

# SCIENCE

9 October 1964

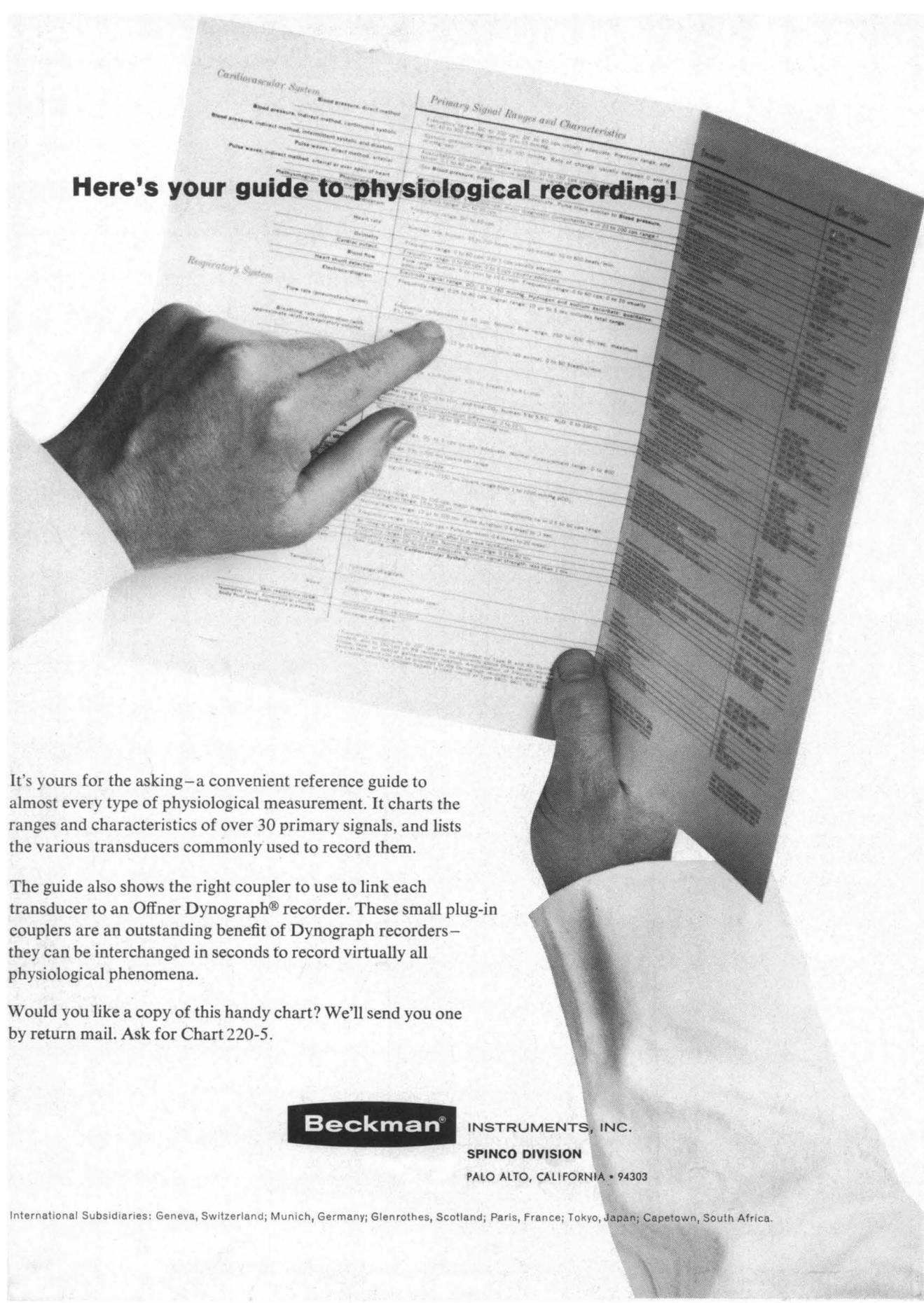
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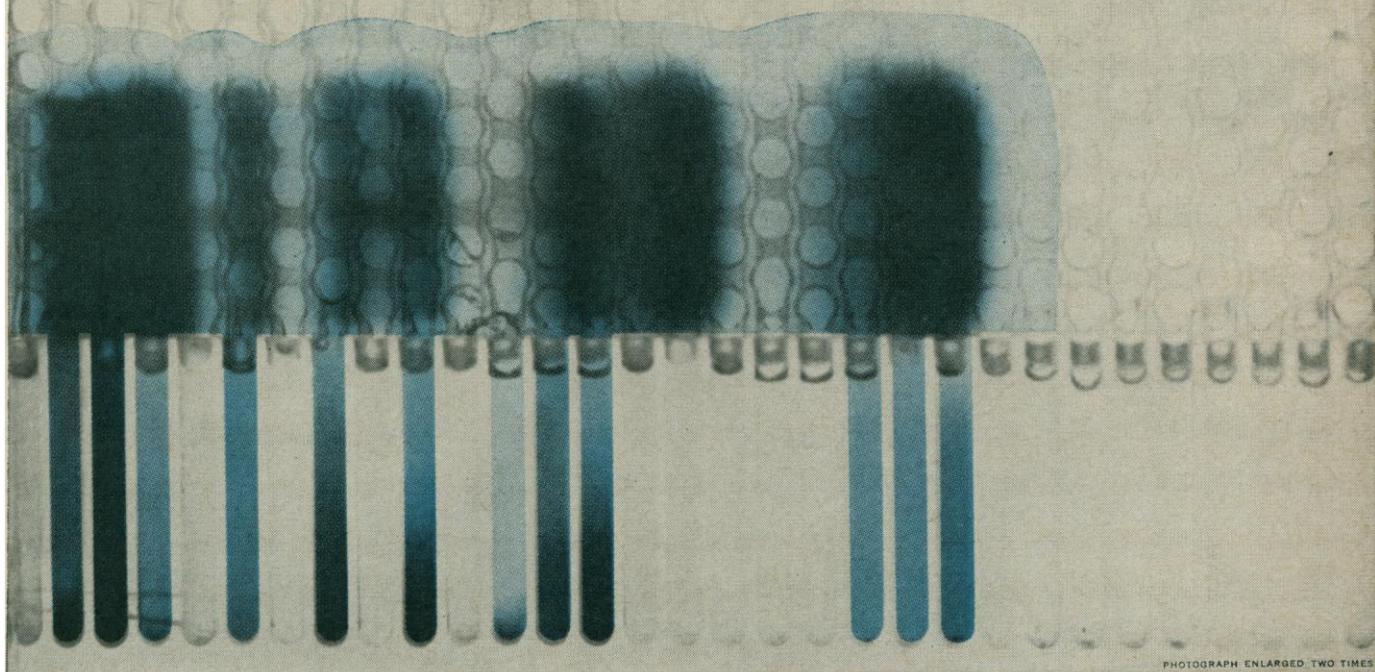
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A transmission Laue photograph of a gypsum single crystal taken with a fine-focus x-ray tube operated at 100 kilovolts and 5 milliamperes. By this technique it is possible to examine, even while they are growing, thick single crystals, crystals in 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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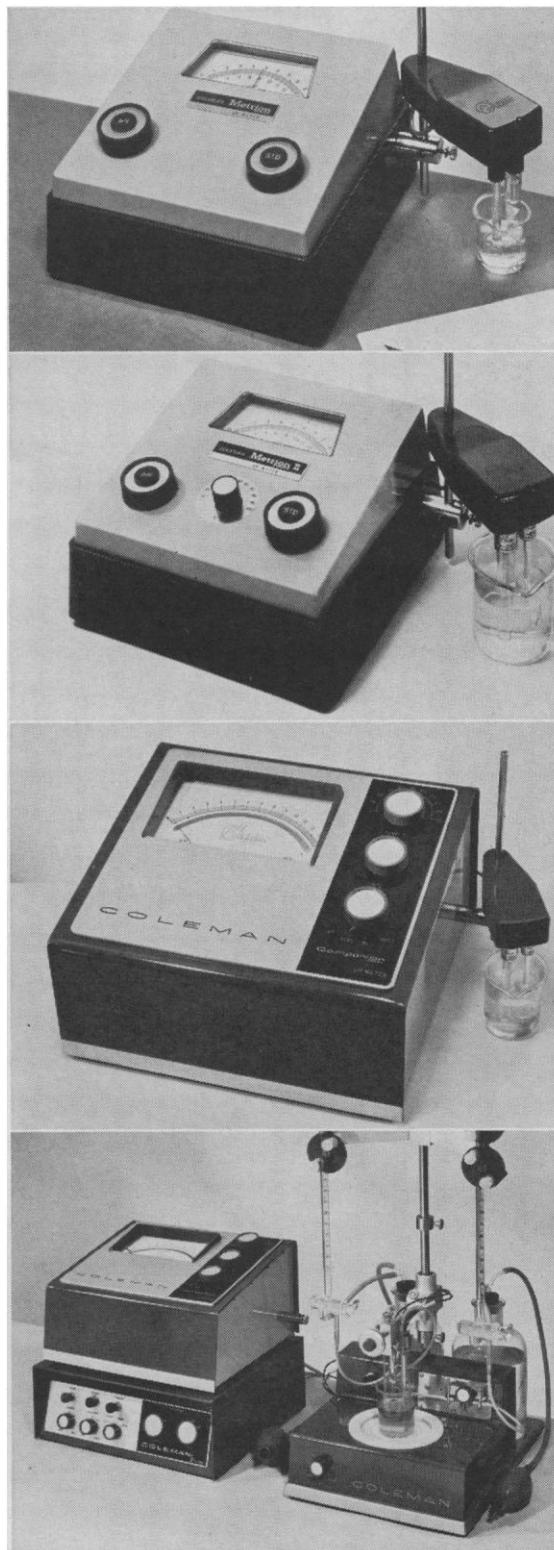
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VOLUME VI: subscription for the calendar year 1964 (4 issues): \$15.00. Back volumes: prices on request.

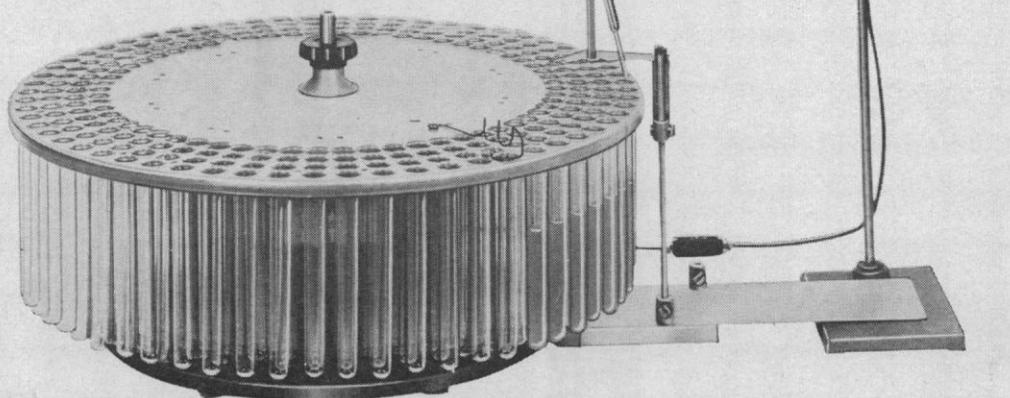
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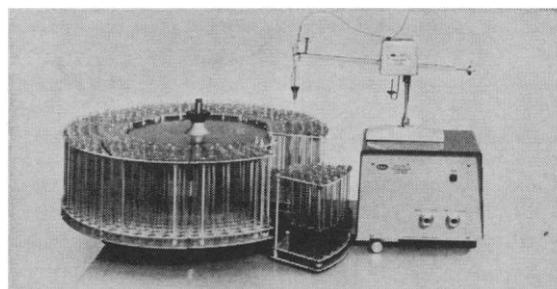
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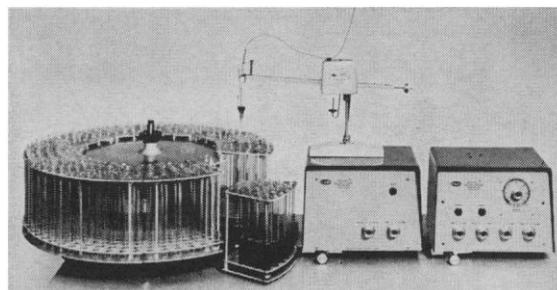
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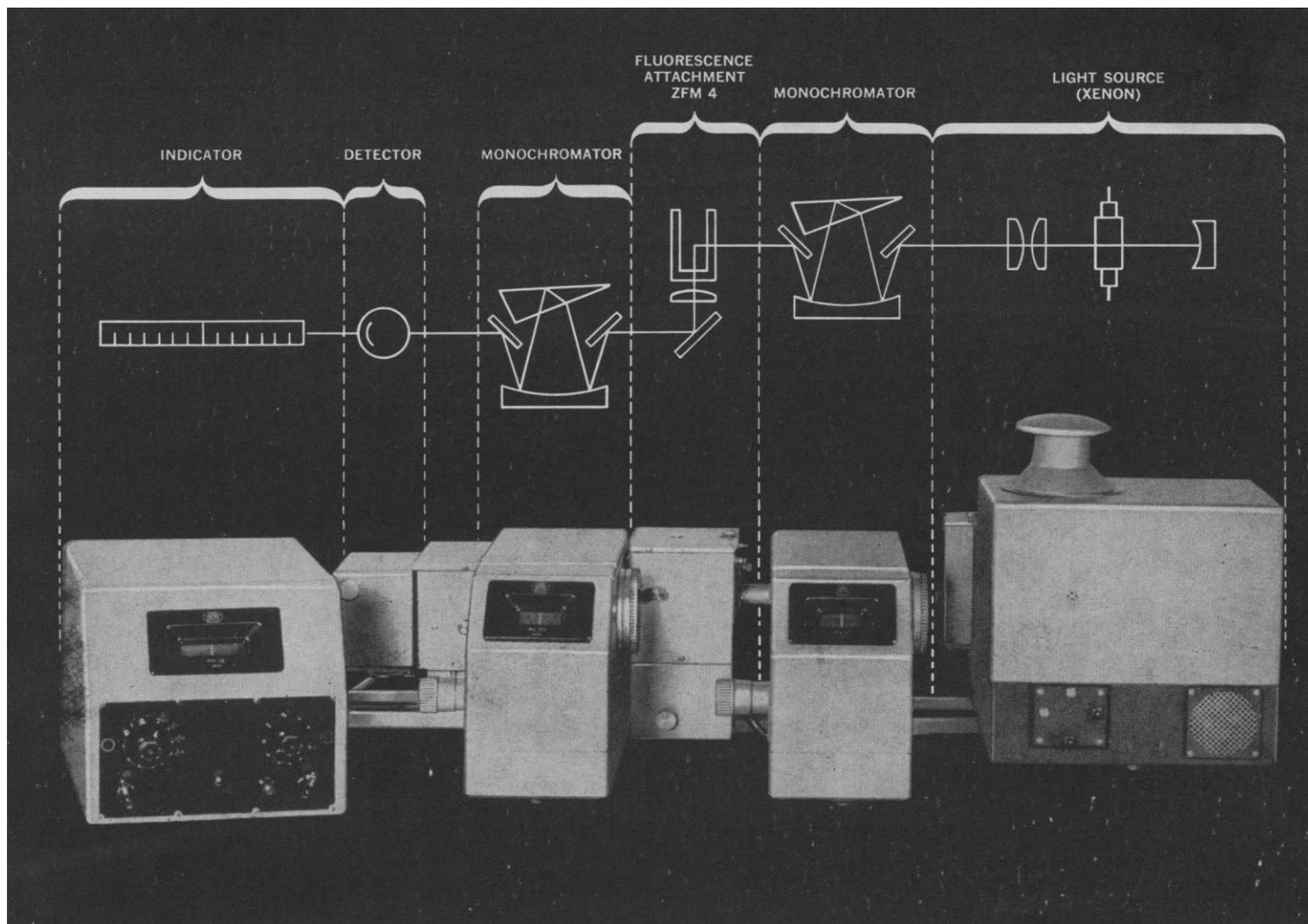
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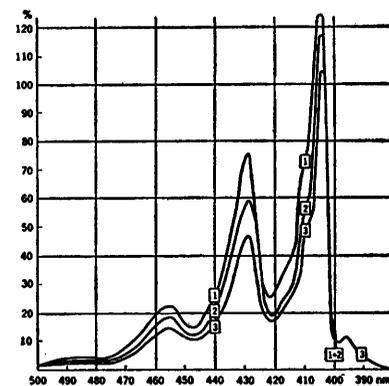
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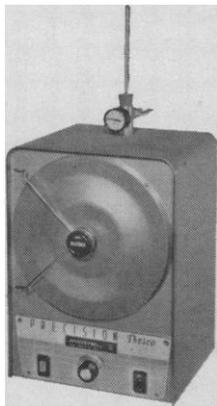
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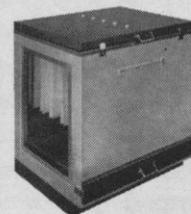
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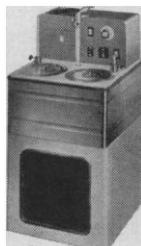
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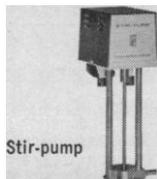
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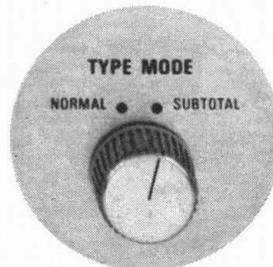
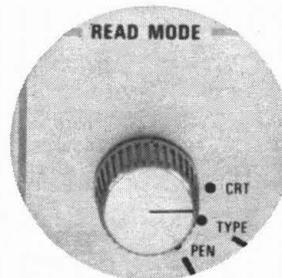
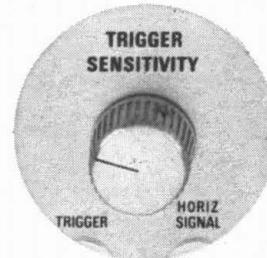
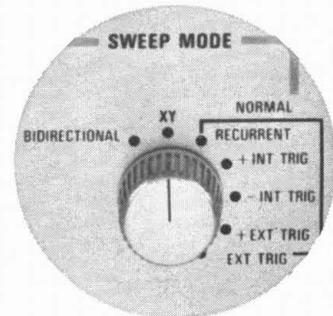
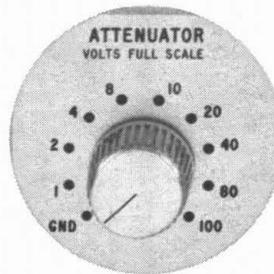
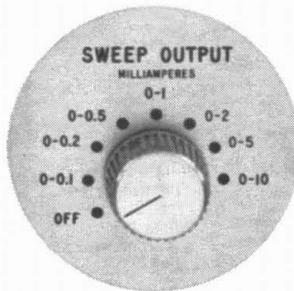
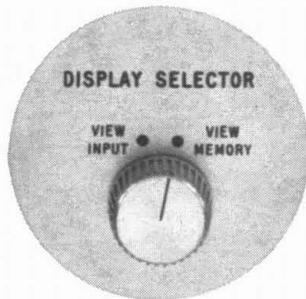
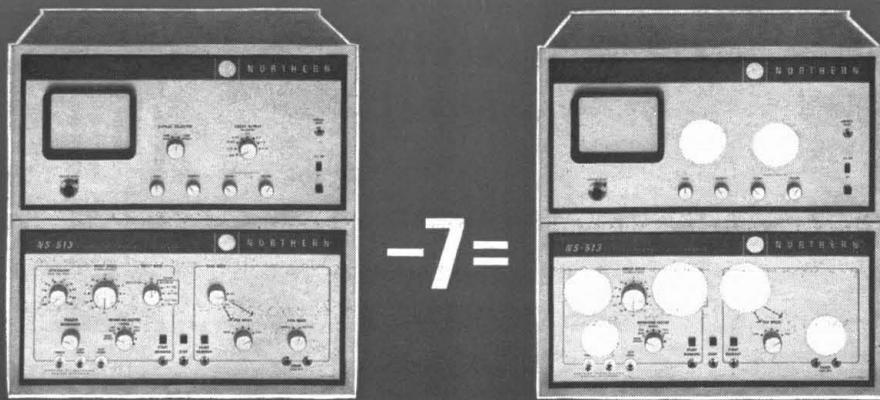
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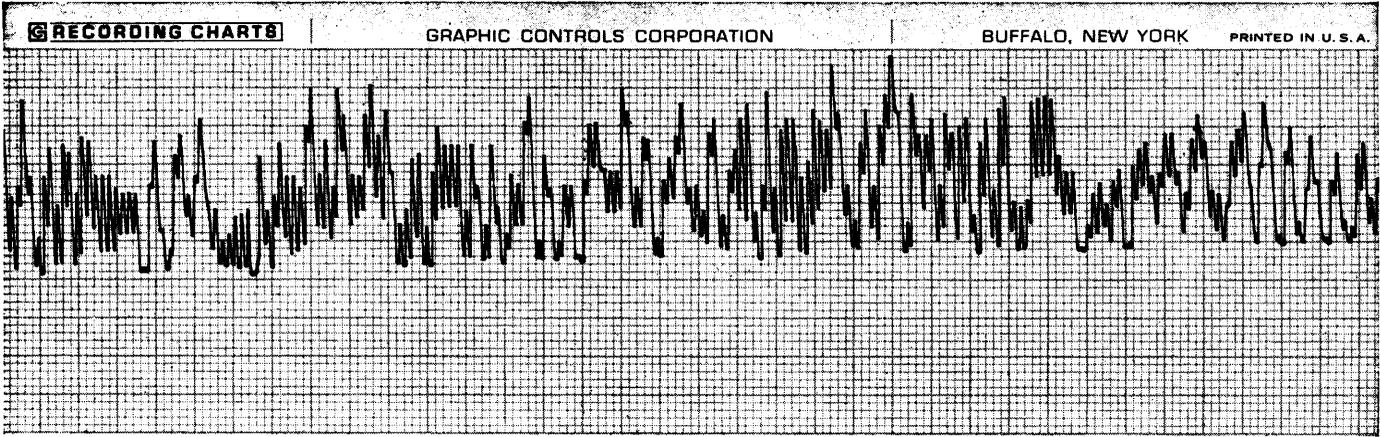
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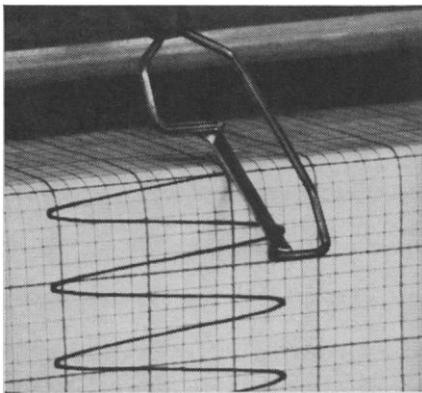


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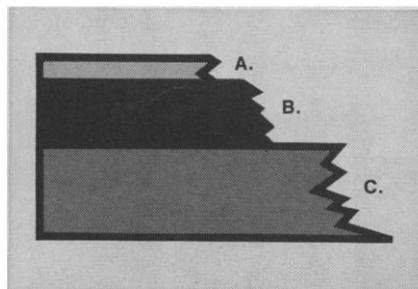


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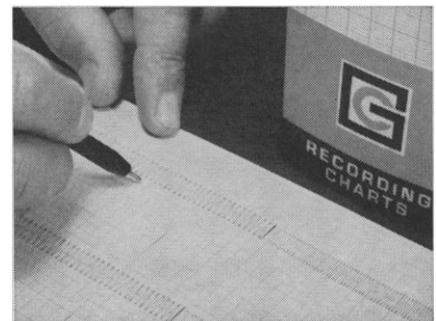
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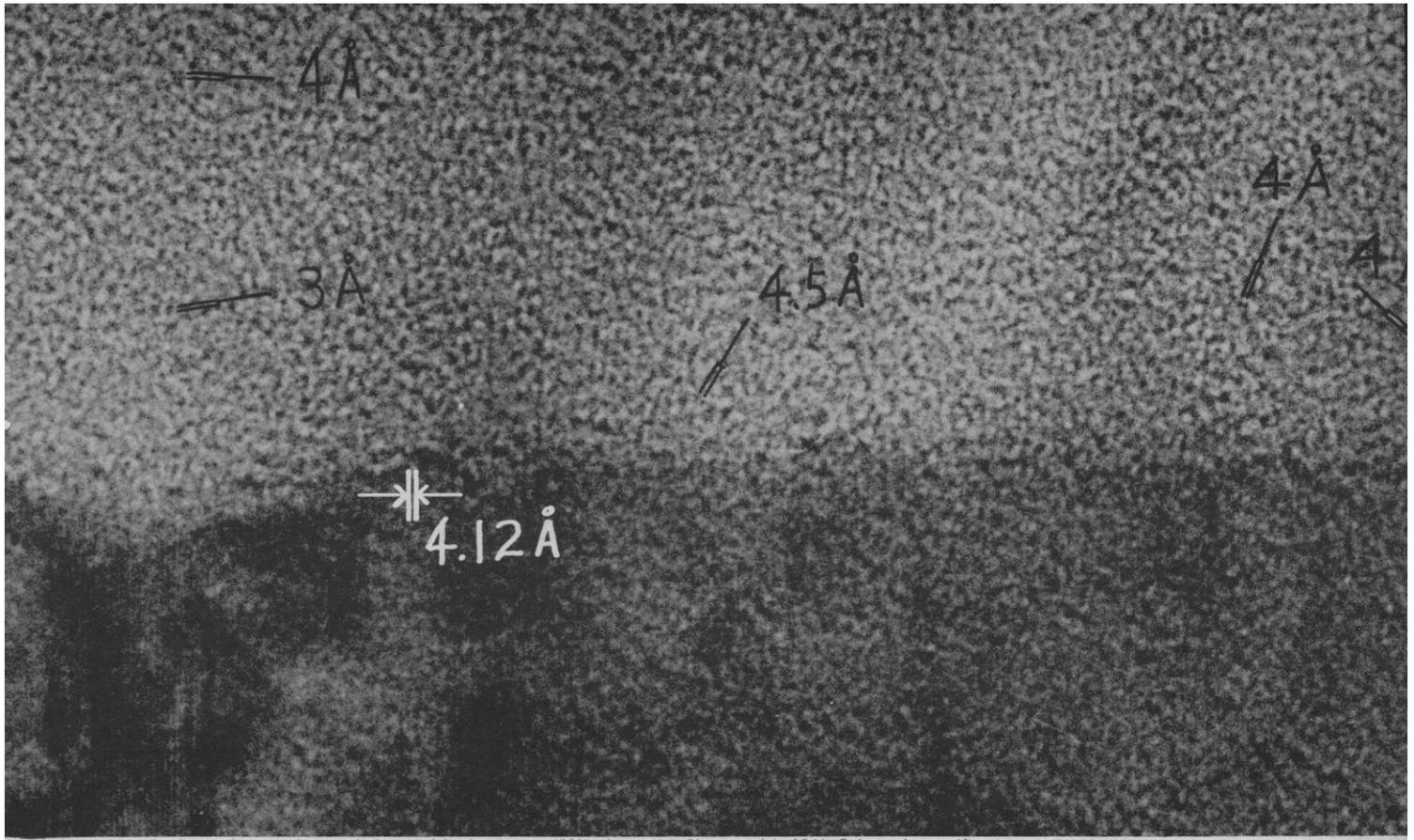
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Micrograph above shows point resolution and lattice image (001) planes  $K_2PtCl_4$  crystal (4.12Å). Enlarged magnification = 2,000,000.

