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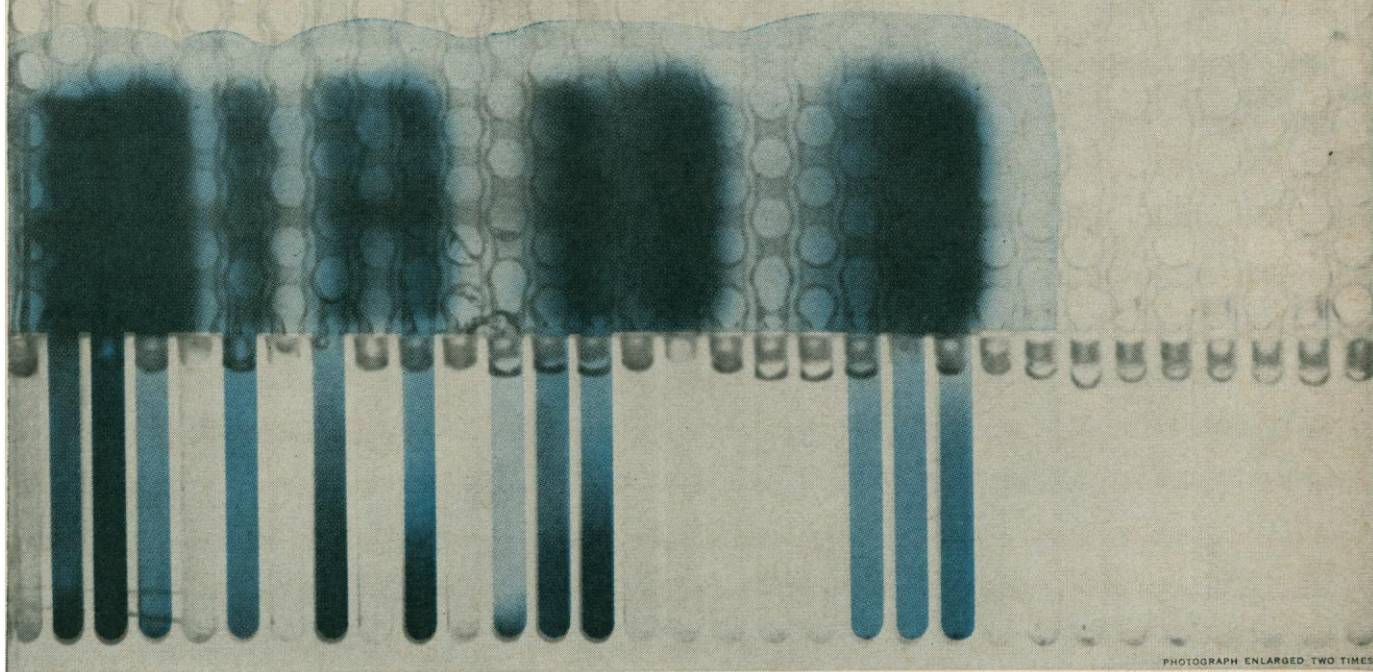
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LETTERS	Essay Tests Can Be Standardized: <i>L. La Fave</i> ; Science and the Election: <i>T. F. Cooke, J. W. Brandt, J. Bennett, C. Adler</i> ; Able Students Still Choose Science: <i>E. Mayr</i> ; The Lunar Surface: <i>H. H. Nininger</i>	171
EDITORIAL	Challenge to Tax Exemption	175
ARTICLES	Lasers for Length Measurement: <i>A. G. McNish</i>	177
	An Absolute Spectrofluorometer: <i>G. K. Turner</i>	183
	Digital Computers in the Biological Laboratory: <i>R. L. Schoenfeld</i> and <i>N. Milkman</i> . .	190
	Precision Digital Tide Gauge: <i>F. E. Snodgrass</i>	198
	Seismic Measurements on the Ocean Bottom: <i>H. Bradner</i>	208
	High-Speed Automatic Analysis of Biomedical Pictures: <i>R. S. Ledley</i>	216
	Nuclear Magnetic Resonance Spectroscopy in Superconducting Magnetic Fields: <i>F. A. Nelson</i> and <i>H. E. Weaver</i>	223
NEWS AND COMMENT	Presidential Campaign—Role of the Scientists; C. P. Snow—Corridors of Power; Cancer Research—More for Leukemia	233
BOOK REVIEWS	<i>Technology: Man Remakes His World</i> , reviewed by <i>M. Kranzberg</i> ; other reviews by <i>E. S. Ferguson, R. L. Strong, A. S. Crafts, L. R. Blinks, W. R. Brode</i>	237
REPORTS	Animal Cell Strains: <i>Cell Culture Collection Committee</i>	241
	A System for Studying Microbial Morphogenesis: Rapid Formation of Microcysts in <i>Myxococcus xanthus</i> : <i>M. Dworkin</i> and <i>S. M. Gibson</i>	243
	Ostracitoxin: An Ichthyotoxic Stress Secretion of the Boxfish, <i>Ostracion lentiginosus</i> : <i>D. A. Thomson</i>	244
	Tuberculin Reactivity of a Carbohydrate Component of Unheated BCG Culture Filtrate: <i>H. Baer</i> and <i>S. D. Chaparas</i>	245
	Phytohemagglutinin Elicitation of Specific Anamnestic Immune Response in vitro: <i>T. W. Tao</i>	247
	Chromosome Abnormalities in vitro in Human Leukocytes Associated with Schmidt-Ruppin Rous Sarcoma Virus: <i>W. W. Nichols et al.</i>	248

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Radiation-Chemical Oxidation of Peptides in the Solid State: <i>W. M. Garrison, M. E. Jayko, W. Bennett-Corniea</i>	250
Chromosome Aberrations: Their Role in the Etiology of Murine Leukemia: <i>M. A. Rich, R. Tsuchida, R. Siegler</i>	252
Serotonin Rhythm in the Pineal Organ: Control by the Sympathetic Nervous System: <i>V. M. Fiske</i>	253
Electron Microscopy of Single-Stranded DNA: Circularity of DNA of Bacteriophage ϕ X174: <i>D. Freifelder, A. K. Kleinschmidt, R. L. Sinsheimer</i>	254
Silicon Oxynitride: A Meteoritic Mineral: <i>C. A. Andersen, K. Keil, B. Mason</i>	256
Chemical Variations in a Granitic Pluton and Its Surrounding Rocks: <i>A. K. Baird et al.</i>	258
Oscillations of Quasars: <i>G. C. McVittie</i>	259
High-Voltage Laue X-ray Photography of Large Single Crystals: <i>B. Paretzkin and H. S. Peiser</i>	260
Crystal and Molecular Structure of Ferrichrome A: <i>A. Zalkin, J. D. Forrester, D. H. Templeton</i>	261
Sodium Perxenate and Xenon (II) Difluoride Reduction at the Dropping-Mercury Electrode: <i>B. Jaselskis</i>	263
Imprinting in an Altricial Bird: The Blond Ring Dove (<i>Streptopelia risoria</i>): <i>E. Klinghammer and E. H. Hess</i>	265
Eel Electroplaques: Spike Electrogenesis without Potassium Activation: <i>Y. Nakamura, S. Nakajima, H. Grundfest</i>	266
Activating and Synchronizing Centers in Cat Brain: Electroencephalograms after Lesions: <i>A. Camacho-Evangelista and F. Reinoso-Suárez</i>	268
Auditory Nuclei: Distinctive Response Patterns to White Noise and Tones in Unanesthetized Cats: <i>D. Galin</i>	270
Light: Evidence for Its Direct Effect on Hypothalamic Neurons: <i>R. D. Lisk and L. R. Kannwischer</i>	272
Planaria: Memory Transfer through Cannibalism Reexamined: <i>A. L. Hartry, P. Keith-Lee, W. D. Morton</i>	274

MEETINGS	Biophysics: <i>L. D. Harmon and F. M. Snell</i> ; Aquatic Pollution: <i>J. J. A. McLaughlin</i> ; American Association of Physical Anthropologists: <i>G. W. Lasker</i> ; Forthcoming Events	276
-----------------	--	-----

DEPARTMENTS	New Products	301
--------------------	--------------------	-----

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A transmission Laue photograph of a gypsum single crystal taken with a fine-focus x-ray tube operated at 100 kilovolts and 5 milliamperes. By this technique it is possible to examine, even while they are growing, thick single crystals, crystals in containers, and crystals enclosed in furnaces. The sample is not damaged or exposed to the air. Exposure, 5 minutes; distance between slit and film, 6 centimeters. See page 260.

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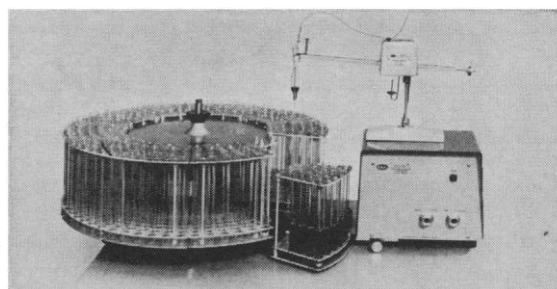
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The LKB RadiRac Fraction Collector has a long history of reliable operation, whether in the cold room or out. Naturally only the finest materials and careful manufacturing procedures go into every component to ensure this sort of dependability. But you can put proven reliability to work in your lab through LKB's Building Block System. Start off with an *Economia Model* (Rotator Assembly and Siphon Stand) at \$450.* Add a Distributor to make a *Sectora Model*, and later a Timing Control and you have the *Universal Model*. Add a Drop Counter if you wish; a "Large Volume Assembly"; a . . . well, write and ask for our brochure; it describes all the possibilities. Request *Bulletin No. 3400S10*.

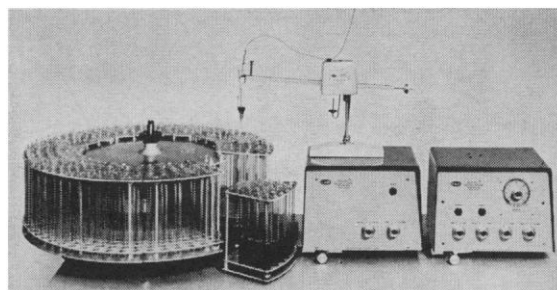
**Prices F.O.B. Wash., D.C., U.S.A. only.*

For prices in other countries, contact:

*LKB Produkter, AB, Stockholm,
or your local LKB Distributor*



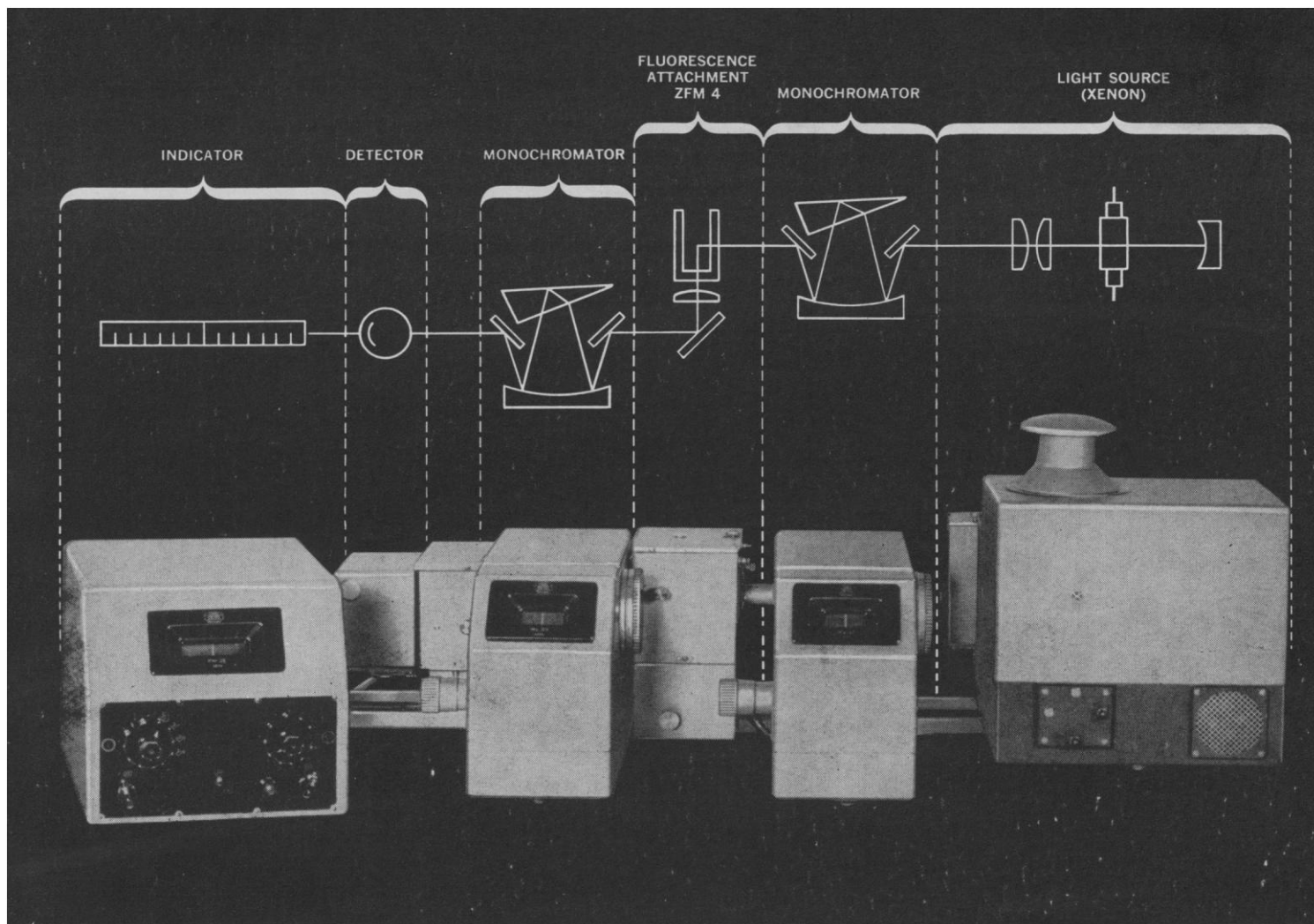
Sectora Model, for volumetric siphoning in spiral or "square-wave" distribution patterns. Includes Rotator, Distributor, Siphon Stand and Rimless Tube Racks.



Universal Model, for volumetric siphoning and timed-flow collecting in spiral or "square-wave" patterns. Includes Rotator, Distributor, Controller Siphon Stand, Rimless Tube Racks and Tubing Holder.



LKB INSTRUMENTS, INC., 4840 Rugby Ave., Washington, D.C. 20014
LKB PRODUKTER AB, P.O. Box 12220, Stockholm 12, Sweden



Spectrofluorometry made simple

With the Carl Zeiss Spectrofluorometer you can measure fluorescence of solutions with high accuracy and operating simplicity. The basic equipment consists of a xenon high-pressure bulb in housing, two quartz monochromators, fluorescence attachment ZFM 4, detector housing and indicator.

The two prism monochromators make it possible to change both the exciter wavelength as well as the wavelength of emitted fluorescent light. Thereby, information is obtained concerning the type and concentration of the substance causing fluorescence.

The mode of operation is briefly as follows: the white light emitted from the xenon bulb enters the first monochromator and is dispersed. By means of the wavelength setting device, the proper monochromatic exciter light is selected. This monochromatic light penetrates the sample and the fluorescent light is deflected into the second monochromator where it is again dispersed to determine the maxima of fluorescence. These amounts can be read off on the indicator.

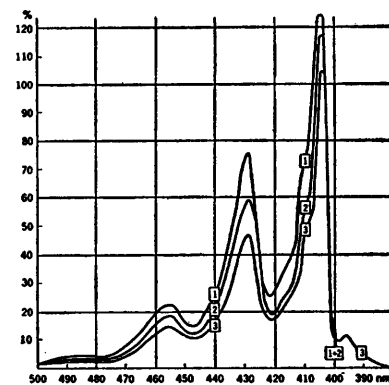
Simplified equipment for spectrofluorometric examination is also available for work of a less critical nature. In this case a

high pressure mercury burner is used as the source of light. The exciter light is selected by monochromatic filters (578, 546, 436, 405, 365, and 313 m μ) and the emitted fluorescent light dispersed by the quartz monochromator. This arrangement can also be reversed.

The Spectrofluorometers are also ideally suited for turbidity measurements.

By adding a few accessories to the basic components you can convert the Spectrofluorometers into high-resolution spectrophotometers for quantitative analysis. Write Dept. SC for more information.

Complete service facilities available.



Fluorescence spectra of 3, 4-benzopyrene: 1, dissolved in benzene, 2, from a paper chromatogram, 3, benzopyrene on paper.

CARL ZEISS, INC.

444 Fifth Avenue, New York, N. Y. 10018

BRANCH OFFICES IN ATLANTA, CHICAGO, LOS ANGELES, SAN FRANCISCO, SEATTLE



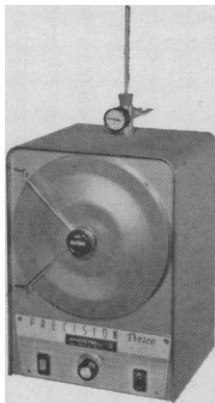
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Since 1920 Precision Scientific Company has been dedicated to producing new products designed with your needs in mind . . . to help you solve basic problems faster, more efficiently, and with more positive results. Several recently introduced products are presented here. *More significant new developments are coming soon!*

THE THELCO MODEL 10 VACUUM OVEN

The Model 10 is a versatile, budget priced vacuum oven. Ideal for general drying, conditioning, desiccating, moisture testing . . . does all and more than bigger, higher priced ovens do. Heats to 150° C in 1 hour, 40 minutes under full 30 inches of vacuum. Two handy shelves provide 108 sq. inches of work space. Write for Bulletin 311.



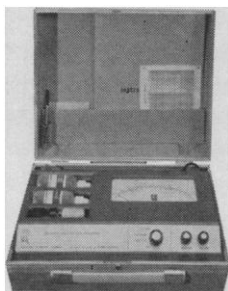
THE TIME-IT ELECTRIC STOPWATCH

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99.999%
Accuracy!



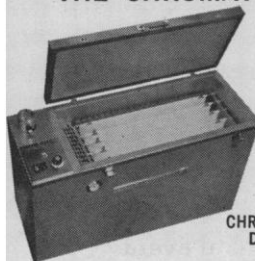
Ideal for timing hundreds of lab tests, experiments and processes. You read elapsed time directly in seconds and 10th of seconds or minutes and 100th of minutes—no conversion arithmetic required. Accurate to within 0.0001 of a second and built to withstand more hard knocks and give longer, more dependable service than ever before. Write for Bulletin 645.

THE GALVANIC CELL OXYGEN ANALYSER



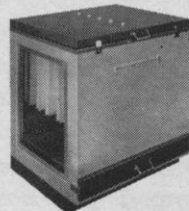
For rapid, reliable, low cost O₂ determination anywhere—inside the lab, in the treatment plant or on streams and lakes. Compact and light weight. No external electrical or other connection needed. Write for Bulletin 638.

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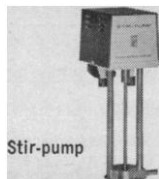
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Save time, money and trouble. Equip your lab with Precision Jacks. Prevent delays, eliminate frustrations, improve results.

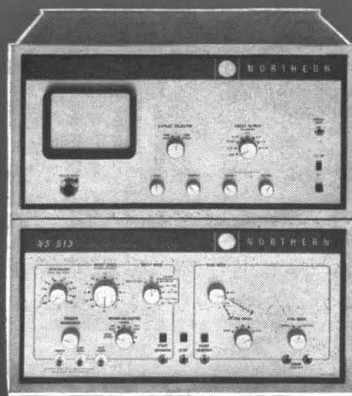
Increase their usefulness with customized Heaters, Hot Plates or Stirrers. And for that job needing remote control, use Power Jack . . . the motorized Big Jack that goes into action at the touch of a button. Lifts up to 100 lbs. Write for Bulletin 637.



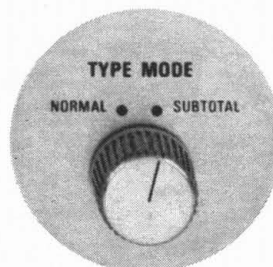
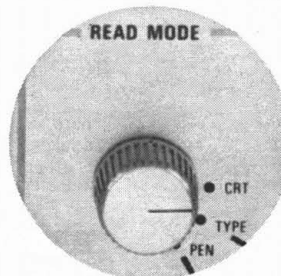
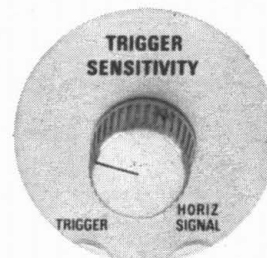
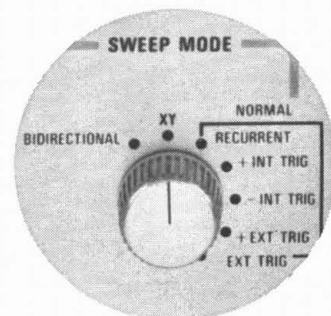
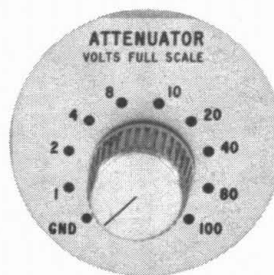
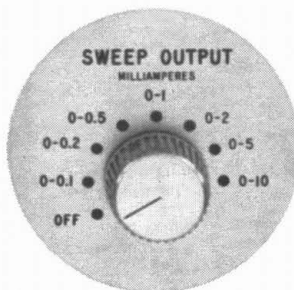
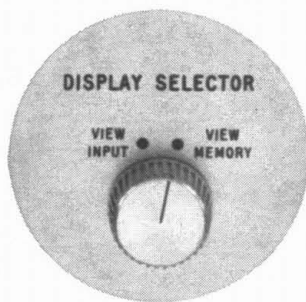
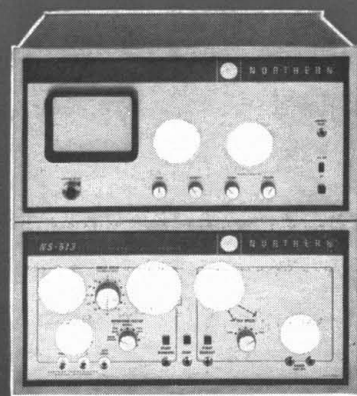
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Ask your Laboratory Supply Distributor or write for the Precision Scientific Bulletins mentioned above.

The Model NS-513
Digital Memory
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-7=



Our model NS-513 signal averaging digital memory oscilloscope would be incomplete without the seven controls shown here. But their counterparts are rarely found in other manufacturers' averagers.

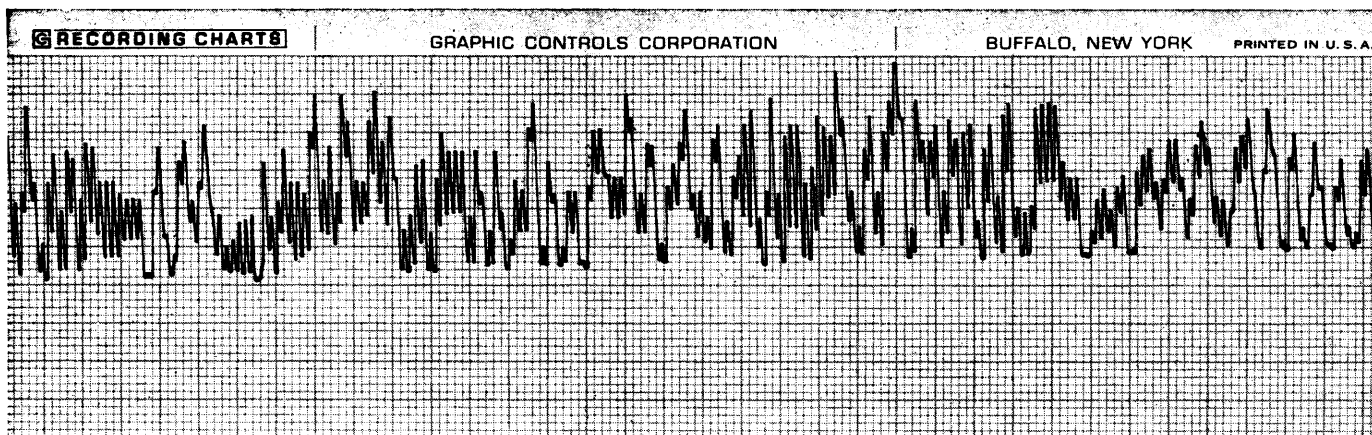
We think this shows unusual thoughtfulness in the design of our averagers. There are a lot of comparably thoughtful design features *inside*, too.

Further information, literature and specifications may be had by writing or phoning (608) 238-4741.

Model NS-513
Digital Memory Oscilloscope
\$9,750, including typewriter,
FOB Madison, Wisconsin

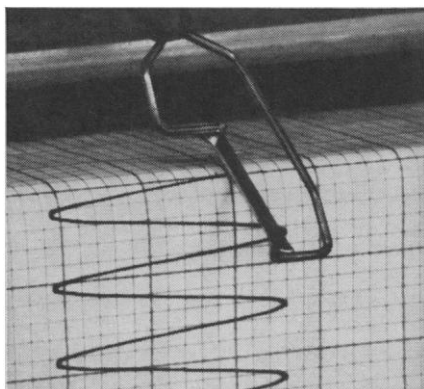


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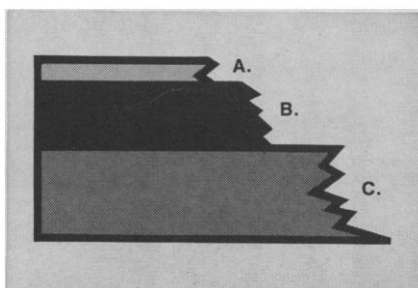


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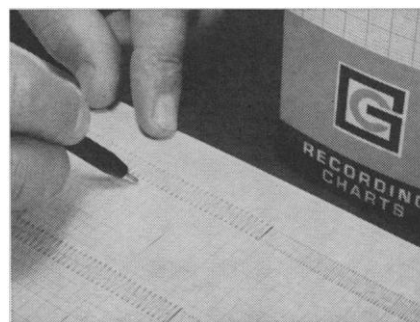
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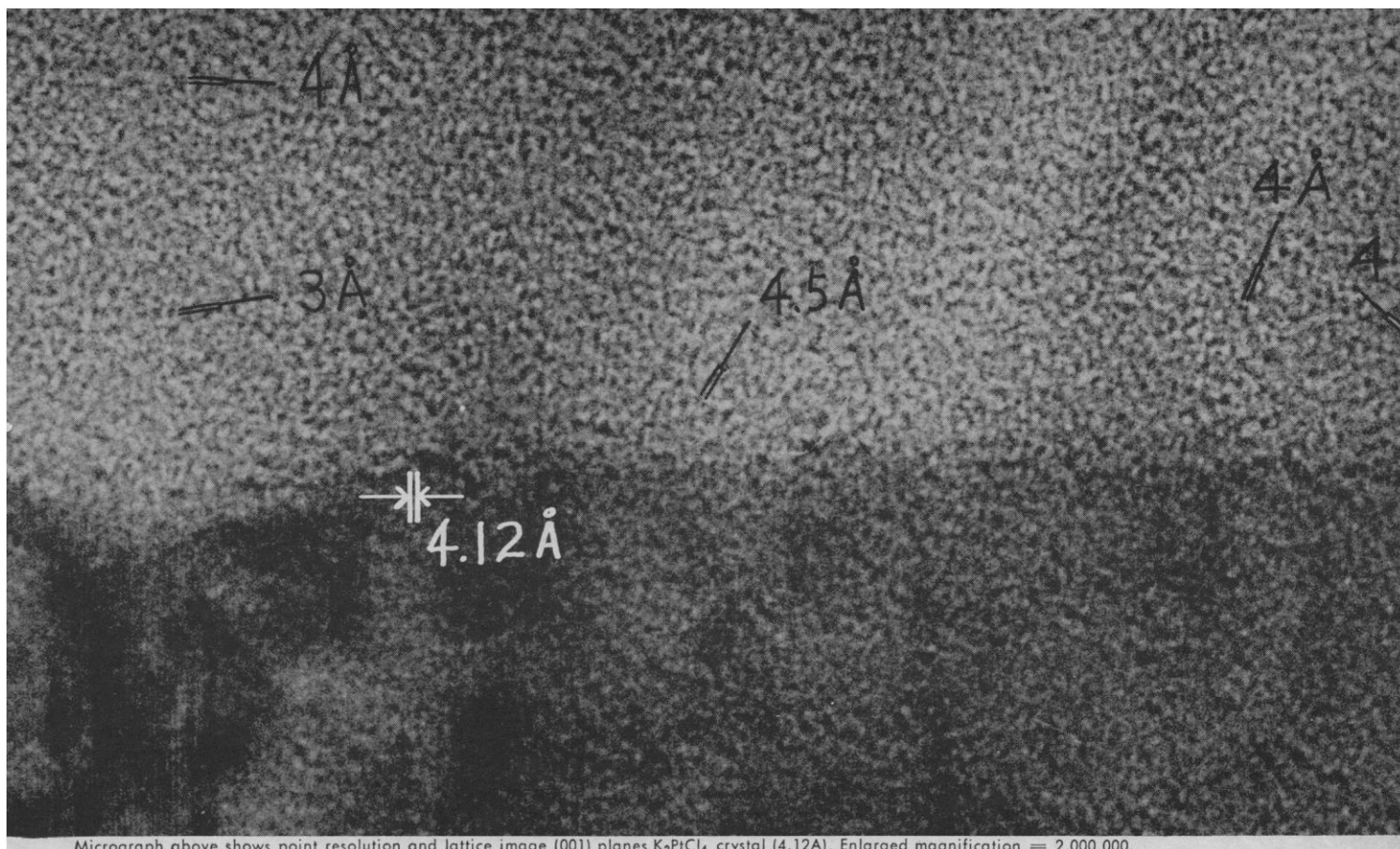
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Micrograph above shows point resolution and lattice image (001) planes K_2PtCl_4 crystal (4.12 Å). Enlarged magnification = 2,000,000.

No. 3 in a Series

ADVANCES IN ELECTRON MICROSCOPY

As research in the life sciences and solid state physics accelerates, ultra high resolution electron microscopy assumes an increasingly important role as a source of fundamental new information. Recently, scientists at the Hitachi Central Research Laboratory have announced new discoveries in electron optics which are being incorporated in their latest designs. The five electron micrographs below of a tiny (0.05 micron) hole in collodion film were taken at equal intervals during a four minute period. They demonstrate the remarkable performance of the new Hitachi HU-11B Electron Microscope.

Careful measurements on the original plates indicated (a) At the direct magnification of 250,000, better than 5Å resolution was maintained for each exposure (b) Electronic stability was better than 2×10^{-6} for four minutes (c) The specimen contaminated at a rate of less than 0.5 angstroms per minute.

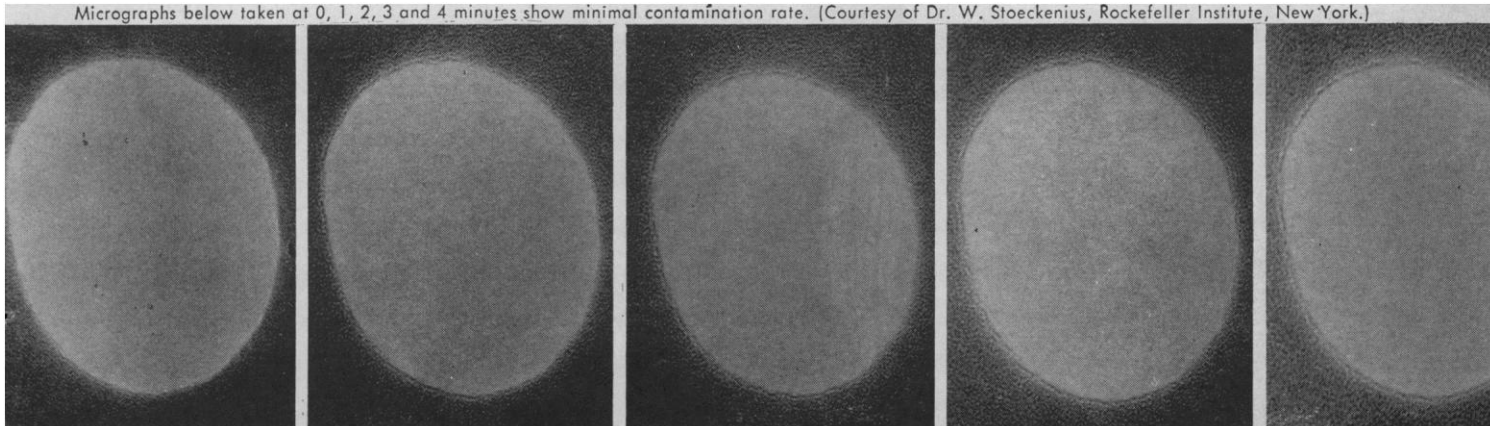
With this constancy of performance, ultra high resolution micrographs can now be obtained similar to that shown above. The (001) lattice image of K_2PtCl_4 Crystal with 4.12 Å spacing is resolved while on the same plate point-to-point resolution of particles as close as 3Å is ob-

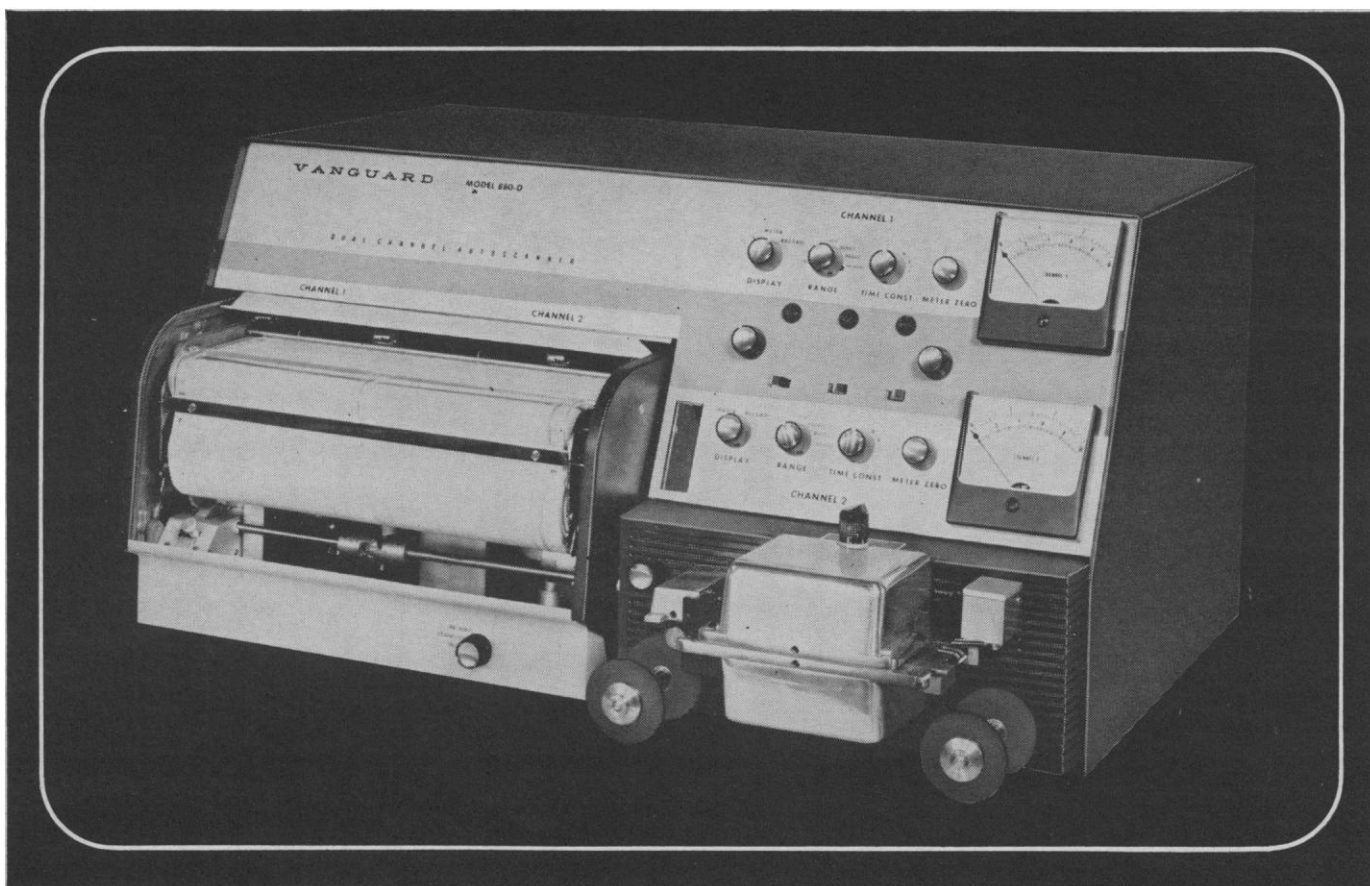
tained. This is the highest point resolution yet demonstrated by any electron microscope, approaching the dimensions of single atoms.

A complete set of these micrographs and details on the Model HU-11B can be obtained from the Perkin-Elmer Corporation, Distributor Products Department, 910 Main Avenue, Norwalk, Conn., exclusive sales and service representative for Hitachi Electron Microscopes in North America.

PERKIN-ELMER

Micrographs below taken at 0, 1, 2, 3 and 4 minutes show minimal contamination rate. (Courtesy of Dr. W. Stoeckenius, Rockefeller Institute, New York.)





new dual channel low background autoscanner

Model 880-D Dual Channel Low Background Autoscanner features two separate channels, both taking their input from the common detector. There is a common high voltage supply for the detecting chambers. Pulses from the chambers are summed under the condition that they not be coincident in time, and are then supplied to both channels of analysis.

Each channel has independent range and time constant selectors and an independent recorder channel. In operation, for example, one channel may be set with a high range and short time constant while the other channel may be set for a low range and long time constant. The net effect is that where there are intense areas of radioactivity interspersed with weak areas on the paper chromatogram, each will be presented on one of

the two channels without running off the recording top or yielding a peak mix so small it cannot be interpreted.

- Texas Instrument dual channel galvanometric-type recorder provides two 5" charts on one 10" strip
- May be used to examine simultaneously intense and weak areas of radioactivity in the presence of each other
- Completely transistorized
- Automatic shut-off of gas and power
- Better than 2% accuracy of count rate on all ranges
- Compact, one unit system adaptable to direct digital quantitation.

For complete specifications on Model 880-D Dual Channel Low Background Autoscanner and the Model 885 Glass Plate Scanner (shown at left), send for new informative brochure. For immediate information and/or a quotation, call your nearest Vanguard office.



Designed as an accessory to operate with Model 880-D, the Model 885 Glass Plate Scanner provides a convenient, low cost system to assay TLC glass plates with unequal accuracy and sensitivity.



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Linde Cryobiology NEWS

REPORT NO. 5 FROM UNION CARBIDE CORPORATION, LINDE DIVISION

Recovery of microorganisms, viable platelets, and leukocytes using liquid nitrogen storage techniques.

Papers read at the 1964 meeting of the American Society for Microbiology and other recent reports indicate significant new advances in the science of cryogenic preservation of tissue and cells.

A paper by Sokolski et al. (1) discussed the preservation of *Lactobacillus leichmanii* in liquid nitrogen for direct inoculum in the vitamin B₁₂ assay. Complete recovery of viable cells was obtained when the suspensions were rapidly frozen by direct immersion in liquid nitrogen and then rapidly thawed by agitating in a 40°C water bath. Assay results on a number of test materials indicated good correlation between freshly prepared suspensions and frozen suspensions stored 3 months in basal medium.

Stapert et al. (2) reported on the preservation of *Sarcina lutea* in liquid nitrogen for direct inoculum in the bioassay for lincomycin. The dose-response slope of the liquid-nitrogen-preserved organism remained relatively constant over a 68-day period and the inhibition zone edges were sharp throughout. The authors further stated that the preparation and storage of one *S. lutea* suspension [in liquid nitrogen] would reduce day-to-day variation in the test organism for inoculum.

Rapid deterioration of viable platelets under ordinary conditions of storage led Djerassi and Roy (3) to experiment on rat platelets frozen in liquid nitrogen. After storage at -196°C, the platelets did not lose their morphologic integrity or their ability to circulate in thrombocytopenic recipient animals. The simultaneous presence of 5% dextrose and 5% dimethylsulfoxide in plasma was a key to a circulating yield of frozen platelets as high as 70% to 87% (compared to the numbers observed when fresh platelets were given).

Cohen and Rowe (4) reported on preservation of leukocytes taken from patients with lymphocytic leukemia. The cells were frozen in 10% to 15% dimethylsulfoxide at a controlled rate of 1°C per minute and stored in liquid nitrogen for 5 months at -196°C. During this time a total of 768 leukoagglutinin tests were performed. The experimenters concluded that cryogenic preservation appears practical for storage of leukocyte panels used for immunogenetic and routine leukoagglutinin testing.

New Products from LINDE

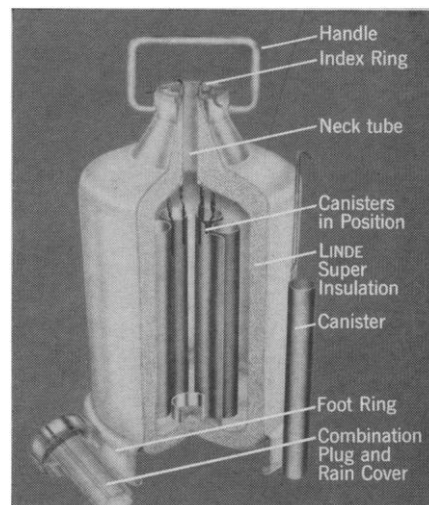
Our new LR-10A-6 portable refrigerator is designed both for economical shipping and small quantity storage of biological specimens. It will hold six canisters with a capacity of 115 cu. in. and has a minimum holding time of 3 weeks at -196°C between refills of liquid nitrogen. Lightweight, rugged, vibration-and-shock resistant, the new LR-10A-6 features a bucket type handle for easy carrying and a special metal foot ring to provide a stable base.

