

# SCIENCE

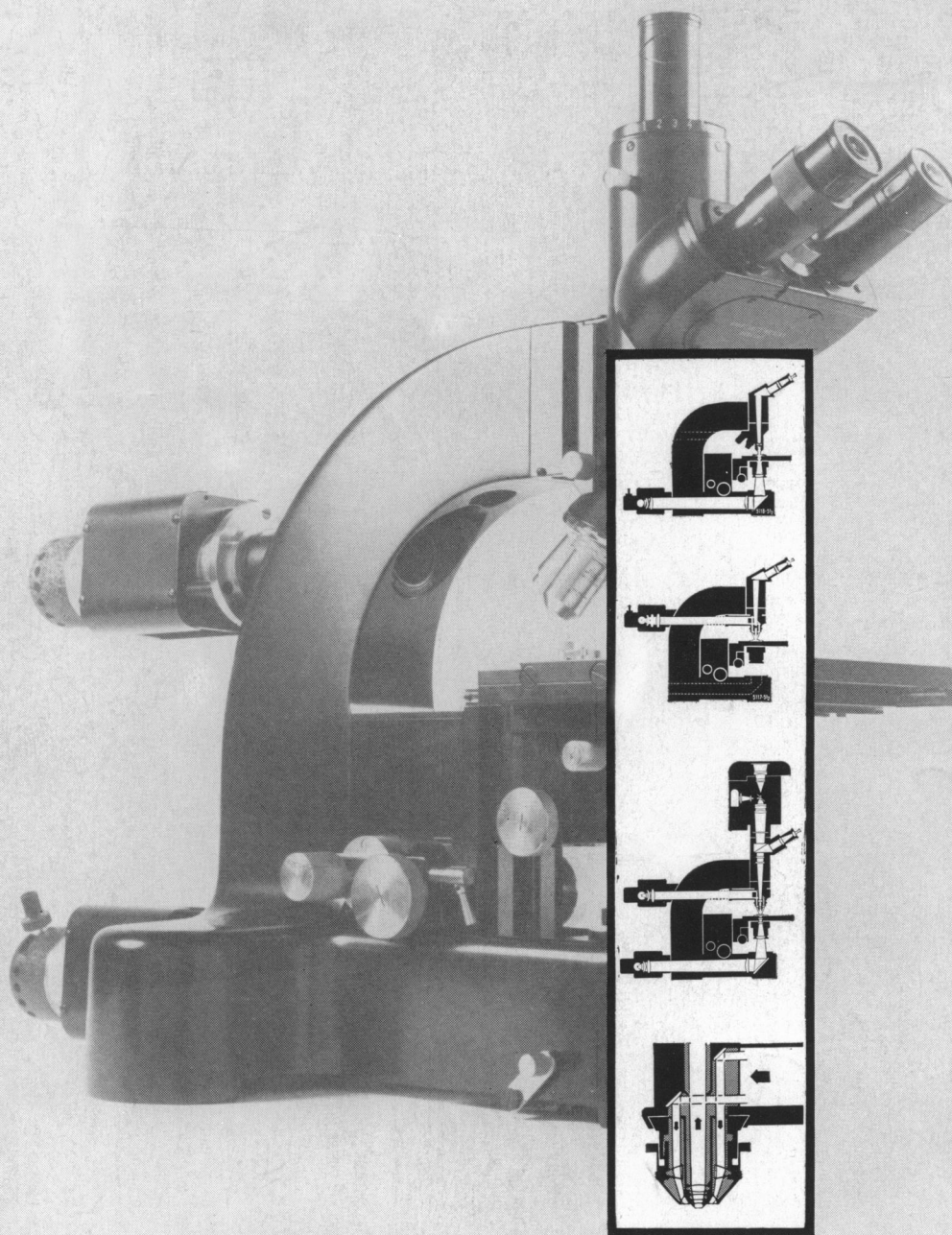
18 August 1961

Vol. 134, No. 3477

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE







### THE MANY-FACETED LEITZ ORTHOLUX ...widest-range Universal Research Microscope

The many-faceted Ortholux meets the requirements of creative research for infinitely varied and subtle scientific observations. It truly represents Leitz' more than 110 years of optical experience and uncompromising exactitude. With intricately inter-designed systems of optics, illumination and mechanics, the Ortholux puts at your disposal a multiplicity of techniques including separate or

combined incident and transmitted illumination, bright field, dark field, phase contrast, polarized and fluorescent methods. The new "Orthomat" combined with the Ortholux effortlessly permits optimum results in 35mm photomicrography. With the "Aristophot" it becomes a photomicroscope for sizes up to 4" x 5".

Write for Complete Details and Specifications of This Incredibly Versatile Instrument.

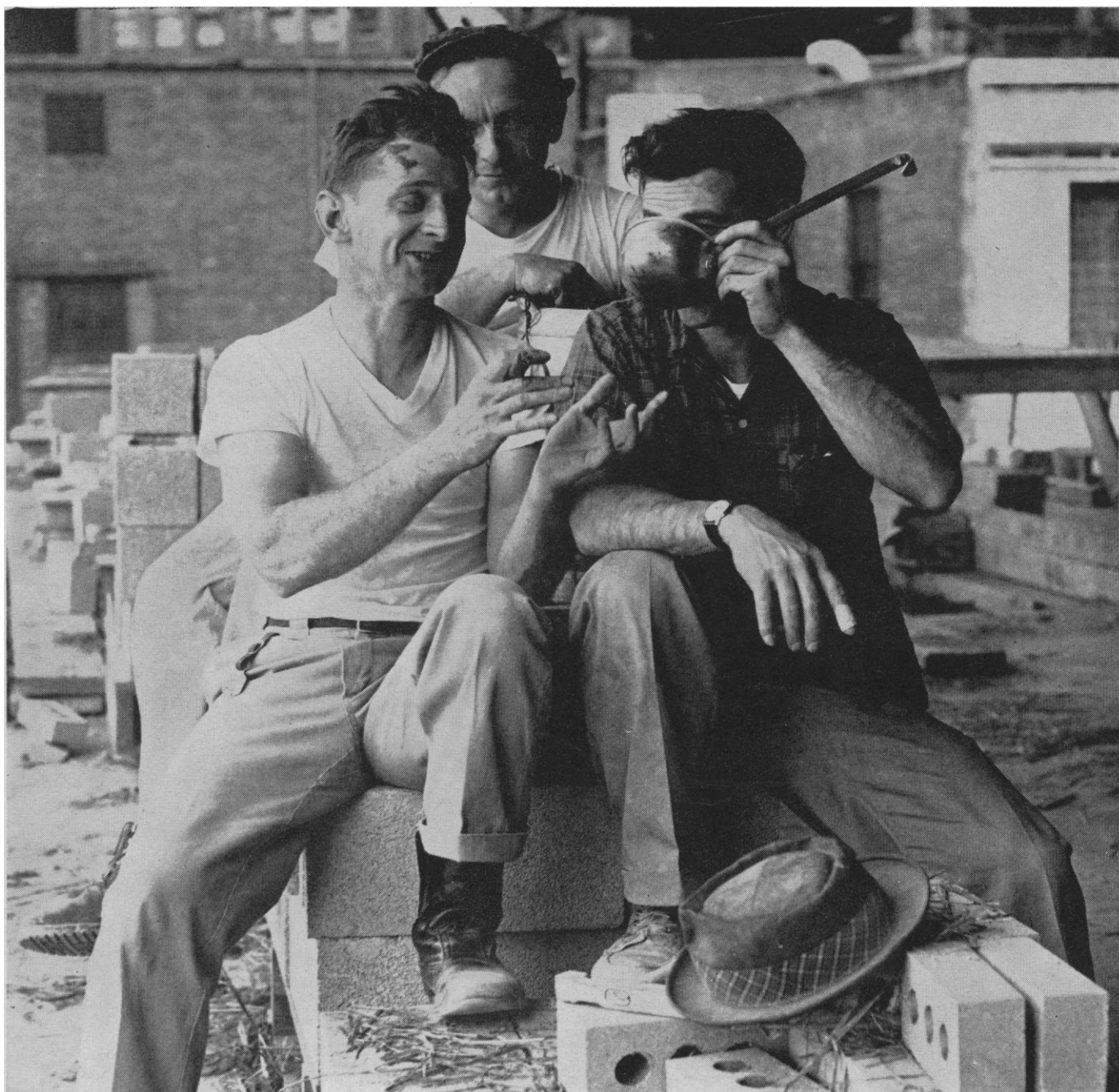
**Leitz**

E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK 16, N. Y.  
Distributors of the world-famous products of  
Ernst Leitz G. m. b. H., Wetzlar, Germany—Ernst Leitz Canada Ltd.  
LEICA AND LEICINA CAMERAS · LENSES · PROJECTORS · MICROSCOPES

E. LEITZ, INC., 468 Park Avenue South, New York 16, N. Y.  
Gentlemen: Dept. SC-818

- ☐ Please send me complete information on the ORTHOLUX.  
☐ Kindly have Leitz representative phone for appointment to demonstrate the ORTHOLUX system at no obligation to me.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_  
Telephone \_\_\_\_\_



## **PROBABLY THE WATER IS ALL RIGHT!**

A cool drink from the common cup. A small chance. Usually no one suffers for it. Usually. It's human nature to take chances. Except at Nutritional Biochemicals. There, human nature gives way to perfectionism. Because lives depend on the absolute purity of N.B.Co.'s biochemicals. So does successful research. In ordering one of N.B.Co.'s 2600 biochemicals, you express confidence. Confidence in a company whose only business is preparing pure biochemicals. A company whose world-wide volume brings you pure biochemicals

at low prices. Send for our Free catalogue today. Or call us at MONTROSE 2-0214, Cleveland, Ohio.

**NUTRITIONAL BIOCHEMICALS CORPORATION**  
 21010 Miles Avenue • Cleveland 28, Ohio  
 24-Hour Delivery in the U.S.A. • Slightly Longer Anywhere Else

Send for our free June, 1961 Catalog containing more than 2600 items. Fill out coupon and mail today for your copy. SC



Name \_\_\_\_\_  
 Organization \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_  
 State \_\_\_\_\_ Zone \_\_\_\_\_

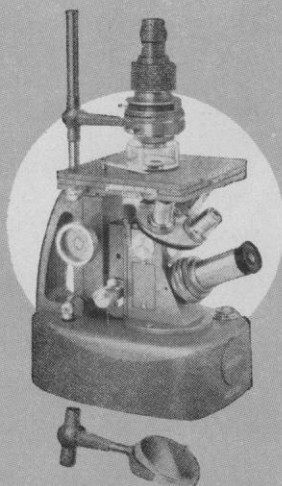


# THE BIO-LOGICAL BUY IN MICROSCOPES

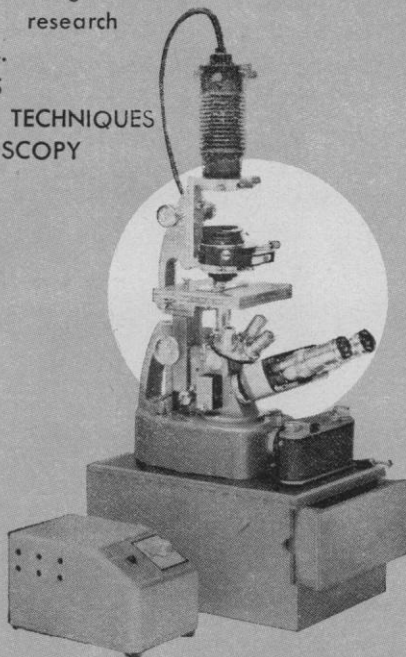
## UNITRON INVERTED MODELS...

are proving to be the most logical and versatile design in all fields of the biological sciences, whether for complex research studies or for routine lab analyses.

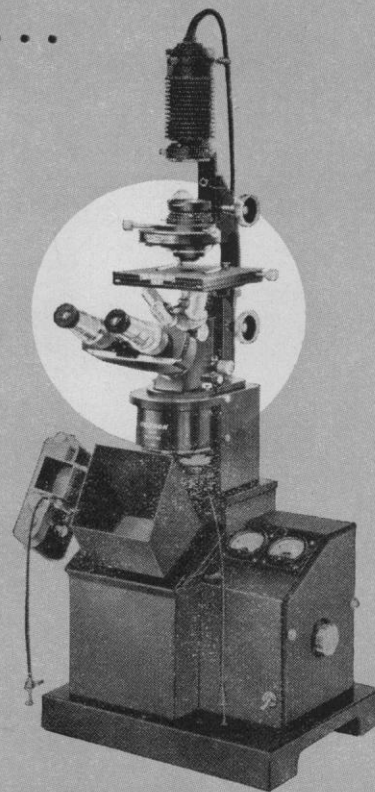
**IDEAL FOR** ● TISSUE CULTURES  
● HANGING-DROP TECHNIQUES  
● GENERAL MICROSCOPY



MODEL MIC



MODEL PH-BMIC



MODEL BU-13

### INVERTED LABORATORY AND RESEARCH MODELS

#### Brightfield Laboratory Models:

**MONOCULAR MODEL MIC.** Four brightfield objectives 5X, 10X, 40X, 100X (oil); eyepieces 5X, 10X, 15X; ample height adjustment of condenser-illuminator for even large culture bottles; built-in base transformer. **\$409.**

**BINOCULAR MODEL BMIC.** Binocular version of Model MIC, with camera mechanism. **\$609.**

#### Brightfield Research Models:

**MONOCULAR MODEL BR-MIC.** Five brightfield objectives 5X, 10X, 20X, 40X, 100X (oil); eyepieces 5X, 10X, 15X; rack and pinion condenser mechanism with individual centering adjustments for condenser and illuminator; elevating compartment provides handy storage for accessories. **\$545.**

**BINOCULAR MODEL BR-BMIC.** Binocular version of Model BR-MIC, with camera mechanism. **\$745.**

#### Phase Research Models:

**MONOCULAR MODEL PH-MIC.** Eight phase objectives 10X, 20X, 40X, 100X (oil) in both bright and dark-medium contrast; eyepieces 5X, 10X, 15X; high intensity Koehler-type illuminator; five-choice intensity transformer; phase turret condenser with aperture for brightfield; elevating base. **\$812.**

**BINOCULAR MODEL PH-BMIC.** Binocular version of Model PH-MIC plus built-in camera mechanism. **\$1012.**

Prices include optics, cabinets, filters, special slides, petri dishes, and basic accessories. The built-in camera mechanism is standard with binocular models and available as an accessory for monoculars. Accommodates 35mm. camera back or Polaroid Land Camera Attachment. Both available at extra cost.

### CAMERA-MICROSCOPES

The all-purpose microscope for visual examination, screen viewing and photomicrography. Built-in 3 1/4" X 4 1/4" camera with four flat field photo-eyepieces on revolving turret. Accessory attachments for 35mm., Polaroid, and movie cameras. Low-power (5X-40X) accessories available. Needs only 9" x 12" table space.

#### Brightfield Research Models:

**MONOCULAR MODEL U-12.** Same objectives and visual eyepieces as Model BR-MIC. **\$1195.**

**BINOCULAR MODEL BU-12.** Binocular version of Model U-12. **\$1379.**

#### Phase Research Models:

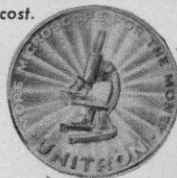
**MONOCULAR MODEL U-13.** Same phase objectives, turret condenser, and visual eyepieces as Model PH-MIC. **\$1390.**

**BINOCULAR MODEL BU-13.** Binocular version of Model U-13. **\$1580.**

### Only UNITRON Inverted Microscopes Offer ALL These Advantages

accommodates slides, wet mounts, special glassware, warming chambers and micro-manipulators ● unobstructed stage for easy access ● built-in, correct intensity illumination ● glare-free coated optics ● special petri dishes for observation of cultures even by highest power oil immersion objective ● graduated mechanical stage ● accessory camera attachments ● long working distance 40X objective and other accessories also available

**ASK FOR A FREE 10-DAY TRIAL.** You be the judge in your own lab. Select the model you want. Then fill out and mail the coupon. Microscopes sent and returned at our expense. You assume no obligation. Or if you want more data on these and other UNITRON microscopes, use coupon to request our complete catalog.



## UNITRON

INSTRUMENT COMPANY • MICROSCOPE SALES DIV.  
66 NEEDHAM STREET • NEWTON HIGHLANDS 61, MASS.

- ☐ I'd like to try UNITRON Model ..... absolutely free for ten days with no obligation. Send details.
- ☐ Send me your complete catalog #4-S-3

NAME \_\_\_\_\_

ORGANIZATION \_\_\_\_\_ DEPT. \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



<b>Editorial</b>	New Categories for Old .....	439
<b>Articles</b>	Solar Research from Rockets: <i>R. Tousey</i> .....	441
	The greatly broadened spectrum above the atmosphere opens a new realm for astrophysics.	
	X-ray Fluorescence Analysis in Biology: <i>T. Hall</i> .....	449
	Both standard and special x-ray methods can help in the difficult study of low-concentration elements.	
	The Psychology of the Scientist: <i>A. Roe</i> .....	456
	A definite personality pattern, encompassing a wide range of traits, characterizes the creative scientist.	
<b>Science and the News</b>	The School Bill: As Usual It Is in Trouble; Notes on Disarmament, Satellites and Radio Astronomy .....	459
<b>Book Reviews</b>	A. Sandage's <i>The Hubble Atlas of Galaxies</i> , reviewed by <i>F. K. Edmondson</i> ; other reviews .....	464
<b>Reports</b>	Host Alternation of Spruce Broom Rust: <i>R. S. Peterson</i> .....	468
	Preference Factors in Experimental Alcoholism: <i>R. D. Myers</i> and <i>R. Carey</i> .....	469
	Suppressor of Pyrimidine 3 Mutants of <i>Neurospora</i> and Its Relation to Arginine Synthesis: <i>R. H. Davis</i> .....	470
	Arginine and Pyrimidine Biogenesis in <i>Neurospora</i> : <i>J. L. Fairley</i> and <i>A. B. Adams</i> ....	471
	Antifungal Agent: <i>M. C. Egeberg</i> , <i>A. F. Elconin</i> , <i>R. O. Egeberg</i> .....	472
	Significance of Some Fossil Wood from California: <i>C. G. Higgins</i> .....	473
	Benzpyrenes in Soil: <i>M. Blumer</i> .....	474
	Hemorrhagic Disease in Rodents Infected with Virus Associated with Thai Hemorrhagic Fever: <i>S. B. Halstead</i> and <i>E. L. Buescher</i> .....	475
<b>Departments</b>	Comparative Endocrinology; Forthcoming Events .....	477
	New Products .....	487
	Letters from <i>B. Commoner</i> , <i>M. W. Friedlander</i> , <i>E. Reiss</i> ; <i>P. H. Klopfer</i> ; <i>W. J. Turner</i> ; <i>B. Fullman</i> ; <i>R. L. DeHaan</i> and <i>M. Schneider</i> ; <i>R. Boyko</i> ; <i>H. C. Sipe</i> ; <i>H. Sacks</i> and <i>D. Zipser</i> .....	495
<b>Cover</b>	NGC 5128 shows one of the most peculiar objects in the sky. Walter Baade and Rudolph Minkowski believe it is two galaxies in collision. From <i>The Hubble Atlas of Galaxies</i> , reviewed on page 464. [Carnegie Institution of Washington]	





## NEW MAGNETIC DATA RECORDER

**E**SPECIALLY designed for medical researchers, teachers and clinicians. Economical data storage . . . designed to instrumentation standards . . . precise repeatability for data processing . . . wide band width . . . time scale expansion or compression . . . economy and reuseability of tape . . . these are some of the advantages of adding this magnetic data recorder to your recording facilities. The Sanborn-Ampex Series 2000 Magnetic Data Recorder serves as an ideal companion to other Sanborn instruments for biophysical research. Any phenomena routinely recorded on a direct-writing or photographic recorder may be recorded on magnetic tape, using the same preamplifiers. Data thus stored can later be graphically recorded for detailed study or

teaching purposes, displayed on a meter or 'scope, or fed into a computer for processing and statistical analysis.

Operation of the instrument is simple and straightforward. All channels may be quickly aligned without need for auxiliary equipment.

For complete information call the nearest Sanborn Branch Office or Service Agency — or write Manager, Research Instrument Sales.

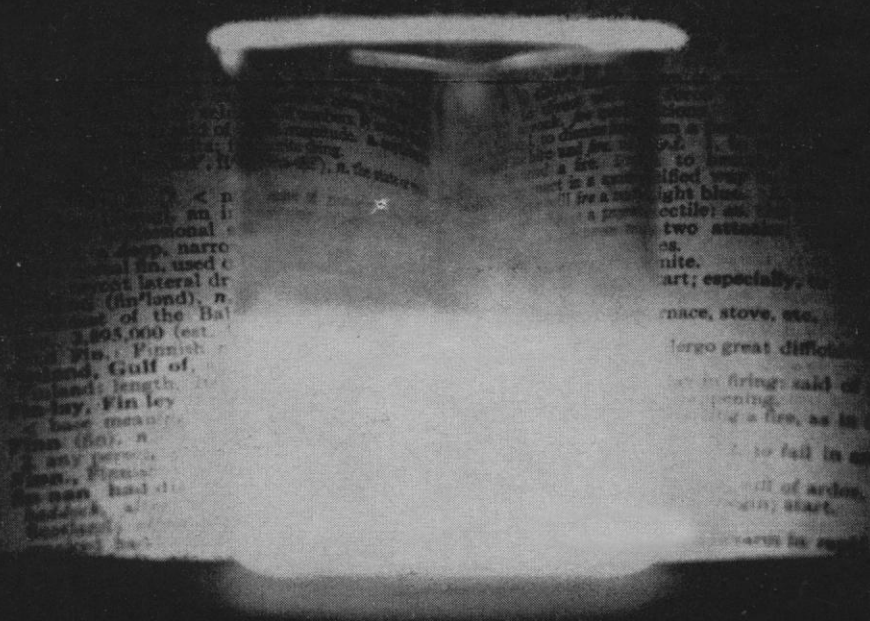
*SANBORN-AMPEX SERIES 2000 MAGNETIC DATA RECORDER in mobile cabinet provides up to 7 recording channels, 4 tape speeds, power supply and Sanborn plug-in electronic circuits for either FM (DC to 5000 cps) or direct recording (50-50,000 cps). The system uses 1/4-inch tape on 10 1/2-inch reels for up to 3.2 hours of continuous recording.*

# SANBORN COMPANY

MEDICAL DIVISION, WALTHAM 54, MASS.



FOR ATP MICROASSAY—DEHYDRATED FIREFLY TAILS—The most sensitive method\* for assaying the minute levels of ATP found in biological systems. Use Schwarz' ATN, crystalline disodium adenosine 5'-triphosphate, to standardize your assay 🦋 SCHWARZ BIORESEARCH is the primary manufacturer of phosphorylated adenosine compounds including isotopically labeled forms 🦋 FIREFLY KIT TO DEMONSTRATE BIOLUMINESCENCE—Provides enough dehydrated firefly tails and ATP for 10 dramatic—and convenient—demonstrations.



The light for the photo was provided solely by firefly tails.

\*For your copy of the latest revised procedure for assay of ATP and for further information on these and other nucleic acid derivatives write to Dept. HB:



**SCHWARZ BIORESEARCH, INC.** Mount Vernon, New York • BIOCHEMICALS. RADIOCHEMICALS. PHARMACEUTICALS. for research, for medicine, for industry.



## LABORATORY INTERFEROMETER

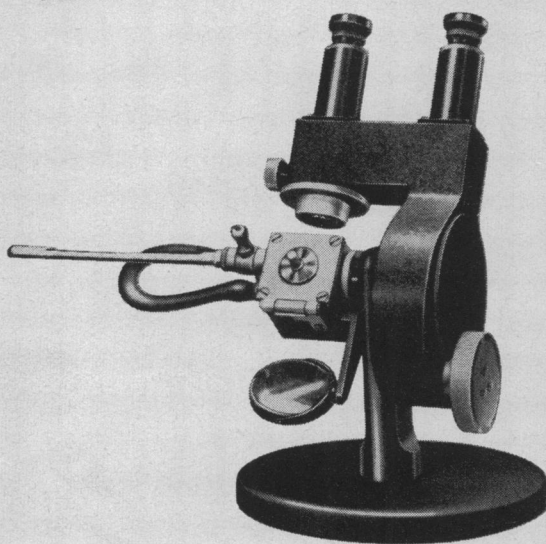
For concentration measurements of solutions and gaseous mixtures. Numerically determines refraction value differences against comparison standards. This extremely easy-to-use instrument develops a higher order of accuracy than any other of its type.

- Liquid examination applications... water examination institutes; oceanographic studies; food product testing; medical, pharmacological, and physiological institutes; plastic and textile industry
- Gaseous examination applications... gas industry; mining; rubber and linoleum factories; incandescent lamp manufacture; hospitals and tuberculosis clinics; physical, physico-chemical and chemical institutes

### TECHNICAL DATA

**Range of measurement —**  
5 to 5000 units of the fifth decimal of the refractive difference  $\Delta n$ , subdivided according to the length of chamber

**Limit of error —**  
 $\pm 2$  units of the eighth decimal to 2 units of the fifth decimal of the refractive difference  $\Delta n$ , likewise in accordance with the length of the chamber



### ABBE REFRACTOMETER

This newly designed instrument measures the refractive index of liquids, fats and oils as well as plastic and solid materials.

- Interchangeable prism casing with insulated lock
- Easier reading and increased measurement accuracy
- Safe, dust-proof scale housing
- Pinion head conveniently positioned for easy manipulation of border line setting
- Adjoining scales for refractive index and dry substance
- Measurements with higher or lower temperatures

### TECHNICAL DATA

**Range of measurement —**  
Refractive index  $n_D = 1.3$  to  $n_D = 1.7$   
Dry substance 0 to 85%

**Limit of error —**  
Refractive index  $\pm 1$  to 2 units of the fourth decimal  
Dry substance  $\pm 0.1$  to 0.2%

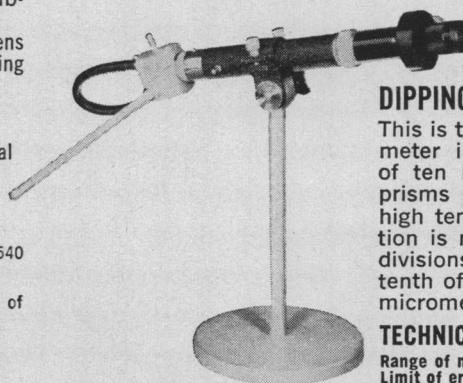
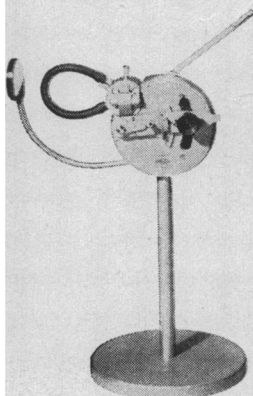
### FOOD PRODUCTS (SUGAR AND OIL) REFRACTOMETER

This precision production control and laboratory instrument is designed for rapid tests in series to determine dry substance or water content.

- Surface of double prism opens horizontally to facilitate filling with sample
- Easy to manipulate
- Fast, accurate measurements
- Economical use of test material

### TECHNICAL DATA

**Range of measurement —**  
Dry substance 0 to 95%  
Refractive index  $n_D = 1.300$  to 1.540  
**Limit of error —**  
Dry substance  $\pm 0.1$  to 0.2%  
Refractive index  $\pm 1$  to 2 units of the fourth decimal



### DIPPING REFRACTOMETER

This is the most accurate of all refractometer instruments. A complete range of ten heatable and ten non-heatable prisms permits rapid analysis, even at high temperatures. Boundary line position is read from scale containing 110 divisions. Readings can be made to one-tenth of a scale division by means of a micrometer screw.

### TECHNICAL DATA

**Range of measurement —** 1.3254 to 1.6470  
**Limit of error —**  $\pm 2$  units of the fifth decimal of the refractive index

CARL ZEISS  
JENA

companion  
of  
scientific  
progress  
for  
six  
generations

Complete information may be obtained from your local Carl Zeiss Jena instrument dealer or by writing: Dept. S8/61

**ERCONA**

Ercona Corporation, Scientific Instrument Division, 16 West 46th Street, New York 36, N.Y.  
In Canada: Jena Scientific Instruments Ltd., 1437 MacKay Street, Montreal, Quebec



# Adams Cyclo-Mixers

T.M. PAT. PEND.

make mixing or agitation in tubes or small flasks quick, complete, and easy...do away with time-consuming and fatiguing hand mixing...eliminate possible contamination from finger-capping or stirring rods. You can mix liquids of different densities...prepare liquid emulsions...dissolve solids of low solubility efficiently and conveniently with an Adams Cyclo-Mixer.

**Single-Unit Cyclo-Mixer with Foot Switch:** When used with the unique Clay-Adams Foot Switch, both hands are left free for holding tubes or flasks. The compact, easily portable Single-Unit Cyclo-Mixer mixes solutions, dissolves most solids in **only seconds**. It accommodates containers of various shapes and sizes—from 0.25 microchemistry tubes to 40-mm. diameter tubes and flasks.

**For procedures requiring prolonged, controlled mixing in test tubes:** Two-Unit or Four-Unit Cyclo-Mixers provide any desired degree of agitation—from gentle mixing to violent churning. They operate at 3 speeds with separate motor and speed control for each tube. Equipped with interchangeable cups, they can accommodate round-bottom tubes from 15 mm. to 25 mm. in diameter and up to 200 mm. in length. Tube clips and support bars eliminate the need for constant monitoring. *Available from your dealer.*

*Clay-Adams*  
New York 10, N. Y.



Cyclo-Mixer, Single Unit, with foot switch  
.....each \$68.50

Cyclo-Mixer, Single Unit, without foot  
switch .....each \$59.50



Cyclo-Mixer, Two Unit .....each \$154.00



Cyclo-Mixer, Four Unit .....each \$248.00

Quick  
as a  
wink\*

\*Mixing time required  
for one typical laboratory  
procedure reduced from  
20 minutes to 11 seconds!



labware  
comes  
clean

**QUICK**

with



**AQUET**

Remarkably effective liquid detergent that cuts through grease like a knife, yet is absolutely safe and gentle even to tender hands and skin! **CONVENIENT:** Always ready to use. Never cakes up like powdered soaps or detergents. Comes in handy reusable squeeze-bottle dispenser that's leakproof;

liquid can't be forced out of bottle by changes in temperature or atmospheric pressure.

**DEPENDABLE:** Won't break down in the presence of acids or bases. **FAST:** Eliminates time-consuming, energy-consuming scrubbing and scraping.

Does away with wiping because Aqueet leaves only a tissue-thin residue of water; glassware dries by itself in 2 minutes with no trace of film.

**G700—AQUET**—One pint in polyethylene dispenser bottle, each \$2.05, per doz. \$22.15

with

**CHROMERGE®**



Instantly outmodes customary cumbersome methods of cleaning labware. Easy as A-B-C!

(A) Add 25 ml. bottle of Chromerge to standard 9 lb. container of concentrated sulphuric acid.

(B) Cover container, shake well for about 30 seconds.

(C) Super-efficient chromic-sulphuric acid solution is mixed and ready to use.

**SAFE:** No danger as with old-fashioned methods requiring the long, tedious job of boiling sulphuric acid with potassium dichromate.

**MORE EFFECTIVE:** More powerful solution. Removes stubborn deposits that resist other cleaners; yet Chromerge protects glass surfaces, is chemically and bacteriologically clean.

Preserves the capacity of volumetric wear, gives a perfect meniscus for precise volumetric work.

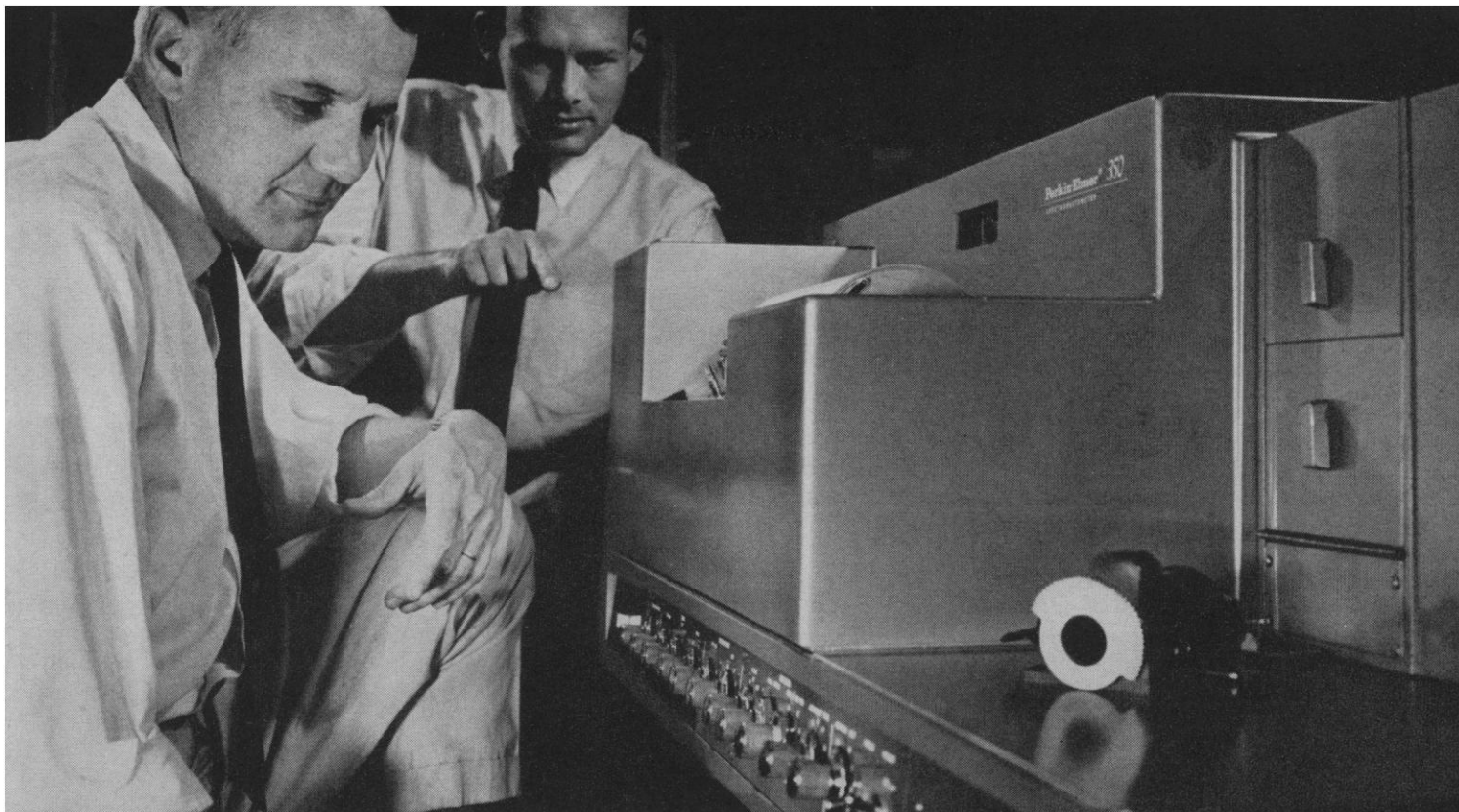
**T701—CHROMERGE**—package of six one-ounce vials, \$5.95 Case of 4 packages, \$21.00

*FOR BEST RESULTS, preclean labware with AQUET, then treat with CHROMERGE*

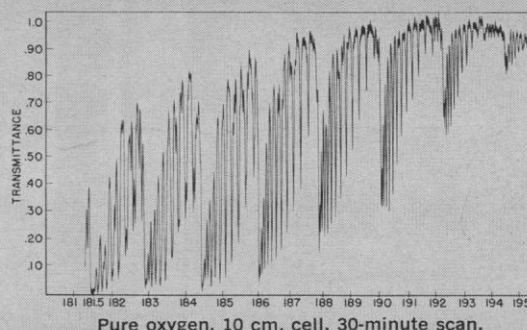
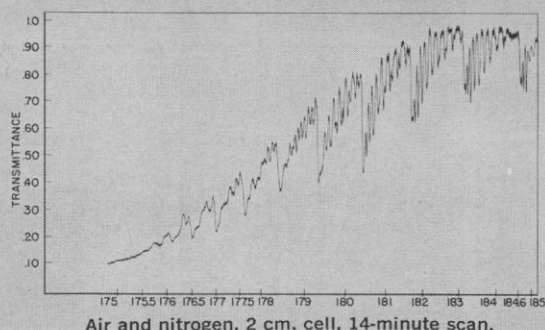
*The* **EMIL GREINER Co.**

20-26 N. Moore Street, Dept. 427, New York 13, N. Y.