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  $5\text{Å}$  resolution was maintained for each exposure (b) Electronic stability was better than  $2$  in  $10^6$  for four minutes (c) The specimen contaminated at a rate of less than 0.5 angstroms per minute.

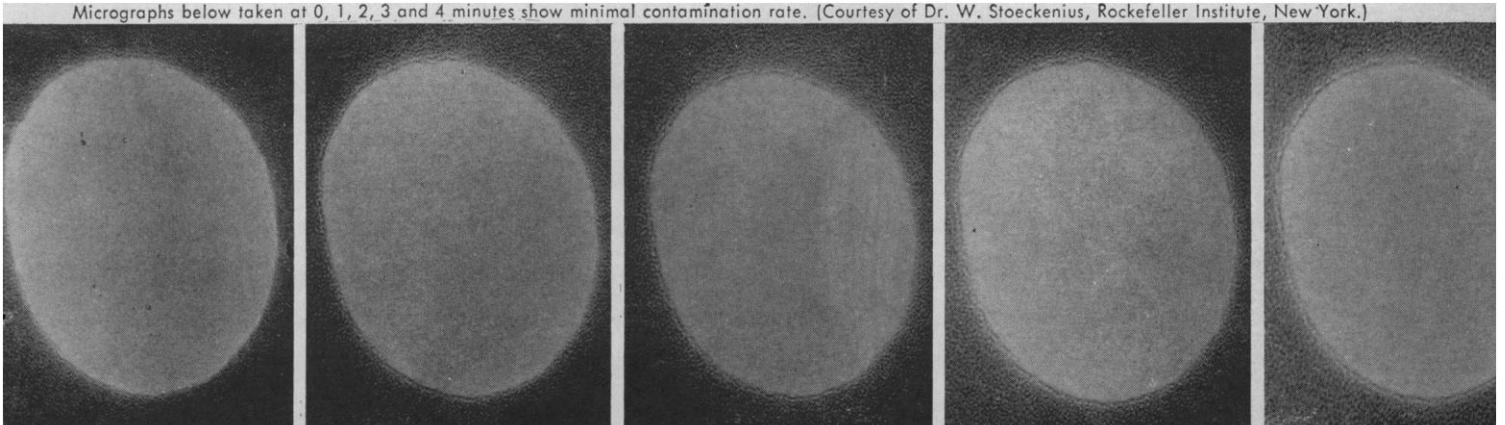
With this constancy of performance, ultra high resolution micrographs can now be obtained similar to that shown above. The (001) lattice image of  $K_2PtCl_4$  Crystal with  $4.12\text{Å}$  spacing is resolved while on the same plate point-to-point resolution of particles as close as  $3\text{Å}$  is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

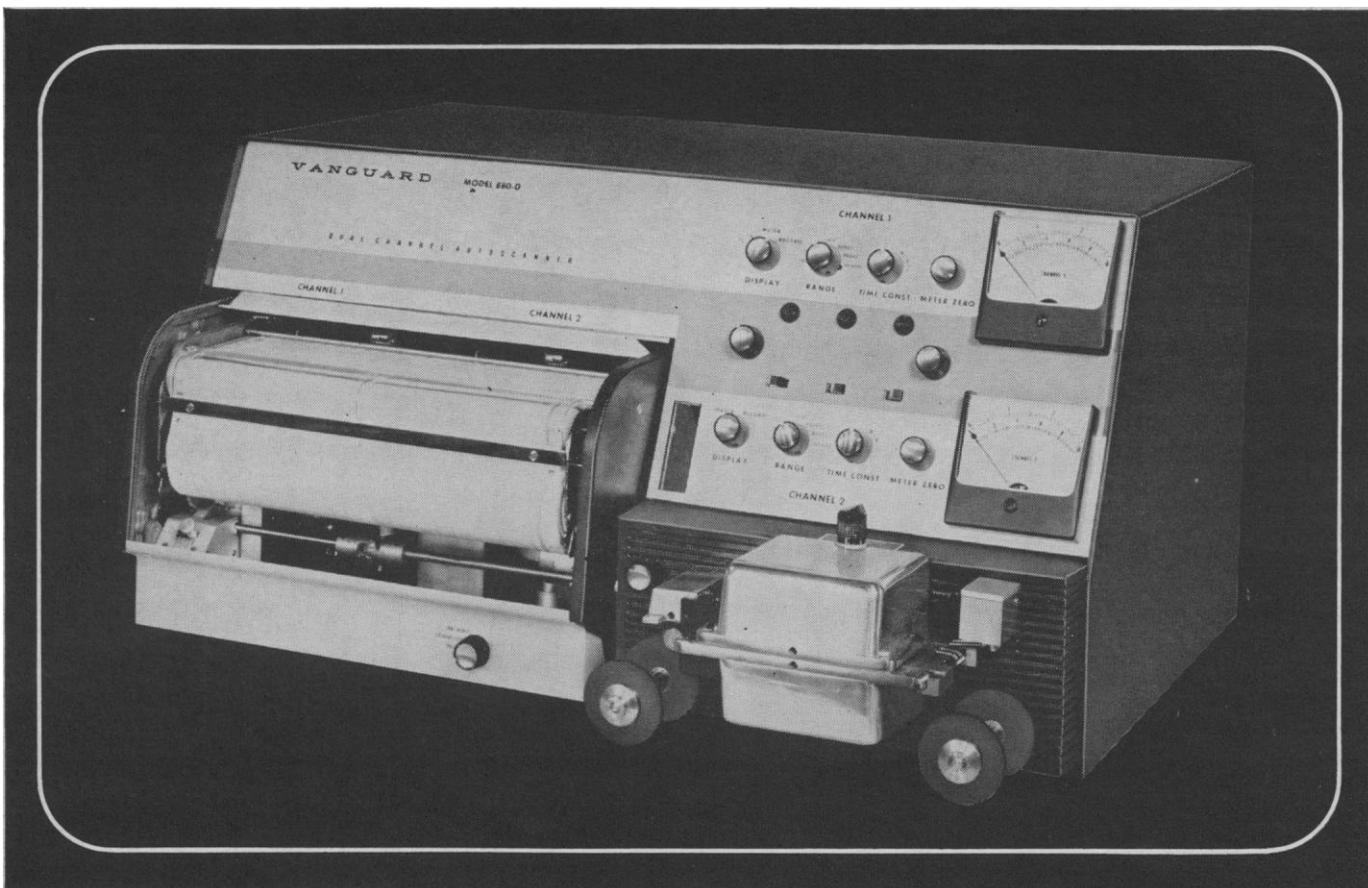
tained. This is the highest point resolution yet demonstrated by any electron microscope, approaching the dimensions of single atoms.

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. Stoekenius, 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.

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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 B<sub>12</sub> 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

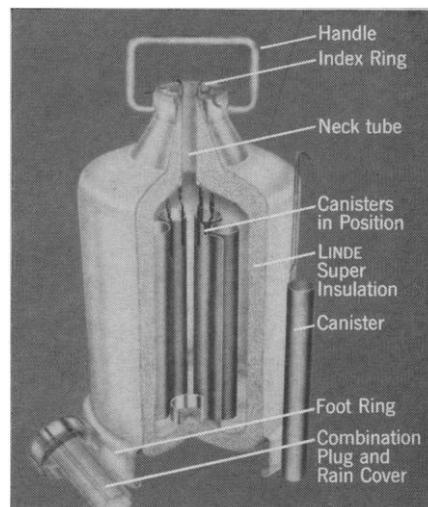
Our new LR-10A-6 portable refrigerator is designed both for economical shipping and small quantity storage of biological specimens. It will hold six canisters with a capacity of 115 cu. in. and has a minimum holding time of 3 weeks at -196°C between refills of liquid nitrogen. Lightweight, rugged, vibration-and-shock 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.

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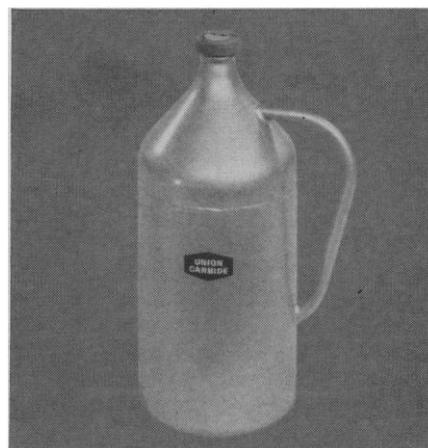
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LR-10A-6 Liquid Nitrogen Refrigerator



LD-4 Liquefied Gas Container

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

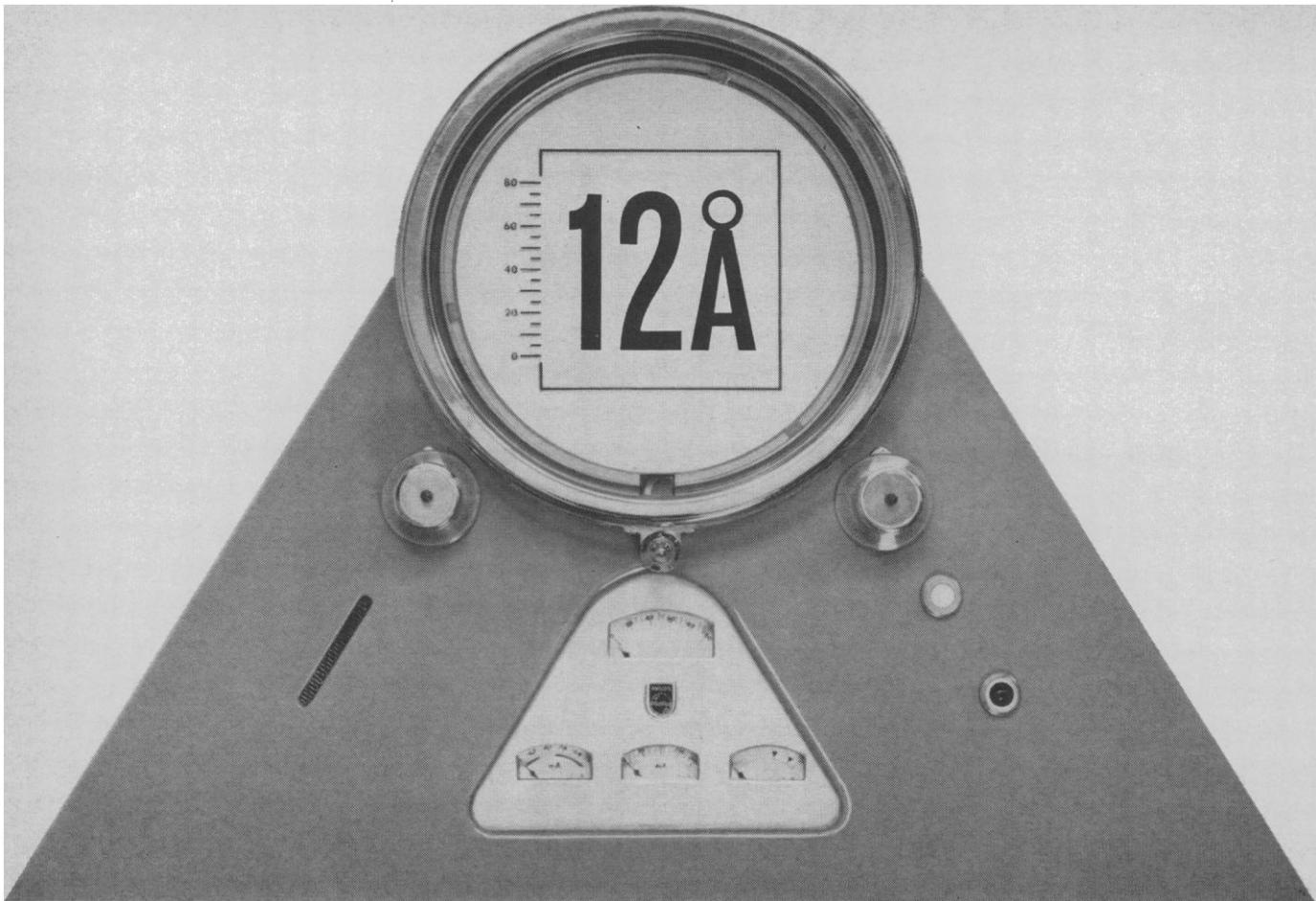
For data, write to Union Carbide Corporation, Linde Division, Dept. SC-1, 270 Park Avenue, New York, N. Y. 10017.

(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) Dierassi, I. and Roy, A., *Blood XXII*, 703-717, 1963. (4) Cohen, H. and Rowe, A. W., *Transfusion* 3, 427, 1963.

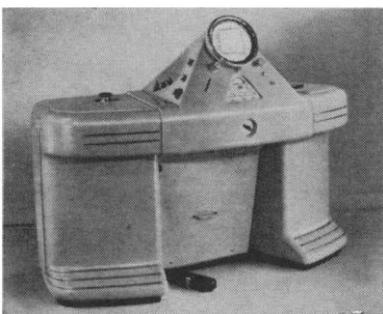
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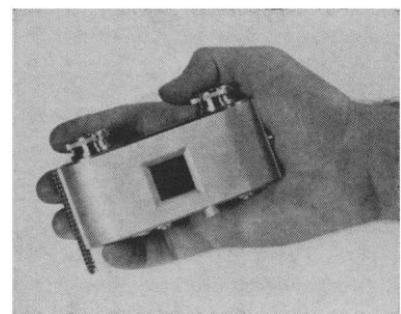
CRYOGENIC PRODUCTS



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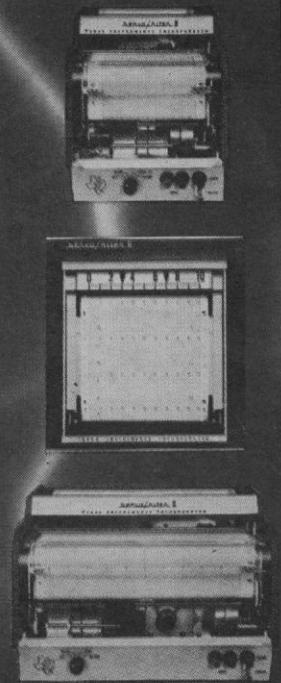
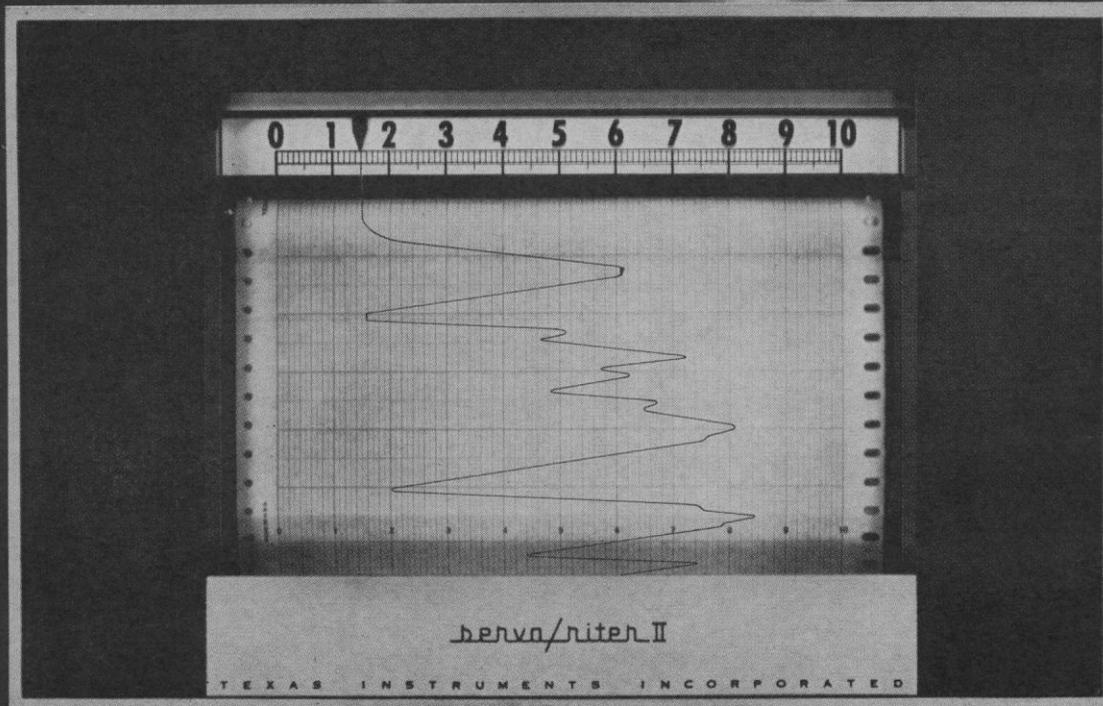
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Ask for a demonstration of the newest strip-chart recorder...the all new servo/riter II.

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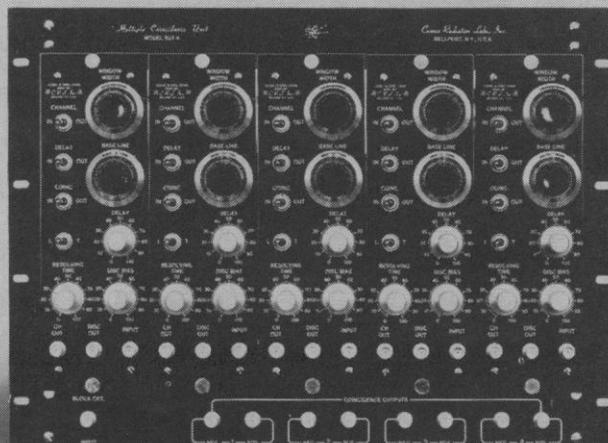
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any other system you can buy.



## 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.

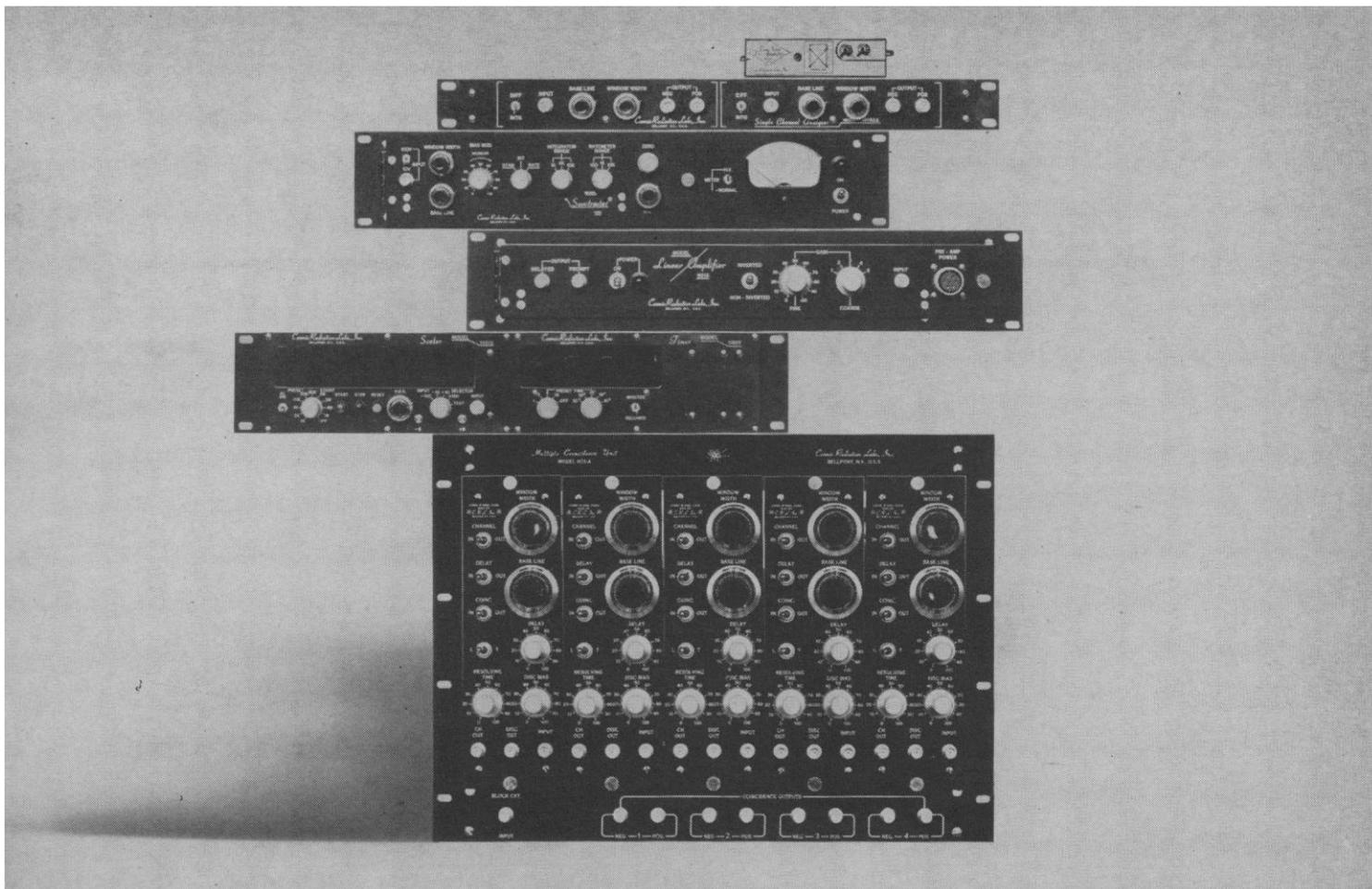
### **1013 Different Coincidence Combinations**

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.**

designed for only fast coincidence applications, exhibits less than 10 nanoseconds of time shift. The 802-B can deliver up to eight simultaneous outputs to the coincidence circuit.

The Model 801-B and 802-B Plug-In Units can also generate an anti-coincidence signal that can inhibit the operation of any one of the fast coincidence circuits.

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.

**Modular Units for Greater Flexibility**

Cosmic Radiation Labs conceived the idea and was the first company to manufacture modular-construction front-panel plug-in units for greater instrument flexibility. Modular units immediately available from Cosmic include: Model 802-B, Fast Discriminator (less than 10 nanoseconds of time shift); 901-AP, Linear Amplifier; Model 1201, Linear Gate; Model 1301, White Emitter Follower; and Model 1402, Mixer-Adder Amplifier. Cosmic is enlarging the scope of the system and is developing new modules that will be announced in the coming months. Cosmic was also the first company to manufacture a solid state multiple coincidence unit. And Cosmic continues to be the leader in coincidence instrumentation.

The key to this leadership is quality — the unequaled quality that gives you instruments whose performance is pre-tested and checked to insure perfect operation. All Cosmic solid state components are completely checked on a curve tracer and all

units receive a 72 hour heat-test before shipment.

These stringent quality controls are routine at Cosmic — and have been since 1955 when Cosmic was born. Since then the quality and design of Cosmic instruments have become known by the world's leading scientists and laboratories; and the dark blue color of Cosmic units, the color of outer space, has become the company's hallmark.

In addition to the 801, Cosmic also manufactures: Nuclear Scaler-Timer Systems; Single Channel Analyzers; Linear Amplifiers; and the Spectrastat® Stabilizer.

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

COSMIC RADIATION LABS, INC., BELLPORT, N.Y., U.S.A.