Another new product, the LINDE LD-4 Liquefied Gas Container, is particularly suitable for use in laboratories, classrooms and other locations requiring small portable cryogenic containers. Weighing only 11½ lb. when full, it can hold up to 4 liters of liquid nitrogen or liquid argon. A large pitcher-type handle makes it easy to pour and lift.

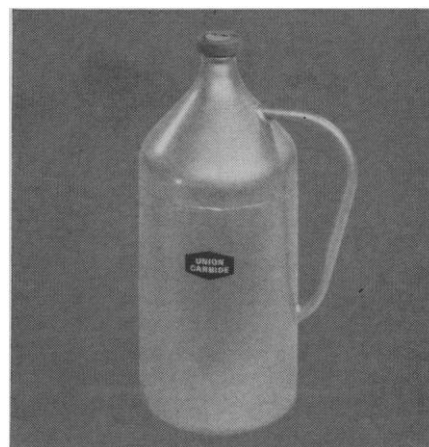
Complete Liquid Nitrogen Capabilities

The full line of LINDE liquid nitrogen equipment includes storage tanks, refrigerators, controlled-rate freezer units, biological transports, and auxiliary equipment.

We also provide technical service from knowledge gained over years of leader-



LR-10A-6 Liquid Nitrogen Refrigerator



LD-4 Liquefied Gas Container

ship in cryogenics, backed up by nationwide delivery of liquid nitrogen.

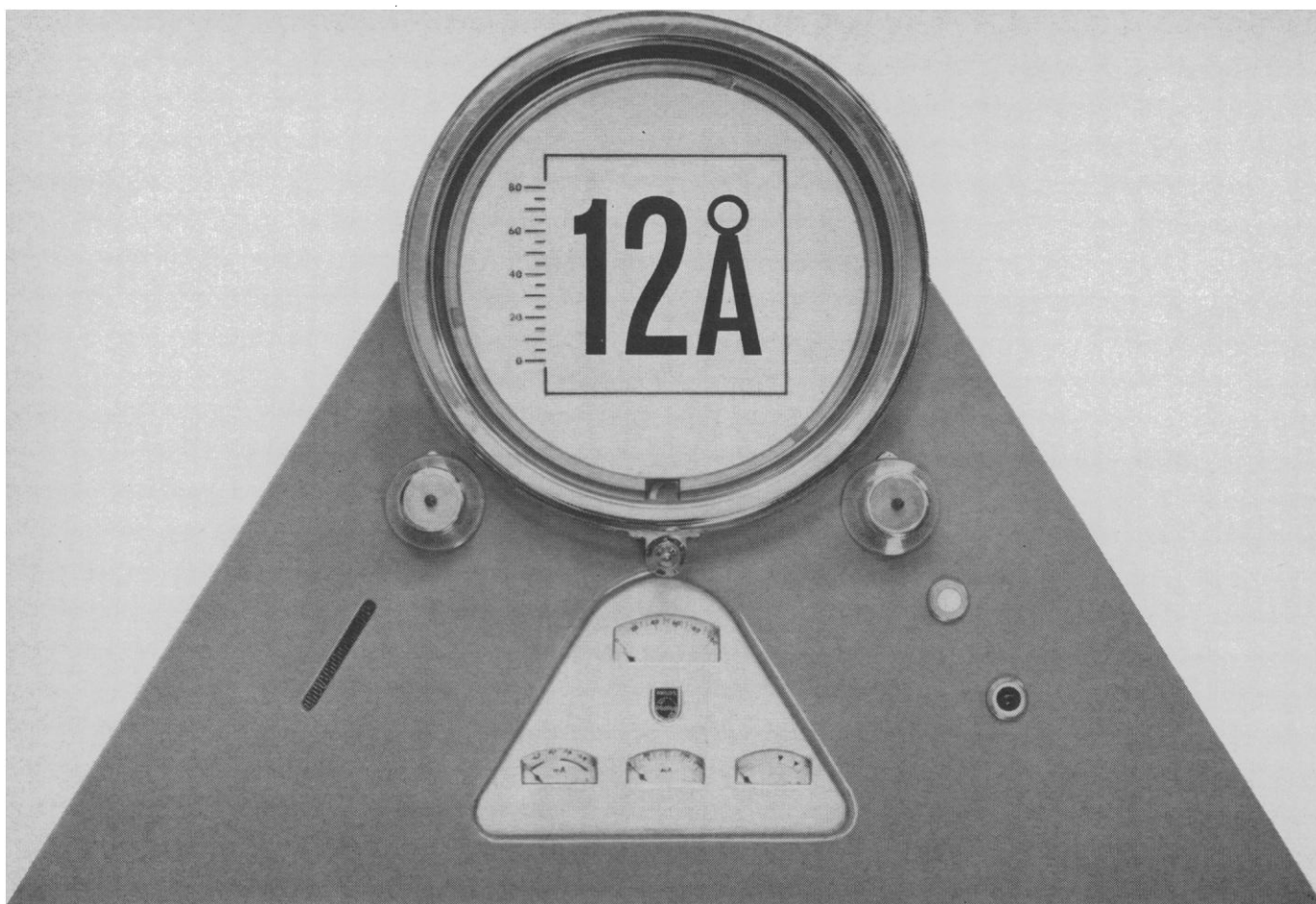
For data, write to Union Carbide Corporation, Linde Division, Dept. SC-1, 270 Park Avenue, New York, N. Y. 10017.

(1) Sokolski, W. T., Stapert, E. M., Ferrer, E. B., and Hanka, L. J., *Bact. Proc.*, RT4, 1964. (2) Stapert, E. M., Sokolski, W. T., Kaneshiro, W. M., and Cole, R. J., *Bact. Proc.*, RT5, 1964. (3) Djerassi, I. and Roy, A., *Blood XXII*, 703-717, 1963. (4) Cohen, H. and Rowe, A. W., *Transfusion* 3, 427, 1963.

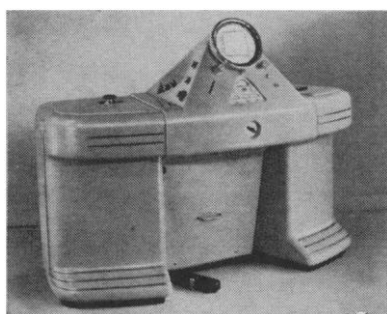
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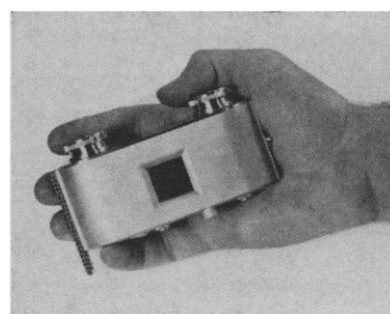
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EM 100, the intermediate microscope in the Norelco electron microscope line, will produce twelve angstroms resolution consistently under optimum conditions. A roll film cassette — supplied with the microscope — can supply as many as 100 micrographs each day. Any number of frames up to 40 exposures may be made on a single roll of 35 mm film. Film is advanced automatically from frame-to-frame and a built-in shutter permits making numerous exposures without



reloading—simplifying darkroom procedures and unnecessary film storage. A built-in exposure guide assures uniform exposure. After setting, a micron marker automatically labels each micrograph.

These are but a few of the practical and workable features contributing to the EM 100's many application successes.

World's Highest Standards in Quality Instrumentation

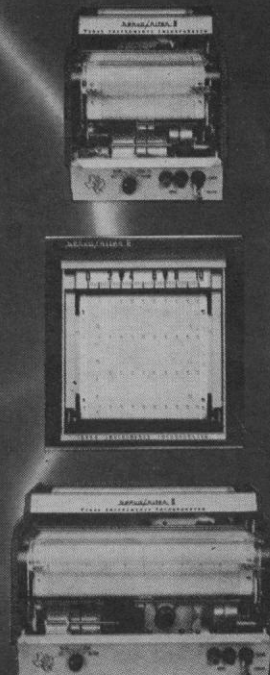
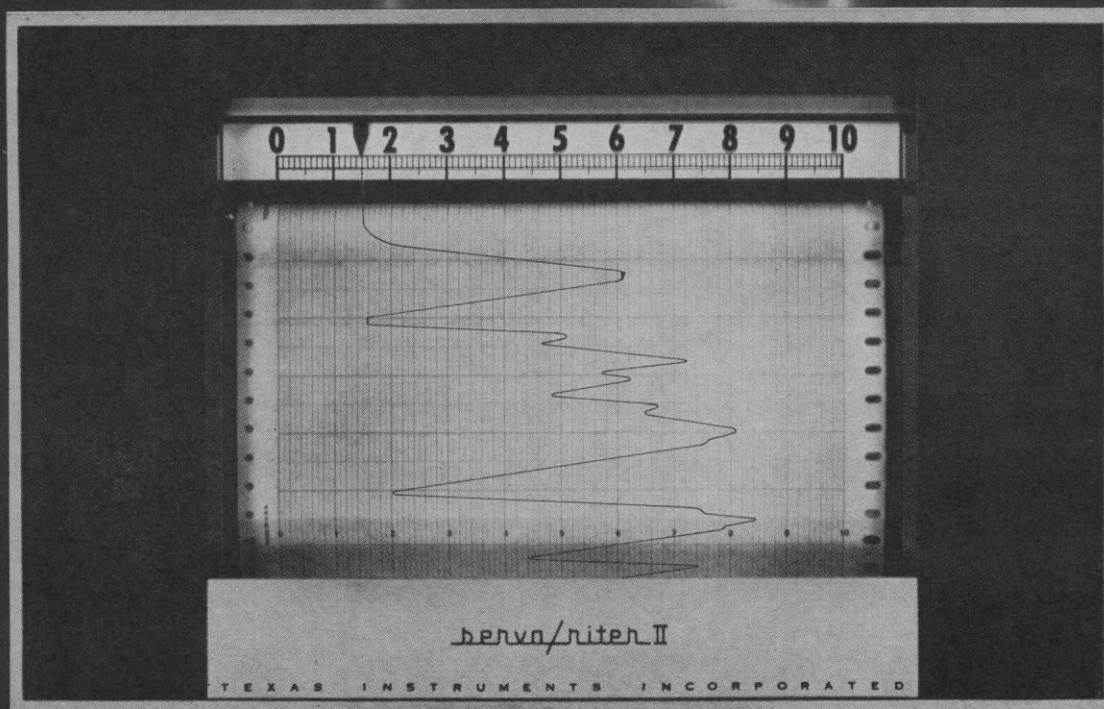
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Reliability—you couldn't ask for more! An all new solid state design utilizes long-life components...an infinite resolution slidewire needs only the contacts changed after millions of cycles of operation...an all new non-mechanical, photoconductive chopper...all this combined in a rugged printed circuit board design. Bearing and wear surfaces are long-life and quiet-running acetal. Quality design throughout assures the reliability and performance of the all new servo/riter II...and that's not all!

New convenience features—and more of them! Front panel access to all operating controls for span switching, zero positioning and suppression, chart speed selection, pen lifters...easily removable door...chart advance...interchangeable chart drive motors...chart supply indicator...chart tear-off...writing platen. Chart loading is faster...filling the removable inkwells is easier...installation is simpler using direct rack mounting with front and rear terminal access...and that's not all!

More versatility—tailor the all new servo/riter II to your needs! Choose the desired input form—d-c potentiometer, thermocouple, universal range, etc.—and plug it into the amplifier...change span and zero position with plug-in circuit cards, too. Marker pens, control contacts, retransmitting slidewires, pen lifter, internal lighting are available options.

Ask for a demonstration of the newest strip-chart recorder...the all new servo/riter II.

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**This multiple coincidence unit
accepts five input signals,
produces four simultaneous output signals,
and outperforms
any other system you can buy.**



But the Cosmic 801 is not in a class by itself . . .

The Cosmic 801 Multiple Coincidence Unit is designed to give you a coincidence system more flexible and reliable than any other you can buy. The four coincidence circuits — each able to present a different set of coincidence conditions — can be used to direct data to four separate sections of the analyzer memory, making it possible for you to study four aspects of a decay scheme at the same time.

The Cosmic 801 has a separate resolving time control for each channel rather than a single control for all channels. With this you are able to optimize the coincidence circuitry for different detectors in a particular coincidence experiment.

The 801 also gives you a separate fine delay control for each channel. This allows you to optimize each channel individually to compensate for the propagation delay inherent in any electronic system. In addition, the 801 has a coarse delay switch for accidental coincidence evaluation.

801 Removes Uncertainty of Pulse-Arrival-Time When Amplitude Restriction Is Used

The single channel analyzer's upper and lower discriminators are long-period one-shot multivibrators that are triggered by the input signals and interrogated and reset by the signals derived from the trailing edge of the Fast Discriminator. This Cosmic feature removes the uncertainty in the Fast Discriminator and Single Channel Analyzer Pulse-Arrival-Time at the Fast/Slow Coincidence Circuit. Slow coincidence means amplitude restriction and by no means increases chance coincidence. On the contrary, slow coincidence reduces chance coincidence

by reducing Pulse-Arrival-Time produced from the detector system. With the Cosmic 801 you can use shorter resolving time.

The unique design of the Fast Discriminator permits recovery time to be determined by the time the input signal passes through zero — regardless of the discriminator bias setting.

Extendable block circuitry can be used to prevent the counting of those events that may have been distorted by previous closely occurring events at the detector or any of the intervening circuits. A much more active source may therefore be counted without spectrum distortion.

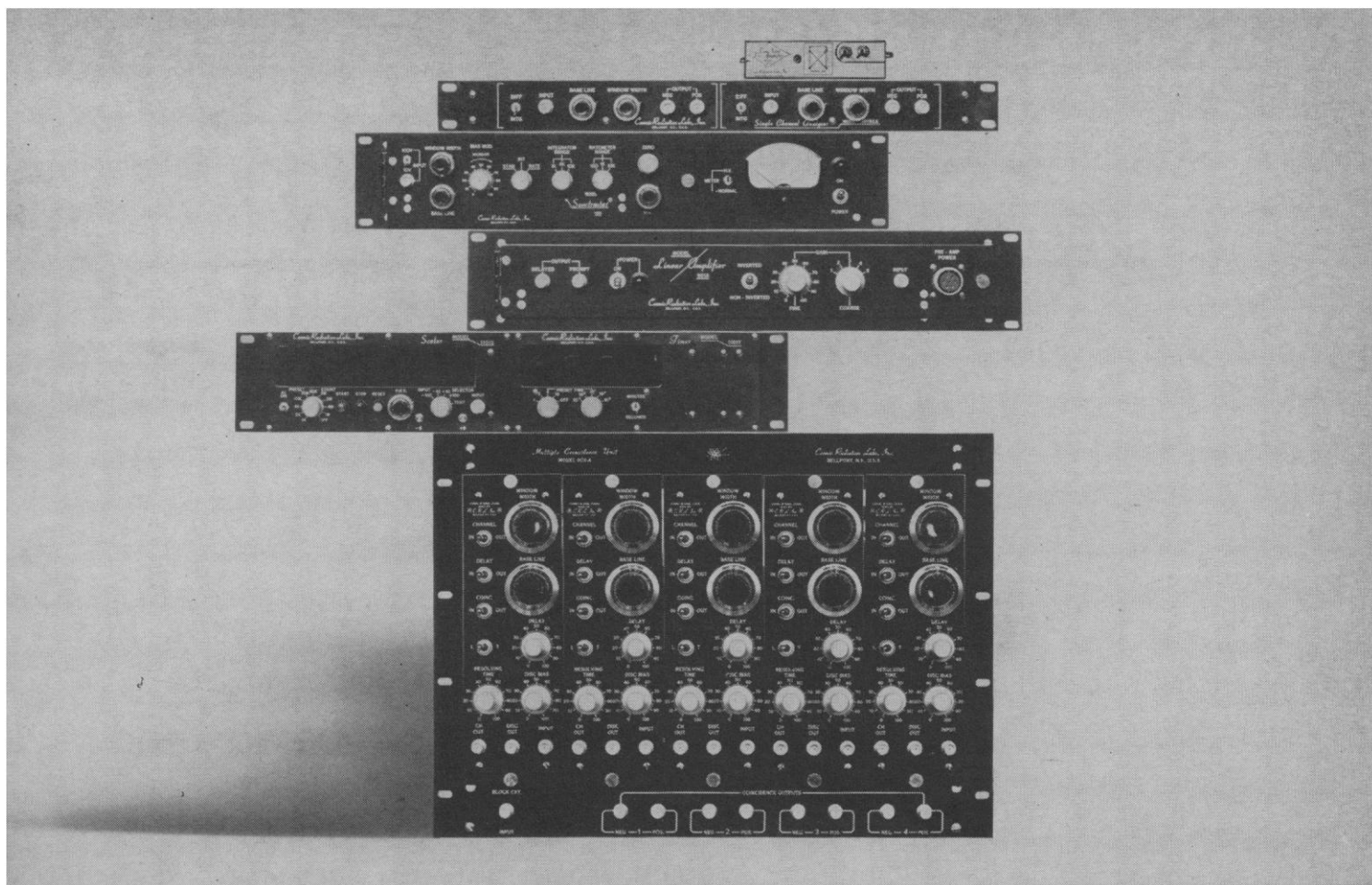
1013 Different Coincidence Combinations

Complete flexibility is achieved by using plug-ins and patch cords similar to that used in computer programming. *You can get as many as 1013 different coincidence combinations with this patch-cord programming.*

Fast/Fast coincidence studies without slow coincidence (amplitude restriction) can be done by removing the patch-cord or by throwing the appropriate front panel switch to the 'out' position.

The Cosmic 801 is also available with one coincidence circuit. The plug-in feature of the circuit lets you add one, two or three coincidence circuits at a later date. Generally two plug-in circuit boards are used for simple coincidence work. Thus with four plug-in units you can conduct two separate simple coincidence experiments simultaneously.

The Cosmic Model 802-B Plug-In Unit can be used in place of the Model 801-B as supplied in the basic unit. The 802-B,



.. all our instruments give the same high-quality performance.

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The Cosmic 801 Multiple Coincidence Unit is a versatile system and with it you can perform a variety of experiments including: delayed coincidence studies, angular correlation studies and analysis of complex decay schemes and doubly tagged compounds.

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For additional information on the Cosmic Model 801 Multiple Coincidence Unit — or for information on any Cosmic instrument — simply return the coupon.

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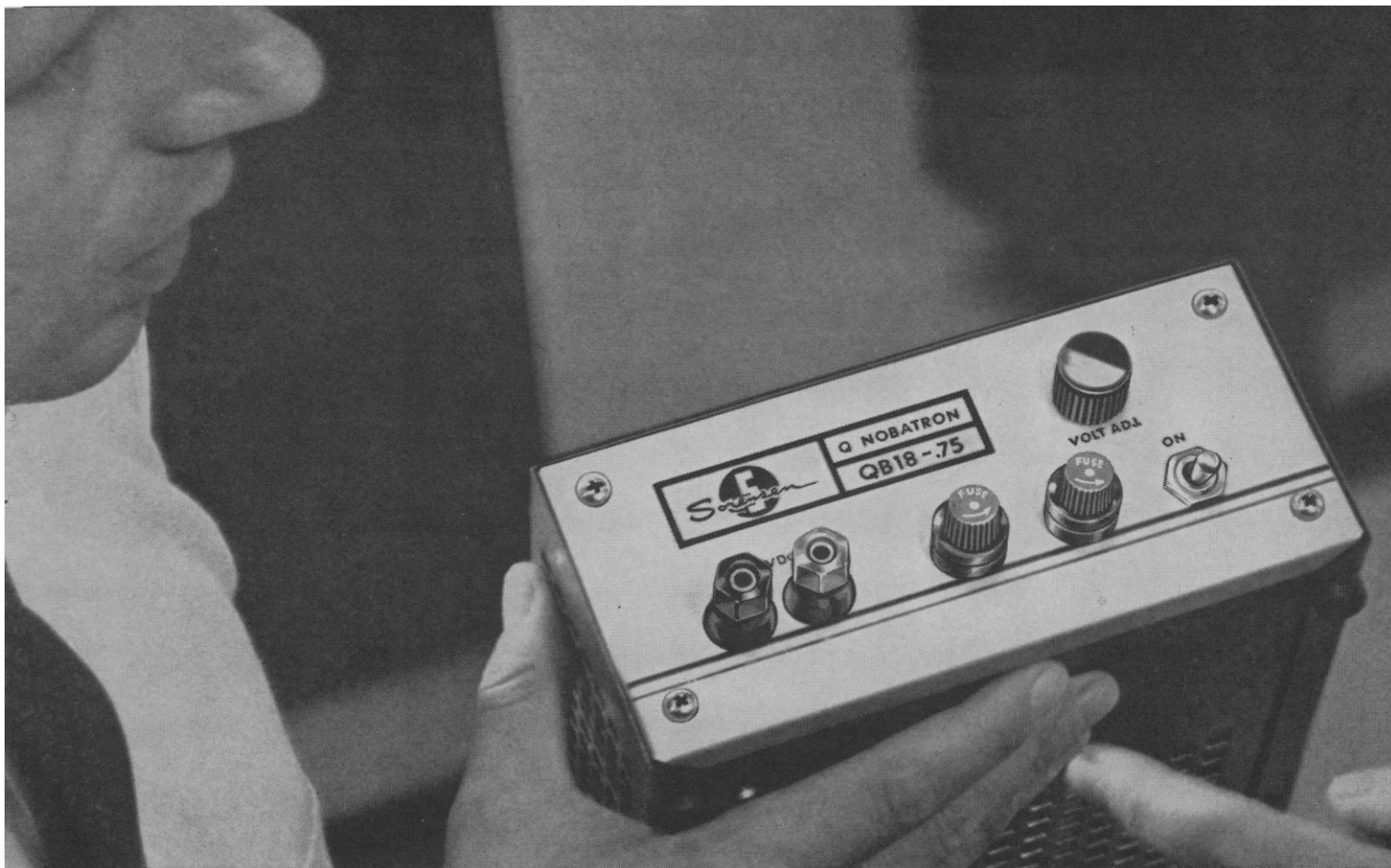


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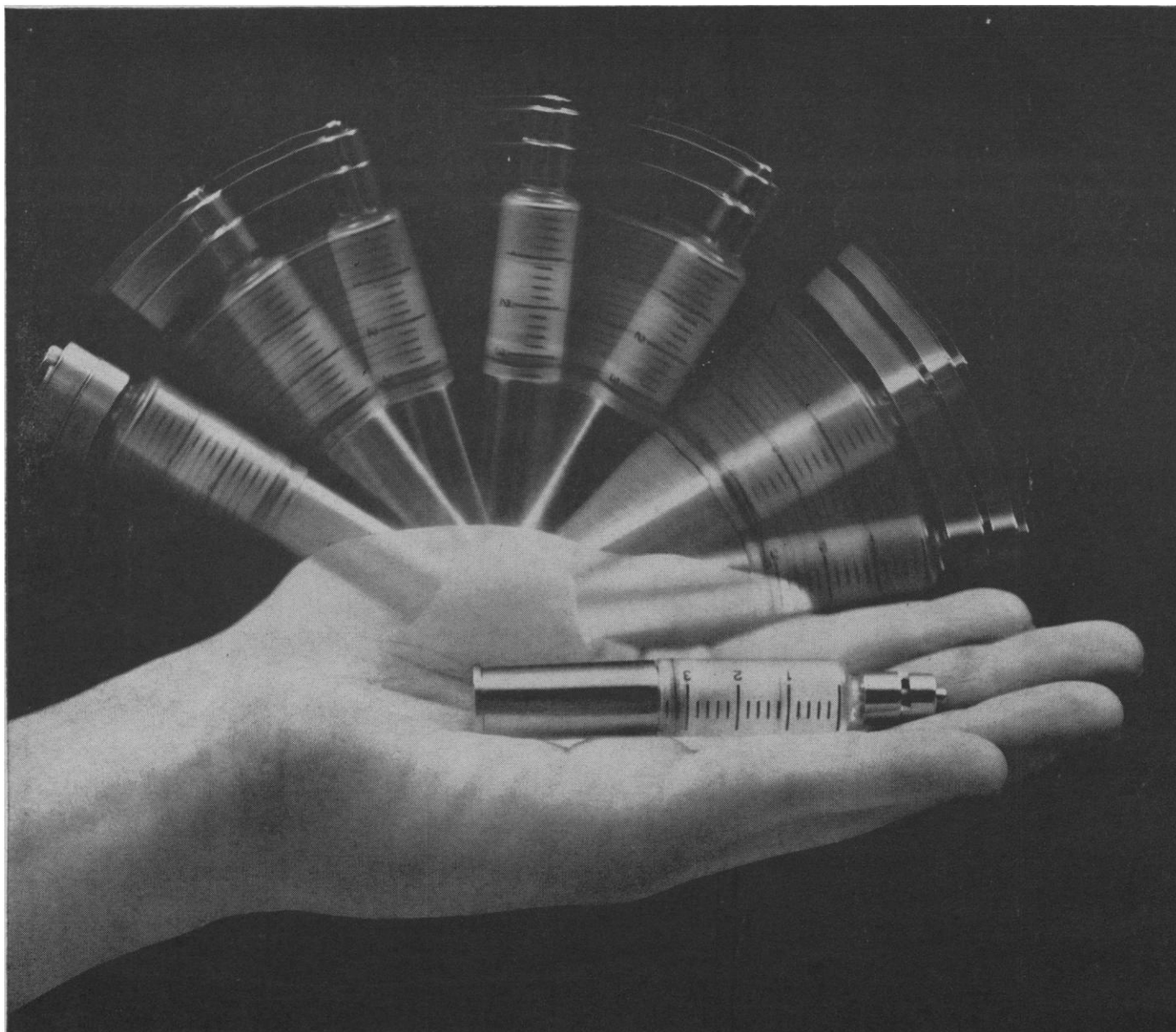
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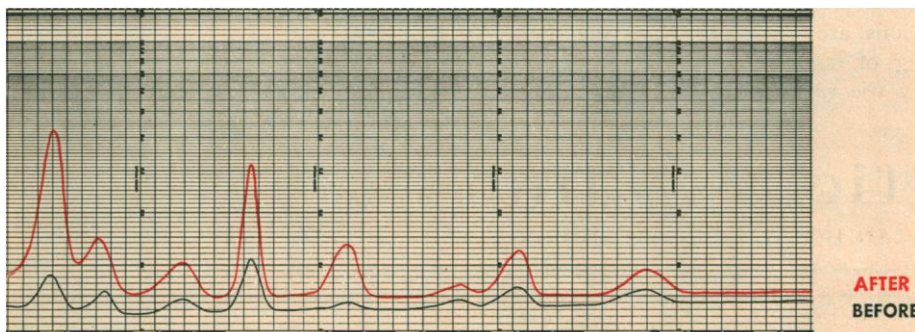
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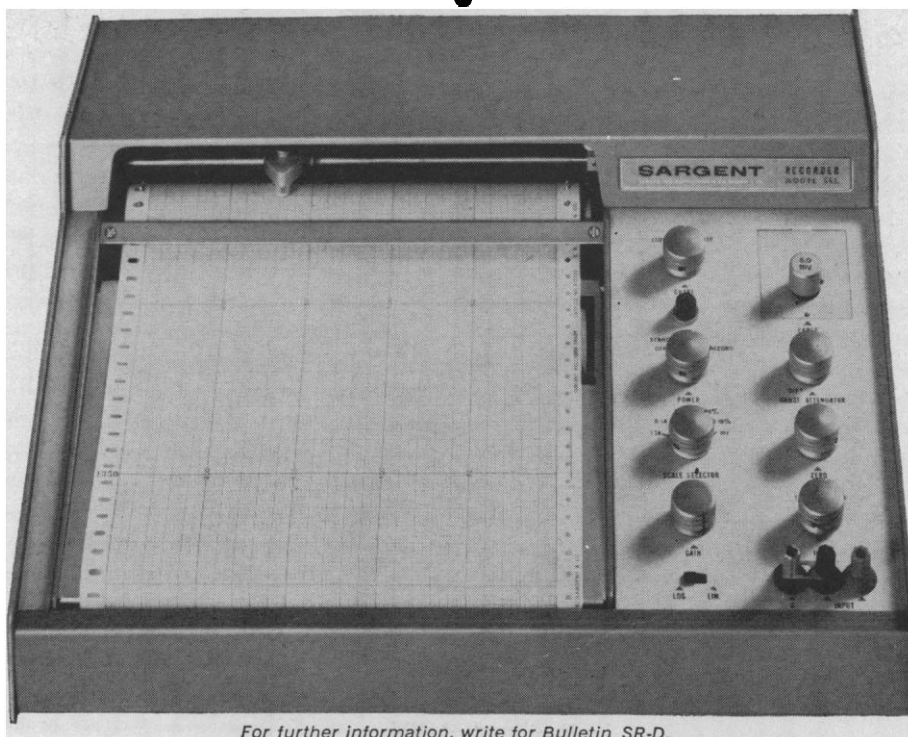
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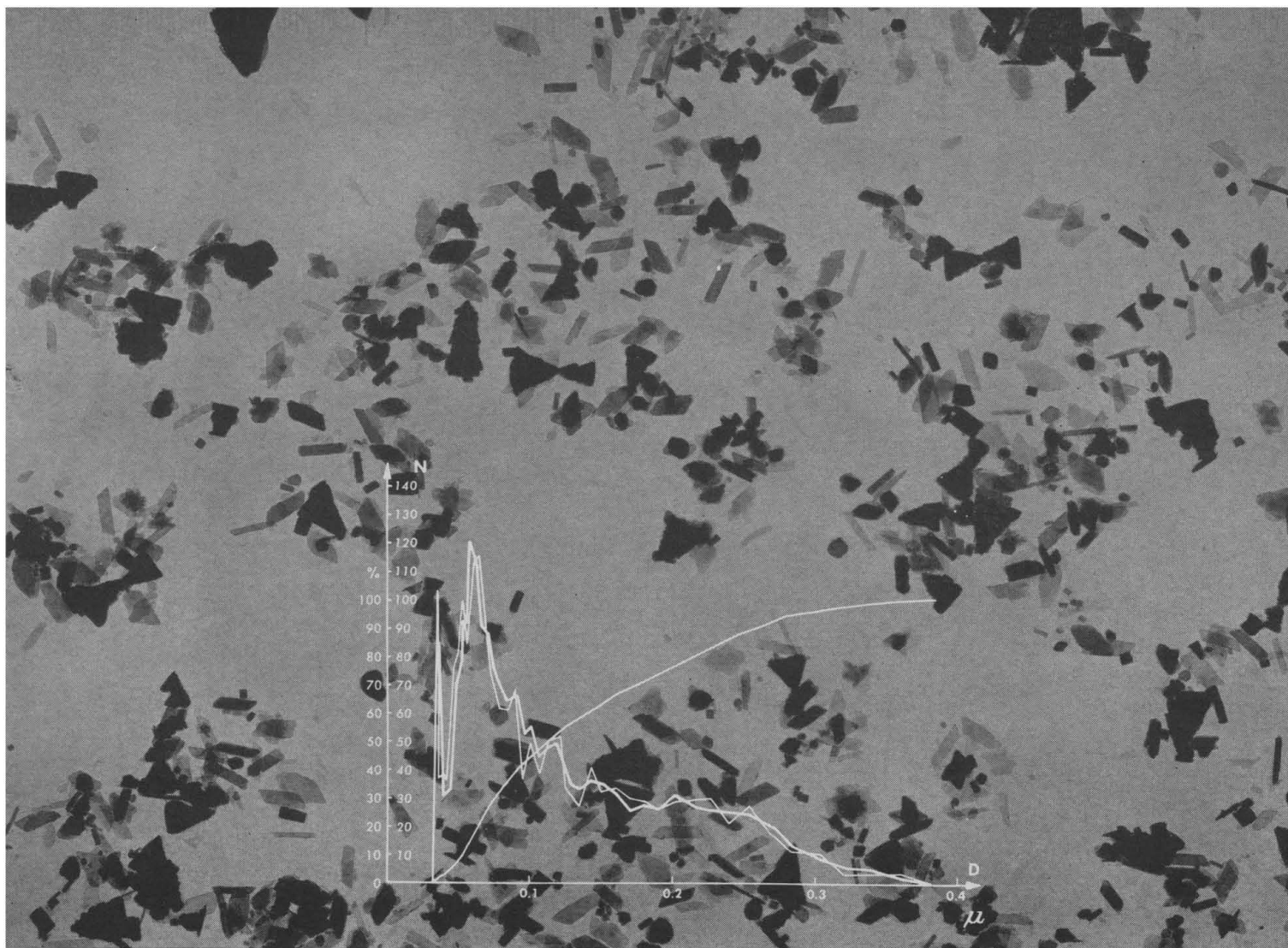


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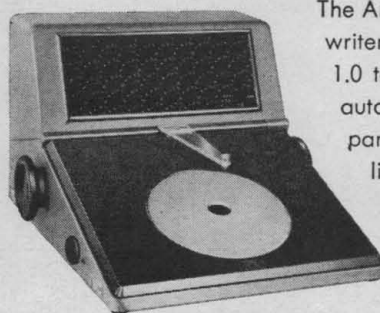


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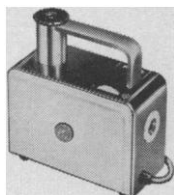
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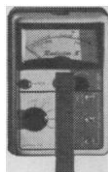
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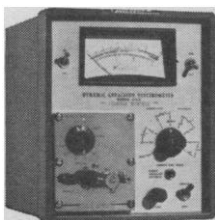
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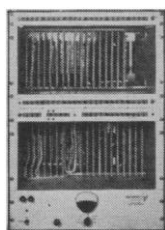
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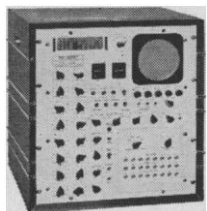
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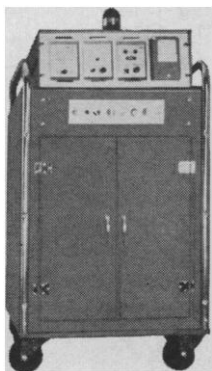
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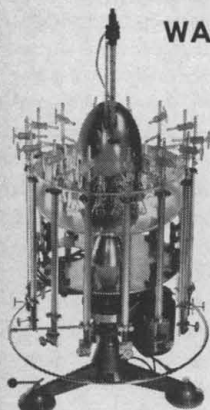
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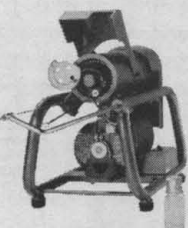


