering in Medicine and Biology, 18th annual conf., Philadelphia, Pa. (H. P. Schwan, Moore School of Electrical Engineering, Univ. of Pennsylvania, Philadelphia 19104)

10-12. Isotope Techniques in the Hydrologic Cycle, symp., Univ. of Illinois, Urbana. (G. E. Stout, Meteorology Section, Illinois State Water Survey, Univ. of Illinois, Urbana)

10-13. Respiratory Therapy, 2nd New England conf., Boston, Mass. (D. Crocker, Children's Hospital Medical Center, 300 Longwood Ave., Boston 15)

10-20. Development of Petroleum Resources of Asia and the Far East, 3rd symp., Tokyo, Japan. (S. Santitham, Rajadarn Ave., Bangkok, Thailand)

11-12. Kentucky Acad. of Science, Univ. of Kentucky, Lexington. (D. M. Lindsay, Georgetown College, Georgetown, Ky.)

11-13. Gerontological Soc., 18th annual, Los Angeles, Calif. (W. D. Obrist, Dept. of Psychiatry, Duke Univ. Medical Center, Durham, N.C. 27706)

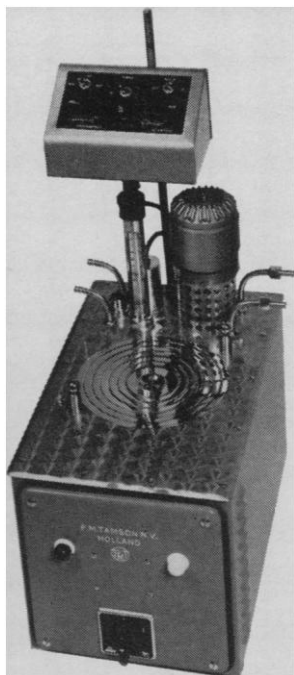
11-13. Bases for Nuclear Spin-Parity Assignments, conf., Gatlinburg, Tenn. (F. K. McGowan, Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn. 37831)

12-13. Clinical Pathology of Infancy, Assoc. of Clinical Scientists, Washington, D.C. (F. W. Sunderman, 1833 DeLancey Pl., Philadelphia, Pa. 19103)

12-13. Society for Industrial and Applied Mathematics, western regional, Seattle, Wash. (B. H. Colvin, Boeing Scientific Research Laboratories, P.O. Box 3981, Seattle)

12-14. Association of Clinical Scientists, Washington, D.C. (R. MacFate, 300 N. State St., No. 5322, Chicago, Ill. 60610)

NEW...TEMPERATURE PROGRAMMER FOR DNA/RNA MELTING CURVES



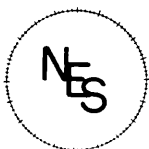
With the NESLAB TP-1 Temperature Programmer attached to a circulating bath, you can vary your sample temperatures automatically at predetermined rates.

The TP-1 is especially valuable in DNA, RNA and similar studies, where accurate temperature control must be maintained over a wide range.

The TP-1 is shown in use with the Tamson T-9 thermostatic bath. Although the TP-1 may be used with any bath that is controlled by a mercury contact thermometer, Tamson baths are particularly recommended because of their wide temperature range and high degree of accuracy.

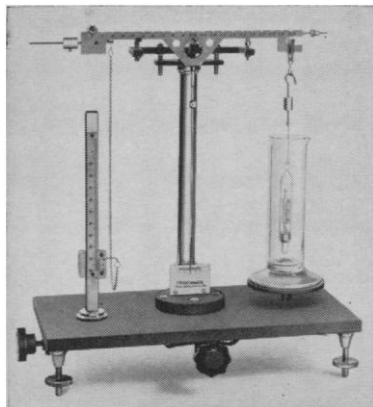
Model TP-1
Temperature Programmer \$155

Model T-9
Circulating Bath (illustrated) ... \$345



NESLAB
Instruments, Inc.

P. O. BOX Y • DURHAM • NEW HAMPSHIRE 03824
TELEPHONE (603) 868-2861



SPECIFIC- GRAVITY AND ANALYTICAL CHAIN BALANCE

TROEMNER MODEL S100

- Determines specific gravity of liquids and solids.
- *Fast*—accurate to 0.0001. Easy knob-operated chain.
- Analytical balance 10 mg-20 grams.
- Direct-reading vernier eliminates calculations.
- Slotted glass basket for S.G. of solids.
- All parts rust-resistant. Heavy, attractive blue-gray base.
- Accessories: Bow pan for conversion to analytical balance; mahogany-and-glass case; plastic hood.
- Send for Bulletin S100.
- Also available: A Westphal balance for S.G. of liquids only.

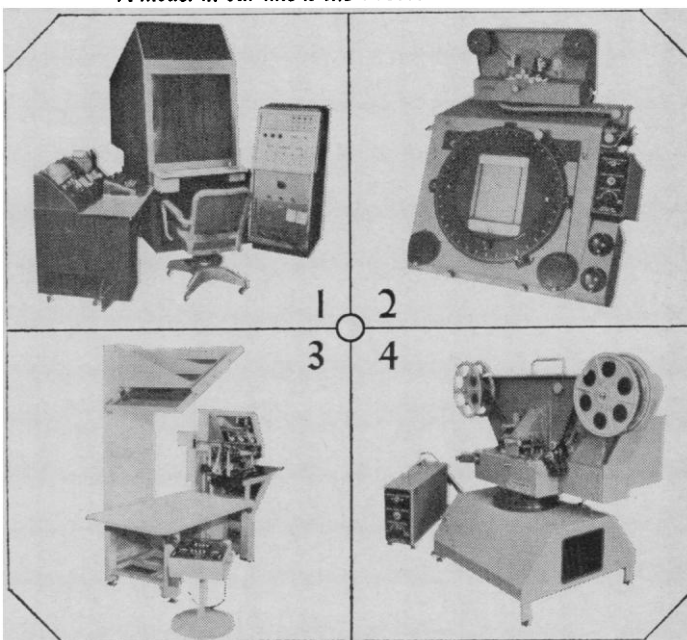


Henry TROEMNER, Inc., 6825 Greenway Ave., Philadelphia, Pa. 19142
Phone (215) 724-0800

Successful PHOTOGRAPHIC DATA REDUCTION

Requires the RIGHT TOOL TO DO THE JOB...

A model in our line is the RIGHT TOOL FOR YOU!