Far Ultraviolet Spectrum of Oxygen.



## FAR ULTRAVIOLET SPECTRAL REGION OPENED BY NEW PERKIN-ELMER MODEL 350 SPECTROPHOTOMETER

With Perkin-Elmer's new Model 350 UV-VIS-NIR Spectrophotometer, you can detect and measure less sample—over a wider wavelength range—with greater precision—than with any other ultraviolet instrument. The Model 350 provides this capability routinely from 175m $\mu$  in the far ultraviolet to 2.7 $\mu$  in the near infrared. You get analytical versatility over the widest wavelength range and through the widest range of optical densities. Compare these advantages offered by the Model 350.

- **Widest wavelength range in one instrument.** The Model 350's optimized wavelength capability ranges from 175m $\mu$  in the far ultraviolet to 2.7 $\mu$  in the near-infrared.

- **Maximum photometric efficiency throughout range.** High absorbances can be measured with accuracy throughout the range of the Model 350. Specially-coated, Perkin-Elmer reflecting optics, combined with high-efficient sources, assure maximum transmission of maximum energy. The double-monochromator dispersion system reduces interfering stray light to a negligible level.

- **Unexcelled resolution.** The standard Model 350 provides uniformly high resolution throughout its range; in the far

ultraviolet—a region of increasing significance—the Model 350's superior energy and dispersion characteristics mean the best resolution possible in the field today.

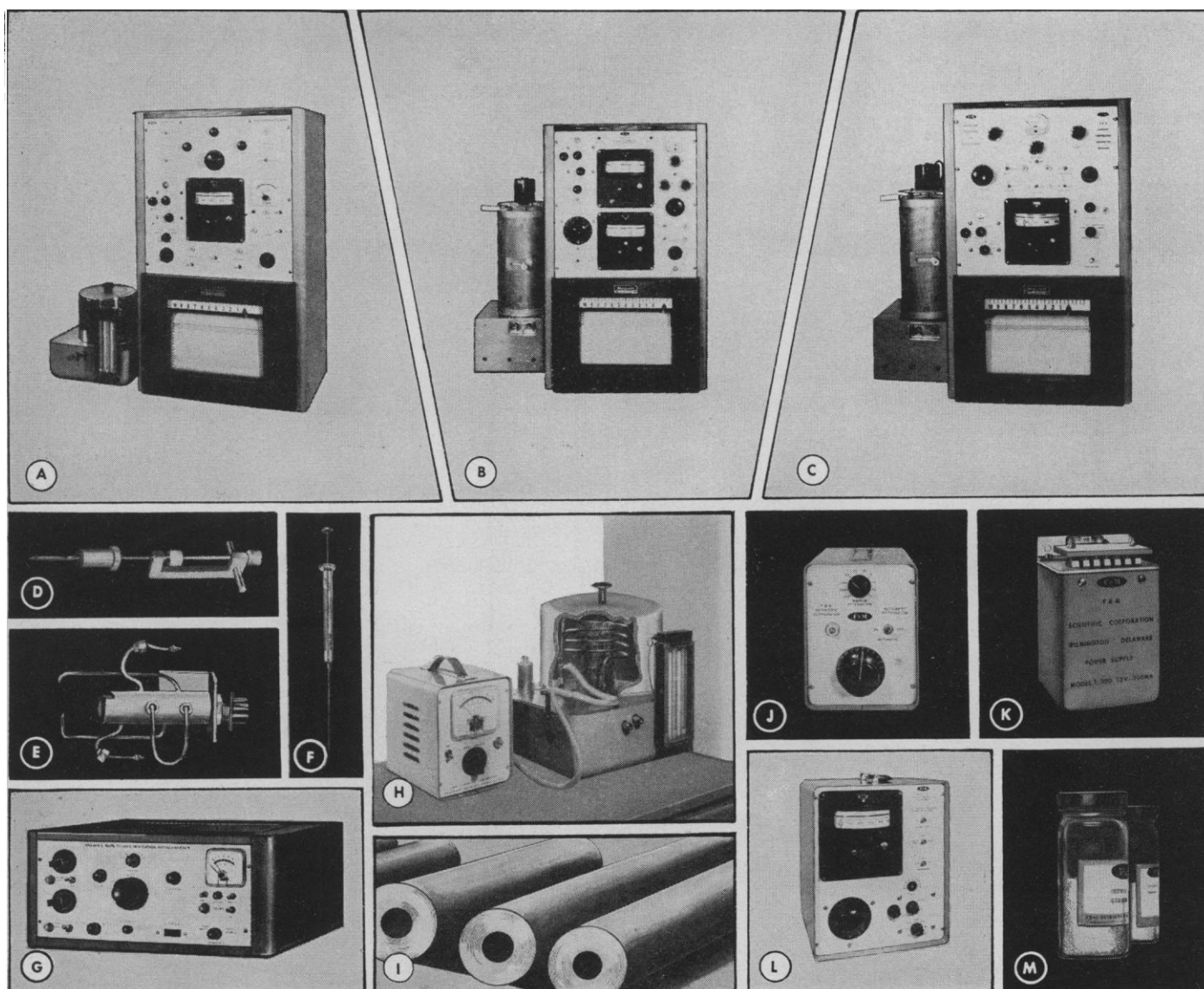
- **Ordinate scale expansion.** Adding range and versatility to the Model 350's excellent absorbance accuracy is the new, integral Ordinate Scale Expansion feature. Any 2, 5, 10 or 20% portion of the transmittance scale—even when the reading is near the zero or 100% line—can be electronically expanded by discrete factors of 50X, 20X, 10X or 5X, facilitating the determination of weak bands.

And more:

- Zero Absorbance Line Compensation
- Fast Pen Response
- Wide Dynamic Scan Speed Range
- High Sensitivity
- Integrated Controls
- Large Sample Compartments
- Wide Range of Accessories

Write for more information and spectra on the Model 350.

INSTRUMENT DIVISION  
**Perkin-Elmer** Corporation  
 NORWALK, CONNECTICUT



## *which chromatograph suits your needs?*

Now F & M offers all these gas chromatographs and accessories. Choose the ones that meet your requirements: **A** Model 609 Gas Chromatograph with flame ionization detector. Ultra-sensitive (parts per billion) instrument. Gives no signal for water nor permanent gases. Operates isothermally or with programmed temperature to 300°C. **B** Model 500 High Temperature Gas Chromatograph. Operates isothermally or with programmed temperature to 500°C. Ideal for analyses of wide-boiling mixtures. **C** Model 300 Gas Chromatograph. Offers same features as Model 500, but operates to 300°C. **D** Model SI-4 Solid Sample Injector for introducing solid samples into gas

chromatographs. **E** Model GV - 10 Gas Sampling Valve for introducing gaseous samples into gas chromatographs. **F** Syringes for introduction of liquid samples into gas chromatographs. **G** Model 1609 Flame Ionization Detector Attachment for Models 500 and 300 gas chromatographs. **H** Model 609FD Fraction Delivery System for Model 609 gas chromatograph. Sends part of gaseous sample to detector, the rest to a collection vessel. **I** Chart paper for use with recorders. **J** Model 50 Automatic Attenuator. Holds peaks "on scale" during a run. **K** Model T-300 DC Power Supply with 300 ma. output. **L** Model 40 Linear Temperature Programmer. Increases temperature

of heating equipment linearly, or holds it constant. **M** Column packings. A wide range of materials for various types of separations.

See F & M instruments on display at the *National Chemical Exposition*, Chicago, September 5-8 (Booth 403) and the *ISA Exhibit*, Los Angeles, September 11-15 (Booth 115).

*\* Call or write today for further information about F & M gas chromatographs and accessories.*

**F&M**

F & M SCIENTIFIC CORPORATION  
Starr Road and Route 41 • P. O. Box 245  
Avondale, Pennsylvania • COlony 8-2281



PRECISION  
CONTROLLED

## FREEZE DRYING EQUIPMENT

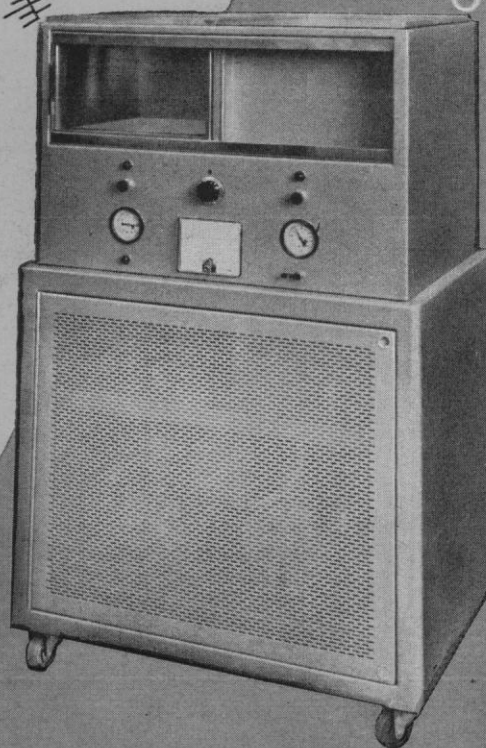
*By*  
**Amsco** *Del-Vac*

The increasingly vital role of freeze drying in the preservation and concentration of critical substances demands better engineered, more versatile apparatus. Now Amsco Del-Vac Freeze Dry Apparatus fulfills this need within laboratories, pilot plants and production facilities.

Significantly finer performance and versatility of Amsco Del-Vac Freeze Drying equipment permit the direct transfer of process data from laboratory or pilot models to large scale production models . . . without intermediate stages of pilot operation.

Whatever your freeze dry needs . . . whether you require heated, refrigerated process shelves; hydraulic stoppering shelves; a powerful, built-in 5 to 10 micron vacuum pump; or fully automatic controls . . . Amsco Del-Vac has an appropriate model.

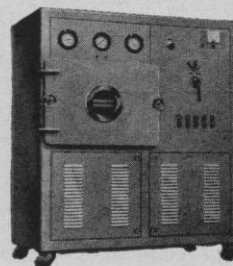
*Write for fully illustrated brochure IC-606.*



**AMERICAN  
STERILIZER**  
ERIE • PENNSYLVANIA

*Scientific and Industrial Department*

*World's largest designer and manufacturer  
of Sterilizers, Operating Tables, Lights  
and related biological equipment*



Most advanced pilot and light production freeze dryer available . . . Amsco Del-Vac Model 22424RHVM, with heated and refrigerated process shelves, hydraulic stoppering shelves, 5 to 10 micron vacuum pump . . . The ultimate in freeze dry efficiency.

# HOW'S YOUR HALF-LIFE?



A budget-priced nuclear experiment and demonstration teaching aid is pictured above. This complete set is ideal for high school and college laboratories, lecture halls and classrooms. One of its radioactive sources (Radium D+E) has a half-life of about 22 years, but what about the half-life of the ratemeter in the hands of enthusiastic high school students and college freshmen?

Lionel/Anton has designed a sturdy, "student-proof", frill-free ratemeter and accessories that can stand the punishment of years of school service. The "Atomic Curriculum Aide" is so versatile it can be applied to almost any atomic physics, chemistry or biology experiment requiring nuclear radiation measurement. You'll find that the "half-life" of your experimental and teaching equipment will increase manyfold with the Lionel 457.

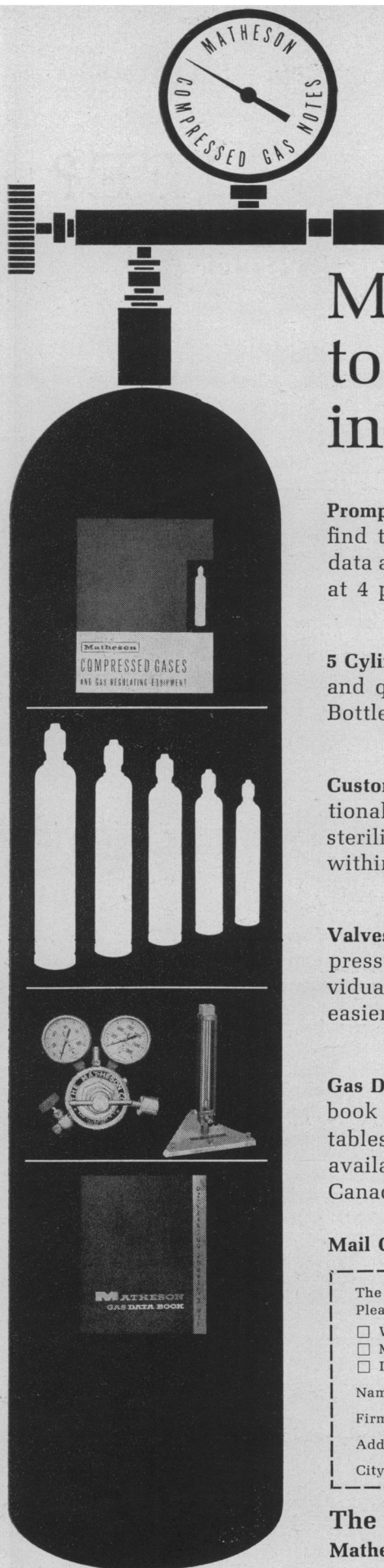
The price for the complete set is only \$194.50 f.o.b. our plant. Delivery can be made in 3 to 4 weeks. You may order, now, or send for our complete catalog. Write Dept. 457 (S)



## LIONEL ELECTRONIC LABORATORIES

(Formerly Anton Electronic Laboratories) 1226 Flushing Ave., Brooklyn 37, N. Y.





## Matheson makes it easy to use compressed gases in the lab or pilot plant

**Prompt Shipment on 82 Compressed Gases** from Acetylene to Xenon, you'll find them all in Matheson's Compressed Gas Catalog, together with prices, data and recommended controls. We stock them all, and maintain inventories at 4 plants in U.S. and Canada for prompt service.

**5 Cylinder Sizes:** Order compressed gas in the most convenient cylinder size and quantity. We're ready to handle orders ranging from a 5 ounce Lecture Bottle to a carload of No. 1 cylinders.

**Custom Mixtures:** Matheson specializes in custom gas mixtures — for proportional and Geiger counter units, instrument filling, special atmospheres, sterilizing, etc. We will prepare any gas mixture to your specifications, usually within plus or minus 1% absolute. Exact analysis available.

**Valves, Accessories:** The Matheson Catalog lists a complete line of valves, pressure regulators, flowmeters and other accessories tailored to fit individual gas requirements. Matheson engineered equipment makes gas handling easier, safer and more precise.

**Gas Data Book:** The Matheson Gas Data Book is the most comprehensive fact book and use manual on compressed gases ever published. Its 444 pages, 68 tables and 68 charts contain essential information on every compressed gas available for laboratory use. Order direct, at \$8.00 postpaid in U.S. and Canada.

### Mail Coupon for Catalog, Bulletins

The Matheson Company, Inc., P. O. Box 85B, East Rutherford, N.J.

Please send the following:

- ☐ Wall Chart: Safe Handling of Compressed Gases
- ☐ Matheson Gas Catalog
- ☐ Information on Matheson Gas Data Book, 3rd Edition

Name

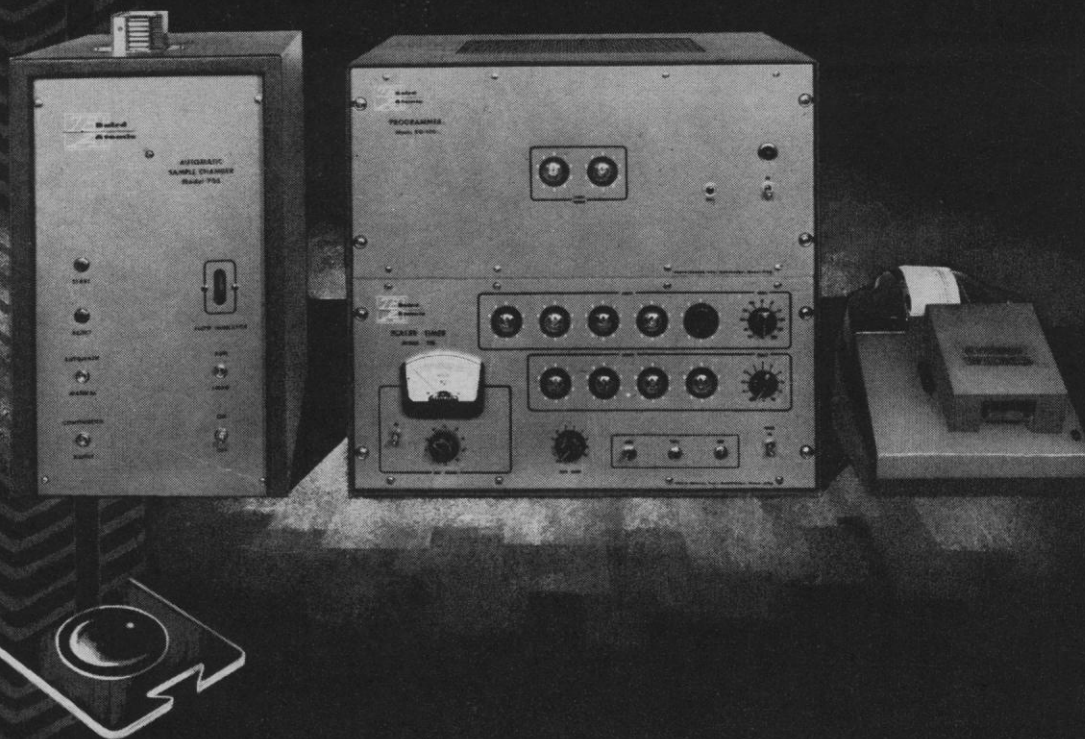
Firm

Address

City  State

**The Matheson Company, Inc.,** East Rutherford, N.J., Joliet, Ill., Newark, Calif.  
**Matheson of Canada, Ltd.** Whitby, Ont.

## Baird-Atomic introduces a new AUTOMATIC SAMPLE CHANGING SYSTEM



This simplified system incorporates the latest techniques and instrumentation for automatic detection, timing, counting and data presentation. It accommodates up to 35 samples, processes and records results including sample number, time, count and, on request, count rate. The overriding time and count functions are performed by the new B/A Model 135 Scaler-Timer.

Heart of the new B/A System is the Model 755 sample changer that assures positive, jam-proof operation because of its simple casted construction. It is specifically designed for geiger or proportional counting but its flexible detector mount-

ing permits the use of scintillation probes for gamma counting.

For complete details, call or write your nearest B/A representative today.

Sales and service offices in: Cambridge, New York, Philadelphia, San Francisco, Cleveland, Washington, D.C., Atlanta, Dallas, Chicago, Los Angeles, Pittsburgh, Detroit, Ottawa, Canada.

Engineers and scientists: *Investigate the challenging opportunities with B/A. Write Industrial Relations Director. All qualified applicants will receive consideration for employment without regard to race, creed, color or national origin.*



**BAIRD-ATOMIC, INC.**

*33 University Road · Cambridge 38, Mass.*

ADVANCED OPTICS AND ELECTRONICS . . . SERVING SCIENCE





# RECORDING TITRATOR

*For Potentiometrically Indicated Reactions*

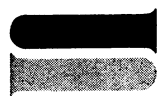
- DUAL MOTOR DRIVEN TITRATING ASSEMBLIES
- MULTIPLE DIRECT READING pH RANGES
- MULTIPLE DIRECT READING MILLIVOLT RANGES
- AUTOMATIC RATE CONTROL
- LOW COST

A basic, universal recording titrator for any and all potentiometrically indicated reactions, using any form of electrode, either glass or metal, accommodating high or low resistance systems, aqueous or non-aqueous media, and all practical orders of constituent quantities whether in trace, micro or macro concentrations.

This titrator is at once a fast balancing, high precision, multi-range recording pH meter and millivolt meter and an efficient all-purpose titrating station with two independent working positions, each having full motorized titrant delivery systems with high speed filling and flushing, automatic safety switches and interchangeable small and large volume burette components. Consolidating these facilities to create an unprecedented work capacity are the synchronized burette and chart drive with direct volume reading on the chart axis and the new Sargent wide ratio automatic rate control.

*For Complete Information Write For Bulletin D*

Designed and Manufactured by **E. H. SARGENT & CO.**



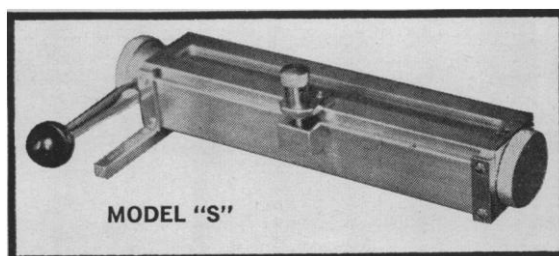
## SARGENT

SCIENTIFIC LABORATORY INSTRUMENTS • APPARATUS • SUPPLIES • CHEMICALS

**E. H. SARGENT & CO., 4647 W. FOSTER, CHICAGO 30, ILLINOIS**  
**DETROIT 4, MICH. • DALLAS 35, TEXAS • BIRMINGHAM 4, ALA. • SPRINGFIELD, N.J.**

introducing exclusive  
**NEW APPLICATOR** for  
**THIN LAYER CHROMATOGRAPHY**

**THE ONLY CONTROLLED METHOD  
FOR APPLYING REPRODUCIBLE  
LAYERS OF VARIABLE THICKNESS**



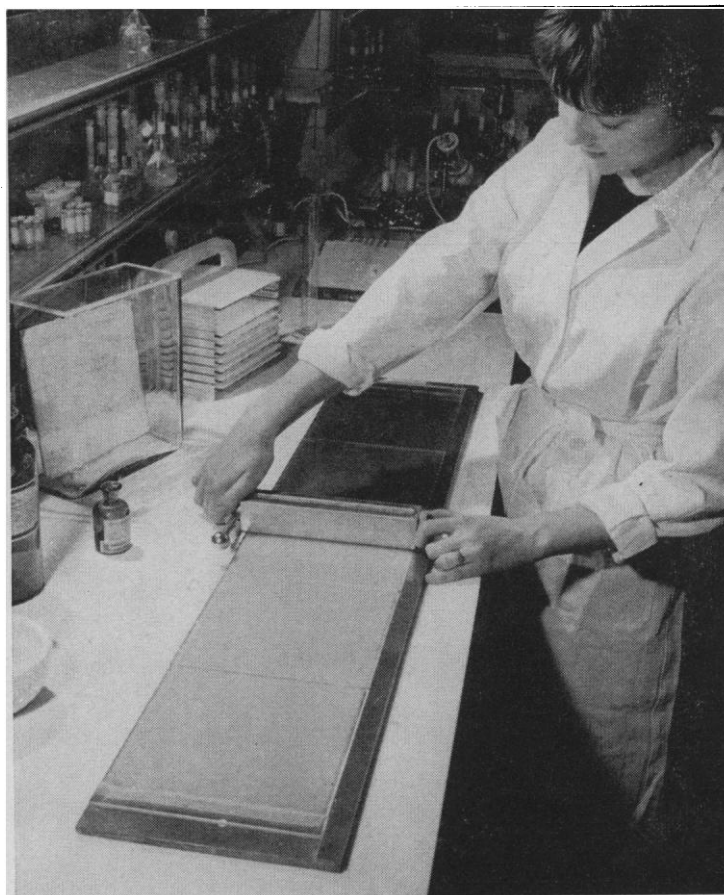
In addition to the previously offered standard applicator for TLC, already used by hundreds of laboratories in the U. S. and Canada, Desaga has now developed a variable thickness instrument — MODEL "S." By means of a micrometer screw setting any layer thickness to 2000  $\mu$  may be applied — the only applicator available which permits the selection and reproduction of a specific layer thickness. This feature not only increases the versatility of the equipment but permits its use with ordinary (high quality) window glass.

Only the new Desaga equipment (after Stahl) offers a complete line of apparatus and adsorbents for TLC. Besides the previously available Silica Gel G, Aluminum Oxide G and Kieselguhr G from Merck (Darmstadt, Germany) we are now introducing two new Cellulose Powders from Macherey, Nagel & Co.—with and without binding agents.

The major advantages of TLC are:

- 1) The speed of separation — 20 to 40 minutes.
- 2) The wide quantitative range — from less than one microgram to 10 mg on a single glass plate.
- 3) The possibility of using highly aggressive (corrosive) sprays.
- 4) The simplicity of the technique and the limited financial investment necessary for its introduction.

Equipment for TLC may be ordered as complete assemblies or as individual components. In experience, Desaga TLC puts you ten years ahead. For further information request our NEW TLC BULLETIN.



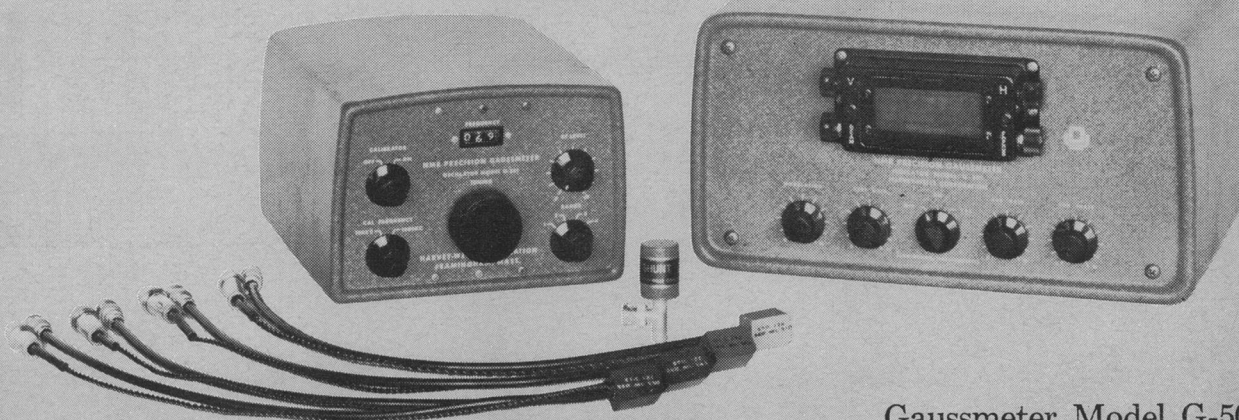
**BRINKMANN**

**BRINKMANN INSTRUMENTS, INC., 115 CUTTER MILL ROAD, GREAT NECK, N.Y.**

**PHILADELPHIA • CLEVELAND • HOUSTON • MIAMI • MENLO PARK, CAL. • ST. LOUIS**



# PRECISION NMR INSTRUMENTATION TO MEASURE AND CONTROL MAGNETIC FIELDS



Gaussmeter Model G-501



Field Control System  
Model FC-501

The Harvey-Wells Model G-501 NMR Gaussmeter is designed to measure homogeneous magnetic fields up to 30,000 gauss to an accuracy of one part in 100,000.

A broad range of measurement is achieved by the interchange of four 18 inch probes and one shunt (5 foot probes are also available), supplied as standard equipment with the unit.

The combination of simplified circuitry and ease of operation makes the G-501 Gaussmeter a most dependable and precise laboratory instrument. Both the G-501, and the FC-501 Field Control System (left) are adaptable to remote operation by use of extension cables combined with Harvey-Wells Standard Remote Drive Accessory.

The Harvey-Wells Model FC-501 NMR Field Control System is recommended for applications where the user not only requires precision measurement of homogeneous magnetic fields but high stabilization of those fields.

The unit has the same capabilities and accuracy parameters as the G-501 Gaussmeter.

All operating controls are conveniently located. The resonance presentation and the meterized error signal are clearly visible on the rack-mounting front panel.

Field control is achieved by means of an error signal, derived from the NMR pattern, which is fed to the power supply enabling it to automatically adjust its output current to the magnet, producing the desired constant magnetic field.

Send for complete specifications.

New literature on Harvey-Wells' precision electromagnets and power supplies is now available and may be obtained by using the attached coupon.



**HARVEY-WELLS CORPORATION**

Magnetics Division, 43 Kendall St., Framingham, Mass.

Dept. A-2

Please send complete information on the G-501 and FC-501 NMR Systems

☐ I am also interested in electromagnets and power supplies.

NAME

POSITION

COMPANY

ADDRESS

CITY



## NEW SCREW CAP VOLUMETRIC FLASK

### SEALS TIGHT! WON'T FREEZE! COSTS LESS!

The Bakelite\* screw cap on this new volumetric flask *holds* tight, can't pop off. Its conical polyethylene liner hugs the flask neck, seals it tight, won't leak a drop. Alkalies can't freeze it.

If you upset the flask, the cap takes much of the shock. In storage, the cap keeps dust and dirt off the flask lip.

*No. 5650 flask with cap closure costs from 40 cents to \$1.00 less*

*than similar types with glass stoppers.*

The 25 and 50 ml sizes fill quicker and easier because of their funnel necks which also serve as mixing chambers. Six other sizes too: 100 thru 2000 ml. All are Class A accuracy. All are made of PYREX® brand glass to shrug off chemical attack, mechanical shock.

There are 16 other PYREX brand volumetric flasks for your work . . . flasks with or without stoppers, in

different styles and capacities.

You will find the world's biggest, widest, broadest line of labware in our LG-2 catalog. Remember, too, the quantity discounts—up to 23.5%.

\*Union Carbide Trademark



**CORNING GLASS WORKS**  
7508 Crystal Street, Corning, New York  
CORNING MEANS RESEARCH IN GLASS

**PYREX® laboratory ware . . . the tested tool of modern research**



# he best \$250 you'll ever invest

## A New...Fully Guaranteed...Professional Quality...GAS CHROMATOGRAPH.

A speedy, reliable solution to routine gas and volatile liquid analysis problems . . . Quickly pays for itself in savings in time and material . . . Inexpensively makes gas chromatography available to everyone.

Ideal for quality control of any raw material or finished product with boiling point to 105°C. (and many up to 120°C.) . . . Safeguards the quality of the product you sell . . . the products you buy.

### A few applications for The Chronofrac\*:

- Combustion products
- Flue gases
- Chemical reaction converters, stream and towers such as:
- Ammonia oxidation process — nitric acid
- Acetone, and by-products such as methyl ethyl ketone
- Depropanizers
- Low molecular weight intermediates
- Alcohols thru C<sub>4</sub>
- Natural and liquid petroleum gases

Simply installed and operated . . . sets up in 30 minutes or less . . . easily operated by non-technical personnel with less than an hours instruction.

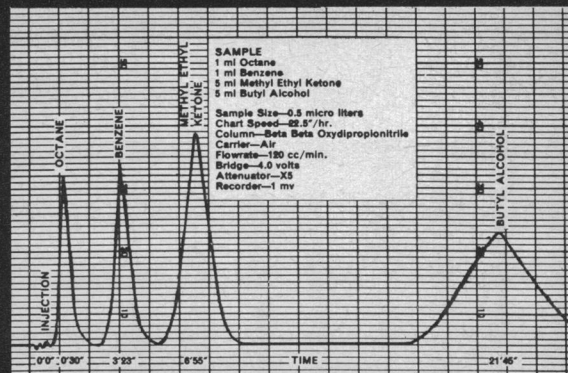
Closely examine the illustrated chromatograms of actual test separations... see how effectively the CHRONOFRAC performs routine analysis . . . how easily this \$250 instrument can take over your present work load . . . and free your expensive equipment for more complex analyses.

# CHRONOFRAC<sup>®</sup>

## MODEL VP-1

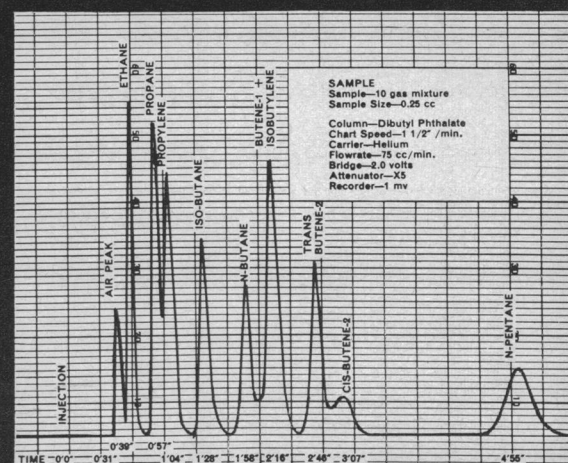


\*Chrono(logical) Frac(tionation)



"Chronofrac" VP-1 liquid separation of 4 major organic groups using catalytic combustion detection.

"Chronofrac" VP-1 separation of 10 gases utilizing thermal conductivity detection.