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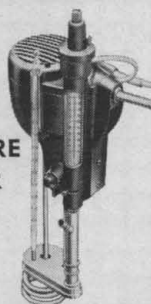
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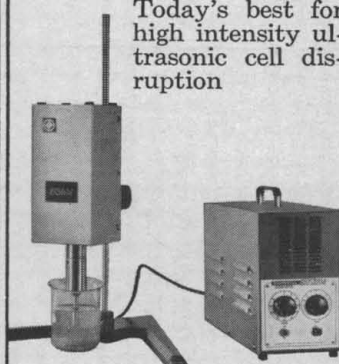
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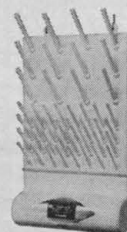
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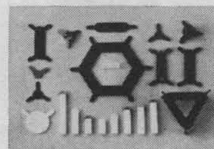
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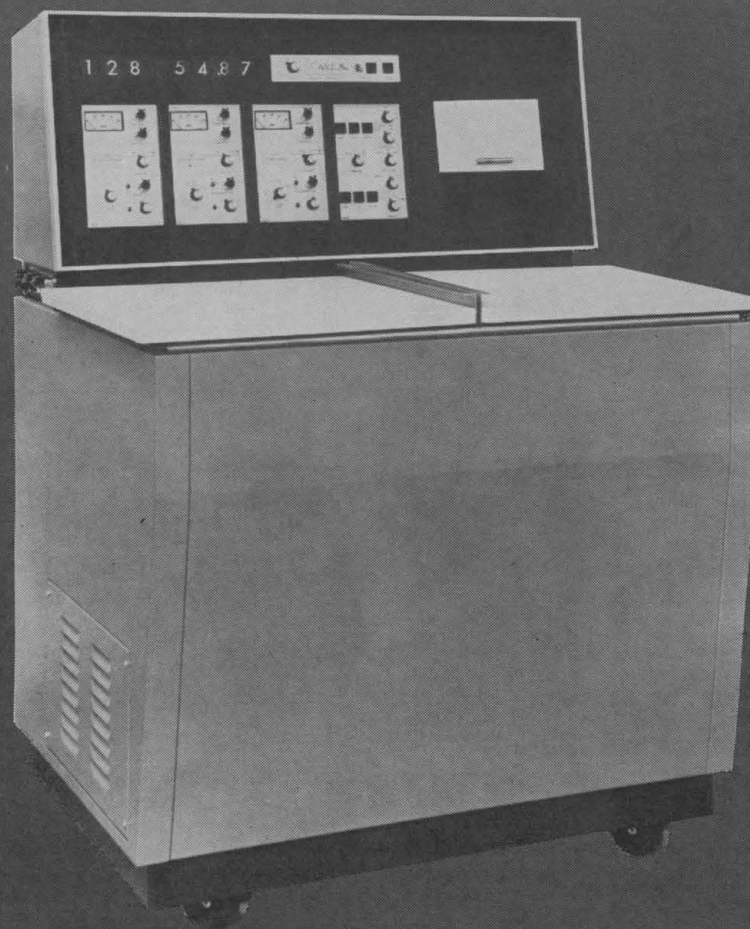
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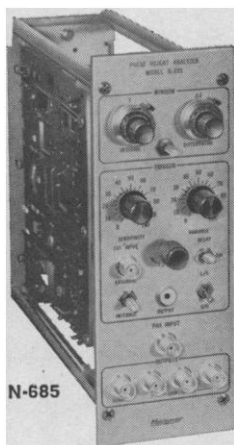
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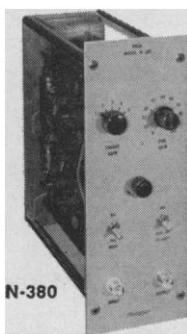
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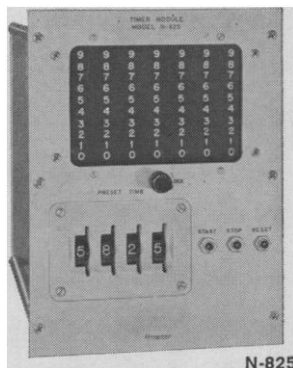
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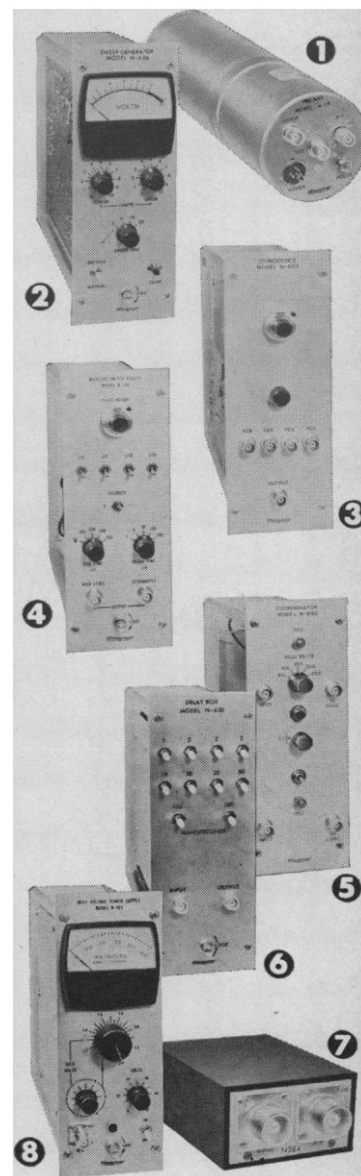
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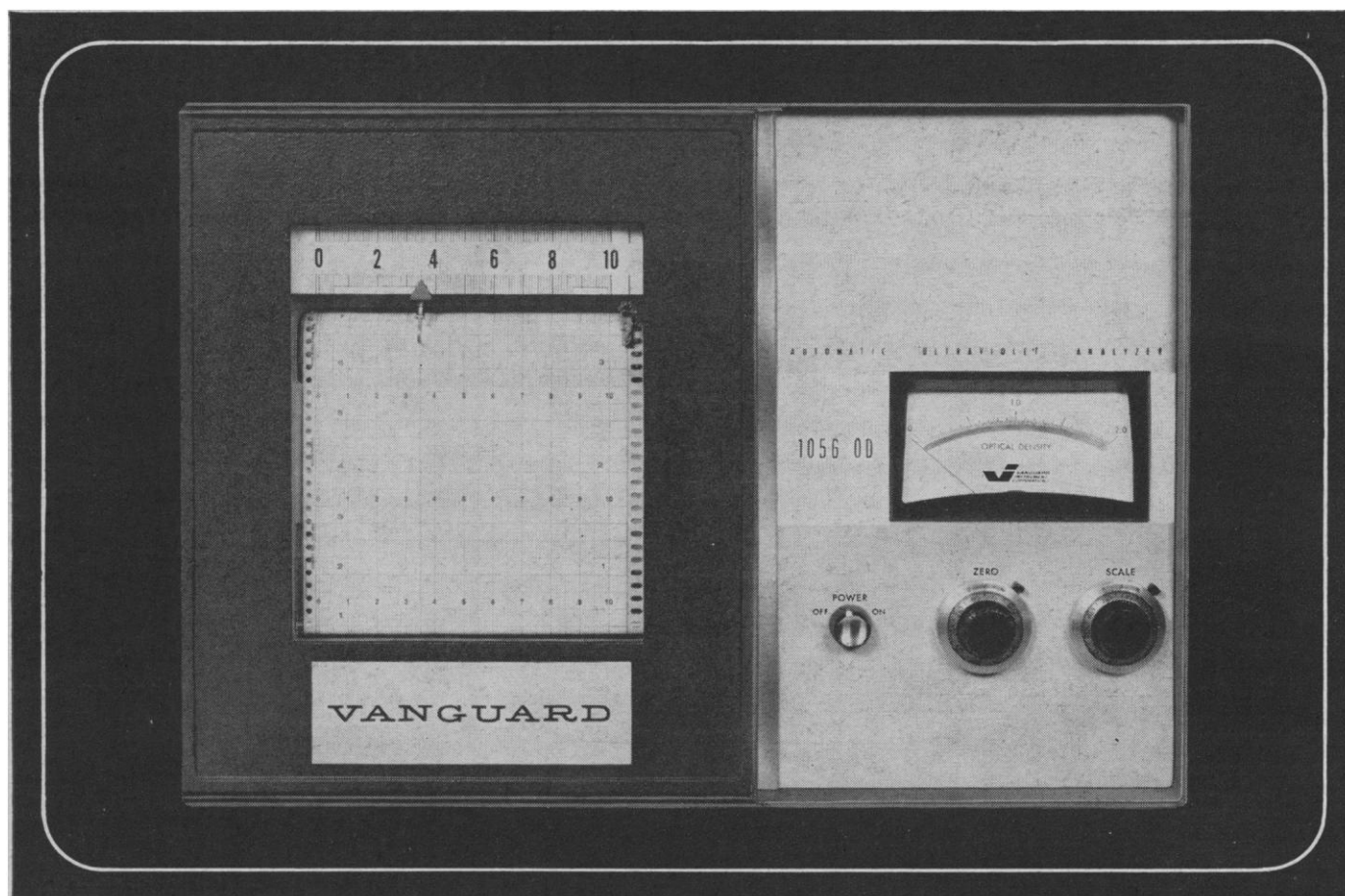
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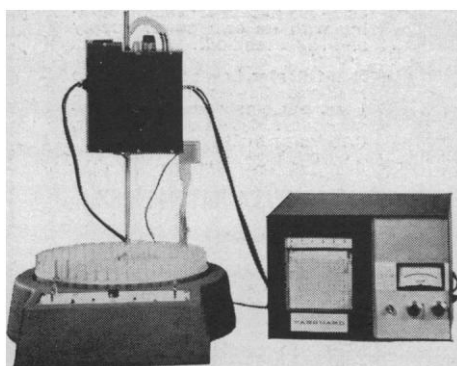
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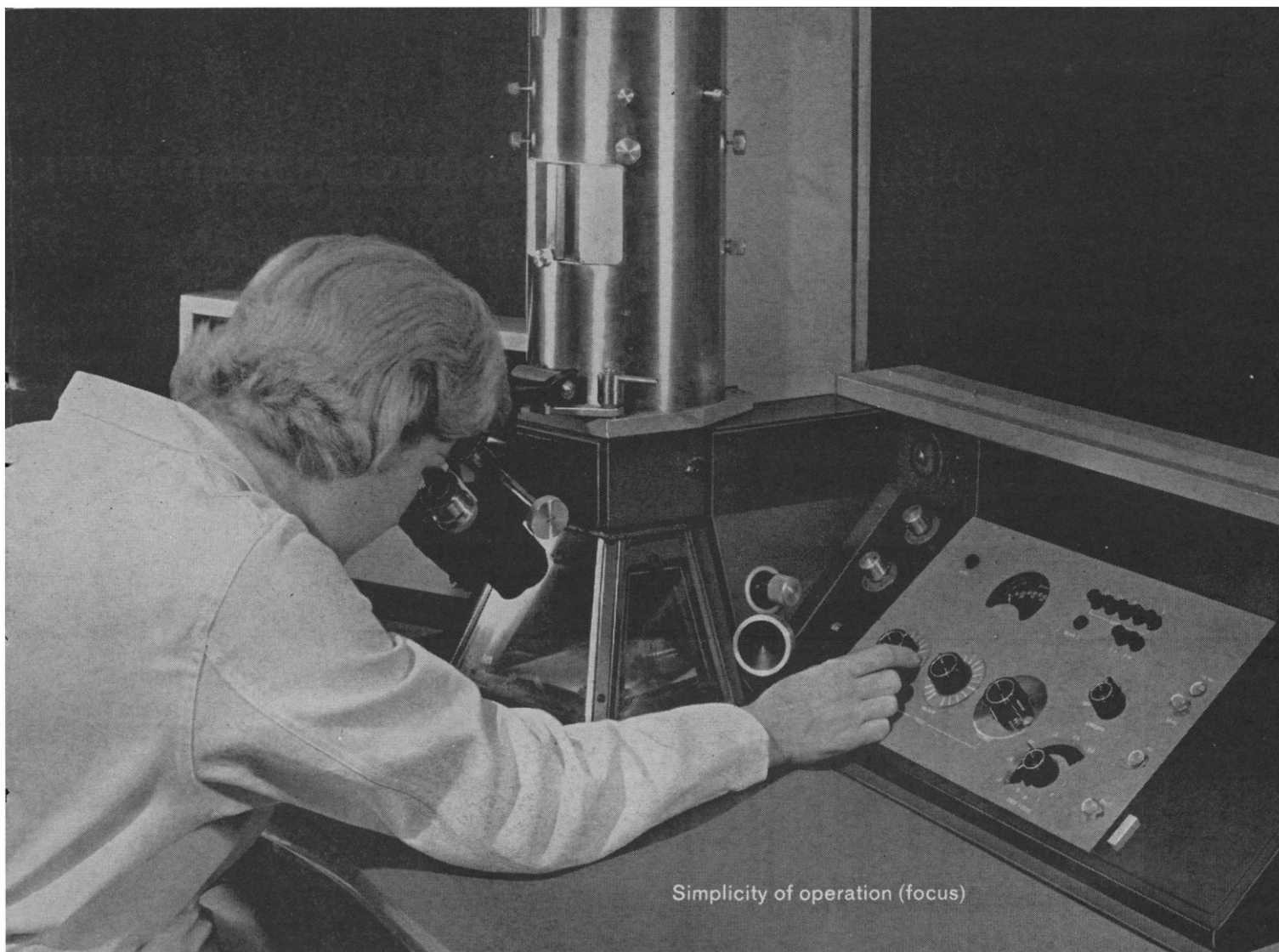
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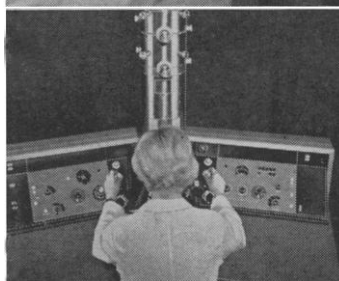
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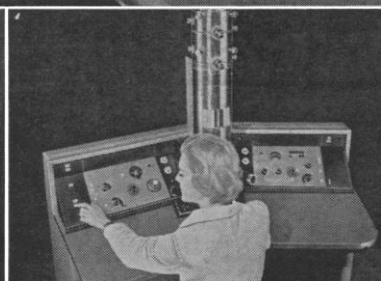
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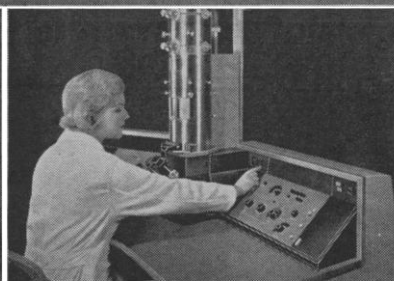
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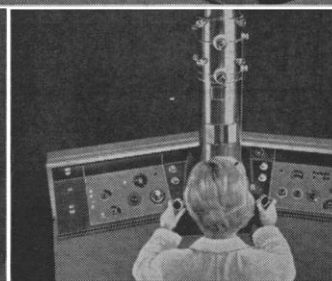
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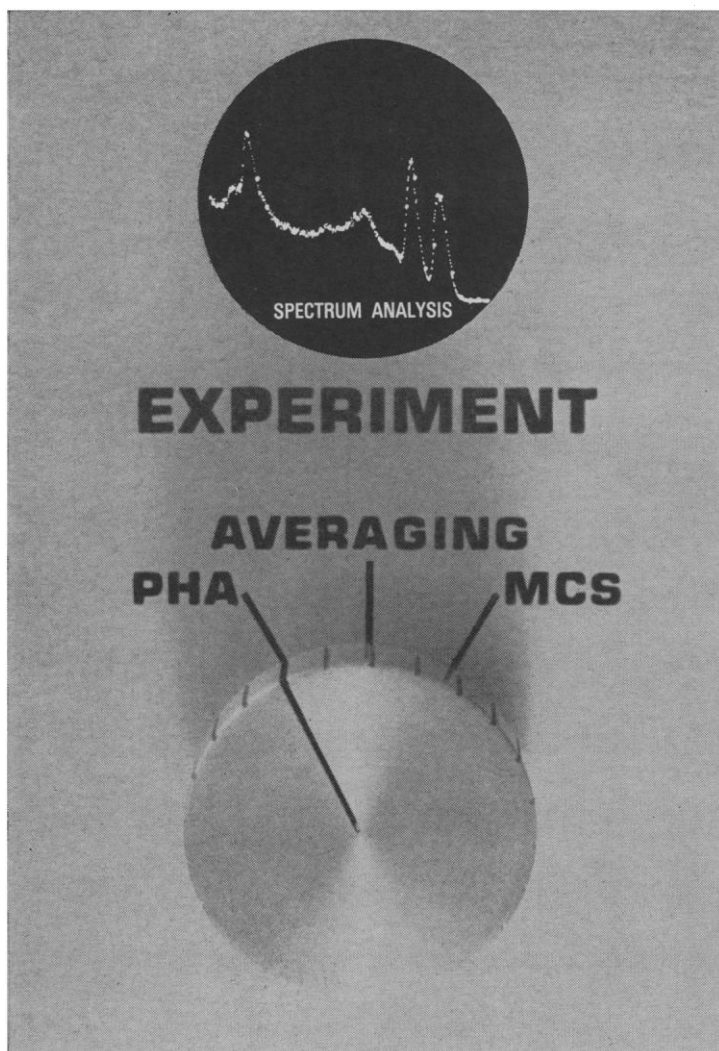
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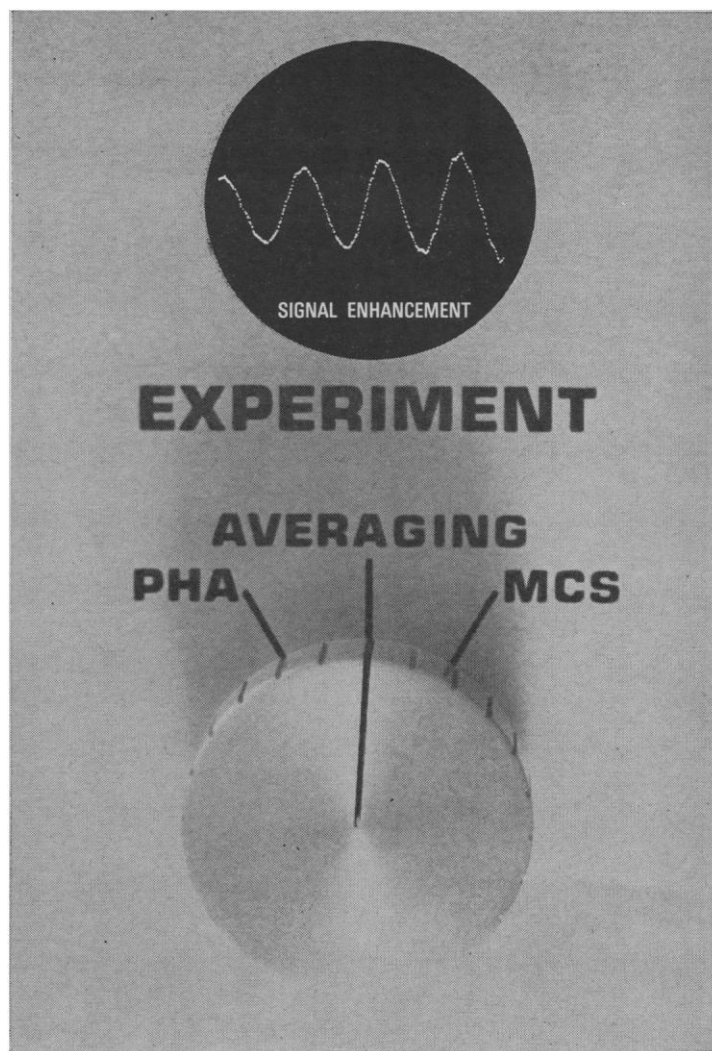


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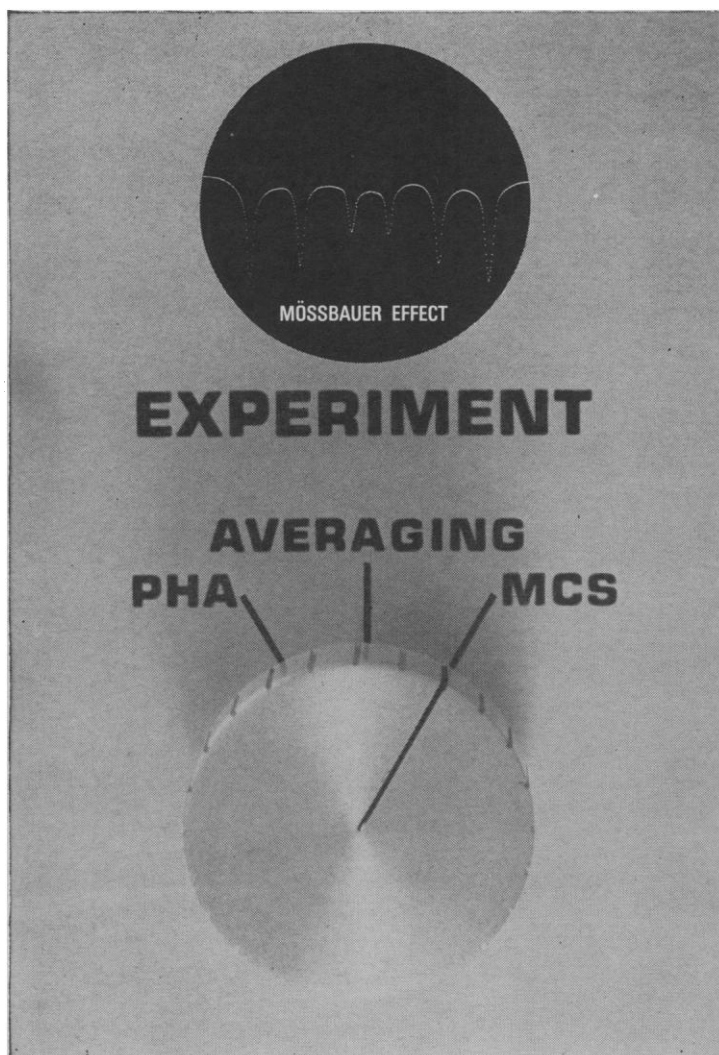


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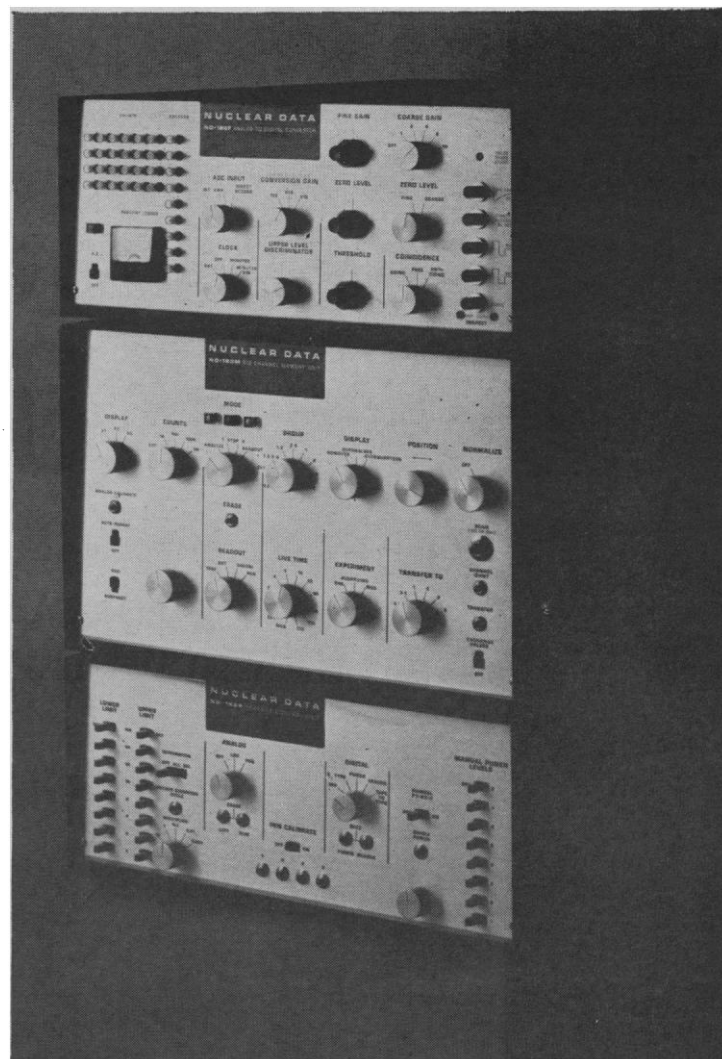
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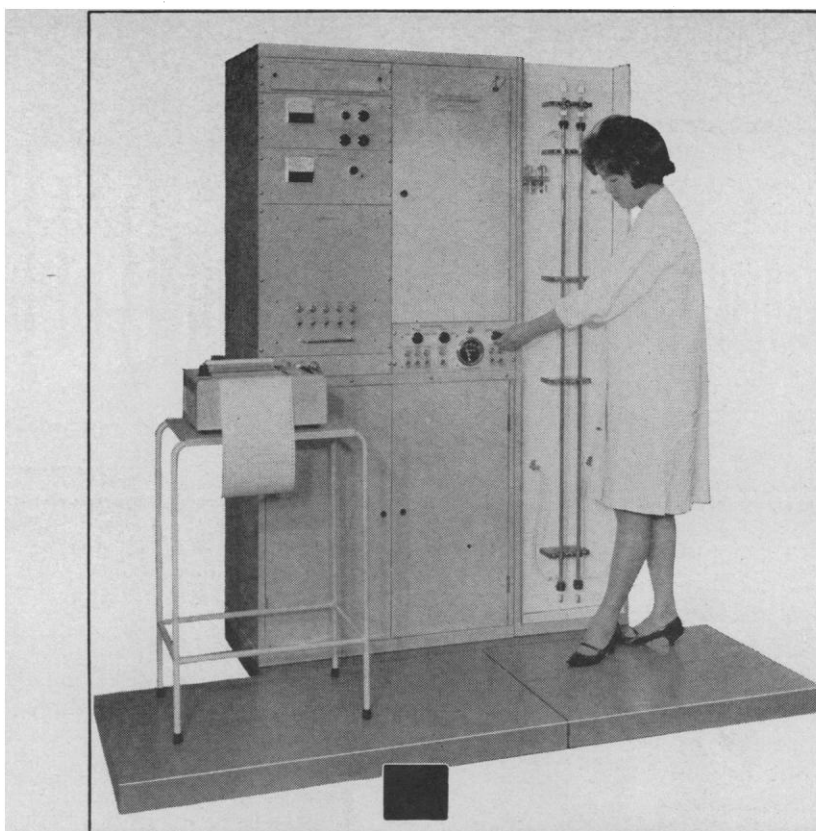
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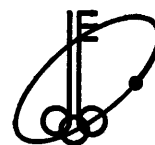
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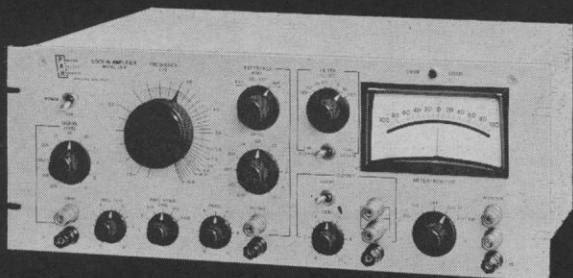


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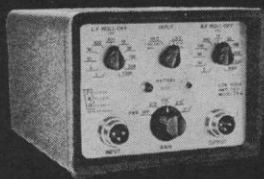
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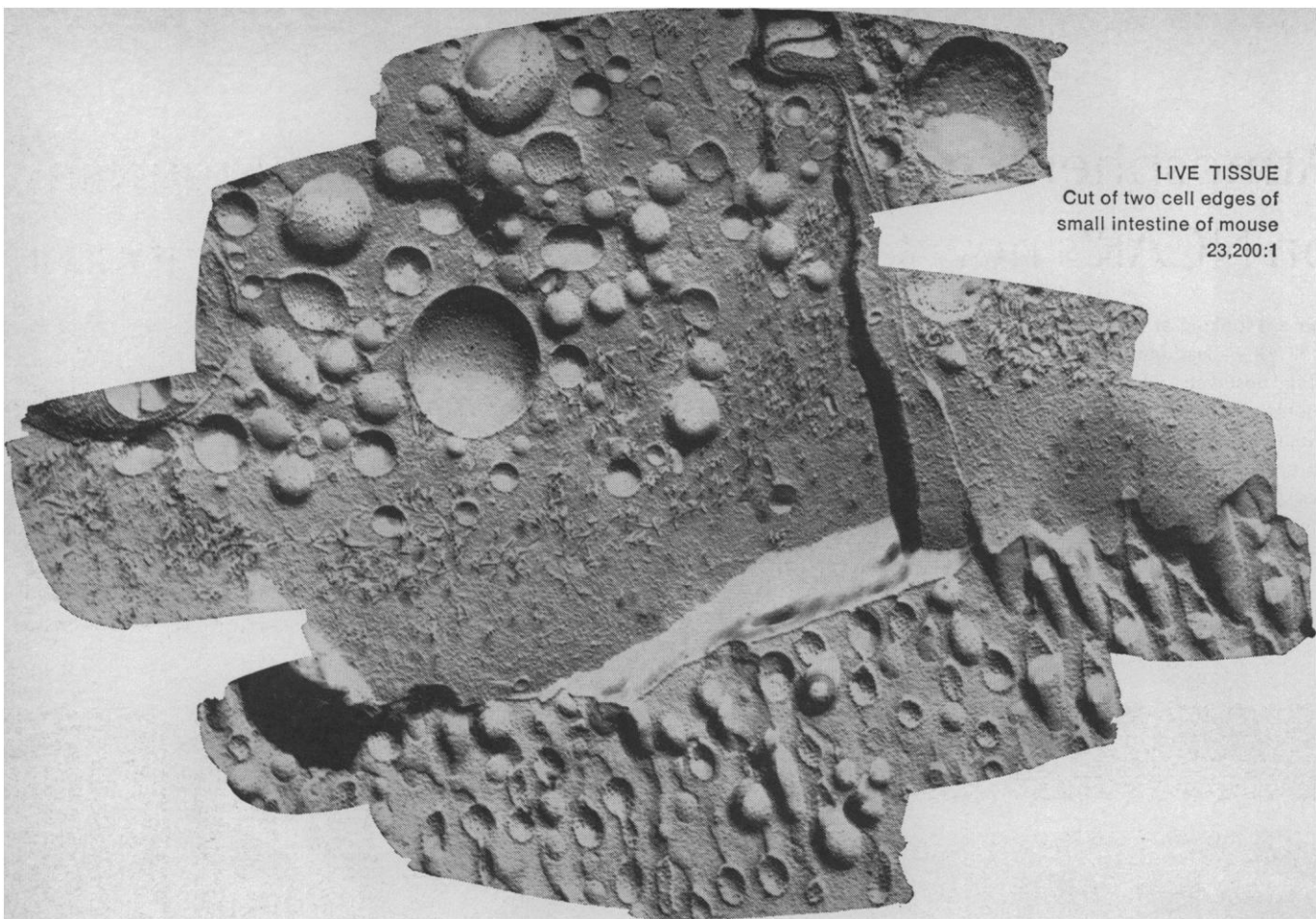
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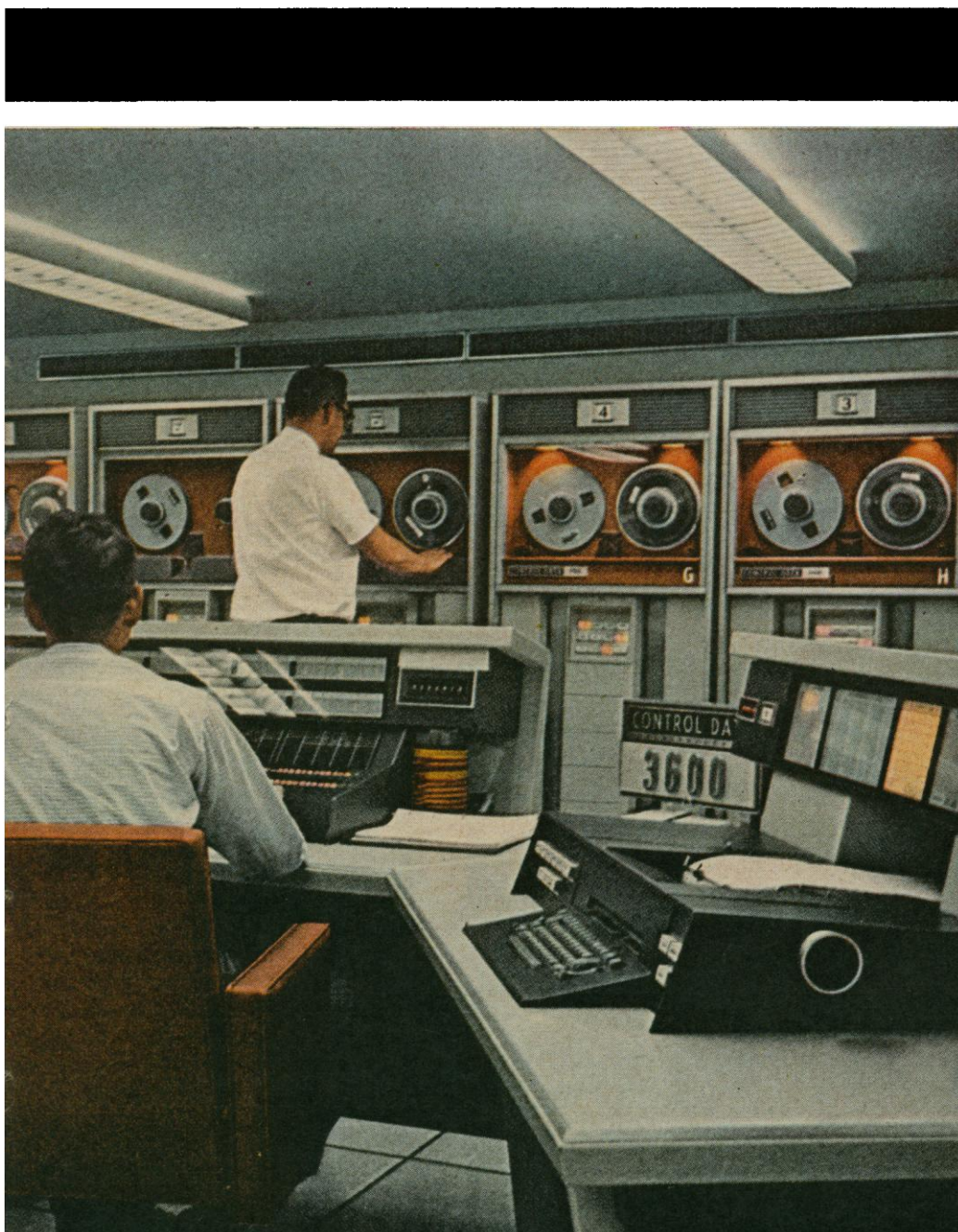
Atmospheric models to undergo intensive studies on NCAR's new CONTROL DATA® 3600 computer

You are looking at the CONTROL DATA 3600 computer system at NCAR — National Center for Atmospheric Research. Its task: sifting observational data . . . testing mathematical atmospheric models against observed behavior . . . handling a staggering amount of calculations to generate approximate answers . . . as more factors become known or as models become more complex. One of NCAR's primary goals is to conduct basic research from which advanced techniques for predicting weather and climatic trends may be developed. They also may uncover means for *tempering* some of weather's destructive forces.

The 3600 is one of the most powerful computers now in commercial production; a visible credential of total-systems capability and support that delivers *more computations per dollar invested*. CONTROL DATA CORPORATION serves science and research — hardware, software, supportive aid, all oriented to the particular user and his methods. For information regarding computer systems, contact your nearest CONTROL DATA representative; or write our Minneapolis address. Dept. G104.

CONTROL DATA
CORPORATION

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New NCAR 3600 computer system (Boulder, Colo.)

- Magnetic Core Storage: 32,768 48-bit words expandable in 32,768-word modules up to 262,144 48-bit words
- Capable of making 500,000 basic calculations per second
- Execution time including access:
 - 4 microseconds — floating point add
 - 1-6 microseconds — floating point multiply
 - 1-14 microseconds — floating point divide
 - 2-26 microseconds — double precision floating point multiply
- Peripheral equipment: 160-A computer, ten 606 tape transports, 405 card reader, 1000 lpm printer
- Memory speeds:
 - 1.5 microseconds — memory
 - .7 microseconds — effective cycle time

Introducing the LKB ReCyChrom for

RECYCLING CHROMATOGRAPHY

NEW INSTRUMENTATION FOR A NEW TECHNIQUE* IN CHROMATOGRAPHIC SEPARATION

The ReCyChrom is equally applicable for preparative and analytical separation of mixtures of large-sized or of small-sized molecules. These molecules do not have to be electrolytes and restrictions on the type of buffer used are less than with other types of chromatography. Components within a narrow range of molecular sizes, usually not resolved on simple gel filtration columns, are separated in the ReCyChrom by allowing the sample to pass repeatedly through the bed, thereby multiplying its effective height many times. Separated fractions and uninteresting or disturbing parts of the effluent may be bled out of the stream after any cycle without interrupting the separation of the remaining components.

The apparatus is especially suitable for grading homologous series of polymers, e.g., dextrans; for routine control of the purity of biochemical preparations such as serum proteins, enzymes and hormones; and for separation of heat labile substances.

One unique advantage of recycling chromatography is the need for columns of only moderate length. Columns in two standard lengths, 60 cm and 100 cm, both with 32 mm bore are available at present. The range of sample volumes accommodated by these columns depends greatly on the nature of the sample. For simple desalting opera-

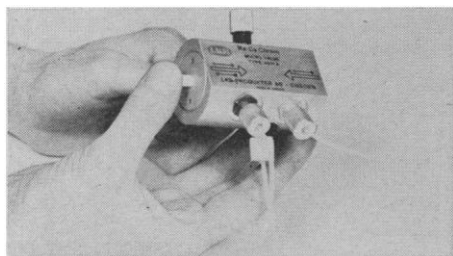
tions or for separation of peptides and amino acids from proteins, a sample of up to 150 ml is not unusual, whereas for purity controls of radioactively tagged concentrated preparations, quantities down to 1/100 of this volume are feasible. Sample application by pipette is eliminated. The pump sucks sample through a selector valve with a holdup of 150 μ l—a reproducible and non-critical method.

The four main components of the ReCyChrom, namely, a separation column, a peristaltic pump, a selector valve and a flow analyzer are available separately for incorporation into other instrument setups. The specially constructed columns with adjustable plungers at both ends can be sealed completely to eliminate the pressure of water head and permit liquid flow in either direction. Closed system operation and ascending flow maintains even packing and prevents the flow rate from falling off with use, even when beds of material with low mechanical strength (gels) are used.

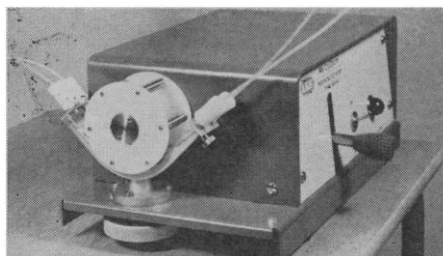
LKB's specially designed peristaltic pump has a very high flow constancy—0.5% over a period of a week—and a continuously variable pumping rate from 0-390 ml/hr.

A choice of three flow analyzers, cooling jackets, terminal box, connections and a cart comprise the remainder of the assembly.

Request literature file 4900S10 for details.



The simple push of a button on the Selector Valve alters the flow circuit from injection or bleeding to recycling.



The Peristaltic Pump has many other uses when not in service for the ReCyChrom.



LKB INSTRUMENTS, INC., 4840 Rugby Ave., Washington, D.C. 20014

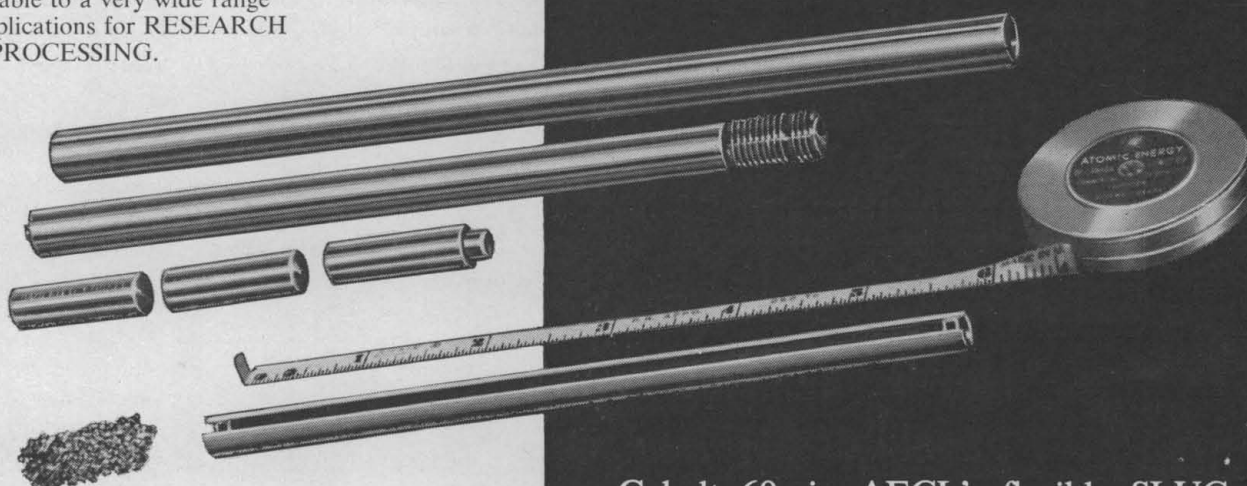
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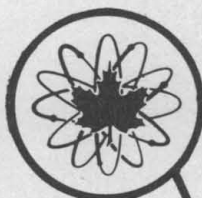
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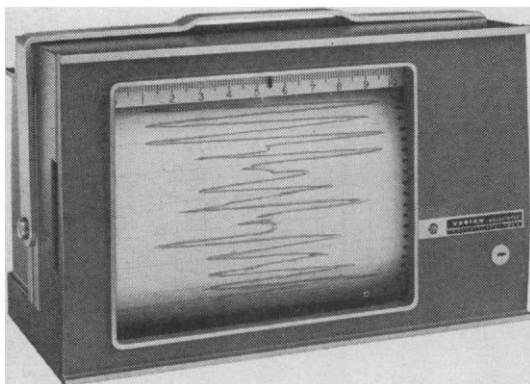


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NEW 10" RECORDERS

Varian's new G-40 series ten-inch potentiometer recorders are—if you'll pardon the expression—five ways better:

- **They're compact.** Die-cast aluminum construction and solid-state design keep weight down to 30 lbs., yet make them rugged and easy to service.

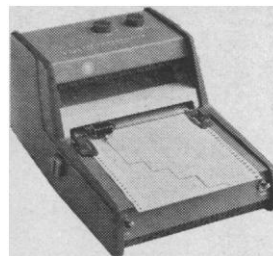
- **True differential input circuit** means you get both high input impedance and high common mode rejection. You can even operate them with unbalanced circuits.

- **Choose from single or multiple range models.** Eight push-button ranges—1 mv to 100 volts—or single range. Attenuator adjustment on all.

- **Fast pen speed.** Less than $\frac{1}{2}$ second full scale.

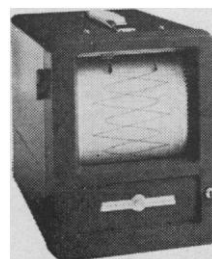
- **And they are accurate.** $0.25\% + 5 \mu v$ on 1 mv range; 0.25% on all other ranges.

Need more information? Well, then: 9 optional chart speeds; controls are in front for easy operation; they're portable or rack-mountable; and prices start at \$985, with healthy discounts for quantity or OEM orders. Three distinct models are available now for laboratory, industrial or OEM applications. Other inputs available as specials. Get all the facts from RECORDER DIVISION.



VERSATILE LAB RECORDER

Varian's G-14 bench top recorder has a unique combination of high input impedance and 1 mv sensitivity. The all solid-state G-14 features: instantly selectable spans of 1 mv, 10 mv, 100 mv, and 1 v; 0.5% accuracy at 10 mv, zener diode reference, and full scale zero plus 100% suppression. Chart speeds from 1"/hr. up to 16"/min. This unique combination of features assures broad application throughout your laboratory. Prices start at \$685. Integrator accessory available. For details write RECORDER DIVISION.

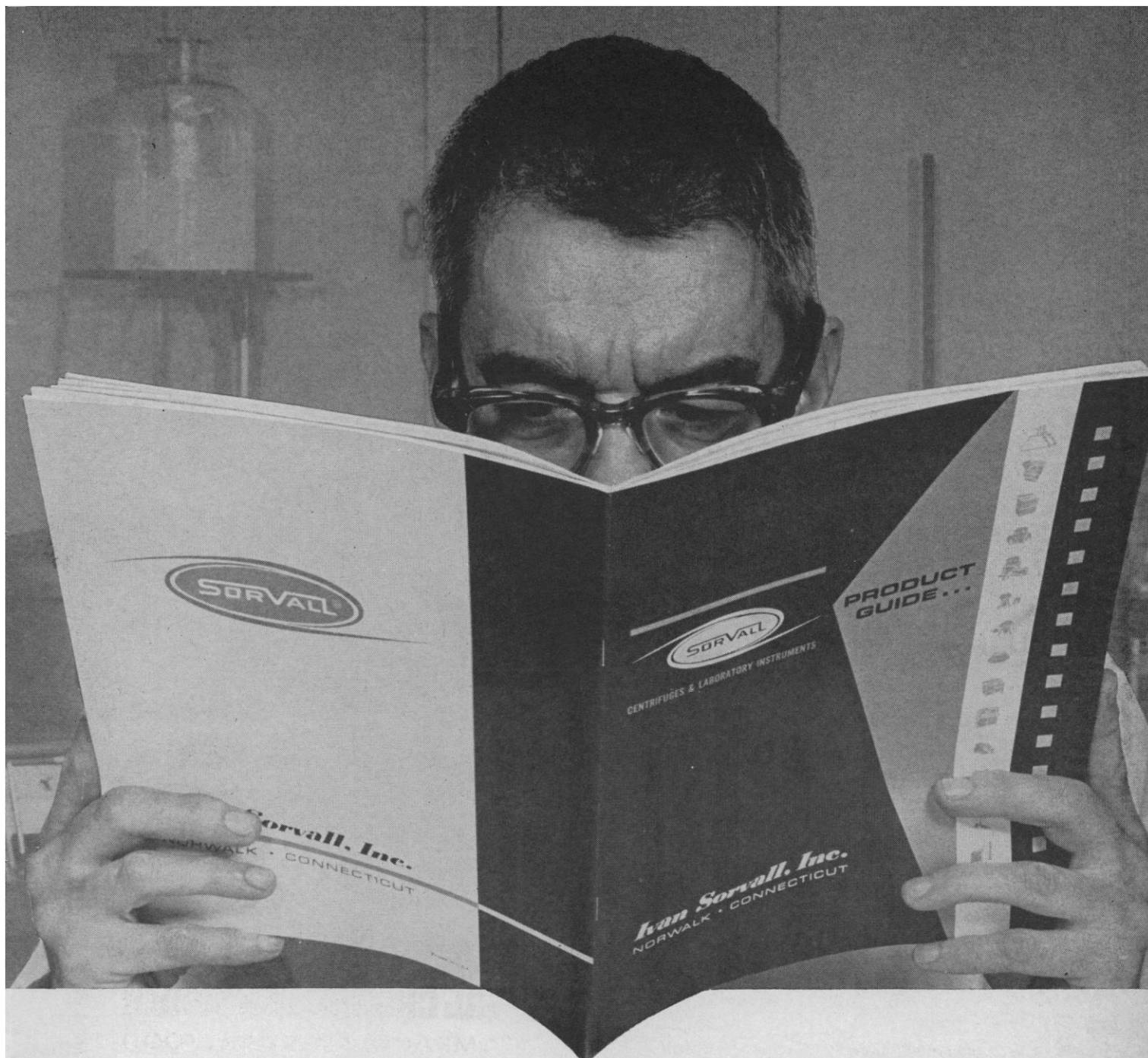


DUAL CHANNEL RECORDER (COMPACT, PORTABLE, TOO!)

Varian's G-22A is the least expensive servo-operated two channel recorder available—and the most compact. It puts two time-correlated variables onto one chart of 5-inch calibrated width. This versatile instrument features: 1% accuracy; spans from 5 mv to 500 v; 1 second full scale balance time; 2 or 4 chart speeds from 1/8"/hr. to 16"/min.; full scale zero adjust. Full accessory line. Portable and rack-mounted models available from \$1195. For full information, write RECORDER DIVISION.



VARIAN ASSOCIATES RECORDER DIVISION
611 HANSEN WAY, PALO ALTO 70, CALIF.
In Europe contact Varian A. G., Zug, Switzerland



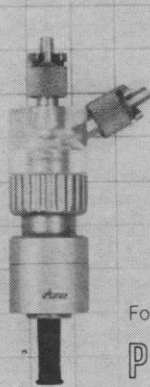
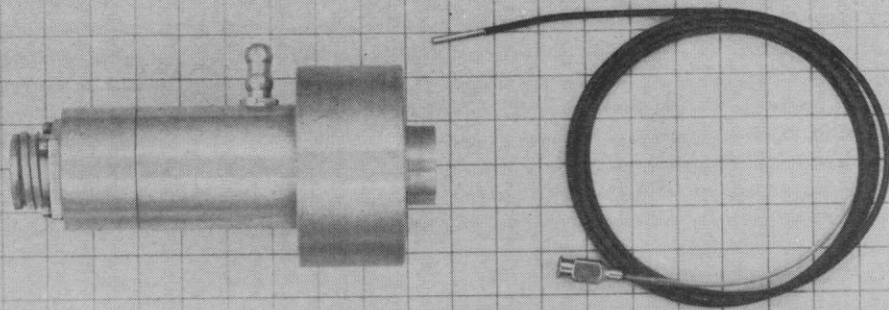
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Our 20-page Product Guide is full of absorbing facts! It details and illustrates compact table-top centrifuges in the 3,300 x G (max.) range, refrigerated floor centrifuges offering 37,000 x G (max.), and automatic, superspeed, general-purpose, and tube-type continuous-flow bench and floor models. It also includes a wide selection of angle and horizontal rotors as well as various accessories. Incidentally, we maintain a larger stock of tubes and adapters, in different sizes and materials, than any other centrifuge manufacturer.