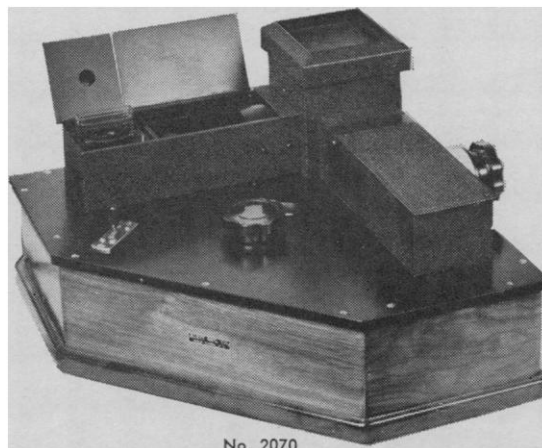


- 1—MEASURING MACHINES, for high precision coordinate measurements
- 2—MOTION ANALYZERS, for general purpose flexible measurement work
- 3—SCANNERS, for search and editing the content of research film
- 4—WALL PROJECTORS, for small group presentations

WRITE FOR CATALOG

VANGUARD INSTRUMENT CORPORATION
20 W. Centennial Ave., Roosevelt, N.Y. (516) FResport 8-8070

50TH ANNIVERSARY 1915-1965 THE KLETT FLUORIMETER



No. 2070

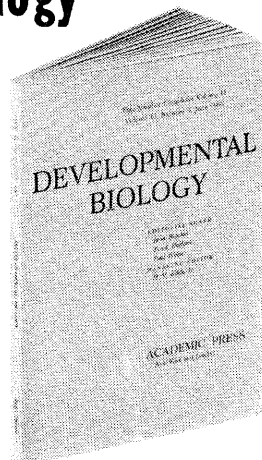
Designed for the rapid and accurate determination of thiamin, riboflavin, and other substances which fluoresce in solution. The sensitivity and stability are such that it has been found particularly useful in determining very small amounts of these substances.

KLETT SCIENTIFIC PRODUCTS

PHOTOELECTRIC COLORIMETERS • BIO-COLORIMETERS
GLASS ABSORPTION CELLS • COLORIMETER NEPHELOMETERS • KLETT REAGENTS • COLONY MARKER AND TALLY

Klett Manufacturing Co., Inc.
179 EAST 87TH STREET, NEW YORK, N. Y.

Developmental Biology



Editorial Board: Jean Brachet, Ernst Hadorn and Paul Weiss
Managing Editor: M. V. Edds, Jr.

Publishes articles bearing on problems of development in the broadest sense; contains papers dealing with embryonic and postembryonic development, growth, regeneration, and tissue repair, of both plants and animals.

CONTENTS OF VOLUME 11, NUMBER 3, JUNE 1965:

THOMAS C. MAYER, The Development of Piebald Spotting in Mice.

Y. KURODA and T. NAGATANI, Experimentally Induced Changes in Fructose-1, 6-diphosphatase Activity in Embryonic Chick Liver and Heart Cells in Vitro.

GENTARO USUKU and JEROME GROSS, Morphologic Studies of Connective Tissue Resorption in the Tail Fin of Metamorphosing Bullfrog Tadpole.

H. D. BEREDES, The Induction of Changes in Chromosomal Activity in Different Polyene Types of Cell in *Drosophila hydei*.

LISELOTTE MEZGER-FREED and JANE M. OPPENHEIMER, Ribonucleic Acid Base Composition in the Developing Amphibian Optic Cup-Lens System.

M. H. MOSCONA and A. A. MOSCONA, Control of Differentiation in Aggregates of Embryonic Skin Cells: Suppression of Feather Morphogenesis by Cells from Other Tissues.

ELIAS SHAAYA and PETER KARLSON, Der Ecdysontiter während der Insektenentwicklung, IV. Die Entwicklung der Lepidopteren *Bombyx mori* L. und *Cerura vinula* L.

MARY GRIFFITHS, A Study of the Synthesis of Naphthaquinone Pigments by the Larvae of Two Species of Sea Urchins and Their Reciprocal Hybrids.

STANLEY SHOSTAK, The Re-formation of the Epidermis of Embryonic *Rana pipiens* Following treatment with Ultrasound.

SOFIA P. FABRO and L. M. RINALDINI, Loss of Ascorbic Acid Synthesis in Embryonic Development.

Author Index—Subject Index.

Subscription Rates:

Volumes 13-14, 1966 (bimonthly) \$18.00 Per Volume \$36.00 Per Year, plus \$1.70 Postage outside U.S.A.

ORDER FORM
ACADEMIC PRESS, INC.
 111 Fifth Avenue, New York, N.Y. 10003

PLEASE SEND:
☐ DEVELOPMENTAL BIOLOGY
☐ Volume 13, \$18.00
☐ Volume 14, \$18.00
☐ Volumes 13-14, \$36.00
☐ SEND SAMPLE COPY

Name

Affiliation

Address

City State Zip

Remittance enclosed ☐ Bill me ☐

12-15. **Neutrality of Medicine**, 2nd intern. Congr., Paris, France. (R. Ellenboger, Ministère des Anciens Combattants et Victimes de Guerre, 37, rue de Bellechasse, Paris 7^e)

14-15. **National Medical Foundation for Eye Care**, Chicago, Ill. (L. A. Zupan, Room 6, 1100 17th St., NW, Washington, D.C.)

14-16. **Hedrologicum Conlegium**, Intern. Soc. for the Study of **Diseases of the Colon and Rectum**, 2nd Congr., Tokyo, Japan. (J. F. Montague, 104 E. 40 St., New York 10016)

14-17. **Southern Medical Assoc.**, Washington, D.C. (R. F. Butts, 2601 Highland Ave., Birmingham 5, Ala.)

14-18. **Mexican Dental Assoc.**, 1st intern. Congr., Mexico City. (R. Espinosa de la Sierra, Asociación Dental Mexicana, Sinaloa no. 9, Mexico 7, D.F.)

14-18. **Dental**, Pacific intern. conf., Honolulu, Hawaii. (W. A. Wakai, 291 Alexander Young Bldg., Honolulu 96813)

14-18. **Society of Exploration Geophysicists**, 35th annual intern., Dallas, Tex. (Dallas Geophysical Soc., Dallas)

14-19. **American Acad. of Ophthalmology and Otolaryngology**, Chicago, Ill. (W. L. Benedict, 15 Second St., SW, Rochester, Minn.)

14-21. **Air Pollution**, 1st world Congr., Buenos Aires, Argentina. (D. D. Torti, Asociación Argentina Contra la Contaminación del Aire, Sarmiento 680, Buenos Aires)

15-16. **Hypervelocity Techniques**, 4th symp., Tullahoma, Tenn. (J. Lukasiewicz, vonKarman Gas Dynamics Facility, ARO, Inc., Arnold Air Force Station, Tenn. 37706)

15-16. **Science conf.**, 4th annual, Belfer Graduate School of Science, Yeshiva Univ., New York, N.Y. (A. Gelbart, Belfer Graduate School of Science, Amsterdam Ave. and 186th St., New York 10033)

15-17. **Association of Military Surgeons of the U.S.**, Washington, D.C. (F. E. Wilson, 1500 Massachusetts Ave., NW, Washington, D.C.)