### BUILT-IN FEATURES:

#### BASELINE STABILITY

Low drift assures true peak areas

#### DUAL DETECTION

Catalytic combustion and thermal conductivity

#### WIDE ATTENUATION

1—125 four position selectivity

#### HIGH SENSITIVITY

5 PPM Hydrogen in any gas

The CHRONOFRAC is in stock now, at selected laboratory supply dealers. Write for 4-page illustrated bulletin and nearest stock location.

Since 1920

PRECISION  
SCIENTIFIC CO.



LOCAL OFFICES IN:  
CHICAGO • CLEVELAND,  
HOUSTON • NEW YORK  
PHILADELPHIA • SAN FRANCISCO

3735 WEST CORTLAND STREET • CHICAGO 47, ILLINOIS

# COLEMAN



## New filters isolate Mg, Li for rapid flame analysis

**Magnesium from 5 to 4,000 ppm; lithium from 0.0097 to 970 ppm**—measurements in these concentrations are quick and easy with two new spectral filters now available for use with the Coleman Flame Photometer.

Another accessory, the **Autoflow Sample Handling System, actually triples analytical speed**—by providing direct feed of sample to atomizer burner and automatic and instantaneous removal of unused sample.

With its analytical scope now encompassing five important metallic elements (Na, Ca, K, Mg, Li) . . . with its unequalled speed and convenience of analysis . . . the Coleman Flame Photometer is a time and money saver for **any** laboratory charged with a heavy analytical work load. Simple and dependable, it requires no water con-

nections, no special fuel gas, and no specially-trained operators.

The advantages of flame analysis over wet chemistry methods have long been established—improved precision in analysis of these elements in higher concentrations; accurate trace analysis in extremely low concentrations; major savings in time, effort, chemicals and laboratory space.

Find out about the special advantages of **Coleman** flame analysis.

Ask for these publications:

- SB-242A—Coleman Flame Photometer;
- SB-265—Autoflow Sample Handling System;
- ST-169—Flame Photometric Determination of Magnesium;
- ST-174—Flame Photometric Determination of Lithium.

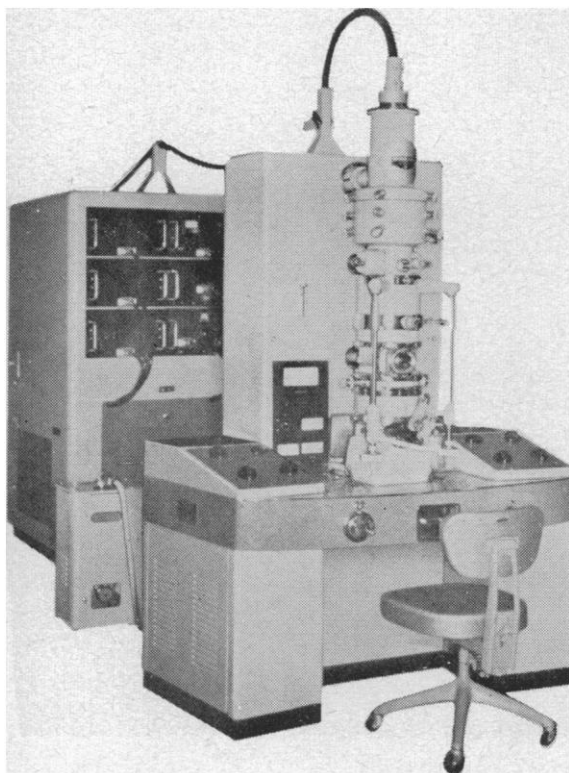
*Order and simplification are the first steps toward mastery of any science*

COLEMAN INSTRUMENTS, INC., MAYWOOD, ILLINOIS



# HITACHI Electron Microscopes

## featuring the new HU-11



Hitachi, Ltd. of Japan, in advance of world-wide competition, announces the successful production of the HU-11, the latest in electron microscopes.

The new HU-11 is an enlarged, high efficiency electron microscope, guaranteed 8-10 Angstrom Unit resolution, capable of probing the very basic structure of matter. This is possible in the HU-11 because it is equipped with a chromatic aberration compensating lens system, a development uniquely Hitachi.

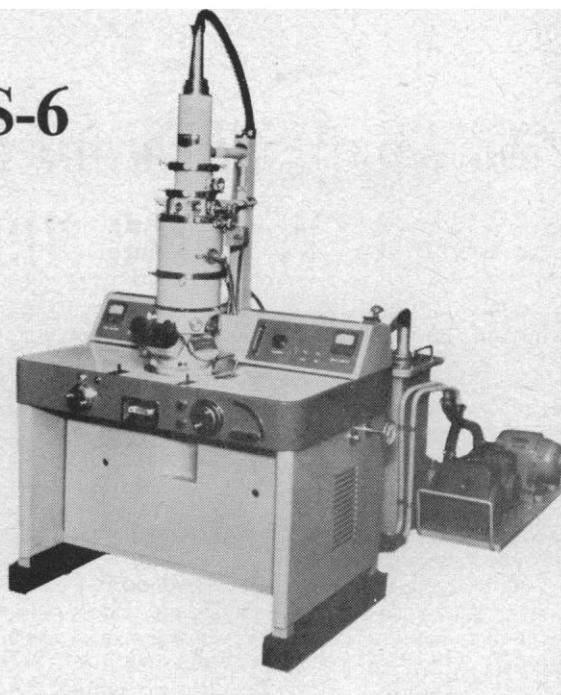
Other improvements include an enlarged specimen chamber facilitating handling of accessories, an exhaust system trap reducing contamination to a minimum (therefore eliminating the need to disassemble the column), increased exposure area of photography permitting recording of high resolution diffraction rays.

## ...and presenting the HS-6

Hitachi's outstanding HS-6, the permanent magnet electron microscope, is equipped with four lenses (condenser, objective, intermediary, projection) with a resolving power reaching 25 A.U. upwards and ensures an electron optical magnification continuously changeable from 2,000x to 20,000x.

The HS-6 is proving itself doubly invaluable photographically as an electron diffraction camera using an additional specimen stage and as the so-called "selected area" diffraction camera. (Camera chamber is loaded with 18 cassettes permitting 36 successive exposures.)

Simplicity of operation, mechanics and circuitry make the HS-6 the ideal instrument for researchers in the most sensitive medical and biological fields.



**Hitachi, Ltd.**

Tokyo Japan

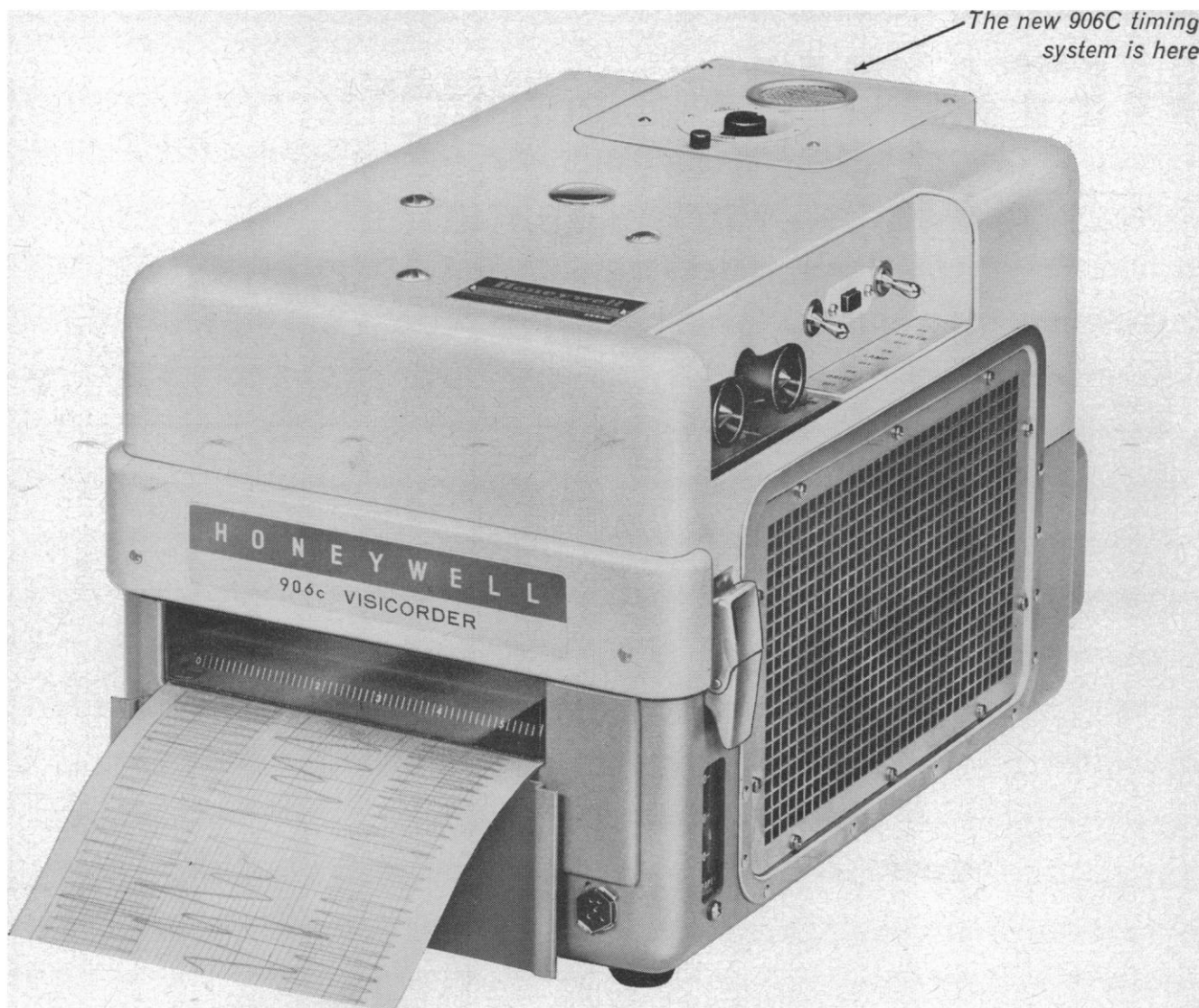
Cable Address: "HITACHY" TOKYO

*For more detailed information get in touch with*

**ERB & GRAY SCIENTIFIC, INC.**

854 S. Figueroa St.,  
Los Angeles 17, Calif.

5927 Riverdale Ave.,  
New York 71, N.Y.



## What's *different* about the NEW 906C VISICORDER OSCILLOGRAPH?

At first glance you may see no difference at all. Just the same functional lines and compact size that you have come to recognize in the Visicorder.

They have not changed since 1956, when the Visicorder principle of oscillography made immediate readout of high frequency data possible for the first time.

Until now, all the improvements that have maintained the Visicorder's record of leadership have been internal:

- increased capacity to 14 channels
- higher frequency response (0-5000 cps)
- simultaneously recorded grid lines
- self-starting lamp for remote operation

But the 906C has a new feature you *can* see, (look carefully at the back of the case) and one that represents still another breakthrough; a built-in flash tube timing system which not only generates its own time base, but which can also be triggered *externally*. You can, in other words, use the 906C's

timing system to record time lines simultaneously with data. Or you can trigger the timing circuit externally—either by supplying a pulsing voltage of only +10v into 20K ohms impedance, or simply by causing impedance to drop to 100 ohms or less through shorting-out or other means.

Thus your "time" signal may actually be an event marker related to shaft rotation, belt movement, or any other effect which might be more conveniently fed to the timing circuit than to a galvanometer.

(Owners of Visicorders 906, 906A, and 906B will be glad to know that only a *field-change* is necessary to economically and easily add this timing system to their instruments).

Write today for full information on the brand-new 906C Visicorder. Ask for Catalog HC-906C. Or call us at SKyline 6-3681, Direct Distance Dialing Code 303.

Minneapolis-Honeywell, Heiland Division  
5200 East Evans Avenue, Denver 22, Colorado

### HONEYWELL INTERNATIONAL

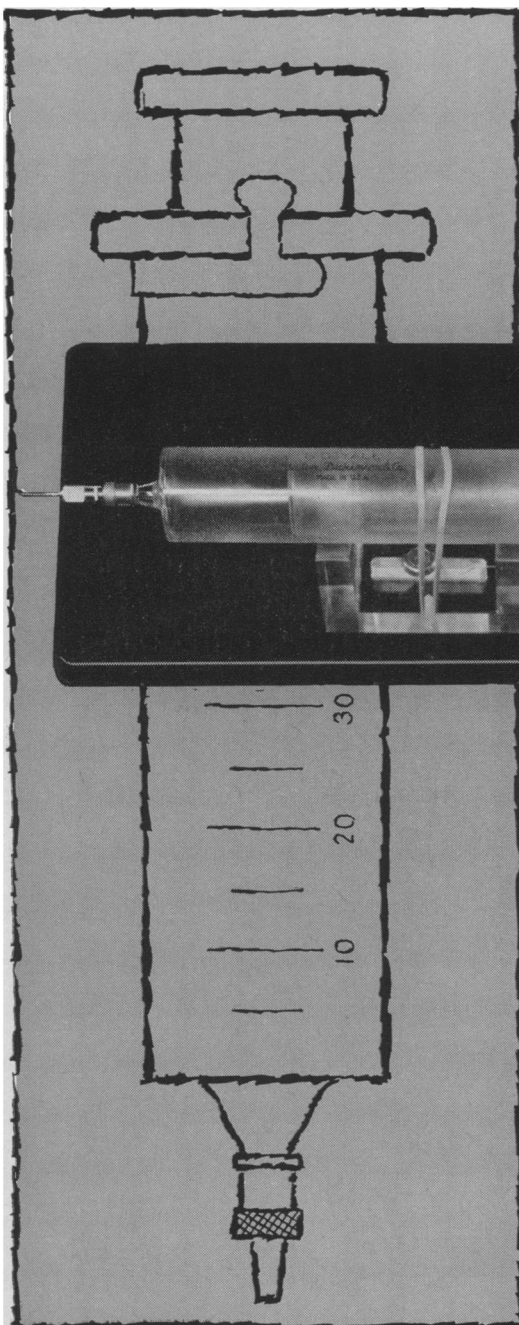
Sales and Service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

## Honeywell

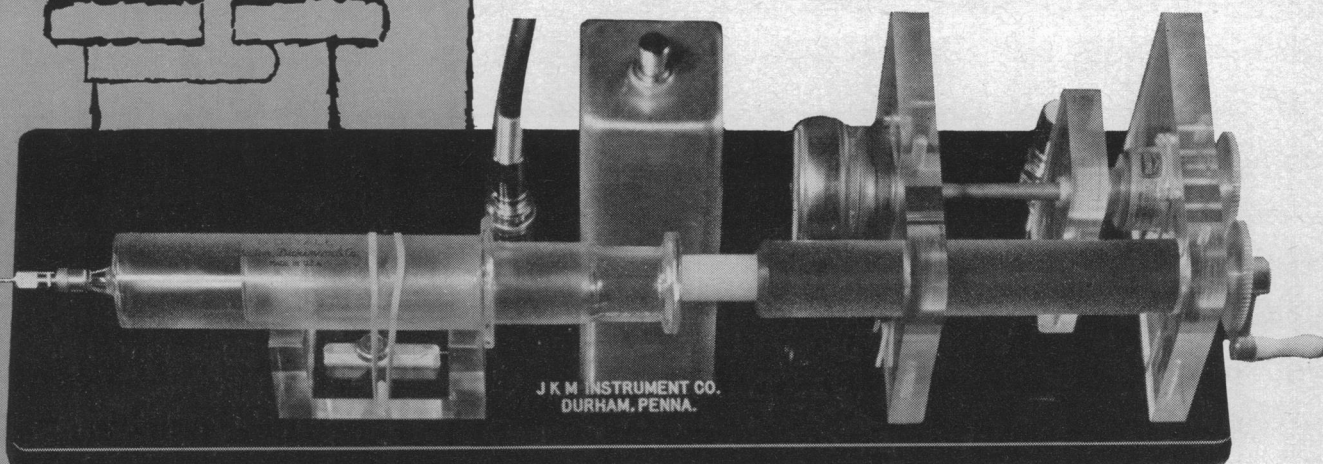


*First in Control*  
SINCE 1885





## PERFORMANCE... PLUS ECONOMY!



### THE JKM CONSTANT RATE SYRINGE DRIVE

Originally developed for injecting samples into the Stubbings Electrophoresis Apparatus\*, the syringe drive is now offered as a separate unit because of its wide area of application—wherever a long term, constant rate sample delivery is required.

The unit is characterized by extreme flexibility of operation. Drive rates may be changed by substituting different sets of gears. Liquid feed rates can be varied by changing the drive rate or syringe size. A length of flexible teflon tubing is supplied to connect the syringe to the reaction vessel.

PRICE ..... \$200.00

\* Patent Pending

### *Check these features:*

- |   |   |
|---|---|
| <input type="checkbox"/> High versatility             | <input type="checkbox"/> Delivers large quantities in short period of time    |
| <input type="checkbox"/> Low cost                     | <input type="checkbox"/> Delivers small quantities over a long period of time |
| <input type="checkbox"/> Accepts any standard syringe | <input type="checkbox"/> Variety of gear sets available                       |
| <input type="checkbox"/> Automatic shutoff            | <input type="checkbox"/> Saves both time and effort                           |
| <input type="checkbox"/> No cleaning problem          | <input type="checkbox"/> Provision for remote control                         |
|   | <input type="checkbox"/> One year warranty                                    |

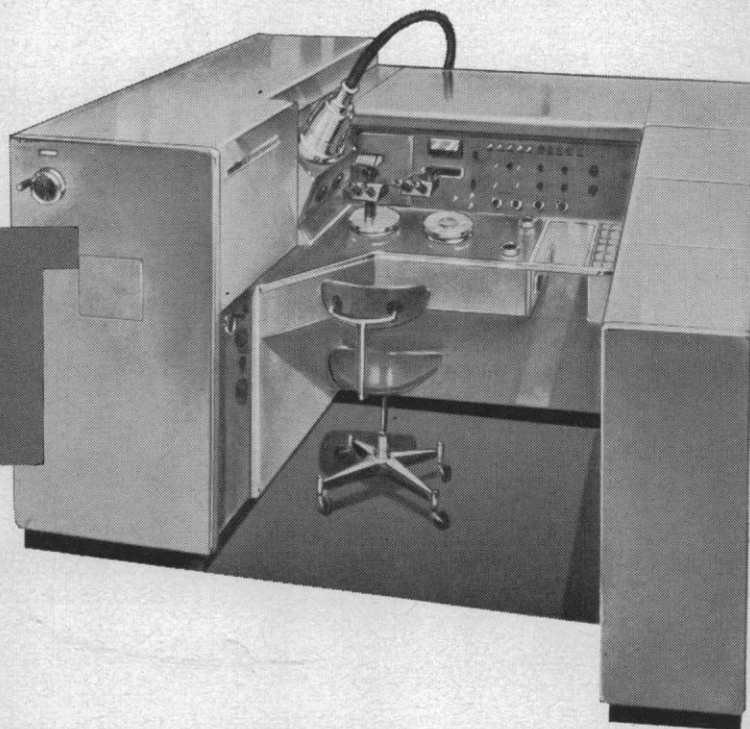
Distributed by the Fisher Scientific Company, Van Waters & Rogers, Inc.



**JKM INSTRUMENT COMPANY** INCORPORATED  
OLD PHILADELPHIA PIKE DURHAM, PENNSYLVANIA

NEWS  
OF  
INNER  
SPACE...

# PROBING THE POINT OF A NEEDLE



We propose to increase the knowledge of men... but only in terms of an observable area. More clearly perhaps is the fact that we propose to open many new vistas simply by confining man's observation to areas ranging from 0.1 to 100 microns — *even smaller than a needle's point* — and to also provide in that observation, both qualitative and quantitative chemical analyses of the elemental composition of these areas.

All of this then, is the function of the new Norelco Electron Probe Microanalyzer... a new instrument

providing the means by which infinitely small areas can be explored. Areas where there is obvious need for a better understanding as to why failings occur in the micro-composition of alloyed materials. Detailed discoveries in the "whys" and "hows" of grain boundaries, alloy diffusion, micro-etch corrosion, thin films, micro-geology, meteoritic composition, micro-inclusions and, in fact, the entire "inner space" of a new world is now on the threshold of real exploration. Here is a new dimension in the chemical analysis of minute areas.



*For more information and specifications on this remarkable Norelco instrument, write today on your letterhead to:*

## **PHILIPS ELECTRONIC INSTRUMENTS**

*A Division of Philips Electronics and Pharmaceutical Industries Corp.*

**750 South Fulton Avenue, Mount Vernon, N. Y.**

*In Canada: Research & Control Instruments • Philips Electronics Industries Ltd. • 116 Vanderhoof Avenue • Leaside, Toronto 17, Ont.*



# ... HARDLY A SCIENTIFIC INSTRUMENT

Good mixer, yes . . . but hardly the tool for the many blending, mixing and grinding requirements of today's scientific laboratory. To meet these requirements Waring designs and manufactures a specialized line of Blenders® and accessories. Let us send you complete details. Just fill in and mail the coupon.

## WARING COMMERCIAL BLENDERS ARE SERVING FIRMS AND LABS IN THESE FIELDS

**INKS**—Detergents to reduce pen clogging  
**CEMENT**—Waterproof cement testing and mildew repellent concrete  
**CERAMICS**—Kaolin and clay slurries  
**COATINGS**—Films, TV tubes, recording tape, adhesive compounds, duplicating machine emulsions  
**COSMETICS**—Shampoos, nail polish, deodorants, powder, hand cream, hair dyes, aerosol hair spray and shaving lather  
**ELECTRONICS**—Cathode ray tube coatings  
**FERTILIZERS**—Both liquid and dry, seed research, plants, cross-pollination, crab grass killer development  
**FOOD PROCESSING**—Relishes, herb and condiment blending, dressings, dog foods  
**GENERAL LABORATORY USE**—Experimental dispersions, emulsions, polymers, slurry and solutions  
**HOMOGENIZING TEMPLATE EMULSIONS**—Sheet aluminum, stainless steel  
**INSECTICIDES**—Repellents and killers  
**INSULATION**—Rock wool-fiber glass, asbestos, ground glass beads  
**PAINT**—Color sampling, water-base, rubber-base, waterproof, enamels  
**PAPER**—Waste paper evaluation, pulping wood fiber, coatings  
**PETROLEUM**—High octane fuel, additives, grease, detergent motor oils  
**PLASTICS**—Experimental mixes, color testing, powder and resin blending  
**PRINTING INK**—Color blending, waterproof inks, engraving fluids  
**RUBBER**—Latex, sponge, synthetic  
**TEXTILES**—Strength tests for synthetics, Nylon, Orlon, Dacron, wool and cotton  
**TOBACCO**—Chemical analyses, homogenized, experimental blends, mixtures  
**VINYL**—Upholstery bases color sampling



WARING PRODUCTS  
CORPORATION  
WINSTED • CONNECTICUT

A Subsidiary of  
Dynamics Corporation of America

### GENTLEMEN:

Send me complete information on your Blenders for laboratory and industrial use. My field of interest is .....

NAME .....

TITLE .....

COMPANY .....

CITY/ZONE ..... STATE .....

American made by American craftsmen to help the American economy

GET READY FOR THE SPACE and SCIENCE ERA! SEE SATELLITES, MOON ROCKETS CLOSE-UP



# AMAZING SCIENCE BUYS

for FUN, STUDY or PROFIT



American Made — Terrific Buy!



## STEREO MICROSCOPE

Years in development. Precision American made. Used for checking, inspecting, small assembly work. Up to 3" working distance. Clear, sharp, erect image. Wide, 3 dimensional field. 2 sets of objectives on rotating turret. 23X and 40X. 10 Days Free Trial.

Stock No. 85,056-W .....\$99.50  
f.o.b. Barrington, N.J.

Low Power Supplementary Lens Attachment for above Stereo—provides 15X down to 6X with clear, extra large 1 1/2" field at 6X.

Stock No. 30,276-W .....\$7.50



ASSEMBLED  
AND  
READY TO USE!

Photographers! This is an actual photograph of the moon taken through our Astronomical Telescope by a 17-year student.

See the Stars, Moon, Planets Close Up!

## 3" ASTRONOMICAL REFLECTING TELESCOPE

60 to 180 Power. An unusual Buy! Famous Mt. Palomar Type

You'll see the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail, Galaxies! Equatorial mount with lock on both axes. Aluminumized and over-coated 3" diameter high-speed f/10 mirror. Telescope comes equipped with a 60X eyepiece and a mounted Barlow Lens, giving you 60 to 180 power. An Optical Finder Telescope, always so essential, is also included. Sturdy, hardwood, portable tripod—FREE with Scope—Valuable STAR CHART plus 272 page "HANDBOOK OF HEAVENS" plus "HOW TO USE YOUR TELESCOPE" BOOK.

Stock No. 85,050-W .....\$29.95 Postpaid

4 1/4" Reflecting Telescope—up to 255 Power, all-metal pedestal mount. Stock No. 85,105-W .....\$79.50 F.O.B. Barrington, N.J.

## THERMOMETER TIE BAR AND CUFF LINKS REGISTER AS HOT CONVERSATION PIECE



Ruggedly precise new style item in matched set of cuff links and tie bar—featuring non-breakable, accurately calibrated thermometers. Sensitive to a tolerance of 1 degree (although some wearers have noted violent fluctuations when worn in close proximity to certain blondes and redheads of the warmer sex!).

Easy to read. Indicia range from 20 (degrees) to (plus) 120 (degrees) Fahrenheit on circular dial. Silver plated, gift boxed—Tie Bar and Cuff Links also available separately.

Stock No. 1700-W Tie Clasp .....\$3.25 Ppd. tax incl.

Stock No. 1701-W Cuff Links .....\$6.55 Ppd. tax incl.

Stock No. 1702-W Set of Clasp & Links, .....\$8.75 Ppd. tax incl.

## WHIRLING WONDERS

### Wonderful World of Whirling Wheels



Here's a new adventure in optical impressions—created by the magical effect of these fascinating, rotating discs. In addition to weird shapes and fantastic "after images" this kit demonstrates "stop motion" stroboscopic principles—"off center" focus and even hypnosis. Kit includes 13 discs, approx. 5" in dia., battery holder, rheostat, small motor mounted on bracket, bulb, socket, plug and complete booklet of instructions and experimental use.

Stock No. 70,414-W .....\$9.95 Postpaid

## NEW BINOCULAR-TO-CAMERA HOLDER

Will Fit Any Camera



For Exciting Telephoto Pictures. Bring distant objects 7 times nearer with a 35mm camera. 7x50 binocular and our NEW BINOCULAR-TO-CAMERA HOLDER. Ideal for long-range shots of wild life, ships, people, vistas. Camera and binoculars attach easily. Use any binocular or monocular—any camera, still

or movie. Take color or black and white. Attractive gray crinkle and bright chrome finish. 10" long. Full directions for taking telephotos included.

Stock No. 70,223-W .....\$11.50 Postpaid

## NEW LOW PRICE FLASHLIGHT POINTER

... Point It Out With Arrow Projected

Ideal for pointing out interesting features on movie and slide projection screens. Excellent lecture tool. For teacher use on maps, etc. Flashlight focuses an arrow where you point it.



Stock No. 60,117-W .....\$5.95 Postpaid

## MIRACLE IN AN EGGSHELL



Easy—Exciting Method to Teach Life Cycle

Visually demonstrates 7 most dramatic stages in development. Actually observe the changes as they take place from fertilized egg to hatched chick standing alone. Each stage easily assembled and fitted into opaque half shell with transparent cover. Special stand holds each stage in proper order. Molded in four colors. Sturdily constructed for extensive use.

Stock No. 70,453-W .....\$5.98 Postpaid

## LIFE SIZE VISIBLE HUMAN HEAD

Precise, Full Color, Take-apart Model



Study the most complex organ easily, inexpensively. Ideal for student, hobbyist, professional. You will be amazed at the detail. Molded from actual human skull. Eyes, ears, and teeth easily removed and disassembled for complete study. Entire brain, spinal cord and organs of mouth and throat presented in vivid detail. Amazingly low price—conforms to rigid laboratory standards. 16-page fully illustrated medical handbook included.

Stock No. 70,447-W .....\$9.95 Postpaid



## STURDY—LOW COST PRECISE LAB BALANCE

Built for hard, daily use. Weighs materials from 100 milligrams to 100 grams, can be used for proportionate measuring. Has removable plastic pans 60mm in dia. Features base of rugged cast iron and adjustable one piece beam for balancing. Overall ht. 5 1/2" x 7" long. Comes complete with set of 12 weights ranging from 100mg to 50g and pr. of tweezers in wooden box. Imported.

Stock No. 70,443-W .....\$15.00 Postpaid

## "FISH" WITH A GIANT MAGNET Bring Up Under-Water Treasures



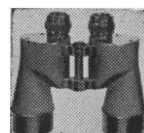
Real fun! Profitable, too! Simply trail this powerful 5 lb. Magnet out the stern of your boat—retrieve outboard motors, fishing tackle, anchors, other metal valuables. Alnico V-Type Magnet has terrific lifting power—2000 Gauss rating—lifts over 125 lbs. on land—more under water. Many industrial uses, too; recover tools and parts from inaccessible spots, hold work in place, rid shop floors of metal fragments, pins, etc.

Stock No. 70,183-W 5-lb. size .....\$9.95 Pstpd.

Stock No. 70,416-W 3 1/2-lb. size .....\$7.95 Pstpd.

## War Surplus American-Made 7x50 Binoculars

Big savings! Brand new! Crystal clear viewing—7 power. Every optical element is coated. An excellent night glass—the size recommended for satellite viewing. Individual eye focus. Exit pupil 7mm. Approx. field at 1,000 yds. is 376 ft. Carrying case included. American 7 x 50's normally cost \$195. Our war surplus price saves you real money.



Stock No. 1533-W .....Only \$55.00 postpd. (Tax included)

6 x 30 Binoculars—similar to above and a terrific bargain. Stock No. 963-W .....\$33.00 Pstpd. (Tax included)

## NEW BATTERY POWERED WALL CLOCK FOR OFFICE AND FACTORY



There's real savings with this battery powered wall clock that eliminates the need for wall sockets, wiring, nearness to outlets... and does away with unsightly extensions and dangling cords. The clock is all chrome, has a 12 1/2" diameter face and will run with faultless accuracy for up to three years on a single, inexpensive battery. This is the perfect "put anywhere—use everywhere" clock for office, factory, home, shop, store, farm, camp, cabin, hotel, club, boat or plane. Price includes battery.

Stock No. 70,435-W .....\$25.00 Postpaid



## WOODEN SOLID PUZZLES

Here is a fascinating assortment of wood puzzles that will provide hours of pleasure. Twelve different puzzles, animals and geometric forms to take apart and reassemble, give a chance for all the family, young or old, to test skill, patience, and best of all to stimulate the ability to think and reason while having lots of fun.

Stock No. 70,205-W .....\$3.00 Postpaid

## OFFSPRING OF SCIENCE...REALLY BEAUTIFUL! CIRCULAR DIFFRACTION-GRATING JEWELRY



1" diameter

Shimmering rainbows of gemlike color in jewelry of exquisite beauty—made with CIRCULAR DIFFRACTION-GRATING REPLICAS. Just as a prism breaks up light into its full range of individual colors, so does the diffraction grating. Promises to become a rage in current fashion.

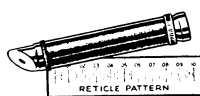
Stock No. 30,349-W Earrings .....\$2.75 Pstpd.

Stock No. 30,350-W Cuff Links .....\$2.75 Pstpd.

Stock No. 30,372-W Pendant .....\$2.75 Pstpd.

Stock No. 30,390-W Tie-Clasp .....\$2.75 Pstpd.

## 50 POWER MEASURING POCKET MICROSCOPE



Fountain pen size, makes direct reading measurements; for checking small parts and dimensions under powerful magnification. Precision, glass etched, reticle calibrated for measurements up to 1/10" by .001" divisions.

Stock No. 30,225-W .....\$7.95 Postpaid

ABOVE INSTRUMENT ON STAND—RACK & PINION FOCUSING

Stock No. 70,404-W .....\$19.75 Postpaid

ORDER BY STOCK NUMBER . . . SEND CHECK OR MONEY ORDER . . . SATISFACTION GUARANTEED!

# EDMUND SCIENTIFIC CO. BARRINGTON, NEW JERSEY

## MAIL COUPON for FREE CATALOG 'W'

144 Pages!  
Over 1000 Bargains!

EDMUND SCIENTIFIC CO.,  
Barrington, N. J.

Please rush Free Giant Catalog-W

Name .....  
Address .....  
City ..... Zone ..... State .....





# PICKER NUCLEAR

## *goes all the way... offers first* **FULLY TRANSISTORIZED** **SCALERS AT SENSIBLE PRICES**

Among these new scalers, there's one (or more) precisely tailored to your need. Common to all are...

*all this counting prowess*

- all-electronic decades
- all-electronic timer (*optional*)
- preset count and preset time
- 1 microsecond resolving time
- 1600, 3200, and/or 500 volt HV supply
- 12 or 25 mv input sensitivity
- precision pulse height analyzer or discriminator (*optional*)
- automatic operation
- count and time read-out (*optional*)
- simplified controls

*prompt delivery*

get details from your local  
Picker representative, or write  
Picker X-Ray Corporation,  
White Plains, New York

*all these operating advantages*

(because they're *fully* transistorized)

- greater operating stability
- greater long term stability
- no need for warm-up delay
- longer component life
- greater compactness
- easier circuit replacement
- more uniform production quality



**no capital investment if you'd rather rent—ask about the PICKER RENTAL PLAN**

# GET YOUR ADVANCE COPY

## of the General Program of the AAAS Denver Meeting

### by first class mail – early in December

The *General Program* of the 128th Meeting of the AAAS in Denver, 26–31 December 1961, will be available to you, at cost, within the first week in December—whether you can attend the Meeting or not.