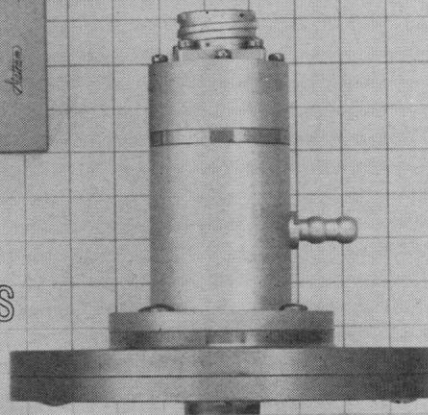
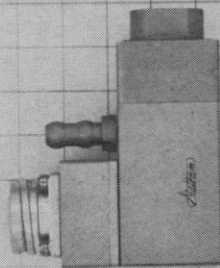
For electron microscopists there are the SORVALL "Porter-Blum" MT-1 and MT-2 Ultra-Microtomes for producing uniform high quality ultra-thin sections. The Product Guide also describes the RF-1 Ribi Refrigerated Cell Fractionator — for the controlled disruption of bacteria, fungi and tissue cells — and a thoroughly versatile micro-macro homogenizer/blender. Postage-paid reply cards are bound into the Guide for your further convenience. How about asking for your copy right away?—Request our Product Guide No. SC-10PG

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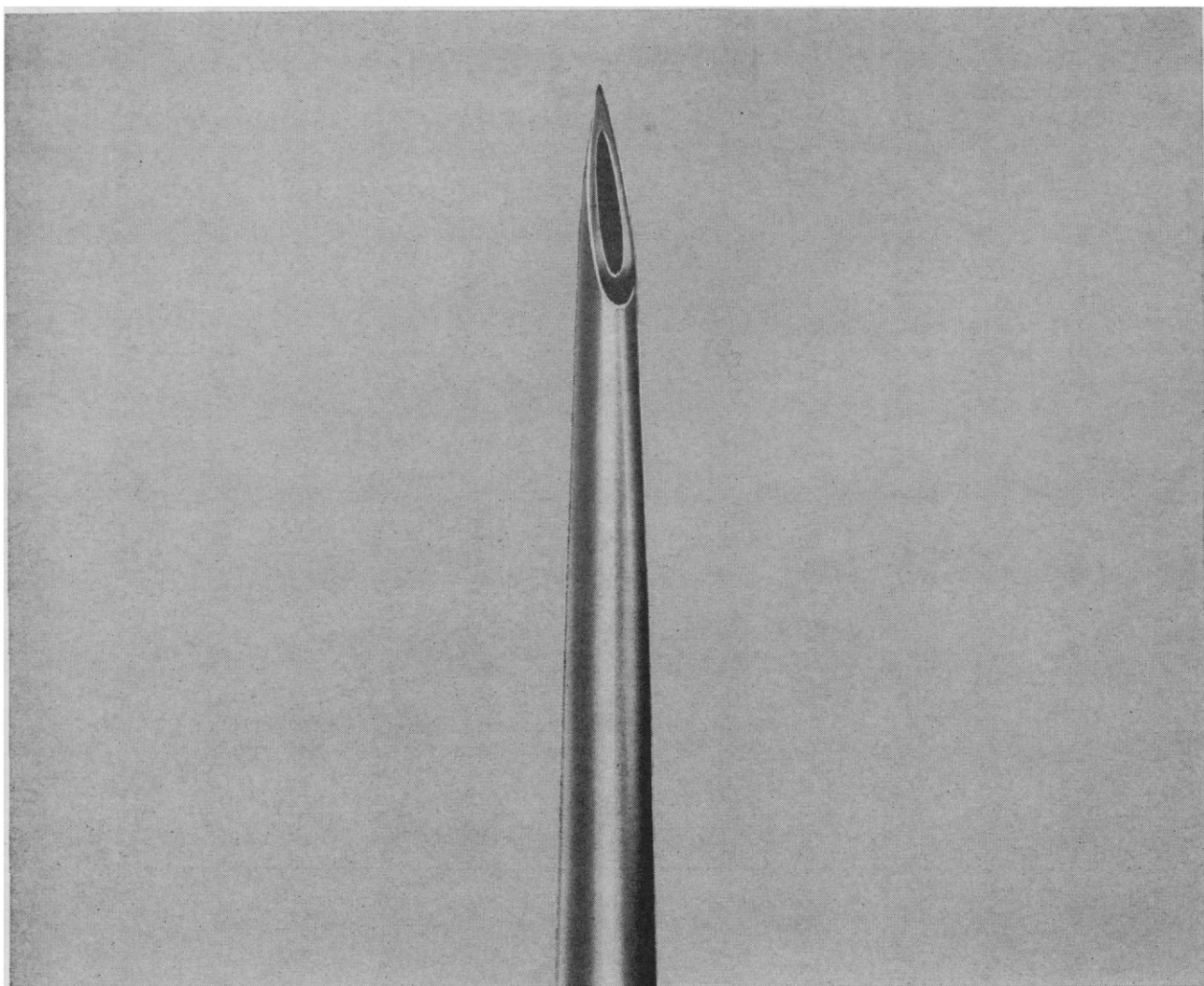
Several models of sensitive air pressure transducers are available for respiratory flow and plethysmography. For measuring cardiovascular pressures, Satham Model P23 transducers are the most widely accepted. Model SF1, an intracardiac strain gage type transducer, permits blood sampling and pressure measurement at the same location.

All instruments are compatible with standard electro-medical recorders.

Let us assist you in selecting the proper transducer for your application. Write or call Mr. J. W. Burns, Department O4, P. O. Box 230, Springfield, New Jersey, Drexel 6-0773 (Area Code 201).

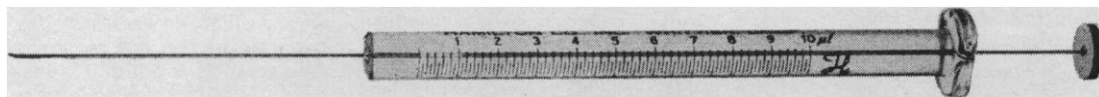


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Ease of septum penetration is the goal...strength is the requirement...this is the needle tip on a Hamilton Microliter 701N syringe. Start with 26 gage stainless steel specially drawn to an I.D. of .0045". Taper 3/16" of the tip electrolytically to .012" O.D., but leave a strengthening shank of .0185". Then grind and polish the tip. Sound difficult and time-consuming? It is! But you get that kind of attention on every tip of every Hamilton needle. That's what it takes to guarantee precision.



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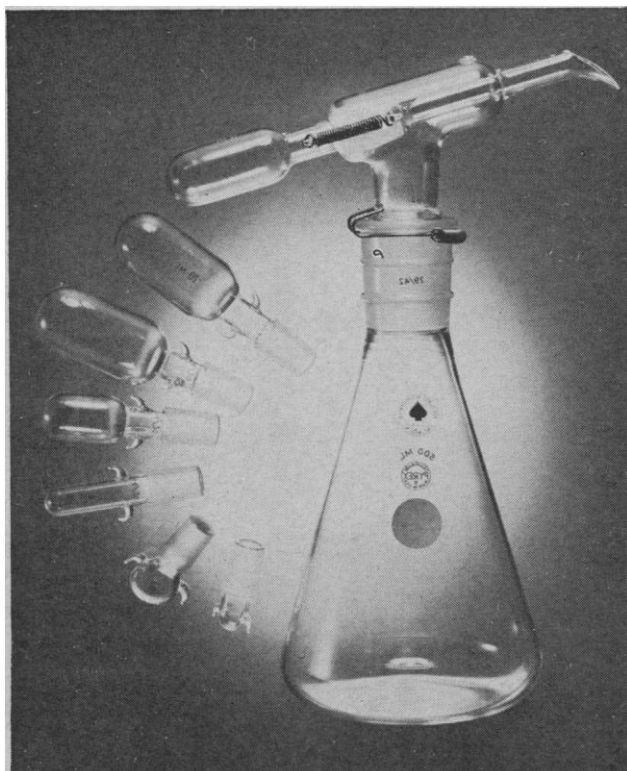


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• **Interchangeable: One Head For All Capacities, All Volumes.**

• **Short Tipping Angle.**

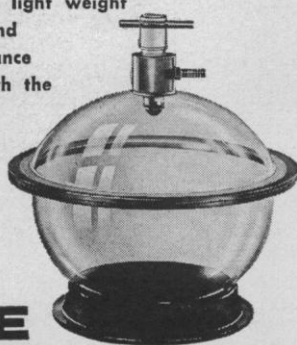
8004 DISPENSING PIPET, Automatic. Fills and pours automatically, rapidly. One head for all capacities, all volumes. Short tipping angle. Interchangeable volumetric bulbs give reproducible volumes within $\pm 1\%$ for capacities greater than 5 ml. Smaller capacities to within ± 0.1 ml. reproducible. Bulb joint is $\frac{1}{4}$ 14/20, head and flask $\frac{1}{4}$ 29/42. Please specify volume of bulb and flask when ordering.

$\frac{1}{4}$ 14/20 Interchangeable Volumetric Heads, Cap.: 1 ml.: \$3.75, 3 ml.: \$3.75, 5 ml.: \$3.75, 10 ml.: \$3.85, 15 ml.: \$3.85, 20 ml.: \$3.95, 25 ml.: \$3.95. Specials to order.

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$\frac{1}{4}$ 29/42 Flask Head \$11.80.

Combines the light weight the impact and shatter resistance of plastic with the transparency of glass.

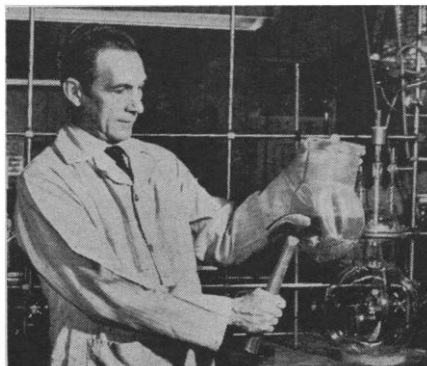


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New ACE plastic coating makes glass safe has many uses

- When glass breaks during hazardous experiments, coating contains flying glass particles, prevents injury.
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 - In vacuum systems, prevents flying glass when evacuated flasks are broken.
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The most convenient and economical instrument for measuring low pressures from 1 micron up. Ace McLeod Gauge, supplied with Hammertone green stand, has metal locking device with position holding action eliminating the need for glass hooks and springs, will hold to any position to which it is rotated. Calibrated TRUBORE® Tubing assures accuracy and changeability in each of the following pressure ranges:

Type	Pressure Range mm. Hg.	Lowest Reading mm. Hg.
A	0-1.0	0.001
B	0-5.0	0.005
C	0-10.0	0.010
D	0-15.0	0.050

For complete line of Ace gauges, see Ace Catalog 60.

For further details, see your new Ace Catalog 64 or write us for information on any specific item.



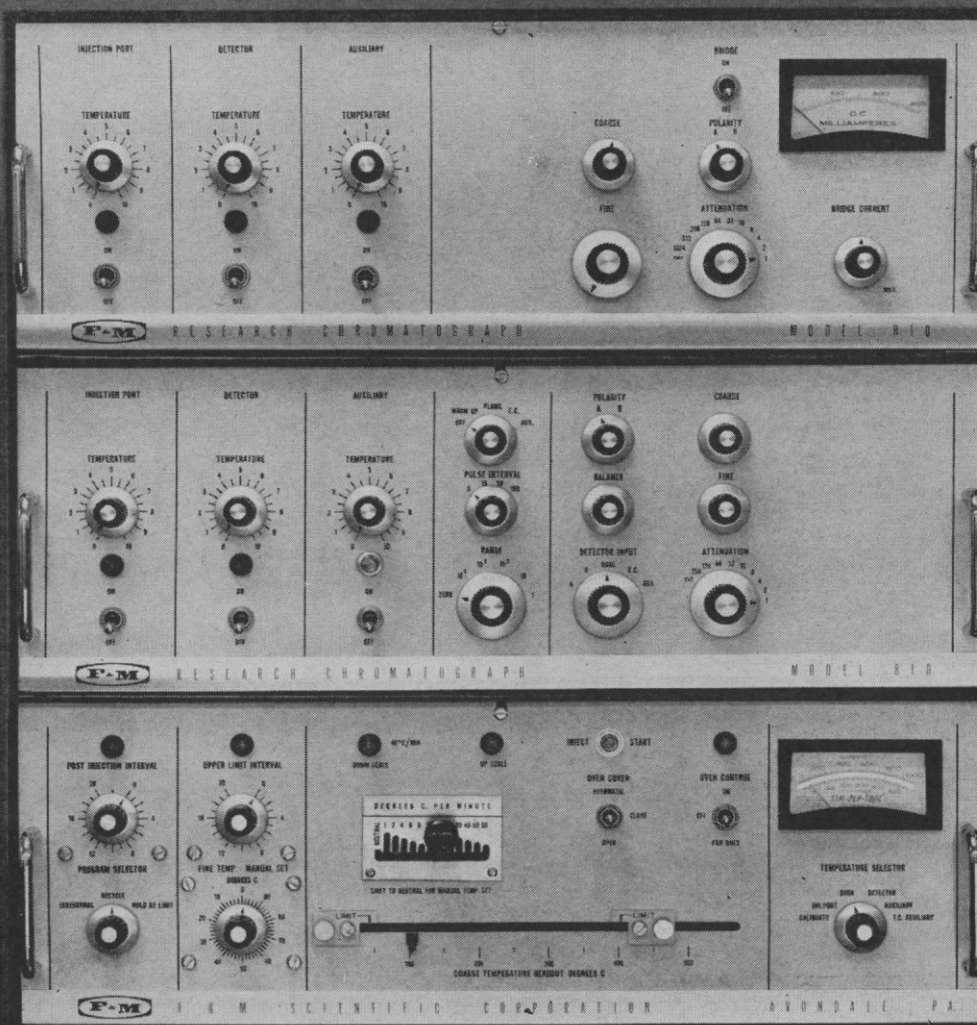
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FAITHFUL SERVANT

You're looking at the control cabinet of an F & M Series 810 Gas Chromatograph. To the analyst who owns one, it is a faithful servant that carries out his every order accurately and reliably . . . and so completely that it makes the 810 an all-but-automatic gas chromatograph. ■ Here's why we say this. After you inject the sample, all you have to do is push the *start* button (in the center of the lower drawer) and the 810 does the rest. ■ First, it automatically starts a pre-set temperature cycle that combines adjustable isothermal and linear programmed periods. Then it cools the column, automatically opening the oven door to accelerate the process, until it re-equilibrates at the starting temperature, ready for the next sample. Meanwhile it automatically maintains predetermined detector conditions, and controls the flow of carrier gas in each of the two columns. When equipped with the automatic attenuator option, it also produces a measurable peak for each detected component regardless of concentration . . . automatically. ■ Why such a sophisticated gas chromatograph? First, because it assures you of almost perfect reproducibility by eliminating the human error that goes hand in hand with manual resetting. Second, because it liberates the chemists and technicians in your laboratory and thus makes them more productive. ■ For more information on the automated F & M Series 810 Gas Chromatographs write F & M Scientific Corporation, Route 41 and Starr Road, Avondale, Pennsylvania, phone (215) 268-2281. European subsidiary: F & M Scientific Europa N.V., Leidsestraat 67, Amsterdam, The Netherlands.



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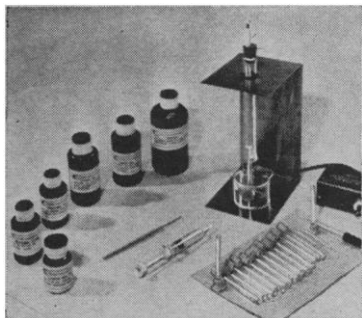
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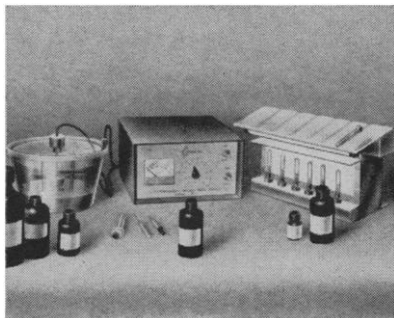
(patents pending)



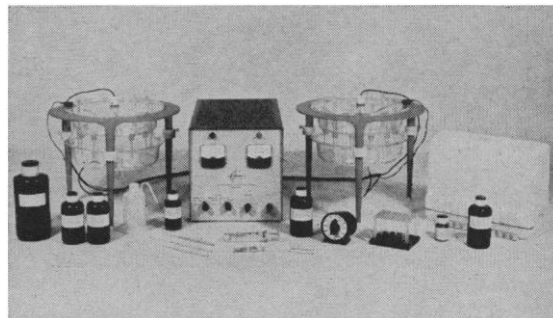
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Trial Kit, with Power Source 150 for the student or occasional user. Runs one sample at a time. Price in U.S.A. \$69.*



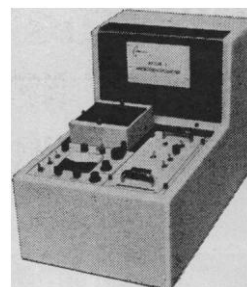
New Model 6, with Power Source 200 for the limited-budget laboratory with regular but modest volume. Runs six samples at a time. Price in U.S.A. \$636.*



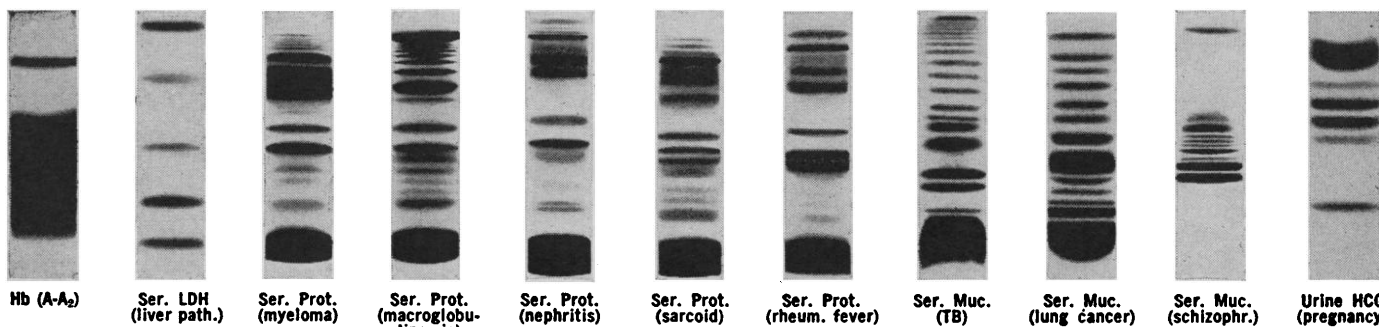
The Model 12, with Power Sources 300 or 1400 (as shown) for the busy researcher or high-volume clinical laboratory. Runs 12-36 samples at a time. Prices in U.S.A. from \$1080.*

All systems include full set of glassware, accessories, and chemicals needed to produce the remarkably sharp and precise separation shown in the normal serum sample above. Resolution is thousands of times more sensitive than paper, agar, cellulose acetate or starch block, and many times finer than starch gel. Fast (30 minute separation) and reproducible. Gels are transparent for quantitation and photography on the Model E Microdensitometer.

Already widely used in animal and plant protein research and in clinical investigation, Disc Electrophoresis now opens the way to sophisticated diagnostic-prognostic indications not previously obtainable. **Some typical separations of clinical significance:**



Model E
Microdensitometer

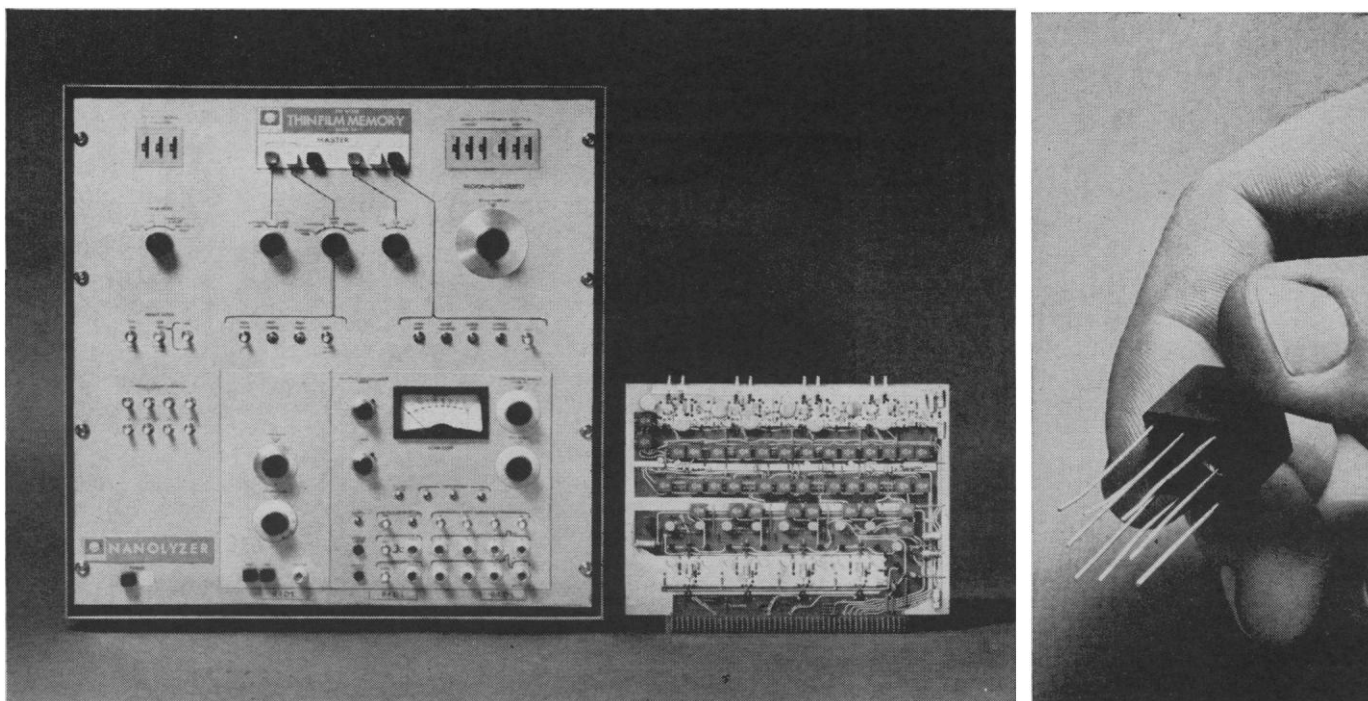


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The Nanolyzer is modular in design and construction. It uses printed circuit boards with functional logic groups on separate boards (illustrated with the Nanolyzer at left). The computer circuits use all-silicon transistor Snap-Logic elements (illustrated at right) to assure matched circuit components during servicing and replacement.

THE NEW RIDL NANOLYZER* OPENS TOTALLY NEW AREAS OF INVESTIGATION

The new RIDL Nanolyzer* is an important advance in multi-channel pulse height analyzer design. It has removed the instrumentation limits, imposed by presently available analyzers, on new areas of investigation in high energy physics, fast radio-chemistry and like applications.

The principal advantage of the Nanolyzer is its ability to collect and handle more data per unit time with an unprecedented degree of accuracy. It accepts, analyzes, stores and displays data seven to fifty times faster than conventional analyzers. Central to this ability is the utilization of a 100 megacycle ADC providing a 10 nanosecond/channel address rate, Snap-Logic silicon elements and a thin-film memory plane.

In addition to the obvious advantage of high speed data acquisition for applications where high counting rates or very short counting times are encountered, the Nanolyzer effects im-

portant economies of time and cost in less demanding uses. Its data handling speed permits more efficient use of accelerator facilities, and results in more accurate data.

Important and unique features of the Nanolyzer follow:

THIN-FILM MEMORY: Memory cycle time of 0.6 μ sec. does not contribute to system dead time because of parallel data transfer from ADC. Capacity 10^6 counts for each of the 256 channels.

ANALOG TO DIGITAL CONVERTER: 100 megacycle crystal controlled, synchronized ramp start/stop, zero cross-over timed amplitude analysis, differential linearity of 2%, dynamic range 376 channels with digitally selected zero suppression of up to 120 channels without pulse distortion.

INPUT CIRCUITS: Double delay-line shaped pulses for rapid system recovery. Selective analysis only of pulses satisfying following criteria: delayed coincidence/anti-coincidence gate timed thru internal ANTI-WALK® Discriminator, unique pile-up rejection circuit, and upper/lower discriminators. Built-in four-channel mixer for one, two or four data inputs into one, two or four sub-groups without external logic.

OPERATING MODES: Six electronically interlocked push switches control all input/output functions. Add or subtract from PHA storage. Remote operating capability. Automatic preset live-

time or clock-time, or preset count operation in any selected channel. Entire memory or any selected part useable during data storage or display. Region-O-Interest* control for selective readout of entire memory, halves, quadrants or between digitally selected upper and lower channel limits. Readouts through magnetic tape, parallel printers, punch tape, IBM typewriter and live external display.

CONSTRUCTION: Modular construction, plug-in printed circuit boards, all-silicon transistor Snap-Logic* elements. Solid state throughout, functional and simple to use controls.

Would you like to know more about this remarkable Nanolyzer? We will be happy to send you more information and complete specifications. After critical evaluation, we believe that you will agree that the development of the Nanolyzer is one of the most significant advancements in multi-channel analyzer technology in recent years. Please write for literature.

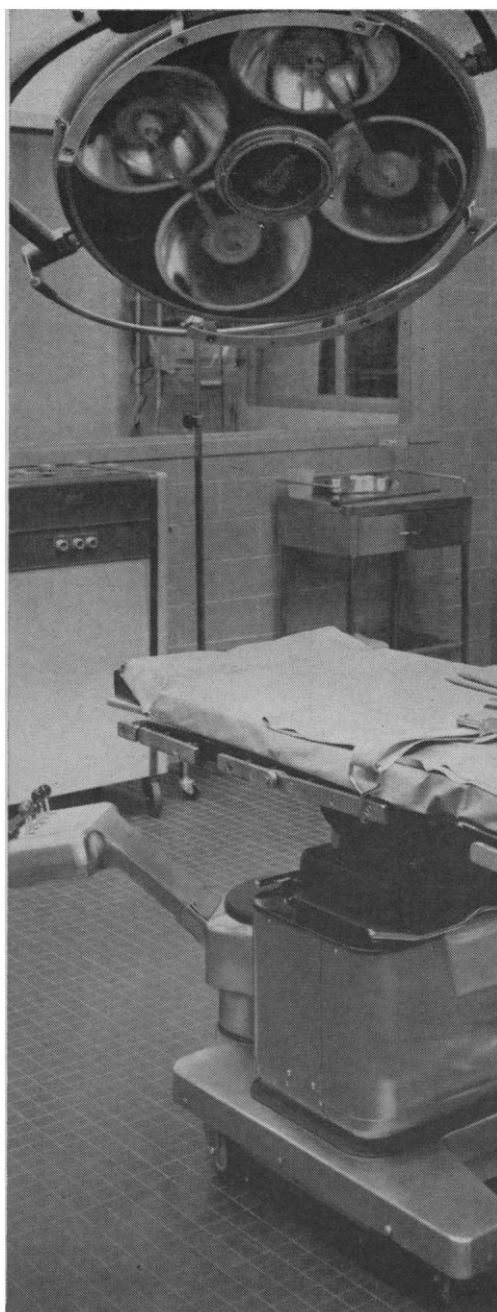
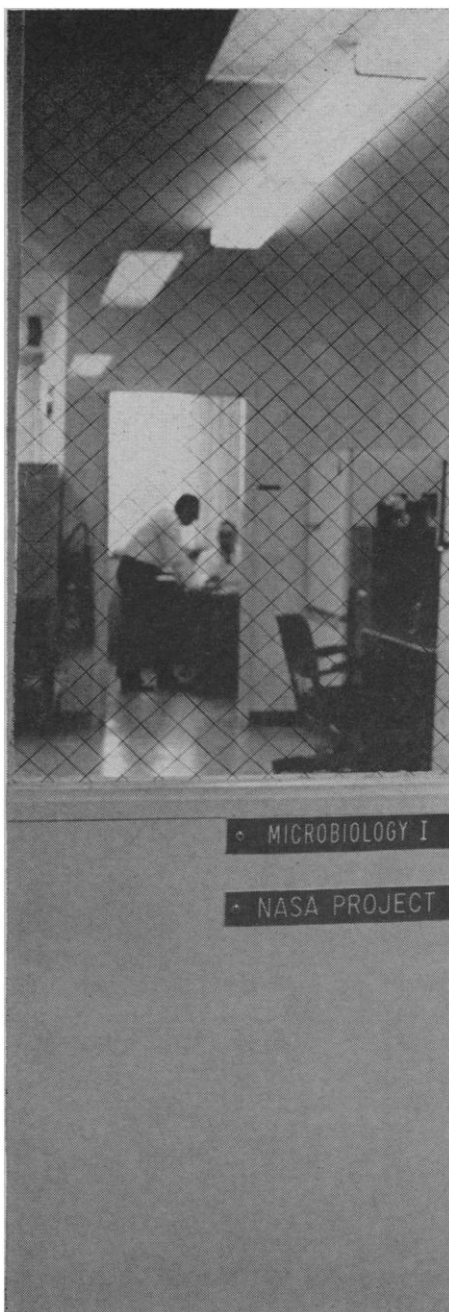
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BIG IDEAS TAKE MANY SHAPES AT CASTLE...

Our new research laboratory is developing space age sterilization techniques for NASA—a contract we've been awarded annually since 1961.

And at the same time, our researchers have developed BioSpore Biological Sterility Indicators—the only positive sterility monitors for all types of sterilization.

Lots of our big ideas are at work in hospitals all over the world—Power-Clave sterilizers with Electrilock Door, major surgical lights, the five-section T-5000 operating table.

Yes, we do a lot of things here at Castle, all of them well. Wilmot Castle Company, 1746 E. Henrietta Rd., Rochester, New York 14602.

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What every Ph.D. should know about cage sanitation:

Anything less than a spotlessly clean cage can cause a fatal infection to an experimental animal during his post-operative recovery period and negate all your test results.

One major cause of unsanitary machine-washed cages is *overfoaming* in the machine, caused by the reaction of the detergent with the high protein soil loads resulting from the animal's feed and waste matter. This overfoaming cuts pump and wash pressure in the machine, thereby preventing it from doing its sanitation job.

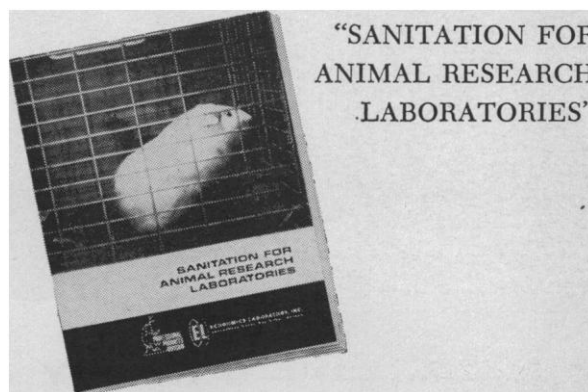
But now, a new Economics Laboratory defoaming agent built into two detergents *completely eliminates foam*, enabling you to eliminate this major cause of unsanitary conditions. It's called EL F-58, and it may mean the difference between success and failure in your next experimental operation. It is now available in two powerful detergents, EVENT and SPEARHEAD, both of which contain polyphosphate to hold soils in suspension for their complete removal during the final rinse.

The first, EVENT, is recommended for non-aluminum, non-galvanized metal or plastic cages. It is a highly alkaline, non-chlorinated detergent for removing high organic soil loads and is recommended whenever heavy duty cleaning is required.

The second, SPEARHEAD, is recommended for aluminum and galvanized metal

cages and racks. Equally effective in hard and soft water, it contains a unique combination of metal corrosion inhibitors. It, too, completely eliminates foaming where organic soil loads are encountered.

For more comprehensive information on cage sanitation, return the coupon below *today* for your *free* copy of this new, up-to-the-minute manual,



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- ☐ Please send free copy of new manual immediately.
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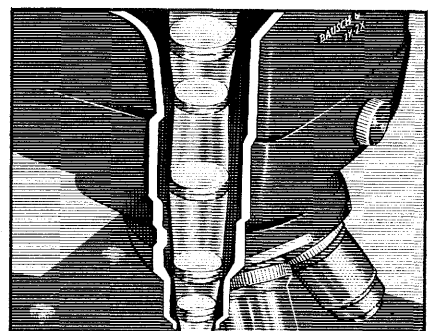
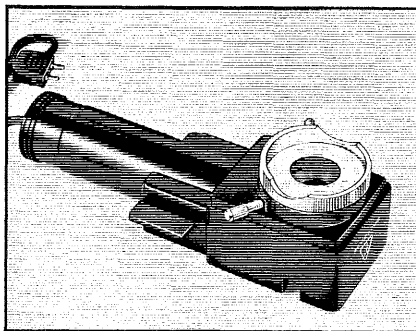
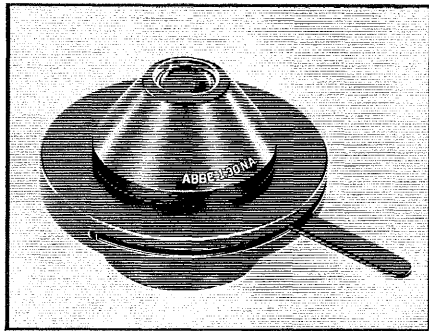
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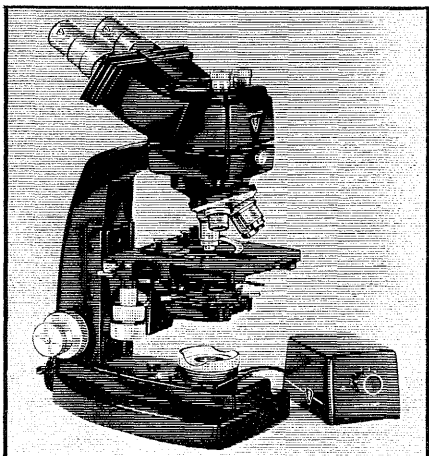
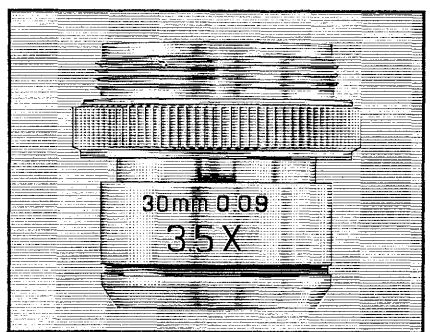
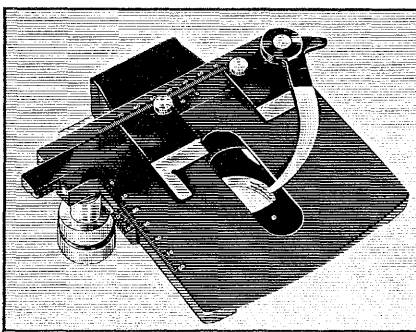
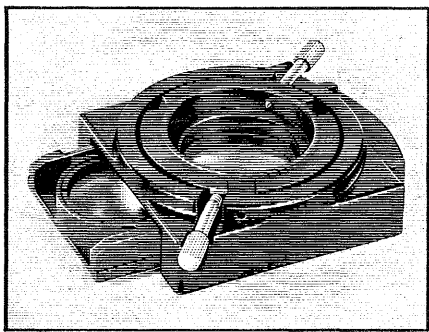
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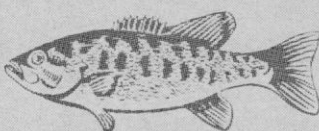
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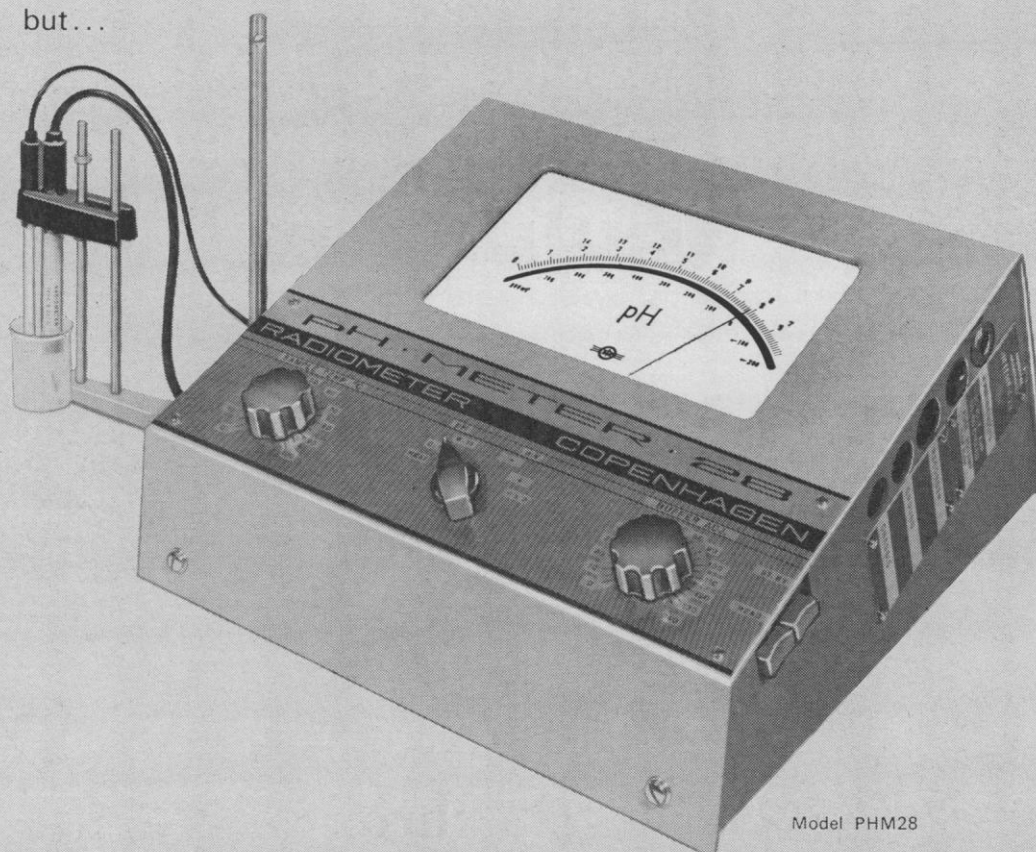