15-18. **Aircraft Design and Technology**, Los Angeles, Calif. (American Inst. of Aeronautics and Astronautics, 1290 Sixth Ave., New York 10019)

15-18. **Information Problems in the Drug Industry**, conf., Philadelphia, Pa. (C. P. Butcher, Graduate School of Library Science, Drexel Inst. of Technology, 32nd and Chestnut Sts., Philadelphia 19104)

15-18. **American Nuclear Soc./Atomic Industrial Forum**, winter meeting, Washington, D.C. (O. J. DuTemple, American Nuclear Soc., 244 E. Ogden Ave., Hinsdale, Ill. 60521)

15-19. **Animal Care Panel**, 16th annual, Philadelphia, Pa. (H. P. Schneider, Hahnemann Medical College, 230 N. Broad St., Philadelphia 19102)

15-19. **Gulf and Caribbean Fisheries Inst.**, 18th annual session, Miami, Fla. (Executive Secretary, 1 Rickenbacker Causeway, Miami 33149)

15-19. **Magnetism and Magnetic Materials**, San Francisco, Calif. (W. D. Doyle, Franklin Inst. Laboratories, Philadelphia, Pa.)

15-19. **World Federation for Mental Health**, 18th annual, Bangkok, Thailand.

C.R.C.

Announces DRY-A-MATIC



Now all C.R.C. Labwashers feature DRY-A-MATIC drying time programmer as standard equipment. This unique device permits the operator to select the precise drying cycle . . . ranging from 15 to 30 minutes!

C.R.C. Labwashers bring you completely automatic glassware washing and drying at a sensible price. Only C.R.C. Labwashers offer all these desirable features:

- Fully automated . . . set it and forget it.
- Choice of distilled or tap water on each of three rinses.
- Pays for itself in man-hours saved.
- Saves up to 50% on labware breakage.
- Under-counter, free-standing and mobile models.
- Low operating costs.
- Authorized service men in your area.

Check your glassware washing problems against in-the-field "Usage Reports".

Request Bulletin No. 186

A-5171

THE CHEMICAL RUBBER CO.
 2310 Superior Ave.
 Cleveland, Ohio 44114

(F. Cloutier, 1, rue Gevray, Geneva, Switzerland)

15-19. Disposal of **Radioactive Wastes** into the Sea and Fresh Waters, symp., Vienna, Austria. (Intern. Atomic Energy Agency, 11 Kärntnering, Vienna I)

15-20. **Productivity, Technology, and Change**, conf., London, England. (British Productivity Council, Vintry House, Queen St. Pl., London, E.C.4)

16-18. **Physics of Failure in Electronics**, 4th annual symp., Chicago, Ill. (M. Goldberg, IIT Research Inst., 10 W. 35 St., Chicago 60616)

16-18. **Spacecraft Sterilization Technology**, 1st natl. conf., California Inst. of Technology, Pasadena. (Office of Space Science and Applications, NASA, 400 Maryland Ave., SW, Washington, D.C.)

17-19. Eastern **Analytical Symp.**, New York, N.Y. (M. E. McGoldrick, Armco Steel Corp., P.O. Box 1697, Baltimore, Md. 21203)

17-19. **Micrography**, intern. congr., Tokyo, Japan. (Mrs. J. Lang, 2501 Hudson Rd., St. Paul, Minn. 55119)

17-20. Canadian **Cardiovascular Soc.**, Winnipeg, Man. (J. B. Armstrong, 1130 Bay St., Toronto 5, Ont.)

17-20. **Hyperbaric Oxygenation**, 3rd intern. conf., Duke Univ. Medical Center, Durham, N.C. (I. W. Brown, Jr., Dept. of Surgery, Duke Univ. Medical Center, Durham)

18. Society of Military **Otolaryngologists**, Chicago, Ill. (G. R. Hart, Box 223, U.S. Naval Hospital, Philadelphia, Pa.)

18-19. **Computational Methods in Crystallography**, conf., London, England. (Meetings Officer, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1)

18-19. **Electronics**, Mid-America conf., Kansas City, Mo. (W. Wiley, Bonzer Inc., 11111 W. 59th Terrace, Shawnee, Kan.)

18-21. American **Anthropological Assoc.**, Denver, Colo. (S. T. Boggs, 1530 P St., NW, Washington, D.C. 20005)

18-24. **Tropical Oceanography**, intern. conf., Miami Beach, Fla. (F. F. Koczy, Inst. of Marine Science, Univ. of Miami, Miami 33149)

20-21. American **Folklore Soc.**, Denver, Colo. (T. P. Coffin, Box 5, Bennett Hall, Univ. of Pennsylvania, Philadelphia 19104)

21-26. **Orthopedics and Traumatology**, 6th Latin American congr., Lima, Peru. (G. de Velasco Polo, Zacatecas 117, Mexico 7, D.F.)

22-24. **Electromagnetic Sensing of Earth by Satellites**, intern. symp., Coral Gables, Fla. (R. Zirkind, Polytechnic Inst. of Brooklyn, Graduate Center, Farmingdale, L.I., N.Y.)

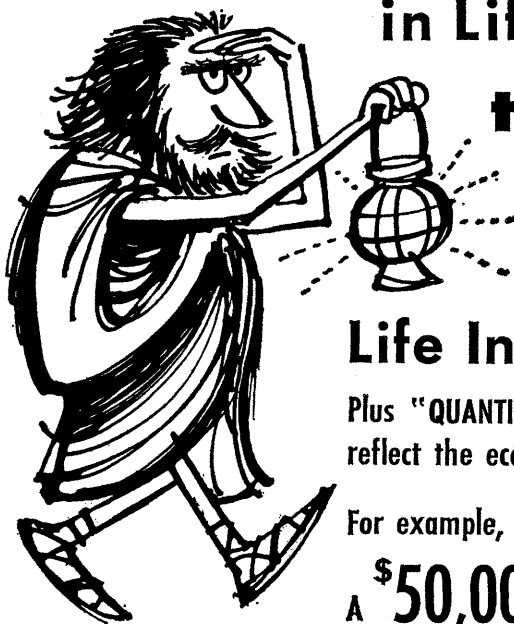
22-26. **Nuclear Electronics**, conf., Bombay, India. (K. Zybylski, Div. of Scientific and Technical Information, Intern. Atomic Energy Agency, 11 Kärntnering, Vienna, Austria)

22-26. **Plutonium**, intern. conf., London, England. (Inst. of Metals, 17 Belgrave Sq., London, S.W.1)

22-3. **Volcanology**, intern. symp., Auckland and Wellington, New Zealand. (J. Healy, Dept. of Scientific and Industrial Research, Rotorua, New Zealand)

24-29. American College of **Apothecaries, Inc.**, Miami Beach, Fla. (R. E. Abrams, Hamilton Court Hotel, 39th and Chestnut St., Philadelphia, Pa. 19104)

Looking for your Best Buy in Life Insurance?



tiaa announces...

NEW LOWER

Life Insurance Rates

Plus "QUANTITY SAVINGS" DIVIDENDS, which reflect the economy of issuing larger policies.