#### Program Content

1. The two-session AAAS General Sessions, "Moving Frontiers of Science," Part I—Speakers: Howard A. Meyerhoff and Arthur R. von Hippel; Harrison Brown, presiding. Part II—Speakers: Halton C. Arp and E. W. Fager; Harrison Brown, presiding.
2. The 29th John Wesley Powell Memorial Lecture. Speaker: Glenn T. Seaborg; Paul M. Gross, presiding.
3. On "AAAS Day," the four broad, interdisciplinary symposia—Physics of the Upper Atmosphere; Geochemical Evolution—The First Five Billion Years; Existing Levels of Radioactivity in Man and His Environment; and Water and Climate—arranged by AAAS Sections jointly.
4. The Special Sessions: AAAS Presidential Address and Reception; Joint Address of Sigma Xi and Phi Beta Kappa by Harrison Brown; the Tau Beta Pi Address; National Geographic Society Illustrated Lecture; and the second George Sarton Memorial Lecture.
5. The programs of all 18 AAAS Sections (specialized symposia and contributed papers).
6. The programs of the national meetings of the American Astronomical Society, American Society of Criminology, American Nature Study Society, American Society of Naturalists, American Society of Zoologists, Beta Beta Beta Biological Society, Biometric Society (WNAAR), National Association of Biology Teachers, Scientific Research Society of America, Society for General Systems Research, Society of Protozoologists, Society of Systematic Zoology, and the Society of the Sigma Xi.
7. The multi-sessioned special programs of the American Association of Clinical Chemists, American Astronautical Society, American Meteorological Society, American Physiological Society, American Psychiatric Association, Association of American Geographers, Ecological Society of America, National Science Teachers Association, National Speleological Society—and still others, a total of some 70 to 80 participating organizations.
8. The sessions of the Academy Conference, the Conference on Scientific Communication, and the Conference on Scientific Manpower.
9. The sessions of the AAAS Cooperative Committee on the Teaching of Science and Mathematics, of the AAAS Committee on Science in the Promotion of Human Welfare.
10. Titles of the latest foreign and domestic scientific films to be shown in the AAAS Science Theatre.
11. Exhibitors in the 1961 Annual Exposition of Science and Industry and descriptions of their exhibits.

#### Advance Registration

Advance registration has these decided advantages: (1) You avoid delay at the Registration Center upon arrival; (2) You receive the *General Program* in ample time to decide, unhurriedly, which events and sessions you particularly wish to attend; (3) Your name is posted in the Visible Directory as the Meeting opens.

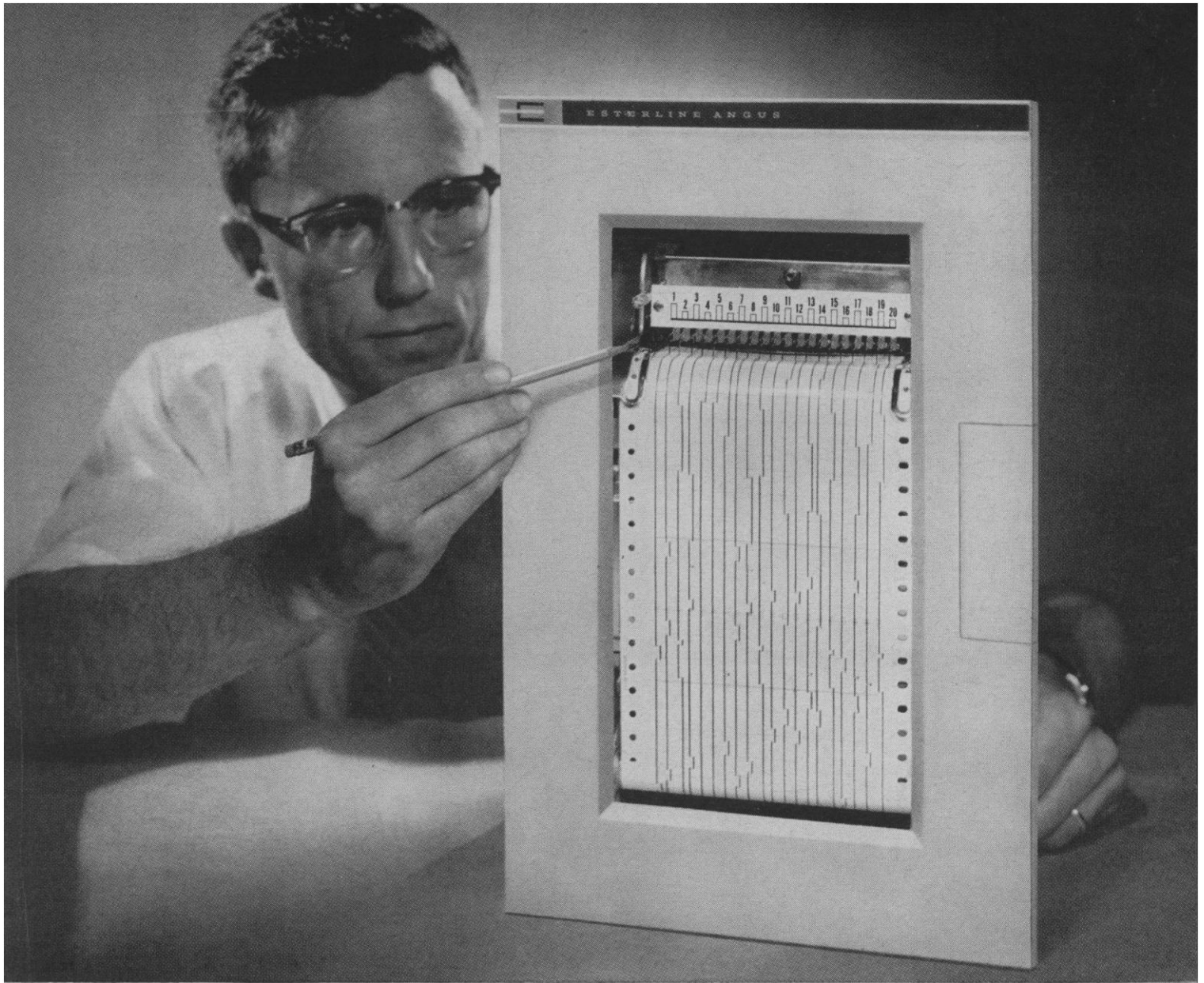
The following coupon may be used both by advance registrants and by those who wish only the advance copy of the *General Program*.

-----THIS IS YOUR COUPON FOR AN ADVANCE COPY OF THE GENERAL PROGRAM-----

- 1a. ☐ Enclosed is \$3.50 for my advance Registration Fee which brings me the *General Program*, Convention Badge, and all privileges of the Meeting (50¢ is for first-class postage and handling).
- 1b. ☐ Enclosed is \$2.50 for only the *General Program*. (It is understood that, if I should attend the Meeting later, the Badge—necessary for the privileges of the Meeting—will be secured for \$1.00 more.)  
(check 1a or 1b)
2. FULL NAME (Dr., Miss, etc.) .....  
(Please print or typewrite) (Last) (First) (Initial)
3. ACADEMIC, PROFESSIONAL, OR BUSINESS CONNECTION .....
4. OFFICE OR HOME ADDRESS .....  
(For receipt of *General Program*)  
CITY ..... ZONE ..... STATE .....
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  
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE  
1515 Massachusetts Avenue, NW, Washington 5, D.C.





Available now in either 10-channel or 20-channel model

## **"620" Esterline Angus Recorder with Tempen\***

Instead of ink, the new "620" Event Recorder with Tempen uses *electrically-heated styluses of stainless steel*. Torture testing reveals they will endure 20 years of continuous operation and still respond in less than 1/20 of a second!

The "620" also uses special chart paper with a non-wax finish, eliminating the danger of marred records caused by external heat, rough handling or discoloration from strong light.

Adaptable to hundreds of research, production and maintenance uses, the "620" can reveal the productive and non-productive

time of any or all machines in a plant. Still other uses include circuit breaker action, psychological testing, qualitative analysis and conveyor operation.

Economically priced, the new "620" with Tempen is another versatile product of Esterline Angus master craftsmen.



For more detailed information, write for new "620" with Tempen descriptive folder. Address: **ESTERLINE ANGUS INSTRUMENT COMPANY, INC.**, Box 596L, Indianapolis 6, Indiana.

**Visit us at ISA Show, Space 504  
Los Angeles • September 11-15**

\*new event recorder  
with *inkless* method  
of writing... operates  
more than 50 days  
without a change  
in charts

*Excellence in graphic recording for over 50 years—***ESTERLINE ANGUS**

## "CHARGED PARTICLES"

### Nuclear Radiations and Materials Evaluation

Chemists and metallurgists have been quick to adopt experimental techniques first used for fundamental nuclear physics research. Today, they are exploiting the characteristics of intense ion beams and neutron fluxes for applied research, engineering and analysis. Already, important results have been obtained using nuclear radiations for trace analysis, wear studies, semiconductor modification and similar applications where interactions of positive ions or neutrons create desired, predictable and measurable effects.

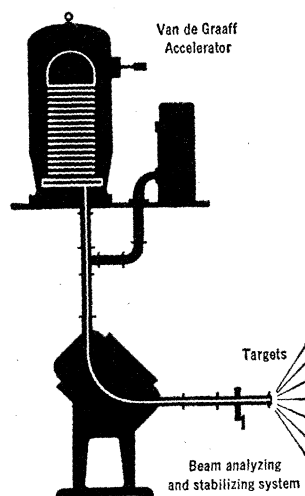
Although a number of positive-ion accelerators have been installed specifically for this kind of developmental work, we believe that the use of particle beams for *materials evaluation* is just getting started, and that many programs are dormant because of the cost and skill-requirement of owning and operating an accelerator facility.

#### Ion Beams and Neutrons for Hire

We think we have an answer to this problem for those who wish to explore activation analysis or research involving accelerated positive ions or neutrons. Here in Burlington, we have a fully-equipped and expertly-staffed *Positive Ion Service Facility*, employing a 2-Mev Van de Graaff accelerator and neutron source as the central research instrument. *Both the facility and the assistance of the staff are now available for independent research and analyses by outside organizations on a rental or contract basis.*

The Van de Graaff is our Model AN-2000. It offers 0.3 to 2.0 Mev hydrogen or deuterium ion beams

with currents up to 100 microamperes in continuous or pulsed operation. A 90° mass analyzing magnet and feedback system stabilizes the voltage. A large fraction of the accelerated ion beam is emitted with a homogeneity within 1 part per 1000 for monoenergetic neutron experiments.



The facility is fully instrumented, including a 200-channel pulse height analyzer for scintillation spectrometry and decay-scheme studies, a remotely-operated sample changer, and neutron moderator.

You may want to use the facility to carry out specific analyses . . . or investigate the feasibility of a certain technique . . . or solve a knotty materials-evaluation problem. Other research possibilities are: *particle interactions; neutron-induced reactions; production of short-lived isotopes; instrument calibration; environmental research; radiation damage and shielding parameters; solid state surface studies; radiobiology.*

Users plan and evaluate all work. We provide an operator. If it bothers you to carry out what

may be proprietary development programs in somebody else's house, have no fear. If the use of accelerators is encouraged, we are content. You may draw the shades tightly on any techniques used, and, of course, the results are strictly your own business. If, however, you would like to take advantage of some knowledge we have, a staff physicist is on hand to help.

If the requirement is perfectly straightforward, such as routine analysis, ship us the sample, and we'll do the work. We will supply cost estimates for any program contemplated on a project or continuous use basis. For more information, write for our Bulletin N-1.

Reaction	Neutron Energy (Mev)	Neutron Yield (n/sec)
D-D	1.5-6*	$5 \times 10^9$
D-Be	0.6-5†	$4 \times 10^{10}$
D-T	14-15*	$5 \times 10^8$

\*monergic †polyergic

Neutron Yield From 2-Mev Van de Graaff

Of course, if the rentee gets carried away with the possibilities of this work and wants to buy an accelerator, that's all right. Van de Graaffs are available from 0.4 to 4 Mev, producing up to 400 microamperes of current for monoenergetic neutron production. For really high neutron fluxes, the microwave linear accelerator excels. We can recommend a package of suitable instrumentation and would be glad to give counsel on installation and shielding.

**HIGH VOLTAGE ENGINEERING CORPORATION**

•  
**APPLIED RADIATION CORPORATION**

•  
**HIGH VOLTAGE ENGINEERING (EUROPA) N.V.**





AMERICAN ASSOCIATION  
FOR THE  
ADVANCEMENT OF SCIENCE

Board of Directors

CHAUNCEY D. LEAKE, *Retiring President, Chairman*  
THOMAS PARK, *President*  
PAUL M. GROSS, *President Elect*  
HARRISON BROWN DON K. PRICE  
HENRY EYRING ALFRED S. ROMER  
H. BENTLEY GLASS WILLIAM W. RUBEN  
MARGARET MEAD ALAN T. WATERMAN  
PAUL A. SCHERER, *Treasurer*  
DAEL WOLFLE, *Executive Officer*

Editorial Board

KONRAD B. KRAUSKOPF H. BURR STEINBACH  
EDWIN M. LERNER WILLIAM L. STRAUS, JR.  
PHILIP M. MORSE EDWARD L. TATUM

Editorial Staff

DAEL WOLFLE HANS NUSSBAUM  
*Publisher Business Manager*

GRAHAM DUSHANE  
*Editor*

JOSEPH TURNER ROBERT V. ORMES  
*Associate Editor Managing Editor*  
ELLEN E. MURPHY, *Assistant Editor*

NANCY TEIMOURIAN, *Assistant to the Editor*

News: HOWARD MARGOLIS, PATRICIA D. PADDOCK

Book Reviews: SARAH S. DEES

Editorial Assistants: NANCY S. HAMILTON, OLIVER W. HEATWOLE, EDGAR C. RICH, JOHN E. RINGLE, CONRAD YUNG-KWAI

Staff Assistants: GENEVIEVE M. KIRBY, JEAN P. D. PIEKNIK

Advertising Staff

EARL J. SCHERAGO, *Director*

BERNICE SCHWARTZ, *Production Manager*

Sales: RICHARD L. CHARLES (New York, N.Y., PE 6-1858); C. RICHARD CALLIS (Old Bridge, N.J., CL 4-3680); HERBERT BURKLUND (Chicago, Ill., DE 7-4973); DILLENBECK-GALAVAN (Los Angeles, Calif., DU 5-3991)

SCIENCE, now combined with THE SCIENTIFIC MONTHLY, is published each Friday by the American Association for the Advancement of Science at National Publishing Company, Washington, D.C. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

Editorial correspondence should be addressed to SCIENCE, 1515 Massachusetts Ave., NW, Washington 5, D.C. Manuscripts should be typed with double spacing and submitted in duplicate. The AAAS assumes no responsibility for the safety of manuscripts. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. For detailed suggestions on the preparation of manuscripts, see *Science* 125, 16 (4 Jan. 1957).

Advertising correspondence should be addressed to SCIENCE, Room 1740, 11 West 42 St., New York 36, N.Y.

Change of address notification should be sent to 1515 Massachusetts Ave., NW, Washington 5, D.C., 4 weeks in advance. Furnish an address label from a recent issue. Give both old and new addresses, including zone numbers.

Annual subscriptions: \$8.50; foreign postage, \$1.50; Canadian postage, 75¢. Single copies, 35¢. Cable address: Advancesci, Washington.

Copyright © 1961 by the American Association for the Advancement of Science.

## New Categories for Old

Man, according to one famous sophistry, is a featherless biped with nails. Like a bird, man walks on two legs, but unlike a bird, he has no feathers. The possession of nails is mentioned in the definition to avoid confusion between men and plucked chickens. Much the same logic has characterized the study of some newer kinds of creatures. Recent history has seen Pentagon sophists produce similar definitions in their efforts to have missiles and other new weapons encompassed in an Army-Navy-Air Force scheme of things. But just as there are more effective ways to advance biology than by grouping together man and fowl, so there may be better ways to understand our military problems than by thinking in terms of land, sea, and air categories.

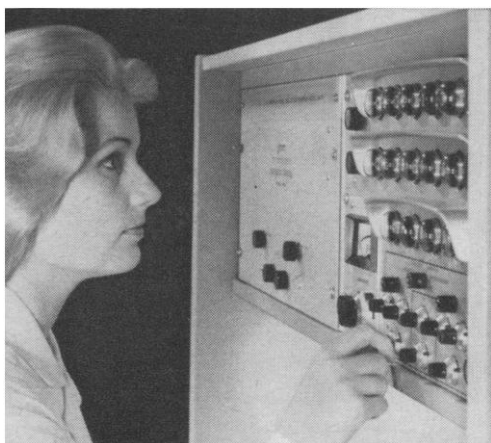
Just such an effort to provide a new set of categories is now under way in the Defense Department. Secretary McNamara and his comptroller Charles Hitch, an economist formerly with the Rand Corporation, have introduced the concept of what they call "program packages." There are seven packages, and the packages group together different military weapons and tasks in terms of similar purposes. Thus, one group is the Central War Offensive Forces program package. It includes both land-based and sea-based missile forces as well as certain aircraft forces, all of which taken together constitute our atomic retaliatory unit. Another group is the General Purposes Forces, which includes expeditionary units for fighting limited wars.

Research and development, which is understood to include all testing and evaluation of prototypes prior to operational use of a new weapon, enters the scheme in two ways. Work associated with a particular element, like the Polaris missile, is classified with that element in the appropriate package. Research efforts not so readily classified, like present military space projects, are grouped in a special program package devoted to "other" research and development.

The package-program approach cuts across not only present service classifications but also present accounting titles—personnel, maintenance, procurement, and so on. Thus, to help evaluate a possible new weapon, the new approach would provide an estimate of research and development costs, including the price of laboratory and test facilities; an estimate of the outlays for the initial equipment and training necessary to bring the new weapon into operational use; and an estimate of the recurring costs necessary to maintain the weapon once it is in use.

Improvements in planning, as might be suspected, did not start from scratch with the Kennedy administration. The idea of package programs builds on procedures that have been developing in the Defense Department during the past few years, particularly in the research and development section. Concerning earlier programing, Harold Brown, the scientific director of this section, told a congressional committee that timetables for development had proved right most of the time, but that efforts at estimating costs had been less successful. The present hope is to expand and improve on earlier efforts. What is wanted is a scheme that will explicitly array, in terms of military effectiveness and costs, the real choices among present weapons and possible future weapons.—J.T.

# NEW VERSATILITY IN Liquid Scintillation Counting With the Packard Tri-Carb® Spectrometer



*Eye-level mounting of the electronic controls over the freezer provides maximum visibility, ease of operation, and results in substantial savings of laboratory space.*

Now you can count assortments of carbon-14 and tritium samples interchangeably without readjusting controls . . . perform double labeling at the true balance point for each isotope . . . or do both. In addition, the new Tri-Carb Spectrometer with its expander-amplifier circuitry can be used for dual-channel gamma counting merely by adding a well detector. This versatility is a Packard exclusive—made possible by two separate channels of pulse-height analysis with individually variable amplifiers and four adjustable discriminator levels.

Other features include all-transistorized circuitry and convenient mounting of all controls at eye level above the freezer. Width of the instrument is reduced to a space-saving 3½ feet.

Three models in various combinations offer a total of nine liquid scintillation counting systems—refrigerated or non-refrigerated . . . for automatic or semi-automatic operation. From this selection you can readily meet the requirements of your budget and provide for present and future needs. You'll get the satisfaction and performance which only a Tri-Carb Spectrometer—with its world-wide reputation for accuracy and reliability—can provide. Call your Packard representative or write for Bulletin AD-1002.

**INSTRUMENTS FOR RADIOACTIVITY MEASUREMENT AND CHROMATOGRAPHY**

# Packard

## BRANCH OFFICES

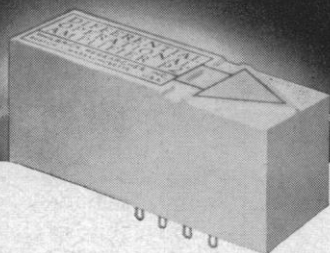
CHICAGO • ALBUQUERQUE • ATLANTA • BOSTON • DALLAS  
LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH  
SAN FRANCISCO • WASHINGTON, D.C. • ZURICH • HANOVER • PARIS

**PACKARD INSTRUMENT COMPANY, INC.**

LA GRANGE 54, ILLINOIS, Telephone HUter 5-6330



## The all-new, all solid-state Philbrick P2 amplifier



**NO TUBES, NO CHOPPERS, NOTHING BUT PERFORMANCE.** An ingenious arrangement of all solid-state components endows this operational amplifier with the most remarkable and versatile characteristics. But let's let them speak for themselves. *Full differential input:* truly floating with respect to ground. *No common mode error.* *Low input current:* typically  $10^{-11}$  amps. *Low noise:* typically under 10 microvolts in the dc to 1 kc range. *Sub millivolt long term stability:* less than 100 microvolts drift per day. *Cool running:* typically 330 milliwatt dissipation. *Wide band pass:* typically 75 kc as a unity gain follower. *High open loop gain:* typically 30,000. **\$210.** *Truly low cost:*

Use the P2 for instrumentation, analog computation, and other applications requiring high reliability and accuracy. Discover its marvelous versatility and convenience. Add, integrate, scale, invert with it. Take advantage of its differential inputs to perform very high impedance voltage following (or amplification), precise current driving, and many other useful applications. The P2's output delivers 1 ma at  $\pm 10$  volts. The cast aluminum housing fits right in your hand. *Please write for further information to:*

GEORGE A.

**PHILBRICK**  
RESEARCHES, INC.

127 CLARENDON ST. BOSTON 16, MASS.  
COMMONWEALTH 6-5375, TWX: BS 1032, FAX: BSN  
REPRESENTATIVES IN PRINCIPAL CITIES  
EXPORT OFFICE: 240 W. 17TH ST., N. Y. 11, N. Y.  
TEL. CHELSEA 3-5200, CABLE: TRILRUSH

478

molecular and functional evolution of neurohypophyseal principles associated with the names of W. H. Sawyer, H. Heller, and J. Maetz; on higher nervous centers as they impinge upon the hypothalamo-hypophyseal complex; and on the insect subesophageal ganglion as an endocrine structure. Crustacean neuroendocrinology, too, was only touched upon.

The 4th International Symposium will be held in Paris in 1964, under the leadership of Louis Gallien. It will face the challenge of maintaining the high quality of the first three symposia and of providing continued coverage of "frontier" areas in the growing field of comparative endocrinology.

HOWARD A. BERN

Department of Zoology,  
University of California, Berkeley

### Forthcoming Events

#### September

1-5. Danube Research, intern. symp., Budapest, Hungary. (Biological Sciences Group, Hungarian Acad. of Sciences, Roosevelt Tèr. 9, Budapest V)

1-9. Topology and Its Methods in Other Mathematical Disciplines, symp., Prague, Czechoslovakia. (Organizing Committee, Ke Karlovu 3, Prague 2)

1-10. International Pharmaceutical Students' Federation, 7th congr., Munich, Germany. (U. Peto, 10 Groffstr., Munich 19)

2-7. International Assoc. for Quaternary Research, Warsaw, Poland. (R. Galon, Secretary General, INQUA, Geographical Inst. Univ., Torun, Poland)

2-9. International Soc. of Surgery, 19th congr., Dublin, Ireland. (T. C. J. O'Connell, 35 Fitzwilliam Pl., Dublin)

3-7. International Assoc. for Hydraulic Research, 9th congr., Belgrade, Yugoslavia. (H. J. Schoemaker, Waterloopkundig Laboratorium, Raam 61, Delft, Netherlands)

3-8. American Chemical Soc., 140th meeting, Chicago, Ill. (A. T. Windstead, National Meetings Dept., ACS, 1155 16 St., NW, Washington 6)

3-9. International Federation of Gynaecology and Obstetrics, 3rd world congr., Vienna, Austria. (V. Grünberger, Medizinische Akademie, Alserstrasse 4, Vienna 9)

3-10. Inter-American Congr. of Radiology, 7th, São Paulo, Brazil. (W. Bomfim-Pontes, Rua Cesario Motta 112, São Paulo)

4. World Federation for Mental Health, 14th annual, Paris, France. (WFMH, 19 Manchester St., London, W.1, England)

4-6. International Assoc. for Shell Structures, colloquium, Brussels, Belgium. (Prof. Dutron, 127 Avenue Adolphe Buyl, Brussels 5)

4-6. International Symp. on the Earth Storm, Kyoto, Japan. (T. Nagata, Science Council of Japan, Ueno Park, Tokyo)

## New Philbrick 6033 solid-state power supply



**BALANCED OUTPUTS, COMPUTING GRADE.** The 6033 is the latest addition in the distinguished line of Philbrick power supplies. It will energize at least 10 Philbrick P2 amplifiers and other transistorized electronic equipment. Like the P2, its remarkable characteristics speak for themselves. *Low internal impedance:* less than 2 milliohms. *Low noise and hum:* guaranteed less than 150 microvolts rms (0.001%). *Highly regulated outputs:* against load, less than 300 microvolts; against line, less than 200 microvolts. *Low long term drift:* typically 0.1%. *Short transient recovery time:* no load to full load, less than 1 millisecond. *Unique short circuit overload protection:* inherent in the 6033's design with no extra circuitry to deteriorate performance. *Truly low cost:* about half that of supplies with comparable performance. **\$285.**

Operates from 115 volt, 50-400 cycles, providing up to 150 ma at plus AND minus 15 volts, slaved to a common reference. Conveniently packaged, cool running, and highly reliable. Available as bench model or modular plug-in. Bench model dimensions:  $3\frac{1}{2}$ " h x  $5\frac{1}{2}$ " w x  $7\frac{1}{2}$ " d. Also available with 300 ma output.

*Complete facts are waiting for you. Please write:*

GEORGE A.

**PHILBRICK**  
RESEARCHES, INC.

127 CLARENDON ST. BOSTON 16, MASS.  
COMMONWEALTH 6-5375, TWX: BS 1032, FAX: BSN  
REPRESENTATIVES IN PRINCIPAL CITIES  
EXPORT OFFICE: 240 W. 17TH ST., N. Y. 11, N. Y.  
TEL. CHELSEA 3-5200, CABLE: TRILRUSH

SCIENCE, VOL. 134

4-7. Neuropathology, 4th intern. congr., Munich, Germany. (W. Haymaker, Armed Forces Inst. of Pathology, Walter Reed Army Medical Center, Washington 25)

4-7. Rheumatology, 10th intern. congr., Rome, Italy. (C. B. Ballabio, Clinica Medica Generale, Via F. Sforza 35, Milan, Italy)

4-8. Low Energy Nuclear Physics, intern. conf., Manchester, England. (L. J. B. Goldfarb, Physics Dept., Univ. of Manchester, Manchester)

4-8. Pharmaceutical Sciences, 21st intern. congr., Pisa, Italy. (Intern. Pharmaceutical Federation, 11 Alexanderstraat, The Hague, Netherlands)

4-8. Plasma Physics and Controlled Nuclear Fusion Research, conf., Salzburg, Austria. (Intern. Atomic Energy Agency, United Nations, New York, N.Y.)

4-9. International Assoc. for Analog Computation, 3rd intern. sessions, Belgrade, Yugoslavia. (D. Strujic, Decanska 14/IV, Belgrade)

4-9. International Congr. of Angiology, 4th, Prague, Czechoslovakia. (Z. Reinis, 4th Medical Clinic, Prague 2/499)

4-9. International Symp. on Fundamental Problems in Turbulence and Their Relation to Geophysics (by invitation), Marseilles, France. (Intern. Union of Geodesy and Geophysics, 53 Avenue de Breteuil, Paris 7)

4-9. Laurentian Hormone Conf., Ho-berg's Resort, Lake County, Calif. (Committee on Arrangement of the Laurentian Hormone Conference, 222 Maple Ave., Shrewsbury, Mass.)

4-13. Inter-African Conf. for Food and Nutrition, 4th, Bukavu, Congo Republic. (Commission for Technical Cooperation in Africa South of the Sahara, Pvt. Mail Bag 2359, Lagos, Nigeria)

4-14. Anglo-American Aeronautical Conf., 8th, London, England. (Inst. of Aerospace Sciences, 2 E. 64 St., New York, N.Y.)

5-8. International Congr. of Homeopathic Medicine, 25th, Amsterdam, Netherlands. (J. L. Fonteijn, Westzijde 116, Zaandam, Netherlands)

5-8. Machine Translation of Languages and Applied Language Analysis, intern. conf., Teddington, England. (L. Dostert, Director, Machine Translation Research, Georgetown Univ., 1715 Massachusetts Ave., NW, Washington 6)

5-8. National Chemical Exposition, 11th, Chicago, Ill. (Chicago Section, American Chemical Soc., 86 E. Randolph St., Chicago 1)

6-8. Effects of Ionizing Radiations on Immune Processes, intern. symp., Lawrence, Kan. (C. A. Leone, Dept. of Zoology, Univ. of Kansas, Lawrence)

6-8. Transmission and Processing of Information, intern. symp., Boston, Mass. (R. M. Fano, Research Laboratory of Electronics, Massachusetts Inst. of Technology, Cambridge 39)

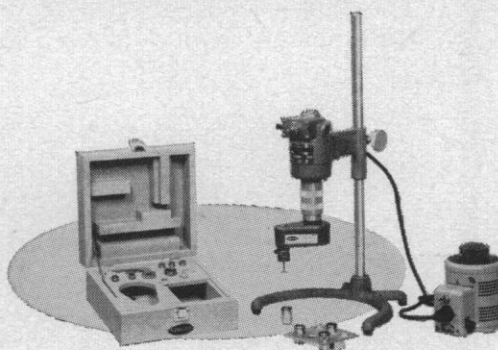
6-12. Human Genetics, 2nd intern. conf., Rome, Italy. (L. Gedda, 5 Piazza Galeno, Rome)

7-8. Pacific Slope Biochemical Conf., annual, San Diego, Calif. (R. G. Wolfe, Chemistry Dept., Univ. of Oregon, Eugene)

7-9. International Cardiovascular Soc.,



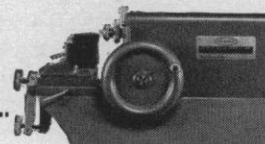
## Micro-Macro Instrumentation for Research



High-precision engineering and design know-how bring you the rugged SERVALL Omni-Mixer for homogenizing, blending, mixing and disintegrating a wide range of materials in capacities from 0.5 ml to 2,000 ml (approx). Basic Macro Unit accepts a variety of stainless steel mixing chambers as well as inexpensive Mason jars, and the Micro-Homogenizer Attachment (optional). All stainless steel chambers are seamless, fluted, and have "mirror-like" inner finish. Chambers, Covers, and Rotor-Knife Blade Assemblies are removable as units for loading and unloading, and are quickly disassembled for autoclaving. Chambers may be lowered easily into temperature-control baths. The SERVALL Omni-Mixer has convenient top drive with heavy-duty, high-torque motor. For Rotor-Knife Blade Assemblies, Teflon bearings are available and may be fitted in the field by the operator on all late-model Omni-Mixers. Speeds: to 16,000 rpm and above with Macro Units; to 50,000 rpm with Micro Unit. ASK FOR BULLETIN SC-80M



SERVALL "Porter-Blum" — the Ultra-Microtome that "sets the standard" for cutting ultra-thin sections (1/2 to 1/40 micron) for electron microscopy. ASK FOR BULLETIN SCB-8MT.



**Ivan Sorvall, Inc.**  
NORWALK • CONNECTICUT

SINCE 1943 THE WORLD'S  
LARGEST MANUFACTURER OF  
SUPERSPEED CENTRIFUGES



# STANDARD

## PRESENTS The Chronofrac, Model VP-1

only  
\$250



**A Thoroughly Tested . . . Fully  
Guaranteed . . . Vapor-Phase  
Chromatograph . . .**

**At Last! Routine Gas Analysis  
and Quality Control  
Through Chromatography . . .  
At a Price Everyone Can  
Afford.**

### SIMPLE OPERATION

Anyone can operate the  
Chronofrac . . . No extensive  
training required.

### EASY INSTALLATION

Provide a source of carrier  
gas . . . a power supply . . .  
attach a recorder. That's all  
there's to it.

### WIDE RANGE ANALYSIS

Combustion products . . . flue  
gases . . . natural and cylinder  
gases . . . alcohols thru C<sub>4</sub>  
. . . in fact almost any raw ma-  
terials or products with boil-  
ing points to 105°C.

### DUAL DETECTION

Catalytic combustion and  
thermal conductivity.

**NO-DRIFT BASELINE  
STABILITY  
EXCELLENT SENSITIVITY  
5-STEP ATTENUATION  
COMPACT—less than 1 sq. ft.**

CAT. NO. S46493  
ONLY \$250

**STANDARD SCIENTIFIC**  
*Supply Corp.* 808 BROADWAY  
NEW YORK 3, N.Y.

5th congr., Dublin, Ireland. (H. Haimovici, 715 Park Ave., New York 21)

7-9. Parapsychological Assoc., 4th annual congr., New York, N.Y. (C. B. Nash, St. Joseph's College, Philadelphia, Pa.)

7-10. Science News Writing Seminar, Colorado State Univ., Fort Collins. (M. G. Payne, Colorado State Univ., Research Foundation, Fort Collins)

7-11. European Orthodontic Soc., 37th congr., Bologna, Italy. (N. Gray, 16 College Rd., Eastbourne, Sussex, England)

7-12. Neurogenetics, symp., Rome, Italy. (L. Gedda, Instituto Gregorio Mendel, Viale Regina Margherita 261, Rome)

7-13. Electroencephalography and Clinical Neurophysiology, 5th intern. congr., Rome, Italy. (R. Vizioli, Viale Università 30, Rome)

10-14. Tuberculosis Conf., 16th intern., Toronto, Canada. (C. W. L. Jeanes, 265 Elgin St., Ottawa, Ont., Canada)

10-15. Neurology, 7th intern. congr., Rome, Italy. (G. Alema, Viale Università 30, Rome)

10-17. International Union of Forest Research Organizations, 13th congr., Vienna, Austria. (Forest Research Inst., IUFRO Bureau, Vienna 89)

11-13. European Organization for Quality Control, 5th congr., Turin, Italy. (Weena 700, Rotterdam, Netherlands)

11-14. International Flax and Hemp Federation, 12th congr., Lisbon, Portugal. (IFHF, 37 rue de Courcelles, Paris 8)

11-15. Cosmic Rays, 7th intern. conf., Kyoto, Japan. (Y. Sekido, Science Council of Japan, Ueno Park, Tokyo)

11-15. Cybernetics, 3rd intern. congr., Namur, Belgium. (Intern. Assoc. for Cybernetics, 13 rue Basse-Marcelle, Namur)

11-15. Instrument Soc. of America, instrument-automation conf. and exhibit, 16th, Los Angeles, Calif. (W. H. Kushnick, 313 Sixth Ave., Pittsburgh 22, Pa.)

11-15. Marine Sciences Instrumentation, symp., Woods Hole, Mass. (D. D. Ketchum, Woods Hole Oceanographic Institution, Woods Hole, Mass.)