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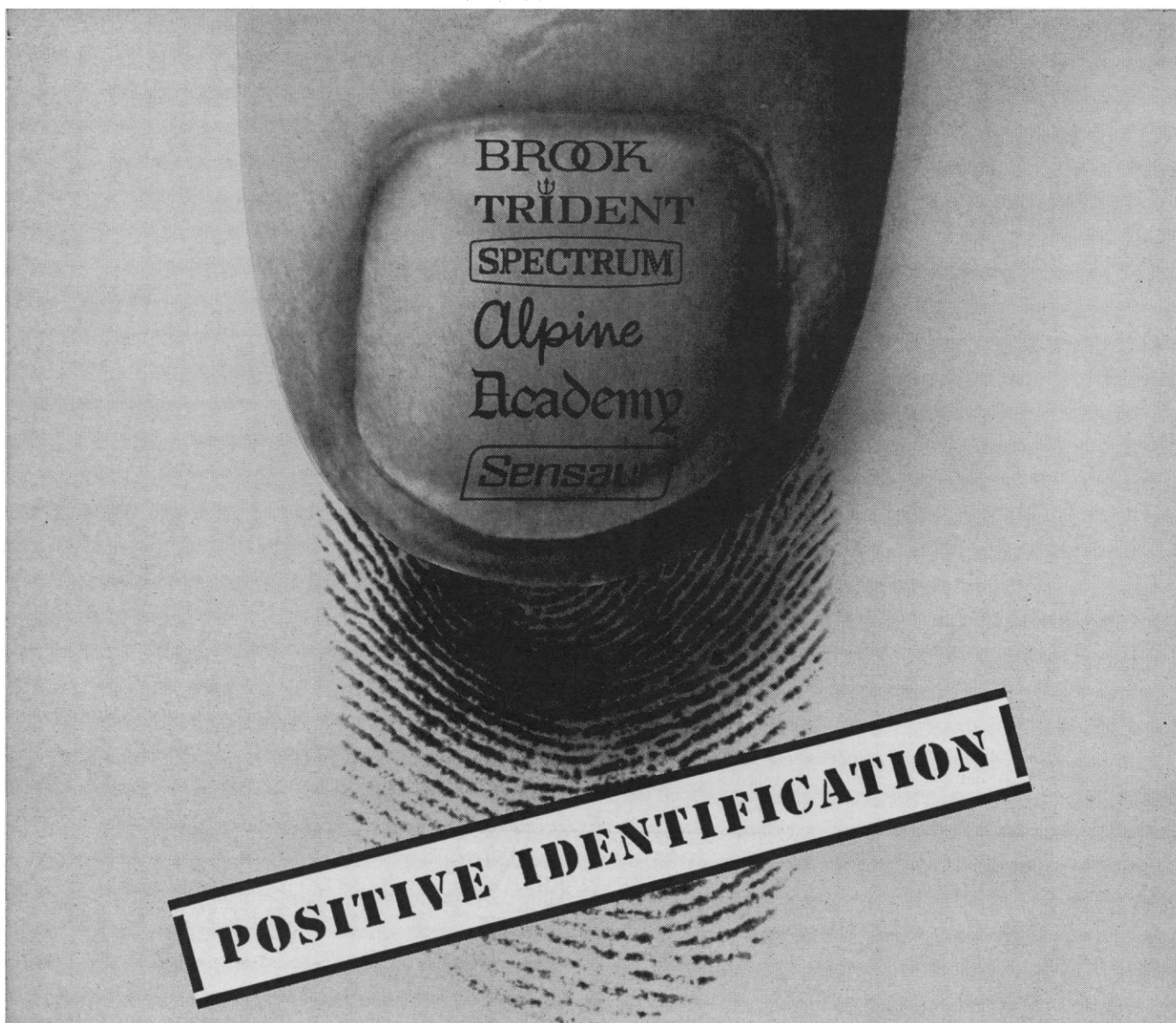
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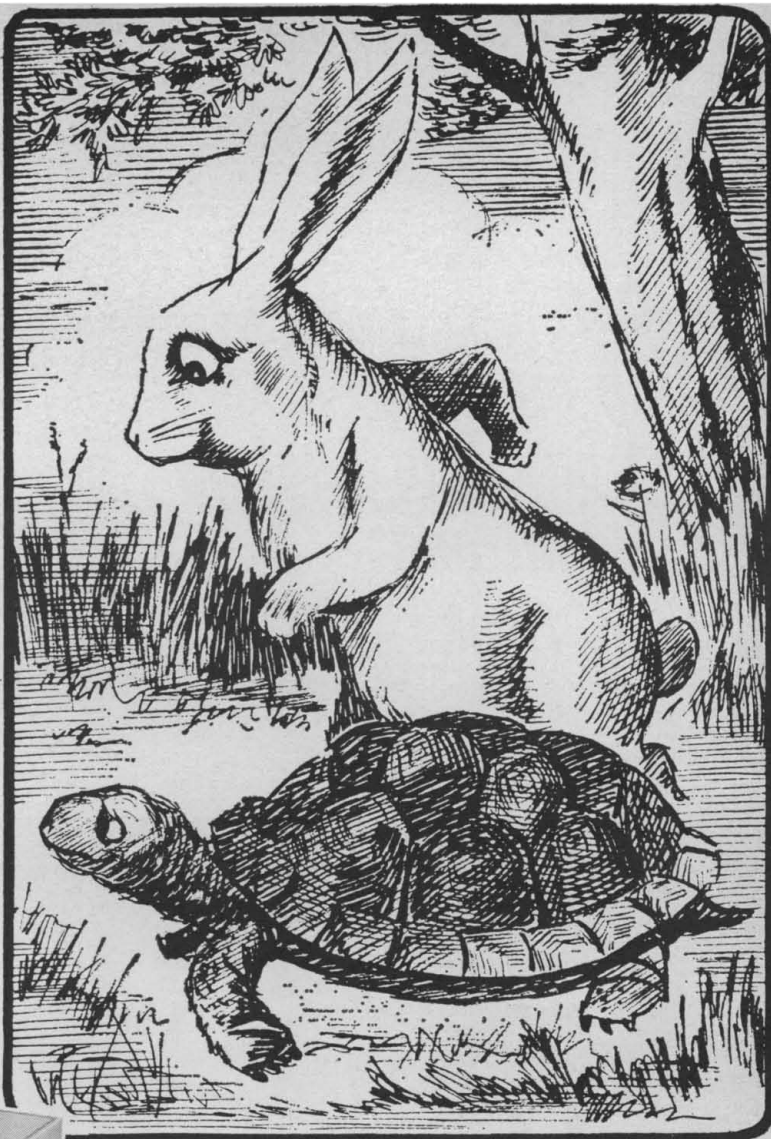
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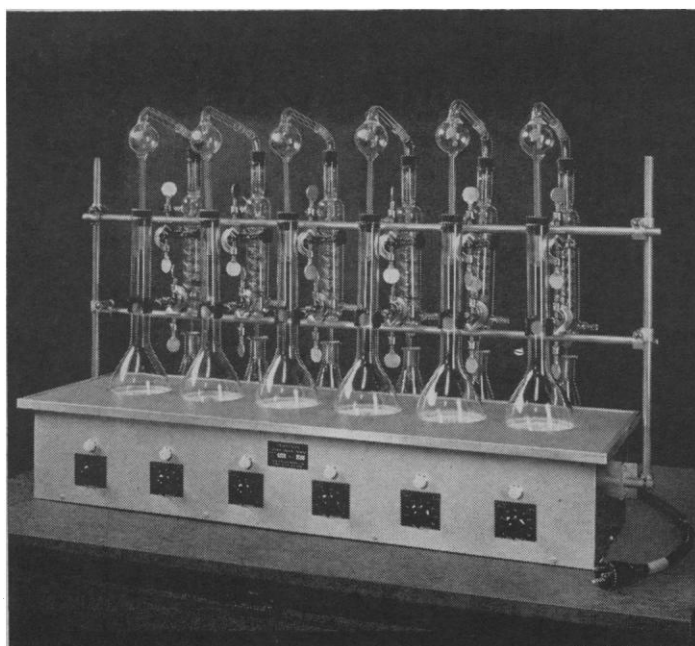
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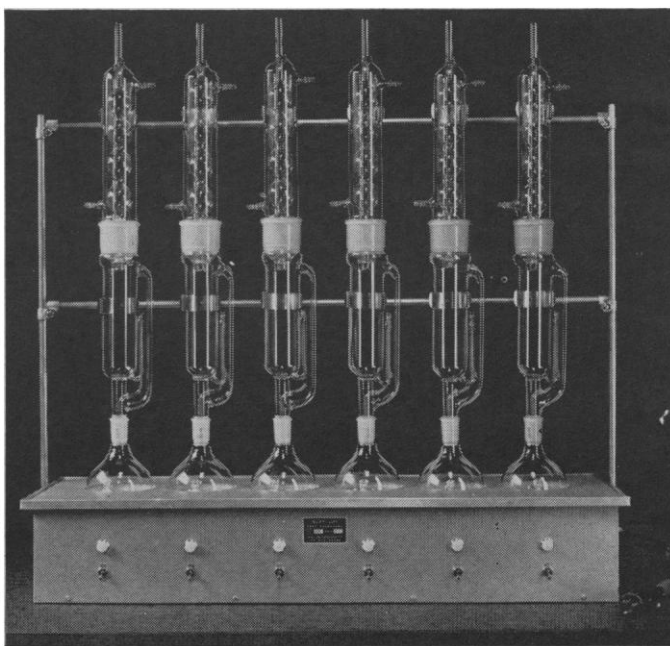
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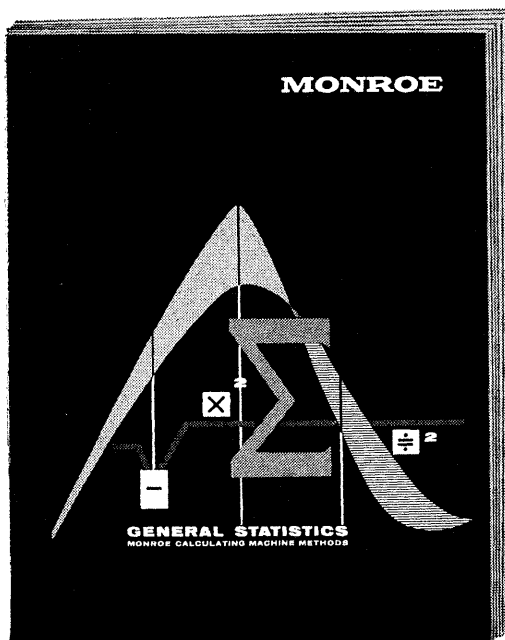


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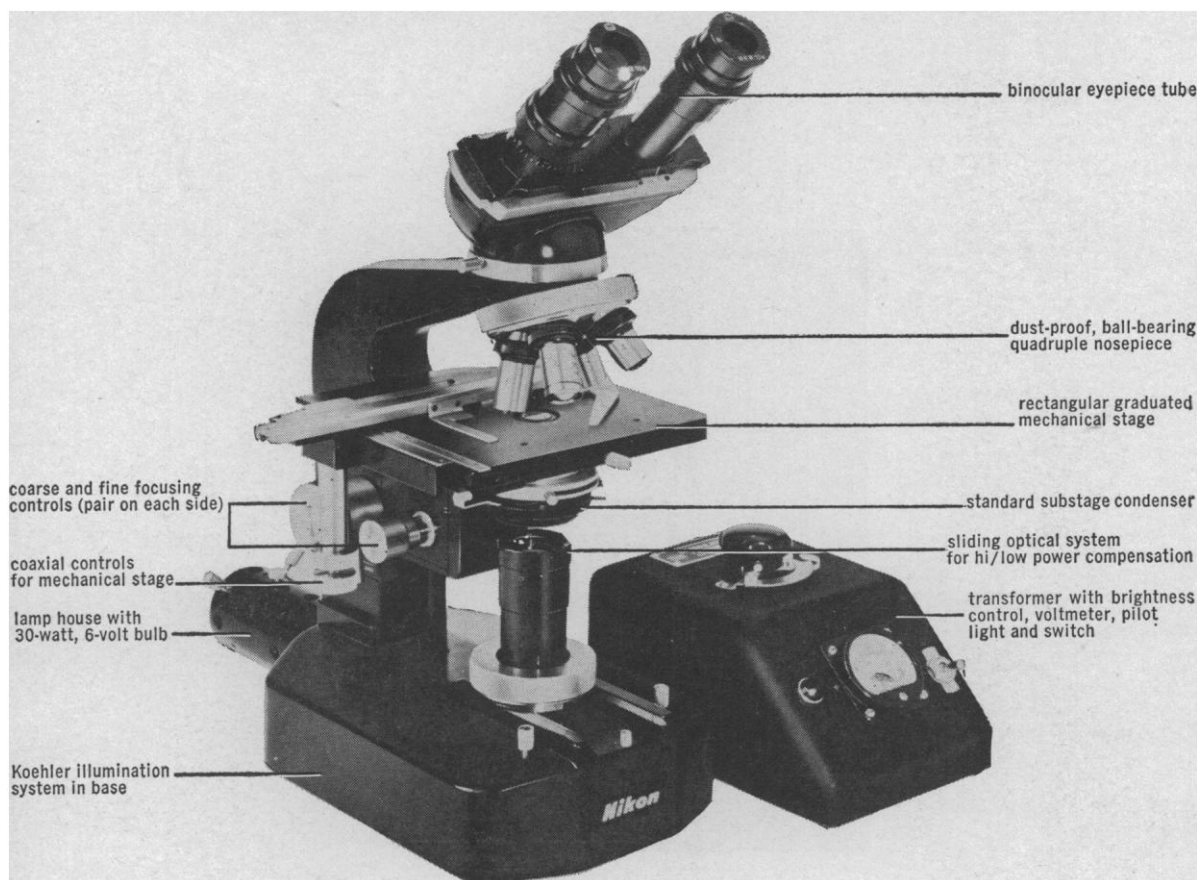
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Nikon *S-ke research microscope*

The Nikon S-Ke never fails to evoke astonishment and admiration for its performance. And rarely is it demonstrated without attracting new users.

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The S-Ke illumination system is an integral part of the microscope, built directly into the base. It is one of the major features of the S-Ke, providing the advantages of Koehler illumination with ease and simplicity—over the entire magnification range of the microscope. The image clarity and resolution this obtains cannot be achieved by any other means.

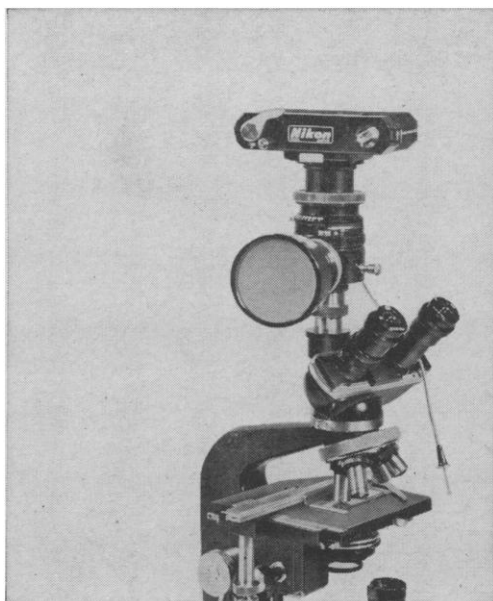
Equally responsible for the acceptance enjoyed by the S-Ke, at the most critical professional levels, is its mechanical accuracy and responsiveness. Yet,

for all its precision, it is a rugged, untemperamental instrument capable of withstanding rigorous use without undue maintenance requirements.

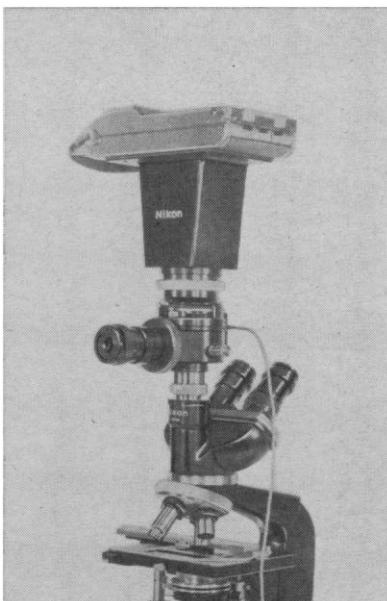
One of the most practical advantages of the Nikon S-Ke is its versatility—the facility with which its qualities can be applied to any number of techniques. The S-Ke draws upon a wide variety of interchangeable attachments and accessories, to fit it for almost every aspect of microscopic investigation. It is virtually a complete laboratory system unto itself.

Nikon S-Ke demonstrations will be cheerfully arranged, on request. For complete details and specifications, write Dept. S-10

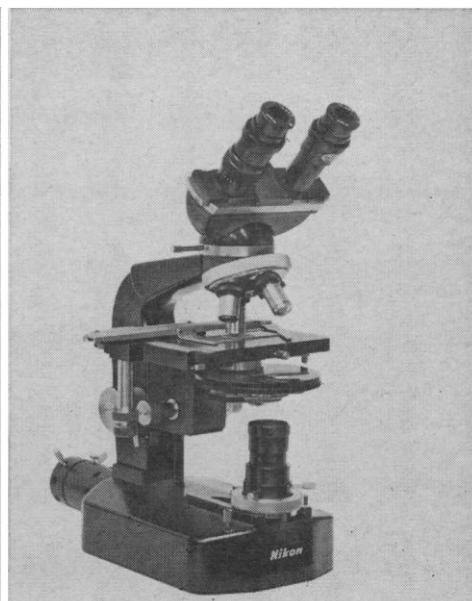
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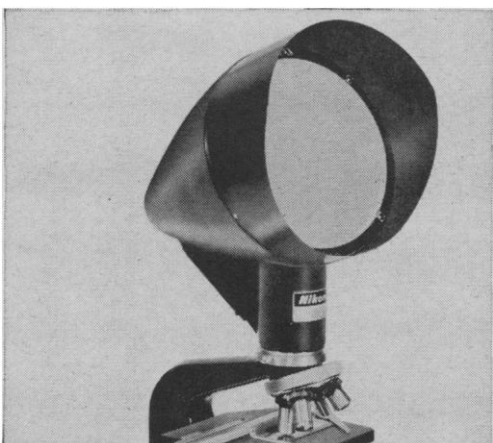
S-Ke equipped with trinocular head, Microflex and M-35 camera body for 35mm photomicrography



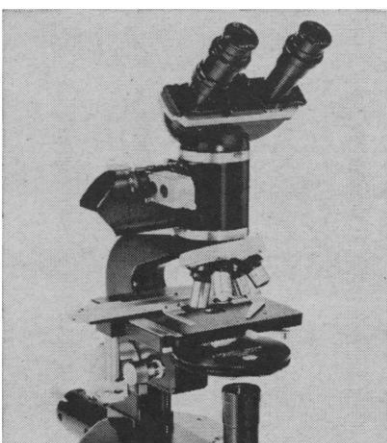
S-Ke equipped with trinocular head, Microflex and camera back for Polaroid photomicrography



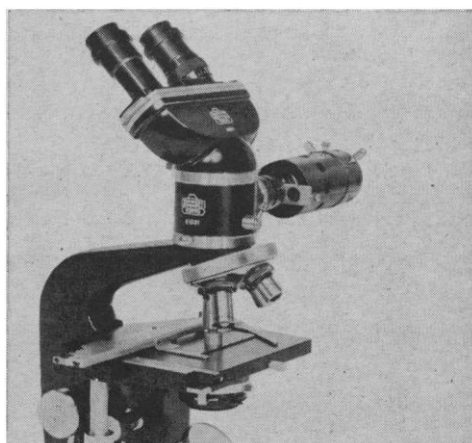
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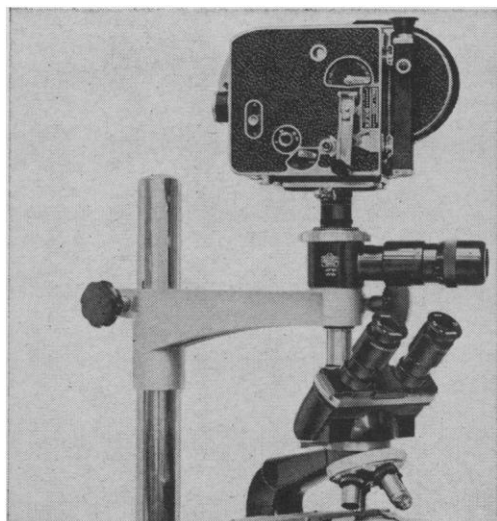


S-Ke equipped with Interference-Phase Attachment for markedly improved perception of unstained, transparent specimens.

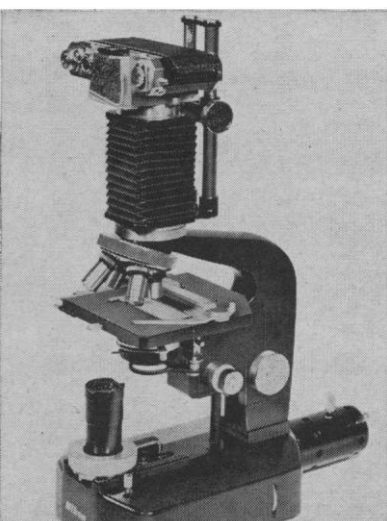


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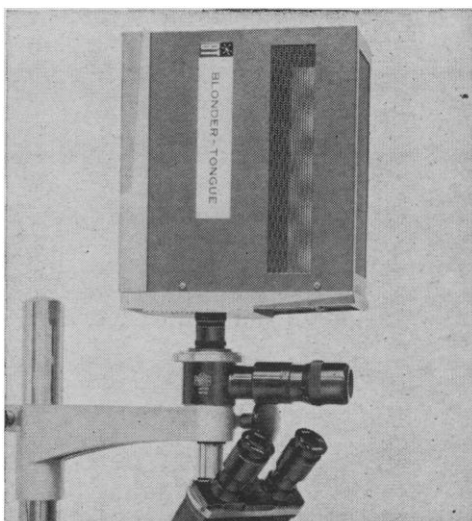
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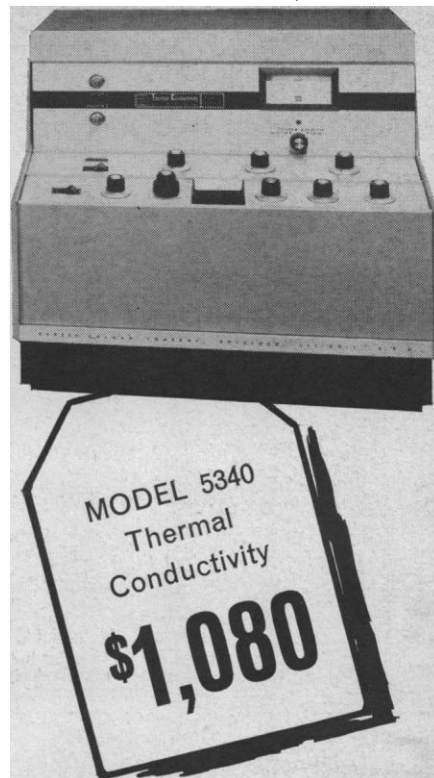
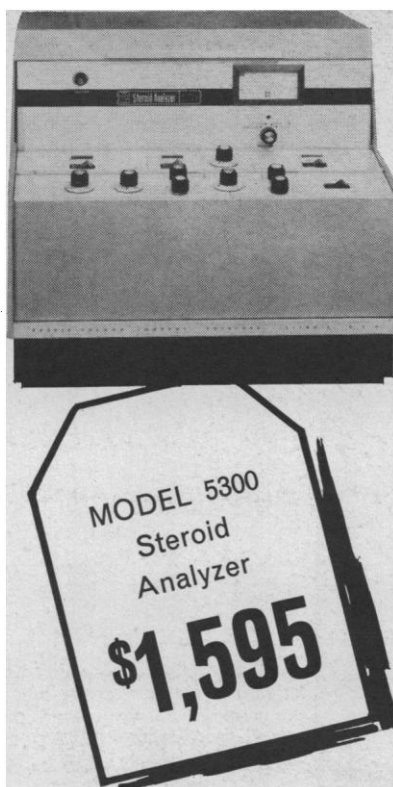
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changeable lens and shutter combinations plus a lensless shutter for photomicrography. In all cases you work with an eye-level, ground-glass reflex viewer for fast, easy, hairline focusing.

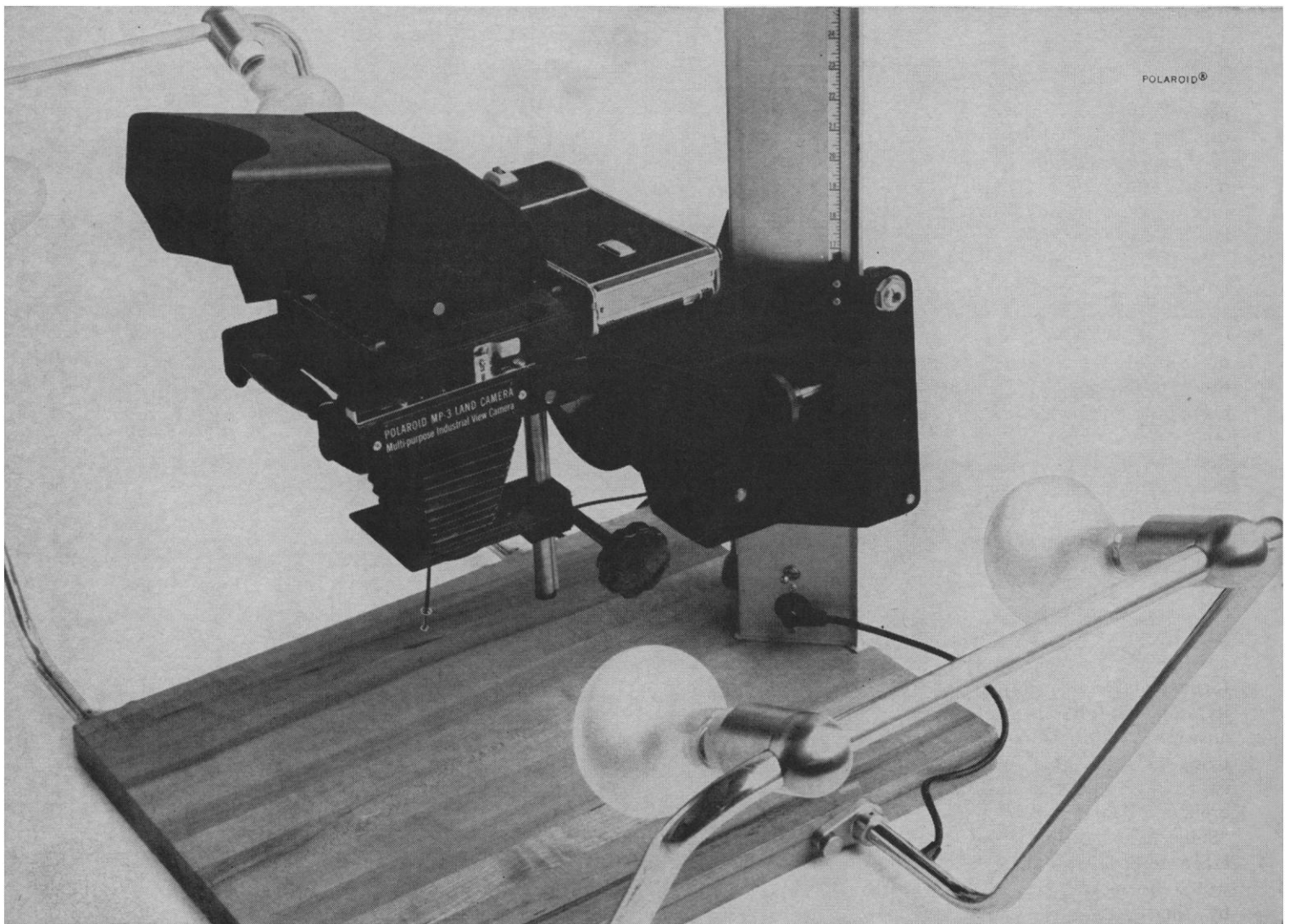
But it's the film systems that give the MP-3 such speed and versatility. It uses thirteen different Polaroid Land films plus conventional 4x5 b&w and color films.

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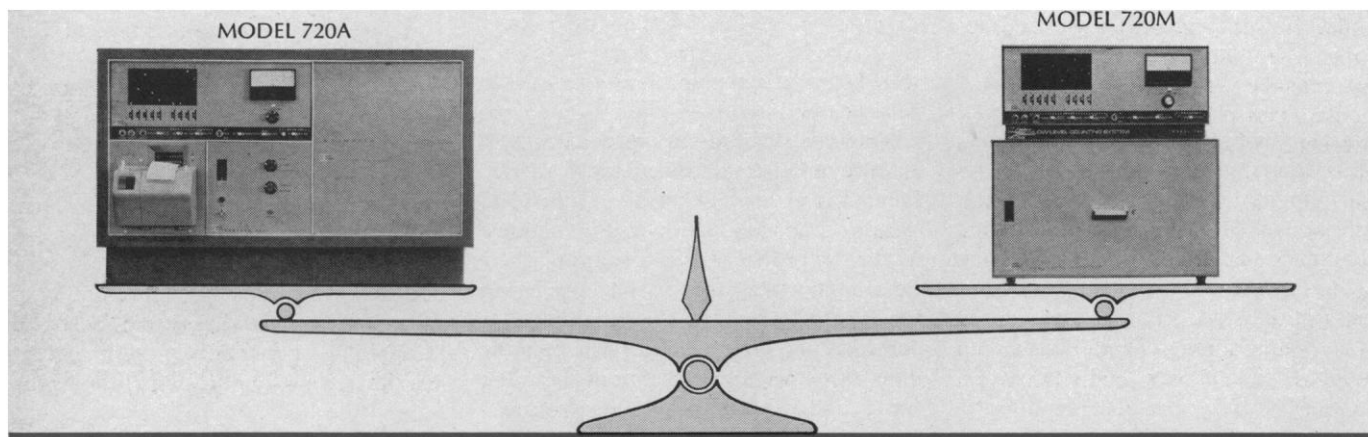
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cratic State Committee of Scientists and Engineers for Kennedy, of which I was cochairman, was, I believe, the first and, at that time, the only group of its kind. . . . A few of the prominent names associated with the present Johnson committee were also supporters of the Kennedy committee.

I found that, in general, scientists were willing to lend their name and perhaps give a contribution, but that they avoided active politicking. . . . I wonder if this year will see a change in the essentially apolitical nature of most scientists. . . . In 1960 we could speculate that the scientific vote in New York state provided the slim margin of victory for Kennedy—a switch of less than 200,000 votes from the Democratic to the Republican column would have given New York state to Nixon, and he would have won the election by five electoral votes.

In any case, I feel that scientists should try to shape their political environment, and I wish the present committee well.

CYRUS ADLER

*Manhattan Physical Research Group,
Inc., 150 Broadway, New York 10038*

Able Students Still Choose Science

The subtitle of Robert C. Nichols's article "Career decisions of very able students" (12 June, p. 1315) reports a declining interest in careers in science and engineering. The actual data, however, indicate that this is true for engineering but not for science, nor does Nichols make this claim in his own analysis. If we include mathematics among the sciences, we find (Table 4) that in 1958, 36.44 percent of male National Merit semifinalists chose one of these six fields: biology, chemistry, geology, mathematics, physics, and psychology; in 1963, 40.96 percent of the students chose these fields. There was an increase in biology, chemistry, psychology, and mathematics, and a decrease in geology and physics. The 6.57 percent decrease in physics was more than compensated by a 7.64 percent increase in mathematics. The data indicate some shifts in popularity of individual fields of science, but not a general decline of interest in science, as implied by the subtitle.

ERNST MAYR

*Museum of Comparative Zoology,
Harvard University,
Cambridge, Massachusetts*

The Lunar Surface

In recent months it has become more and more common for scientists to discuss the surface of the moon as though it were in a state akin to the average back yard. A case in point is the report in *Science News Letter* (22 Feb. 1964) which quotes Thomas Gold, director of the Center for Radio-physics and Space Research, Cornell University, as saying that "the action of micrometeorites on the moon's surface cannot fail to produce at least a thin layer of finely pulverized material like dust."

Estimates of the number of meteorites weighing from 10 to 7000 pounds which strike the earth each year have generally agreed with those of C. C. Wylie, who estimated the numbers to be at least 6000 to 7000 [*Contrib. Univ. Iowa Obs.* 7 (1936), pp. 226-27]. Since Wylie's publication my own estimates, based on observations of fireballs, surface features, and weight of some 7000 meteorites in museum collections, observations of meteorite craters, and evaluation of the adequacy of field data, have been revised slightly upward from his.

On the earth most meteorites in this weight range produce no noticeable results, since during their passage through the atmosphere they are for the most part reduced to inconspicuous particles. On the atmosphereless moon, however, the results are quite different. A meteorite weighing only ten pounds, striking the lunar surface at a speed of 20 miles per second, would, according to Ralph Baldwin's estimates (*The Face of the Moon*, Univ. of Chicago Press, Chicago, 1948), create a crater 48 feet in diameter and 15 feet deep.

If the frequency of fall per unit area is the same on the moon as on the earth, then in the past half billion years 23.4 craters per acre (15,000 per square mile) have been formed on the lunar surface by meteorites of the 10- to 7000-pound range alone.

Meteoritic rubble of varying degrees of coarseness must reach to great depths on the surface of the moon, but it is evident that dust-like deposit created by the action of micrometeorites is a very minor constituent of this rubble. Hence, the lunar surface cannot be covered by a thin layer of dust alone.

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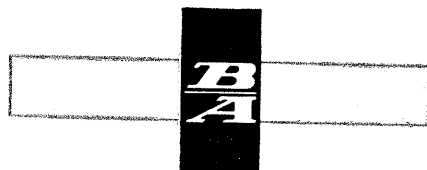
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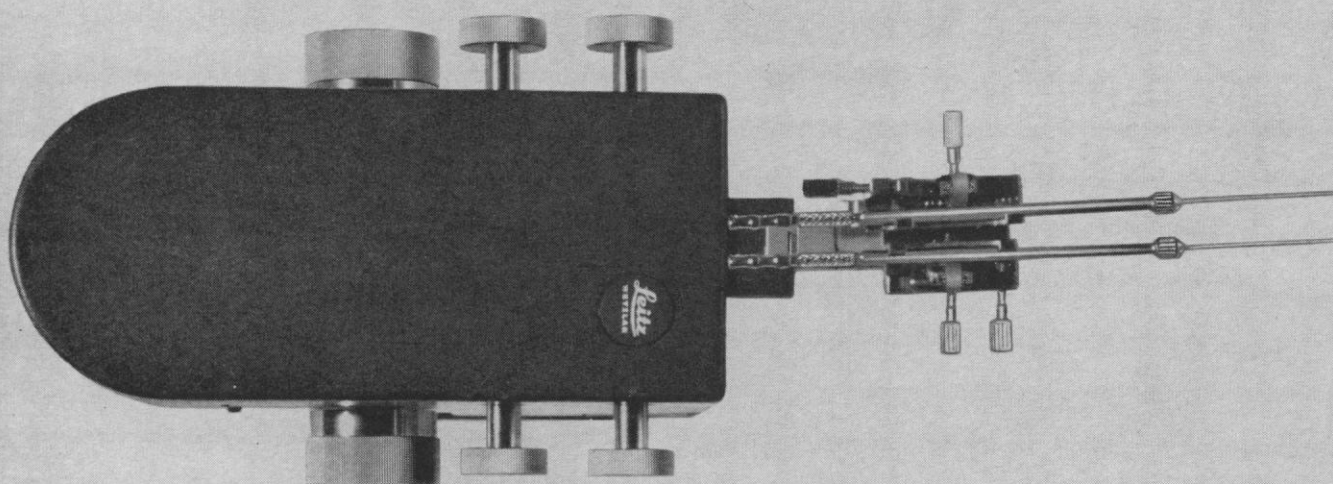
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Challenge to Tax Exemption

The Internal Revenue Service is considering taxing many normally tax-exempt scientific societies because they engage in activities considered by IRS to be not closely enough related to the purposes for which tax-exempt status was granted. By law, *unrelated* commercial activities are subject to taxation even if the income goes to a tax-exempt body; the classic case is the macaroni factory owned by a university. The position which IRS seems now to be taking is that the sale of advertising in association journals and the sale of subscriptions to nonmembers are not sufficiently related to the normal purposes of a scientific society for income from these activities to remain free from taxation.

The IRS has a very proper interest in collecting all taxes it considers due the federal government. But one of the arguments for taxing scientific societies seems strained—namely, that income other than that received directly from members helps to pay expenses, makes dues or fees lower than they would otherwise be, and thus violates the requirement that no part of the net earnings of a tax-exempt organization should inure to the benefit of the individual members.

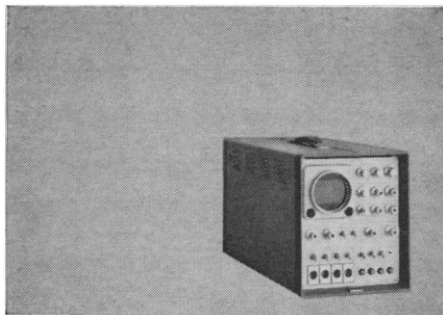
Congressman Patman's attacks against tax-exempt foundations add a bit of flavor to the situation. So do the cries of the editors and publishers of a few commercial magazines. Now that the numbers of scientists and engineers, the industrial uses of their talents, and the variety of equipment for which they are responsible have grown to their present state, a Johnny-come-lately commercial interest in the technical publishing field has blossomed. The proprietors of some of these magazines that are given away free and that depend entirely upon advertisers for their income find life hard and think it would be easier if association-owned magazines were taxed.

On the other side of the case is the established public policy of granting tax exemption for certain specified activities that are carried out in the public interest rather than for private gain. To be considered, also, is a long history of association sponsorship and members' support of publications that did not have, and often still do not have, sufficient circulation to be commercially attractive but that have helped to build the scientific and engineering enterprise to its present state. To take a specific example, it would be silly in practice and harassing in principle to require the American Mathematical Society to compute annually the "profit" made on subscriptions to its *Bulletin* entered by universities, government laboratories, foreign scientists, and other nonmembers. All in all, opposition to the proposed changes will be strong. Representative Curtis of Missouri has introduced a bill to prevent IRS from making them. The bill will not be acted upon by this Congress, but it is a warning. If IRS proceeds, a similar bill will be introduced next year and will stand a good chance of adoption, for the new rulings would hit not only scientific societies but also religious, charitable, educational, labor, and other professional societies.

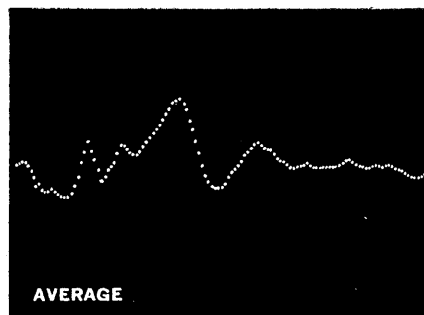
If IRS does try to change the rules along the indicated lines, we predict that it will be forced to retreat. Nevertheless, it will be prudent for officers and members of scientific societies to be warned of the probable struggle and to examine carefully the proposed new rulings when they are made public.—DAEL WOLFLE

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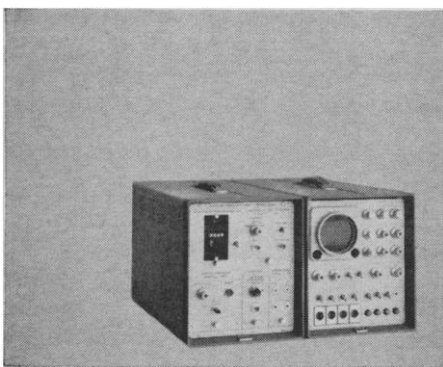
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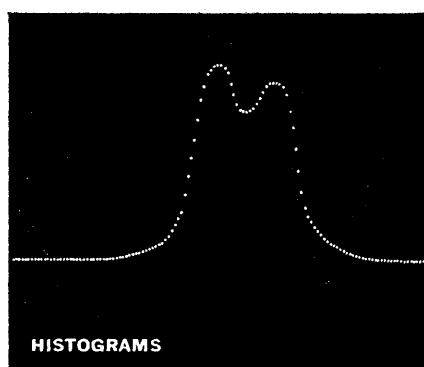
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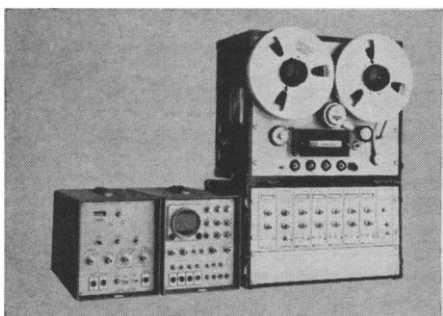
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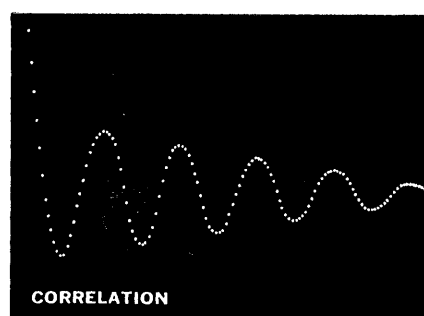
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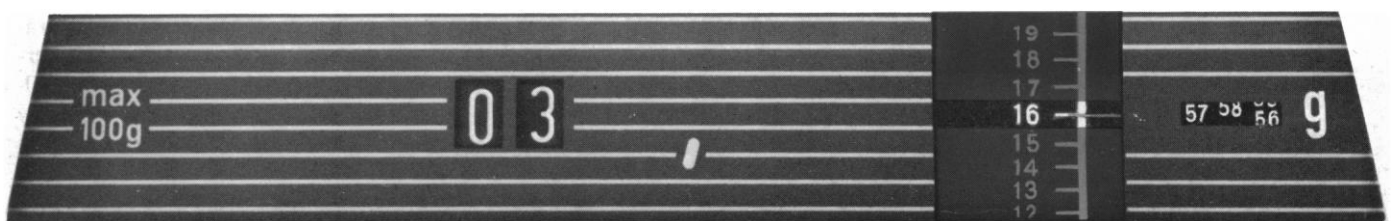
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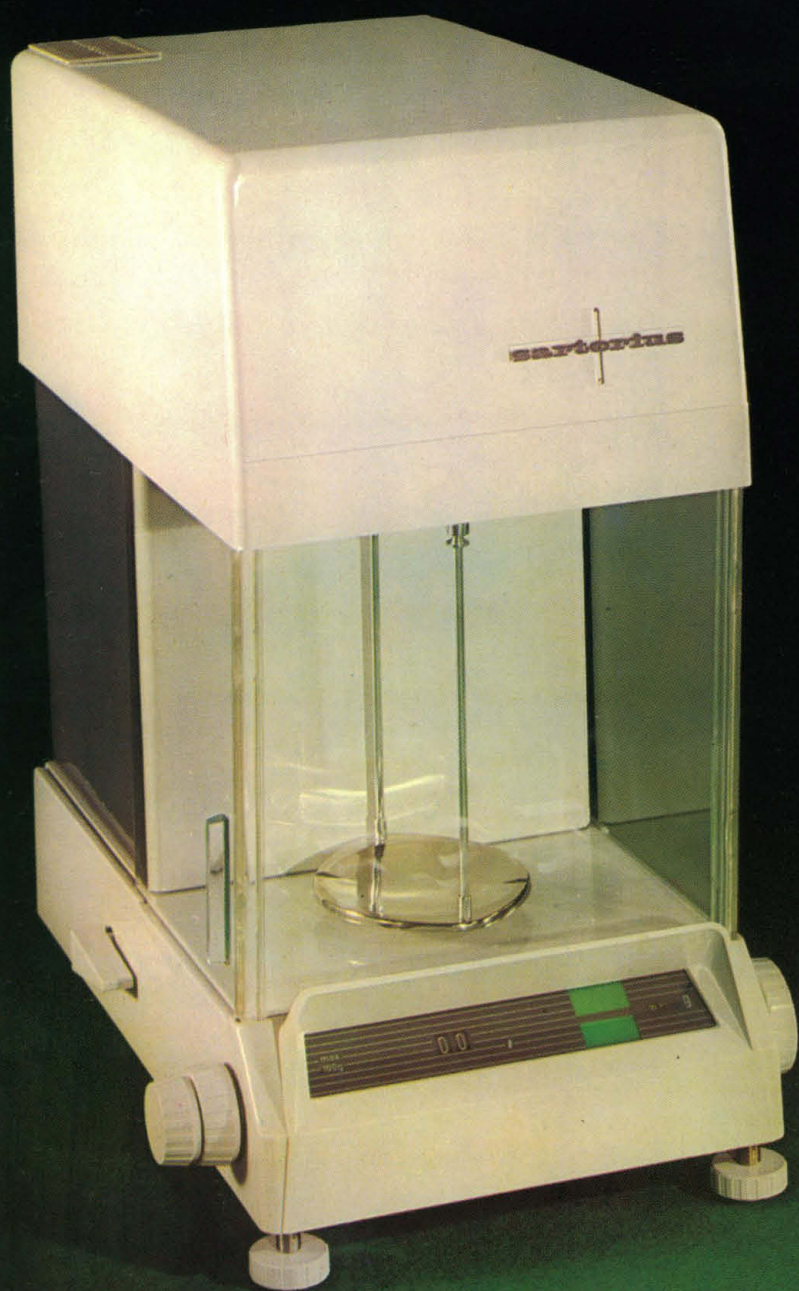
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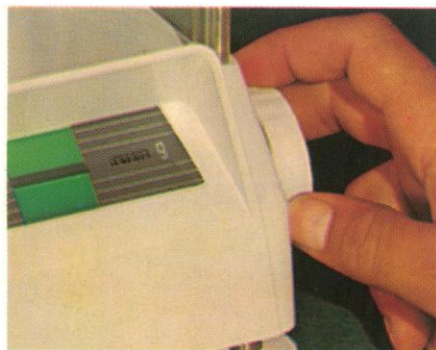
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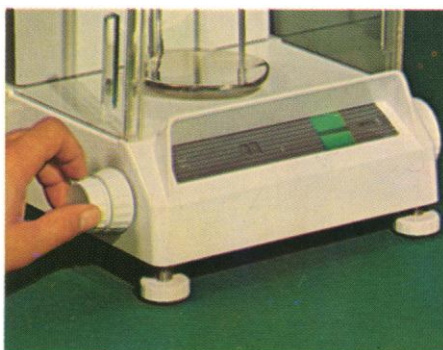
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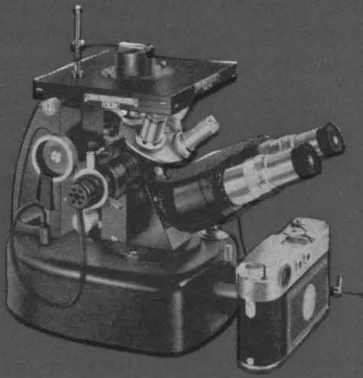
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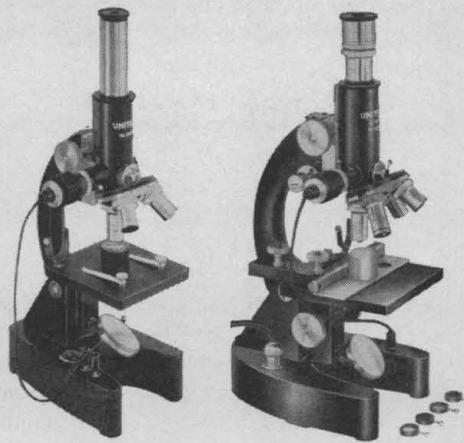
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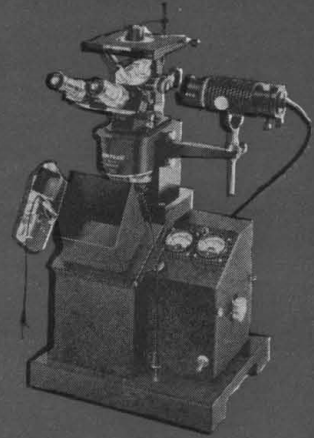
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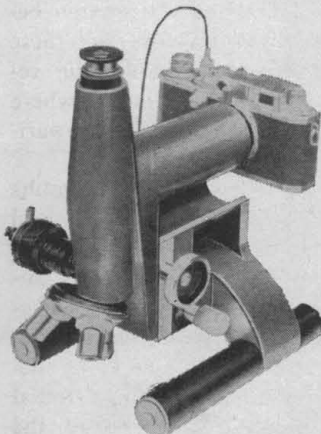
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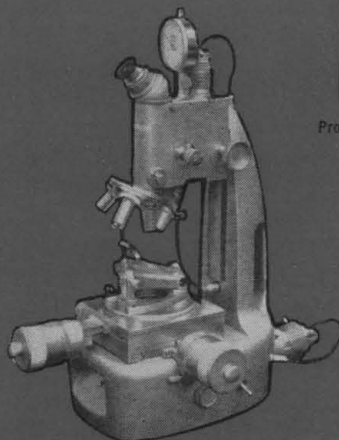
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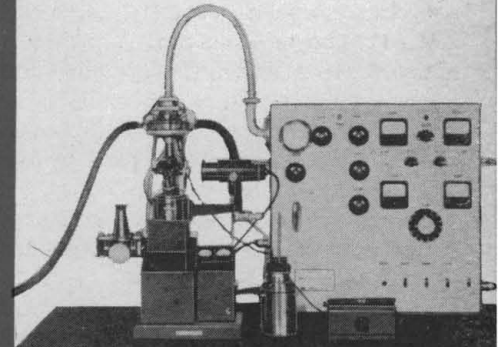
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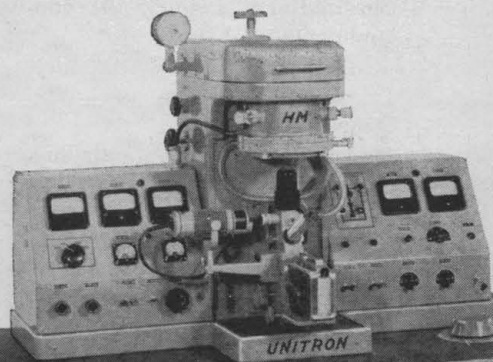