For example,

A **\$50,000** POLICY COSTS ONLY **\$98**

at age 30. Here's how:

\$50,000 20-Year Home Protection Policy

Age at Issue	25	30	35
Annual Premium (<i>Payable only 16 Years</i>)	\$134.00	\$159.00	\$206.50
Cash Dividend End of First Year*	55.50	61.00	70.50
First Year Net Premium	\$ 78.50	\$ 98.00	\$136.00

*These dividends are based upon the 1965 dividend scale and are, of course, not guaranteed.

This is a plan of level premium Term insurance which provides its largest amount of protection initially, reducing by schedule each year over a 20-year period to recognize decreasing insurance needs. There are several other insurance periods, and Home Protection policies are available at all ages under 56.

ARE YOU ELIGIBLE FOR TIAA? Yes, if you are employed by a college, university, private school, or other nonprofit educational or scientific institution that qualifies for TIAA eligibility.

Send the coupon for the new Life Insurance Guide and a personal illustration of TIAA policies for your age. TIAA is nonprofit and employs no agents.

tiaa	
TEACHERS INSURANCE AND ANNUITY ASSOCIATION 730 Third Avenue, New York, N. Y. 10017	
Please send the new Life Insurance Guide and personal illustrations.	
Name _____	Date of Birth _____
Address _____	
Dependents' Ages _____	
Nonprofit Employer _____ college, university, or other educational or scientific institution	

new!

The J. T. Baker BATCH Directory —An informational tool for locating compounds of carbon with structural atomic ele- ments selected by the user.

Now you can find the carbon compound you need from J. T. Baker's laboratory line as quickly as you can jot down the BATCH Number. J. T. Baker's unique BATCH Directory uses a five-digit code that classifies a chemical according to structural and atomic elements.

The code is easy to use. The *B*-digit (*B*=Basis or Benzene Ring Number) denotes the nature (and number) of rings present. The *A*-digit (*A*=Atomic class) is assigned on the nature (and number) of atoms present other than carbon, hydrogen and oxygen. The *T*-digit (*T*=Total heteroatom count) relates to the number of atoms present other than carbon and hydrogen. The *C*-digit (*C*=Carbon) is the unit's value in the number of carbon atoms in the empirical formula. The *H*-digit (*H*=Hydrogen) is derived from the number of hydrogen atoms in the empirical formula.

Once you're familiar with the assignment of BATCH Numbers, you'll be able to pinpoint the compounds you want from the more than 5,000 organic compounds available from J. T. Baker. Make this "system" work for you in establishing: (1) members of a class of structures; (2) substitution products of a structure; (3) isomers or homologs of a structure; (4) the usual or systematic name of a class of compounds. Write today for your copy of J. T. Baker's BATCH Directory, Dept. CTK.

J. T. Baker Chemical Co., Phillipsburg, N. J.

'BAKER ANALYZED' REAGENTS • LABORATORY ORGANICS • SPECIALTY GASES



NEW BOOKS

(Continued from page 479)

gions, Descriptive and Deductive. J. C. Boileau Grant and J. V. Basmajian. Williams and Wilkins, Baltimore, ed. 7, 1965. 795 pp. Illus. \$13.50.

Handbook of Human Embryology. R. W. Haines and A. Mohiuddin, Williams and Wilkins, Baltimore, ed. 3, 1965. 239 pp. Illus. \$7.

Papers on Bacterial Viruses. Selected by Gunther S. Stent. Little, Brown, Boston, Mass., ed. 2, 1965. 447 pp. Illus. Paper, \$5. Thirty papers.

The Pharmacological Basis of Therapeutics. Louis S. Goodman and Alfred Gilman, Eds. Macmillan, New York, ed. 3, 1965. 1805 pp. Illus. \$22.50.

Sensory Restriction: Effects on Behavior. Duane P. Schultz. Academic Press, New York, 1965. 224 pp. Illus. \$7.50.

Studies on the Piriform Lobe. F. Valverde. Harvard Univ. Press, Cambridge, Mass., 1965. 143 pp. Illus. \$7.50.

General

Analytical Philosophy of History. Arthur C. Danto. Cambridge Univ. Press, New York, 1965. 330 pp. Illus. \$10.

Aspects of Scientific Explanation: And Other Essays in the Philosophy of Science. Carl G. Hempel. Free Press, New York, 1965. 515 pp. Illus. \$12.50.

Biology—or Oblivion: Lessons from the Ultimate Science. Brian Hocking. Schenckman, Cambridge, Mass., 1965. 128 pp. Illus. \$2.95.

The Dawn of European Civilization: The Dark Ages. David Talbot Rice, Ed. McGraw-Hill, New York, 1965. 360 pp. Illus. \$28.50. The contributors are David Oates, R. H. Pinder-Wilson, Sirarpie der Nersessian, Cyril Mango, J. M. Hussey, Tamara Talbot Rice, Donald Bullough, William Culican, Peter Lasko, David Wilson, Charles Thomas, Philip Grierson, and Denys Hay.

Drinking in French Culture. Roland Sadoun, Giorgio Lolli, and Milton Silverman. Rutgers Center of Alcohol Studies, New Brunswick, N.J., 1965. 151 pp. \$6. Monographs of the Rutgers Center of Alcohol Studies, edited by Mark Keller.

Employment and Earnings Statistics for States and Areas, 1939-64. U.S. Dept. of Labor, Washington, D.C., 1965 (order from Superintendent of Documents, Washington, D.C.). 696 pp. Paper, \$4.

Freedom of the Individual. Stuart Hampshire. Harper and Row, New York, 1965. 112 pp. \$3.95.

Genetics and Prehistory. The Rede Lecture, 1965. Sir Gavin de Beer. Cambridge Univ. Press, New York, 1965. 38 pp. Illus. Paper, \$1.

A Guide to Fortran IV. Seymour V. Pollack. Columbia Univ. Press, New York, 1965. 270 pp. Illus. \$5.

A History of Marginal Utility Theory. Emil Kauder. Princeton Univ. Press, Princeton, N.J., 1965. 270 pp. Illus. \$6.50.

A History of the Concept of Valency to 1930. W. G. Palmer. Cambridge Univ. Press, New York, 1965. 185 pp. Illus. \$8.

The Student and the New Math: For

Delmar's new complete line of cryogenic equipment

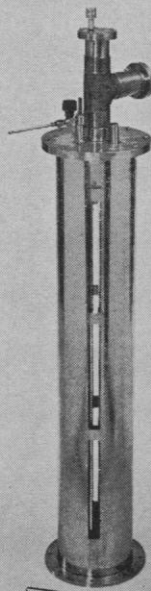
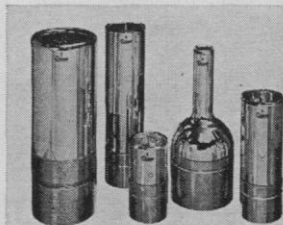
from Dewar Flasks to complete cryostats

COMPLETE CRYOSTATS—Providing stable environment for studies in the range of 1.2°K and higher, these units are supplied completely assembled and ready to install.

SPECIAL-PURPOSE CRYOSTATS—Delmar cryostats can be made in any practical size or configuration to meet special requirements. Units are available with optical windows or for use with standard magnets.