11-15. Radioecology, symp., Fort Collins, Colo. (Miss A. Barker, American Inst. of Biological Sciences, 2000 P St., NW, Washington 6)

11-16. International Union for the Scientific Study of Population, 12th congr., New York, N.Y. (C. V. Kiser, Milbank Memorial Fund, 20 Wall St., New York 5)

11-16. University of Hong Kong, intern. scientific congr., Hong Kong. (University of Hong Kong, Hong Kong)

11-19. International Congr. of Navigation, 20th, Baltimore, Md. (E. W. Adams, Jr., 22 Light St., Baltimore 2)

11-21. International Cloud Physics Conf., Canberra and Sydney, Australia. (E. G. Bowen, Commonwealth Scientific and Industrial Research Organization, University Grounds, Sydney)

12-13. International Federation of Surgical Colleges and Societies, 4th annual Oslo, Norway. (K. Cassels, IFSC Office, Royal College of Surgeons of England, Lincoln's Inn Fields, London, W.C.2)

12-15. International Pharmaceutical Federation, 19th general assembly, Athens,

Greece. (J. H. M. Winters, Alexanderstraat 11, The Hague, Netherlands)

12-15. Mass Spectrometry, conf., Oxford, England. (W. J. Brown, Instrumentation Div., A.E.I. (Manchester) Ltd., Trafford Park, Manchester 17, England)

15-20. World Medical Assoc., 15th general assembly, Rio de Janeiro, Brazil. (L. H. Bauer, 10 Columbus Circle, New York 19)

13-16. European Congr., of Gerontology, 3rd, Amsterdam, Netherlands. (A. J. S. Douma, Haanplein 8, The Hague, Netherlands)

14-17. Chemotherapy, 2nd intern. symp., Naples, Italy. (P. Preziosi, Casella postale 266, Naples)

14-20. High Energy Physics, intern., Aix-en-Provence, France. (E. W. D. Steel, European Organization for Nuclear Research, Geneva 23, Switzerland)

16-20. German Soc. for the History of Medicine, Physical Science and Technology, Augsburg, Germany. (G. Mann, Secretary, Wilhelmplatz 7, Bonn, Germany)

16-27. International Scientific Film Assoc., 15th congr., Rabat, Morocco. (M. Afifi, 85 Ibn Toumert, Rabat)

18-2. World Meteorological Organization, Commission for Aerology, 3rd session, Rome, Italy. (WMO, 1 Avenue de la Paix, Geneva, Switzerland)

18-20. Applied Spectroscopy, 8th symp., Ottawa, Canada. (R. Lauzon, Div. of Pure Chemistry, National Research Council, Ottawa, Ont.)

18-21. Embryological Conf., 5th intern., London, England. (L. Brent, Dept. of Zoology, University College, London, Grover St., London, W.C.1)

18-22. International Congr. of Neuro-radiology, 6th Rome, Italy. (E. Valentino, CIT, Ufficio Congressi, Piazza Colonna 193, Rome)

18-23. Speleology, 3rd intern. congr., Vienna, Austria. (Generalsekretariat des 3rd Internationalen Kongresses für Speläologie, Obere Donaustr. 99/7/1/3, Vienna 2)

18-25. International Seaweed Symp., 4th, Biarritz, France. (M. Barriety, Centre Scientifique, B. P. 28, Biarritz.)

19-21. International Mechanical Pulp- ing Conf., 4th, Chicago, Ill. (J. H. Perry, Norton Co., Worcester, Mass.)

19-29. International Conf. on Fish Nutrition, Washington, D.C. (FAO, Intern. Agency Liaison Branch, Office of the Director General, Viale delle Terme di Caracalla, Rome, Italy)

19-22. Australian Conf. on Food Technology, Homebush (near Sydney), Australia. (T. B. Partridge, Australian Scientific Liaison Office, 1907 K St., NW, Washington 6)

19-22. International Office of Documentation of Military Medicine, 23rd session, Athens, Greece. (Intern. Committee of Military Medicine and Pharmacy, Hôpital Militaire, 79 rue Saint Laurent, Liège, Belgium)

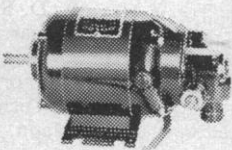
20-21. Industrial Electronics, symp., Boston, Mass. (W. M. Trenholme, General Electric Co., West Lynn, Mass.)

21-22. Conference on Radiofrequency Spectroscopy in Solids, Bangor, Wales. (Physical Soc., 1 Lowther Gardens, Prince Consort Rd., London, S.W.7, England)

# HELLER ELECTRONIC VARIABLE-SPEED

## AC CONTROLLER and Matching DC MOTOR

2T60 ELECTRONIC CONTROLLER  
with matching 1/50 H.P. DC MOTOR



**\$87**

Complete, F.O.B.,  
Las Vegas,  
Nevada

### SPECIFICATIONS

• Thyatron tube operated controller gives stepless operation • Input: 110-120 V., 60 cy. single phase • Output: 0-120 V., 200 ma. DC to armature • 1/50 H.P. ball bearing, right angle, gear head, shunt wound, DC motor • Reversible • Armature shaft is extended • Armature speed 0 to 4000 R.P.M. • Motors in gear ratios: 6, 18, 30, 36, 60, 100, 300, 540, and 1120:1 in stock.

Other models to  
3/4 H.P. motors  
available.  
Request data.

**GERALD K. HELLER CO.**

2673 South Western Street, Las Vegas, Nevada, P.O. Box 4426

# NEW THIN FILM NRC VACUUM COATER

Here's a newly-designed vacuum evaporation system for research and development in electronics, optics, infrared and semi-conductor products.

## The NRC Model 3166 Exclusive Features

NEW ELECTRIC HYDRAULIC HOIST to raise and lower bell jar.

NEW NRC 6" fractionating 4-stage diffusion pump (Model HS6-1500) rated 1550 liters/sec., 750 micron forepressure tolerance.

ALL CONTROLS ON FRONT PANELS, for easy reading and operation, and less floor space required.

FULL OPENING, straight-through high conductance gate valve.

NEW CIRCULAR CHEVRON BAFFLE COLD TRAP, for more even cooling of chevron plates, prevention of backstreaming, and cryogenic pumping of condensable vapors.

LARGE BASE PLATE has 17 electric and mechanical feed-through seals all identically sized (1" diameter) for greater flexibility and possible different arrangements of feed-through in base plate—either 18" or 24" diameter bell jar can be used interchangeably.



A Subsidiary of National Research Corporation  
160 Charlemont Street, Dept. 25H  
Newton 61, Massachusetts  
DEcatur 2-5800

Write or call for data  
sheet and prices  
for the Model 3166  
Vacuum Coater.

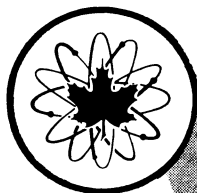
## Atomic Energy of Canada Limited

—offers a complete—

Readily available in large quantities in versatile Pellet and Slug Forms. Sealed in a wide range of "Weldcap" stainless steel capsules.

COBALT 60 Radiation provides reliability, simplicity, penetrating high energy and precise dose control.

Inquiries are welcome on any aspect of gamma irradiation, — source design to stringent output and uniformity specifications, irradiator design and fabrication, consulting services—or perhaps one of our standard Gammacell irradiators will suit your purpose.



**ATOMIC ENERGY OF CANADA LIMITED**  
Commercial Products Division • P.O. Box 93 • Ottawa • Canada

# Cobalt 60

**SOURCE RANGE  
and SERVICE**  
for  
*Gamma Irradiation  
Research*

21-23. French Medical Congr., 33rd, Paris. (C. Laroche, 34 rue de Bassano, Paris 8)

24-27. American Inst. of Chemical Engineers, Lake Placid, N.Y. (E. R. Smoley, 30 School Lane, Scarsdale, N.Y.)

25-29. European Committee of Liaison for Cellulose and Paper, symp., Oxford, England. (British Paper and Board Makers' Assoc., Technical Section, St. Winifred's, Welcomes Rd., Kenley, Surrey, England)

25-30. Magnetism and Crystallography, intern. conf., Kyoto, Japan. (Science Council of Japan, Ueno Park, Tokyo)

26-30. European Congr. of Aviation Medicine, 6th, Paris, France. (CERMA, 5 bis Avenue de la Porte de Sèvres, Paris 15)

27-3. International Union of Theoretical and Applied Mechanics, Kiev, U.S.S.R.

(Y. A. Mitropolsky, Scientific Committee, Kalinin pl. 6, Mathematical Inst., Kiev)

28-29. European Conf. of Chemical Engineers, Toulouse, France. (Soc. of Industrial Chemistry, 28 rue Saint-Dominique, Paris 7, France)

#### October

1-3. Council for Intern. Organizations of Medical Sciences, Paris, France. (CIOMS, 6 rue Franklin, Paris 16)

1-4. Process Engineers, annual, Vienna, Austria. (Osterreichischer Ingenieur- und Architektenverein, Eschenbachgasse 9, Vienna 1)

1-5. Electrochemical Soc., Detroit, Mich. (Electrochemical Soc., Inc., 1860 Broadway, New York 23)

1-7. International Special Committee on

Radio Interference, plenary session, Philadelphia, Pa. (S. D. Hoffman, American Standards Assoc., 10 E. 40 St., New York 16)

1-8. International Congr. of Industrial Chemistry, 33rd, Bordeaux, France. (Société de Chimie Industrielle, 28 rue Saint-Dominique, Paris 7, France)

2-4. Communications Symp., 7th natl., Utica, N.Y. (R. K. Walker, 34 Bolton Rd., New Hartford, N.Y.)

2-7. International Astronautical Federation, 12th congr., Washington, D.C. (American Rocket Soc., 500 Fifth Ave., New York 36)

2-7. Inter-Regional Leprosy Conf., Istanbul, Turkey. (WHO, Regional Office for Europe and Regional Office for the Eastern Mediterranean, 8 Scherfigsvej, Copenhagen Ø, Denmark)

2-7. Climatic Change, symp., Rome, Italy. (UNESCO, Place de Fontenoy, Paris 7, France)

2-11. International Council for the Exploration of the Sea, 49th annual, Copenhagen, Denmark. (Charlottenlund Slot, Charlottenlund, Denmark)

3-5. Physics and Nondestructive Testing, symp., Argonne, Ill. (W. J. McGonagle, Argonne Natl. Laboratory, 9700 S. Cass Ave., Argonne)

3-8. Aerosol Congr., 3rd intern., Lucerne, Switzerland. (Federation of European Aerosol Assocs., Waisenhausstrasse 2, Zurich, Switzerland)

4-10. Latin American Congr. of Electroencephalography, 5th, Mexico, D.F. (J. Hernandez Paniche, Instituto Mexicano de Seguro Social, Hospital La Raza, Mexico, D.F.)

4-10. Latin American Congr. of Neurosurgery, 9th, Mexico, D.F. (J. H. Mateos, Tonalá No. 15, Mexico 7, D.F.)

6-7. American Medical Writers' Assoc., New York, N.Y. (S. O. Waife, P.O. Box 1796, Indianapolis 6, Ind.)

6-8. Therapeutics, 7th intern. congr., Geneva, Switzerland (P. Rentchnick, Case Postale 229, Geneva 2)

8-10. Zooplankton Production, symp., Copenhagen, Denmark. (J. H. Frazer, Marine Laboratory, P.O. Box 101, Victoria Rd., Aberdeen, Scotland)

8-11. Society of American Foresters, Minneapolis, Minn. (H. Clepper, SAF, 425 Mills Bldg., Washington 6)

8-13. American Acad. of Ophthalmology and Otolaryngology, Chicago, Ill. (W. L. Benedict, 15 Second St., SW, Rochester, Minn.)

9-11. National Electronics Conference and Exhibition, 17th annual, Chicago, Ill. (NEC, 228 N. La Salle St., Chicago, 1)

9-12. Instrument Symp. and Research Equipment Exhibit, 11th annual, Bethesda, Md. (J. B. Davis, Natl. Institutes of Health, Bethesda 14)

9-12. Water Pollution Control Federation, 34th annual, Milwaukee, Wis. (R. E. Fuhrman, 4435 Wisconsin Ave., NW, Washington 16)

9-13. American Rocket Soc., space flight meeting, New York, N.Y. (ARS, 500 Fifth Ave., New York 36)

9-13. Luminescence of Inorganic and Organic Systems, intern. conf., New York, N.Y. (Miss G. M. Spruch, New York Univ., Washington Sq., New York 3)

10-12. Nuclear Reactor Chemistry, 2nd



**NOW...7 MORE VALUES FOR CONTROL OF YOUR CLINICAL CHEMISTRY DETERMINATIONS**

Hyland Clinical Chemistry Control Serums are useful as CONTROLS, run in parallel with unknowns as checks on equipment, reagents and technic, or as STANDARDS to calibrate equipment and standardize reagents. Prepared from freshly drawn human blood, they have the same natural constituents as your specimens. Freeze-dried for STABILITY, they are prepared for use simply by the addition of distilled water. After reconstitution they remain stable for five days (except for glucose) when stored under refrigeration.

**Supplemental Normal Clinical Chemistry Control Serum:** 5 cc vials, box of 3 vials (list no. 36-935) at \$5.50.

**Abnormal Clinical Chemistry Control Serum:** 5 cc vials, box of 3 vials (list no. 36-835) at \$5.50 or 6 vials (list no. 36-865) at \$9.00.

**Normal Clinical Chemistry Control Serum:** 5 cc vials, box of 6 vials (list no. 36-905) at \$9.00.

**HYLAND LABORATORIES**

4501 Colorado Blvd., Los Angeles 39, Calif.

Branch Office: 160 Lockwood Ave., Yonkers, New York

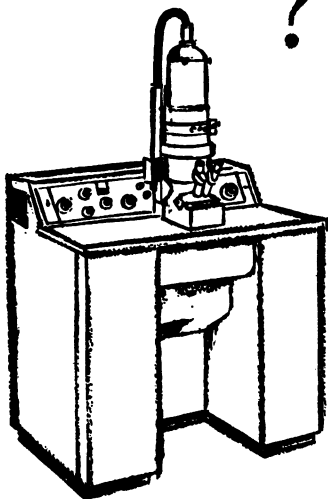
 <p><b>NORMAL CLINICAL CHEMISTRY CONTROL SERUM</b></p> <p>PROVIDING NORMAL VALUES FOR:</p> <ul style="list-style-type: none"> <li>Albumin</li> <li>Calcium</li> <li>Chloride</li> <li>Cholesterol</li> <li>Creatinine</li> <li>Globulin</li> <li>Glucose</li> <li>Non-protein Nitrogen</li> <li>Phosphorus, inorganic</li> <li>Potassium</li> <li>Protein-bound Iodine</li> <li>Protein, total</li> <li>Sodium</li> <li>†Transaminase (SGO-T)</li> <li>Urea Nitrogen</li> <li>Uric Acid</li> </ul>	 <p><b>ABNORMAL CLINICAL CHEMISTRY CONTROL SERUM</b></p> <p>PROVIDING ELEVATED VALUES FOR:</p> <ul style="list-style-type: none"> <li>†Amylase</li> <li>†Alkaline Phosphatase</li> <li>Bilirubin</li> <li>Calcium</li> <li>Chloride</li> <li>Creatinine</li> <li>Glucose</li> <li>†Lactic Dehydrogenase</li> <li>Non-protein Nitrogen</li> <li>Phosphorus, inorganic</li> <li>Potassium</li> <li>Protein-bound Iodine</li> <li>Sodium</li> <li>†Transaminase (SGO-T)</li> <li>Urea Nitrogen</li> <li>Uric Acid</li> </ul>
---	---

†Component represents actual enzyme activity



# LOOKING FOR SOMETHING?

???



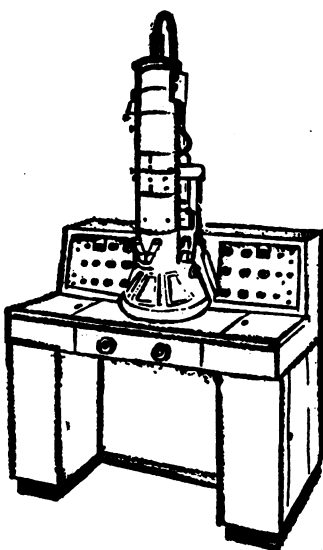
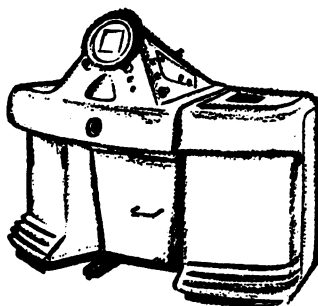
If whatever you are looking for is small enough, electron microscopy is sure to help. More power to you if you select a Norelco instrument—and this is why!

Beginning with the EM-75, Norelco offers a low priced screening and general service tool

for use in areas requiring approximately 30 Angstroms resolution. No microscope is made which compares with the trouble-free workhorse features of this instrument. And to add to its value—it is readily convertible into a projection X-ray microscope for morphological evaluations of opaque materials.

The EM-100 provides resolution in the area of 15 Angstroms and has had tremendous worldwide acceptance. It has many outstanding features like the Norelco *immersion lens* which alone makes possible many unusual techniques such as free manipulation and even deformation of the specimen while under observation.

Newest in the Norelco line is the EM-200 with a resolution of less than 10 Angstroms. This is the ultimate in highest possible performance—unsurpassed for organic and inorganic structural research studies. Information is readily available on this or any of the Norelco Electron Optical Instruments simply by writing Philips Electronic Instruments, Mount Vernon, New York.



## KRYOMAT LOW TEMPERATURE CIRCULATORS

TABLE MODEL TO **-30°C**

CONSOLE MODELS TO **-80°C**



Introducing the world's first table model Kryomats for low temperature control—offered in two models. Range from +20 to -30°C.

A separate line of instruments, Ultra Kryostats, for variable control or measurements between +40 and -80°C, are also available. Air or water cooling, built-in timer and accuracy to  $\pm 0.02^\circ\text{C}$  are just a few of the many outstanding features of these instruments.

Most important is the unique and exclusive use of a secondary cooling system instead of conventional compensating heaters.

for all your temperature control problems  
between -80°C and +300°C, contact:

**L**auda Instruments, Inc.  
P.O. Box 422 Great Neck, N.Y.

# TODAY'S BEST BUY IN AUTOMATIC TEST-DATA INTEGRATION



## IDEAL FOR USE WITH GAS CHROMATOGRAPHS

In just a few short months RIG's new Electronic Integrator PX 592 has won wide acclaim as the ideal answer to a long-standing need among users of analytical instruments: An inexpensive accessory instrument for use with standard recorders to automatically integrate test data with the inherent precision and accuracy of the recording instrument itself.

Check *and compare* the PX 592's remarkably low price and outstanding operating features . . . and you'll see why so many companies hail it as today's best buy.

- Can be used with any standard servo-drive recorder.
- Records both variable and integral with one pen (see chart above).
- Resets automatically at full-scale integral reading.
- Excellent long-term day after day repeatability.
- Built-in adjustable threshold minimizes noise and zero errors.
- Integral time constant is three days.
- Pipping pen may be used to display each reset.
- Continuous integral recording possible using 2nd pen.
- Special low-cost control unit available for automatic readout and reset.



For complete details,  
write for Bulletin No. 041.

**RIDGEFIELD  
INSTRUMENT GROUP**

a Schlumberger division

Ridgefield, Conn., P.O. Box 337, Idlewood 8-6571

conf., and Analytical Chemistry in Nuclear Reactor Technology, 5th conf., Gatlinburg, Tenn. (Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn.)

10-20. International Committee for Biological Control, Tunis. [P. Grison, Laboratoire de Biocénologie et de Lutte Biologique, La Minière, par Versailles (S.-et.-O.), France]

11-13. Gaseous Electronics Conf., American Physical Soc., Schenectady, N.Y. (C. J. Gallagher, General Electric Research Laboratories, Schenectady, N.Y.)

11-14. Tau Beta Pi Assoc., Cincinnati, Ohio. (R. H. Nagel, Univ. of Tennessee, Knoxville)

11-14. Western Inst. on Epilepsy, 13th annual conf., San Antonio, Tex. (F. Risch, 3097 Manning Ave., Los Angeles, Calif.)

12-13. Congress of Neurological Surgeons, New York, N.Y. (E. Weiford, 4706 Broadway, Kansas City 12, Mo.)

12-29. Pacific Intern. Trade Fair, 2nd, technical meetings, Lima, Peru. (PITF, P.O. Box 4900, Lima)

14-20. International Congr. of Neurological Surgery, 2nd, Washington, D.C. (B. S. Ray, 525 E. 68 St., New York 21)

15. American College of Dentists, Philadelphia, Pa. (O. W. Brandhorst, 4236 Lindell Blvd., St. Louis, Mo.)

15-20. American Inst. of Electrical Engineers, fall general meeting, Detroit, Mich. (E. C. Day, AIEE, 33 W. 39 St., New York 18)

15-20. International Congr. of Allergology, 4th, New York, N.Y. (W. B. Sherman, 60 E. 58 St., New York 22)

15-21. Pan American Congr. of Endocrinology, 5th, Lima, Peru. (M. San Martin, Av. Central 325, San Isidoro, Lima)

16-17. Engineering Writing and Speech, natl. symp., East Lansing, Mich. (J. D. Chapline, Philco Corp., 3900 Welsh Rd., Willow Grove, Pa.)

16-17. Ionization of the Air, intern. conf., Philadelphia, Pa. (I. C. Kornbluh, American Inst. of Medical Climatology, 1618 Allengrove St., Philadelphia 24)

16-18. American Soc., of Safety Engineers, Chicago, Ill. (A. C. Blackman, 5 N. Wabash Ave., Chicago 2)

16-18. Entomological Soc. of Canada and Entomological Soc. of Quebec, Quebec, Canada. (L. L. Reed, ESC, Neatby Bldg., Carling Ave., Ottawa, Canada)

16-18. Metallurgy of Beryllium, intern. conf., London, England. (Secretary, Inst. of Metals, 17 Belgrave Sq., London, S.W.1)

16-19. American Dental Assoc., Philadelphia, Pa. (H. Hillenbrand, 222 E. Superior St., Chicago 11, Ill.)

16-19. Vacuum Science and Technology, 2nd intern. congr., Washington, D.C. (W. M. Welch, Intern. Organization for Vacuum Science and Technology, 1515 Sedgwick St., Chicago 10, Ill.)

16-20. American Ornithologists' Union, Washington, D.C. (H. G. Deignan, U.S. National Museum, Washington 25)

16-20. American Soc. of Civil Engineers, New York, N.Y. (W. H. Wisely, 33 W. 39 St., New York 18)

16-20. Symposium on the Programming and Utilization of Research Reactors, Vienna, Austria. (Intern. Atomic Energy Agency, Room 2249, United Nations, New York, N.Y.)

17-19. Japan Conf. of Radioisotopes, 4th, Tokyo. (R. Suga, Japan Atomic Industrial Forum, Inc., No. 1, 1-Chome, Shiba Tamura-cho, Minato-ku, Tokyo)

18-20. Design of Experiments in Army Research, Development, and Testing, 7th conf. (by invitation only), Fort Monmouth, N.J. (F. G. Dressel, Army Research Office (Durham), Box CM, Duke Station, Durham, N.C.)

18-20. Optical Soc. of America, Los Angeles, Calif. (Miss M. E. Wurga, 1155 16 St., NW, Washington 6)

19-20. International Geophysics Assoc., 12th colloquium, Salzburg, Austria. (IGA, Freisaalgasse 31, Salzburg)

19-21. Indiana Acad. of Science, Terre Haute. (E. D. Weinberg, Dept. of Bacteriology, Indiana Univ., Bloomington)

20-21. Shallow Water Research Conf., Atlantic Coast, 1st natl., Baltimore, Md. (D. S. Gorsline, Oceanographic Inst., Florida State Univ., Tallahassee)

20-24. American Heart Assoc., annual, Miami Beach, Fla. (AHA, 44 E. 23 St., New York 10)

23-25. International Scientific Radio Union and Inst. of Radio Engineers, fall meeting, Austin, Tex. (Miss H. E. Hart, U.S.A. Natl. Committee URSI, 2101 Constitution Ave., NW, Washington 25)

23-25. Metallurgical Soc. of the American Inst. of Mining, Metallurgical and Petroleum Engineers, fall meeting, Detroit, Mich. (AIME, 29 W. 39 St., New York 18)

23-27. Metal Congr. and Exposition, 43rd natl., Detroit, Mich. (A. R. Putnam, American Soc. for Metals, Metals Park, Novelty, Ohio)

23-28. Congress of Chemical Engineering, 1st, San Juan, P.R. (R. Munoz, Apartado 47, Estación de Río Piedras, San Juan)

24-25. Shallow Water Research Conf., Gulf Coast, 1st natl., Tallahassee, Fla. (D. S. Gorsline, Oceanographic Inst., Florida State Univ., Tallahassee)

24-26. Aerospace Nuclear Propulsion, intern. symp., Las Vegas, Nev. (P. M. Uthe, Lawrence Radiation Laboratory, Univ. of California, Box 808, Livermore)

24-27. American Dietetic Assoc., 44th annual, St. Louis, Mo. (Mrs. T. Pollen, ADA, 620 N. Michigan Ave., Chicago 11, Ill.)

26-27. American Soc. of Tool and Manufacturing Engineers, Toronto, Canada. (A. Cervenka, Vanderbilt Blvd., Oakdale, L.I., N.Y.)

26-27. Instrumentation Facilities for Biomedical Research, symp., Omaha, Neb. (H. G. Beenken, Univ. of Nebraska College of Medicine, 42 and Dewey Ave., Omaha)

26-27. New Mexico Acad. of Science, Albuquerque. (K. G. Melgaard, P.O. Box 546, Mesilla Park N.M.)

26-28. Professional Group on Electron Devices, annual meeting, Washington, D.C. (I. M. Ross, Technical Program Chairman, Room 2A-329, Bell Telephone Laboratories, Murray Hill, N.J.)

26-30. American Soc. for Aesthetics, Detroit, Mich. (J. R. Johnson, Cleveland Museum of Art, Cleveland 6, Ohio)

27-28. Shallow Water Research Conf., Pacific Coast, 1st natl., Los Angeles, Calif. (D. S. Gorsline, Oceanographic Inst., Florida State Univ., Tallahassee)



## SIGMA IS PLEASED TO ANNOUNCE FURTHER PRICE REDUCTIONS

As you know, the Sigma Catalog is growing rapidly. New items are becoming available faster than we can compile them into our list. In fact hundreds of compounds remain unannounced simply because our control laboratory has not had the time to properly assay them.

Prices are reduced regularly so even our newest catalog becomes obsolescent immediately.

Some of the most important reductions are:

$\beta$ -DPN, Sigma Grade	Now only \$10.00	per gm
(Diphosphory Nucleotide)	6.00	per 500 mg
Close to 100 % Pure	3.60	per 250 mg
$\beta$ -DPNH, Sigma Grade	Now only \$24.50	per gm
(Diphosphory Nucleotide,	15.00	per 500 mg
Reduced Form)	9.00	per 250 mg
Almost 100 % Pure and	4.50	per 100 mg
substantially free of the		
$\alpha$ -Isomer		
TPN, Sigma Grade	Now only \$98.00	per gm
(Triphosphory Nucleotide,	35.75	per 250 mg
	10.75	per 50 mg
TPNH, Type I	Now only \$29.50	per 100 mg
(Triphosphory Nucleotide,	17.90	per 50 mg
Chemically Reduced Form)	10.75	per 25 mg
TPNH, Type II	Now only \$31.00	per 100 mg
(Triphosphory Nucleotide,	18.50	per 50 mg
Enzymatically Reduced Form)	11.10	per 25 mg
L-Arginine Decarboxylase	Now only \$3.85	per 100 mg
	20.00	per gm
L-Glutamic Decarboxylase	Now only \$5.00	per gm
	3.00	per 500 mg
Histidine Decarboxylase	Now only \$10.00	per gm
	3.60	per 250 mg
L-Lysine Decarboxylase	Now only \$5.00	per gm
	3.00	per 500 mg
2-Phosphoglyceric Acid	Now only \$53.00	per gm
Barium Salt, 80 % Minimum	6.25	per 100 mg
L-Tyrosine Decarboxylase	Now only \$10.00	per gm
	3.60	per 250 mg
Cytidine Diphosphate	Now only \$195.00	per gm
Sodium Salt, Sigma Grade	8.70	per 25 mg
Cytidine Triphosphate	Now only \$195.00	per gm
Sodium Salt, Sigma Grade	4.20	per 10 mg
Deoxy Cytidine-5'-Triphosphate		
Sodium Salt, Sigma Grade	15.00	per 10 mg
	Now only \$745.00	per gm

CALL US COLLECT AT ANY TIME, JUST TO GET ACQUAINTED

Day, Station to Station,  
PROspect 1-5750

Night, Person to Person,  
Dan Broida, WYdown 3-6418



The Research Laboratories of

# SIGMA CHEMICAL COMPANY

3500 DEKALB ST., ST. LOUIS 18, MO., U. S. A.

MANUFACTURERS OF THE FINEST BIOCHEMICALS AVAILABLE

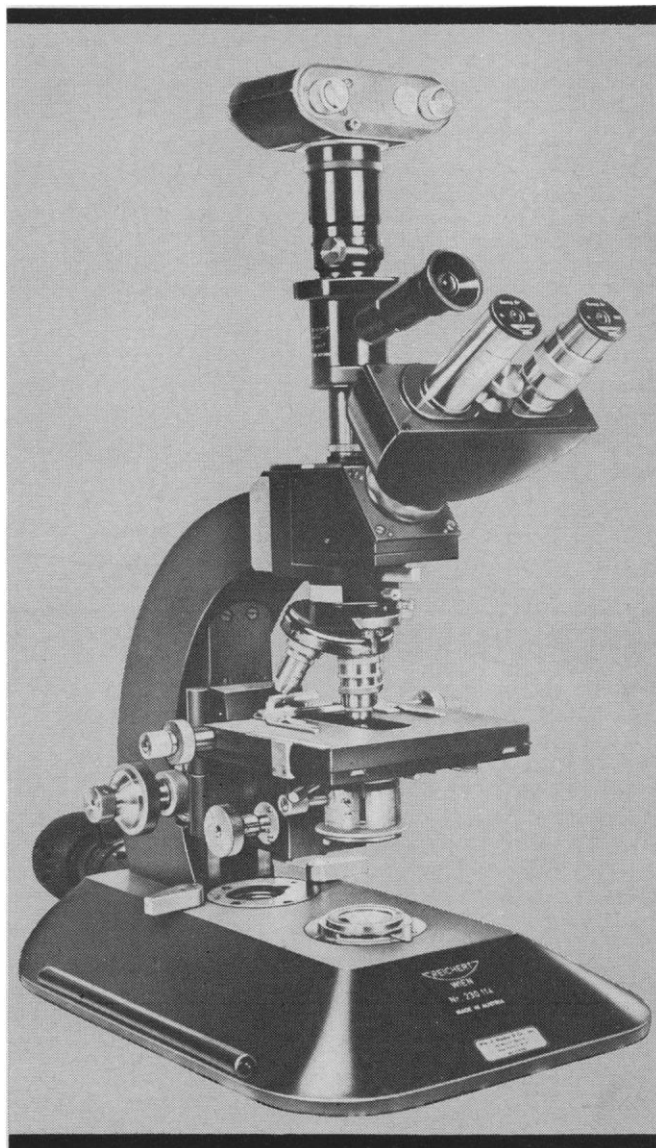


## DESIGN FOR RESEARCH

REICHERT

## ZETOPAN

A truly universal microscope for all microscopic investigations. Ingeniously designed for maximum working comfort and operational ease. All transitions are instantaneous, versatility unlimited. Built-in illuminating systems for transmitted, reflected and mixed light.



PHASE-ANOPTICAL CONTRAST ■ FLUORESCENCE AND CONTRAST-FLUORESCENCE MICROSCOPY ■ COMPONENTS FOR RESEARCH IN POLARIZED LIGHT AND FOR METALLOGRAPHY ■ MICRO-PROJECTION ATTACHMENT ■ CINE AND PHOTOMICROGRAPHY ■ UNIVERSAL CONDENSERS ■ COMPLETE RANGE OF ACHROMATIC, APOCHROMATIC, FLUORITE AND FIELD-FLATTENING OBJECTIVES

Ask for a demonstration or write for full particulars:

**WILLIAM J. HACKER & CO., INC.**  
P. O. BOX 646 • West Caldwell, N. J.



# Hamilton Microliter Syringes

Precision Syringes from  
1 ul to 500 ul

Here's the syringe that meets the demand of precision analysis by offering accuracy, greater sensitivity, speed and minute — yet accurate discharge. They're quality built, too, with individually fitted stainless steel plungers in precision bore NC glass to assure leak proof performance. By meeting critical demands, they have become the standard in gas chromatography, chemistry, biology and medicine.



FREE LITERATURE on Hamilton Microliter Syringes, just clip this ad to your letterhead and mail.



**HAMILTON COMPANY, INC.**  
P.O. Box 307-K, Whittier, California



*Just Published . . . . . 759 pages*

## ANNUAL REVIEW OF BIOCHEMISTRY

*Volume 30 (July 1961)*

### Other ANNUAL REVIEWS

ENTOMOLOGY	Vol. 6	Jan. 1961
PSYCHOLOGY	Vol. 12	Feb. 1961
PHYSIOLOGY	Vol. 23	Mar. 1961
PHARMACOLOGY	Vol. 1	Apr. 1961
MEDICINE	Vol. 12	May 1961
PLANT PHYSIOLOGY	Vol. 12	June 1961
PHYSICAL CHEMISTRY	Vol. 11	Sept. 1960
MICROBIOLOGY	Vol. 14	Oct. 1960
NUCLEAR SCIENCE	Vol. 10	Dec. 1960

*\$7.00 postpaid (U.S.A.); \$7.50 postpaid (elsewhere)*

Most Back Volumes Available

**ANNUAL REVIEWS, INC.**

231 Grant Avenue, Palo Alto, California

## SAVE TIME-CONSUMING WORK with this *NEW* universal instrument for AUTOMATIC ULTRAVIOLET MONITORING OF CHROMATOGRAPHIC ELUENTS

### UVISCAN CONTINUOUS FLOW UV MONITOR

*For Use with all Fraction Collectors*

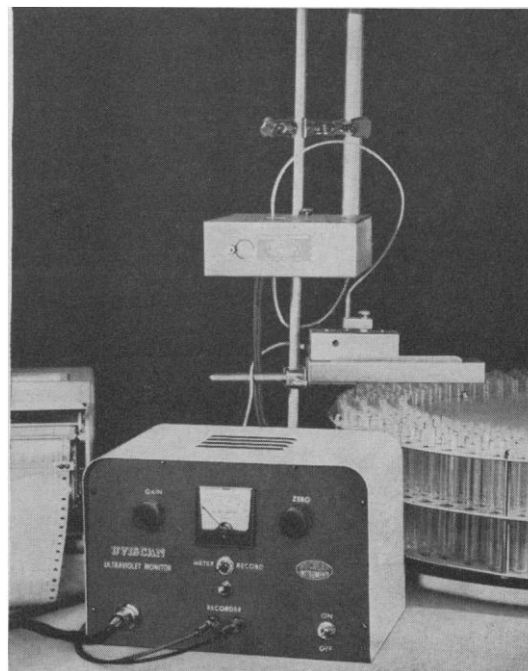
Through the use of automatic Fraction Collectors, more separations have been obtained in a given time. This creates the need for speedy identification of a particular compound in one specific test-tube among several hundred samples. UVISCAN identifies compounds with great accuracy and automatically indicates, on a recorded chart, the test-tube in which the desired compound is contained.