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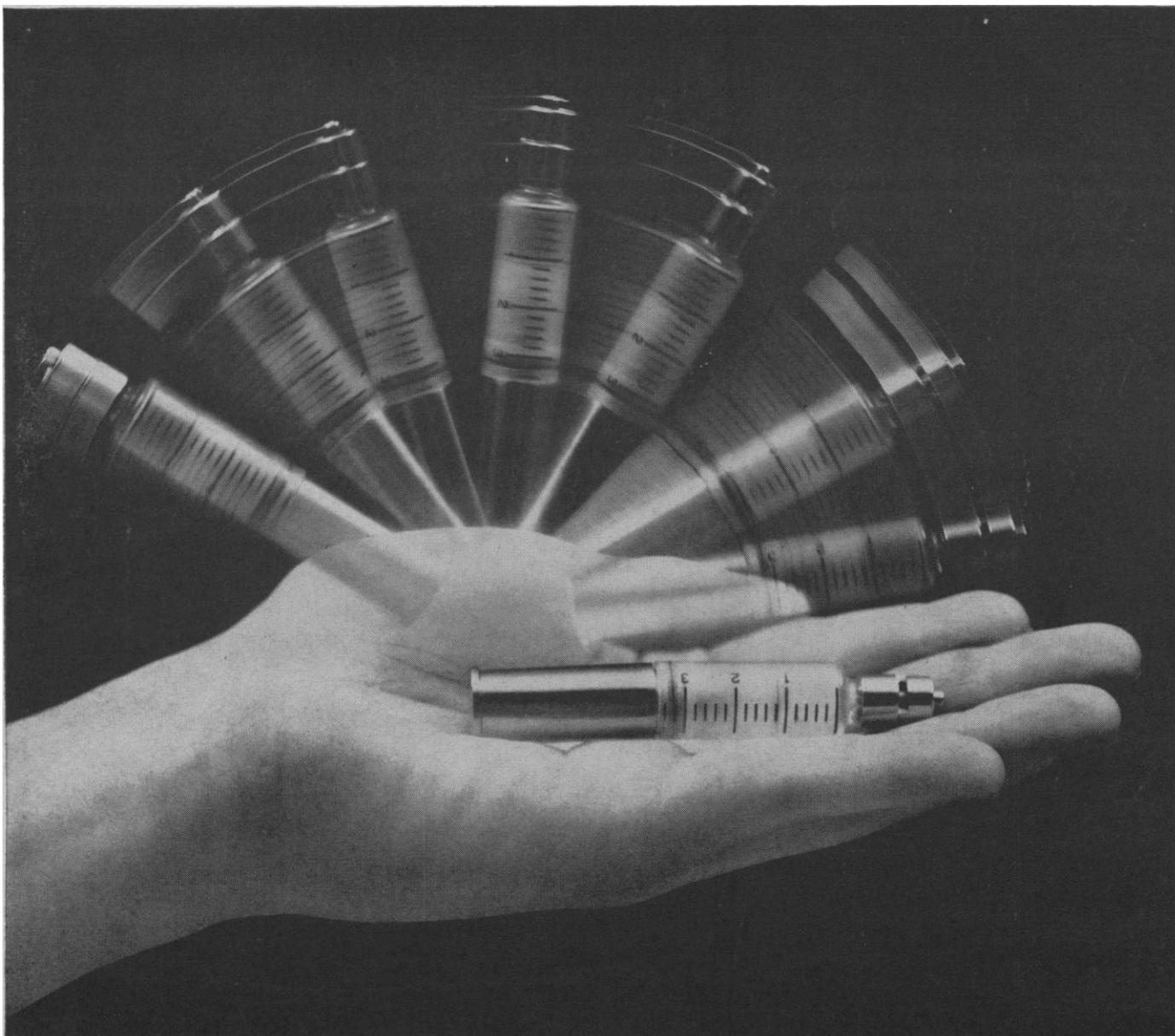
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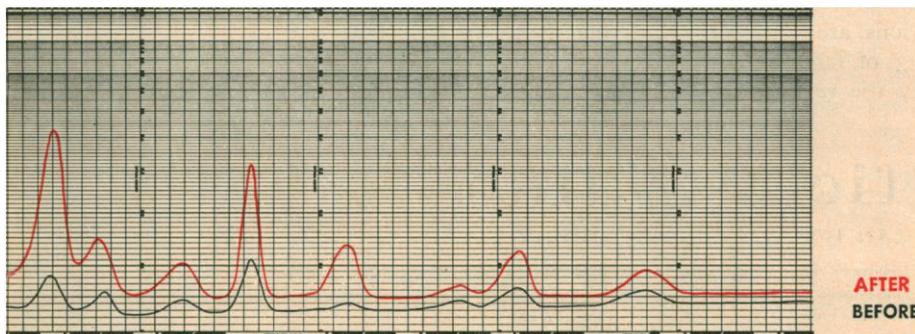
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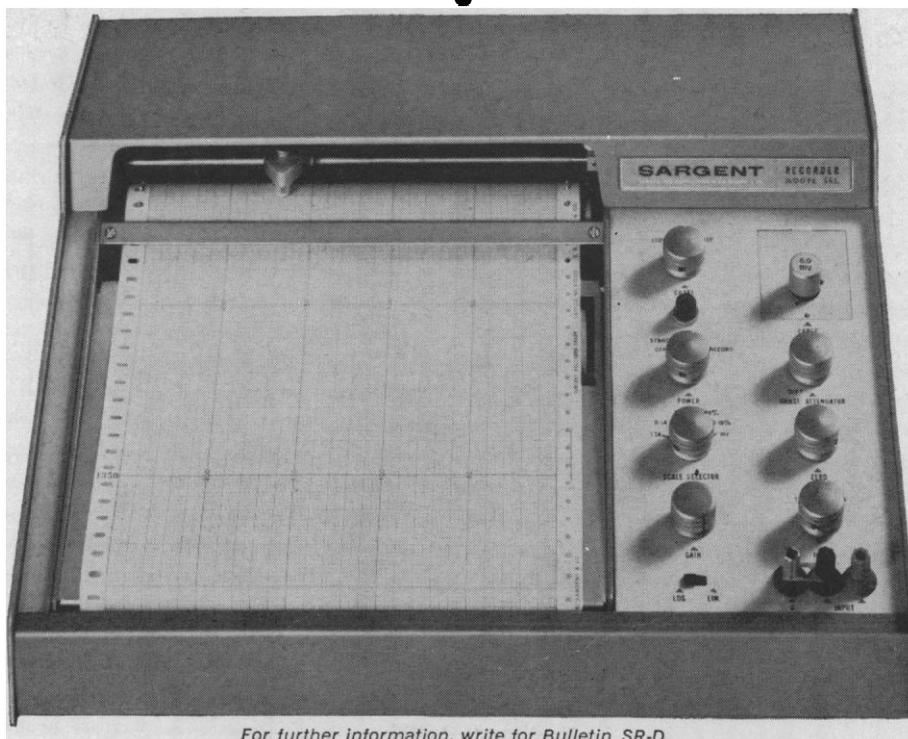
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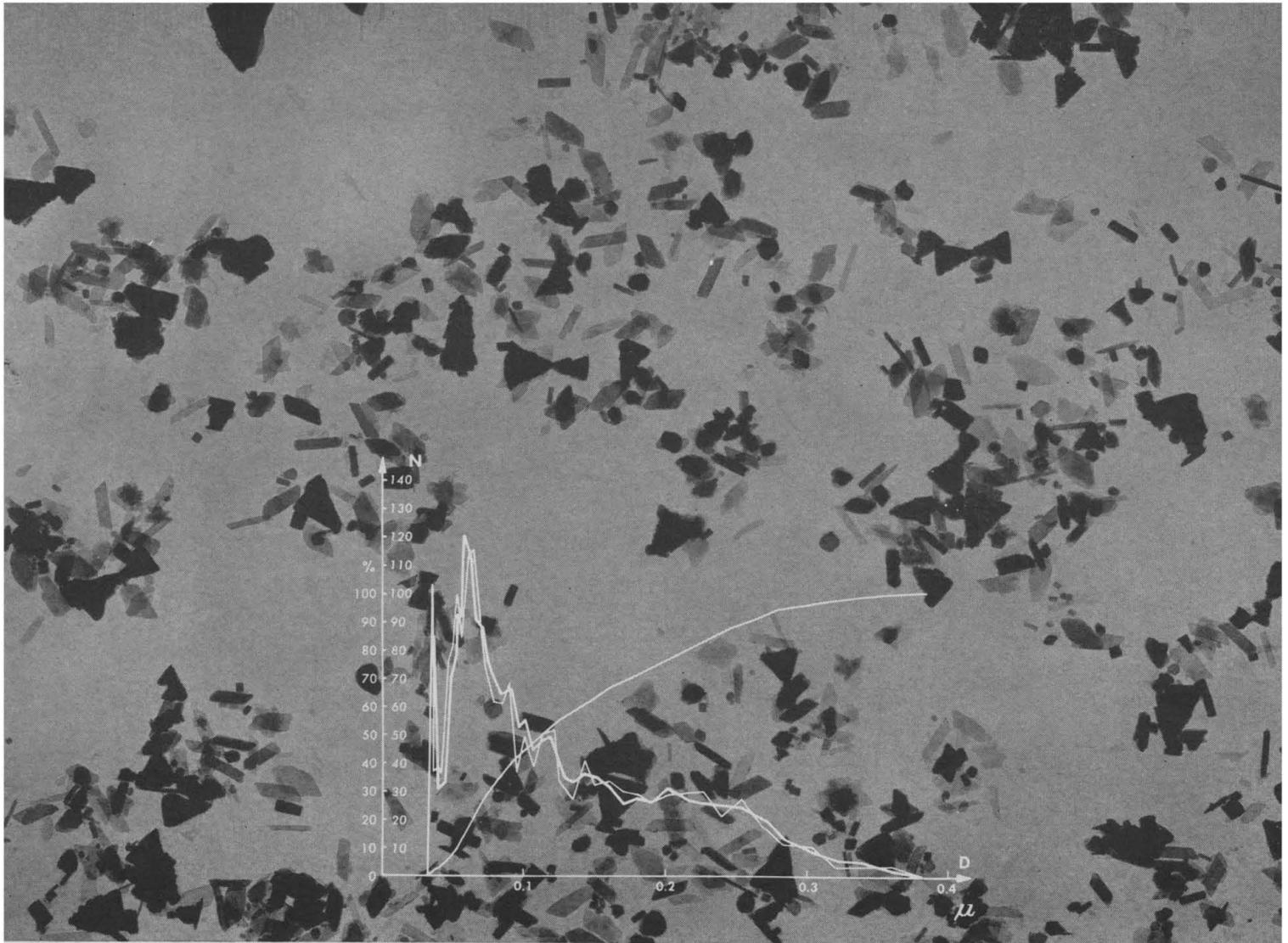


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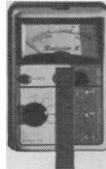
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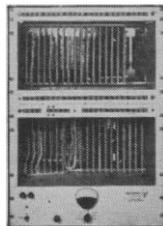
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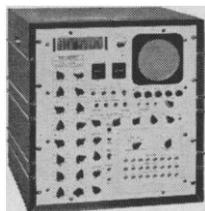
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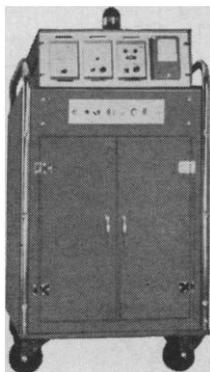
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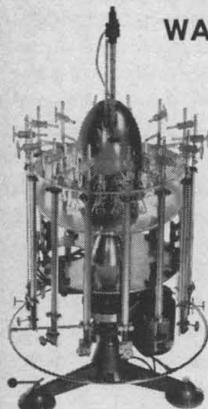
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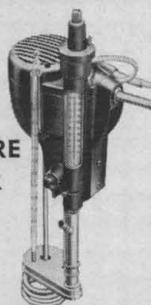
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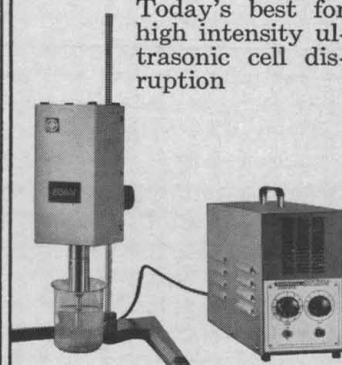
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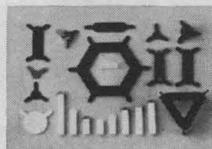
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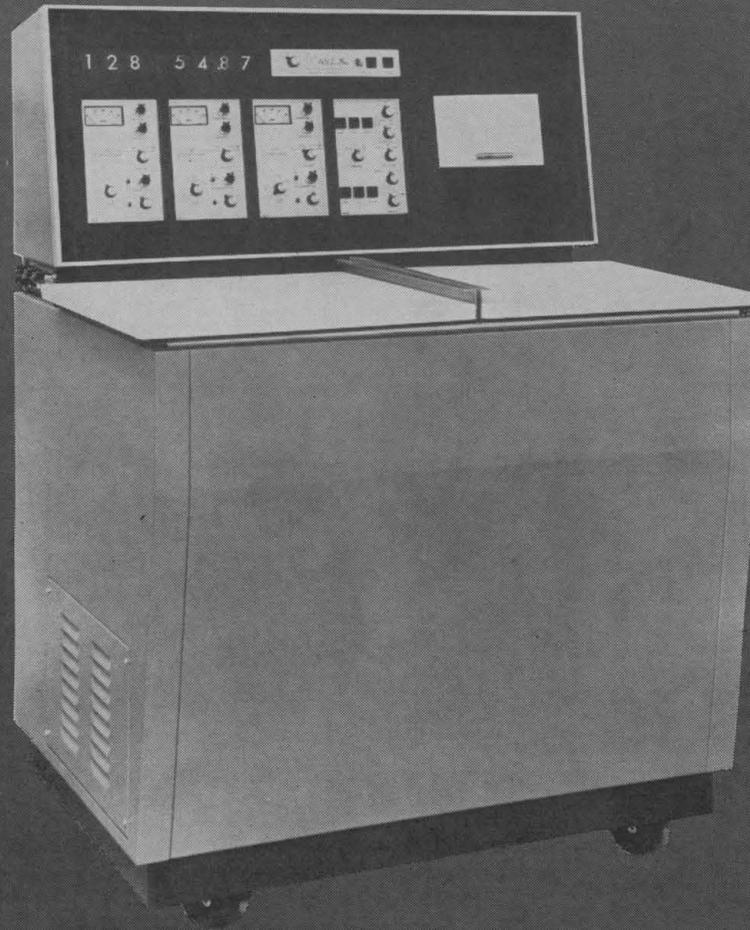
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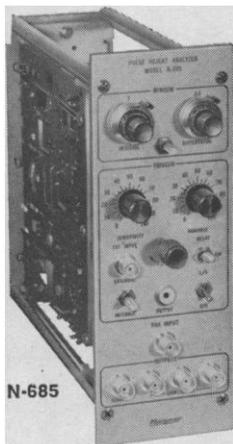
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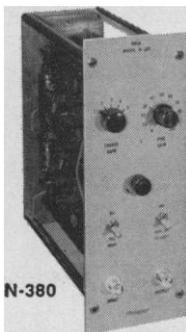
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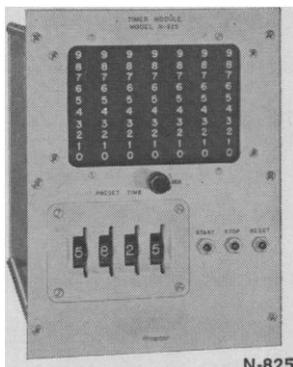
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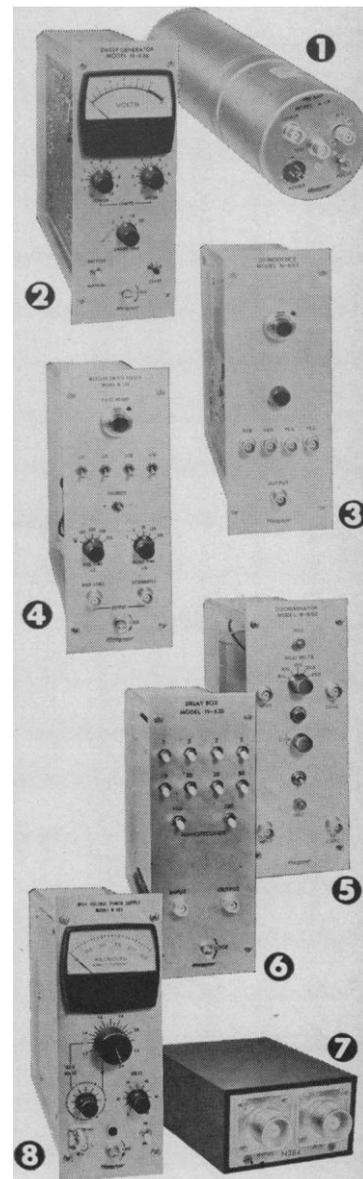
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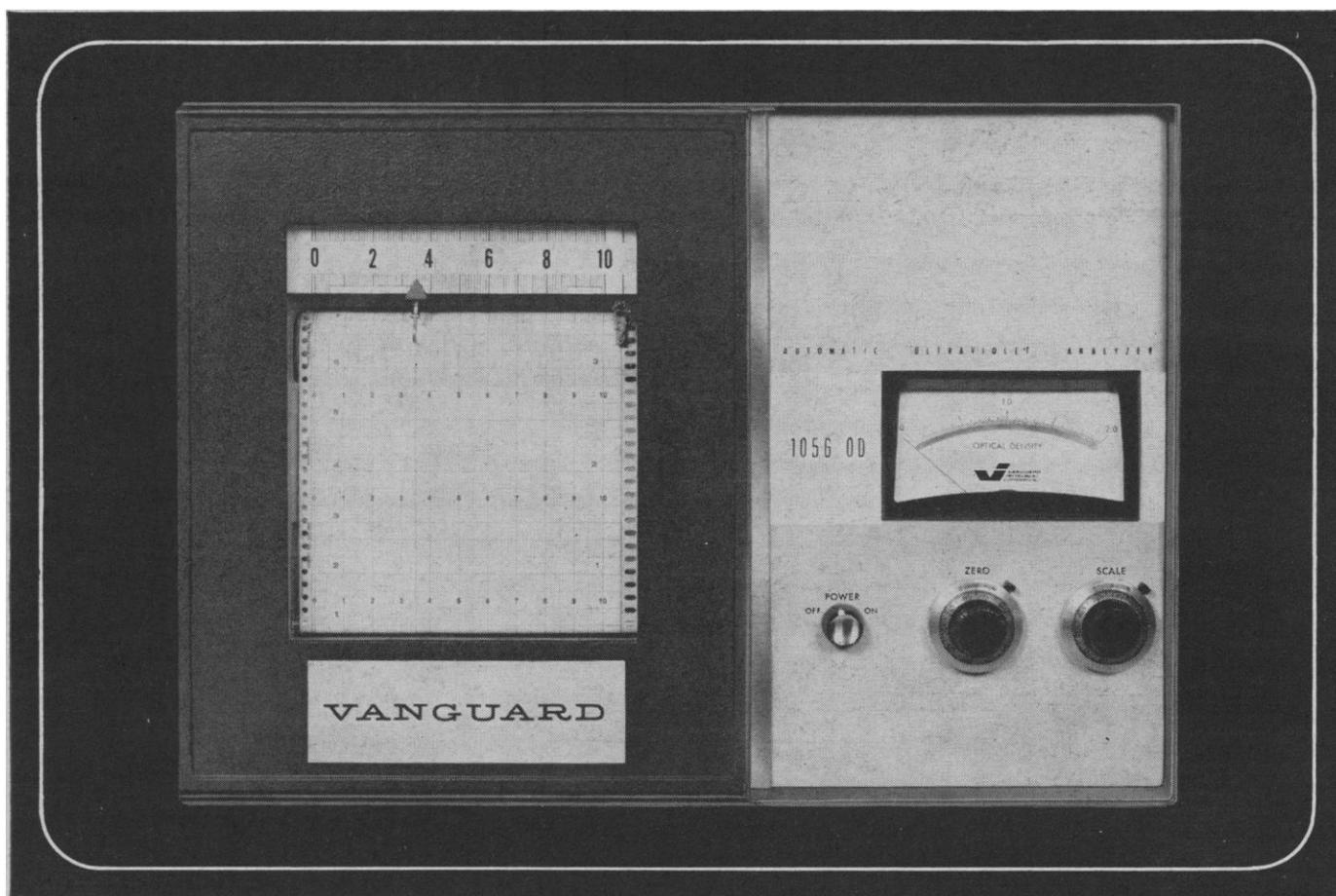
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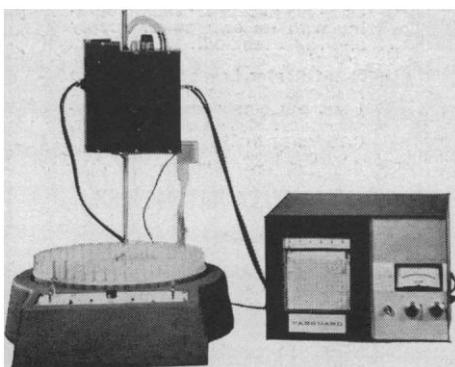
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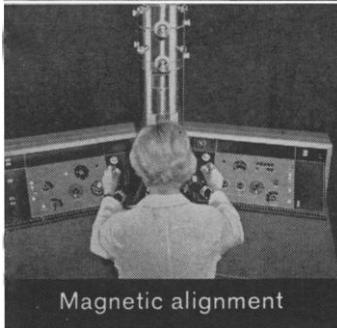
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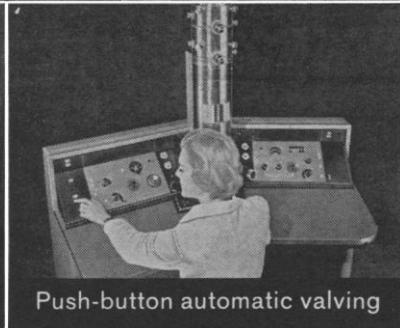
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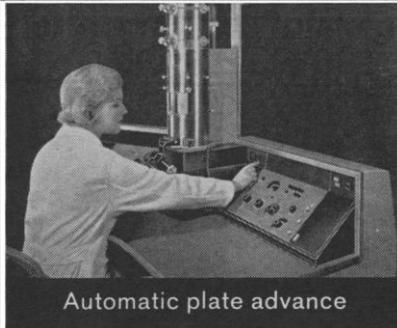
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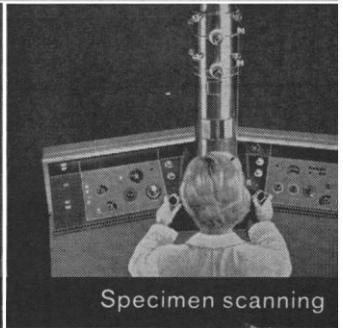
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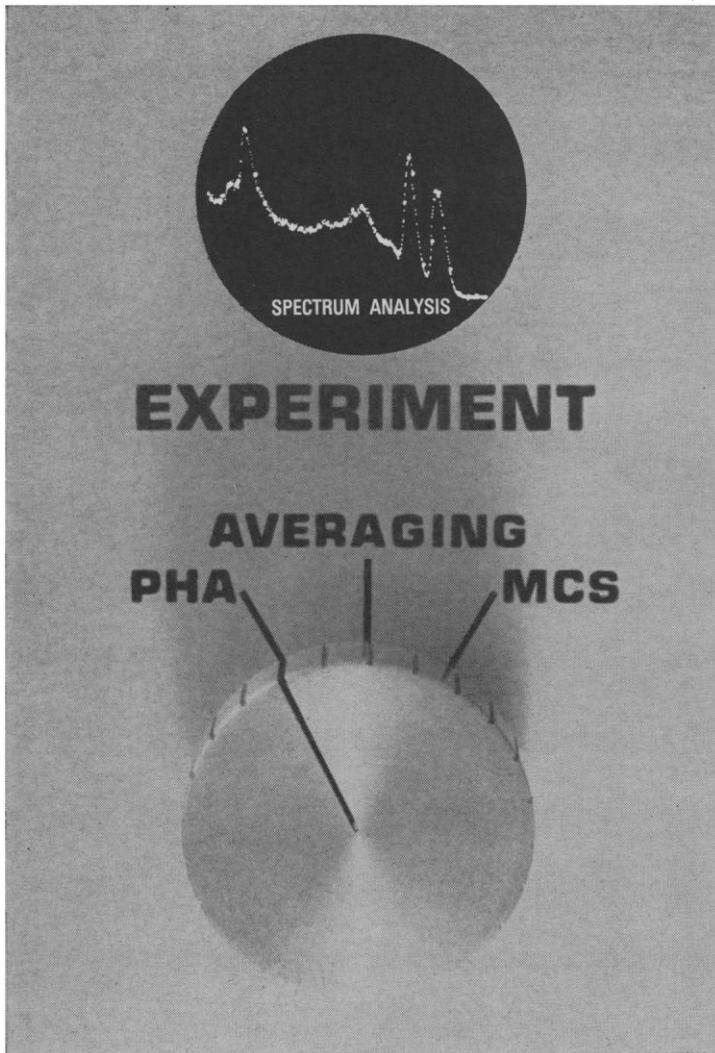
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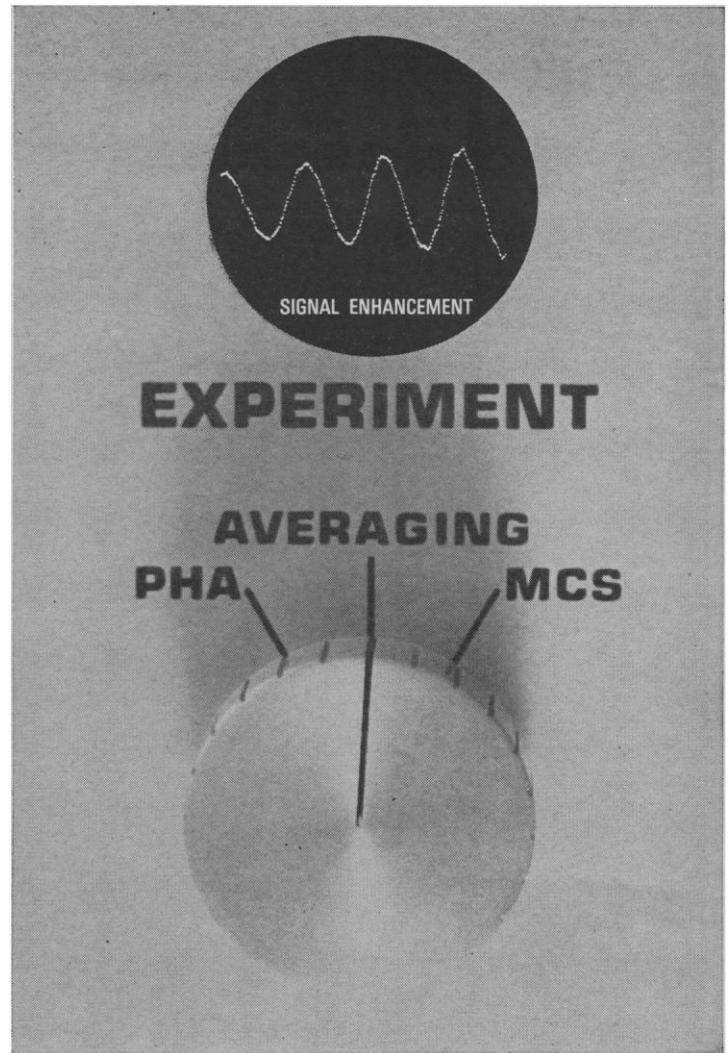


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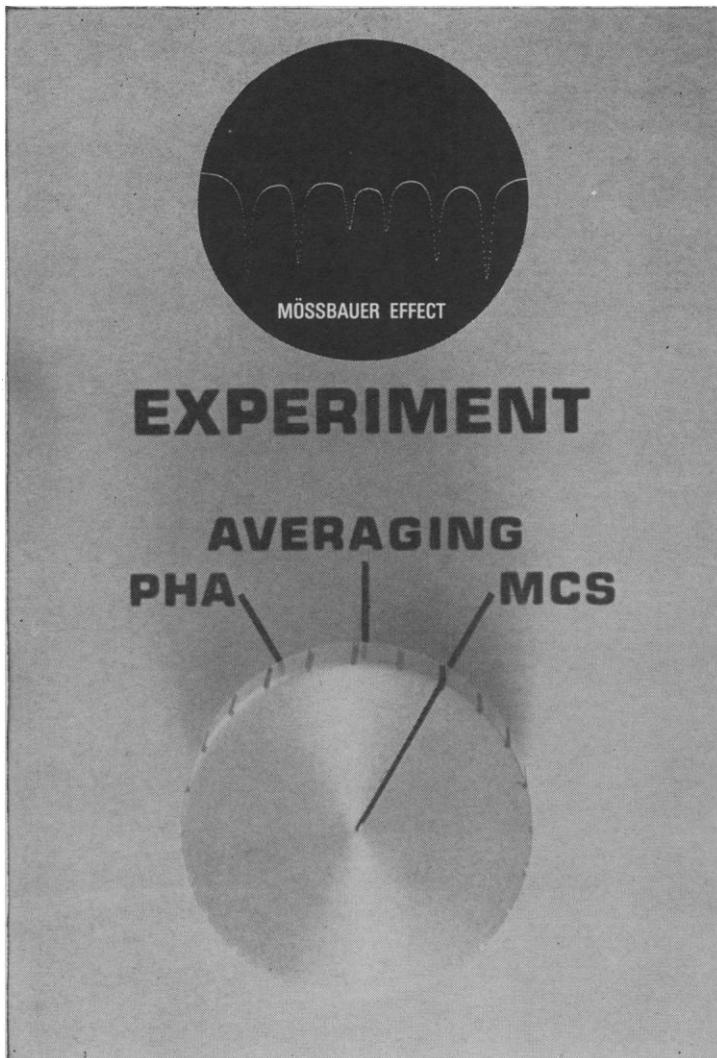