RELATED ACCESSORIES—Specialized vacuum equipment includes automatic liquid nitrogen level controller, cryogenic fluid level detector, transfer tubes, and low pressure gas regulator. All operate without electrical power.

DEWAR VESSELS, HANDLING EQUIPMENT—Heavy-duty and standard vacuum vessels are offered in cylindrical and spherical configurations in sizes ranging from 150 to 30,000 cc.




Delmar

SCIENTIFIC LABORATORIES
317 MADISON ST., MAYWOOD, ILL.

Ask for
new Cryogenic
Catalog DC-10S

A SUBSIDIARY OF COLEMAN INSTRUMENTS, INC.



**model SW1 Electronic
SQUARE WAVE STIMULATOR**

The Model SW-1 Square Wave Stimulator is a useful tool in the classroom as well as in the research laboratory.

SPECIFICATIONS

- Wave Form—a square wave
- Stimulus Amplitude—continuously adjustable from 0 to 100 volts—indicated by a calibrated dial.
- Stimulus Duration—continuously adjustable from .04ms to 32ms in three ranges—.04ms to 32ms; .4ms to 3.2ms; and 4ms to 32ms.
- Frequency—1 pulse per second to 1000 pulses per second continuously adjustable in 3 ranges.
- Sync-Output—100 volt spike pulse.
- Signal Magnet Output—Power frequency voltage sufficient for 2 ohms and over.
- Modes of Operation—automatic, manual and single pulse control. Polarity Reversing Switch.
- Power Requirement—115 volt 60 cycle.

Catalog No. 7092-610 Square Wave Stimulator, Model SW-1

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

DIFCO LABORATORY PRODUCTS

BIOLOGICS CULTURE MEDIA
REAGENTS

Media for Standard Methods
Culture Media
Dehydrated and Prepared
Microbiological Assay Media
Tissue Culture and Virus Media
Bacterial Antisera and Antigens
Fluorescent Antibody Reagents
Endotoxins Lipopolysaccharides
Clinical and Serological Reagents
Sensitivity Disks Unidisks
Peptones Hydrolysates Amino Acids
Enzymes Enrichments Dyes Indicators
Carbohydrates Biochemicals

DIFCO

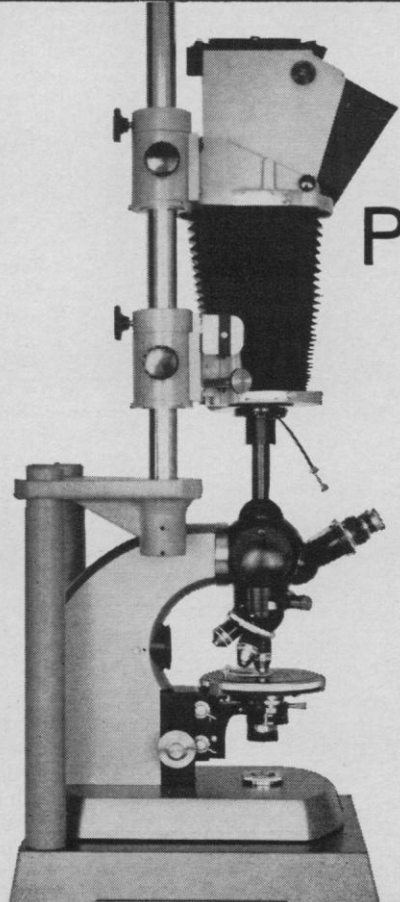
*over 65 years' experience
in the preparation of
Difco products assures*

**UNIFORMITY STABILITY
ECONOMY**

*Complete Stocks Fast Service
24-hour Shipment*

Descriptive literature available on request

DIFCO LABORATORIES
DETROIT 1 MICHIGAN USA

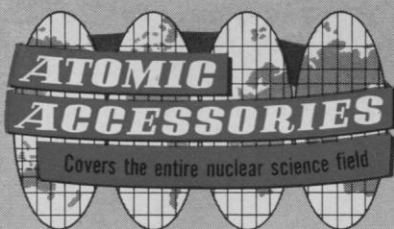


we can solve any
**PHOTOMICROGRAPHIC
PROBLEM**

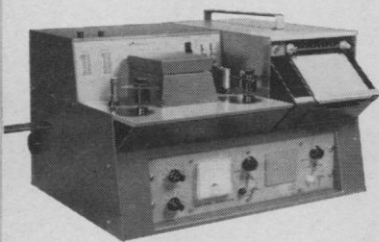
The Brinkmann Mark-V Universal Photomicrographic Camera is the most recent addition to our line of cameras and exposure meters. It is designed for use with all laboratory and research microscopes. A 4 x 5" Graflok back accepts cut film, Polaroid, No. 120 roll film and 35 mm adaptors. A new high-sensitivity built-in photo-meter facilitates exposure determination. Low-power accessories for magnifications from 2-50X are available.

For complete descriptive literature or a practical demonstration in your laboratory, write to:

BRINKMANN
CANTIAGUE ROAD, WESTBURY, N.Y. 11590
ST. LOUIS • CHICAGO • HOUSTON • CLEVELAND • PHILADELPHIA • SAN FRANCISCO
INSTRUMENTS



NEW! DELUXE 4-Pi RADIOCHROMATOGRAM SCANNER



Model RSC-363 Deluxe Scanner

For Counting Tritium,
Carbon-14, Sulphur-35,
Iodine-131, etc.
on PAPER STRIPS . . .
THIN-LAYER
CHROMATOGRAPHY

Features:

NO CONTAMINATION,
static charge and lint problems
as found in detectors positioned
one above the other. Paper
strips pass vertically between
2 side-by-side detectors.

**THREE SEPARATE
GAS-FLOW DETECTORS:**
2 for paper strips, one for
glass plates.

Send for FREE literature.
(Bulletin RS-6)

A ATOMIC ACCESSORIES, INC.
811 West Merrick Road
Valley Stream, N.Y.
A Subsidiary of Baird-Atomic, Inc.

Elementary School Parents and Others.
Jerome T. Murray. Regnery, Chicago, Ill.,
1965. 716 pp. Illus. \$4.95.

Yearbook of Physical Anthropology,
1963. Jack Kelso, Gabriel W. Lasker, and
Sheilagh T. Brooks, Eds. Published for
the American Assoc. of Physical Anthro-
pologists by Instituto de Investigaciones
Históricas, Universidad Nacional Autón-
oma de México and Instituto Nacional de
Antropología e Historia, México, D.F.,
1965 (available from Instituto Nacional
de Antropología e Historia, Córdoba 45,
México 7, D.F.). 310 pp. Illus. Paper.
Yearbook of Physical Anthropology Series,
vol. 11.

**Yearbook of the National Institute of
Sciences of India, 1965.** Natl. Institute of
Sciences of India, New Delhi, 1965. 245
pp. R. 15.