#### FEATURES

- Amplifier yields signal from as low as 0.05 to 4 Optical Density.
- Easily accessible Flow Cell with adjustable light-path from 1 to 10 mm.
- Minimum volume 0.125 ml.
- High Stability. During 24 hours the baseline will remain constant within 0.5 mv.
- Wave Length from 254 to 280 millimicrons.
- Linear or Logarithmic Recorders available.

#### RELATED EQUIPMENT FOR CHROMATOGRAPHY

- Complete line of Fraction Collectors: CONTINUOUS, SECTIONAL and REFRIGERATED.
- All-Teflon-and-glass Micropump.
- VARIGRAD — Density gradient device.



LABORATORY APPARATUS



**BUCHLER INSTRUMENTS, INC.**

514 West 147th Street, New York 31, N. Y.

ADirondack 4-2626

PRECISION INSTRUMENTS

REQUEST BULLETIN S3-4100  
FOR DETAILS

## New Products

**Digital voltmeter** measures from 100  $\mu$ v to 1.500 kv in five ranges. Display is by means of optical projection and is free from ambiguity; red and black backgrounds signify positive and negative inputs, respectively. Input impedance is 10 megohms except on the lower two ranges which have impedances of 1 and 0.1 megohm. Long-term accuracy is said to be  $\pm 0.1$  percent of full scale in each range. Two additional voltage ranges of 100 and 1000 v have input impedances of 100 megohms and accuracy  $\pm 0.5$  percent. Readout time is constant at 280 msec. Normally voltage is measured continuously. An adjustable dead zone permits jitter free readings in the presence of transients. Short or long time constant is selectable. The internal Zener reference can be preset to its precise value and corrected if necessary against a built-in Weston standard cell. A sampling mode of operation permits single voltage readings that remain on display until a succeeding sample is taken. (Solartron Laboratory Instruments Ltd., Cox Lane, Chessington, Surrey, England)

### Circle 1 on Readers' Service card

**Slide projector** is available with a zoom lens that permits up to 175-percent change in projection distance or picture size. Focal length is continuously variable from 3.75 to 6.5 in. The lens telescopes to fit the standard carrying case. (Bausch & Lomb Inc., Rochester 2, N.Y.)

### Circle 2 on Readers' Service card

**Excitation source** provides all necessary supply voltages and wave forms for designing, testing, and demonstrating *p-n-p* transistor switching circuitry. The instrument contains three regu-

lated power supplies, a square-wave generator, and output control switches. Two of the power supplies furnish, respectively, 0 to 15 volts, variable, regulated to 200 ma lead, and 12 volts, fixed, regulated to 100 ma lead. The third supply drives the square-wave generator over the range 0 to  $-12$  volts. The generator provides two square waves 180 deg out of phase with each other. Frequency is variable from 5 to 500 kcy/sec. Also available is a push-button pulse generator. (Navigation Computer Corp., Valley Forge Industrial Park, Norristown, Pa.)

### Circle 3 on Readers' Service card

**Synchro tester** is a portable instrument for testing aircraft and missile synchro-transmitter or indicator systems, or both. The instrument embodies a high-speed digital presentation which indicates directly in angle from electrical zero. Over-all accuracy is said to be  $\pm 3$  min when used either as a transmitter or receiver. A correction curve permits repeatability to 1 min accuracy. The unit has a self-checking electrical zero transformer with a zeroing adjustment to compensate for minor changes in temperature. (American Machine & Metals Inc., Sellersville, Pa.)

### Circle 4 on Readers' Service card

**Differential gaussmeter** employs dual Hall-effect probes to measure magnetic field gradient. The two probes are held parallel and at a fixed separation by a spacer. They are balanced in a reference magnetic field and can then be rotated at will in the earth's field without affecting the gradient measurement. Full-scale ranges from 0–0.1 to 0–20,000 gauss are covered in 17 steps. Both gradient and absolute field are indicated directly in gauss on a meter or can be fed into an external oscilloscope or recorder. Frequency response is d-c to 400 cy/sec. (Radio Frequency Laboratories, Inc., Powerville Rd., Boonton, N.J.)

### Circle 5 on Readers' Service card

**Spectrum analyzer** covers the frequency range 10 to 1180 Mcy/sec. According to the manufacturer, the analyzer is able to discriminate signals separated by as much as 80 db at 50 kcy/sec separation and by 90 db at 150 kcy/sec separation. Signal sensitivity better than 90 dbm is provided over the fundamental range, 10 to 68 Mcy/sec, and slightly reduced sensitivity is provided to 1180 Mcy/sec with harmonic operation of the local oscillator. Resolution is said to be 5 kcy/sec when signal levels are approximately equal. A built-in, 0.1- and 1-Mcy/sec crystal-controlled calibrator provides markers that allow calibration of the viewing screen at any spectrum-width setting. Photographic, *x-y*, and roll-chart recording facilities are available. (Lavoie Laboratories, Inc., Morganville, N.J.)

### Circle 6 on Readers' Service card

**Microwave tracking antenna mount** (Fig. 1) designed for field use has handwheels for manual tracking in azimuth and elevation. The mount is available with parabolic, helical beam, and horn antennas. (Automation Dynamics Corp., 255 County Rd., Tenafly, N.J.)

### Circle 7 on Readers' Service card

**Mass flowmeter** consists of a smooth-bore metal tube, a small heater coil, two temperature detecting elements, one downstream and the other upstream from the heater, and a temperature compensator. Heat is injected into the fluid through the wall of the tube and the liquid boundary layer. The down-

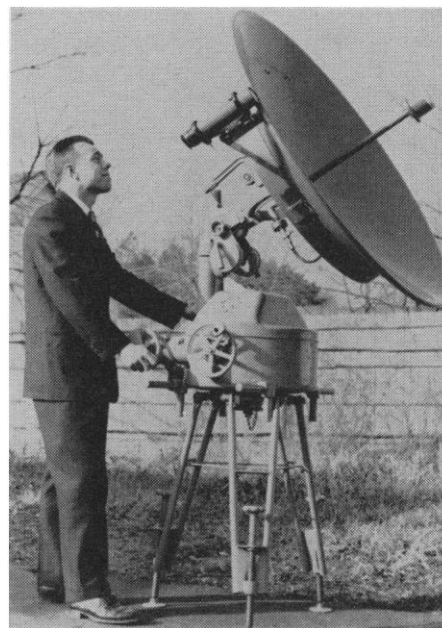
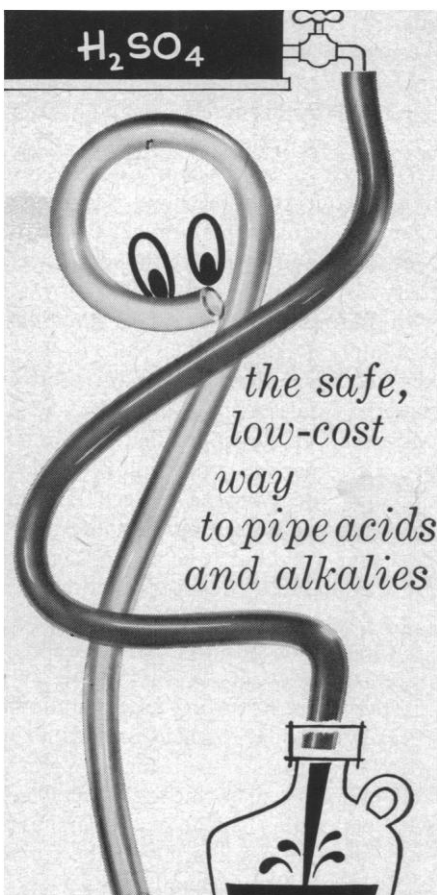


Fig. 1. Microwave tracking antenna mount.

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writer assumes responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on pages 423 and 497. Circle the department number of the items in which you are interested on this card.




**Nalgon**<sup>®</sup>  
PLASTIC TUBING


If the handling of corrosives has been giving you trouble . . . it's Nalgon vinyl plastic tubing to the rescue! This safe (excellent resistance to acids and alkalies), low-cost\* tubing is solving problems in industry, laboratory and hospital.

What else besides acid resistance? Plenty! Nalgon is amazingly flexible, extremely tough, non-toxic, non-contaminating, crystal clear and available in 40 diameters from 1/8" to 2" I.D.

**Write** Dept. No. 218N for additional information and sample. We welcome inquiries on applications of Nalgon to *your* specific problem.

\*For example, 1/4" I.D. costs less than 15¢ per foot.

 **VOPLEX** PRODUCT

 **THE NALGE CO., INC.**  
ROCHESTER 2, NEW YORK  
*The Quality Standard  
of Plastic Laboratory Ware*

stream thermometer measures the resultant temperature of the outside surface of the boundary layer; the upstream thermometer measures initial temperature. Minimum measurable flow is determined primarily by the internal tube diameter; maximum is determined by the effects of turbulence. Accuracy is said to depend on application with  $\pm 1$  percent being achievable. Operating temperature range is up to 500°F. (Flow Measurements Corp., 10506 Wheatley St., Kensington, Md.)

**Circle 8 on Readers' Service card**

**Wire bonder** (Fig. 2) is designed to bond a wire 0.0002 in. in diameter to a transistor stripe measuring 0.001 by 0.003 in. The wire is positioned on the stripe by maneuvering in the horizontal plane with joystick assemblies and in the vertical plane with a lever. A binocular microscope enables the operator to see the target. Positioning precision of 10 to 15  $\mu$ in. is said to be possible. (Kulicke and Soffa Manufacturing Co., 401 N. Broad St., Philadelphia, Pa.)

**Circle 9 on Readers' Service card**

**High-pressure pump** (Fig. 3) produces pressures up to 10<sup>5</sup> lb/in.<sup>2</sup> from air at 80 to 100 lb/in.<sup>2</sup>. The pump is a reciprocating type with an output of just over 6 in.<sup>3</sup>/min at 10<sup>4</sup> lb/in.<sup>2</sup>, falling to just under 2 in.<sup>3</sup>/min at 9 × 10<sup>4</sup> lb/in.<sup>2</sup>. Pressure is adjusted by means of an air control valve. Pressure may be raised gradually or the control valve may be set to produce the required pressure. The pump is enclosed in a safety cabinet with electrically interlocked doors. The pressure gage is viewed through mirrors. (Charles S. Madan & Co., Ltd., Vortex Works Broadheath, Altrincham, England)

**Circle 10 on Readers' Service card**

**Seismic timer and blaster** permits determination of depth to bedrock. Determinations to 100 ft can be made with the timer when an instrumented sledge hammer is used to generate seismic shock waves. The blaster, which greatly extends the range, is a battery-operated, capacitor-discharge type. (Dynametric, Inc., 2965 E. Colorado Blvd., Pasadena, Calif.)

**Circle 11 on Readers' Service card**

**Magnetic-memory drum**, the size of a baseball, has a capacity of 358,000 bits with a storage density of 600 bits per inch. Magnetic heads used to store and pick up data are floated on a

0.0001-in. thick film of air on the surface of the drum. The drum, which rotates at about 10,000 rev/min, is suspended on air bearings. Access time is reduced by using a one-word loop. (Sperry Gyroscope Co., Great Neck, N.Y.)

**Circle 12 on Readers' Service card**

**Ball and socket joints** of glass use O-rings on the inner member to effect a vacuum-tight seal and are said to require no lubrication. Tubes may be joined within 10° of axial center and may be secured with a standard metal ball and socket clamp. The inner joint member can also be used in combination with standard ground sockets. (California Scientific Glass Co., 9811 E. Rush St., El Monte, Calif.)

**Circle 13 on Readers' Service card**

**Automatic sampling machine** (Fig. 4) withdraws a measured volume of the sample from a test tube placed in a locator and transfers the sample with a measured volume of reagent into an empty test tube. To prevent contamination, the sampling pipette automatically follows the lowered liquid level in its downward movement so that only the tip is wetted. As a further precaution, each sample is flushed from the pipette with the reagent. Both the volume of sample and the volume of reagent are preset by the operator. (National Instrument Co., Inc., 4119 Fordleigh Rd., Baltimore 15, Md.)

**Circle 14 on Readers' Service card**

**Recorder control** can be used with commercially available potentiometric recorders to set the recorder to any of 15 voltage ranges and any of 15 current ranges, and to change the setting while recording. Auxiliary circuits permit reversal of polarity and check of recorder zero without disturbing or disconnecting the input signal or the recorder. No modification or adjustment of the recorder or the control is required to change from one recorder to another. Ranges are 10 mv to 500 v, and 10  $\mu$ a to 500 ma, full scale, on a 10-mv recorder. Output resistance as seen by the recorder is 1000 ohms (max.). Input resistance for voltage measurement is 100 kohm per volt of decade switch setting, 1 megohm/volt with a 1-mv recorder; for current measurement, input resistance is 1000, 100, or 10.0 ohms, depending on decade switch setting. (Cahn Instrument Co., 14511 Paramount Blvd., Paramount, Calif.)

**Circle 15 on Readers' Service card**



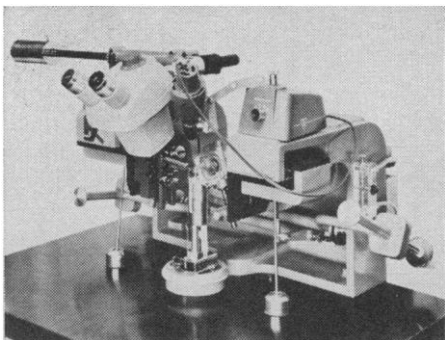


Fig. 2. Wire bonder.

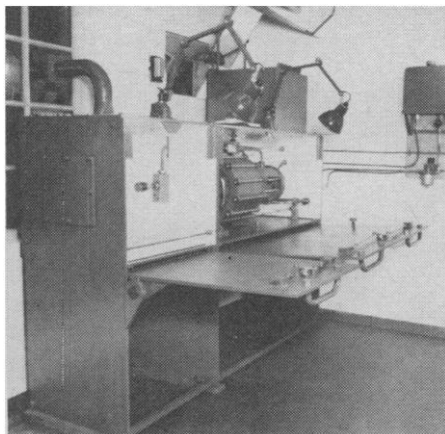


Fig. 3. High-pressure pump.

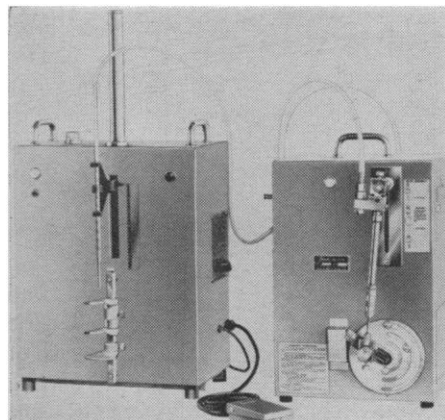


Fig. 4. Automatic sampling machine.

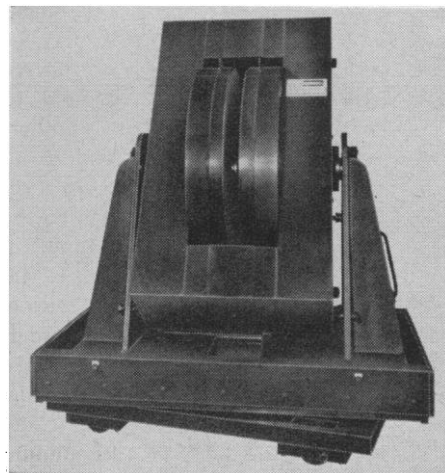


Fig. 5. Electromagnet.

**Differential conductivity meter** is designed to measure, indicate, and transmit to a remote recorder the difference in solution conductivity at any two locations. Independent temperature compensation is provided for the cells at the two locations. The instrument incorporates two complete and independent self-balancing Wheatstone bridges. Three indicating scales are provided, two for the individual conductivities and one for conductivity difference. Electrical or pneumatic transmitters can be provided for remote recording. Temperature compensators may be manual or automatic. (Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, N.J.)

Circle 16 on Readers' Service card

**Electromagnet** (Fig. 5) provides a field of 51.5 kgauss with 1/2-in. gap and 1 1/2-in. diameter pole pieces. Distance between coils as well as gap can be varied. Pole tips may have a maximum diameter of 18 in. A field of 40 kgauss is attained with 1-in. gap and 6-in. diameter tips; 35 kgauss with 2-in. gap and 6-in. tips; 10 2/3 kgauss with 4-in. gap and 18-in. tips. Maximum power is 200 kw with low-impedance coils and 12 kw with high-impedance coils. Vertical and horizontal rotation are provided. (Pacific Electric Motor Co., 1009 66th Ave., Oakland, Calif.)

Circle 17 on Readers' Service card

**Strip-chart recorder** of the moving-coil type is said to be accurate within  $\pm 1$  percent. The writing system may be ink pen, hot wire, or electrosensitive paper. Standard chart speeds of 1/2, 1, 6, or 12 in./hr or in./min may be changed by replacing wheels in a gear train. Dual-speed chart mechanisms are also available. A variety of voltmeter and ammeter ranges are available for both a-c and d-c. Response time is said to be about 0.6 sec. (Atkins Technical Inc., 1276 W. Third St., Cleveland 13, Ohio)

Circle 18 on Readers' Service card

**Annunciator display** has a capacity of 60 messages that may be displayed individually or in combination. The device operates on a rear-projection principle providing 60 lenses that are used for data or color background. The display features one-plane presentation. Overall size is 5 1/4 by 12 by 16 1/2 in. (Industrial Electronic Engineers, Inc., North Hollywood, Calif.)

Circle 19 on Readers' Service card

*NOW*  
the  
accuracy  
of glass  
in  
breakproof  
Nalgene®  
graduates

*Nalge makes them unbreakable . . . and keeps making them better! New Nalgene graduated cylinders feature calibration to best glass standards, in accordance with federal specifications.*

New Nalge techniques give you accuracy never before possible in plastic, or even in glass, because now for the first time graduates can be *molded* to absolute uniformity *every time*. You get finer calibration lines than ever before. Meniscus is flat, easy to read. Non-wetting walls contain and deliver the same amount of solution every time.

Corrosion resistant, of course. Virgin polypropylene throughout, with stable octagonal base. No more loss of valuable contents and no dangerous acid splash through breakage. So next time you break a glass graduate, replace it with Nalgene—complete line of sizes from 25 to 2000 ml. Ask your laboratory supply dealer.

#### Accuracy tested, accuracy proved!

A random sampling by a nationally-known testing laboratory\* shows new Nalgene graduates to be well within National Bureau of Standards Class A specifications for accuracy. Actual calibrations found in tests on 50 ml graduates:

Capacity, ml.	10.00	20.00	30.00	40.00	50.00
Nalgene Instrument No. 12	10.01	19.99	29.86	39.92	50.01
Nalgene Instrument No. 13	10.04	19.99	29.87	39.88	49.92
Nalgene Instrument No. 14	10.07	20.03	29.89	39.87	49.97

\*Name and data on request.

New complete line catalog.  
WRITE Dept. 218.



**THE NALGE CO., INC.**  
ROCHESTER 2, NEW YORK

The Quality Standard of Plastic Laboratory Ware

**Temperature transducers** designed to be resistant to damage by nuclear radiation use tungsten as the resistance element. Operating temperature range is  $-325^{\circ}$  to  $+500^{\circ}\text{F}$ . Element resistances up to 1000 ohms at  $+32^{\circ}\text{F}$  are available. Accuracy is said to be  $\pm\frac{1}{2}^{\circ}\text{F}$ , and repeatability to be within  $\pm 0.05$  percent of resistance value measured at  $77^{\circ}\text{F}$ . Response time is approximately 0.4 sec for 63 percent of final resistance value. Transducer tube lengths up to 18 ft can be supplied, and sensing element diameters as small as 0.1 in. and sensitive length of 0.5 in.

are available. Construction material in addition to tungsten includes alumina and 304 stainless steel. (Winsco Instruments & Controls, 11789 W. Pico Blvd., Los Angeles 64, Calif.)

Circle 20 on Readers' Service card

**Composite seal** is a stainless-steel V-ring combined with a fluorocarbon-plastic seal. The composite is designed to operate at temperatures from  $-65^{\circ}$  to  $+600^{\circ}\text{F}$ . The units are re-usable. (Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.)

Circle 21 on Readers' Service card

**Microfilm recorder** is actuated by information supplied by a computer to make multiview drawings of parts to be fabricated. Once the engineering specifications for the part are fed in, the computer can be asked to produce drawings of any view or cross section of the part in three dimensions. The same computer code used to produce the drawings can also be used to produce tapes for operation of automatic production equipment. Information is recorded on 35-mm microfilm. Printing is accomplished by photographing displays on the face of a Charactron shaped-beam tube. An accessory unit permits automatic processing and projection of the film on a 2- by 2-ft screen within 8 sec. (Stromberg-Carlson Div., General Dynamics Corp., P.O. Box 2449, San Diego 12, Calif.)

Circle 22 on Readers' Service card

**Binary-coded decimal-to-decimal converter** is the first of a series of modular solid-state devices constructed by simultaneous fabrication of multi-element components. The device contains 40 silicon diodes and is designed to drive an indicator tube directly from binary-coded inputs. In the manufacture of the units, a single silicon wafer is diffused to form a large planar diode. From this wafer, as many elements as desired are simultaneously fabricated in a specific pattern. The resulting array is joined to a circuit plate. (Burroughs Corp., Plainfield, N.J.)

Circle 23 on Readers' Service card

**Strain-gage auxiliary instrument** is a miniature device that contains a signal amplifier, power supply, bridge-balance circuits, and calibration circuits. The latter can be programmed from a remote source. Four reference points are provided, and polarity of the calibration can be reversed to simulate compression or tension of a strain gage. Signals are amplified to a maximum output of  $\pm 5$  volts d-c., and output impedance is 350 ohms. (Video Instruments Co., 3002 Pennsylvania Ave., Santa Monica, Calif.)

Circle 24 on Readers' Service card

**Cryogenic thermometer** measures temperature in the range of  $0.3^{\circ}$  to  $25.0^{\circ}\text{K}$ . The instrument operates by measuring mutual inductances as small as  $2 \times 10^{-4}$  by use of an a-c bridge circuit and ruby crystals. Bridge current is supplied by a modular signal generator tuned to 155 cy/sec. Bridge output is amplified by a transistorized narrow-



## Gives reproducible results, bottle after bottle

Take one set of results you got with Du Pont Nitric Acid Reagent. You can change bottles, shipments or locality, and you'll reproduce the same results—time after time! That's because Du Pont continuously runs this reagent through 113 separate analytical tests to keep it uniform for your most stringent requirements.

It's of uniformly high purity, too, exceeding American Chemical Society requirements. And you get the convenience of single-trip cartons, dripless sleeves, safety grips on 5-pint bottles and color-coded caps and labels.

Du Pont's family of reagents includes Nitric, Sulfuric, Hydrochloric and Glacial Acetic acids, and Ammonium Hydroxide. They're readily available all over the country. Ask your local laboratory supply house or write for list of suppliers. Industrial and Biochemicals Department, N-2545 S, Wilmington 98, Delaware.



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

# PHOTOVOLT

## Electronic pH METERS

### Two-way pH Meter Model 85

- Single range 0-14, scale length 3", readable to 0.05 pH Unit.
- Available — compact battery pack for field use (\$38.00 addtl.).
- Fully stabilized, simple, usable with all types of electrodes.

Write for Bulletin #195

**\$135**



A complete line of pH meters, incorporating permanently frictionless taut-suspension indicating meters, modern electronic tubes and circuits. Simple in operation and maintenance; featuring sealed amplifier plug-in units.

### High Precision pH Meter Model 110

- Single range 0-14, scale length 7", readable to 0.02 pH unit.
- Temperature control 0-100° C., voltage selector for 80-260 volts.
- Available — carrying cover and baseboard for bottles, beakers.

Write for Bulletin #105

**\$235**



### Standard Laboratory pH Meter Model 115

- Single range 0-14, scale length 4", readable to 0.05 pH unit.
- Temperature control 20-100° C., available with carrying case.
- Additional millivolt scale for redox measurements and titrations.

Write for Bulletin #225

**\$175**



### Portable pH Meter Model 125

- Single range 0-14, scale length 5½", readable to 0.03 pH unit.
- Only 3 batteries, standard radio type, 2,000 hours of service.
- Available — carrying frame for instrument, beakers, bottles.

Write for Bulletin #118

**\$195**



### Tester Model 25 for Checking and Adjusting pH Meters

A compact, inexpensive instrument without batteries; for checking performance of PHOTOVOLT and other pH meters. Requires neither electrodes nor buffers. Write for Bulletin #138

**\$68**

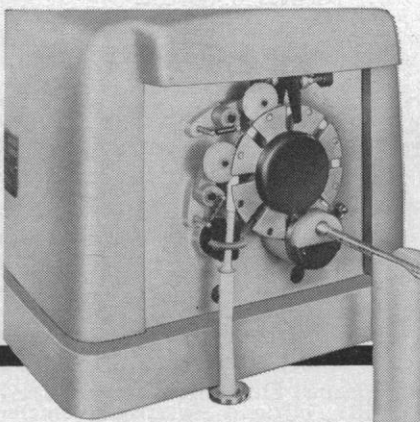
**PHOTOVOLT  
CORPORATION**  
1115 Broadway, New York 10, N. Y.

## NOW...MECHANICALLY, COTTON PLUG UP TO 2400 PIPETTES PER HOUR

# Bellco

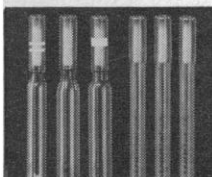
presents...the

## HARRISON PIPETTE PLUGGER



- Cotton plugs pipettes up to 2400 per hour
- Consistently uniform cotton plugs
- Versatile—accepts full range of standardized cotton plugging pipettes without adjustment
- 3-speed control
- Compact — requires little floor space

NOTE  
UNIFORMITY OF  
COTTON PLUGS

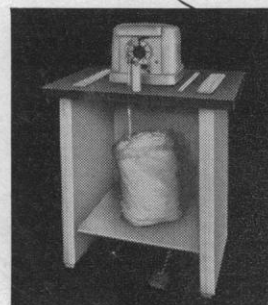


The Harrison Pipette Plugger eliminates the slow, tedious job of hand stuffing cotton in pipettes. An experienced operator can plug pipettes up to 2400 per hour, with each cotton plug absolutely uniform in size. Cotton plugging speeds adjustable to 22, 30 or 40 pipettes per minute. The Harrison Pipette Plugger can be used over a full range of standardized cotton plugging type pipettes *without adjustment*, including the following pipettes: Bellco V.I.P. 12-334, Corning 7086, and Kimble 37034A. Other pipettes having identical top dimensions and tolerances as these will also be satisfactory. However, conventional pipettes can be reworked and shaped to the cotton plugging top dimensions . . . if they are of borosilicate glass.

The Harrison Pipette Plugger is mounted on a sanitary work surface featuring a semi-enclosed base. A shelf beneath the table holds the cotton roving, which is fed through a special opening in the table.

WRITE FOR BULLETIN NO. P-50-1 S

**BELCO GLASS INC. VINELAND, N. J.**





now, a  
completely  
automatic  
electronic  
control  
laboratory  
furnace

**THERMOLYNE**



## THERMOLYNE TYPE 2000

Just dial desired temperature. This electric furnace, specifically designed for laboratory use, automatically holds preset temperatures within close limits by means of a potentiometric control system. Practically immune to vibration, dust, dirt to give long, trouble-free service. Rigid, braced construction . . . long-life heating elements embedded in interchangeable plates that give fast, even heat distribution. Chamber surrounded by high-grade, multiple-type insulation. Chamber size 4" x 3 3/4" x 9". Operating temperatures to 1650°F continuous, 1900°F intermittent. 115 and 230 volts. Price complete, \$247.50. Write for literature and name of nearest dealer.

**THERMOLYNE CORPORATION**

568 Huff St., Dubuque, Iowa

band amplifier. Measurements are said to require no special compensation and can be read directly on a calibrated scale. (Malaker Laboratories, Inc., Mountainside, N.J.)

### Circle 25 on Readers' Service card

Cadmium-sulfide **photoconductive cell** features a dark current of 2.5  $\mu$ a and an average cell current of 10 ma with 5.0 ft-ca illumination of 2700°K color temperature. Dissipation rating is 1 watt. The cell is a side-sensitive device mounted in a hermetically sealed glass envelope with conventional seven-pin miniature base. (Amperex Electronic Corp., 230 Duffy Ave., Hicksville, N.Y.)

### Circle 26 on Readers' Service card

**Solid-state radiation detectors** are semi-conductor devices sensitive to protons, electrons, deuterons, alpha particles, and high-energy heavy particles. A shallow, reversed bias *p-n* junction in silicon is used to attain high energy resolution, fast response, and linearity of pulse height with particle energy over a specified energy range. The width of the depletion area determines the sensitive volume of the detector. Output is proportional to the energy deposited within the depletion region and is independent of the mass of the particle. A variety of performance specifications is available in each of three sizes. (Hughes Aircraft Co., P.O. Box 90515, International Airport Station, Los Angeles 45, Calif.)

### Circle 27 on Readers' Service card

**Diode tester** is a back-current and saturation-voltage tester with a voltage range from 0 to 3000 v in four steps and a current range from 0 to 100  $\mu$ a in four steps. Regulation is said to be better than  $\pm 0.1$  percent; ripple and noise, 0.05 percent. (Trans Electronics, Inc., 7349 Canoga Ave., Canoga Park, Calif.)

### Circle 28 on Readers' Service card

**Infrared spectrophotometer**, model 421, uses two gratings to cover the spectral range from 4000 to 550 wave numbers. Each grating is used only in its first order. Overlapping orders are eliminated by four filters automatically inserted into the radiation beam. The two gratings are mounted back to back. At the crossover point, 2000 wave numbers, scanning halts briefly, and the second grating rotates into position. If desired, abscissa scale change may also occur automatically at this point. The

crossover occurs without gaps or overlapping and without shift in wave-number indication. Scanning rate can be varied from 65 sec for the entire range to 4.5 min per wave number. Accessories developed for use with other instruments can be used with model 421. Wavelength coverage of the far infrared can be added by suitable prism interchanges. (Perkin-Elmer Corp., Norwalk, Conn.)

### Circle 29 on Readers' Service card

**Nuclear methods** are used to measure soil moisture and density with equipment composed of a counting unit and a moisture or density probe which contains radioactive material and a detector system. Measurements are performed by inserting the probe in, or placing it on, the material being tested and reading the portable counter. The equipment does not require an AEC license. (Testlab Corp., 3398 N. Milwaukee Ave., Chicago 41, Ill.)

### Circle 30 on Readers' Service card

**Digital clock** furnishes a binary-coded output of the day, hour, and minute, provided by contact closures. Visible readout is also provided. Basic timing pulses are formed by a cam-microswitch arrangement driven by a synchronous motor to produce minute counts. Stepping switches then form a logical time counter with appropriate carries. Each digital output consists of four binary bits that may be arranged in any desired code. Stepping the switches takes 2 sec of each minute during which an inhibit signal prevents ambiguous readings. (Electro-Logic Corp., 515 Boccaccio Ave., Venice, Calif.)

### Circle 31 on Readers' Service card

**Coaxial tuner** is designed for use in the frequency range 1.0 to 10 Gcy/sec (kMcy/sec). The tuner consists of a strip line section with a rail-guided carriage upon which an adjustable probe is mounted. Length of the tuner is 11.5 in.; carriage travel is 7.5 in. Voltage-standing wave ratio as high as 10:1, and of any phase, can be matched to 1.00. Radio-frequency leakage has been minimized by means of a poly-iron choke mounted along the tuner slot. Insertion loss is less than 1 db when a mismatch of 3:1 is corrected. (FXR, Inc., 25-26 50 St., Woodside 77, N.Y.)

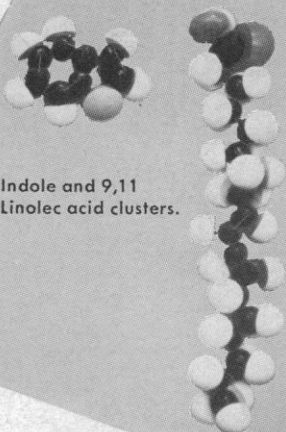
### Circle 32 on Readers' Service card

JOSHUA STERN  
National Bureau of Standards,  
Washington, D.C.

## Godfrey MOLECULAR MODEL KIT



Indole and 9,11  
Linoleic acid clusters.



*Plus*

### NEW SUPPLEMENTARY MODELS for Researchers, Teachers, Students

Godfrey molecular models give best representation of van der Waals' and covalent radii—a true picture of steric hindrance. Models of small ring compounds and bicyclic compounds easily made. Show flexibility and resilience of actual molecules.

**NEW** Supplementary Atoms: 15 new atoms just designed—35 elements may be represented in 65 valence states, using only 26 different atoms.  
*Write for Full Details*



**BRONWILL SCIENTIFIC**  
A Division of Will Corporation

275 No. Goodman St.

• Rochester 7, N. Y.

**DIFCO**

## Dehydrated Culture Media DIFCO

The utmost in efficiency and economy in the bacteriological laboratory is realized through use of Dehydrated Culture Media, Difco.

Convenience—any medium can be instantly prepared.

Stability—media can be kept without deterioration.

Availability—each medium is instantly available.

Completeness—no additional ingredients are required.

Uniformity—successive lots are identical.

Comparability—dependable, comparative studies are possible in widely separated laboratories over long periods of time when standardized Difco Products are employed.