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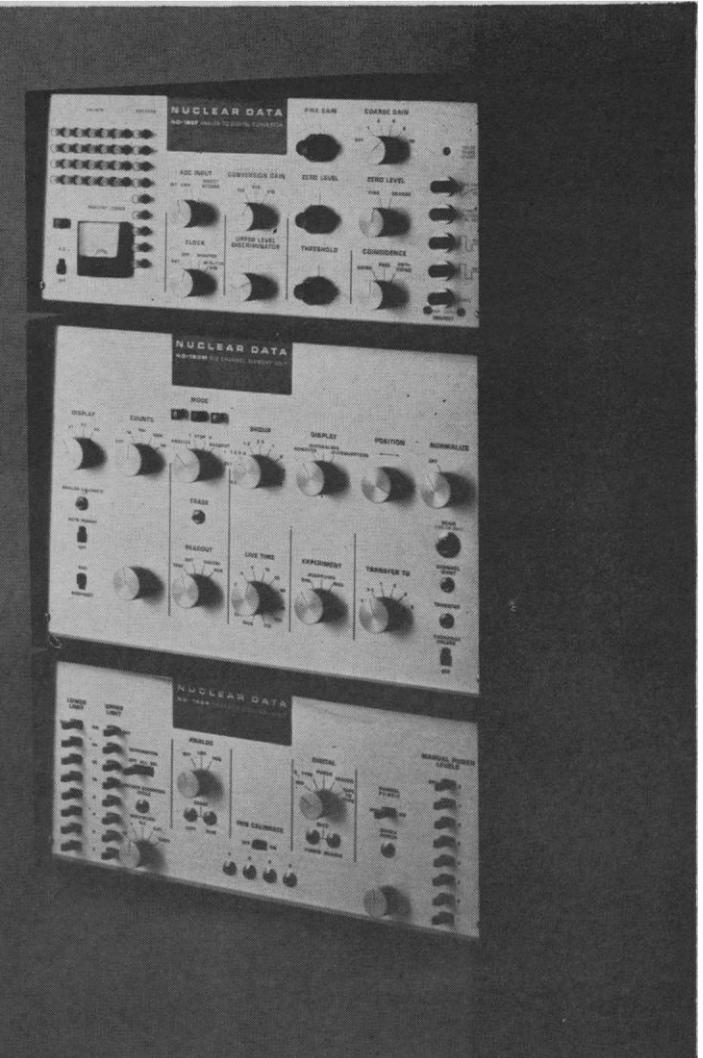


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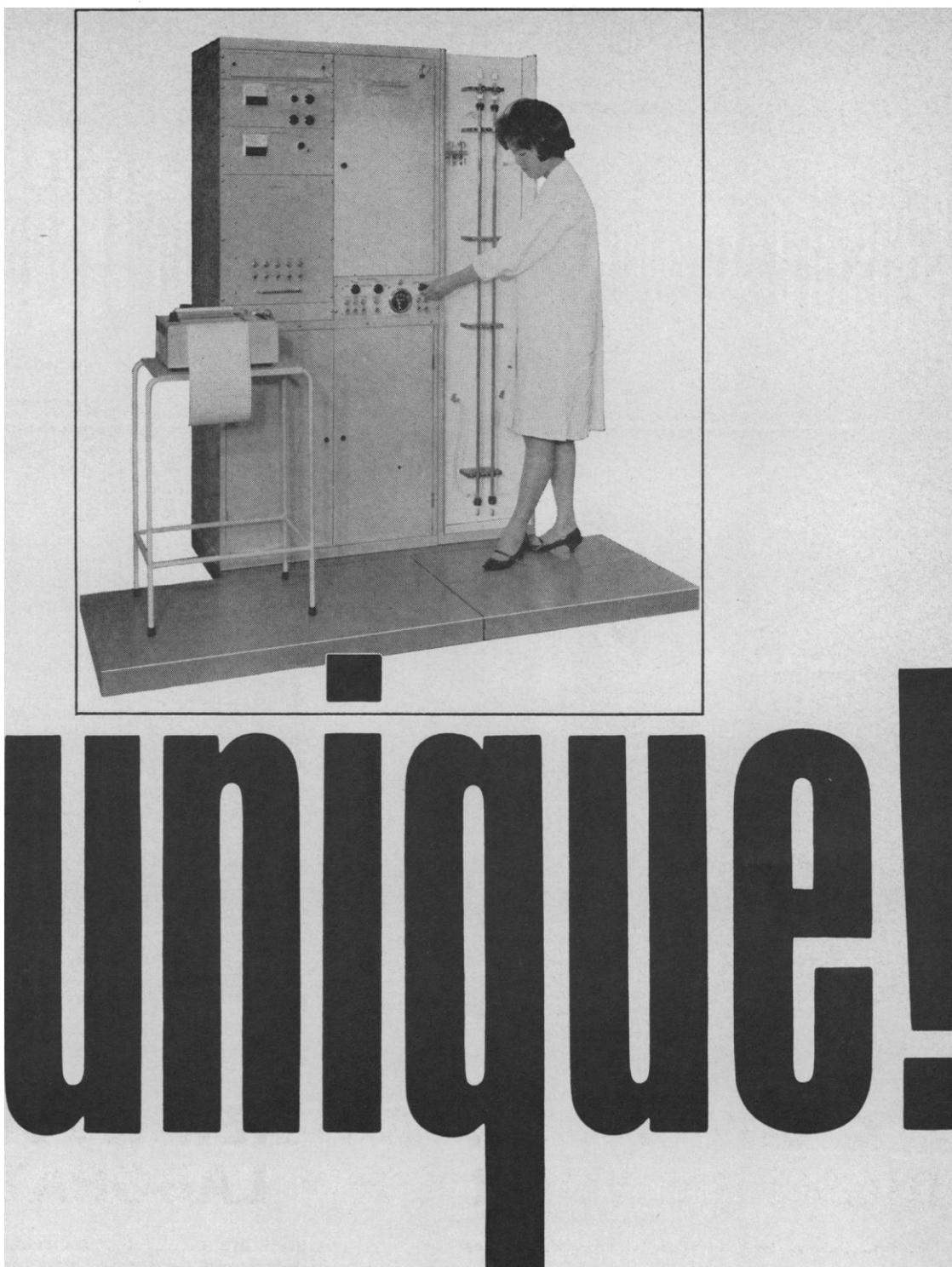
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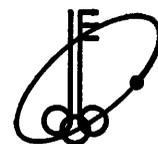
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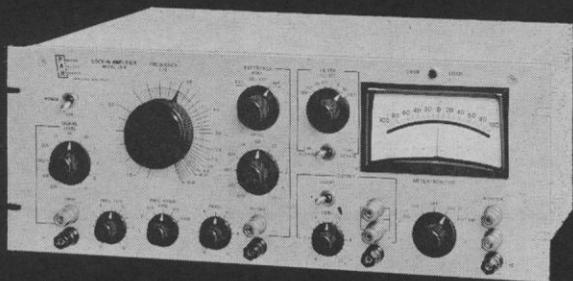
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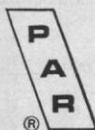
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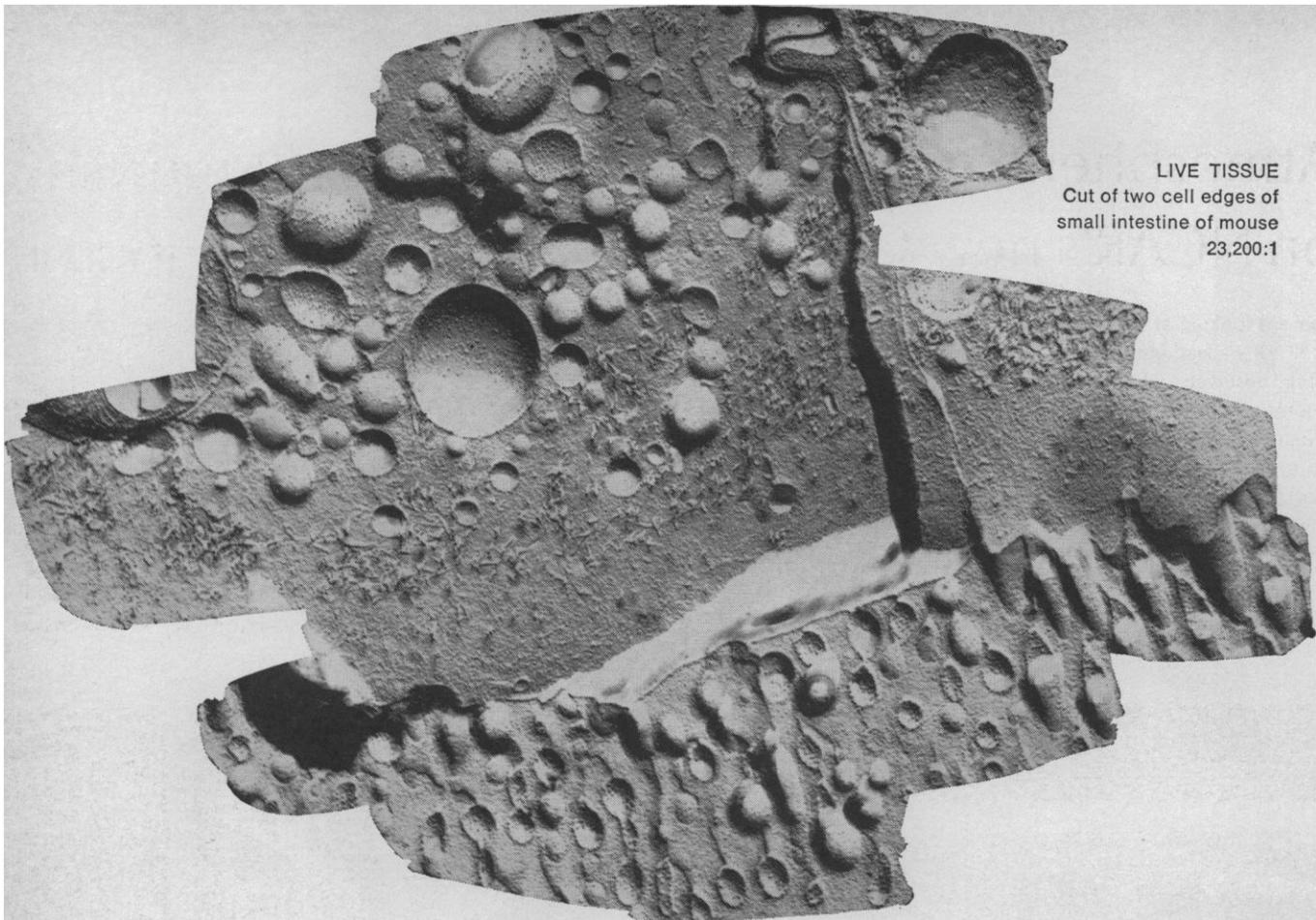
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Cut of two cell edges of  
small intestine of mouse  
23,200:1

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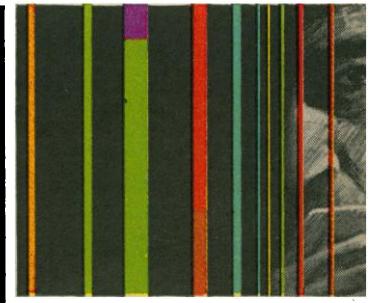
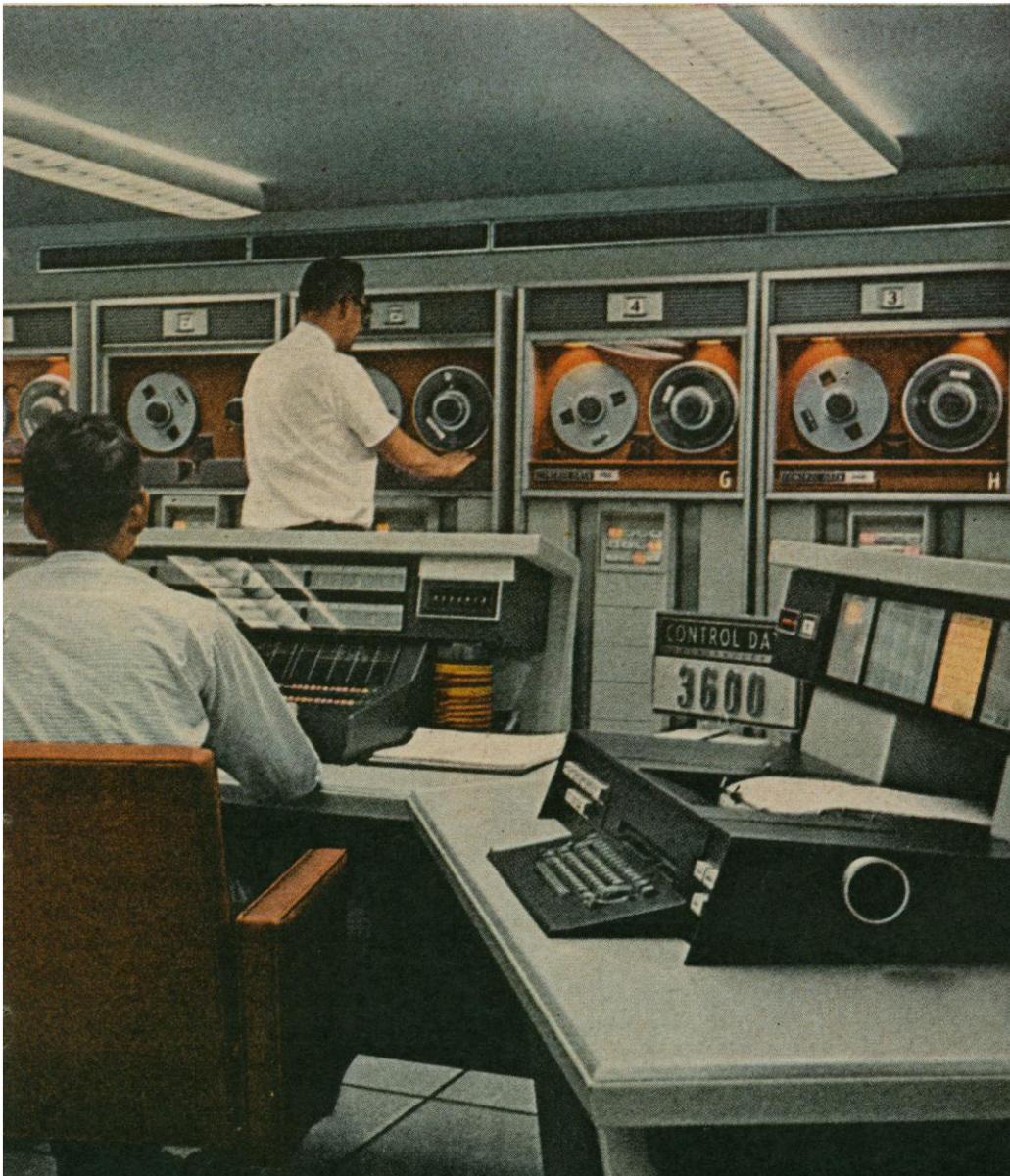
# Atmospheric models to undergo intensive studies on NCAR's new CONTROL DATA® 3600 computer

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.

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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
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- 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

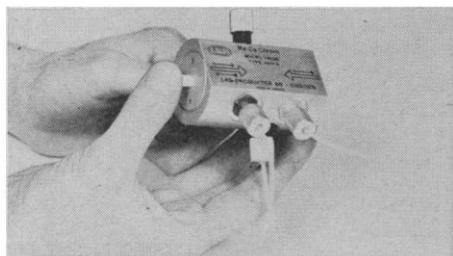
## NEW INSTRUMENTATION FOR A NEW TECHNIQUE\* IN CHROMATOGRAPHIC SEPARATION

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.

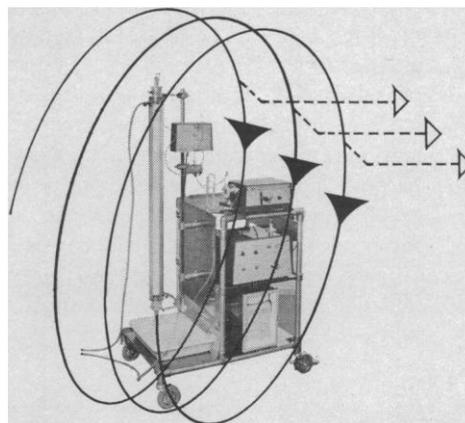
The apparatus is especially suitable for grading homologous series of polymers, e.g., dextrans; for routine control of the purity of biochemical preparations such as serum proteins, enzymes and hormones; and for separation of heat labile substances.

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-

\*According to J. Porath and H. Bennich



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



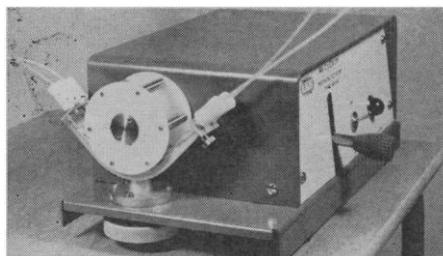
tions or for separation of peptides and amino acids from proteins, a sample of up to 150 ml is not unusual, whereas for purity controls of radioactively tagged concentrated preparations, quantities down to 1/100 of this volume are feasible. Sample application by pipette is eliminated. The pump sucks sample through a selector valve with a holdup of 150  $\mu$ 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 Peristaltic Pump has many other uses when not in service for the ReCyChrom.*



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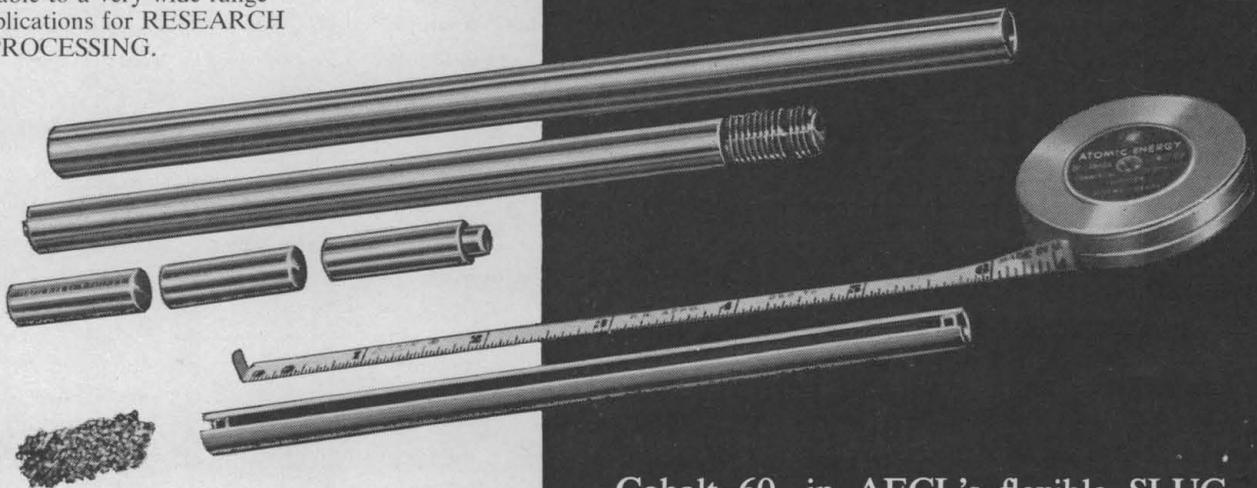
# Cobalt 60

*for use in  
RESEARCH and  
INDUSTRIAL PROCESSING*

AECL's versatile

## *weldcaps*

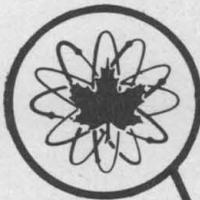
double-welded stainless steel capsules illustrated below, are adaptable to a very wide range of applications for RESEARCH and PROCESSING.



Cobalt 60, in AECL's flexible SLUG and PELLET forms, is available with activities from SEVEN to more than TWO HUNDRED CURIES per gram.

## **AECL's CONSULTING SERVICES**

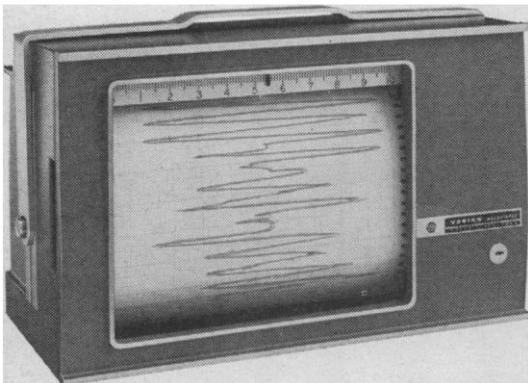
Unmatched experience with Cobalt 60 in research, industrial processing and in medicine, is available to you through



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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.

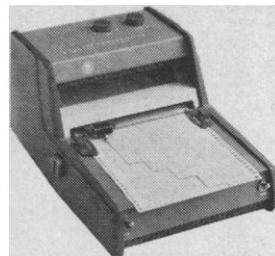
- **True differential input circuit** means you get both high input impedance and high common mode rejection. You can even operate them with unbalanced circuits.

- **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.



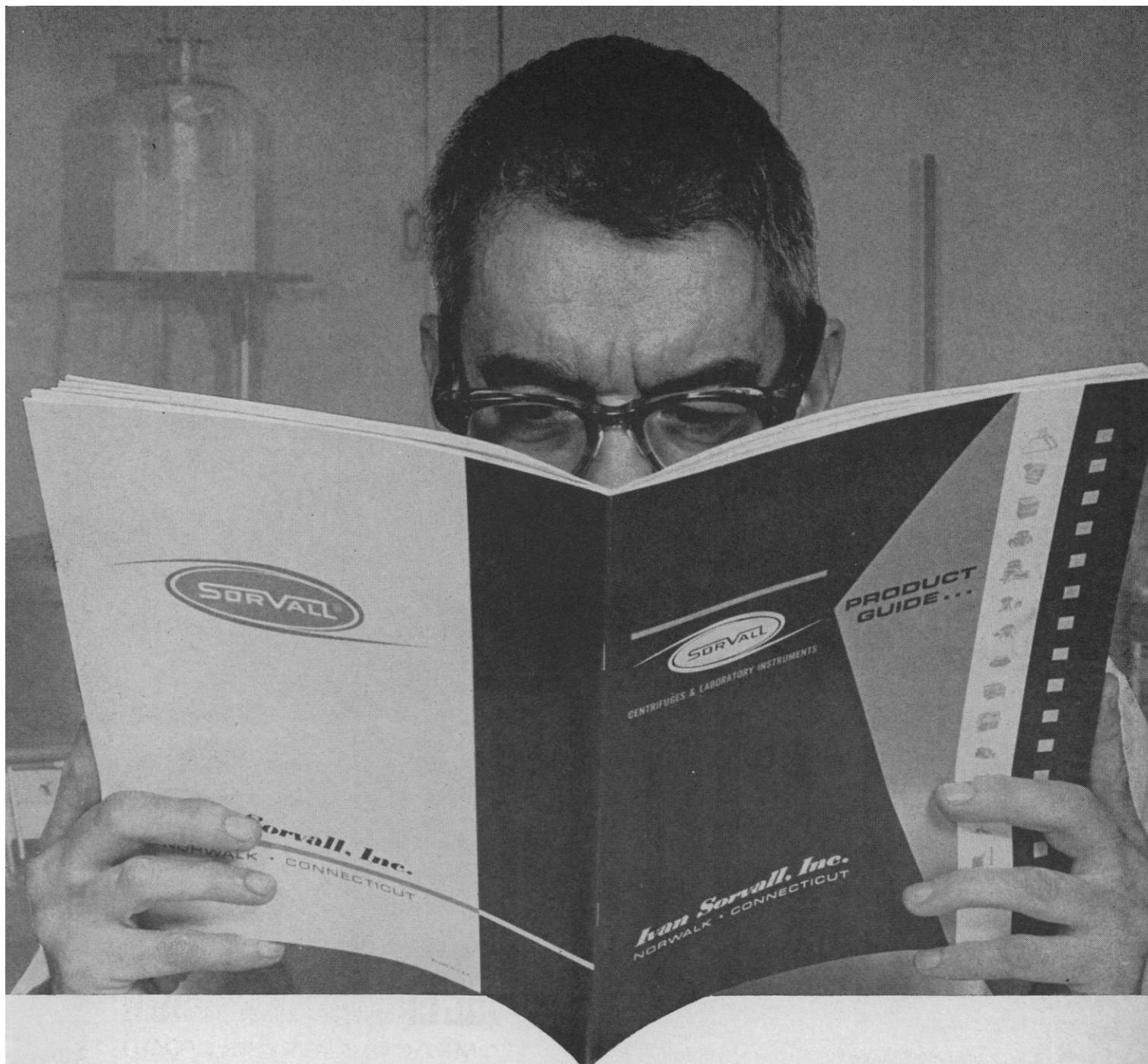
## DUAL CHANNEL RECORDER (COMPACT, PORTABLE, TOO!)

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  
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*In Europe contact Varian A. G., Zug, Switzerland*



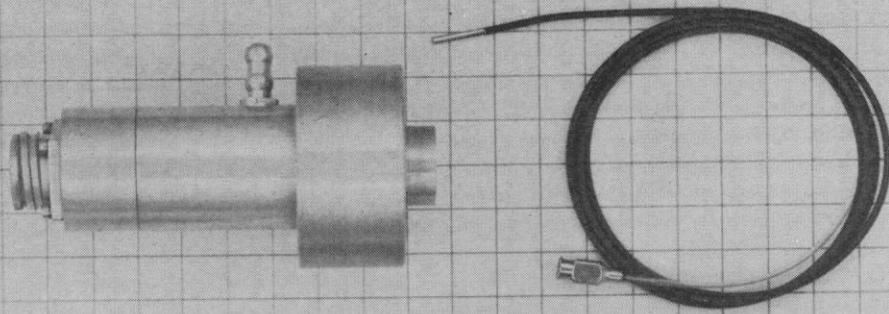
## GET THE INSIDE STORY FROM SORVALL!

Send today for our Product Guide to the world's finest laboratory centrifuges and specialized instruments.