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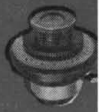
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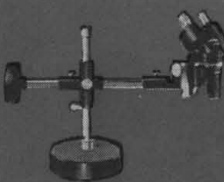
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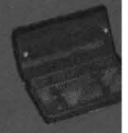
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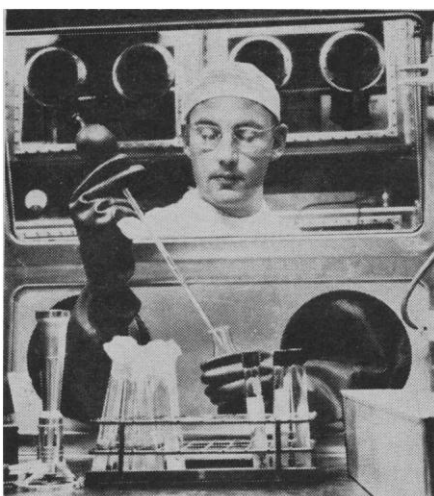
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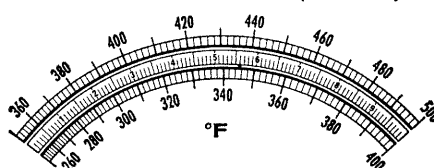


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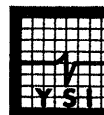
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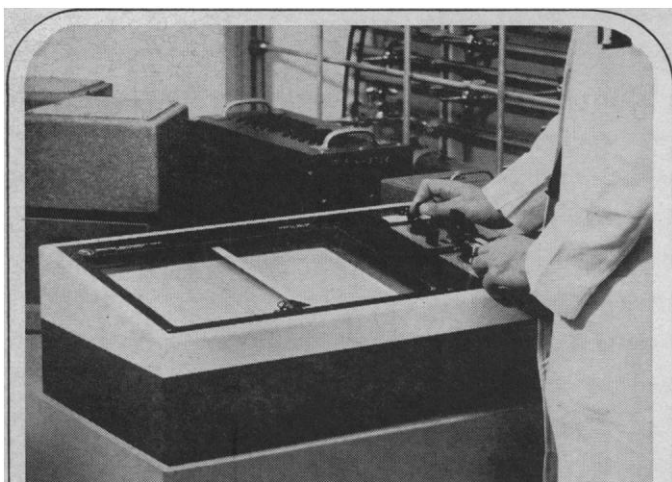
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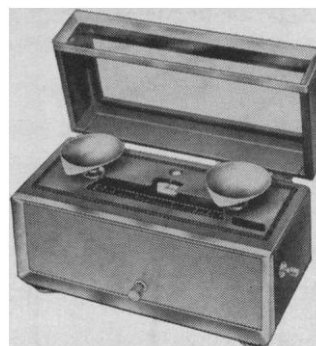
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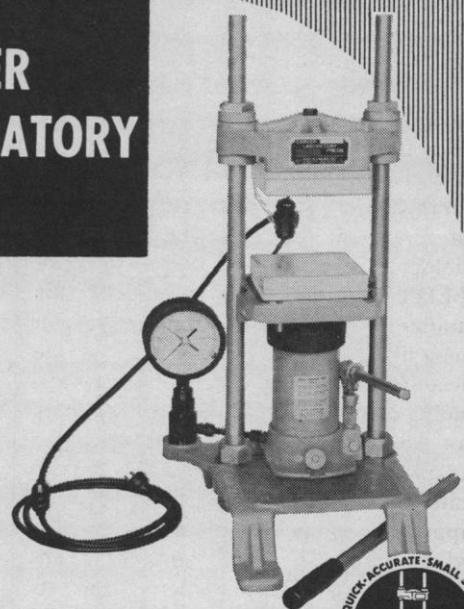
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A general session on Education in Biophysics elicited considerable interest and delegates discussed the problems associated with the evolution of biophysics as a discipline in their respective countries.

As an experiment, the meeting was organized with invited speakers only; more than 100 papers were presented. Although this procedure evoked considerable criticism, the meeting was undeniably stimulating and provided some excellent discussions.

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Aquatic Pollution

The pollution of marine waters was the subject of a symposium held by the Aquatic Biology Group at the meeting of American Society for Microbiology in Washington, D.C., 5 May 1964.

Robert Littleford (U.S. Public Health Service) severely criticized the increasing pollution of our waters and called for new approaches to the problem. He said that dumping waste into the marine environment and forgetting it as it floats away nullifies responsibility. Over the years the pollutants have increased 1000-fold, and the variety from almost every industrial organization has also increased. Pollution, an environmental problem, is also a biological problem, yet biologists have shirked pollution study. He called for studies by virologists of the shellfish hepatitis problem, and emphasized the need for a critical overhaul of microbiological techniques. The methodology for other ecosystems cannot simply be adapted for the marine environment. Littleford called for a coordinated approach to pollution study—one in which biologists, oceanographers, sanitary engineers, and other specialists would work as a team. There should be an end to projects that do not consider the whole environment, especially the life in these polluted waters. These studies should take into account the interaction of organisms and environment, the spread of infective agents arising from sewage and other man-made wastes, and the negative and positive effects of treated sewage on the

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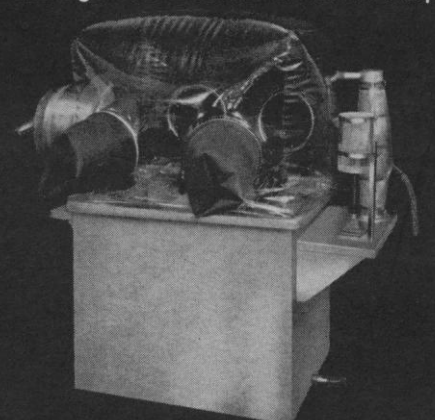
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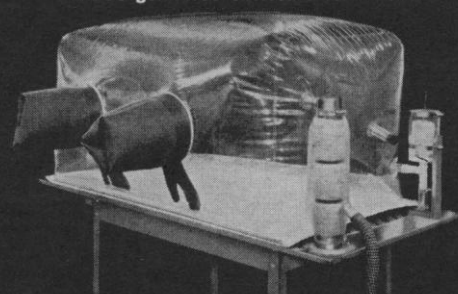
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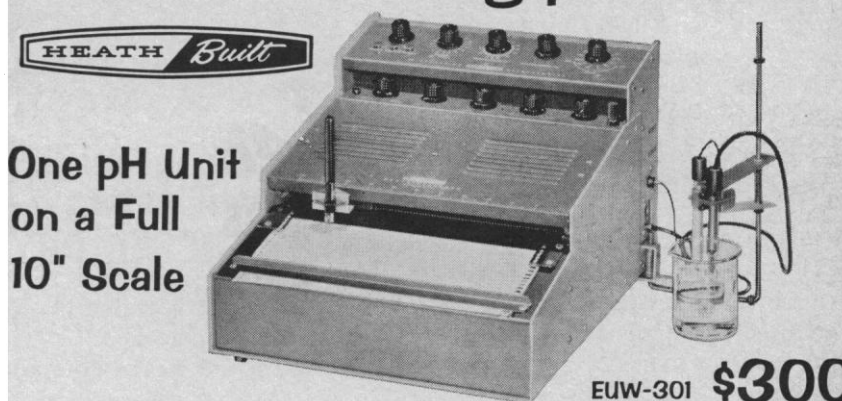


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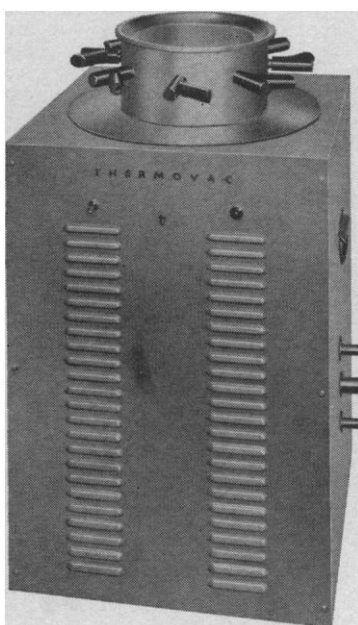
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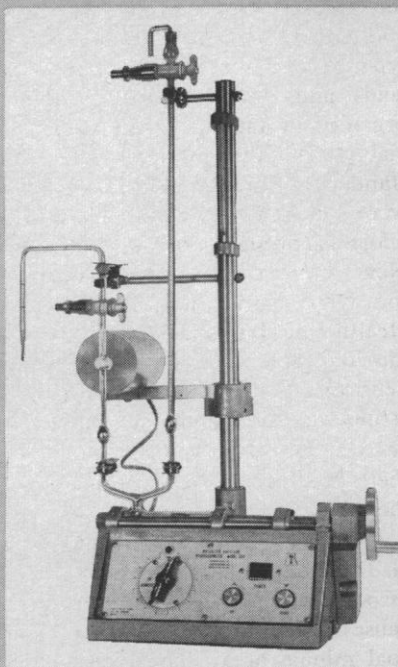
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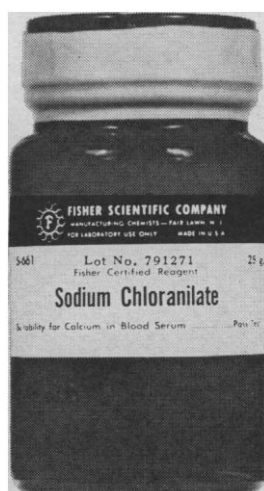
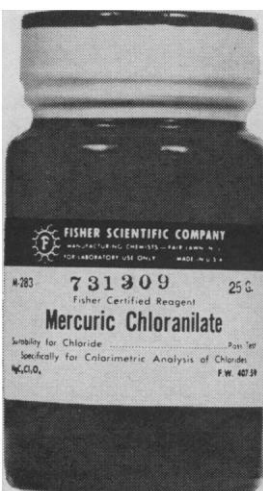
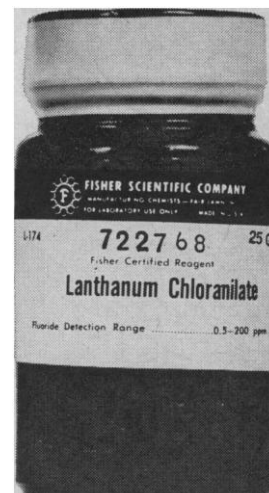
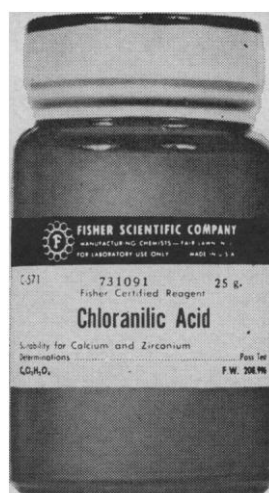
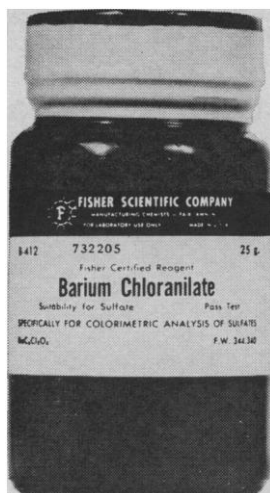
SCIENCE, VOL. 146

growth and viability of the phytoplankton of the offshore fisheries and shellfish areas. (Littleford remarked that he spoke as an individual and that his opinions were not necessarily those of the U.S. Public Health Service.)

Ross F. Nigrelli (Osborne Marine Laboratories, New York Aquarium) agreed on the need for unified studies of pollution. In commenting on the recent mass killing of fish in the Mississippi Delta, he asserted that such mass kills have taken place during the past 25 to 30 years. The most recent occurrence has been blamed on pesticides; however, pesticides were not being used at the time of earlier kills. This points up the need to separate subtle biological kills from pollutional kills—a task requiring team studies.

An analysis was made by Galen Jones (Boston University) of the effect of chelators on the growth of *Escherichia coli*. Using both synthetic and natural sea water he has demonstrated that chelation increased the longevity of an *E. coli* population. The bactericidal action of natural sea water varies with season, temperature, and location; such fluctuations reflect residual organic matter and organic nutrients locally produced. When questioned about the reliability of *E. coli* as a pollution indicator, he agreed that small traces of chelators in the test system or in the natural waters would alter the *E. coli* count, and that the amount and type of chelator (for example, amino acids and other natural or synthetic organic substances) could vary appreciably. He thought that the present standard bacteriological techniques were not reliable. Questions from the audience brought out the fact that the New York City Health Department, the New York State Department of Health, the Interstate Sanitation Commission, and the U.S. Public Health Service all use different systems for estimating fecal pollution and the percentage of dissolved oxygen. Hence there has been great confusion as to the safety of bathing beaches.

Iron-oxidizing bacteria, said Donald G. Lundgren (Syracuse University), are associated with the acid drainage that causes a serious pollution problem in coal mining areas. The high acidity of these waters is the result of sulfuric acid. Corrosion caused by acids and iron precipitates is an additional pollution problem. Fundamental knowledge on iron-oxidizing bacteria is needed before pollution control can be achieved by the sanitary engineer. Lundgren



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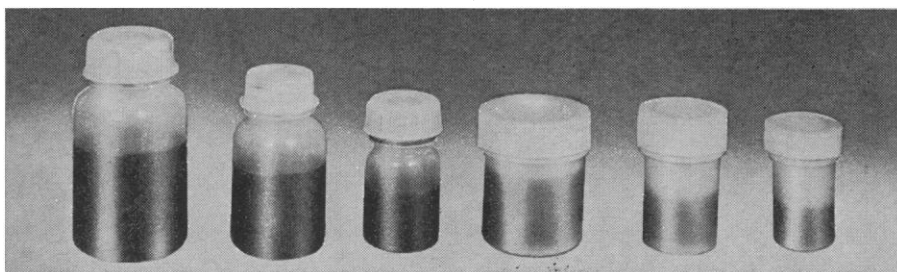
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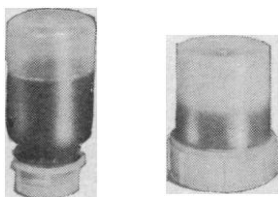
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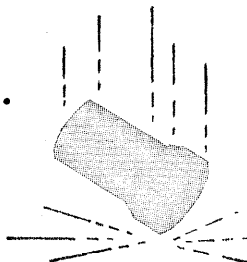
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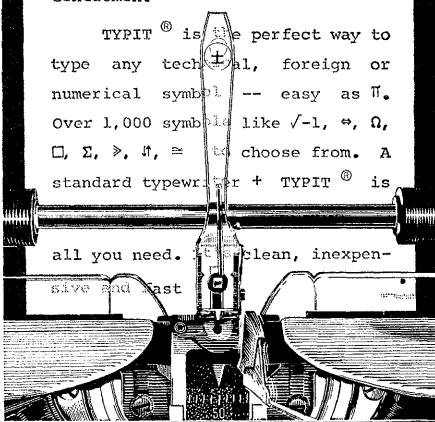
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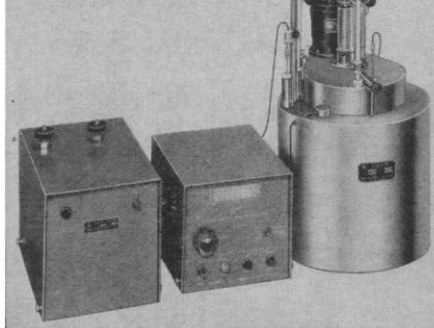
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described *Ferrobacillus ferrooxidans*, which oxidized ferrous iron for energy, and fixed carbon dioxide as the sole source of carbon. A system was described for growing ferrobacilli in 160-liter batches in order to obtain enough cell material for analysis. Both gross and fine structures of these bacteria were studied with electron optics; results revealed a cell envelope, two-layered cell wall, a layered cytoplasmic membrane, polyribosomes, and circular organelles of unknown function. A model for iron oxidation and acid production was described. It was determined that ferrobacilli assimilated carbon dioxide by the conventional autotrophic route, the Calvin scheme.

L. W. Slanetz (University of New Hampshire) reported that he has used membrane filters to enumerate fecal streptococci; the method was direct, reliable, and reproducible. While the number of fecal streptococci was lower than the number of coliforms, they were comparable to the numbers of *Escherichia coli* and, in some samples, to the number of fecal coliforms in the test samples. Fecal streptococci were good indicators of sewage or fecal contamination of sea water.

George Cowherd (Interstate Sanitation Commission) discussed Raritan Bay. The commission is charged with the control of pollution of the interstate tidal waters in the New York metropolitan area. Cowherd said that at certain seasons the waters of Raritan Bay do not meet the commission's requirement of an average dissolved oxygen concentration of not less than 50 percent saturation. It has started to determine when, where, and why these low oxygen values occur. They have integrated six investigatory techniques:

1) Sampling of waste waters from the 133 treatment installations in the control district and from the many plants, particularly along the heavily industrialized Arthur Kill which discharges into Raritan Bay.

2) Using the Army Corps of Engineers' hydraulic model at Vicksburg, Virginia, to determine how waste water moves within the New York harbor complex.

3) Surveying fish populations.

4) Monitoring pH, chlorides, temperature, and dissolved oxygen continuously by means of an automatic water-analysis device which transmits information by leased telephone wire to the commission's New York office.

5) Direct sampling in Raritan Bay.

6) Studying the effects of secondary

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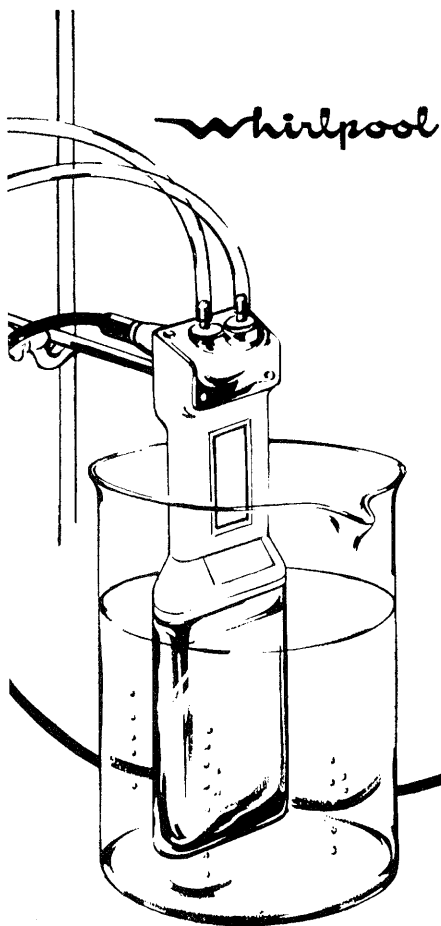
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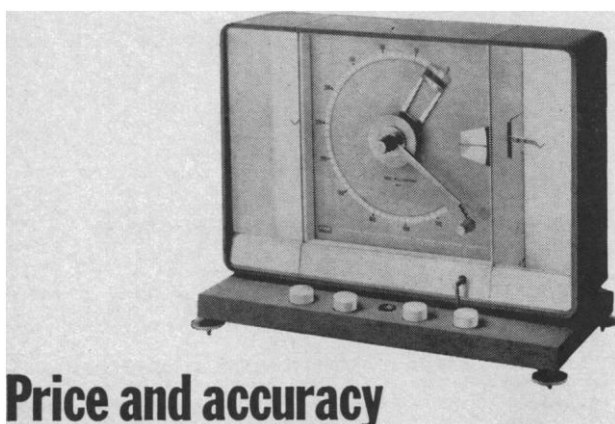
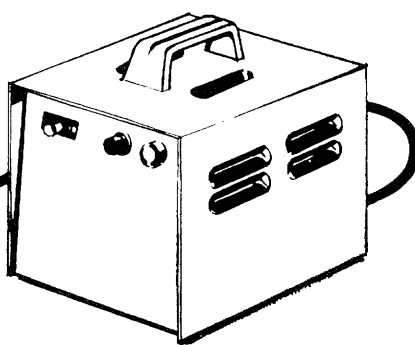
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treatments on the phytoplankton population and dissolved oxygen in Raritan Bay. This latter work is done by the Haskins Laboratories for the commission.

Cowherd mentioned the commission's interest in the "harbor taste" of fish from Raritan Bay. The commission, he said, has produced a taste similar to this, within a week, by exposing fish of the same species to one part per million of a petroleum product. He said the commission is requiring waste treatment by industry to eliminate toxicity and taste problems. Cowherd was asked by Warren Litsky (University of Massachusetts): "Why bother with all this when we know it's oil that contaminates the Arthur Kill and eventually the Bay?" Cowherd replied that the contamination was caused primarily by discharges from chemical and petroleum industries. The discussion elicited a further comment by Litsky: "We know that the big pollutant is oil. Everybody knows that. Just stick your toe in the Arthur Kill, and don't light a match" (laughter). It was asked whether ships discharging bilges could be at fault. Cowherd said they were partly at fault, "But we do police the refineries and find they discharge oil into the Arthur Kill, too." Ships, he added, are not easy to police.

John J. A. McLaughlin (Haskins Laboratories, New York) presented data from 1000 Raritan Bay samples collected over a 5-month period. Analyzing these samples for phytoplankton by the standard Sedgwick-Rafter method for concentration of such material gave erroneous results; this sand-filtration technique recommended by the American Public Health Association failed to trap the dominant phytoplankton, *Nannochloris*, a tiny alga. This organism grew to densities of 1,000,000 cells per milliliter during July and August, and constituted 99 percent of the population. This bloom persisted well into October. Temperature drops in October and November caused massive death of these organisms. The bloom of this genus in Raritan Bay paralleled its blooming in the duck excreta-enriched Great South Bay of Long Island. The organism was thought to have destroyed the clam industry in that area. McLaughlin stressed the cumulative effect on oxygen and carbon dioxide balances of massive phytoplankton death, and pleaded for studying the phytosociological aspects of the harbor ecosystem.

John Burke (St. Francis College,

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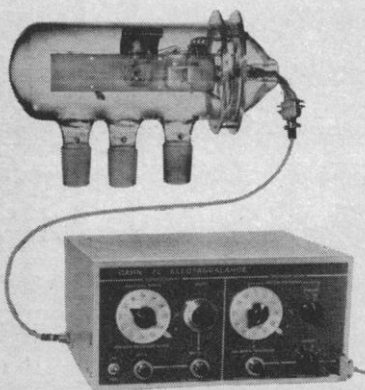
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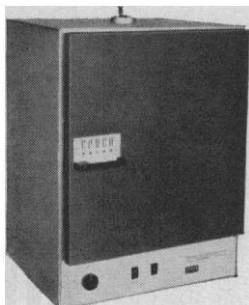
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SCIENCE, VOL. 146

Brooklyn), an oyster epicurean, made many in the audience uneasy. The concentration by shellfish of phytoplankton dinoflagellates, such as *Gonyaulax catenella* and *G. tamarensis*, has led to the death of some consumers of raw clams or raw oysters. These flagellates produce a potent neurotoxin concentrated by the filter-feeding shellfish. Eating these shellfish may mean paralysis or death. Analysis of the two toxins derived from laboratory cultures indicates that they are quite similar physiologically (paralysis leads to death in mice), but chemical identifications are still lacking.

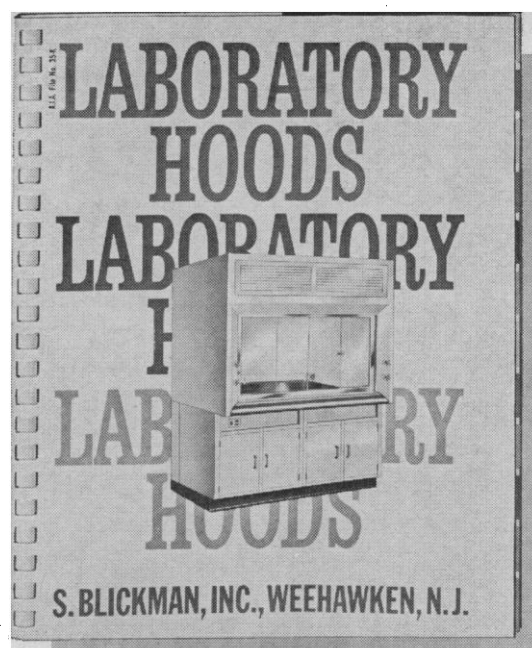
The consensus of the symposium was that understanding how pollution affects the marine environment is obtainable only by joint efforts of scientists who have widely diverse training, and that the "standard" methods developed for other environments were inadequate.

JOHN J. A. McLAUGHLIN
Haskins Laboratories, 305 East 43
Street, New York, New York

American Association of Physical Anthropologists

The American Association of Physical Anthropologists held its 33rd annual meeting in Mexico City 20-25 June. Louis S. B. Leakey from Kenya described and analyzed the fossil hominoid remains called *Zinjanthropus* and *Homo habilis*—the former with huge teeth and jaws and the latter with dental and other features that place it in the genus *Homo*. Besides U.S., Canadian, and Mexican scholars, James M. Tanner and N. A. Barnicot from England, José Pons and Miguel Fusté from Spain, J. Tacoma from the Netherlands, Juan Munizaga from Chile, and Hertha de Villiers from South Africa also participated.

Much interest centered on Mexican problems, especially James E. Anderson's demonstration of human skulls up to 87 centuries old from Tehuacan. But, besides studies in Mexico, the pattern of the tapestry of the "human fabric" (as the species was described in one presentation) was shown to repeat itself in various parts of the world by studies of American Indians, Canary Islanders, Melanesians, Southeast Asians, East Africans, and others. This worldwide view of the human species belonging to a genus with a history millions of years deep influenced the clos-



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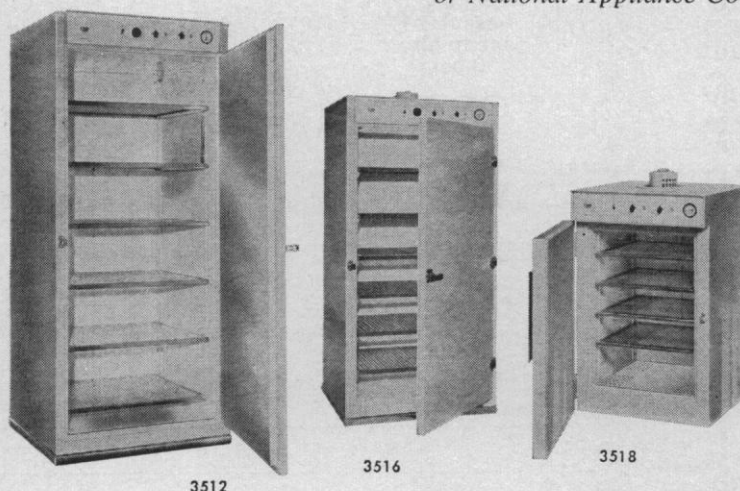
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ing round-table discussion on the direction of developments in the science. In this broad perspective physical anthropology was seen as the study of the gamut of human variability.

At the meetings, the National Institute of Anthropology and the National University first issued two volumes, *Physical Anthropology 1953-1961* and *Yearbook of Physical Anthropology—1962*. These are volumes 9 and 10 of the Yearbook series formerly published by the Wenner-Gren Foundation for Anthropological Research. These and future issues may be secured from the Instituto de Antropología e Historia, Córdoba 45, Mexico 7, D.F. (\$4.50 per volume).

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Forthcoming Events

October

16-24. American Soc. of **Clinical Pathologists**, annual, Bal Harbor, Fla. (ASCP, 445 N. Lake Shore Dr., Chicago, Ill.)

17-18. Society for **Psychophysiological Research**, 4th annual, Washington, D.C. (L. A. Gustafson, SPR, 74 Fenwood Rd., Boston, Mass. 02115)

17-20. College of American **Pathologists**, Bal Harbor, Fla. (E. E. Simard, Box 136, Salinas, Calif.)

18-21. Association of **Military Surgeons** of the U.S., Washington, D.C. (Brig. Gen. F. E. Wilson, Suite 132, 1500 Massachusetts Ave., NW, Washington, D.C. 20005)

18-22. **Metallurgical Soc.**, fall meeting, Philadelphia, Pa. (D. A. Parks, Inst. of Metals Div., Metallurgical Soc. of AIME, 345 E. 47 St., New York, N.Y. 10017)

18-23. American Acad. of **Ophthalmology and Otolaryngology**, Chicago, Ill. (W. L. Benedict, 15 Second St., SW, Rochester, Minn. 55901)

18-24. **Dental Education**, 2nd Latin American seminar, Mexico City. (D. Restrepo, Pan American Sanitary Bureau, 1501 New Hampshire Ave., NW, Washington, D.C. 20036)

19-20. **Unconventional Inertial Sensors**, symp. (secret), Farmingdale, N.Y. (R. E. McIntyre, RMG-8, Bureau of Naval Weapons, Washington 25, D.C.)

19-21. **Mechanisms**, conf., American Soc. of Mechanical Engineers, Lafayette, Ind. (T. P. Goodman, Technological Inst., Northwestern Univ., Evanston, Ill.)

19-21. Academy of **Psychosomatic Medicine**, New York, N.Y. (R. N. Rutherford, 200 Broadway, Seattle, Wash.)

19-21. Technical Assoc. of the **Pulp and Paper Industry**, plastics-paper conf., Washington, D.C. (TAPPI, 360 Lexington Ave., New York 10017)

19-22. Association of Official **Agricultural Chemists**, 78th annual, Washington, D.C. (L. G. Enslinger, AOAC, Box 540, Benjamin Franklin Station, Washington, D.C. 20044)

19-23. American Soc. of Civil Engineers, New York, N.Y. (W. H. Wisely, ASCE, 345 E. 47 St., New York, N.Y.)

19-23. American Soc. for Metals, Philadelphia, Pa. (A. R. Putnam, ASM, Metals Park, Ohio)

19-23. Radiochemical Methods of Analysis, symp., Salzburg, Austria. (Intern. Atomic Energy Agency, 11 Karntnerring, Vienna 1, Austria)

20-30. Nov. UNESCO, 13th session, general conf., Paris, France. (UNESCO, Place de Fontenoy, Paris 7°)

21. Animal Nutrition Research Council, annual, Washington, D.C. (K. Maddy, Agricultural Chemicals Div., Monsanto Chemical Co., 800 N. Lindbergh Blvd., St. Louis 66, Mo.)

21-22. American Heart Assoc., Council on Arteriosclerosis, annual, Atlantic City, N.J. (D. M. Smith, AHA, 44 E. 23 St., New York, N.Y. 10010)

21-22. Industrial Hygiene Foundation, annual, Pittsburgh, Pa. (R. T. P. deTreville, IHF, 4400 Fifth Ave., Pittsburgh 15213)

21-23. Aerospace and Navigational Electronics, 11th East Coast conf., Baltimore, Md. (M. Hastings, Mail No. 1281 A, Baltimore Space and Defense Center, Westinghouse Electric Corp., P.O. Box 1693, Baltimore 21203)

21-23. Pain, intern. symp., Detroit, Mich. (R. S. Knighton, 2799 W. Grand Blvd., Detroit)

21-23. Spectroscopy, Instrumentation and Chemistry, 3rd Pacific meeting, San Francisco, Calif. (J. G. Conway, Lawrence Radiation Laboratory, Univ. of California, Berkeley 4)

21-24. Acoustical Soc. of America, 68th, Austin, Tex. (W. Waterfall, ASA, 335 E. 45 St., New York, N.Y. 10017)

21-25. Cybernetics, 4th intern. congr., Namur, Belgium. (Intern. Assoc. for Cybernetics, 13 rue Basse-Marcelle, Namur)

22-23. New Mexico Acad. of Science, Albuquerque. (K. S. Bergstresser, 739 42 St., Los Alamos, N.M.)

23-24. Kentucky Acad. of Science, Morehead. (G. Levey, College Box 2325, Berea, Ky.)

23-24. American Physical Soc., Chicago, Ill. (R. G. Sachs, Argonne National Laboratory, Argonne, Ill. 60440)

23-25. Association of Clinical Scientists, Washington, D.C. (R. P. MacFate, 300 N. State St., No. 5422, Chicago, Ill. 60610)

23-25. Experimental Gerontology, symp., Basel, Switzerland. (Prof. Verzar, Inst. de Gerontologie Experimentale, Nonnenweg 7, Basel, Switzerland)

24-29. American Acad. of Pediatrics, annual, New York, N.Y. (AAP, 1801 Hinman Ave., Evanston, Ill.)

25-31. American Soc. for Horticultural Science, Caribbean Region, 12th annual, Maracay, Venezuela. (E. H. Casseres, Londres 40, México 6, D.F.)

26-27. American Inst. of Aeronautics and Astronautics/Canadian Aeronautics and Space Inst., joint meeting, Ottawa, Ont., Canada. (P. J. Burr, AIAA, 1290 Sixth Ave., New York, N.Y. 10019)

26-27. Combustion Inst., western states section, fall meeting, Univ. of Utah, Salt Lake City. (Secretary, CI, 16902 Bollinger Dr., Pacific Palisades, Calif. 90272)

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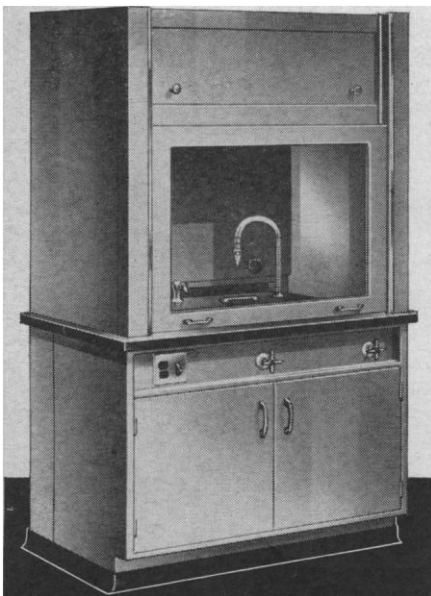
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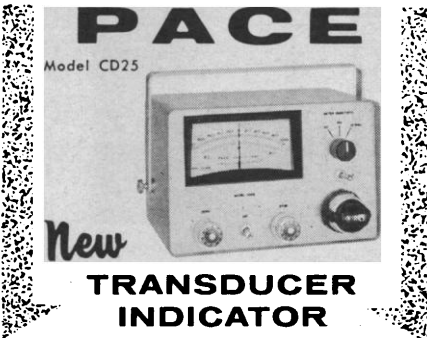
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SCIENCE, VOL. 146

26-28. **Antimicrobial Agents and Chemotherapy**, 4th conf., American Soc. for Microbiology, New York, N.Y. (ASM, 115 Huron View Blvd., Ann Arbor, Mich.)

26-28. Chemical Inst. of Canada, 14th **Chemical Engineering** meeting, Hamilton, Ont. (CIC, 48 Rideau St., Ottawa 2)

26-28. Society of **Rheology**, 35th annual, Pittsburgh, Pa. (H. Markovitz, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13)

26-14. Pan American **Standards** Committee, textiles seminar, Lima, Peru. (American Standards Assoc., 810 18th St., NW, Washington, D.C.)

27. Oak Ridge Inst. of **Nuclear Studies**, Oak Ridge, Tenn. (W. G. Pollard, Box 117, Oak Ridge)

27-29. Joint **Computer** Conf., San Francisco, Calif. (R. I. Tanaka, c/o Lockheed Missiles and Space Co., 3251 Hanover St., Palo Alto, Calif.)

28-30. Society of **Experimental Stress Analysis**, annual, Cleveland, Ohio. (B. E. Rossi, 21 Bridge Square, Westport, Conn.)

28-30. **Inertial Guidance Test**, 2nd symp., Holloman Air Force Base, N.M. (F. P. Ray, Holloman AFB).

28-30. **Nuclear Science**, 11th symp., Philadelphia, Pa. (U.S. Office of Aerospace Research, 4th and Independence Ave., SW, Washington, D.C.)

28-30. **Rock Mechanics**, 6th symp., Rolla, Mo. (C. Christianson, Dept. of Mining Engineering, School of Mines and Metallurgy, Univ of Missouri, Rolla)

28-30. Southeastern **Library** Assoc., 21st biennial conf., Norfolk, Va. (E. F. Jesse, c/o Armed Forces Staff College Library, Norfolk)

29-30. Computation for **Cardiovascular Research**, New York, N.Y. (L. D. Cady, New York Acad. of Sciences, 2 East 63 St., New York, N.Y.)

29-31. American Soc. for **Aesthetics**, Chicago, Ill. (J. R. Johnson, Cleveland Museum of Art, Cleveland 6, Ohio)

29-31. **Electron Devices**. Inst. of Electrical and Electronics Engineers, Washington, D.C. (M. Mass, Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.)

29-31. **Gerontological** Soc., 7th annual, Minneapolis, Minn. (GS, 660 South Euclid, St. Louis, Mo. 63110)

29-31. **Indiana** Acad. of Science. Indianapolis. (C. F. Dineen, Biology Dept., St. Mary's College, Notre Dame, Ind.)