*Specify "DIFCO"*

**DIFCO LABORATORIES**  
**DETROIT 1, MICHIGAN**

## NOW...prepare serial dilutions 4 times faster

WITH THE NEW

*Filamatic®*

## SAMPLE DILUTER

### AUTOMATICALLY

**ASPIRATES** a measured volume of the sample

**PIPETTES** a measured volume of diluent

**MIXES** and dispenses the two liquids

**WASHES** out all trace of the sample at the completion of the cycle

### EXCLUSIVE FEATURES

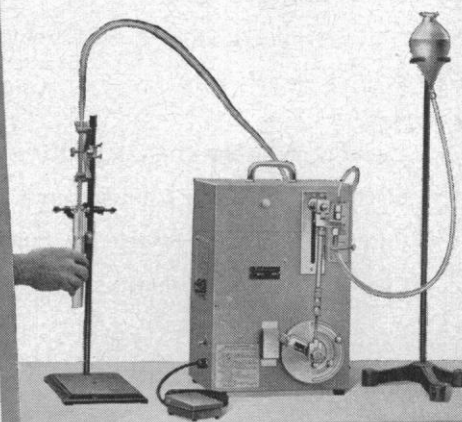
1. INSTANT CALIBRATION... read volume of aspirated sample on the pipette graduations
2. AUTOMATIC AIR PURGE... instantly eliminates all air bubbles from the system
3. ELECTRONICALLY CONTROLLED... press a foot switch to aspirate sample... once again to dispense sample and diluent
4. SAMPLE CONTACTS ONLY a glass pipette
5.  $\pm 0.001$  ml accuracy

U. S. and Foreign Patents Pending.

Call your laboratory supply dealer today for a free, no obligation demonstration... or write for complete data to:

**NATIONAL  
INSTRUMENT  
COMPANY, INC.**

4121 FORDLEIGH ROAD  
BALTIMORE 15, MD, U.S.A.



# Automatic Protein and/or Peptide Analyses

(Either Individual Samples or Column Effluent)

## Quantitate...

Total Nitrogen by Kjeldahl

Total Protein by Biuret

Total Protein by Folin—Ciocalteu  
(Lowry modification)

Amino Groups by Ninhydrin

Tyrosine by Folin—Ciocalteu

Histidine by Pauly Diazo Reaction

Arginine by Sakaguchi

Glutamic Acid by Decarboxylase

Lysine by Decarboxylase

Albumin by HABA Dye  
[2-(4' hydroxyazobenzene) benzoic acid]

## Analyze...

Biological Fluids directly

Effluent from DEAE or Resin Chromatographic  
Column

Effluent from Poraeth Electrophoretic Column

Electrophoretic Starch Block Fractions

Electrophoretic Paper Chromatogram Segments

Check point stages in Protein Fractionation

Counter Current Distributions

with the **TECHNICON®**

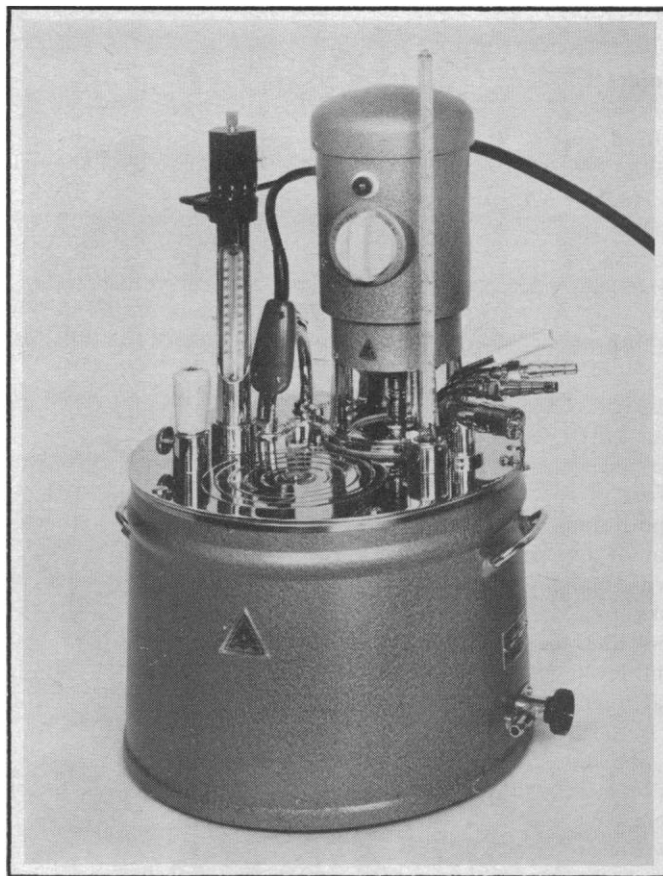
# AutoAnalyzer®

Any or all of these determinations may be run on the same AutoAnalyzer: Takes only two minutes to change from one type of analysis to another. Any combination may be run simultaneously from the same sample by adding additional standard AutoAnalyzer modules. The response time is such that most of the analyses may be run at 40 samples per hour.

for information, select area of interest and write to

**TECHNICON CHROMATOGRAPHY CORP.**  
42 RESEARCH PARK • CHAUNCEY, NEW YORK

# CONSTANT TEMPERATURE CIRCULATORS



## EXCLUSIVE FEATURES:

- 1) Electronic "fine" temperature setting control in addition to magnetic setting contact thermometer. For the first time permits **reproducible** temperature settings to 0.01°C
- 2) Combined pressure/suction pump
- 3) Valve for continuous (from 0 to maximum) control over the rate of circulation.
- 4) Drain valve eliminates pouring
- 5) Building block design permits complete disassembly without tools
- 6) Carrying handles
- 7) Three heater ranges

for all your temperature control problems  
between -80°C and +300°C, contact:

**L**auda Instruments, Inc.  
P.O. Box 422 Great Neck, N.Y.

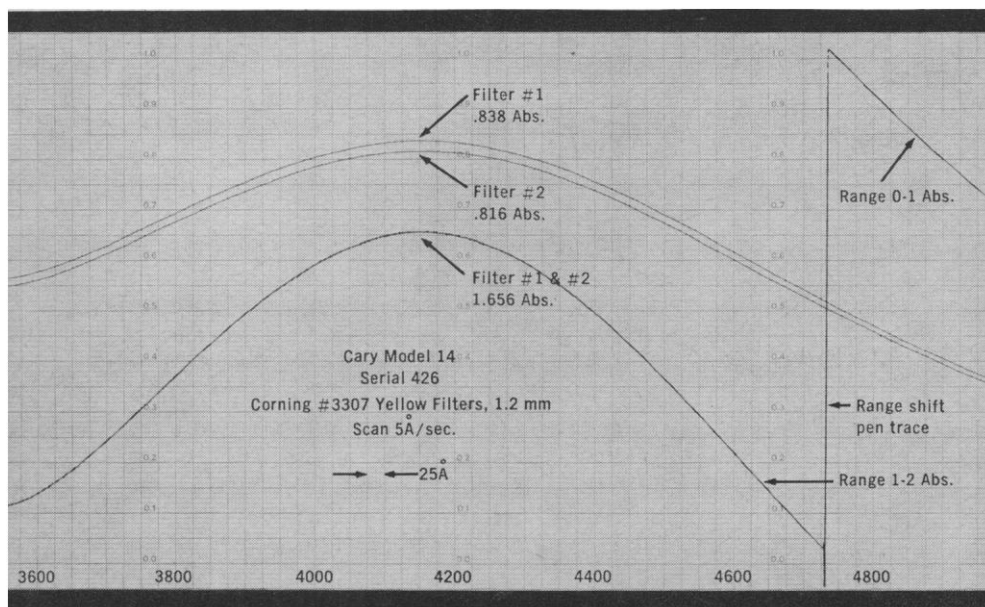


**NO. 3**

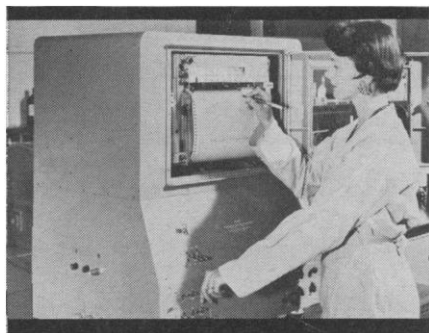
DATA SERIES Evaluating Spectrophotometer Performance

## PHOTOMETRIC ACCURACY and REPRODUCIBILITY:

The precision to which the instrument measures the absorbance of a sample (accuracy) and repeats this measurement (reproducibility).



**Cary Model 14 records spectra  
accurate and reproducible to .002  
at 1.0 absorbance  
unit, to .005 at 2.0**



High photometric accuracy and reproducibility are essential to provide reliable data for correctly interpreting scientific studies. These features also are of prime importance in control analyses where product quality or important production decisions are based on analytical results.

The *high photometric accuracy* of the Cary Model 14 is illustrated by the above spectra of two Corning #3307 filters, 1.2 mm thick, which were measured separately and in combination. The individual absorbance values of filter #1 plus filter #2 were compared with the observed absorbance value of the combination. As shown on the record, the Model 14 measured the combined absorbance of the filters to *within .002 absorbance*, equivalent to .01% at 2% transmittance. With the superior performance of the Model 14, along with proper sample handling technique, an analytical accuracy of .2% may be obtained on concentration determinations.

The *excellent photometric reproducibility* of the Cary Model 14 is illustrated by the curve for the filter combination which is actually three superimposed records.

Photometric accuracy and reproducibility are just two of several important criteria on which spectrophotometer performance should be based. Others include: Resolution; wavelength accuracy and reproducibility; stray light. Because the Cary Model 14 excels in each of these performance criteria, it is regarded as the finest instrument of its kind. A descriptive brochure is yours for the asking. Write for data file E23-81

for Kotzebue was 19 mi/hr. Since wind velocity has a decisive effect on fallout distribution, the AEC estimates of the fallout pattern must be in error.

3) Although fallout on the ground in northern Alaska from past nuclear tests is very low compared to that in temperate zones, the  $\text{Sr}^{90}$  levels of caribou and of the few Eskimo bones that have been analyzed thus far are much higher than the values for cattle and people in temperate United States. The CNI bulletin reports data which show that this is due to the unusual mineral nutrition of lichens. This remarkable situation is not mentioned in the AEC report, though we were pleased to learn recently that the responsible officials are now taking steps to institute a research program on the problem.

4) The CNI bulletin contains eight pages of detailed discussion, written by the biologists who investigated the problem for the AEC, of the unusual food chain in the Arctic (lichen-caribou-man). This discussion shows that predictions of biological  $\text{Sr}^{90}$  distribution based on the temperate-zone food chain (grass-cow-milk-human) do not apply to Alaska. Nor is the ecological behavior of  $\text{Sr}^{90}$  in tropical environments applicable to Alaska. Nevertheless, the AEC report on Project Chariot states that "possible radiation effects upon the biota of the Chariot site have been estimated from the Nevada Test site and the Pacific Proving ground data" (p. 55).

Margolis states that AEC officials believe "that the CNI assertion that the  $\text{Sr}^{90}$  yield might be ten times greater than the AEC believed likely was based on misreading of an AEC sponsored study. The study gave 5 percent as the most probable portion of the total radioactive yield that might get into the fallout." Margolis himself finds fault with the CNI conclusion and endeavors to show that at most the AEC estimate of fallout is low by a factor of 4 rather than by the factor of 10 suggested in our bulletin. As stated in the CNI report, the factor 10 is derived from two sources: a possibly fivefold underestimation by the AEC on the vented yield (which is explained above) and an estimated twofold error regarding the pattern of fallout deposition. The factor of 5 has been discussed already. The other factor of 2 can arise if the winds at the Chariot site are stronger than the values used in AEC estimates of the fallout pattern. Stronger winds could blow more of the fallout away from the immediate site (which can be

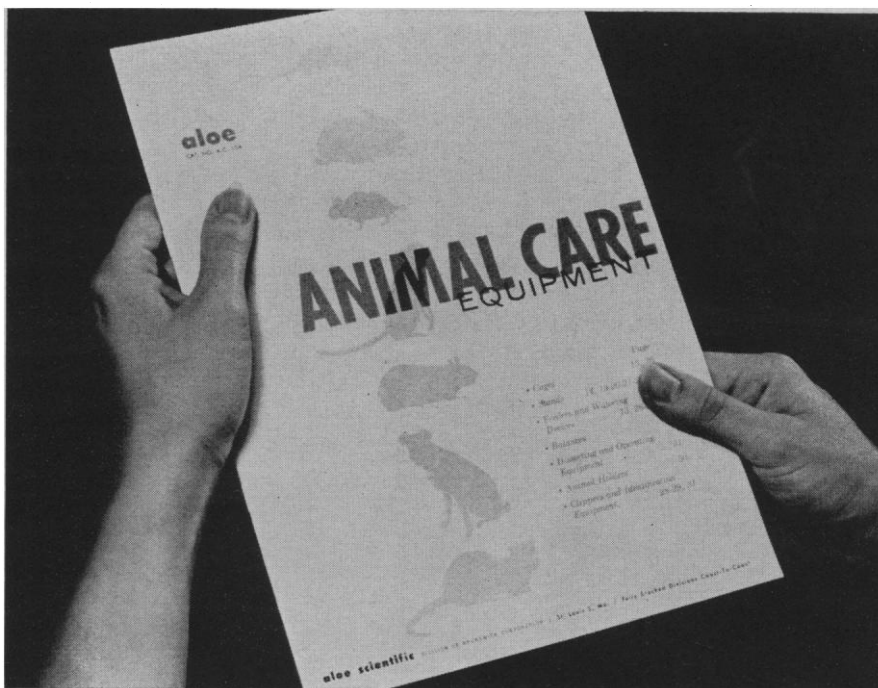


INSTRUMENTS

**APPLIED PHYSICS  
CORPORATION**  
2724 South Peck Road  
Monrovia, California

closed off from animals) and further downwind where it becomes accessible to the food chain. Of course, if the intensity downwind should rise the intensity at the site must drop accordingly, but for the reasons stated we are mainly concerned with some distances downward from the site. It seems reasonable that these effects could increase the AEC estimate of the downwind deposition of fallout by a factor of 2, because the wind velocities at the Chariot site tend to be significantly higher than the value used in the AEC estimate.

Margolis states on his own authority that "As it happens, the exposure from habitual television watching, or from current levels of fallout, is roughly the same as the exposure the 700 Eskimos might receive if pessimistic assumptions about the absorption of  $Sr^{90}$  are correct." Now, this sentence would be roughly correct if Margolis had added as an important condition, that the statement refers only to the effects of these three sources of radiation on the gonads. If Margolis were to amend his statement in this way it would then be technically correct, but still quite misleading to a reader interested in comparing the relative risks to his health from these three sources, because it fails to mention the risks to the bone marrow from these sources of radiation. It is an elementary fact now well established in the relevant literature that the risk from fallout radiation is of two kinds: (i) a genetic risk of deleterious mutations due to exposure to the gonads, and (ii) a somatic risk (from leukemia and other forms of cancer) due chiefly to irradiation of the bone marrow. The gonadal exposure is due to cesium-137; the marrow exposure is due to  $Sr^{90}$ . All published comparisons [see for example, the report of the British Medical Council, *The Hazards to Man of Nuclear and Allied Radiations* (Medical Research Council, HMSO, London, 1956)] of the radiation risk from television watching and from fallout refer only to gonadal exposure for the simple reason that while television watching may lead to a maximum of 1 mrem of exposure to the gonads per year, it has no measurable effect on the bone marrow, because the radiation is too soft to penetrate more than a few millimeters of body tissue. Hence any estimate of the risk from  $Sr^{90}$ , which necessarily refers to an effect on the marrow, will be incomparably greater than the hazard, to the bone marrow, of television



## Available Now Complete "Animal Care Equipment" Brochure

Ask your Aloe Scientific Representative for a copy of this brochure, or — fill in the form below, — clip and mail to the address indicated.

Included in this brochure are products born of long experience in the field — selected, tested and proved with the Animal Care Requirements in mind.

Thoroughly presenting the current available equipment, the brochure includes —

- Cages — all types plus custom availability
- Cage Stands and Racks
- Feeders and Watering Services
- Dissecting and Operating Equipment
- Animal Balances and Holders
- Clippers and I. D. Equipment

Complete equipment — with the assurance that your related needs can be readily integrated and filled. Complete stock of Laboratory Equipment, Apparatus, Reagents — from Aloe Scientific with fully stocked Divisions Coast to Coast.

ALOE SCIENTIFIC/Division of Brunswick Corporation  
General Office: 1831 Olive Street, St. Louis 3, Missouri

Attn: Merch. Mgr.

Please forward your complete brochure of "Animal Care Equipment"

Name..... Title.....  
Please Print

Firm.....

Street and Number.....

City and State.....

☐ Please see that I'm forwarded all future related announcements to Animal Care.

watching. It will be noted that Margolis' comment also includes a statement of equality between exposure to Eskimos from current levels of fallout, and from  $\text{Sr}^{90}$  that might result from the Chariot explosions. The exposure to Eskimos from present fallout is approximately known (about 1 to 3  $\mu\mu\text{C}$  of  $\text{Sr}^{90}$  per gram of calcium in the bones; see *Radiological Health Data*, Jan. 1961, p. 21). We would expect Margolis to show, in support of his statement, that the  $\text{Sr}^{90}$  that Cape Thompson Eskimos might absorb from the Chariot explosion also amounts to about 1 to 3

$\mu\mu\text{C}$  of  $\text{Sr}^{90}$  per gram of calcium in the bones. We suggest that he produce such calculations. For our part, after careful study of the available data, we concluded, as stated in the CNI report, that there were not sufficient data about the relevant parameters (for example the mineral nutrition and feeding habits of the caribou; the total  $\text{Sr}^{90}$  in the Eskimo diet) to warrant such a calculation.

None of the foregoing observations are adequately represented in Margolis' account of the CNI report on the Chariot Project. Nevertheless, Margolis

had ample opportunity to become acquainted with these matters in advance of the preparation of his article. A few days after the CNI report had been made public, one of us received a long distance telephone call from Margolis. In this call he made several criticisms of the CNI report, and asked for comment on them. During this conversation Margolis acknowledged that he had not yet seen a copy of the CNI report. Accordingly, a copy of the report was sent to him immediately. After several days he called again. In this second conversation nearly all of the points which we have enumerated above (including an explanation of the so-called "technical error") were explained to Margolis at some length. We regret that they do not appear in his article. In particular, we believe that ordinary journalistic practice would recommend that the specific reply given to his query about the supposed technical error in the CNI report should appear in his article alongside his discussion of the AEC "complaint" about it.

We should also like to note that the quotations which Margolis attributes to "a spokesman for CNI" do not precisely reflect what was said to him, and it is pertinent that he neither asked for permission to quote (which would have readily been granted) nor checked the quotations with their source.

The foregoing comments explain why we believe that Margolis' article on the reports about Project Chariot is incomplete, misleading, and in some respects quite incorrect.

BARRY COMMONER  
M. W. FRIEDLANDER  
ERIC REISS

*St. Louis Committee for Nuclear  
Information, St. Louis, Missouri*

In reply to the CNI letter:

1) The bulk of my article, contrary to the impression given by CNI's letter, was not concerned with CNI's technical errors or with my own predictions of radiation levels, but with the likelihood that the CNI report would mislead rather than inform the public on the central question of the magnitude of the fallout risk.

2) With regard to the material dealt with in the letter, much of it is simply a recounting of parts of the CNI report, and this recounting does not conflict with the summary of the report I gave in my article. Other parts are attacks on the AEC, to which I assume the AEC will reply if they deem it worthwhile. I should point out, though, that

## DISRUPTS CELLS WITHOUT DESTROYING ENZYME ACTIVITY!



**BIOSONIK**

*Ultrasonic Apparatus*

**Y**ou can expect maximum protein liberation *without* destroying enzyme activity when you use this new ultrasonic apparatus for the disruption of biological cells. The *Biosonik* is also useful in sonic research on liquids, living organisms, chemical mixtures and solutions. *Difficult suspensions and emulsions are no problem.* The apparatus is compact . . . operates quietly . . . tuning is semi-automatic . . . there is no excessive heating . . . and cooling is efficient. Maximum energy input is 400 watts. Batches up to 200 ml. may be processed in the sterilizable chamber. Ask us for bulletin BB-100.

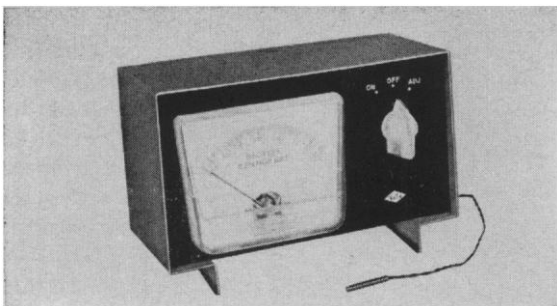
S-3280X Biosonik, Model U-20, 20 Kc, complete with generator, transducer, housing and sample chamber, for operation on 115 volts, 60 cycle current. Price .....\$1,855.00

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

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

Branch Sales Offices: Albany 5, N. Y. • Boston 16, Mass. • Elk Grove Village, Ill. • Philadelphia 43, Pa. • Silver Spring, Md.  
Branch Warehouse: Elk Grove Village, Ill.





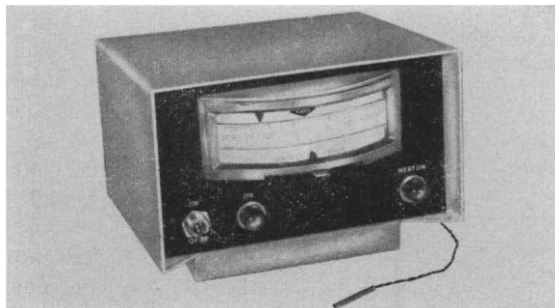
### SAMPLE TEMPERATURE INDICATOR

Continuous sample temperature indication is conveniently obtained for both bulk and manifold freeze-drying techniques using the VirTis Sample Temperature Indicator. The thermistor probe measures only 1/8" in diameter by 1" in length, small enough to fit into virtually any container. A thin, vinyl coated, completely flexible wire connects the probe to the indicator. The indicator scale covers the complete temperature range of interest in freeze-drying from  $-50^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$ .

## VirTis TEMPERATURE INDICATION AND CONTROL FOR FREEZE-DRYING

### SAMPLE TEMPERATURE CONTROLLER

The new VirTis Sample Temperature Controller takes the guess work out of bulk freeze-drying procedures. Continuous temperature indication and control from  $-50^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$  is provided in this one instrument. To operate, simply freeze the temperature thermistor probe in a representative sample, and set the dial pointer on the controller to whatever temperature is compatible with the heat sensitivity of the material to be dried. The Sample Temperature Controller is an ideal companion instrument to the VirTis Mechanically Refrigerated Freeze-Mobile, Unitrap, and Duo-Dryer.



For full details write:



THE VIRTIS COMPANY, INC.  
GARDINER, NEW YORK

18 AUGUST 1961



**Imitation is the sincerest form of flattery** and the Cenco Lab Jack has been overwhelmed with it. While some who have followed offer sound design, or others decent quality, none (as yet) has equalled Cenco's design and quality at the same price.

Developed in collaboration with Dr. Aaron B. Lerner of Yale University, the Cenco Lab Jack's simple, efficient design and precision construction are still its outstanding features. It will hold 100 lbs. easily, with complete stability at all elevations between 3 and 10 1/4 inches. Its scissors action permits steady, level, and quick raising or lowering—a feature especially noticeable when maneuvering fragile glassware.

With over 25,000 in use throughout the world today, we find only one trouble with the Cenco Lab Jack. It lasts too long.

**NO. 19089-001-Cenco — Lerner  
Lab Jack.....\$34.00**

### CENTRAL SCIENTIFIC

A Division of Cenco Instruments  
Corporation

1700 West Irving Park Road,  
Chicago 13, Illinois

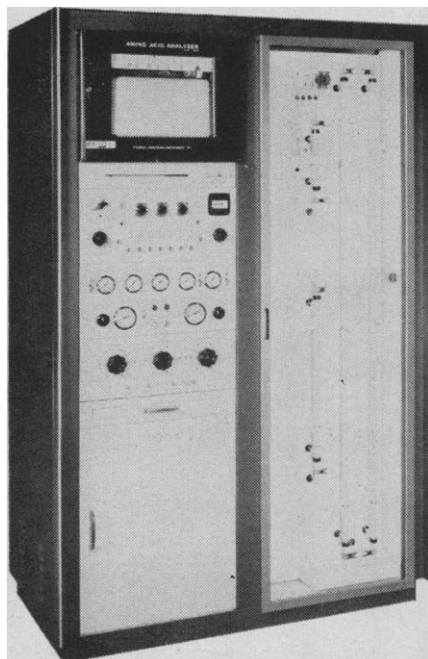
Mountainside, N. J.  
Montreal  
Santa Clara  
Somerville, Mass.  
Toronto  
Los Angeles  
Birmingham, Ala.  
Ottawa



Vancouver  
Houston  
Cenco S.A., Breda,  
The Netherlands  
Tulsa

501

# New PHOENIX AMINO ACID ANALYZER



## Model K-8000

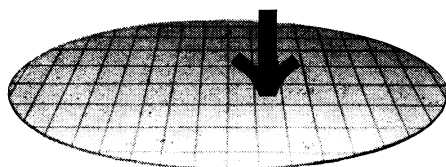
Automatic Analysis of Amino  
Compounds in

- Protein Hydrolysates
- Protein-free plasma and other
- Physiological fluids
- Tissue extracts
- Hydroponic solutions
- Foods
- Culture media
- Pharmaceuticals
- Adaptable to Phoenix  
Stream Splitting System 5500

Sensitivity: 0.1 to 3.0 micromoles of amino  
acid with a precision of  $100 \pm 3\%$ . Use-  
ful results at even lower levels.



PHOENIX PRECISION INSTRUMENT COMPANY  
3803-05 NORTH FIFTH ST., PHILADELPHIA 40, PENNSYLVANIA



Speaking  
of  
**Millipore®**  
Filters

### ESTIMATION OF COLIFORM BACTERIA IN ICE CREAM BY USE OF THE MEMBRANE FILTER

The use of a dilute wetting agent, to which the sample is added for filtration through a membrane filter, has provided a direct one day method for the enumeration of true coliform bacteria in ice cream. The method eliminates interference from sucrose and consequent false-positive reactions. Previously these false reactions could be overcome only through time-consuming isolation and identification procedures.

Nutting et. al., 1959, APPLIED MICROBIOLOGY,  
7:4, pp. 196-199, July

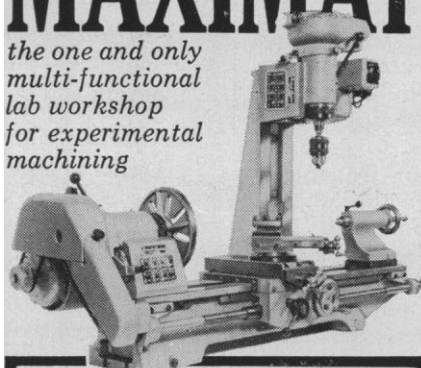
Millipore® filters are available in eleven pore-size grades from  $5\mu$  down to  $10\mu$ . They retain on their surfaces all particles larger than rated pore size.

When writing for technical information please state your fields of interest.

**Millipore®** FILTER  
CORPORATION  
Dept. S, Bedford, Massachusetts

## MAXIMAT

the one and only  
multi-functional  
lab workshop  
for experimental  
machining



NEW—from the makers of UNIMAT! This remarkable 10" tool room lathe does the work of FOUR machines (lathe, drill press, jig borer, vertical milling machine) in the space of ONE, and at less cost than a single-purpose lathe meeting the same high tool room standards of precision. The exclusive VERTI-BED holds a detachable head-stock-and-motor unit for vertical functions without impeding simultaneous horizontal operations. Best bet: the double-spindle model shown above—no change-over necessary!

WRITE FOR CATALOG AND PRICE LIST  
**AMERICAN EDELSTAAL INC.**  
Dept. AH, 350 B'way, N. Y. 13, N. Y.

the CNI summary of what the AEC said and did is not always, indeed is rarely, quite the same as what the AEC said and did. For example, the AEC began contracting for studies of the food chain, including the absorption of strontium, nearly 2 years ago, and indeed a good deal of the material CNI cites was developed as a result of studies sponsored by the AEC.

3) On the technical points directly questioning the reliability of my article: I don't see how CNI argues that it has not erred in its handling of the AEC fallout figures. The pertinent AEC report clearly states that its estimates are based on an assumed fivefold enrichment of  $Sr^{90}$  (not four- to five-fold, as stated in CNI's letter). The AEC prediction for the most probable average venting of fallout was 5 percent, and for  $Sr^{90}$ , 25 percent. Obviously CNI's report, which postulated a further fivefold increase in  $Sr^{90}$ , must be wrong, since the fallout can hardly contain more than 100 percent of all the  $Sr^{90}$  produced by the test. Further, Dr. Friedlander, in calculating CNI's estimate of the average  $Sr^{90}$  deposit throughout the zone, simply multiplied the AEC estimate by 10, and although CNI might well argue that the deposit "some distance downwind" might be 10 times the AEC estimate, the average deposit throughout the zone can hardly, for the reason noted above, be off by more than a factor of 4.

CNI is correct in criticizing my handling of the television example, although if readers will refer to my article I think they will find that the error is not as significant as CNI implies. What is curious is that CNI itself has included a grosser form of this same error in its own report. CNI does not inform its readers that there is no danger of genetic damage from  $Sr^{90}$ , but actually includes a reference to the possibility of genetic damage. Further, Dr. Commoner's article in the CNI report, in giving figures on the generally recommended guide lines for  $Sr^{90}$  absorption in humans, does not give the figure for  $Sr^{90}$  (67 units) but instead gives the figure for whole body exposure (including, of course, the gonads) and announces that "this corresponds to about 17 strontium units in the bone." Thus CNI misleads its readers into believing the generally accepted guide line is smaller by a factor of 4 than the actual figure, and this is done by applying the whole body rate, deliberately set this low because it includes genetically dangerous exposure, to calculate a rate for

# STOKES *automatic* WATER STILLS



for the  
ultimate in  
•  
**SIMPLICITY**  
•  
**EFFICIENCY**  
•  
**PURITY**

Stokes automatic water stills are noted for their simplicity. Anyone can operate them in a matter of seconds. With a minimum of attention, Stokes Stills will deliver distilled water at rated capacities of  $\frac{1}{2}$  to 100 gallons per hour. And they produce the purest distillate possible . . . completely free of pyrogens, bacteria or minerals. What's more, all models are effective in purifying both soft and hard water.

Your Laboratory Supply House stocks Stokes Stills. Next time you need one, see them . . . and specify Stokes.

Pharmaceutical Equipment Division  
F. J. STOKES CORPORATION  
5500 Tabor Road  
Philadelphia 20, Pa.

## STOKES

bone marrow, where the danger is solely somatic.

This ties in with CNI's complaint about my statement that the probable increase in  $\text{Sr}^{90}$  in the 700 Eskimos, under pessimistic assumptions, would be about equal to present levels. CNI gives the current level of strontium in Eskimos as 1 to 3 units. This is based on a total sample of six. The values are: an infant (2.42), a 7-year-old (3.35), and four adults (0.18; 1.94; 0.47; and 0.59). Aside from the small sample size, it is difficult to know what would be a fair average calculated from this data to compare with the National Committee on Radiation Protection guide line, which is 67 units for an average for individuals within a population, and three times this, 200 units, for a single individual within the population. The levels for very young children are higher since they have been exposed to a given level all their lives. If, as with the Chariot test, the level is not to be kept up by continued testing, the level in the children will fall as they grow. This makes the CNI calculation seem somewhat excessive, but if we accept their figure of 1 to 3 units as the range for the average figure and compare it with the relevant NCRP guide line (67 units), then the current levels would be about  $1/67$  to  $1/22$  of the guide line. Even under the assumptions in the CNI report this seems unlikely to be increased more than several times, if that much, and the increase, like the base, will be some small fraction of the guide line, in other words (to repeat my error) an increase "roughly the same" as current levels.

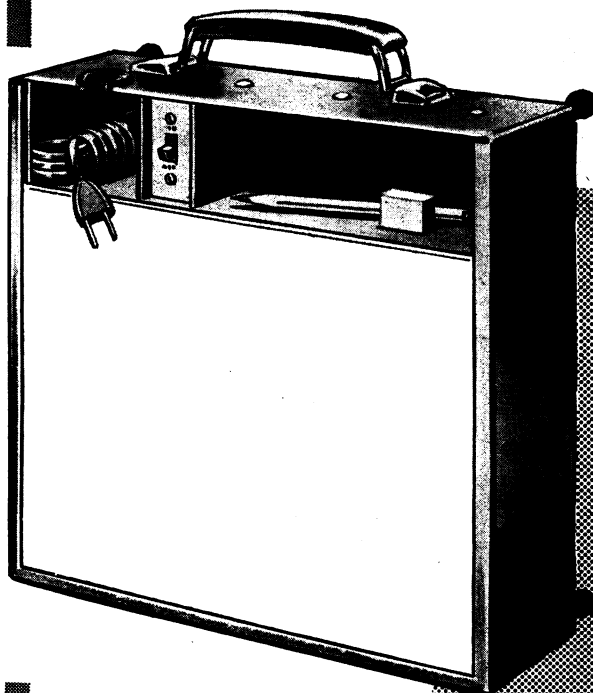
The point of my comparison of the potential increase, under pessimistic assumptions, with exposure from television and current levels of fallout was not to imply that the type or amount of radiation was precisely the same, but to give the reader a general idea of the magnitude of exposure involved, in contrast to the CNI report which talked repeatedly in terms of "great uncertainty" concerning the harm that might be done, of the fallout "sealing off Cape Hope," of "little margin for error," and which, in general, could not have been better phrased to scare the daylights out of the lay audience for which it was written.

4) Finally, I must insist that my article reflects quite precisely Dr. Commoner's responses to my questions concerning the misleading nature of the CNI report.—H.M.

# Portable Cool . . .

## Glow Box

THE SCIENTIST'S LIGHT BOX



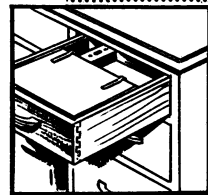
### TILTS EASILY FOR TABLE-TOP USE

Model 12-12D for  $8\frac{1}{2}$ " X 11" curves, charts, spectra, X-ray film, biological samples, etc. Model 12-20E for double size sheets 11" X 18".