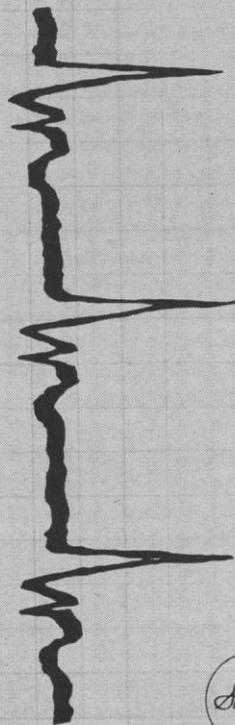
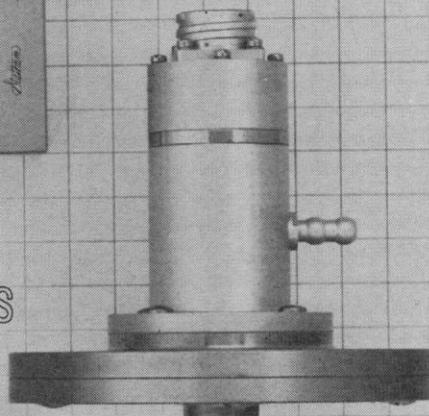
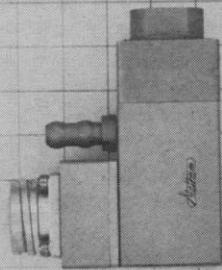
Our 20-page Product Guide is full of absorbing facts! It details and illustrates compact table-top centrifuges in the 3,300 x G (max.) range, refrigerated floor centrifuges offering 37,000 x G (max.), and automatic, superspeed, general-purpose, and tube-type continuous-flow bench and floor models. It 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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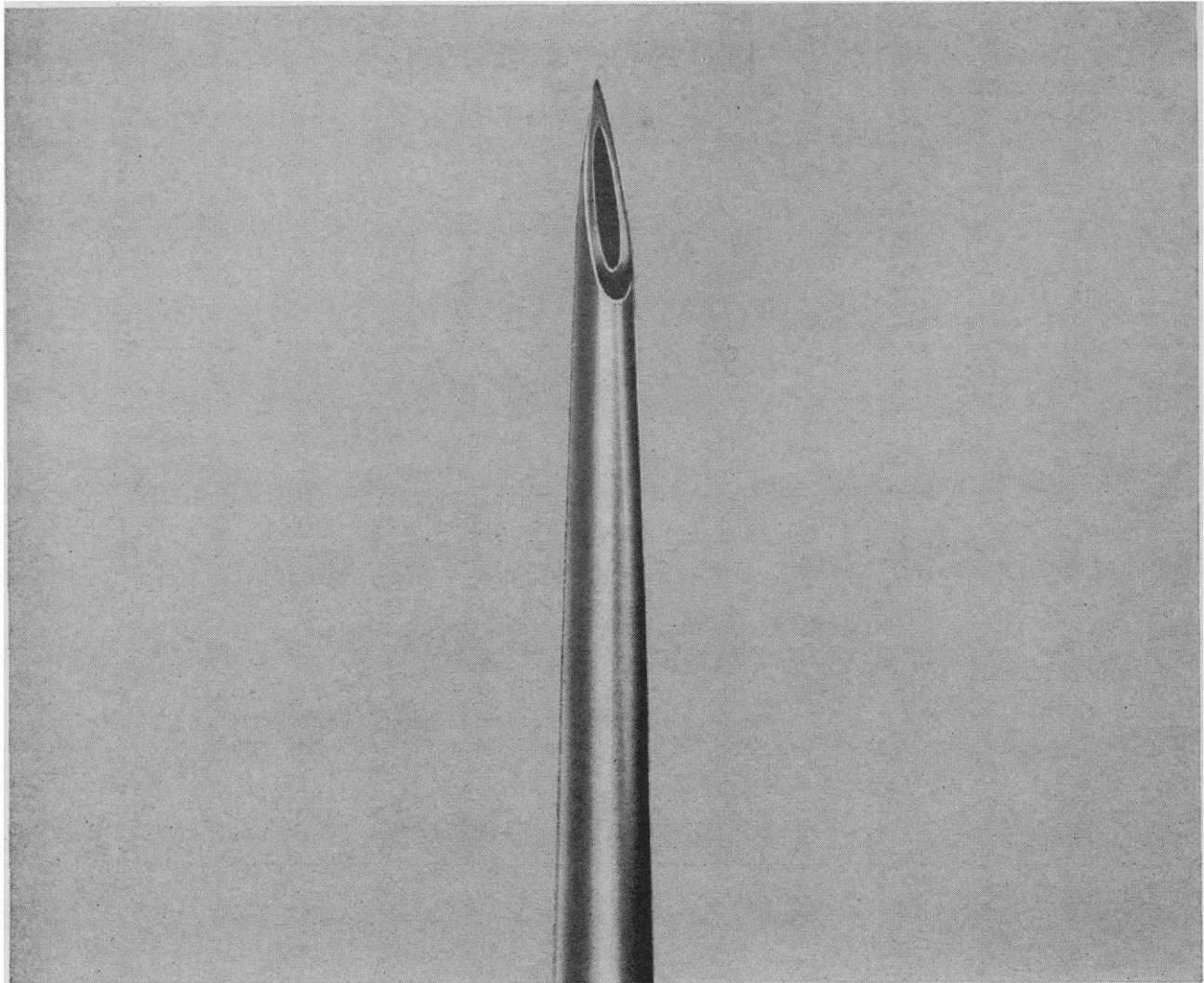
Several models of sensitive air pressure transducers are available for respiratory flow and plethysmography. For measuring cardiovascular pressures, Statham Model P23 transducers are the most widely accepted. Model SF1, an intracardiac strain gage type transducer, permits blood sampling and pressure measurement at the same location.

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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).

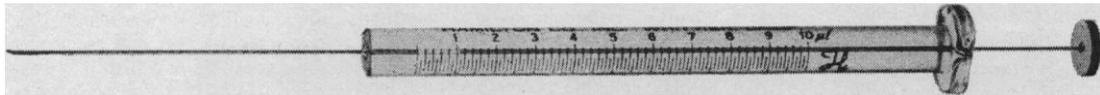


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Ease of septum penetration is the goal... strength is the requirement... this is the needle tip on a Hamilton Microliter 701N syringe. Start with 26 gage stainless steel specially drawn to an I.D. of .0045". Taper 3/16" of the tip electrolytically 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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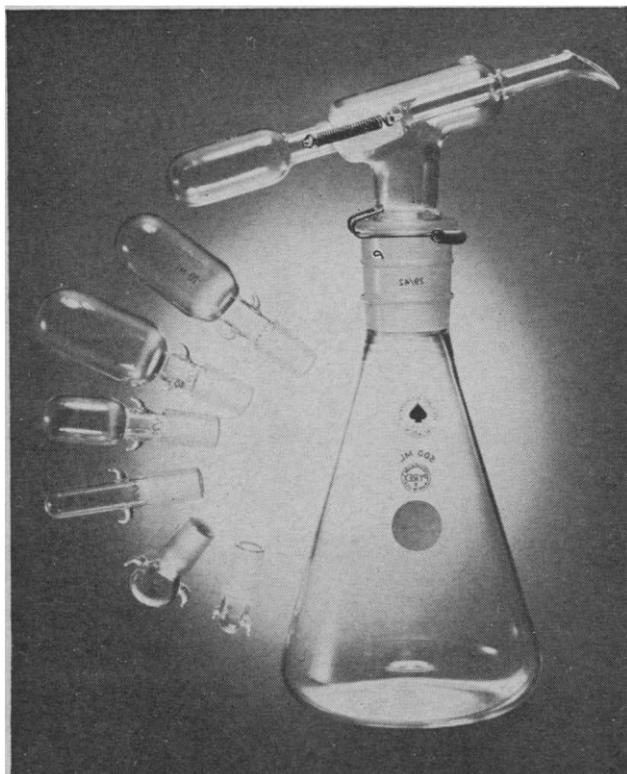


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Combines the light weight the impact and shatter resistance of plastic with the transparency of glass.

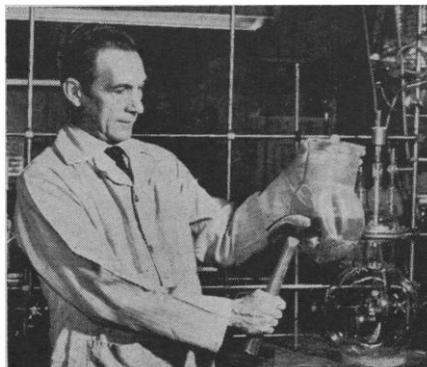


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For complete line of Ace gauges, see Ace Catalog 60.

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



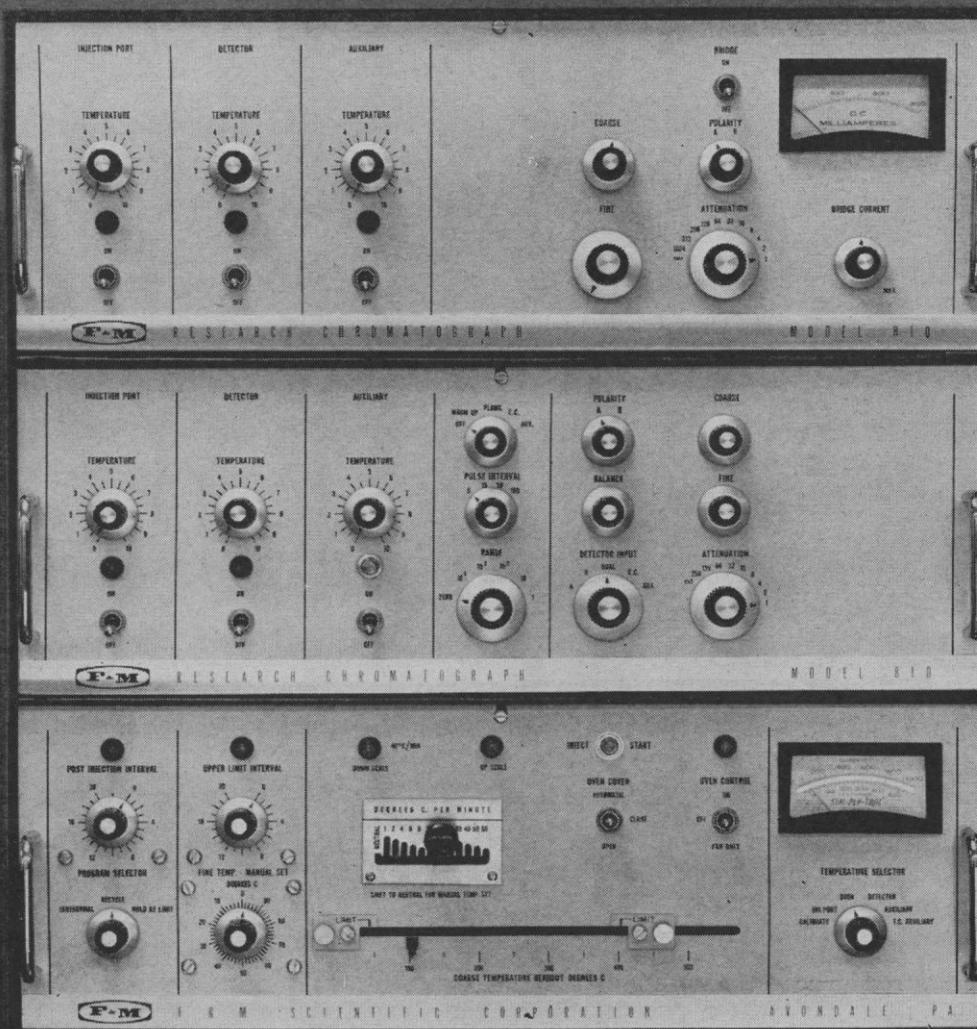
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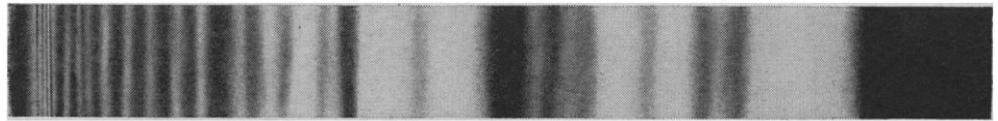


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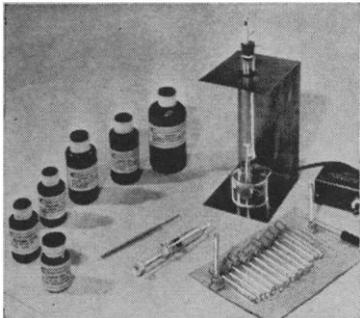
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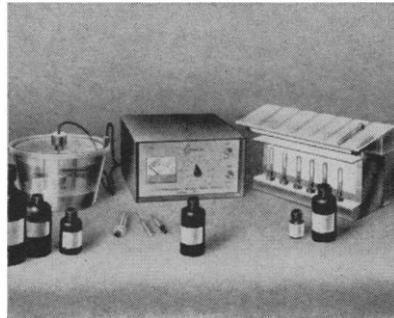
(patents pending)



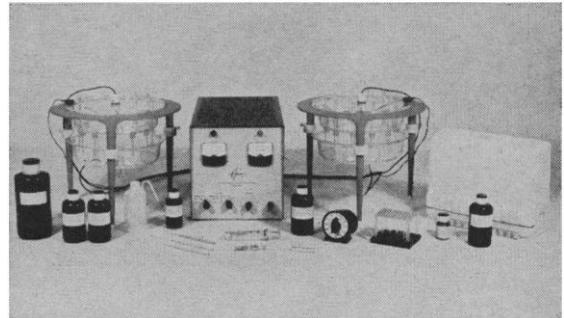
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**Trial Kit, with Power Source 150** for the student or occasional user. Runs one sample at a time. Price in U.S.A. \$69.\*



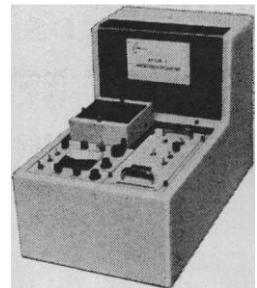
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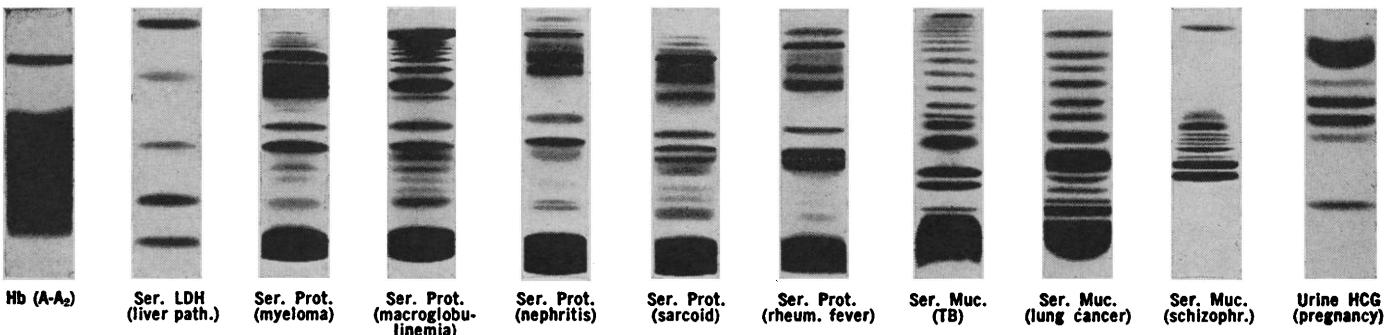
**The Model 12, with Power Sources 300 or 1400** (as shown) for the busy researcher or high-volume clinical laboratory. Runs 12-36 samples at a time. Prices in U.S.A. from \$1080.\*

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.

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Model E  
Microdensitometer

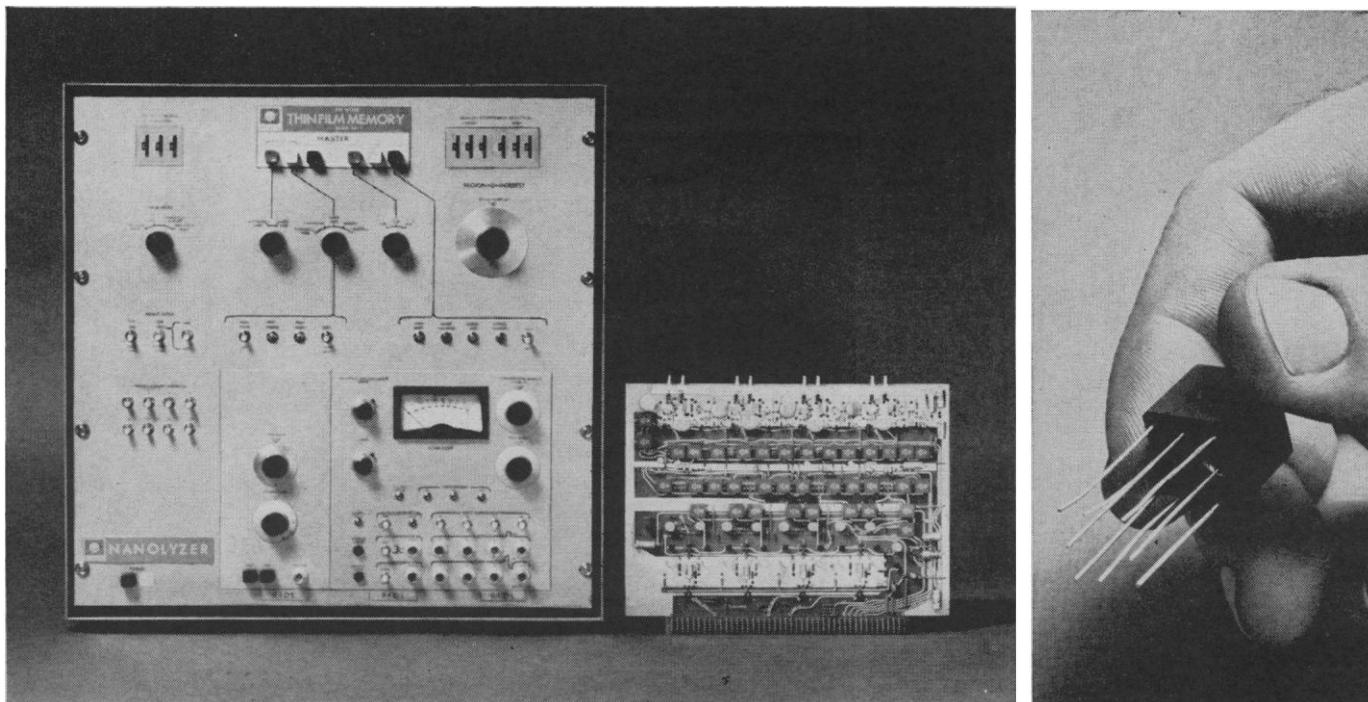


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\*Export prices on request

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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-

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Important and unique features of the Nanolyzer follow:

**THIN-FILM MEMORY:** Memory cycle time of 0.6  $\mu$ 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.

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**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.

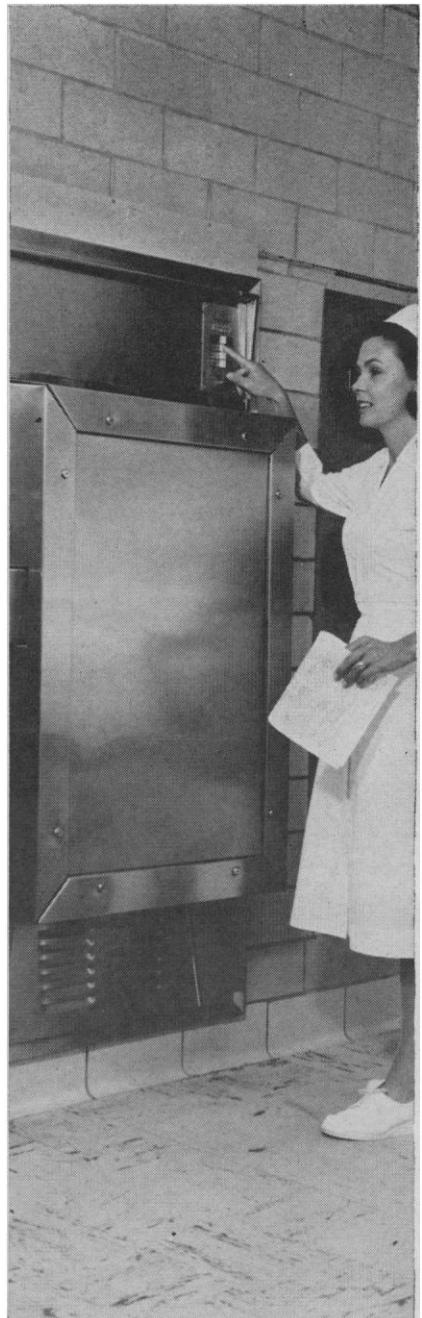
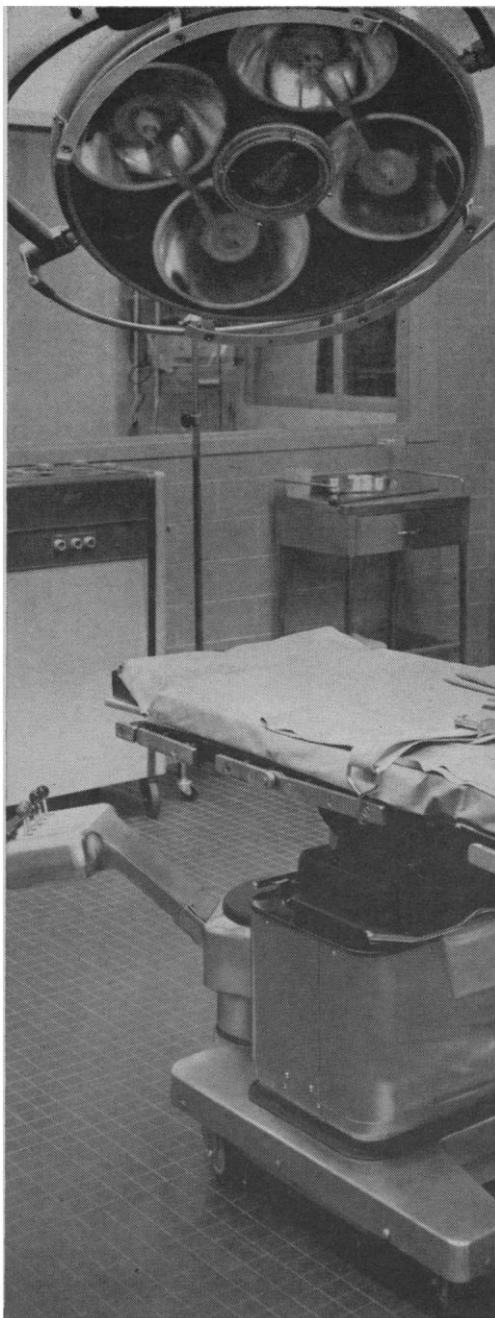
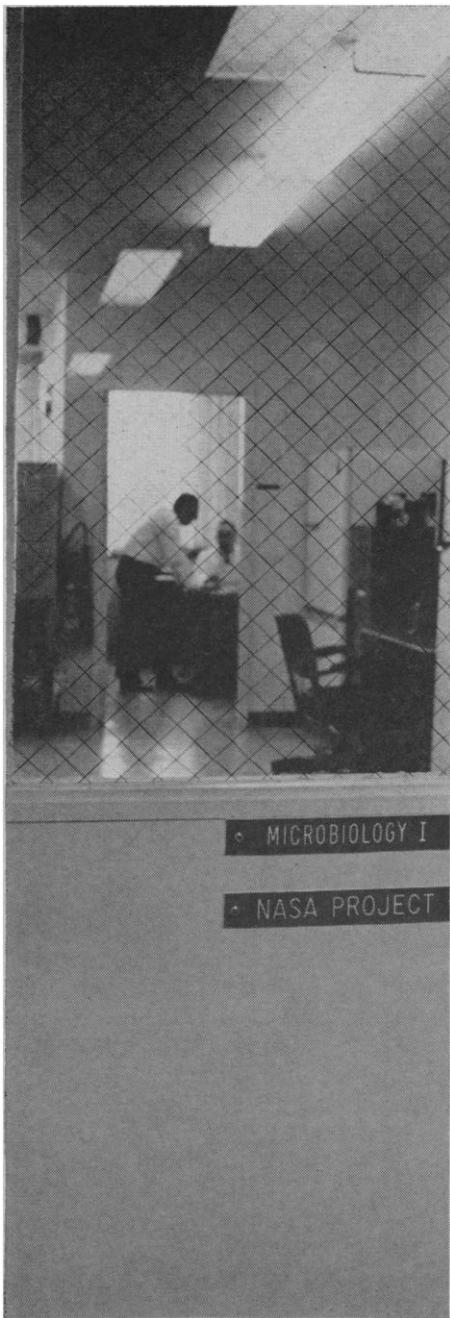
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# What every Ph.D. should know about cage sanitation:

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.

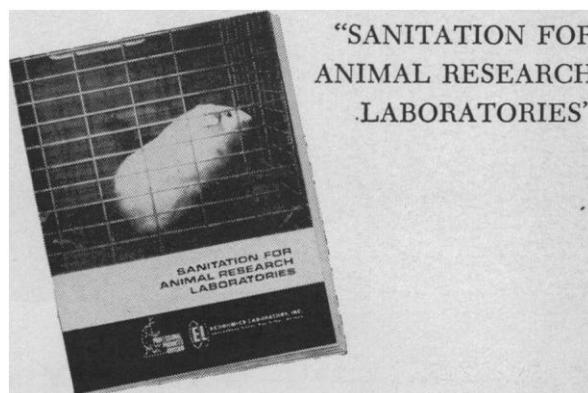
But now, a new Economics Laboratory defoaming agent built into two detergents *completely eliminates foam*, enabling you to eliminate this major cause of unsanitary conditions. It's called EL F-58, and it may mean the difference between success and failure in your next experimental operation. It is now 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,



**E ECONOMICS LABORATORY, INC.**

Economics Laboratory, Inc., Dept. 142-D  
250 Park Ave., N.Y., N.Y. 10017

Please send free copy of new manual immediately.  
 Have my local EL Sanitation Expert phone for an appointment.