29-31. Society of **Photographic Scientists and Engineers**, annual symp., Washington, D.C. (W. S. Dempsey, FMA, Inc., 4925 Fairmont Ave., Washington, D.C.)

29-31. Society for the **Scientific Study of Religion**, Washington, D.C. (S. Z. Klausner, SSSR, 1424 16th St., NW, Washington, D.C.)

30-1. **Meteoritical** Soc., 27th meeting, Arizona State Univ., Tempe. (C. B. Moore, Dept. of Geochemistry, Arizona State Univ., Tempe)

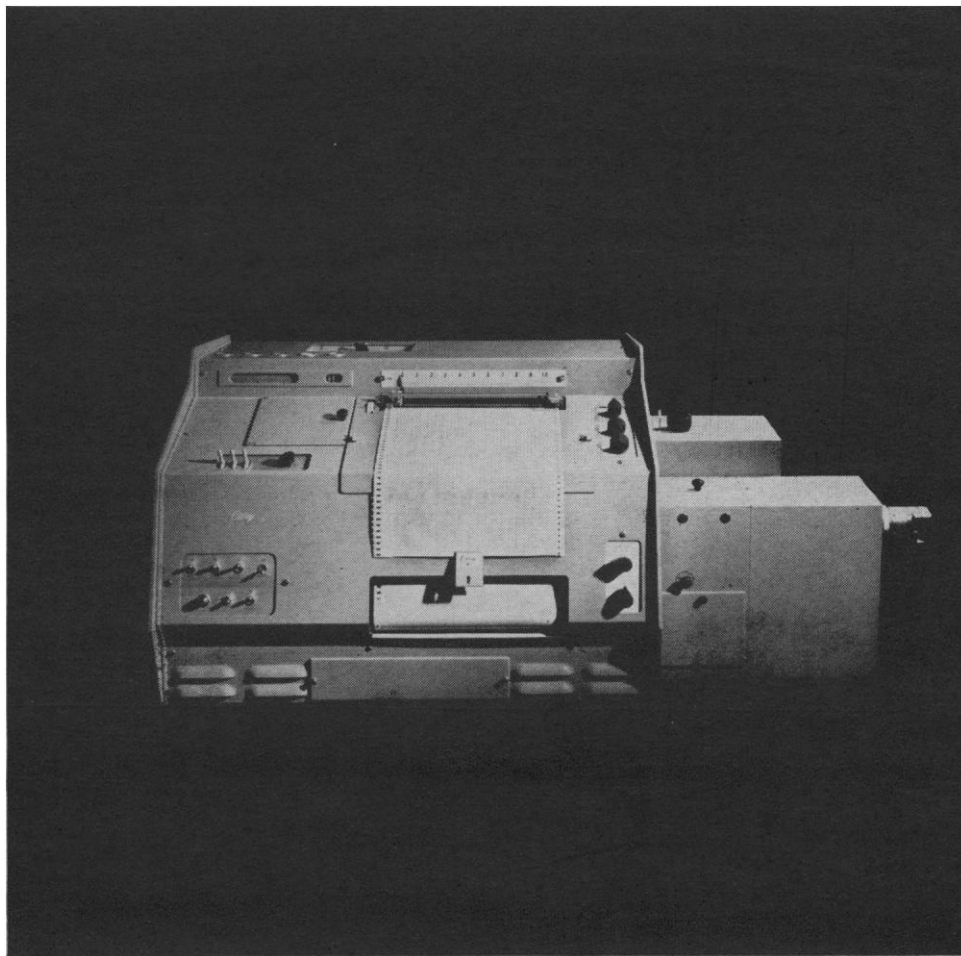
November

1-7. **Plant Scientists** of Latin America, 6th meeting, Lima, Peru. (M. Paulette, Universidad Agraria, Apartado 456, Lima)

2-4. Society of **Engineering Science**, 2nd technical meeting, Michigan State Univ., East Lansing. (A. C. Eringen,

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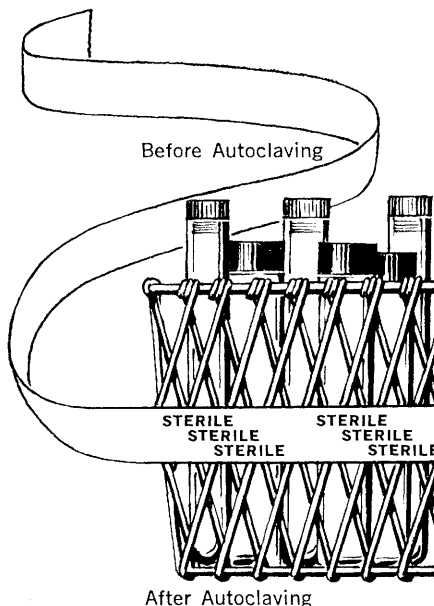


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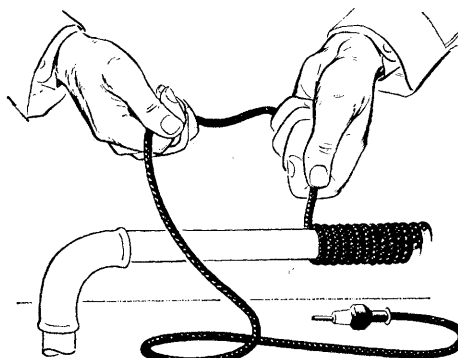
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School of Aeronautical and Engineering Sciences, Purdue Univ., West Lafayette, Ind. 47907)

2-6. United Nations, **Drug Supervisory Body**, 62nd session, Geneva, Switzerland. (UN, Palais des Nations, Geneva)

2-9. Natural Gas in Production of **Petrochemicals**, seminar, Teheran. (U.N. Economic Commission for Asia and the Far East, Sala Santitham, Rajadamnern Av., Bangkok, Thailand)

3-5. **Liquification** in Mine Chambers, conf., Ostrava, Czechoslovakia. (Mrs. E. Vergeinerova, Czechoslovak Scientific and Technical Soc., Siroka 5, Prague 1)

4-6. **Diffraction**, 22nd Pittsburgh conf., Pittsburgh, Pa. (W. M. Biagas, Pittsburgh Diffraction Conf., Crucible Steel Co., P.O. Box 7257, Pittsburgh 15213)

4-6. **Design of Experiments**, 10th conf., (by invitation only), Washington, D.C. (F. G. Dressel, Army Research Office-Durham, Box CM, Duke Station, Durham, N.C.)

4-6. Northeast **Electronics Research and Engineering** meeting (NEREM), Boston, Mass. (J. E. Storer, Inst. of Electrical and Electronics Engineers, 313 Washington St., Newton 58, Mass.)

4-6. **Manned Space Flight**, 3rd, American Inst. of Aeronautics and Astronautics, NASA Manned Spacecraft Center, Houston, Tex. (AIAA, 141 E. 44 St., New York 17)

4-7. American Physical Soc., **Plasma Physics** Div., New York, N.Y. (S. J. Buchsbaum, Bell Telephone Laboratories, Murray Hill, N.J.)

4-7. American Soc. of **Tropical Medicine and Hygiene**, New York, N.Y. (G. M. Jeffrey, Box 295, Kensington, Md.)

4-7. French Soc. of **Orthopedics and Traumatology**, 39th congr., Paris. (Secretariat, Pavillon Ollier, Hôpital Cochin, 27, rue du Faubourg Saint-Jacques, Paris 14°)

5-6. U.S. Army Materiel Command, Inst. of **Environmental Sciences**, joint meeting, Aberdeen Proving Ground, Md. (A. Armstrong, 104 Bliss Lane, Glen Burnie, Md.)

5-7. **Nutrition Hygiene** Conf., Brno, Czechoslovakia. (K. Halacka, Hygiene Section, Czechoslovak Medical Soc., Sokolska 31, Prague 2)

6-7. **Biochemistry**, 7th annual West Central States conf., State Univ. of Iowa, Iowa City. (G. F. Lata, Dept. of Biochemistry, State Univ. of Iowa, Iowa City)

6-7. Experimental Methodology and Applied Immunology in **Allergy Research**, symp., Erfurt, East Germany. (H. D. Faulhaber, Gesellschaft für Experimentelle Medizin der D.D.R., Littenstr. 78, Berlin C.2, East Germany)

6-7. Central Soc. for **Clinical Research**, Chicago, Ill. (J. F. Hammarsten, Ancker Hospital, St. Paul 1, Minn.)

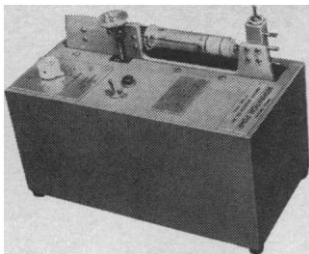
7. International Acad. of **Oral Pathology**, 2nd conf., San Francisco, Calif. (J. L. Bernier, Dental School, Georgetown Univ., Washington, D.C. 20007)

7-14. International **Dental** Federation, 52nd meeting, San Francisco, Calif. (G. H. Leatherman, 35 Devonshire Pl., London, W.1)

8-14. **Switching Circuit Theory and Logical Design**, 5th annual symp., Princeton Univ., Princeton, N.J. (T. H. Crowley, Bell Telephone Laboratories, Murray Hill, N.J.)

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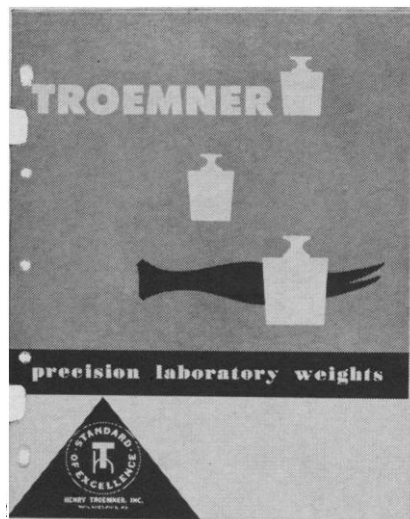
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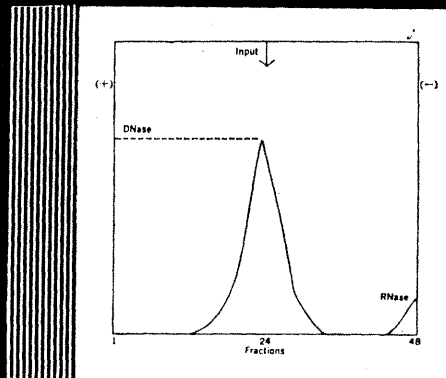
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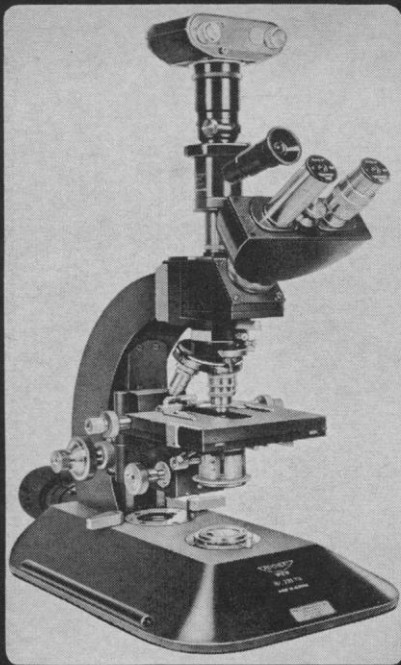


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9-12. American **Dental** Assoc., San Francisco, Calif. (H. Hillenbrand, 222 E. Superior St., Chicago, Ill.)

9-13. Institute of **Neurosurgery**, 25th anniversary, Santiago, Chile. (C. Villavicencio, Casilla 70-D, Santiago)

9-13. **Mathematical Education**, seminar Dalat, South Vietnam. (Assoc. of Southeast Asian Insts. of Higher Learning, Ratasastra Bldg., Chulalongkorn Univ., Race Course Rd., Bangkok, Thailand)

10. American College of **Dentists**, San Francisco, Calif. (O. W. Brandhorst, 4236 Lindell Blvd., St. Louis, Mo.)

10-11. **Quality Control**, seminar, Cleveland, Ohio. (R. C. Schultz, American Soc. of Tool and Manufacturing Engineers, 10700 Puritan Ave., Detroit 38, Mich.)

11-12. Use of **Plastics in Machine Construction**, conf., Hungary. (Hungarian Soc. of Mechanical Engineers, Szabadsag ter 17, Budapest 5)

11-13. Eastern **Analytical** symp., New York, N.Y. (M. Margoshes, Room 3, Chemistry Bldg., Natl. Bureau of Standards, Washington, D.C. 20234)

11-13. American Soc. for **Cell Biology**, Cleveland, Ohio. (D. E. Green, Inst. for Enzyme Research, 1710 University Ave., Madison 6, Wis.)

11-13. American **Concrete** Inst., fall meeting, Miami, Fla. (W. T. Eefting, 3332 Pan American Dr., Miami, Fla. 139733)

11-14. American Acad. of **Neurological Surgery**, Miami, Fla. (E. W. Davis, 806 S.W. Broadway, Portland, Ore.)

11-14. **Models for the Perception of Speech and Visual Forms**, symp., Boston, Mass. (Symp. Committee, Data Sciences Laboratory, Air Force Cambridge Research Laboratory, Bedford, Mass. 01731)

12-13. American Soc. of **Cytology**, 12th annual, Pittsburgh, Pa. (W. R. Lang, 1012 Walnut St., Philadelphia, Pa. 19107)

12-13. **Nerve as a Tissue**, conf., Lankenau Hospital, Philadelphia, Pa. (K. Rodahl, Lankenau Hospital, Philadelphia 51)

13-15. Association of **Clinical Scientists**, 26th meeting, Washington, D.C. (R. P. MacFate, 300 N. State St., No. 5322, Chicago, Ill. 60610)

14-19. American Acad. of **Ophthalmology and Otolaryngology**, Chicago, Ill. (W. L. Benedict, 15 Second St., S.W., Rochester, Minn. 55901)

14-21. Pan American **Medical Women's** Alliance, 9th congr., Los Angeles, Calif. (E. M. Hohl, 1234 N. Vermont Ave., Hollywood, Calif.)

15-17. Water in the **Arid Zones** of the Old World, symp., Halle an der Saale, East Germany. (Deutsche Akademie der Naturforscher Leopoldina, August-Bebel Str. 50 a, Halle an der Saale)

15-19. American Soc. of **Agronomy**, Crop Science Soc. of America, Soil Science Soc. of America, annual, Kansas City, Mo. (L. A. Richards, American Soc. of Agronomy, 677 S. Segoe Rd., Madison 11, Wis.)

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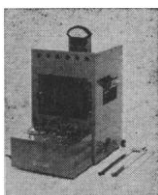
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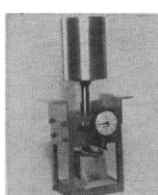
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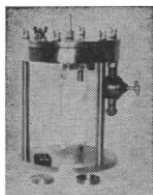
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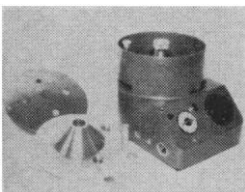
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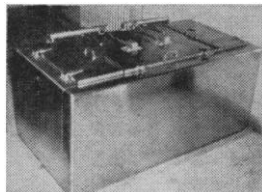
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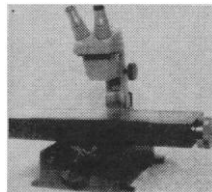
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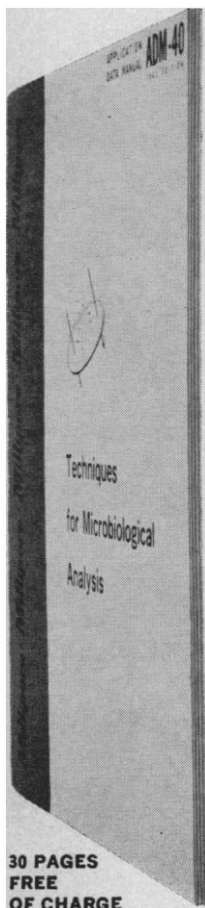
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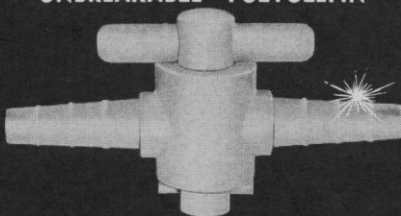
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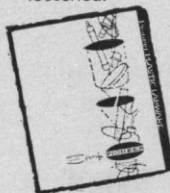
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16-19. Gulf and Caribbean Fisheries Inst., conf., Ocho Rios, Jamaica. (Executive Secretary, Gulf and Caribbean Fisheries Inst., 1 Rickenbacker Causeway, Miami, Fla. 33149)

16-19. Magnetism and Magnetic Materials, Minneapolis, Minn. (J. B. Goodenough, Lincoln Laboratory C182, Lexington, Mass. 02173)

16-20. Interagency Chemical Rocket Propulsion Group, Mechanical Behavior Working Group, 3rd annual, Redstone Arsenal, Ala. (T. H. Duerr, AMSMI-RKP, Redstone Arsenal, Ala. 35809)

16-20. Soil Science Soc. of America, annual, Kansas City, Mo. (W. E. Jeske, 7515 N.E. Ankeny Rd., Ankeny, Iowa)

17-18. Allied Air Force Medical Conf., 10th annual, Fontainebleau, France. (Officier Administratif, Division Médicale d'Aircant, Camp Guynemer, Fontainebleau)

18-20. Northeastern States Navy Research and Development Clinic, Philadelphia, Pa. (N. R. Droulard, Franklin Inst. Laboratories, 20th and Parkway, Philadelphia, Pa. 19103)

18-21. Neurological Surgeons, 14th congr., Bal Harbour, Fla. (J. R. Russell, 1815 N. Capitol Ave., Indianapolis, Ind. 46202)

19-21. Geological Soc. of America, Miami Beach, Fla. (J. W. Peoples, 10 Wesleyan Place, Middletown, Conn.)

19-21. Paleontological Soc., Miami Beach, Fla. (R. L. Langenheim, Jr., Dept. of Geology, Univ. of Illinois, Urbana)

19-21. National Council of Teachers of Mathematics, Atlanta, Ga. (J. D. Gates, 1201 16th St., NW, Washington, D.C.)

19-22. American Anthropological Assoc., 63rd annual, Detroit, Mich. (E. R. Service, Dept. of Anthropology, Univ. of Michigan, Ann Arbor)

21-22. American Geological Inst., Miami Beach, Fla. (L. Hoover, 1444 N St., NW, Washington, D.C. 20005)

21-24. American Speech and Hearing Assoc., San Francisco, Calif. (K. O. Johnson, 1001 Connecticut Ave., NW, Washington, D.C.)

23-24. Water for Texas, 9th annual, Texas A&M Univ., College Station. (E. T. Smerdon, Water Resources Inst., Texas A&M Univ., College Station)

23-25. American Physical Soc., Fluid Dynamics Div., Pasadena, Calif. (R. J. Emrich, Dept. of Physics, Lehigh Univ., Bethlehem, Pa.)

23-27. Dosimetry of Irradiations from External Sources, intern. symp., Health Physics Soc., French section, Paris, France. (M. Gras, 5, rue Armand, Gauthier, Paris 18°)

23-27. Use of Radioisotopes in Animal Nutrition and Physiology, symp., Intern. Atomic Energy Agency, Food and Agriculture Organization of the UN, Prague, Czechoslovakia. (Symp. Secretariat, Kärntnering 11, Vienna 1)

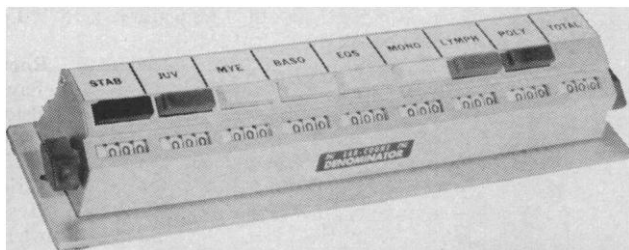
23-28. Internal Medicine, 8th intern. congr., Buenos Aires, Argentina. (Secretariat, Melo 2081, Buenos Aires)

24. Manufacturing Chemists' Assoc., 14th conf., New York, N.Y. (MCA, 1825 Connecticut Ave., NW, Washington, D.C.)

26-28. Central Assoc. of Science and Mathematics Teachers, 64th annual, Detroit, Mich. (Sister Mary Ambrosia, Gesu Convent, 17180 Oak Drive, Detroit 48221)

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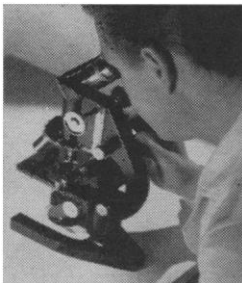
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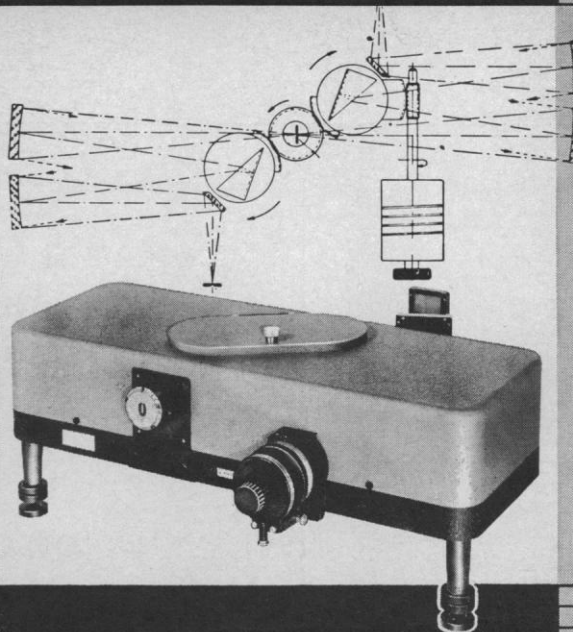
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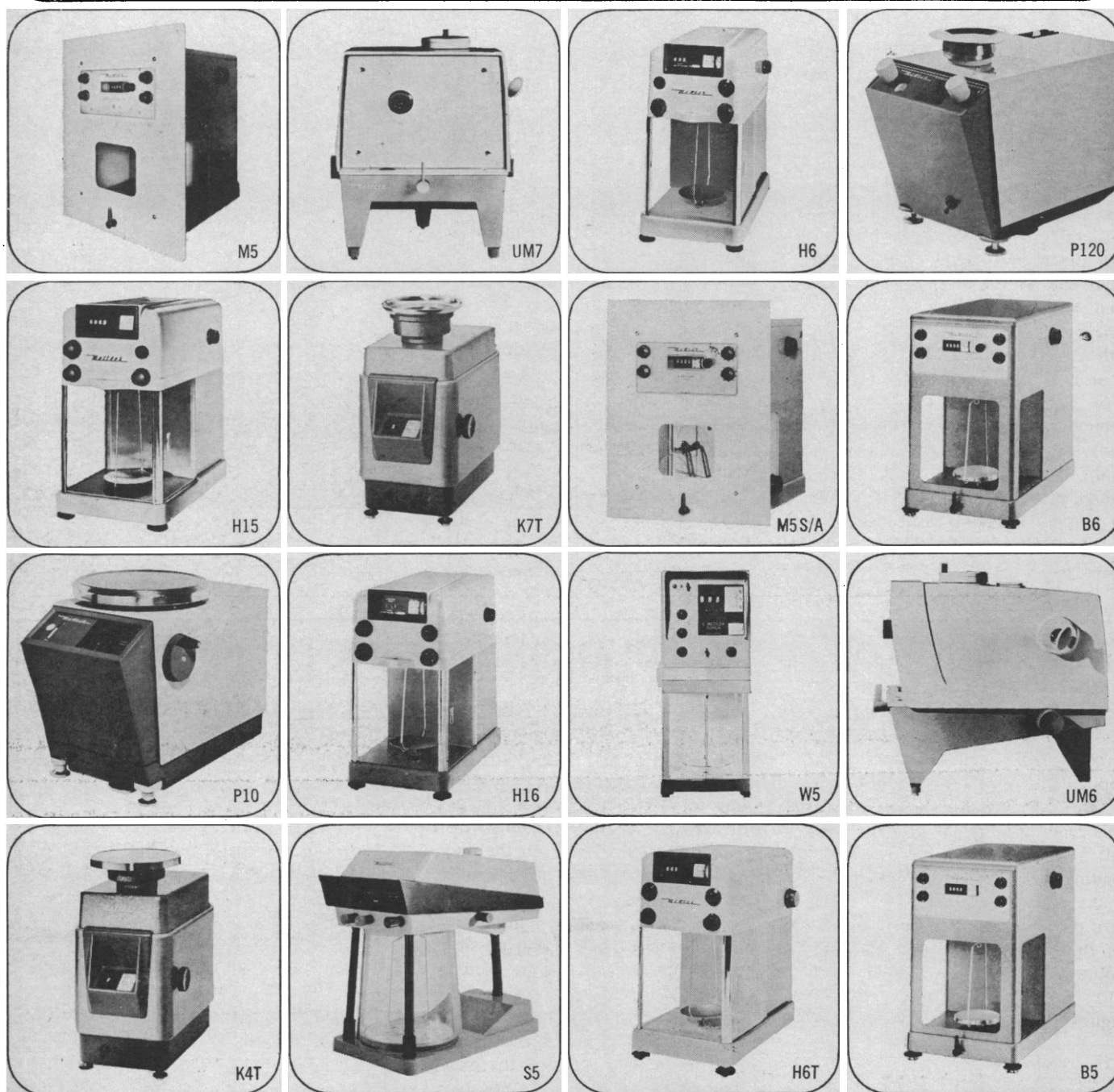
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Transducer indicator (model CD25) is designed to operate with Pace variable reluctance transducers to provide convenient analog or digital readout. A carrier system, the instrument applies a 5000-cy/sec signal to the transducer in a bridge circuit. As the variable being measured changes, the transducer modulates the carrier signal, causing bridge unbalance which is amplified, demodulated, and displayed. The reading may appear on a 5-inch taut band meter with ± 1 percent full-scale accuracy or on a 3-digit dial with the meter used as a null detector. This zero center meter has two scales: ± 100 (100 divisions total) and ± 30 (60 divisions total). A six-position meter sensitivity switch provides choice of 100, 30, or 10 percent of transducer output equal to full scale, with or without zero suppression. A "span" control is used to set the maximum transducer reading to a convenient point on the meter. For instance, if a 0 to 50-lb/in.² range pressure transducer is to be used, the meter is calibrated by applying a precise pressure of 50 lb to the transducer. After zeroing the meter with the ten-turn zero control, this known pressure is applied and the "span" control is used to set the desired full-scale reading. This reading might be 100 for "percent full scale" readout, or 50 for direct readings in pounds per square inch. If the meter is calibrated to read pressure directly in pounds per square inch on the 100 scale, it will also read in pounds-per-square-inch units on the "30" and "10" positions. A ten-turn digital suppression control potentiom-

eter allows the initial steady-state pressure to be suppressed to zero so that small fluctuations can be read on more sensitive scales. A polarity switch reverses the demodulator output so that negative transducer signals can be suppressed during differential pressure measurements. An external output on the rear provides a ± 10 -volt d-c full-scale signal with a frequency response flat from 0 to 1000 cps ($\pm 5\%$) from a source impedance of 100 Ω . The carrier-demodulator system of this transducer indicator is all solid state and provides regulation of 0.1 percent of reading. Full-scale meter reading corresponds to 20-mv/volt transducer input with long-term stability of $\frac{1}{2}$ percent. The unit is available with battery power.—D.J.P. (Pace Engineering Co., 13035 Saticoy St., North Hollywood, Calif.)

Circle 1 on Readers' Service card

Master titration controller ("77") permits an economical conversion of any modern pH meter into an automatic titrator and pH-stat. The "77" will perform very fast accurate titrations with Luft series BH gravity feed burettes, but can also be used with recording and digital piston-type burettes. The key to its performance is the presence of two independent set points which permit the selection of both the end point and the point at which the unit shifts from rapid to slow delivery of the titrant; an order-of-magnitude increase in titration speed is often possible. The two set points can also be used to keep the pH value within a desired band. An excursion from this band will actuate a base or acid delivery means, depending on the direction of the excursion. The "77" also provides a constant voltage source (adjustable, 0 to 6 volts d-c) which is tied in with the control circuit and which enables it to perform amperometric and Karl Fischer titrations without the need for a pH meter. Green, amber, and red panel lights permit easy selection of control points and also serve to indicate the stage of control during the progress of the titration: fast, slow, wait, and read. On "read" an auxiliary line becomes activated

which can be used for automatic refilling of the burette, and for actuation of printing devices and transfer switches, and so forth. Since the "77" can operate by any variable which can be converted into a d-c signal (sensitivity is better than 1 μ a) or a resistance (θ —1 megohm), it can be used for automating operations such as distillation, fraction collecting, weighing, gauging, and also in temperature, vacuum cryogenic, and other applications.—R.L.B. (Luft Instruments, Inc., Old Winter St., Lincoln, Mass.)

Circle 2 on Readers' Service card

Laboratory stirrer provides constant-speed stirring at speeds from 50 to 3000 rev/min ± 5 percent, from no load to twice rated load. The unit employs a d-c shunt motor whose output is monitored and fed back by a solid-state circuit to give constant speed despite viscosity changes. The Fisher Sted-speed Stirrer uses a 1/70 hp, 24-volt d-c, ball-bearing motor, permanently lubricated and totally enclosed. Two separate output shafts give two speed ranges: 50 to 500, and 300 to 3000 rev/min. To operate the stirrer the stainless-steel impeller (16-inch shaft with 2½-inch propeller) is added to the proper motor shaft and the desired speed is set by a dial on the control box. The dial has two ranges: 50 to 500 rev/min, with 25-rev/min divisions, and 300 to 3000 rev/min, with 100-rev/min graduations. The 8 by 10 by 5½-inch control box, which also has a "forward"/"reverse" switch, is connected to the stirrer by a 6-ft cord. Such a constant-speed device is of interest in work requiring the stirring of emulsions, slurries, and suspensions often encountered by rheologists, colloid and polymer chemists, and pharmacologists.—D.J.P. (Fisher Scientific Co., 415 Fisher Bldg., Pittsburgh 19, Pa.)

Circle 3 on Readers' Service card

Radiation counter is a high efficiency gamma counter capable of detecting fractions of a nanocurie (10^{-9} curie) in small laboratory animals and human arms. This is a floor-mounted instrument approximately 55 inches high, requiring a floor space of about 48 by 36 inches. The horizontal counting well, 5 inches in diameter and 17¾ inches deep, is located about 40 inches above the floor. Stainless-steel sleeves are used between the well and the plastic scintillator. This detector is monitored by eight selected 3-inch photomultiplier tubes mounted on the rear of the

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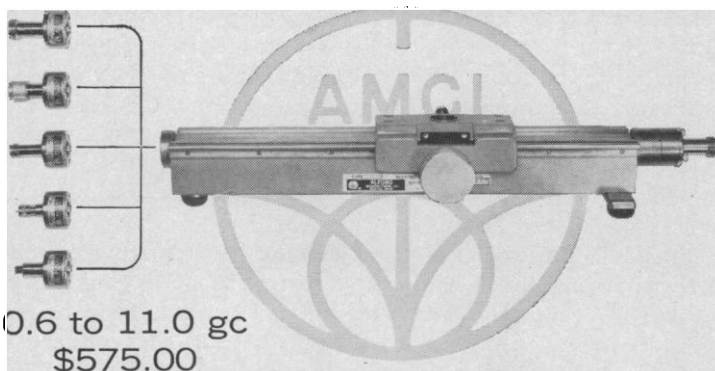
Robert L. Bowman (R.L.B.), with the assistance of Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writers assume responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on page 135. Circle the department number of the items in which you are interested on this card.

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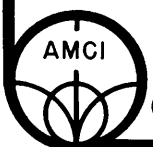
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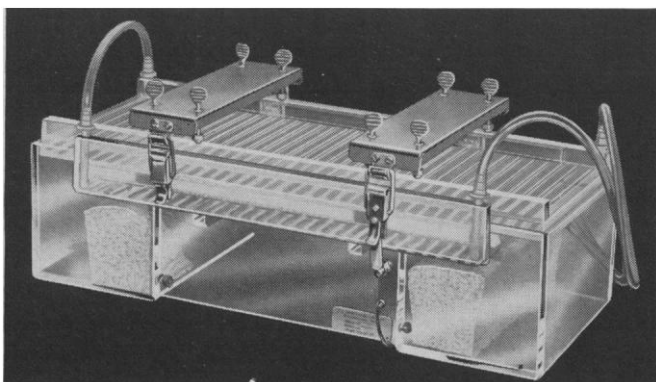
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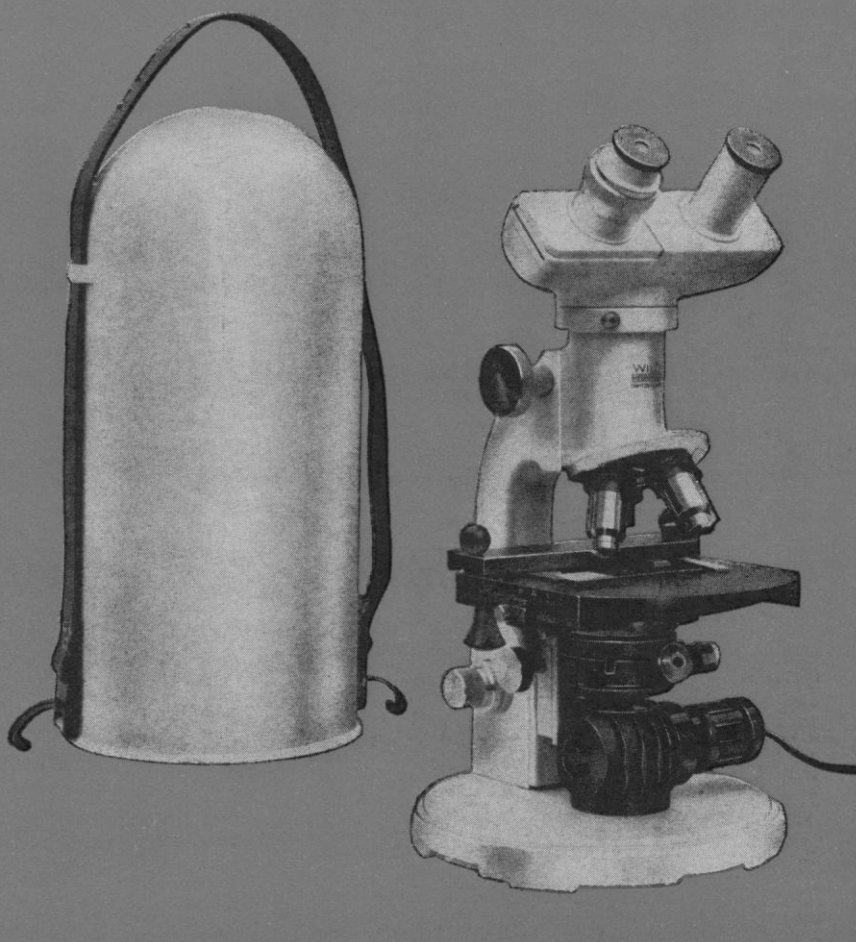
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Proportional temperature controller is designed to maintain the temperature of constant-temperature baths to within $\pm 0.01^\circ\text{C}$ in the range from 0°C to 250°C . Temperature of the bath is sensed by a thermistor probe which plugs into the front panel of the controller. The resistance of the thermistor is compared to that of a "set" resistor in a bridge circuit and the resulting error signal is amplified by a solid-state circuit so as to provide the proper amount of power to the heater to bring it to the set temperature. The sensitivity of the system is such that a deviation of 0.01°C between the bath temperature and the set point produces a 10-percent change in heater output. The temperature "set" resistor actually consists of a one-turn potentiometer for coarse setting in series with a ten-turn potentiometer for fine adjustments. Any setting can be reproduced to within $\pm 0.02^\circ\text{C}$. A 0- to 150-volt voltmeter on the front panel shows the voltage applied to the heater(s) so that the proportion of full power output can be observed. The rear of the controller contains four grounded a-c outlets, two of which are "controlled" outlets into which bath heaters with a total resistive load of 750 watts can be plugged. The other two outlets are "convenience" outlets into which stirrers, pumps, or other equipment totaling not over 750 watts can be plugged. Dimensions of the instrument are 12 by $15\frac{1}{2}$ by 10 inches, and models are available for 110 or 230 volts a-c operation.—D.J.P. (Fisher Scientific Co., 415 Fisher Bldg., Pittsburgh, Pa. 15219)

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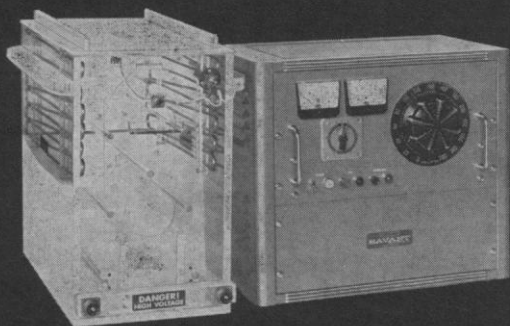
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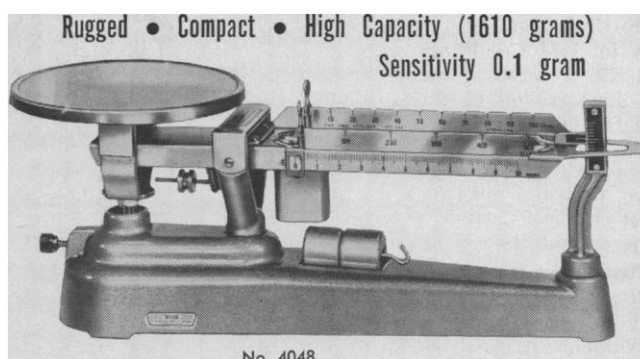
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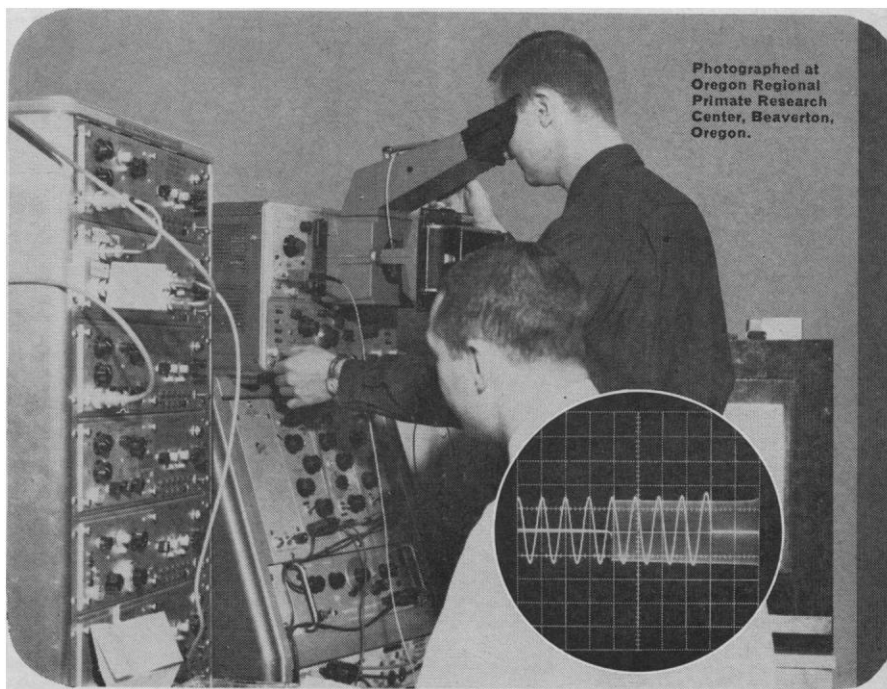
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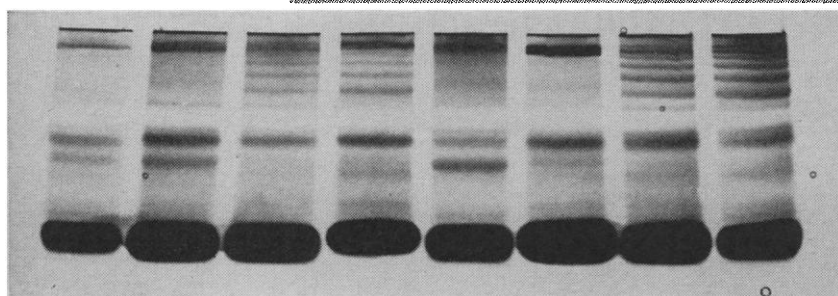
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Mathematics, Physical Sciences,
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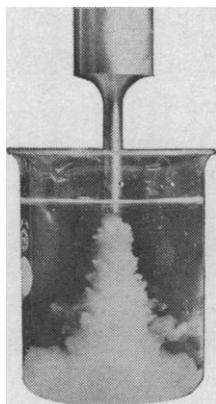
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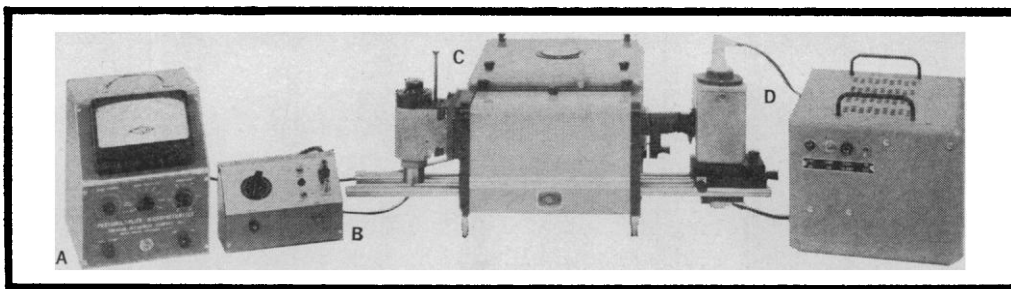
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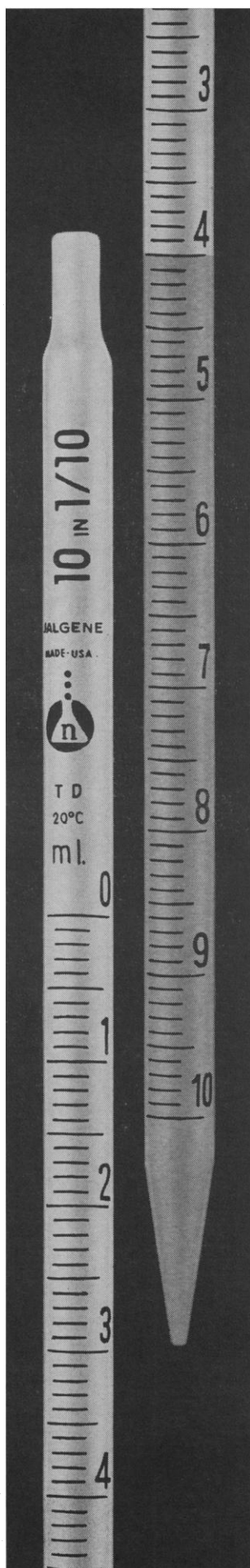
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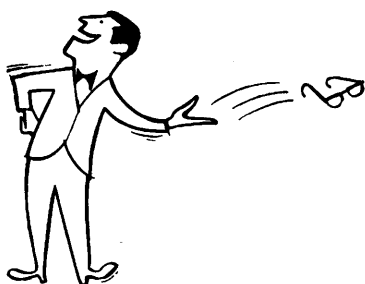