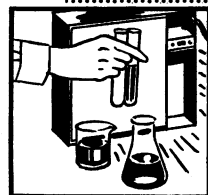
### FITS STANDARD DESK DRAWER FOR STORAGE OR USE

Keep GLOW BOX in your desk drawer immediately available whenever you wish to examine, compare, or trace. It's so convenient!



### STANDS UPRIGHT FOR DEMONSTRATIONS

The uniform, diffuse light focuses attention on displays of samples for lectures, demonstrations, etc.

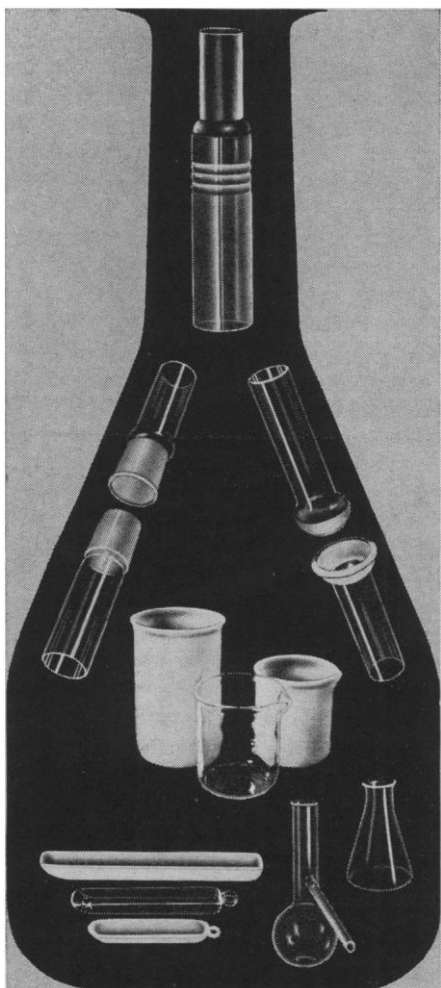


LITERATURE AVAILABLE



INSTRUMENTS for  
RESEARCH and  
INDUSTRY  
CHELTENHAM, PA.





## VITREOSIL® PURE FUSED QUARTZ FOR USE IN PRODUCTION OF SEMI-CONDUCTOR METALS...

Where you produce such metals as germanium and silicon, VITREOSIL is ideal for use. For special requirements or special problems, write us your requirements. Now available Quartz to metal seals. See our ad in Chemical Engineering, Electronic Engineers Master & Electronic Designers' Catalogues.

## SPECTROSIL®

**FOR HYPER-PURITY IN  
SEMI-CONDUCTOR WORK**

*Unique Transmission characteristics*

**PURITY**—purest form of fused silica

**TRANSPARENCY**—unique optical properties

**HOMOGENEITY**—completely homogeneous and free from granularity

**AVAILABILITY**—block material for lenses, prisms, etc; rod, fiber, wool; hollow ware as tubing, crucibles, and special apparatus.

*Write for complete illustrated catalog.*



**THERMAL AMERICAN  
FUSED QUARTZ CO., INC.**  
18-20 Salem St., Dover, N. J.

## Reprint Requests

Some years ago an article appeared in which the merits of printed "reprint-request" postcards were closely examined [J. Hedgpeth, *Am. Scientist* 42, 497 (1954)]. Rather few of the cards' alleged merits withstood the author's critical scrutiny. The cards were adjudged discourteous, inconsiderate, and generally to be abhorred. In fact, I was sufficiently impressed by the fire of condemnation to forswear the use of such contemptible missives. Subsequently, each of my reprint requests was accompanied by a carefully worded letter of justification. Unfortunately, this habit was shattered by the disillusionment that resulted when I and several colleagues at Yale received smudged, printed reprint-request postcards from several of the same knights who had joined in challenging the boorish reprint collectors. Sad is the life of the idealists!

In recent months the need for renewed attack has become acute. To pass over, for the moment, the dozens of mailings to anonymous collectors that the cards demand, there are now appearing increasing numbers of cards requesting *two* reprints, "one for me and one for my library." When each of the two workers at an arctic research station sent me such a card the dam was breached, and this flow commenced. Perhaps these men were merely lonely and wanting to encourage correspondence. Perhaps their months of solitude in bitter arctic wastes had caused each to retreat from contact with the other (but two libraries?). In the face of such a pattern, however, it is clear that the most economical solution would be to abolish all journals and to offer all articles for sale as separates. Could the alternative proposed by Hedgpeth also be prayerfully reconsidered?

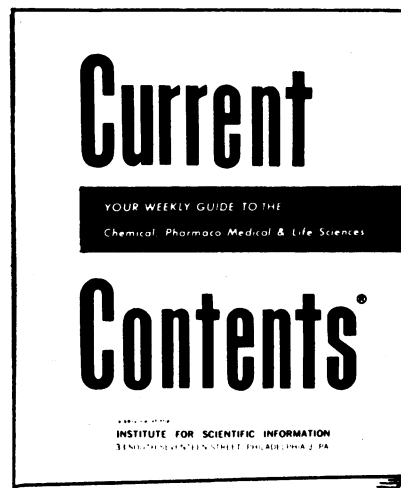
PETER H. KLOPPER

*Department of Zoology, Duke  
University, Durham, North Carolina*

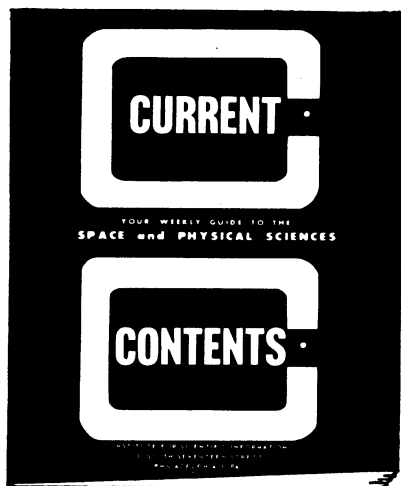
## Repetitive Self-Stimulation

Since Olds and Milner described the repetitive self-stimulation by rats with electrodes implanted in their brain, there has been increasing acceptance of the concept that this self-stimulation is of a rewarding nature. Certainly it is understandable how this view has arisen, but I submit that this

# TIME SAVERS



**CURRENT CONTENTS OF CHEMICAL, PHARMACO-MEDICAL & LIFE SCIENCES** is a comprehensive weekly service that lists the tables of contents, most of them in advance, of more than 600 primary scientific journals. With this service, the scientist is given a unique, convenient method to scan the title pages of journals of interest to him without physically handling thousands of individual issues per year. Spending about one hour per week, he can easily check off articles of interest. **CURRENT CONTENTS** also provides, when possible, author addresses so scientists can write to colleagues for reprints. In addition, Original Article Tear Sheets are available.



**CURRENT CONTENTS OF SPACE & PHYSICAL SCIENCES** enables scientists to keep up with new developments in such fields as missiles and rockets, electronics, mathematics, computers, physics, nuclear energy and instrumentation. This new weekly service comprehensively reports the contents of more than 500 primary journals—over 100,000 individual articles per year. As a special bonus, all basic chemical journals are covered in this edition of **CURRENT CONTENTS**. Available only to **CURRENT CONTENTS** subscribers is our exclusive Original Article Tear Sheet service. OATS supplies the principal ingredient in the effective utilization of scientific information—prompt and convenient access to original documents. And cost of OATS is lower than hard-to-read photocopies.

*Gratis review copies of the above listed services are available upon request.*

**INSTITUTE FOR SCIENTIFIC INFORMATION**  
33 SOUTH SEVENTEEN STREET, PHILADELPHIA 3, PA.

SCIENCE, VOL. 134

is not quite the correct significance of the phenomena observed. To equate this self-stimulation with reward is to equate it with a consummatory act. A consummatory act is accompanied by gratification and is followed by quiescence and by cessation of appetitive or searching behavior. Prior to culmination of the consummatory act an animal continues to search incessantly for gratification. This is manifested as "repetition compulsion" in myriad forms resembling the self-stimulation phenomenon. A rat, for instance, may copulate 50 times in rapid succession but stops after ejaculation.

From the physiological as well as the psychological standpoint it would appear that this self-stimulation has to do with the "promise of a reward," with a productive phenomenon anticipating the consummatory act. The questions to be asked are: Does it lead to cessation of the specific behavior? Is it followed by relaxation and sleep? Does a new form of behavior develop upon awakening? If an animal were to be stimulated in such a way that this sequence of events were to occur, we could properly refer to such stimulation as involving a reward system. (For comparison, consider the case of the donkey with a carrot held out in front of it. The Olds-Milner system never allows the donkey to get the carrot.) Otherwise we should continue to employ the term first used by Olds and Milner: *positive reinforcement system*.

WILLIAM J. TURNER

Central Islip State Hospital,  
Central Islip, New York

## Letters in "Science"

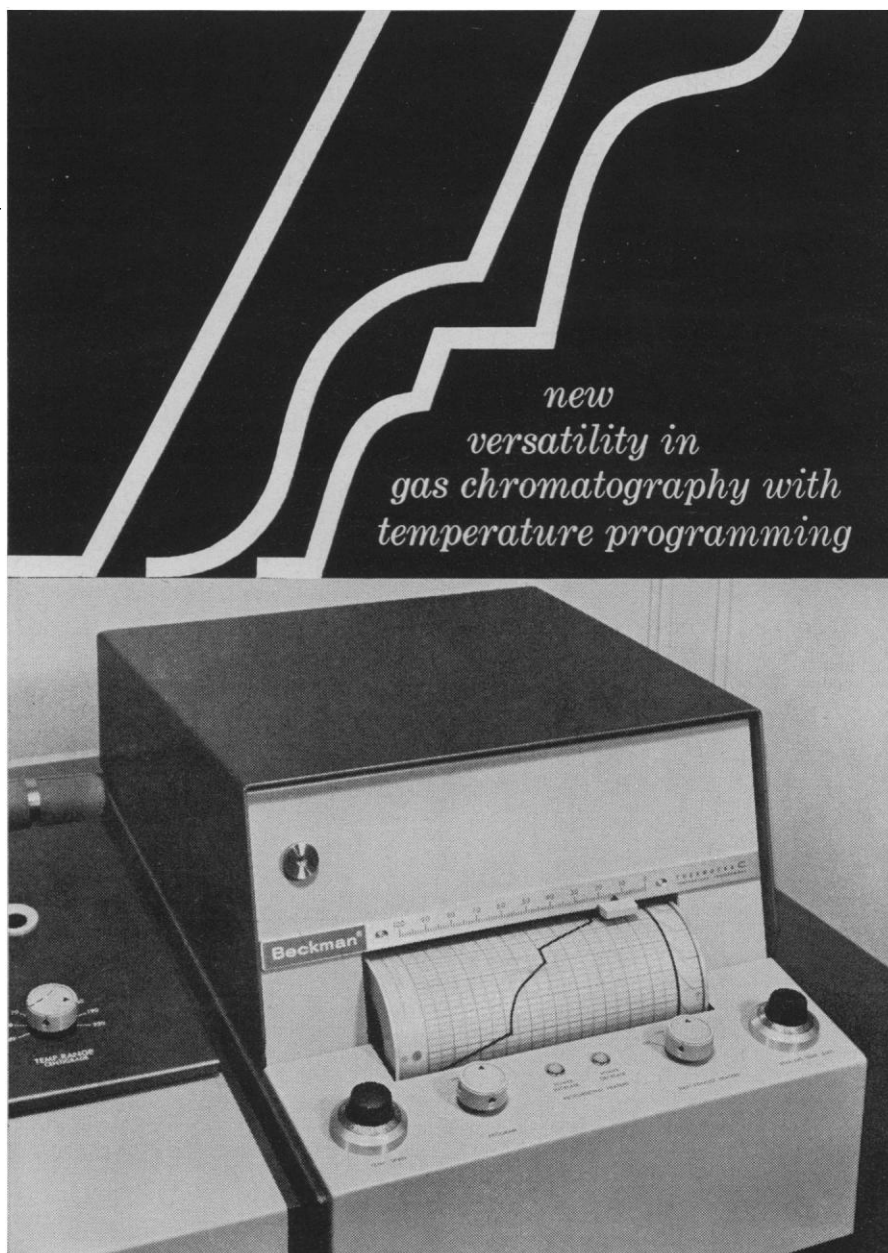
I hope you will permit a reader from foreign parts to offer his thanks to Conway Zirkle for writing the letter on degrees and titles [*Science* 133, 1626 (1961)] and to you for publishing it. The activities of the Society for the Rationalization of the Title of Doctor cannot be too widely known. And while I am about it, thanks also to Kirby Walker for his letter, in the same issue (p. 1648), on books as prestige objects.

To those of us who spend our lives contemplating the dreary acres of scientific literature unrelieved by a spark of wit, it is a real joy to read such correspondence in a scientific journal.

BENJAMIN FULLMAN

29 Hampstead Hill Gardens,  
London, England

18 AUGUST 1961



new  
versatility in  
gas chromatography with  
temperature programming

Reduce analysis time...improve peak height sensitivity...insure complete analysis...make columns more versatile...all with the new Beckman Thermotrac\* Temperature Programmer. Linear, non-linear, and step function programming—all on the same instrument, in the same or successive gas chromatograph runs. Rate-to-rate switching is not required.

Thermotrac is simple to operate. Plot the program with ink, pencil or black tape on the Mylar format sheet, insert, set zero and span. Optical follower changes column temperature as plotted. Programs are reproducible, and any 60-minute or shorter cycle can be plotted. Rapid temperature rise, cooling, and equilibration characteristics minimize operator effort. Simultaneous programming of sample and reference columns insures base line stability, while solid-state electronics permit proportional temperature control, maintaining temperatures to  $\pm 0.1^\circ\text{C}$  through  $350^\circ\text{C}$ . Designed for direct use with Beckman GC-2 and GC-2A Gas Chromatographs, the Thermotrac is adaptable to virtually any laboratory gas chromatograph.

For full information, see your Beckman laboratory apparatus dealer, or write for Data File 38-33-04.

**Beckman**

INSTRUMENTS, INC.

SCIENTIFIC AND PROCESS  
INSTRUMENTS DIVISION

Fullerton, Calif.

TRADEMARK B.I.I.

## The Yellin Case

A recent editorial, "One in eighteen thousand" [*Science*, 133, 2037 (1961)], begins with the words: "For many scientific purposes an event that happens only once in ten or twenty thousand tries is statistically insignificant. . . . But in other cases, the focus of interest may be on the unusual event itself. . . ." That editorial represents for me just such an unusual event, since it is the first time that I have found an idea proposed by an editor of *Science* so

repugnant and outrageous as to compel me to express myself in the form of a "letter to the editor."

I refer, of course, to the suggestion that: "To minimize the chance that so rare an event [the Edward Yellin case] will occur again the [National Science] Foundation need only include on its application form a question about the criminal record of the candidate."

I do not know what proportion of the members of the scientific community have criminal records, but I would guess that such individuals must

be rare, indeed. Furthermore, to my knowledge, there is no evidence whatsoever that such persons, as a group, have demonstrated any lack of scientific ability, even if that term is interpreted to include such qualifications as "motivation, independence, objective judgment, accuracy, and integrity" in their scientific endeavors.

On the other hand, the National Science Foundation, and all other granting agencies, recognize that some small percentage of funds granted for scientific investigations is used illegally by scientific charlatans for their own furtherance or aggrandizement. Again however, there is no correlation, to my knowledge, between that group of persons engaging in such unfortunate activities, and the hypothetical group of investigators with previous criminal histories. Until such a significant, positive correlation has been demonstrated, it seems to me that the editor's suggestion is, at the very least, irrelevant.

Irrelevance is a sufficient reason not to accept a suggestion. However, I do not find this idea repugnant primarily because it is irrelevant, but because it is one more manifestation of a trend in present-day society to suggest, and sometimes even to accept, protestations and oaths of loyalty, purity, and moral righteousness in place of such qualities as capability, originality, and creative thought.

ROBERT L. DEHAAN

3003 North Calvert Street,  
Baltimore, Maryland

Your proposal in the editorial, "One in eighteen thousand," that National Science Foundation fellowship application forms include a question concerning the candidate's record of criminal convictions is reasonable enough, but it fails to touch on the central issue raised by the Yellin case—freedom of the individual conscience and the privacy of ideas.

National Science Foundation officials would not have had to face the stern inquisitors of the House Un-American Activities Committee if they had awarded a fellowship to an individual previously convicted of the common crime of embezzlement or bigamy. Yellin's offense was to invite an indictment for contempt of Congress by refusing to answer the House Un-American Activities Committee's questions about his past political associations on the grounds that this committee's investigation was an encroach-

# PICK A VOLUME SET THE PLUNGER TILT AND POUR

Scientists have been quick to accept tilting dispensers because they offer speed and convenience. Now here's a new dispenser with versatility and which saves you money, too!

Versatility because Kontes K-75920 dispensers have an exclusive adjustable plunger in the chambers, permitting a range of volumes from each chamber. It saves you money because you need buy only one to get a wide range of volumes.

**K-75920 Dispenser, Tilting**

	SIZE		
	A	B	C
Range, ml.	0-3.4	0-15	0-27
Reproducibility, ml.	±0.05	±0.25	±0.25
Each	\$24.50	\$29.50	\$36.25


These products and approximately 200 others are completely described in a new Bulletin—TC-4. Write for your free copy.

(Patent applied for)  
\*Viton is a Du Pont Trademark.

**KONTES GLASS COMPANY**  
Vineland, New Jersey

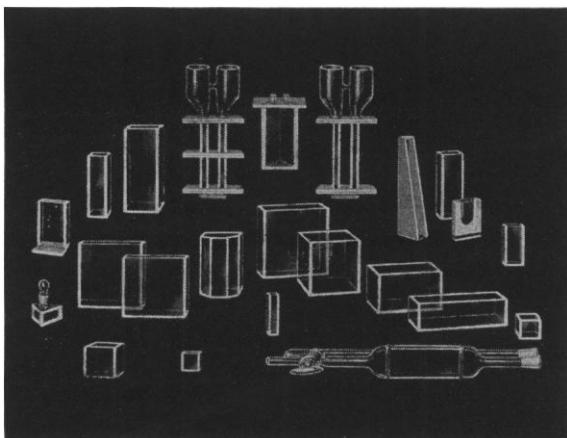


Set and adjust volumes with movable plunger. Viton® "O" Ring holds plunger in position.





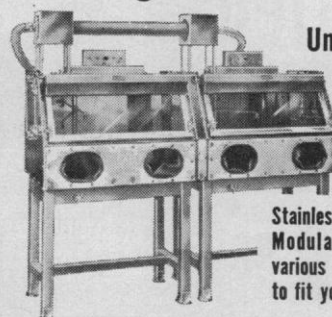
# GLASS ABSORPTION CELLS made by **KLETT**



**SCIENTIFIC APPARATUS**  
Klett-Summerson Photoelectric Colorimeters—  
Colorimeters — Nephelometers — Fluorimeters—  
Bio-Colorimeters — Comparators — Glass Stand-  
ards—Klett Reagents.

**Klett Manufacturing Co.**  
179 East 87 Street, New York, New York

## 22 types of Safety Enclosures for Handling Hazardous Substances



**Unitized  
SAFETY  
ENCLOSURES**

**Stainless Steel, All Purpose:**  
Modular adaptability with  
various adaptor accessories  
to fit your needs.

### DRY RADIOACTIVE WASTE CONTAINER

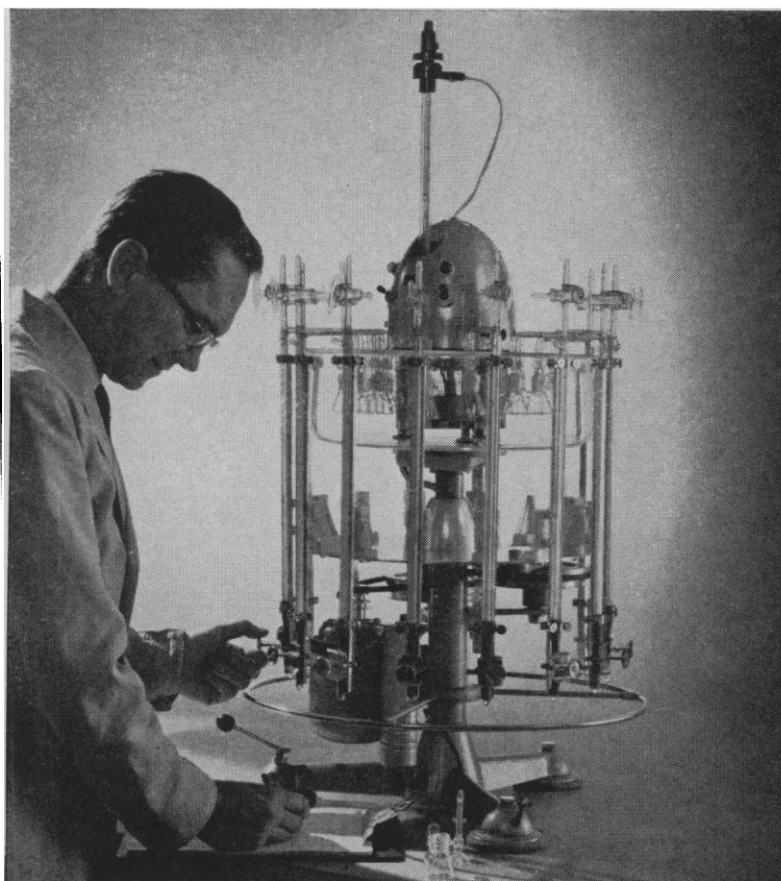
All-welded stainless steel con-  
struction with stainless steel  
inner container.

Write for illustrated folder  
describing these and 20 other  
kinds of enclosures. S. Blickman, Inc., 6908  
Gregory Avenue, Weehawken, New Jersey.



**BLICKMAN SAFETY ENCLOSURES**

Look for this symbol of quality **Blickman-Built**  
ESTABLISHED 1889



**WRITE FOR ILLUSTRATED LITERATURE**

**trim**  
for today's  
compact lab...

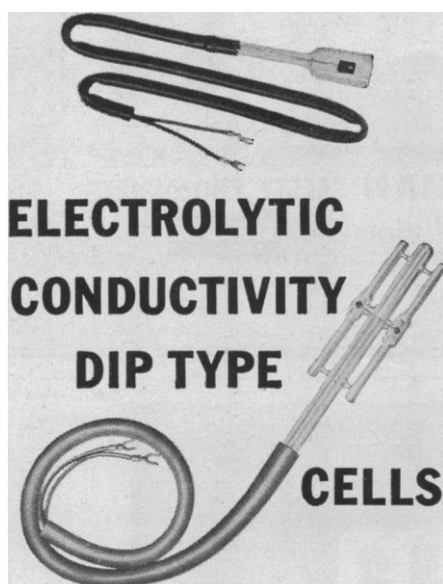
## New Bronwill WARBURG APPARATUS

Every design feature is for space  
economy and efficient, time-saving  
use. 320° rotation brings any of 14  
double capillary manometers out front  
for quick reading. Also—new  
lagless electrode heating. Special  
UVL model for photosynthesis.



**BRONWILL SCIENTIFIC**  
A DIVISION OF WILL CORPORATION

275 N. GOODMAN ST. • ROCHESTER, N. Y.



Every Laboratory Conductivity Cell now a certified cell at no extra cost!

You can now obtain from Industrial Instruments a dip type glass and platinum electrolytic conductivity cell in any cell constant from 1/100 to 100 with certified accuracy within  $\pm 1\%$  of nominal value.

Write for a complete catalog of conductivity cells and measuring instruments and equipment.



ment of his constitutional rights of free speech and assembly guaranteed by the First Amendment. Yellin could easily have avoided serious difficulty with the committee and the citation for contempt by refusing to cooperate with the committee as hundreds of others have done in recent years by standing on the Fifth Amendment.

Yellin's challenge of the committee's right to probe the political beliefs of our citizens was undertaken with the clear knowledge that this action could result in his imprisonment. His decision to undergo this risk is in the highest traditions of our nation. It was awareness of this, I am sure, that helped Yellin win his reinstatement as a student after a hearing by the investigating committee of the University of Illinois.

Several years ago, an application for financial support of a research project on leukemia was rejected by an agency of the Public Health Service because the principal investigator, Linus Pauling, had failed to obtain the necessary political clearance. Public opposition to this unwarranted interference in research now makes it unnecessary for an investigator to undergo political screening to obtain a federal grant for a project in the health sciences.

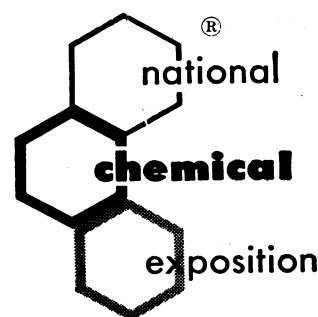
Protection of freedom of thought is particularly important to us as scientists. It would be harmful to all of us if political clearance became a necessary condition to obtaining a federally supported fellowship.

MONROE SCHNEIDER  
*Jewish Chronic Disease Hospital,  
Brooklyn, New York*

#### Krebiozen

We read with interest your notes on the Krebiozen trial [*Science* 133, 1345 (1961)], which included reference to the Citizens Emergency Committee for Krebiozen.

If any further proof were required as to the validity of your statement that "professional sentiment in the field is overwhelmingly against Krebiozen," it is furnished by your most liberal application of the noun *scientist* to George D. Stoddard in connection with his criticism of the work of Andrew C. Ivy. Indeed, a large question involved in the litigation of Ivy versus Stoddard is that of freedom of research and inquiry in America. But to imply that a "scientist" in the field of education is qualified to criticize the work



The 11th

## NATIONAL CHEMICAL EXPOSITION

will be held in the

CHICAGO AMPHITHEATRE  
SEPTEMBER 5-8, 1961

at the time of the 140th  
national meeting of the

## AMERICAN CHEMICAL SOCIETY

Everything that's new in the chemical process industries,—chemicals, equipment, apparatus, services—plus a series of outstanding special exhibits, the Trail Blazers of Chemistry, Art and Photographic Exhibits by chemists, etc.

## PLAN TO ATTEND!

For information about booth space available, and for entry forms and admission tickets, write

## National Chemical Exposition

Chicago Section ACS

86 E. Randolph St., Chicago 1, Ill.

FRanklin 2-1123

of, and imply professional incompetence on the part of, a physiologist in the highly specialized field of cancer research is ludicrous, to say the least.

RHODA BOYKO

*Citizens Emergency Committee  
for Krebiozen, New York, New York*

*According to American Men of Science, Stoddard is a former head of the department of psychology at the University of Iowa. In recent years he has held administrative posts, and he is now chancellor of New York University.—ED.*

### Mathematics Degrees

I noted with interest the editorial on the proposed Doctor of Arts degree for noncreative mathematicians [*Science* 133, 1979 (1961)]. I commend you for publishing it.

I would urge, however, that it may be equally productive to consider a more restricted designation than the current Ph.D. for programs which stress the creative aspects of a discipline more than a scholarly treatment of its substance, structure, and relation to other fields of knowledge. For the former group, the Doctor of Mathematics might be appropriate.

H. CRAIG SIPE

*George Peabody College for Teachers,  
Nashville, Tennessee*

### Communication between Social and Physical Scientists

In the 12th to 14th paragraphs of the New York *Times* obituary of the Soviet physicist Kurchatov (8 February 1960), the following sentences appeared (p. 4).

"One of Dr. Kurchatov's most significant public statements came in early 1958 when he publicly asserted that it was the Soviet Union, not the United States, that invented the hydrogen bomb. . . .

"That the Academician's claim may be correct has been indicated by evidence published in this country that the Soviet 1953 thermonuclear explosion was accomplished with the use of a form of lithium deuteride as a solid. This evidence suggests that the November, 1952, American thermonuclear device had to be very bulky because it contained much refrigeration apparatus



**WILD\***

**M20 MICROSCOPE**

**The one instrument for all research  
and scientific investigation**

**WITH CAMERA 2** — Permits continuous binocular observation. Phototube deflects 25% of light to binocular tube. Special format indicating eyepiece provides rapid perfect focusing.

**WITH CINETUBE** — Use with any 16mm movie camera having 50mm or 75mm focal lengths. Focus on specimen during film exposure. Contains two built-in beam splitters, plus a photocell for exposure determination (with galvanometer), and an internal projection tube for titling or designating footage.

**WITH INCIDENT LIGHT ATTACHMENT** — Permits observation and photomicrography under bright and dark field conditions, with polarization. Optical quality and handling convenience fully comparable to specially designed incident light microscopes.

**WITH DRAWING TUBE** — Stress parts of a preparation, combine separated details, observe and draw various layers of the object, secure facsimile or enlarged illustration of the picture . . . in perfect operator comfort.

Phase contrast, Varicolor, Universal Lamp, and other accessories are also available for the Wild M-20.

Can any other microscope offer so much versatility, precision and utility? Your own evaluation of this superb Swiss crafted instrument will provide the answer.

**WRITE FOR BOOKLET M20.**

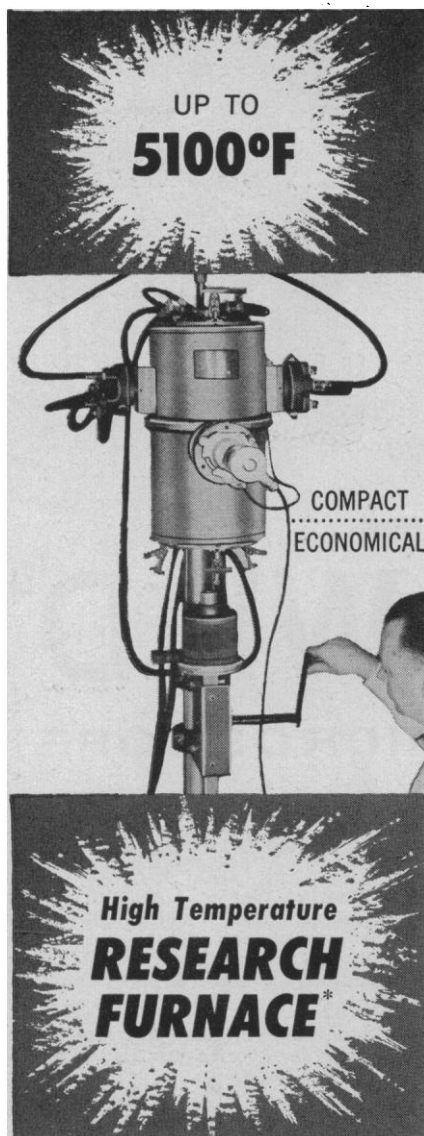
**\*The FIRST name in Surveying Instruments, Photogrammetric Equipment and Microscopes.**

**WILD**  
**HEERBRUGG**

**WILD HEERBRUGG INSTRUMENTS, INC.**  
**PORT WASHINGTON, NEW YORK**

Full Factory Services In Canada: Wild of Canada Ltd.,  
157 MacLaren St., Ottawa, Ontario





**High Temperature Operation —**  
Up to 5100°F for intermittent use, up to 4800°F for continuous operation.

**Extremely Compact —**  
8" high x 4" diameter working volume contained within a 20" x 10 1/4" unit. Also available, 15" high x 12" diameter working volume contained within a 30 1/2" x 22" unit.

**Controlled Atmosphere —** Inert gas protects charge and furnace element.

**Water-Cooled —** Circulation through electrodes, coverplates and outer shell.

**Easy Furnace Access —** Removable top and bottom covers, with hearth lift mechanism for bottom loading.

**Unrestricted Viewing —** Inert gas is directed against side and top sight ports to scavenge atmosphere.

Unusually compact and economical laboratory furnaces meet the severe requirements of melting and sintering materials in excess of 4500°F. Curtiss-Wright Research Furnaces feature a specially designed cylindrical graphite resistance element surrounded by a graphite radiation barrier, carbon insulation and aluminum outer shell; mounted on a vertical supporting column for easy access. Equipment and instrumentation is available for any degree of semi-automatic or automatic control.

Systems Engineering Services available  
Phone SWinburne 9-0500 or write:

**CURTISS WRIGHT**  
CORPORATION

Princeton Division • Princeton, N. J.

In Canada: Canadian Curtiss-Wright Ltd.  
287 Horner Avenue, Toronto, Canada

needed to keep the heavy hydrogen employed in liquid form. Not until March, 1954, a half year after the Russian explosion, the evidence suggests, did the United States explode a real hydrogen bomb utilizing lithium deuteride."

If it was news that the Russians had the first hydrogen bomb and that there was a period of 6 months in which a hydrogen-bomb gap existed, then, as the following comments suggest, the news was—and remains—quite well hidden.

An informal survey was conducted among social and physical scientists in the Cambridge, Massachusetts, area. Quite universally social scientists had not previously known that there had been an apparent 6-month hydrogen-bomb gap in Russia's favor, and what is more, although they professed to having read the *Times* story, they (again quite universally) had not appreciated what was being reported. Some of these persons, it might be noted, teach and write about international (and particularly military) policy.

Physical scientists, on the other hand, did not see the matter as news. Quite universally they had "here or there" picked up the information given in the story, and, what is more, they expressed surprise that it was, in some quarters, news.

At least two points are worthy of further consideration. First, the story, which if news was surely one of the most important stories of the postwar period, was not picked up, given headline status, or made any sort of national issue by those (congressmen, commentators, and so on) who make national issues. Indeed, when more recently Khrushchev repeated the assertion, reports of his speech indicated not that he was apparently correct but that this was a typical Soviet claim. Second, if social scientists are to concern themselves with offering advice and evaluating national policies, then some means must be found by which they are given at least that information which the community of physical scientists has acquired.

Suggestions for the regular transmission of such information certainly seem in order.

HARVEY SACKS

Department of Sociology,  
University of California, Berkeley

DAVID ZIPSER

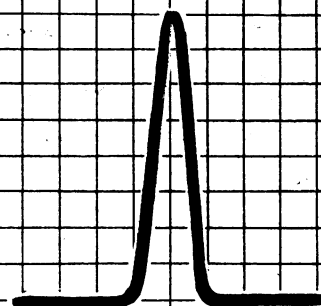
Department of Biology, Harvard  
University, Cambridge, Massachusetts

## INTRODUCING WORTHINGTON RIBONUCLEASE A

Chromatographically  
Homogeneous

100 mg—\$18.00

1 gram—\$120.00



also

## CRYSTALLINE RIBONUCLEASE

4X crystallized.

An old product with  
a new low price:

1 gram	\$ 50.00
5 grams	225.00
10 grams	400.00

Quantity prices  
available, on request.

**WORTHINGTON  
BIOCHEMICAL  
CORPORATION**

FREEHOLD 1,  
NEW JERSEY