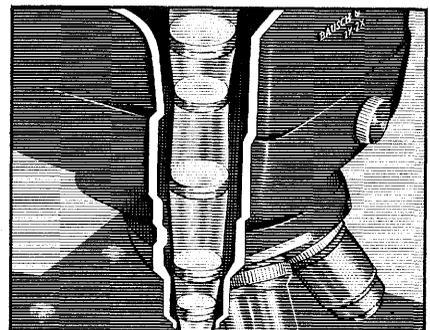
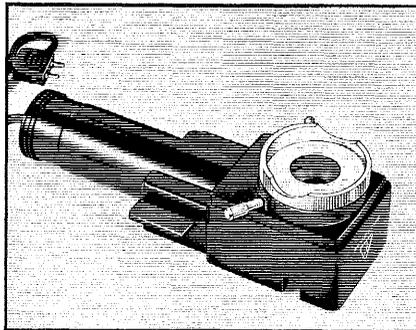
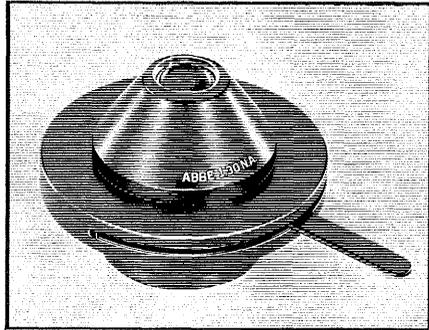
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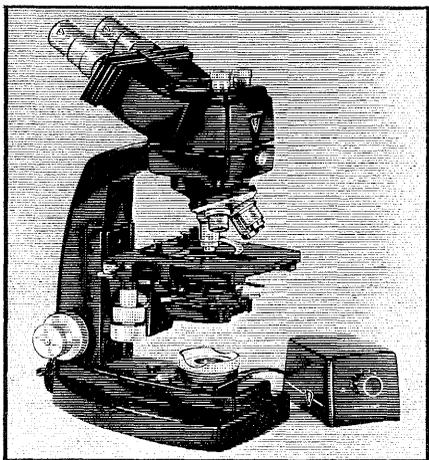
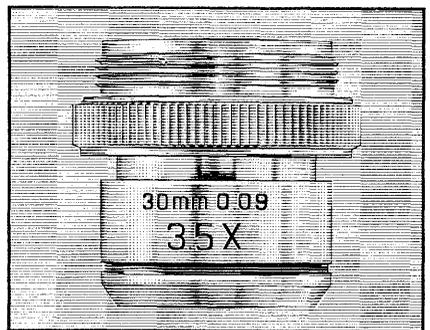
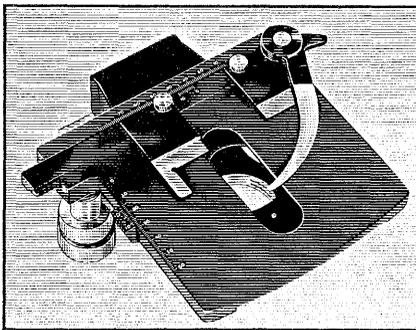
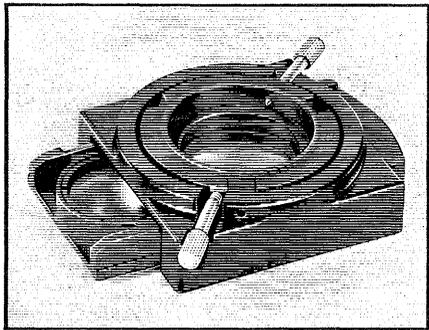
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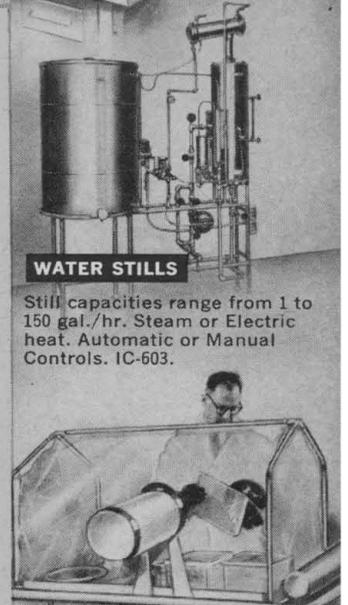
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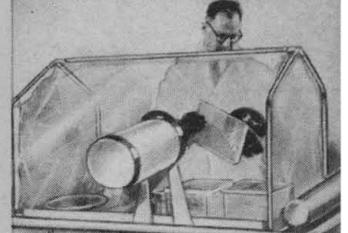
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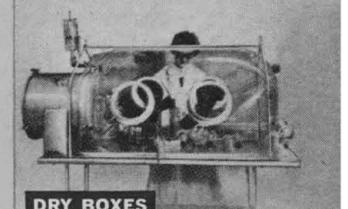
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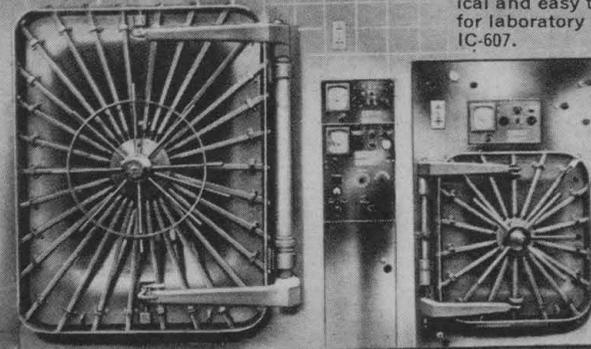
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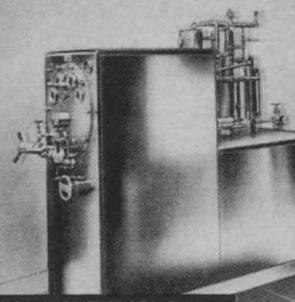
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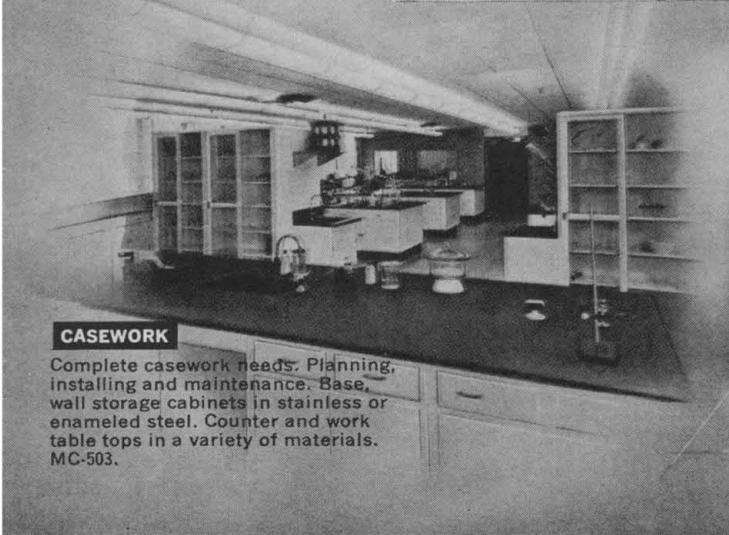


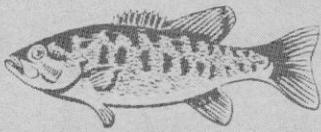
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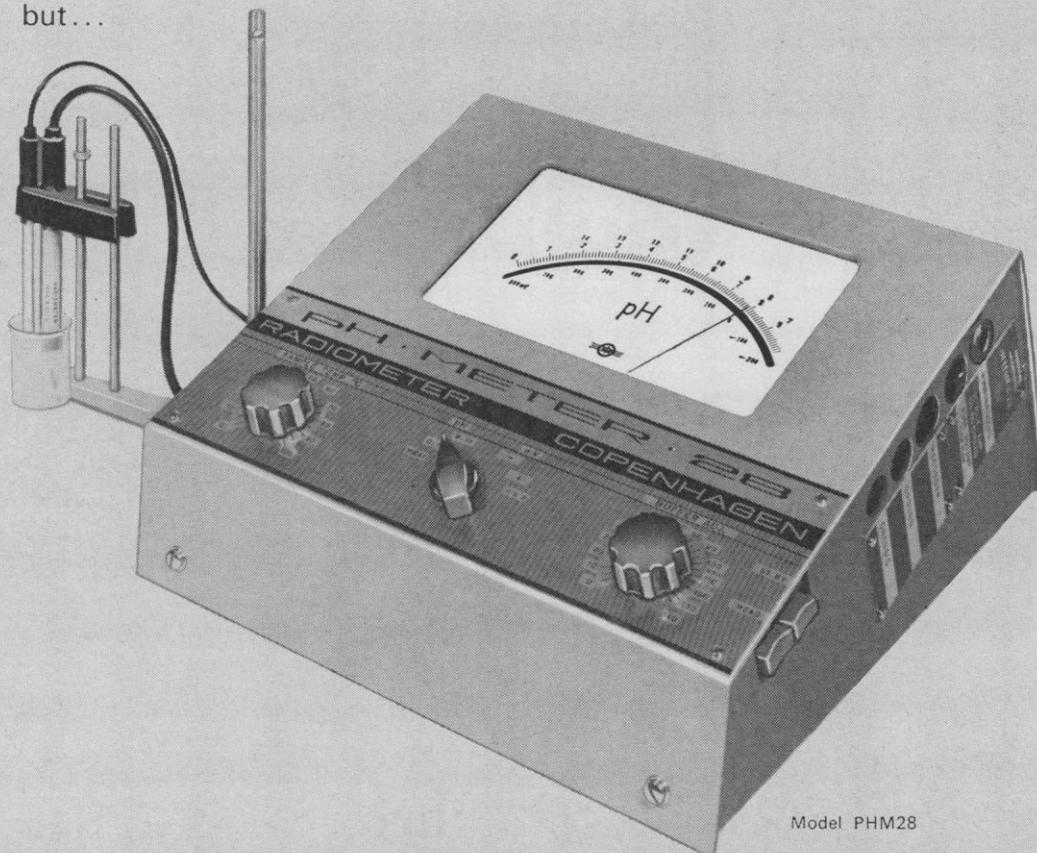
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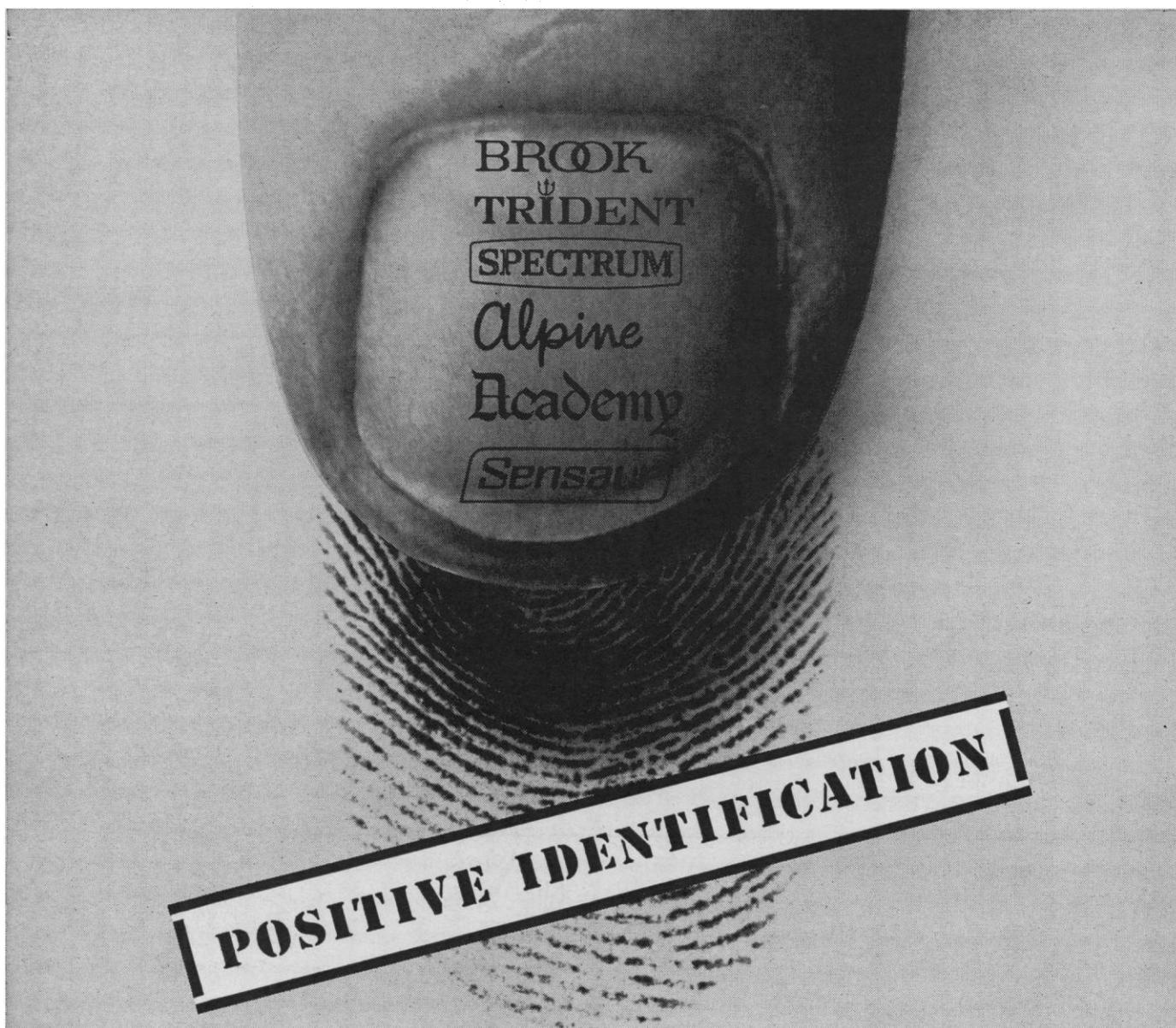
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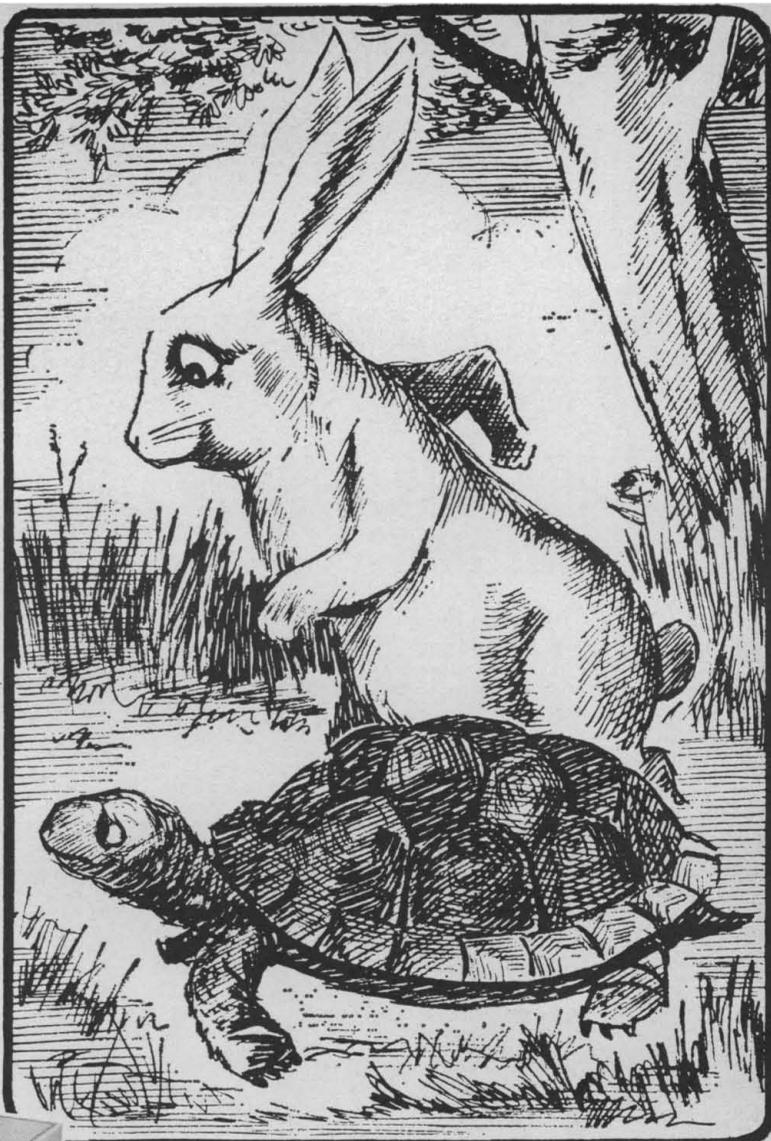
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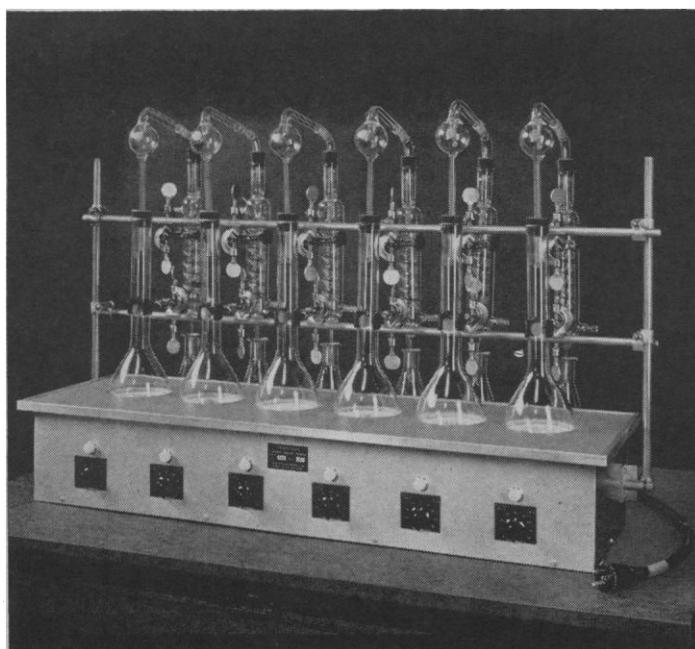
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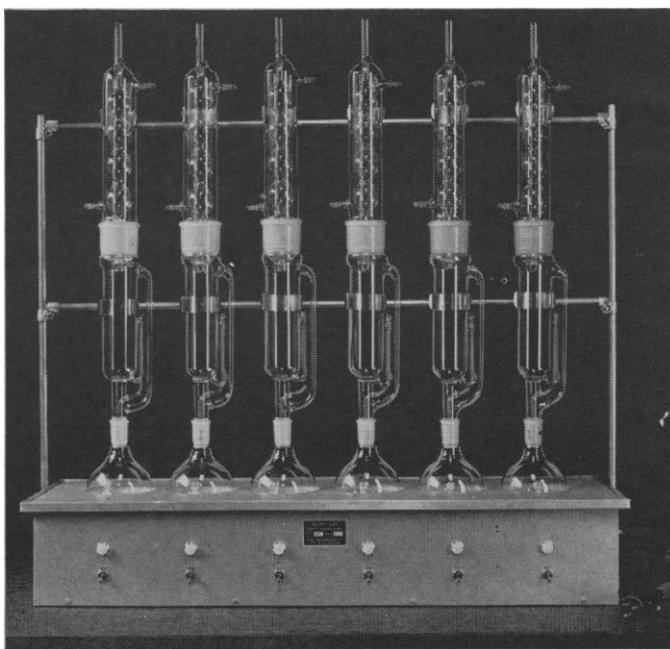
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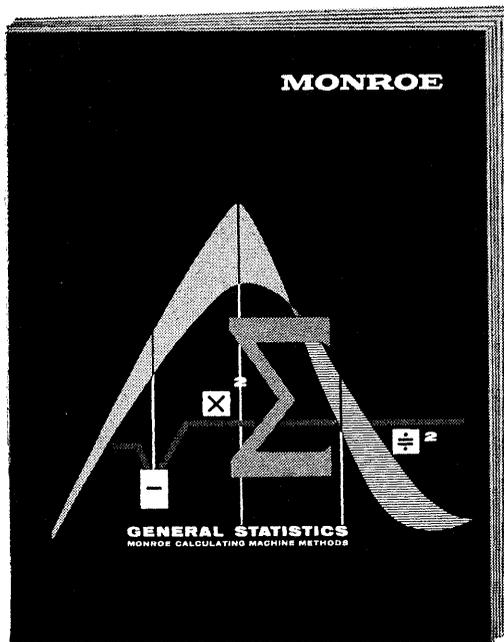


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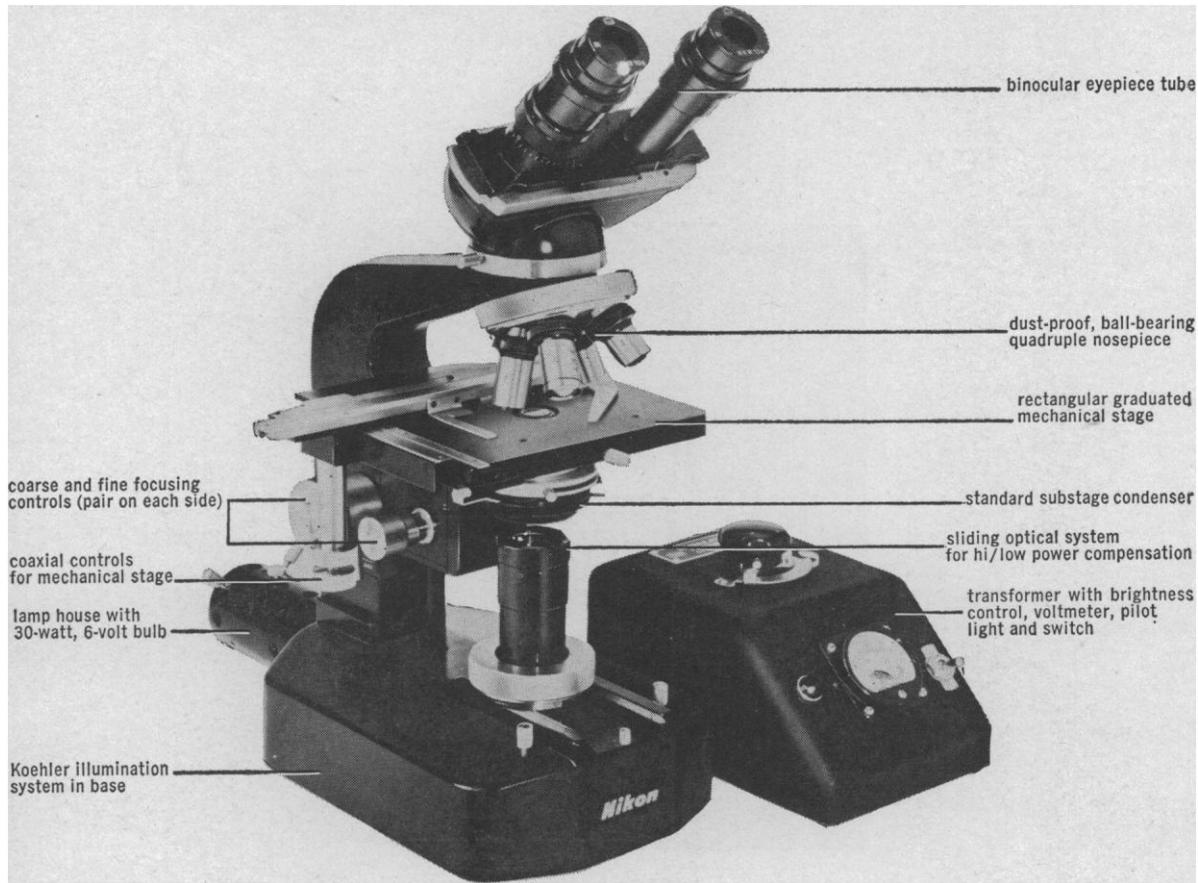


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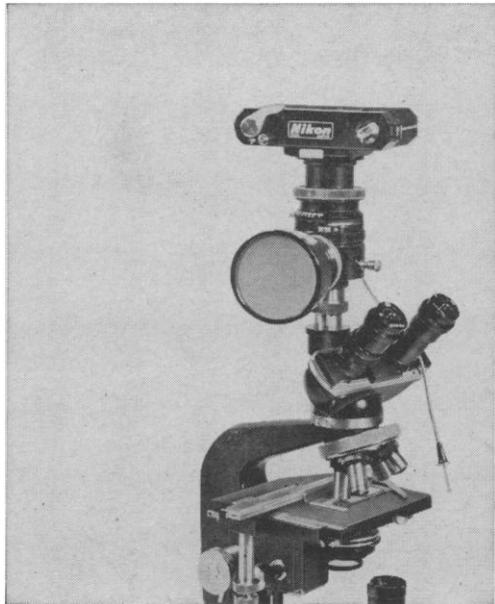
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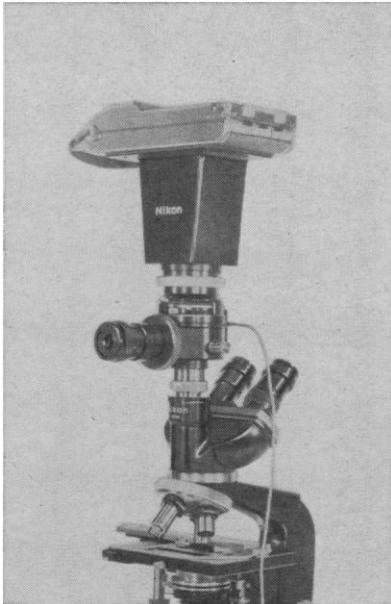
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Nikon S-Ke demonstrations will be cheerfully arranged, on request. For complete details and specifications, write Dept. S-10

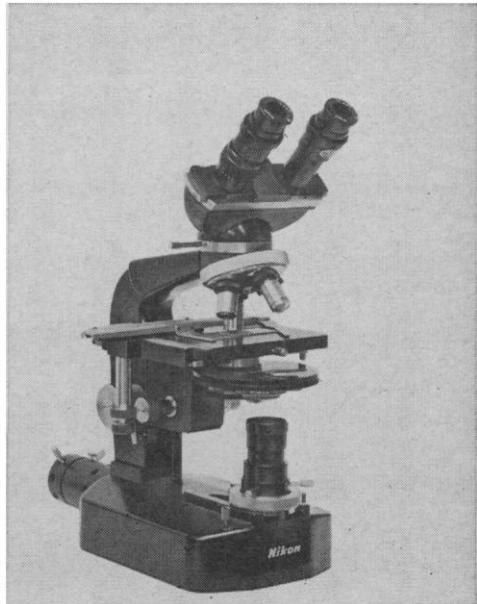
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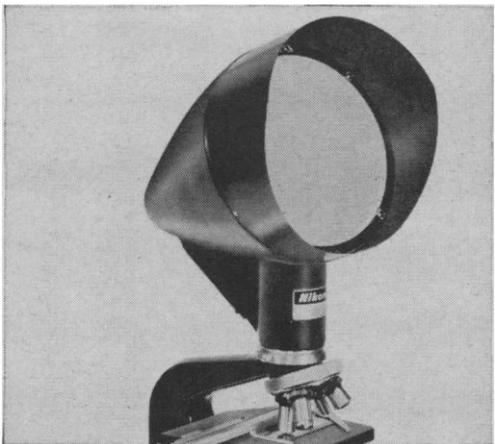
S-Ke equipped with trinocular head, Microflex and M-35 camera body for 35mm photomicrography



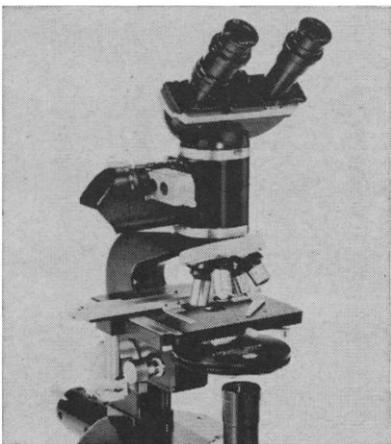
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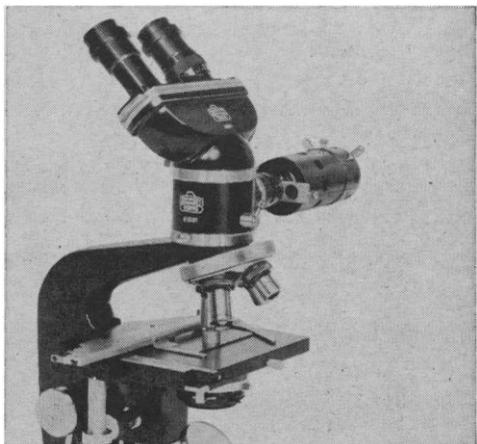
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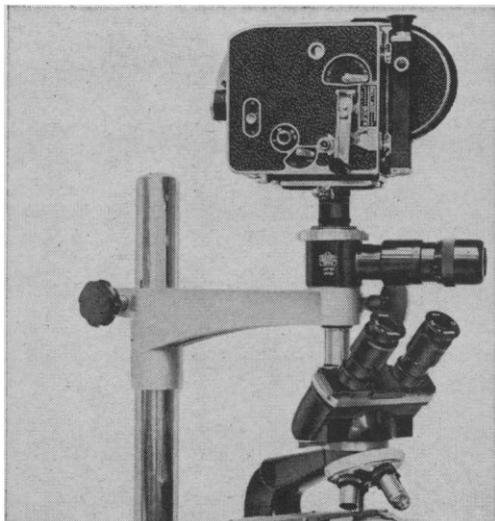