Mathematics, Physical Sciences, and Engineering

**Advances in Astronomy and Astro-
physics.** vol. 3. Zdeněk Kopal, Ed. Aca-
demic Press, New York, 1965. 401 pp.
Illus. \$14. Five papers: "The abundance
of elements in the solar atmosphere" by
Lawrence H. Aller; "Determination of
the elements of eclipsing variables from
Fourier transforms of their light curves"
by Masatoshi Kitamura; "Internal struc-
ture of the stars and apsidal motions" by
Zdeněk Kopal; "Special analysis of solar
flares" by Zdeněk Švestka; and "Survey
of modern cosmology" by Ya. B. Zeldo-
vich.

**Annual Review of Astronomy and As-
trophysics.** vol. 3. Leo Goldberg, Armin
J. Deutsch, and David Layzer, Eds. An-
nual Reviews, Palo Alto, Calif., 1965. 446
pp. Illus. \$8.50. Thirteen papers: "Clus-
tering of galaxies" by G. O. Abell; "Absolute
spectral energy distributions in stars" by
J. B. Oke; "The energy balance and dy-
namics of the interstellar medium" by
F. D. Kahn and J. E. Dyson; "Spectral
line broadening" by Henri Van Regemor-
ter; "The system of astronomical con-
stants" by G. M. Clemence; "Theory of
stellar orbits in the galaxy" by A. Ollon-
gren; "Model atmospheres" by Jean-
Claude Pecker; "Chemical evidence bear-
ing on the origin of the solar system" by
Hans E. Suess; "Some observational as-
pects of stellar evolution" by Olin J.
Eggen; "Radio radiation from the galactic
nuclear region" by Bernard F. Burke;
"Cosmic magnetobremssstrahlung (syn-
chrotron radiation)" by V. L. Ginzburg
and S. I. Syrovatskii; "Spectra of comets
and their interpretation" by Claude Ar-
pigny; and "Radar astronomy" by Gordon
H. Pettengill and Irwin I. Shapiro.

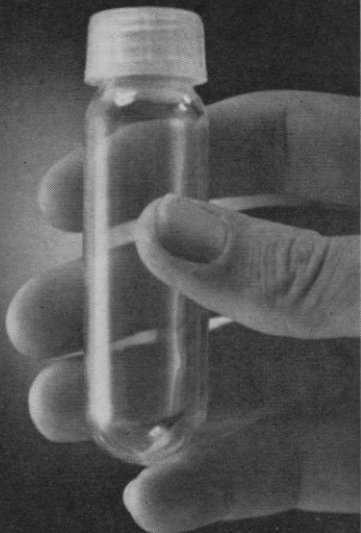
Contemporary Algebra: First Course.
John R. Mayor and Marie S. Wilcox.
Prentice-Hall, Englewood Cliffs, N.J.,
1965. 480 pp. Illus. \$4.96.

Coulomb Excitation. L. C. Biedenharn
and P. J. Brussaard. Oxford Univ. Press,
New York, 1965. 340 pp. Illus. Paper,
\$6.40. Oxford Library of the Physical
Sciences.

**Dissociation Constants of Organic Bases
in Aqueous Solution.** D. D. Perrin. Butter-
worth, Washington, D.C., 1965. 474 pp.
Illus. \$28.

ANOTHER NEW PRODUCT
OF NALGE RESEARCH

**THIS NALGENE®
CENTRIFUGE TUBE
WITHSTANDS
100,000 x G...**



**AND HAS THE
CLARITY OF GLASS!**

■ A new polycarbonate centrifuge tube
from Nalge is unexcelled for high speed
centrifuging. Originally designed for virus
vaccine studies, the tube is virtually
shatterproof. Available in two mouth
openings— $\frac{1}{4}$ " and $\frac{1}{2}$ ". The $\frac{1}{4}$ " opening
has a lip to prevent accidental spillage.
The price? Far below anything in its class.

■ Nalge offers the most extensive line of
plastic centrifuge ware. Round or con-
ical tubes, with or without closures. Bot-
tles—with flat or spherical bottoms. Plus
a variety of resins—all non-contaminat-
ing, corrosion-resistant and unbreakable.

■ Polycarbonate tubes—window clear . . .
autoclavable . . . use in high speed re-
frigerated centrifuges. Polypropylene
tubes—autoclavable . . . extremely high
chemical resistance . . . priced to use as
disposables. Polyethylene tubes—eco-
nomical . . . high chemical resistance . . .
low temperature applications.

■ Nalgene Centrifuge Ware is always in
stock—ready for immediate delivery. As-
sortable with other Nalgene Labware for
maximum discount. Read the whole story
in our new brochure N-44. Ask your lab
supply dealer, or write Dept. 21221, The
Nalge Co., Inc., 75 Panorama Creek
Drive, Rochester, New York 14625.

**NALGENE
LABWARE**
Leader in quality plastic labware since 1949

(Continued from page 468)

standards. California led the way in prescribing such standards, and other states were beginning to follow suit.

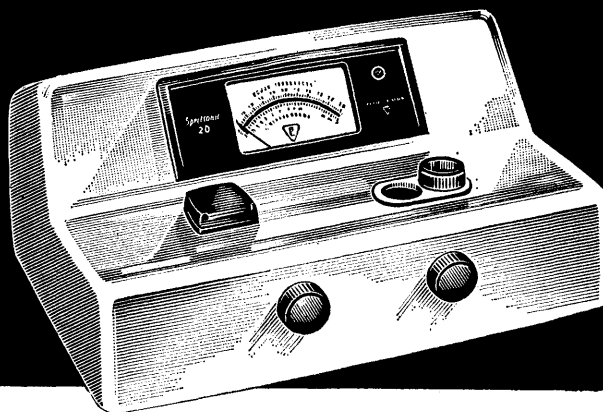
The journey through Congress of this year's Clean Air Act Amendments bill (which included the vehicle-emission standards) was relatively easy, even though some members objected to the provisions for research on disposal of solid wastes as an ill-advised federal venture into the garbage business. Success was assured (it may never have been much in doubt) after the straightening out of a mix-up which caused the Administration some embarrassment. This concerned its position on fixing standards for exhaust emission. HEW had appeared to support strongly the Muskie subcommittee's recommendations for standards; but then James M. Quigley, an assistant secretary of HEW, testified in April that the emission control methods to be used by the automobile manufacturers to meet California's requirements should be evaluated before being applied nationally. This surprising testimony produced headlines such as "LBJ Scuttles Smog-Control Bill," and some observers were quick to suggest that President Johnson, the master of consensus, was snuggling up to the car manufacturers for political purposes. The turn-about defied logical explanation, and the Administration was soon back to an endorsement of the Muskie proposals.

In time, Congress may have to return again to the problem of automobile exhaust emissions. V. G. MacKenzie, the assistant surgeon general in charge of PHS's air pollution division, indicated recently that the application of controls on carbon monoxide and hydrocarbon emission to automobile engines of the kind now in use is no better than a holding action. By 1980 the number of automobiles will have so increased that, without controls, pollution from exhaust emissions will have grown worse. Moreover, for certain emissions, such as oxides of nitrogen, no technical means of control are yet available, MacKenzie said.