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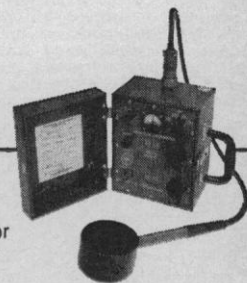
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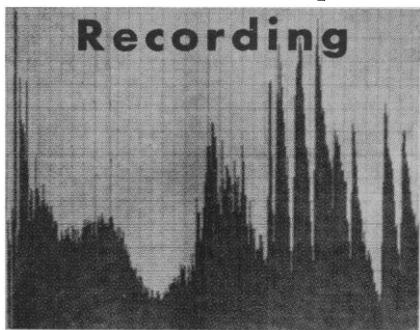
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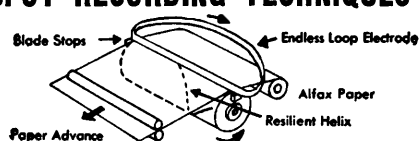


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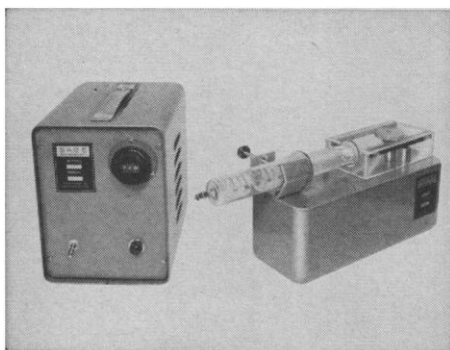
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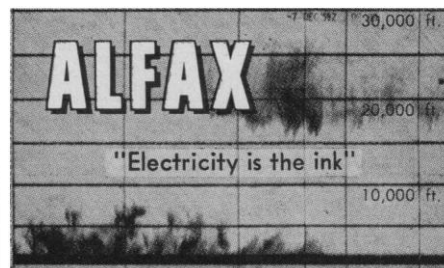
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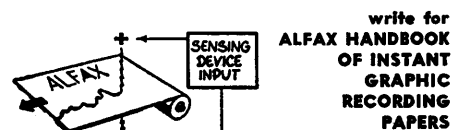
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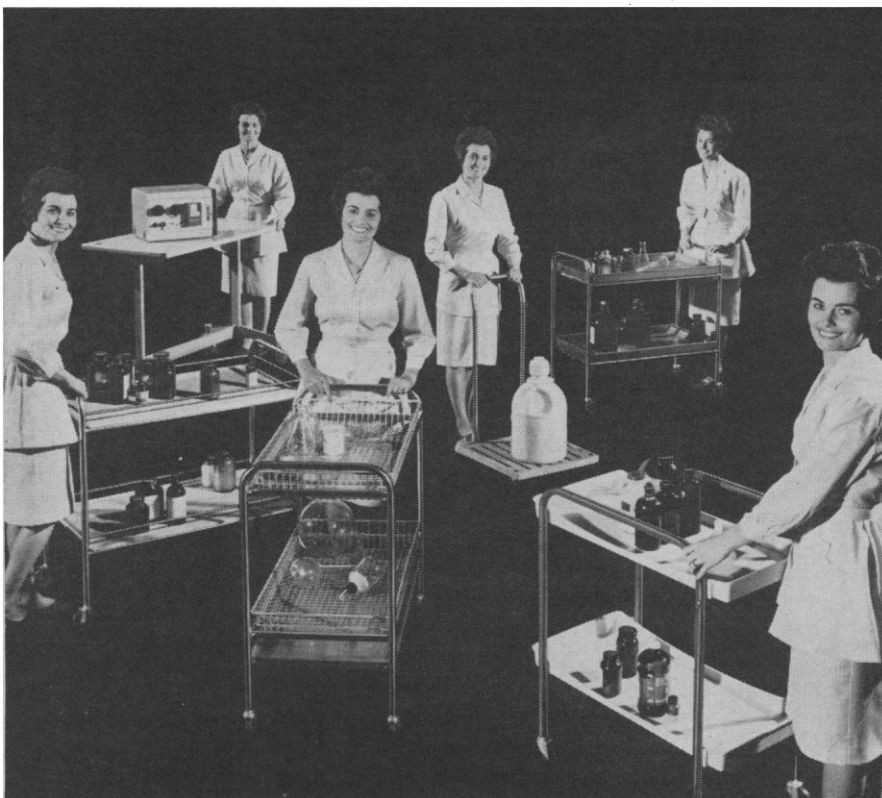
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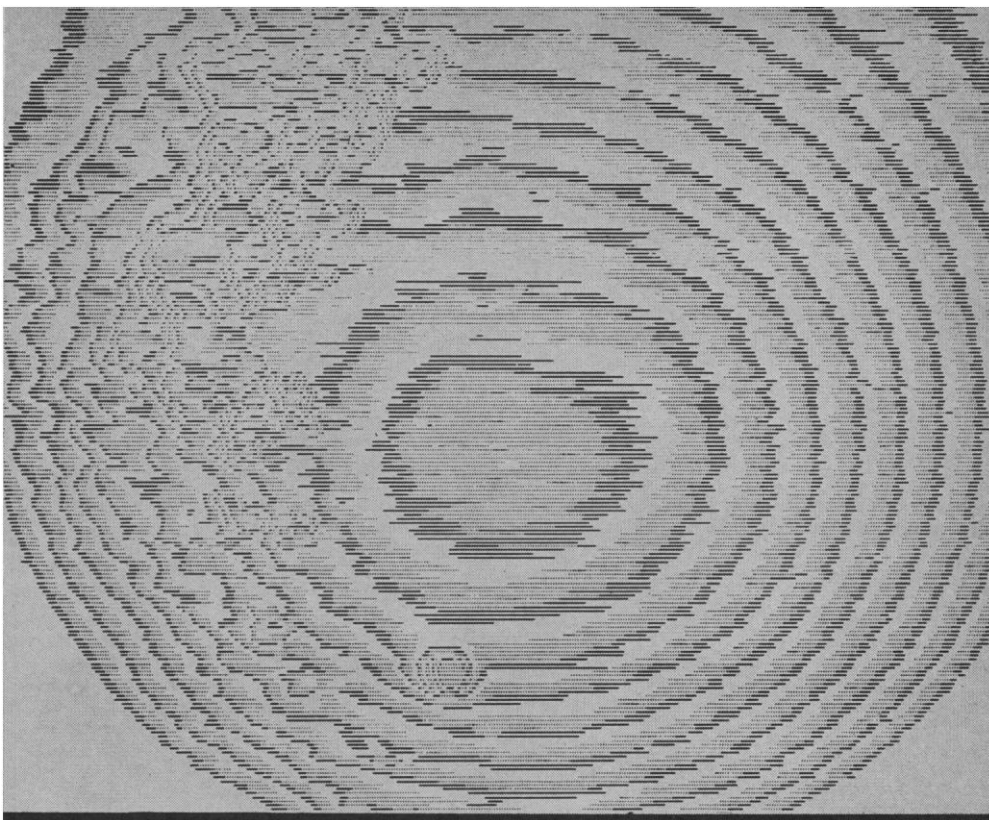
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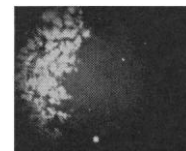
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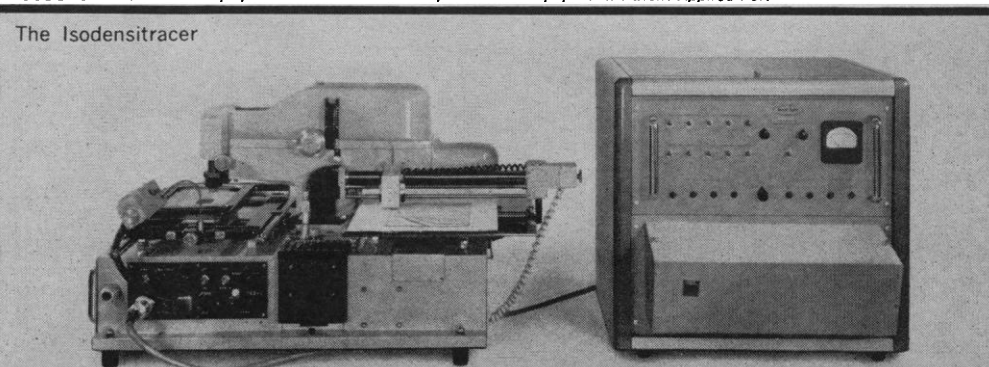
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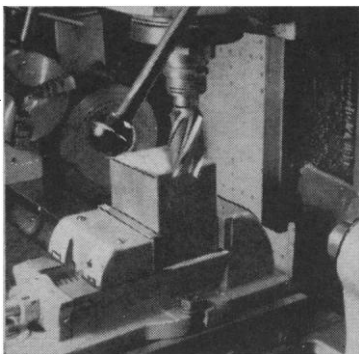
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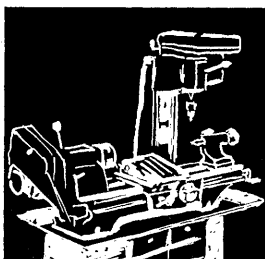
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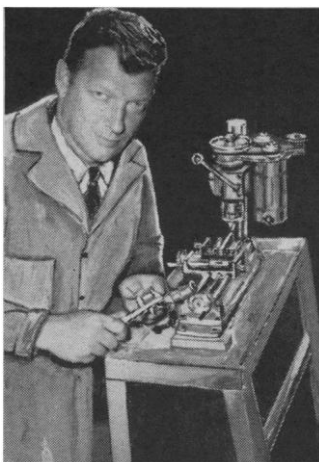
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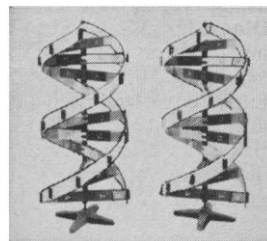
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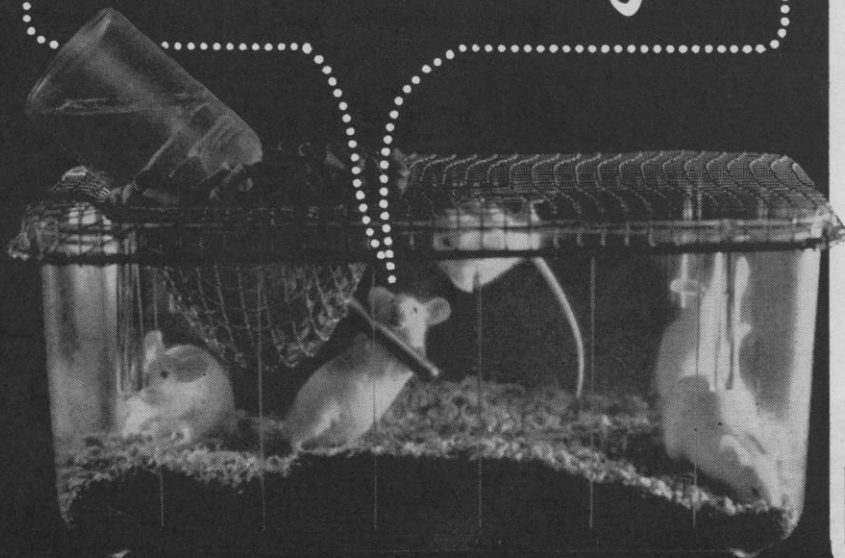
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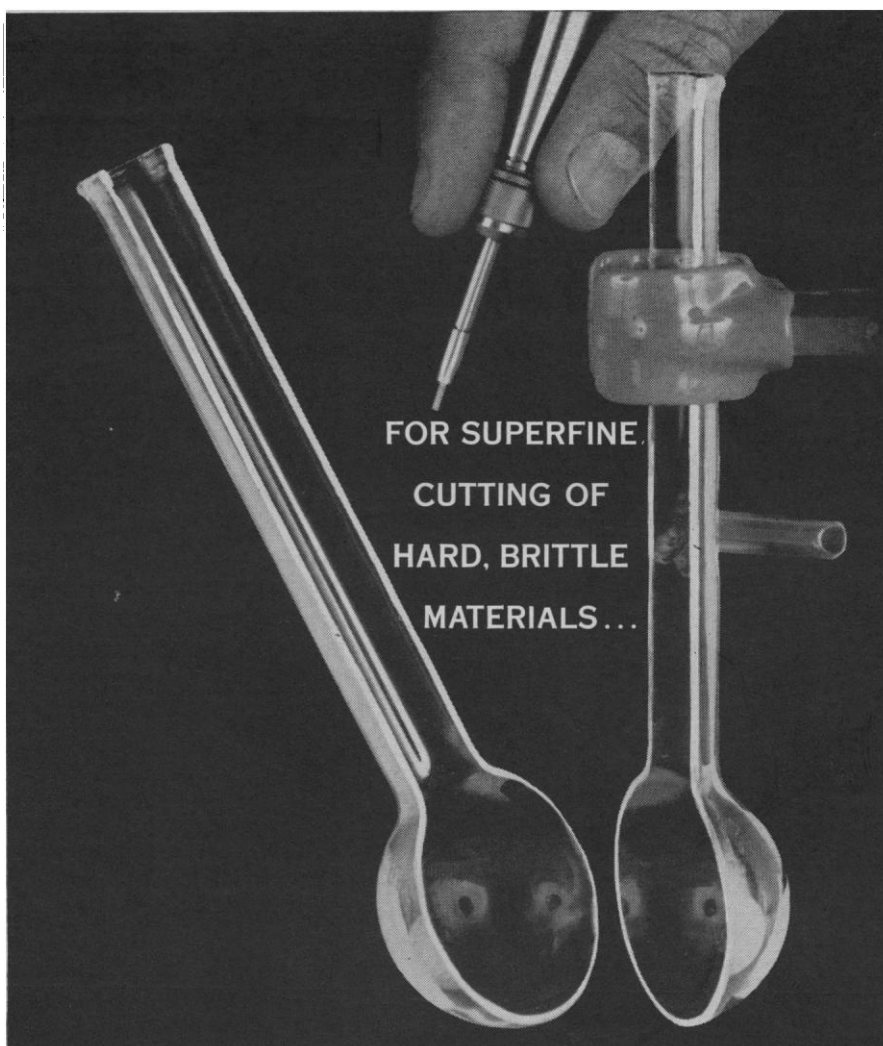
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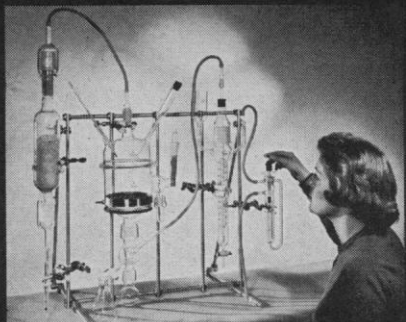


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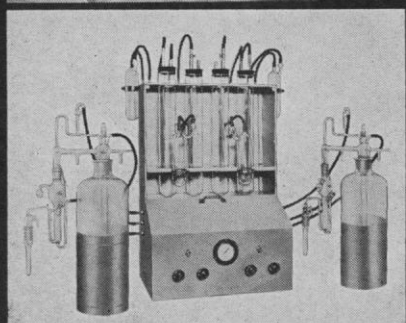


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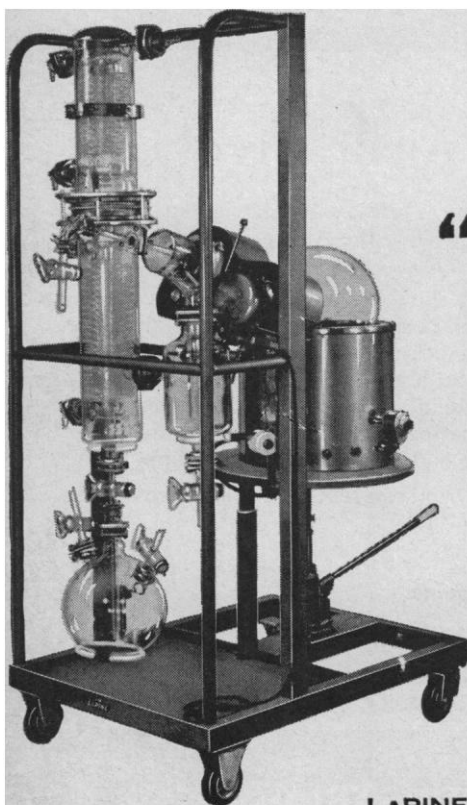
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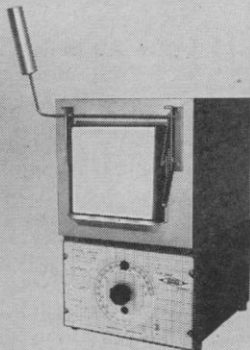
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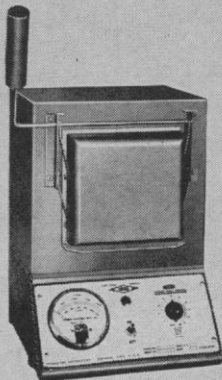
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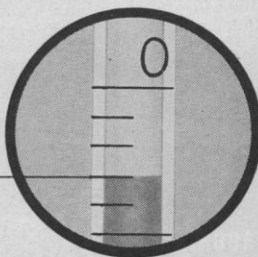
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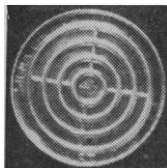
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Available at present in Stainless Steel or Aluminum in two depths. If demand warrants, we would be happy to make other sizes, too.

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Size	Stock No.	Price
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1 1/4" dia. x 3/32" high (32mm x 2.4mm)	316-12	1000- 35.00 5000- 160.00

Aluminum:

Size	Stock No.	Price
1 1/4" diam. x 1/8" high (32mm x 3.2mm)	AL-1	100-\$ 3.75 500- 11.80
1 1/4" dia. x 3/32" high (32mm x 2.4mm)	AL-12	1000- 18.00 5000- 81.00

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10 plates \$ 7.00	10 plates \$ 6.50	10 plates \$ 5.95
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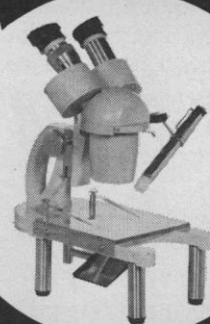
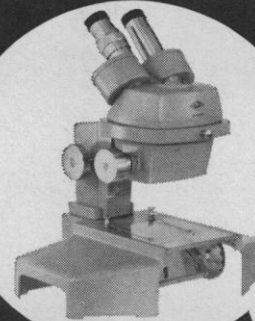
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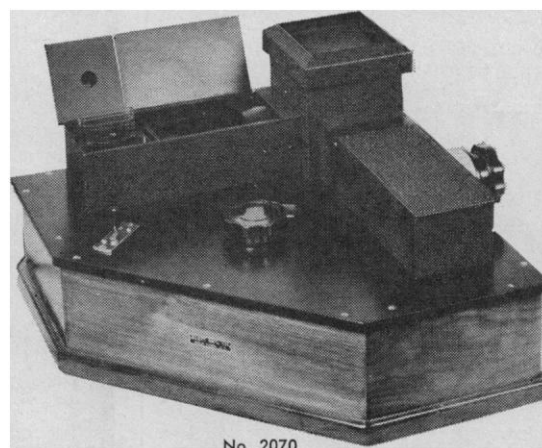
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NEWS AND COMMENTS

(Continued from page 236)

denly accumulated during the summer. One of these findings was an apparent break-through of researchers at Roswell Park and elsewhere in attempts to grow the virus particles cited by Endicott in large quantities. Another was the discovery by a team of researchers from the Pfizer laboratories, the South Jersey Medical Research Foundation, and the University of Pennsylvania that some of the particles associated with leukemia were present in cow's milk. Although NCI and other officials are careful to emphasize that this is only one of many new clues, it is clearly one that raises the possibility of a major public health "scare" and may have influenced the Senate committee, which had not yet completed its deliberations.

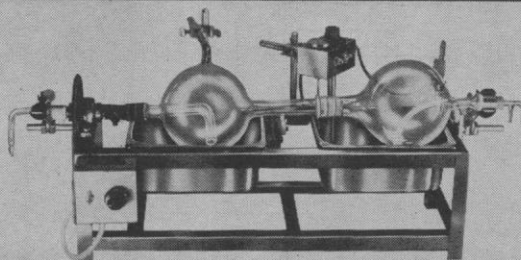
The major influence, however, appears to have been the conviction that the level at which NCI had planned to fund leukemia research was not high enough to exploit satisfactorily all the new discoveries. The appropriation followed the discoveries very quickly and shows how speedily Congress can react when the significance of scientific information is presented to it in comprehensible fashion. In fiscal 1964, about \$24 million was spent on studies related to leukemia, with all but \$250,000 going to support outside grantees and contractors. Although the spending level for the current fiscal year had not been determined, it appears that with the special appropriation, it will total around \$33 or \$34 million. The additional \$10 million has been specifically earmarked according to the NCI for (i) efforts to substantiate the viral nature of leukemia and to develop vaccines; (ii) developmental work to minimize the dangers to scientists working on isolating and growing the viruses; (iii) further clarification of leukemia in animals and its relation to man; and (iv) intensive development of new leads in chemotherapy, supportive therapy, and pharmacology.—ELINOR LANGER

Announcements

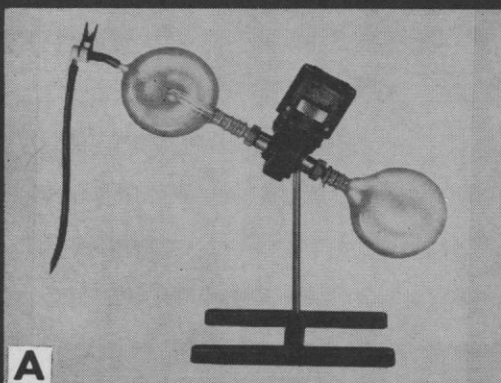
The National Bureau of Standards Institute for Basic Standards has initiated a service for the **calibration of humidity measuring instruments**. The facility is being offered to both government and the public, but only instruments suitable for use as laboratory or plant standards are being accepted

9 OCTOBER 1964

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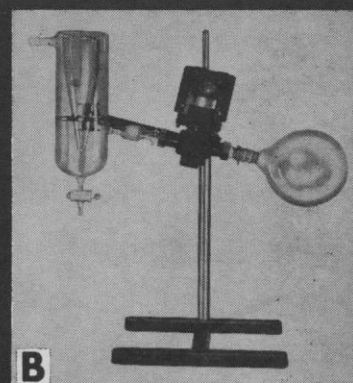


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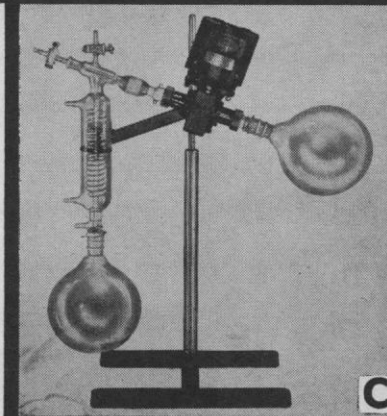


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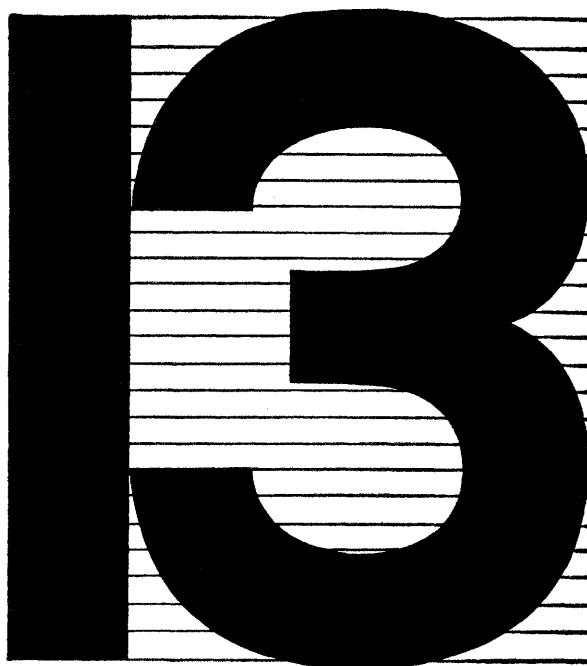
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SG2857 iso-Propyl Alcohol	205 m μ
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SG5696 2-Methylbutane	191 m μ
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SG7602 Cyclopentane	192 m μ
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SG2272 Butyl Alcohol	206 m μ

Low residue 0.0005% max. Low moisture 0.05 max. Low fluorescence less than 0.5% as quinine base. All are typically much less. It has been known for some time that spectra obtained in the region between 160 m μ and 210 m μ are very intense and often highly characteristic. Much valuable information can be gained by exploration in this area. However, the lack of commercially available solvents that are essentially free of impurities with high absorptivity in the far UV has discouraged use of this region.

Now, all MC&B Spectroquality Solvents devoid of intrinsic absorption characteristics in the far UV region, and some with inherent absorptivity in this area, are available with cut-offs that extend well into the far UV.*

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for calibration. The results will be reported in terms of dew-point temperature (degrees centigrade), mixing ratio (grams of water vapor per kilogram of dry air), volume ratio (parts of water vapor per million parts of air), or relative humidity (percent). Information regarding the fees charged for the calibrations may be obtained from Test Administration, Accounting Division, National Bureau of Standards, Washington, D.C. 20234.

Grants, Fellowships, and Awards

Applications are invited from U.S. scientists to participate in a conference on **developmental biology and fertilization**, to be held in Tokyo 27-31 March. The Meeting is sponsored by the U.S.-Japan Cooperative Science Program. Funds are being provided by the National Science Foundation for 20 U.S. investigators to attend the meetings and to visit major Japanese centers for developmental biology. Deadline for receipt of applications: *1 November*. (C. L. Markert, Department of Biology, Johns Hopkins University, Baltimore, Md.)

The International Laboratory of **Genetics and Biophysics** in Naples, Italy, has announced the availability of ten 2-year fellowships beginning 1 January 1965. The program, intended for postgraduate research and further training through advanced courses at the laboratory, is open to applicants 30 or under who have received a university degree during the past 5 years in mathematics, physics, chemistry, biology, or medicine. Applications should include academic transcripts, a tentative program of proposed scientific work, and one copy of each scientific publication. Submission deadline: *15 November*. (G. Polvani, Laboratorio Internazionale di Genetica e Biofisica, Casella Postale 104, Napoli, Italy)

The Population Council is offering fellowships for pre- or postdoctoral study in **demography** during the 1965-66 academic year. Applicants must have completed 4 years of college, and preference will be given those with at least a year's graduate work. Recipients may choose their own place and course of study. Stipends begin at \$2700, plus tuition and university fees; supplemental funds will be used for books, necessary travel, and special expenses. Stipends are larger for postdoctoral fel-

lows. Deadline for applications from the U.S. and Canada: *30 December*; from other countries: *11 January*. (Fellowship Secretary, The Population Council, 230 Park Avenue, New York 10017)

The Atomic Energy Commission is offering two types of fellowships in **health physics**. Each fellowship is for a year, renewable for up to 3 years; stipends include dependency and travel allowances, tuition, and fees at a participating university. Applicants for each must be U.S. citizens. Information on both programs is available from the Health Physics Fellowship Office, University Relations Division, Oak Ridge Institute of Nuclear Studies, Oak Ridge, Tenn. 37831. The fellowship programs are:

AEC special fellowships in health physics, for full-time graduate study toward the M.S. or Ph.D., during an academic year and 3 months' on-the-job training at a government laboratory. The annual stipend is \$2500. Applicants must be under 35 years old and have a bachelor's degree in biology, chemistry, engineering, physics, or a related field.

Advanced health physics fellowships, for persons now active in the field, with at least 2 years' training besides schooling and able to study at the doctoral level. Preference is given those less than 32 years of age. The stipend is \$4000 a year.

Meeting Notes

The **Air Pollution Control Association** will hold its 58th annual meeting in Toronto, Ontario, 20-24 June 1965, and papers are solicited. Deadline for 200-word abstract and title in triplicate: *15 November*. (M. Katz, Director, Environmental Assessment, Occupational Health Division, Department of National Health and Welfare, 45 Spencer St., Ottawa, Ontario)

The theme of the 13th Hahnemann Medical College symposium will be the **stomach**, and related areas of the esophagus and duodenum. The meeting, scheduled 14-16 December in Philadelphia, will stress the basic aspects of the physiology and diseases of the stomach and interrelationships of the abnormalities to functions of adjacent areas of the intestinal tract. (J. H. Moyer, Department of Medicine, Hahnemann Medical College, Philadelphia, Pa.)

9 OCTOBER 1964



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J-160



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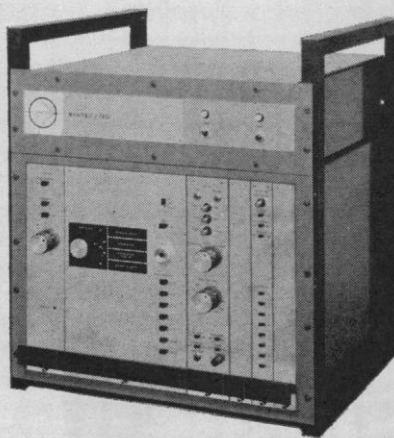
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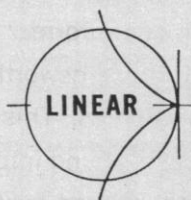
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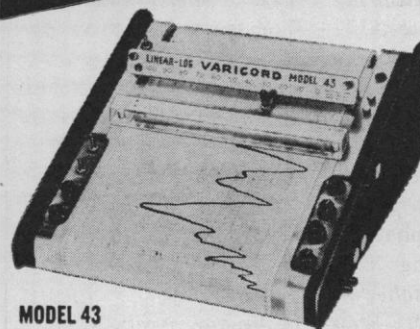


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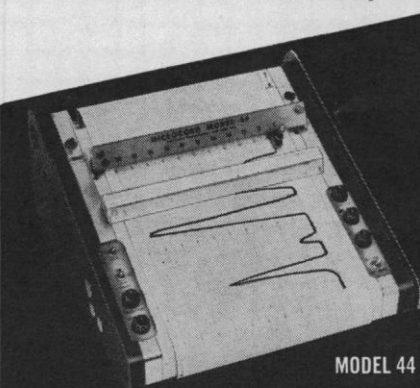
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Courses

A course in **digital simulation** technology has been organized by Control Technology, Inc. It is scheduled 16-23 October, in Long Beach, California. Registration fee for the full course is \$350. (Digital Simulation, Control Technology, Inc., 1232 Belmont Ave., Long Beach, Calif. 90804)

Films

The following 16-mm, sound, color films are available from Thorne Films, Inc., 1229 University Ave., Boulder, Colorado 80302.

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Hot Wire Technique with Chick Embryo (3 minutes; \$41). A simple procedure for removing chick embryos from their yolks by using a circular piece of nickel-chrome wire, which can then act as a carrier during the fixing and staining process.

Development of the Cardio-Vascular System of the Chick: The Heart (20 minutes, color or black and white, sound. First of series of five films). Heart development in the early chick embryo, later development, and effects of development of the truncus, ventricle, and sinoatrial region on heartbeat rate. (Audio-Visual Center, Indiana University, Bloomington, Ind.)

Scientists in the News

George W. James, director of socio-economics research at Battelle Memorial Institute, has been elected president of the National Association of Business Economists, succeeding **Richard W. Everett** of Continental Can Company.

Richard Cole, formerly in charge of the countermeasures evaluation branch of the military evaluations division at the U.S. Naval Radiological Defense Laboratory, has been named to head the chemical technology division at the laboratory.

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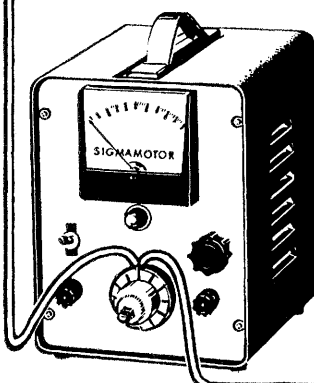
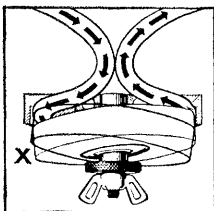
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 - Substitution types
 - Equal-arm types
- Semi-micro balances
 - Substitution and equal-arm types
- Micro-balances
- Recording balances
 - Vacuum and vacuum / pressure types
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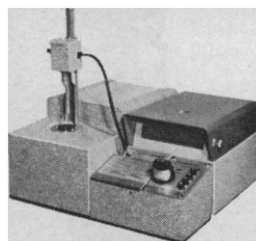
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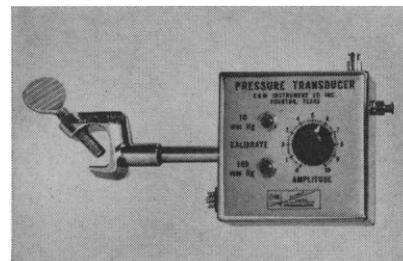
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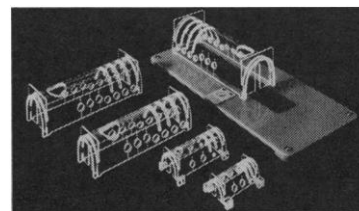
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James G. Kelly, chief of the community projects section at the NIH Mental Health Study Center, has been appointed associate professor of psychology at Ohio State University.

Harpur College, Binghamton, N.Y., has appointed **H. R. Kells** assistant dean. He has been assistant to the chairman of the college's division of science and mathematics.

The following appointments have been announced by Rice University:

Friedrich Horn, formerly at the University of London; professor of chemical engineering.

Angelo Miele, former director of astrodynamics and flight mechanics at Boeing Scientific Research Laboratories, Seattle, Washington; professor of astronautics.

G. C. Jain, formerly at Purdue University; associate professor in electrical engineering.

Douglas Price-Williams, formerly at the London School of Economics; associate professor of psychology.

William H. Summerson, formerly chief scientist at the U.S. Army Edgewood Arsenal, Maryland, has become director of the Food and Drug Administration's Bureau of Scientific Research.

At the California College of Medicine:

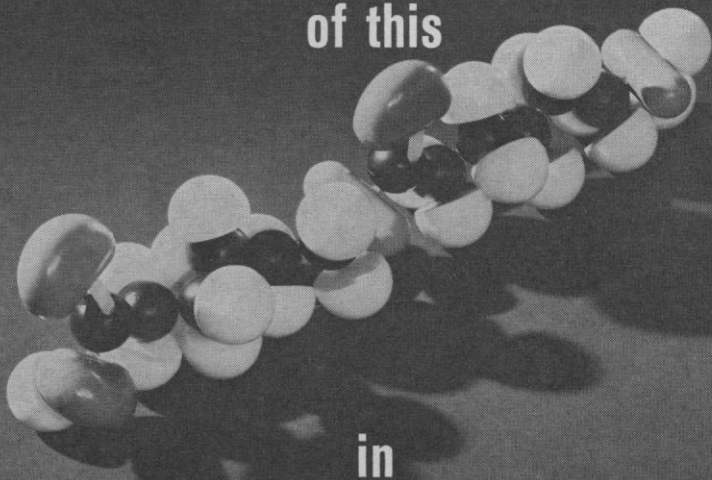
Thomas L. Nelson, former professor in the University of Kentucky college of medicine, has become professor and chairman of the pediatrics department.

Bernard J. O'Loughlin, former professor of radiology and head of the diagnostic division and chief of pediatric radiology at the University of California, Los Angeles, has been appointed professor and chairman of the department of radiology.

Bernard O'Connor, head of the neurology service at Los Angeles County Rancho Los Amigos Hospital, has become chief of the division and associate professor of medicine.

Thomas Gold, chairman of Cornell's department of astronomy and director of the university's center for radiophysics and space research, and **Harry Messel**, head of the school of physics at the University of Sydney, Australia, have been named directors of the newly established Cornell-Sydney joint astronomy center. The center will employ facilities at Cornell, Sydney, and the

if you
can determine
the
molecular weight
of this



in
minutes

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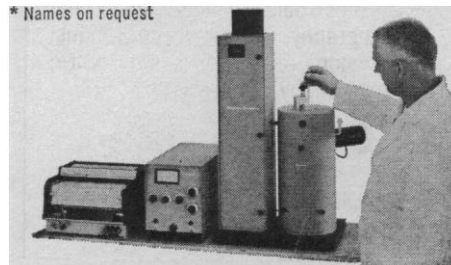
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* Names on request



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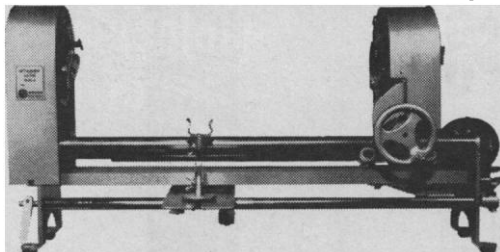
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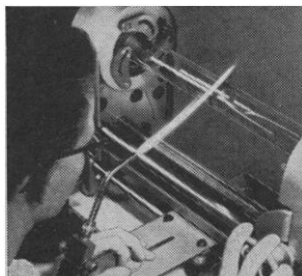
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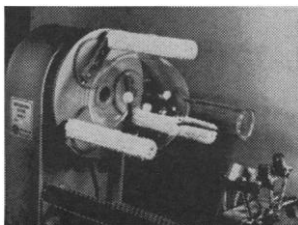


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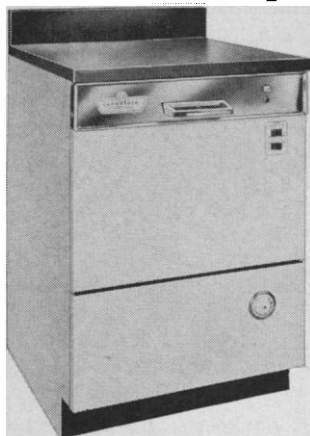


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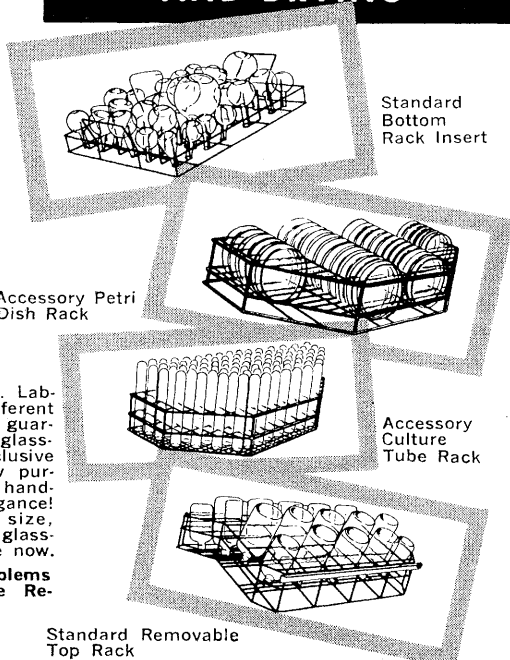
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Arecibo Ionospheric Observatory in Puerto Rico. Members of the Cornell faculty who have joined the center are:

Edwin E. Salpeter, professor of nuclear studies;

Philip Morrison, professor of physics;

Kenneth I. Greisen, professor of physics and director of Cornell's cosmic astronomy program;

Gordon H. Pettengill, associate director of the Arecibo Ionospheric Observatory;

Associate professors of astronomy **Frank D. Drake**, **Marshall H. Cohen**, **W. Ian Axford**, **Mukul R. Kundu**, and **Martin O. Harwit**.

Sydney faculty members associated with the center are:

R. Hanbury Brown, director of Sydney's stellar interferometer;

W. N. Christiansen, head of Sydney's electrical and engineering school;

C. B. A. McCusker, who is in charge of Sydney's cosmic astronomy installation;

B. Y. Mills, department of physics.

Roy H. Garstang, former assistant director of the University of London Observatory and Reader in Astronomy at the university, has joined the University of Colorado as professor of physics and astrophysics, and permanent fellow of the Joint Institute for Laboratory Astrophysics.

Dorland J. Davis has been appointed director of the National Institute of Allergy and Infectious Diseases, to succeed **Justin M. Andrews**, who has retired. Davis was formerly director of intramural research at NIAID.

Recent Deaths

Philip E. Ohmart, 48; founder and president of the Ohmart Corporation; 27 August.

Fred W. Schueler, 43; professor and chairman, department of pharmacology, Tulane University school of medicine; 7 September.

Angus M. Woodbury, 78; director of ecology research on the Colorado Project at the University of Utah; 1 August.

Rufus B. von Kleinsmid, 89; Chancellor, University of Southern California; 9 July.

Erratum: In the report "Lobuloalveolar differentiation in mouse mammary tissues in vitro" by R. Ichinose and S. Nandi (31 July), the sentence beginning on page 496, column 3, line 13, should have read: "The contents of media 2, 3, and 4 will be referred to hereafter as 'incomplete hormone supplements'; the contents of medium 5, as 'complete hormone supplement'."