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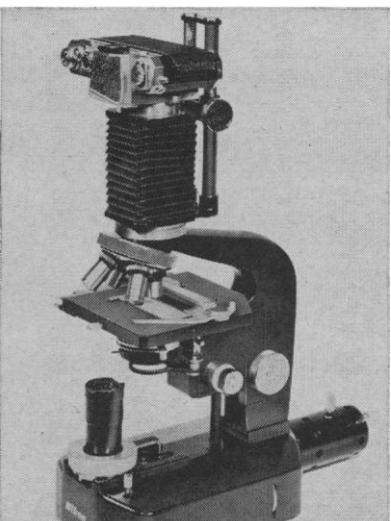


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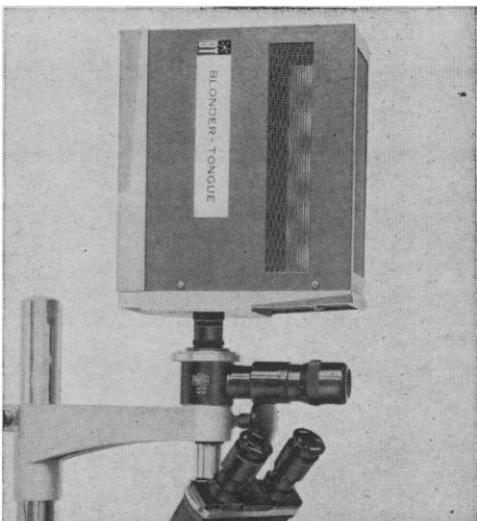
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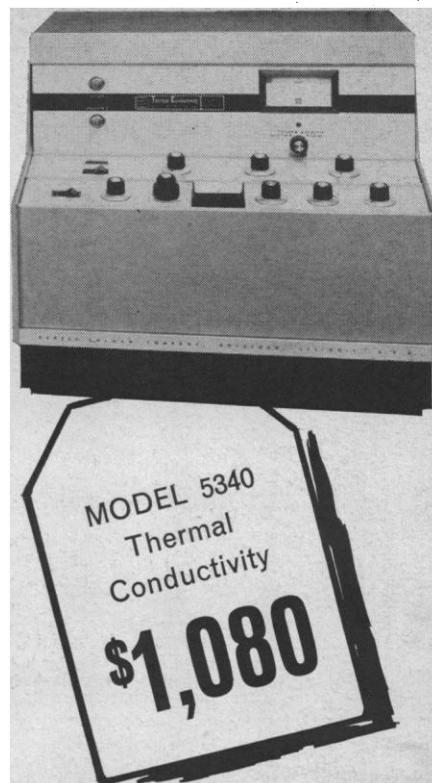
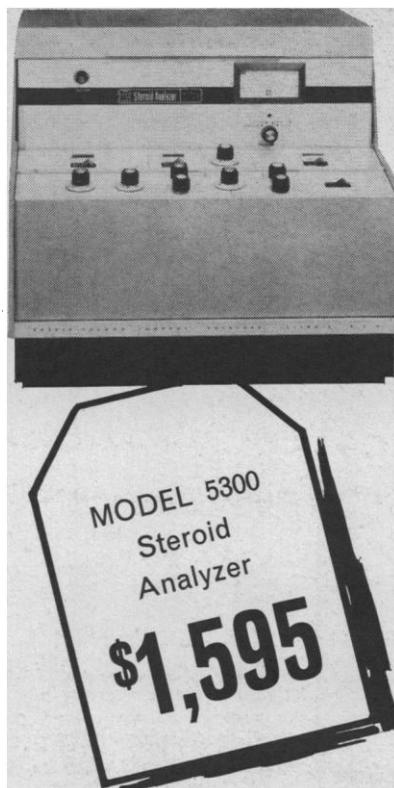
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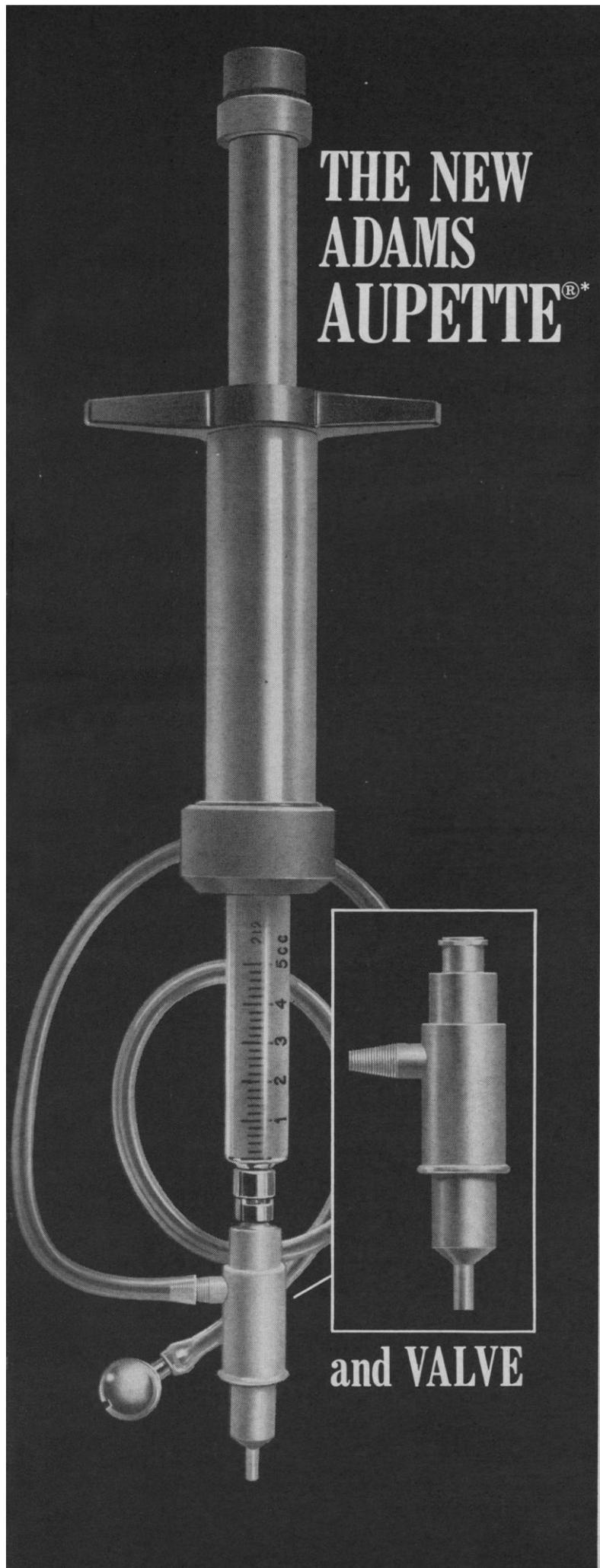
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Physically, the MP-3 is a rigid stand on a laminated wood base. A counter-balanced camera body rides easily up and down the stand and swings to a horizontal position for bigger work mounted on a wall. Prepositioned floodlights illuminate regular size work on the base.

Optically, the MP-3 is even more sophisticated. You can work with four inter-

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.

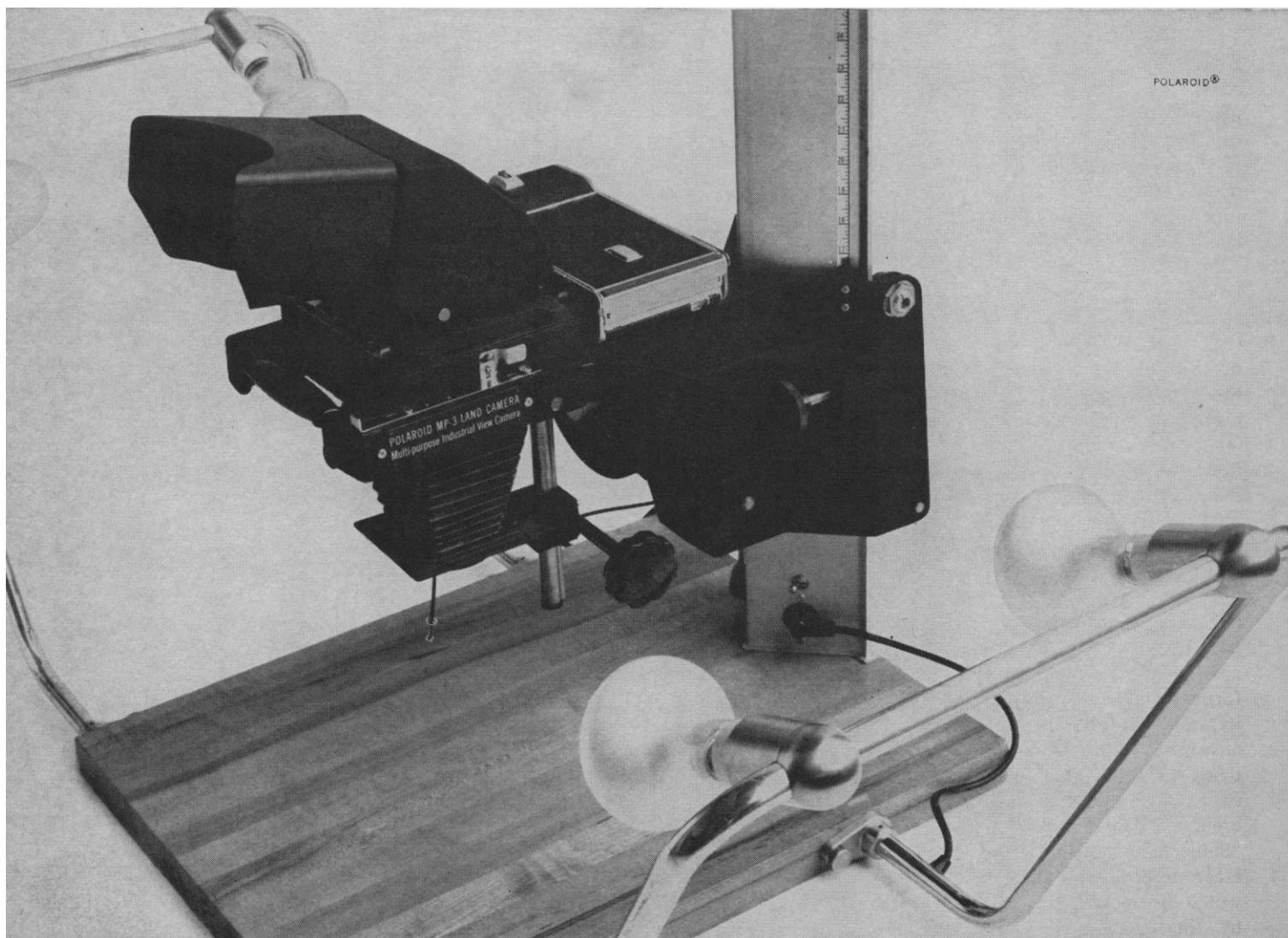
But it's the film systems that give the MP-3 such speed and versatility. It uses thirteen different Polaroid Land films plus conventional 4x5 b&w and color films.

Many jobs call for just a print. You can get a black and white in 10 seconds with 3 1/4 x 4 1/4 roll film or three speeds of 4 x 5 film (one is A.S.A. 3,200!). And full color prints in 60 seconds are now available. If you need a negative to work with, another 4 x 5 Polaroid Land Film will supply a fully developed fine-grain negative and a matching positive print, in just 20 seconds.

Then there are two kinds of transparency film (one for line work, one for continuous tone) which can be mounted and ready for projection in seconds. And, you can use any conventional 4 x 5 black & white or color film.

The MP-3 is a precision instrument. It can meet the demands of skilled professional photographers. It is also an extremely simple camera to use. Inexperienced personnel can easily use it to record results of their regular work.

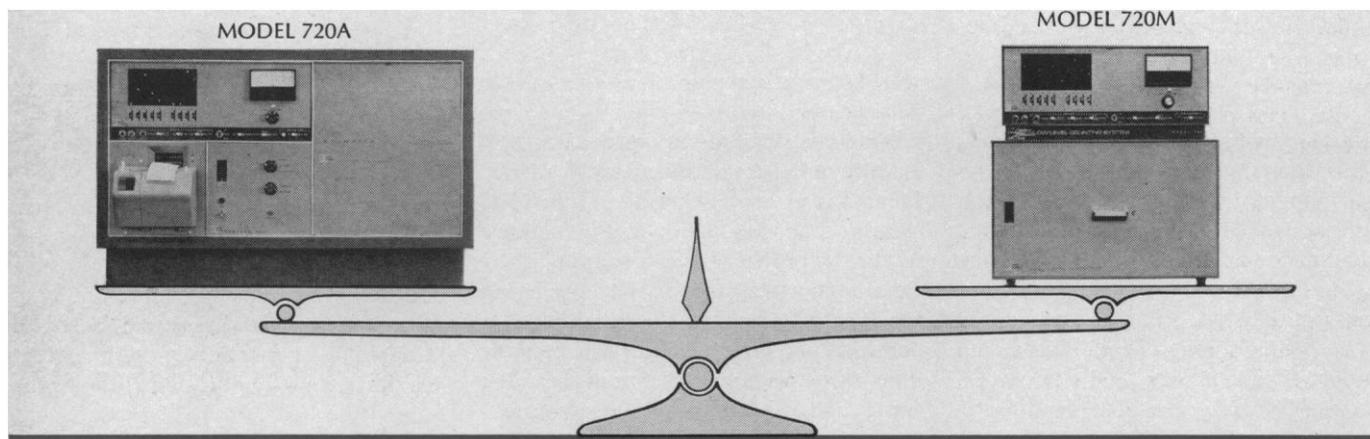
More details on this new camera are contained in our free, 8-page brochure, which we'll be happy to send you. Even if you are satisfied with your present photographic set-up, it makes fascinating reading. Write: Technical Sales Dept., Polaroid Corp., Cambridge 39, Mass. Today.



**This is the closest anybody's come to an "ideal" industrial camera.**

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The 720A Automatic Low Level Counting System has a capacity of 100 planchets up to 2" in diameter. The automatic changer can be programmed to count on a single sample or continuous-run basis.

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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 Radiophysics 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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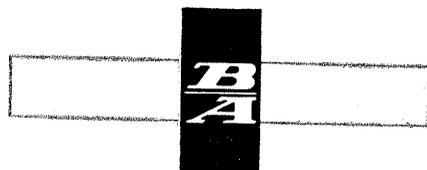
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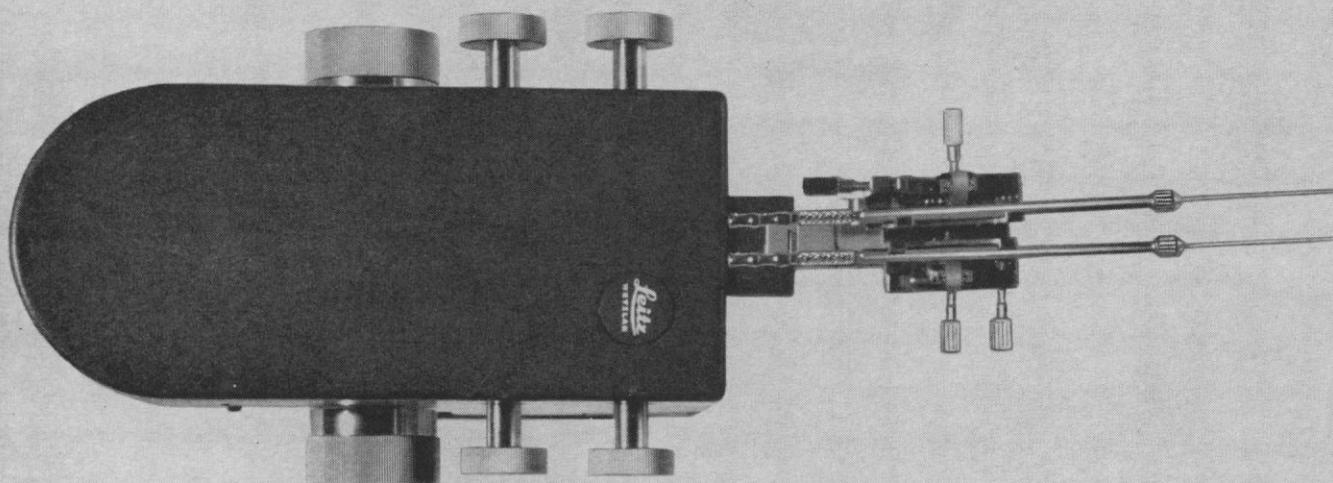
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## Challenge to Tax Exemption

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.

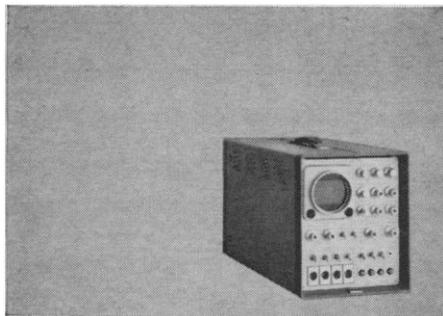
Congressman Patman's attacks against tax-exempt foundations add a bit of flavor to the situation. So do the cries of the editors and publishers of a few commercial magazines. Now that the numbers of scientists and engineers, the industrial uses of their talents, and the variety of equipment for which 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.

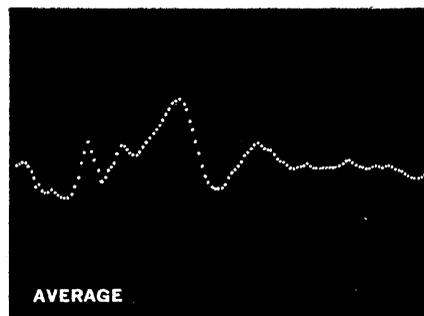
If IRS does try to change the rules along the indicated lines, we predict that it will be forced to retreat. Nevertheless, it will be prudent for officers and members of scientific societies to be warned of the probable struggle and to examine carefully the proposed new rulings when they are made public.—DAEL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

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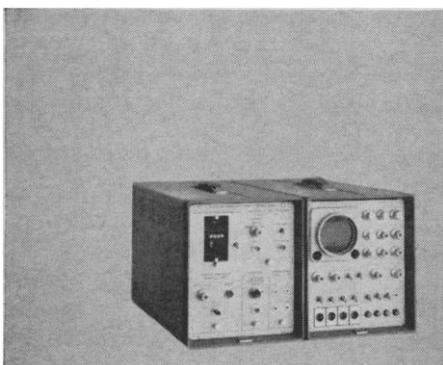
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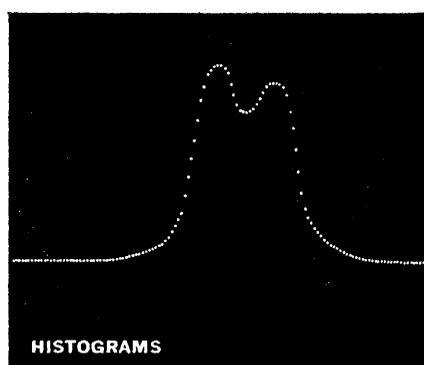
Four years of successful application of the Mnemotron 400B CAT (Computer of Average Transients) in neurophysiology, cardiology, ophthalmology and other biology research laboratories has established the versatility and reliability of this multi-purpose digital computer. Its circuitry derives and accumulates data from a succession of responses masked by random activity or background, and provides CRT display or output in analog or digital form for permanent record or further processing by general purpose computers.



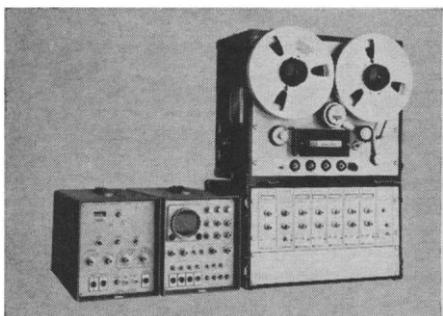
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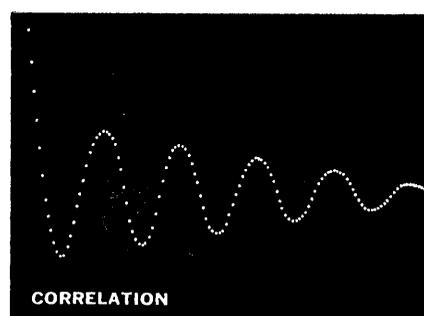
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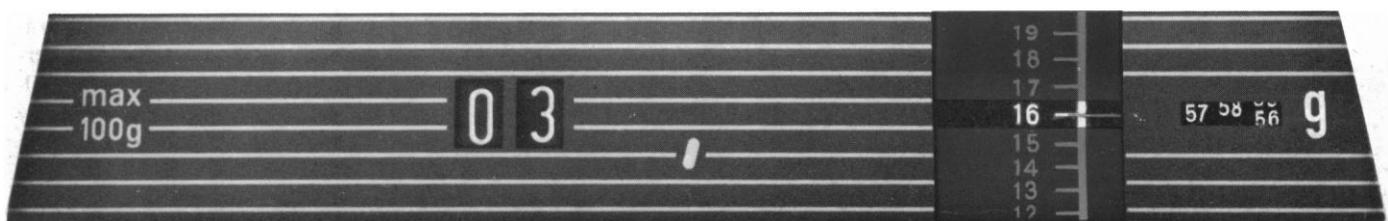
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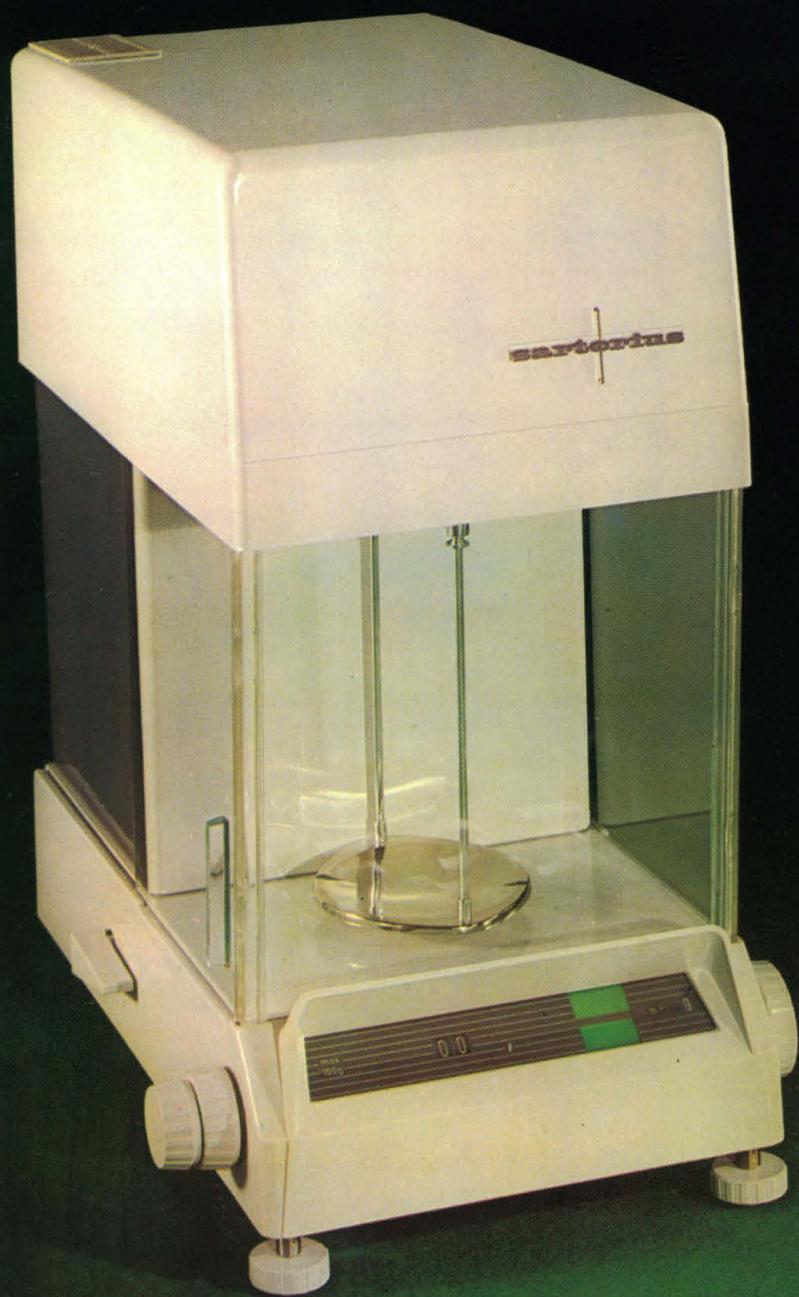
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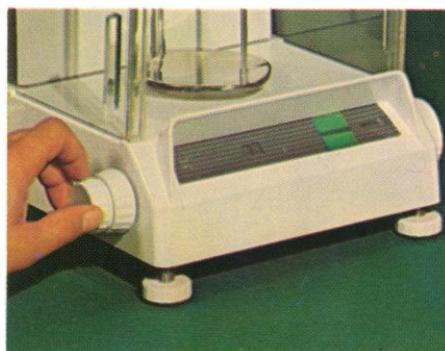
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Optional Mechanical Tare	10 g	1 g	1 g	—
Optical Range	10 g	1 g	1 g	1 g
One Scale Division	100 mg	10 mg	10 mg	10 mg
Readability (digital)	1 mg	0.1 mg	0.1 mg	(**)
Reproducibility	0.3 mg	0.05 mg	0.05 mg	0.3 mg
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(\*) Capacity with optional manual tare range. Mechanical capacity (built-in weights) is without tare.

(\*\*) Estimate 1/10 scale division = 1 mg.