PHS is continuing its research on the control of pollutants resulting from fuel combustion. Meanwhile, MacKenzie and others already wonder whether the ultimate solution may not be to abandon the spark ignition engine and develop a radically different automobile propulsion system. Greater use of mass transit would help, too.


22 OCTOBER 1965

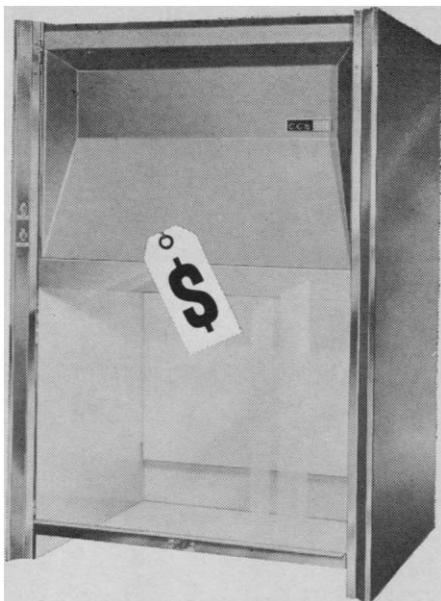
1 out of every 2 COLORIMETERS sold is a Spectronic 20! WHY?



- **REMARKABLE STABILITY** . . . needle never fluctuates even with severe power changes.
- **EXTENDED RANGE IS UNEQUALLED** . . . from 340m μ —950m μ .
- **DOUBLE VALUE—DOUBLE DUTY** . . . it's a colorimeter *and* it's a spectrophotometer.
- **USES CERTIFIED-PRECISION DIFFRACTION GRATINGS** . . . unique in its price class . . . unhindered by limitations of range and purity characteristic of glass filters . . . lowest stray light.
- **FASTER WARM-UP** . . . usually 5 minutes or less (2 minutes for Transistor Regulated Model).
- **HIGH SENSITIVITY** . . . at all wavelengths—including the lowest.
- **DIRECT SCALE READINGS** . . . optical density or percent transmittance.

And many more good reasons. Spectronic 20 is available separately or as part of a complete Data Acquisition System capable of processing 4 samples a minute. For further information or a demonstration, write to Bausch & Lomb, 75922 Bausch Street, Rochester, New York 14602.

BAUSCH & LOMB 



PRICE IS THE MOST IMPORTANT THING TO CONSIDER IN BUYING A LABORATORY FUME HOOD. RIGHT?

WRONG!... Anyone can build a cheap hood. The trick is to manufacture quality fume hoods that will give maximum service, and do the best possible job, without sacrificing cost.

The new CCS fiberglass fume hoods meet these requirements. Advanced design (Patent #201678) features double-wall construction and air foil entrance. Note: Fig. 1: Air Entry is uniform with very little turbulence in the air flow pattern, compared to the older thin wall hoods, see fig. 2.

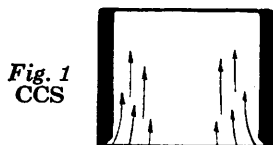


Fig. 1
CCS

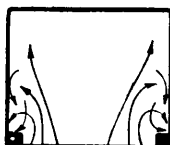


Fig. 2
other

Available in five popular sizes, CCS hoods are modular designed and will work with existing support tables or cabinets.

1. **Portable Fume Hood, Fiberglass 30.** (Shown Above) 30" x 24" x 24". Ideal for Laboratories requiring multiple locations
Model 2030.....Price \$250
2. **Fume Hood, Fiberglass 47.** 47" x 30" x 59". Ideal for many general laboratory requirements.
Model 4030.....Price \$450
3. **Fume Hood, Fiberglass 70.** 70" x 30" x 59". Ideal for laboratory use requiring maximum work space.
Model 6030.....Price \$740
4. **Radiation Fume Hood, Fiberglass R-70.** 70" x 34" x 60". Ideal for radioactive and cleanroom work. Advanced air flow design.
Model 7030.....Price \$1,180
5. **Bacteriological Table Hood, Fiberglass B-45.** 45" x 24" x 23". Ideal for inoculation and tissue culture and biological procedures.
Model 4530.....Price \$280

For complete information on the new CCS fiberglass hoods—contact your laboratory supply dealer or write for Catalog #666-S



C.C.S.

CHEMICAL CONTROL SYSTEMS
102 W. 31st Street
Independence, Missouri



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: minimize resistance to vapor flow to speed drying time
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 ¾ 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.

Automobile exhaust emissions are, of course, only one source of air contamination in the rapidly growing urban areas. Sulfur oxides, principally from the burning of coal and fuel oil, also are major pollutants, and there are others. The mounting public concern over air pollution is easily understandable. Not everyone goes down to the river, to be repelled by the water's burden of indigestible wastes. But inhabitants of the increasingly numerous cities afflicted by smog become quickly offended. Poor visibility, smarting eyes, and the nagging thought that continuous exposure to contaminated air may bring on a chronic illness make ready converts to the antipollution cause.

Through the Clean Air Act of 1963 and this year's amendments, Congress has tried to give the federal government a meaningful role while, at the same time, holding to the philosophy that air pollution control is primarily a state and local responsibility. Eventual stringent controls seem assured, whether imposed by the states and localities or by a Congress grown impatient at a lag-gard performance in the statehouses and city halls.—LUTHER J. CARTER

Announcements

The Division of Mathematics of the National Academy of Sciences—National Research Council has established the **Committee on Support of Research in the Mathematical Sciences**. The committee's duties include preparing studies of current research in mathematical sciences and of mathematics education at the undergraduate, graduate, and post-doctoral levels; of current levels and forms of support of mathematical research by federal and private agencies; and an indication of support needed in the immediate future to maintain the present state of mathematical activity.

Lipman Bers, of Columbia University, is chairman. The other members are:

T. W. Anderson, Columbia University

R. H. Bing, University of Wisconsin

H. W. Bode, Bell Telephone Laboratories

R. P. Dilworth, California Institute of Technology

G. E. Forsythe, Stanford University

Mark Kac, Rockefeller University

C. C. Lin, Massachusetts Institute of Technology

J. W. Tukey, Princeton University

F. J. Weyl, Office of Naval Research

22 OCTOBER 1965

to simplify waveform comparison applications

Type 502A



oscilloscope

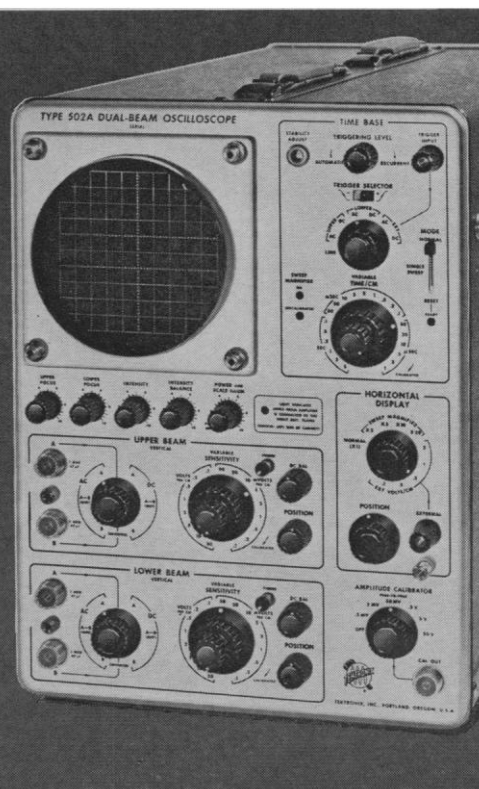
To measure stimulus and reaction on the same time base.

To measure transducer outputs, such as pressure vs. volume

To measure phase angles and frequency differences.

To measure plots of X-Y curve-tracing presentations

To measure other characteristics of low-level displays.



features ■ 2 identical vertical amplifiers ■ 17 calibrated steps of sensitivity ■ 21 calibrated sweep rates ■ 4 steps of sweep magnification ■ Continuously adjustable sweep and sensitivity controls ■ Push-button beam finders ■ Intensity-balance control.

main performance characteristics include: Passbands from dc-to-50 kHz, minimum, to dc-to-1 MHz maximum • Calibrated Vertical Sensitivity in 17 steps from 100 μ V/cm to 20 V/cm, both amplifiers • Calibrated Sweep Range in 21 rates from 1 μ sec/cm to 5 sec/cm • Common-mode rejection, up to 40,000 to 1 • Phase difference, less than 5 degrees, at -3 dB • Variable, Uncalibrated, Sensitivity and Sweep Range Controls • 2X, 5X, 10X, or 20X Sweep Magnification • Flexible Trigger Facilities • Amplitude Calibrator • Electronically-Regulated Power Supplies.

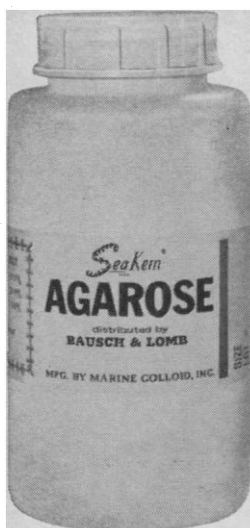
Type 502A Oscilloscope . . . \$1050

Rack Mount Type RM502A . . \$1150

U.S. Sales Prices, f.o.b. Beaverton, Oregon

For a demonstration, please call your Tektronix field engineer.

Tektronix, Inc.



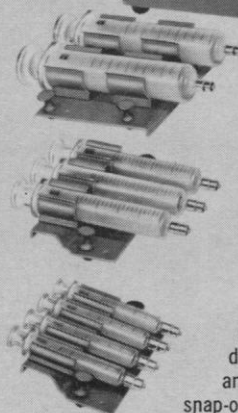
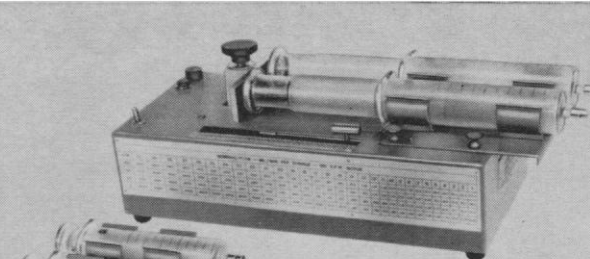
 DISTRIBUTED
EXCLUSIVELY
THROUGH
**BAUSCH
& LOMB**

Bausch & Lomb has been selected by Marine Colloid, Inc. as exclusive distributor for SeaKem® Brand Agarose in the laboratory and clinical fields.

DATA

Strongly-gelling Agar extract (powder form)
Non-ionic, with minimal adsorption and electroendosmosis
High optical clarity
Sulfate content—less than 0.5%
Ash content—less than 1.5%
Moisture content—less than 15%
(Assay available on request.)

Supplied in standard units of 25, 100 and 250 grams. Larger quantities available on request. For information about the Bausch & Lomb Spectrophor I electrophoresis equipment, write for folder No. 34-2080. Bausch & Lomb, 87822 Bausch St., Rochester, N.Y. 14602.



**NEW
COMPACT
INFUSION
PUMP**



Model 975 is a new, low-cost pump designed for infusion only, using glass or disposable plastic syringes of 100, 50, 20, and 5 ml. size. Syringes are held in simple, snap-on syringe plates. The 30-position gearbox permits instantaneous selection of any synchronous speed over a 17,000 to 1 range. In all, 330 precise rates are possible from 0.00046 ml./minute to 154.8 ml./minute. Dimensions are 14" x 6 3/4" x 3 1/2"; weight is 12 pounds.

Model 975, complete with 4 syringe plates\$275.00
f.o.b. Dover, Mass.

Write for Bulletin 975 and Catalog

HARVARD APPARATUS CO., INC.
DOVER · MASSACHUSETTS · U.S.A. · 02030
(a non-profit organization)

PRIOR

micro-manipulators



NEW!
TILTING MODEL
"X" AXIS ROTATABLE
THROUGH 360°
\$200.

AVAILABLE FOR LEFT
OR RIGHT HAND
OPERATION

ASK FOR OUR
NEW MANIPULATOR
LITERATURE.

eric  **sobotka company, inc.**
IMPORTERS AND DISTRIBUTORS OF MICROSCOPES AND SCIENTIFIC INSTRUMENTS

110 WEST 40TH STREET, NEW YORK, NEW YORK 10018. • AREA CODE 212 WISCONSIN 7-9216

NEW!



LOW COST, THREE-IN-ONE PORTABLE RECORDER

CEC's new solid-state DG 5511 introduces engineering and performance advantages never before offered by any recorder in its price range.

This portable, 2-channel, thermal writing recorder is so versatile it provides the capability formerly achieved only through multiple instruments. The DG 5511 features *two* plug-in signal conditioners for a wide range of voltage inputs. *No* preamp is needed for high level signals. Due to its all-modular design, users may convert from high level signal inputs to low level inputs by a simple change of plug-in attenuator/amplifier units. In addition, the DG 5511 is remarkably easy to use with its unique snap-in, front chart-loading and convenient push-button selectable chart speeds.

Features: Portable • Rugged and compact • Lightweight • Low cost • Versatile (3 in 1) • High performance • Snap-in chart loading • Excellent frequency response • Push-button chart speeds • All solid state.

A wide range of accessories and operating supplies is available. For a desk top demonstration of the DG 5511, contact your nearest CEC Field Office, or write for CEC Bulletin 5511-X18.

CEC

Data Recorders Division

CONSOLIDATED ELECTRODYNAMICS

A SUBSIDIARY OF BELL & HOWELL/PASADENA, CALIF. 91109
INTERNATIONAL SUBSIDIARIES: WOKING, SURREY, ENGLAND AND FRIEDBERG (HESEN), W. GERMANY