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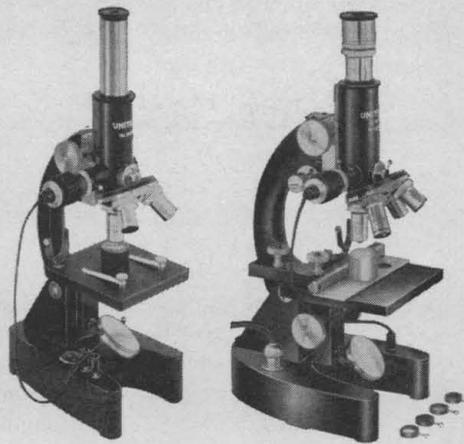
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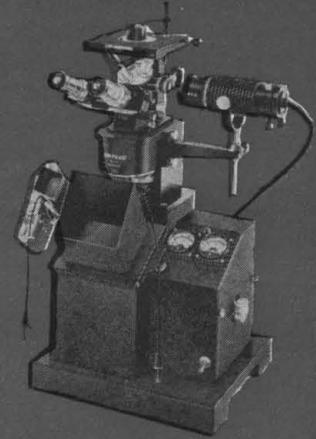
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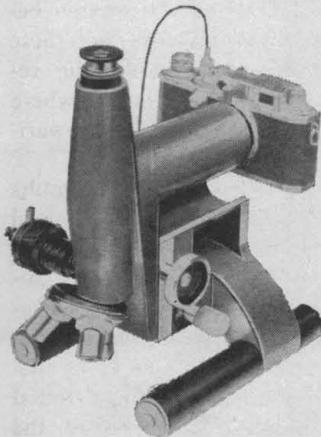
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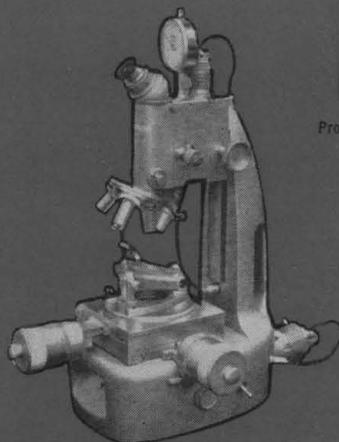
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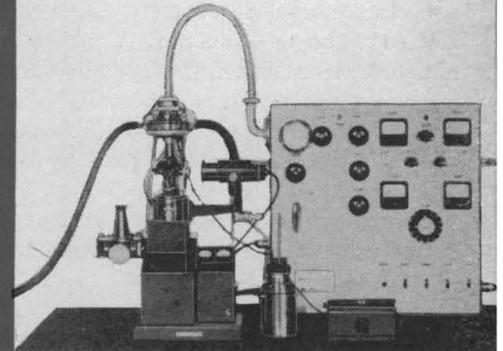
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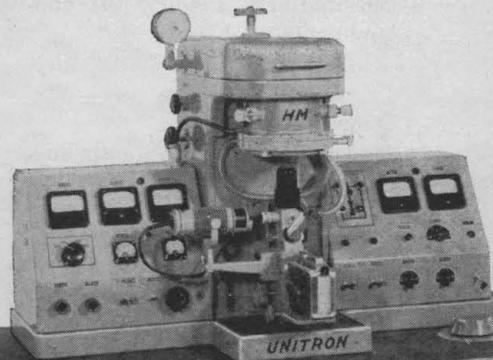


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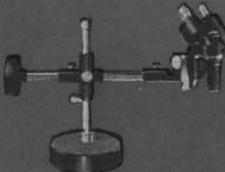
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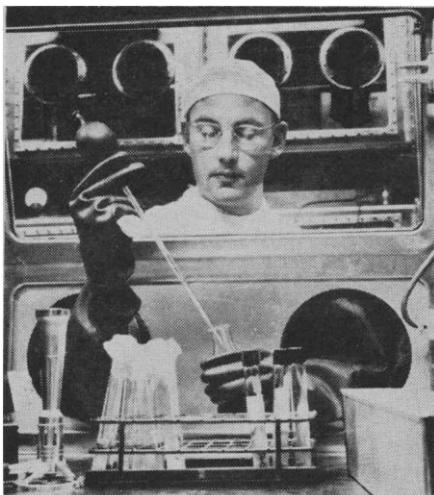
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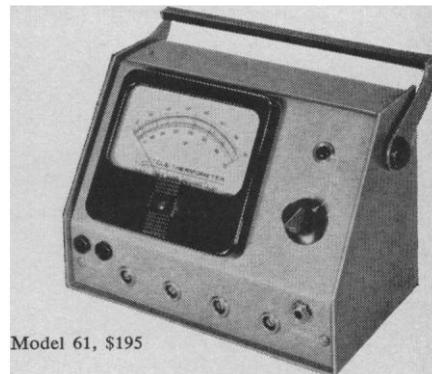
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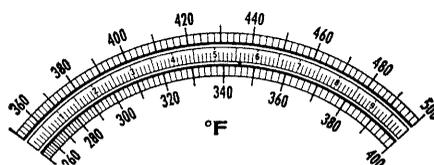
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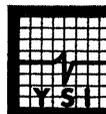
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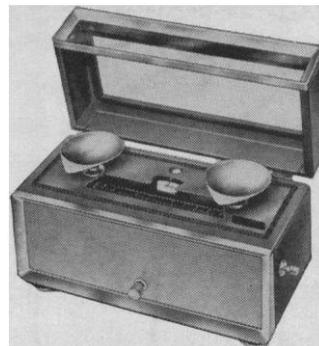
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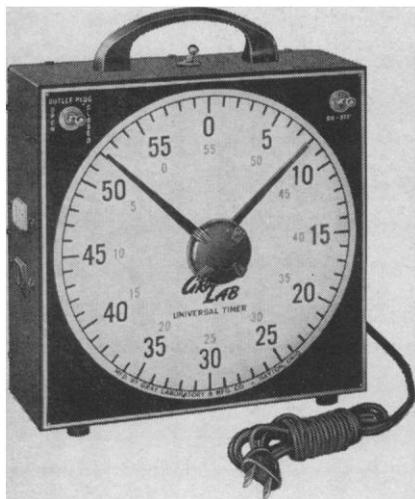
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A general session on Education in Biophysics elicited considerable interest and delegates discussed the problems associated with the evolution of biophysics as a discipline in their respective countries.

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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

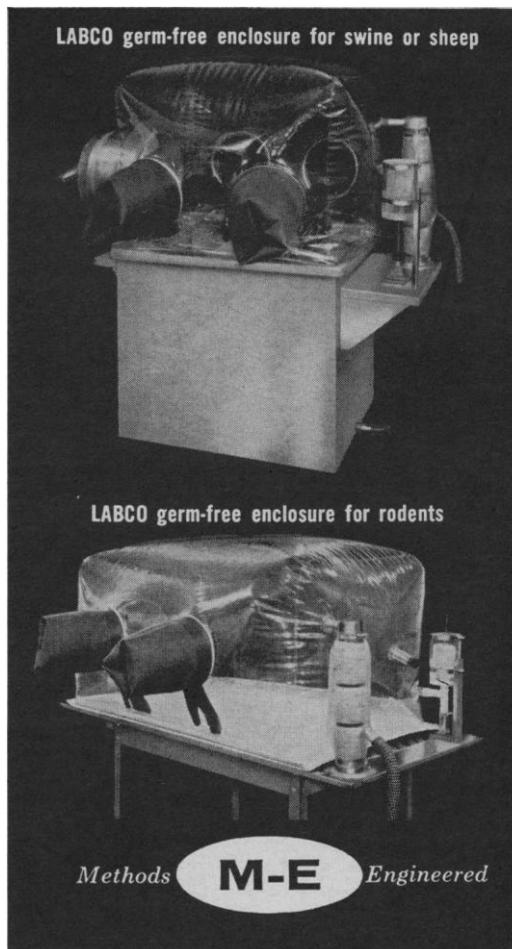
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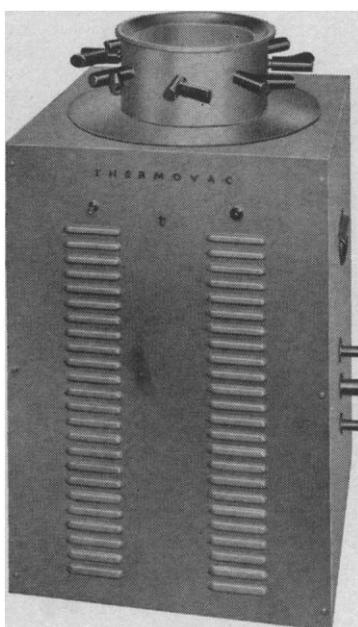
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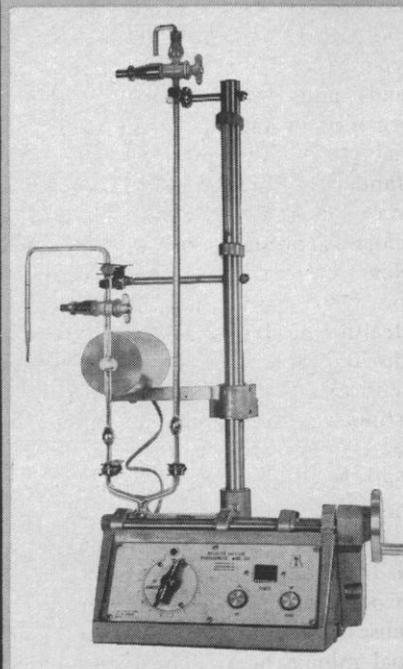
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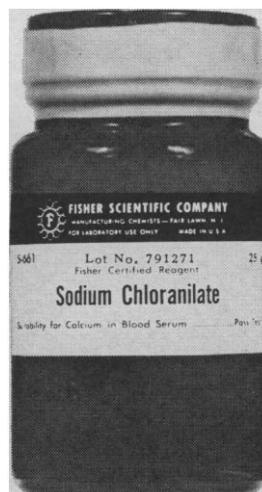
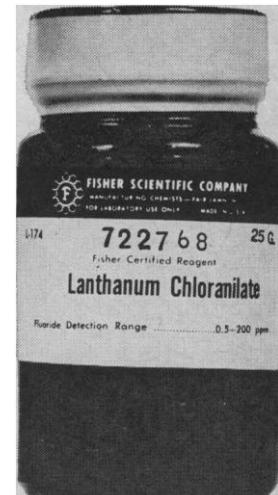
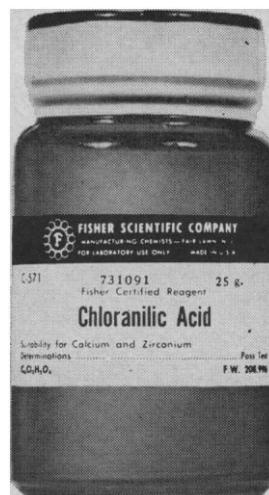
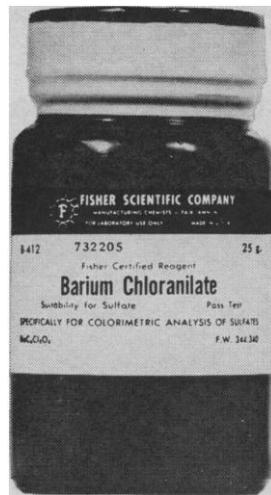
SCIENCE, VOL. 146

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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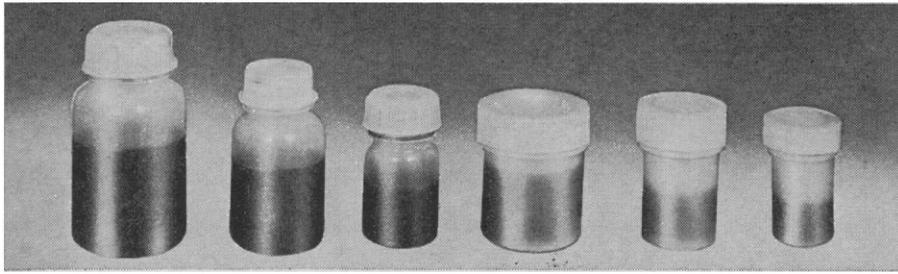
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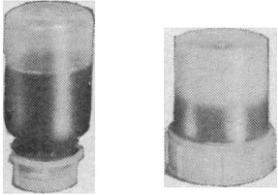
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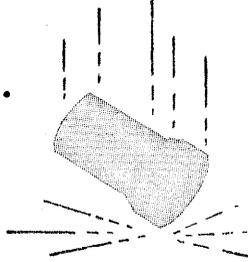


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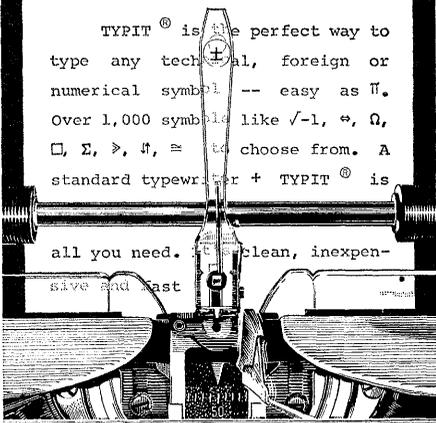
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described *Ferrobacillus ferrooxidans*, which oxidized ferrous iron for energy, and fixed carbon dioxide as the sole source of carbon. A system was described for growing ferrobacilli in 160-liter batches in order to obtain enough cell material for 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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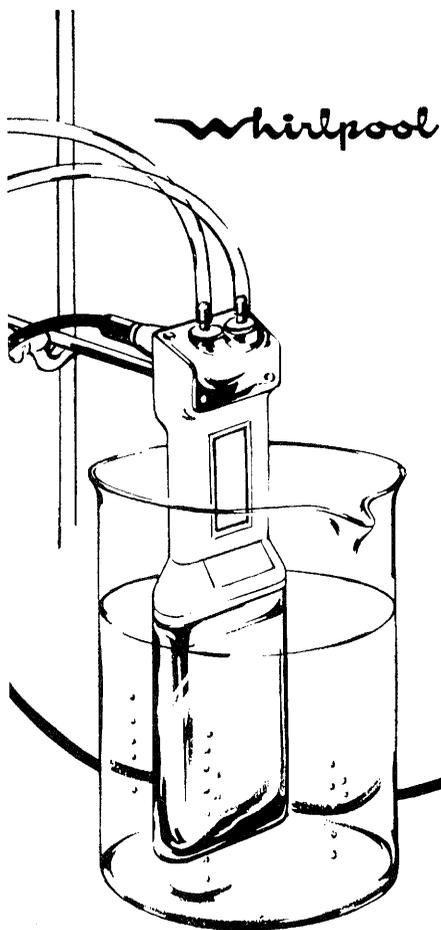
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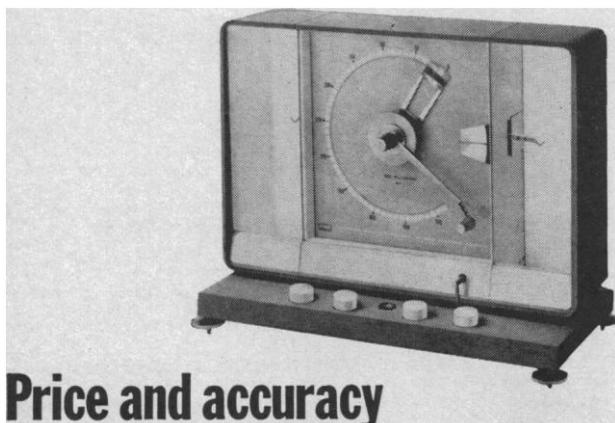
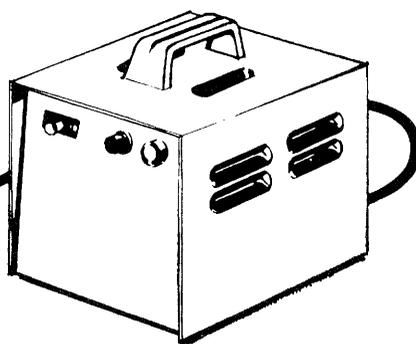
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treatments on the phytoplankton population and dissolved oxygen in Raritan Bay. This latter work is done by the Haskins Laboratories for the commission.

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 phyto-sociological aspects of the harbor ecosystem.

John Burke (St. Francis College,

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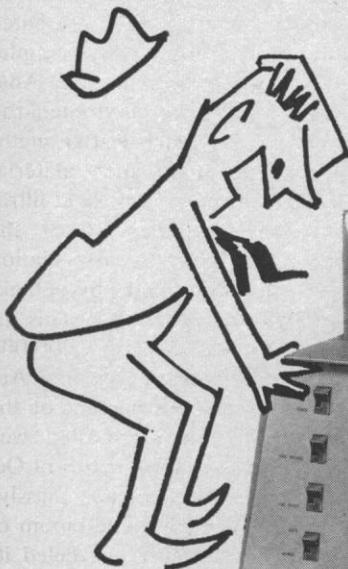
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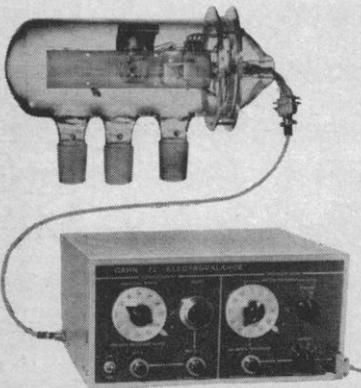
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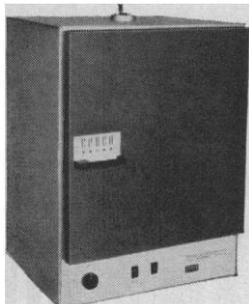
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Brooklyn), an oyster epicurean, made many in the audience uneasy. The concentration by shellfish of phytoplankton dinoflagellates, such as *Gonyaulax catenella* and *G. tamarensis*, has led to the death of some consumers of raw clams or raw oysters. 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.

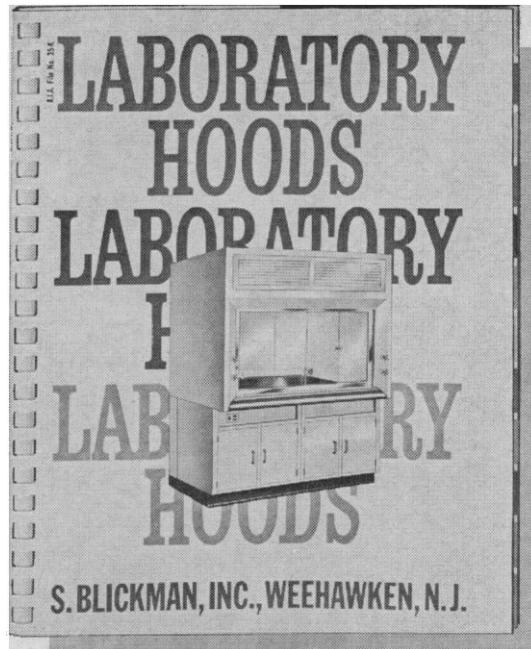
The consensus of the symposium was that understanding how pollution affects the marine environment is obtainable only by joint efforts of scientists who have widely diverse training, and that the "standard" methods developed for other environments were inadequate.

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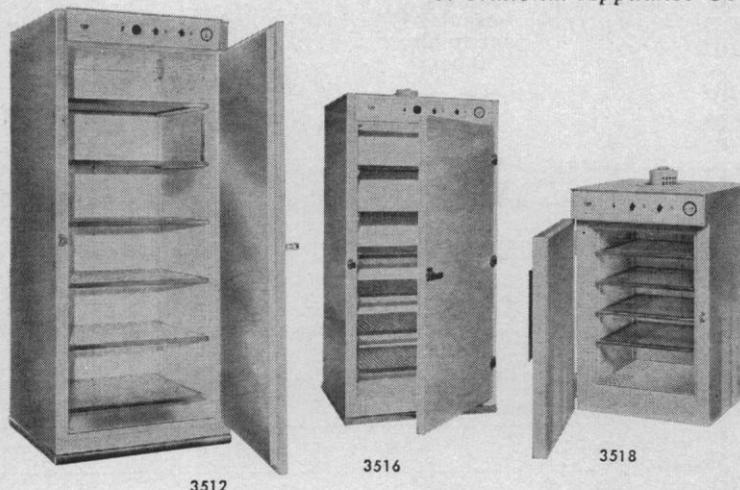
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ing round-table discussion on the direction of developments in the science. In this broad perspective physical anthropology was seen as the study of the gamut of human variability.

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. Ensminger, 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<sup>e</sup>)

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)

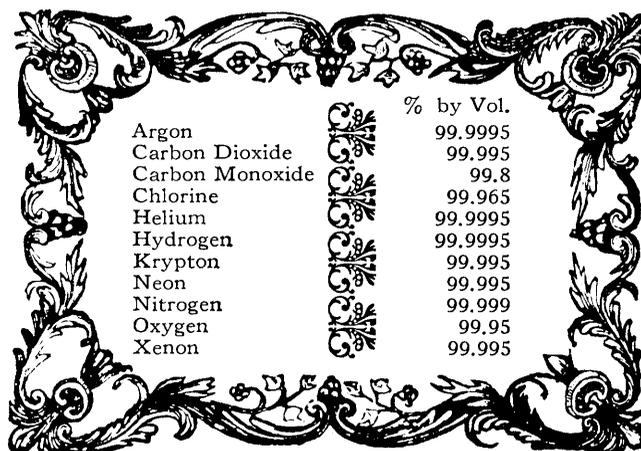
26-27. Combustion Inst., western states section, fall meeting, Univ. of Utah, Salt Lake City. (Secretary, CI, 16902 Bollinger Dr., Pacific Palisades, Calif. 90272)

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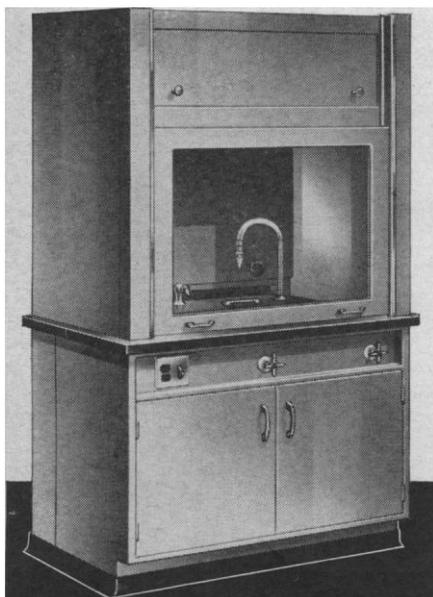
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SCIENCE, VOL. 146

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)

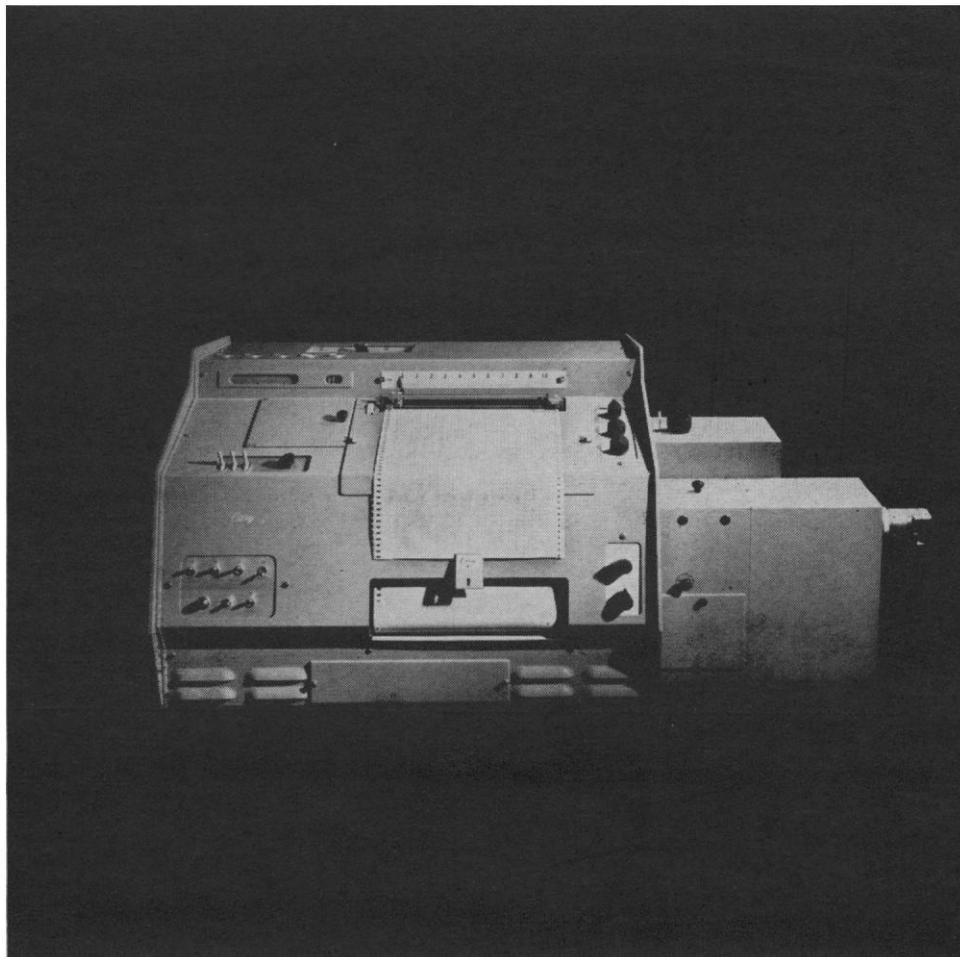
#### November

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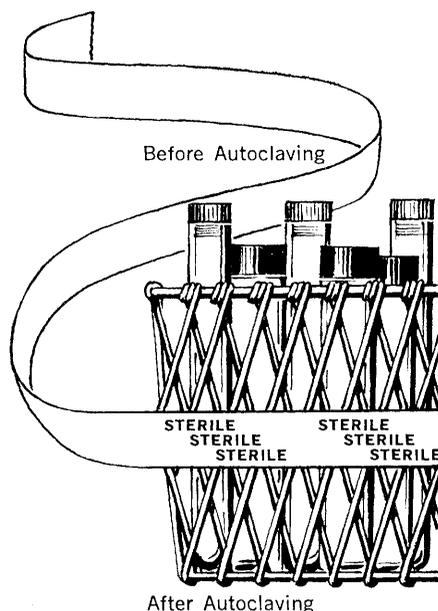
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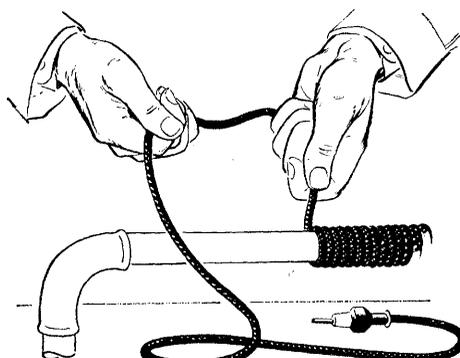
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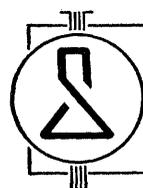
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School of Aeronautical and Engineering Sciences, Purdue Univ., West Lafayette, Ind. 47907)

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.)

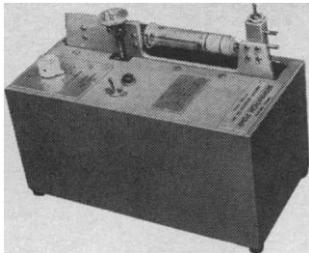
7. International Acad. of **Oral Pathology**, 2nd conf., San Francisco, Calif. (J. L. Bernier, Dental School, Georgetown Univ., Washington, D.C. 20007)

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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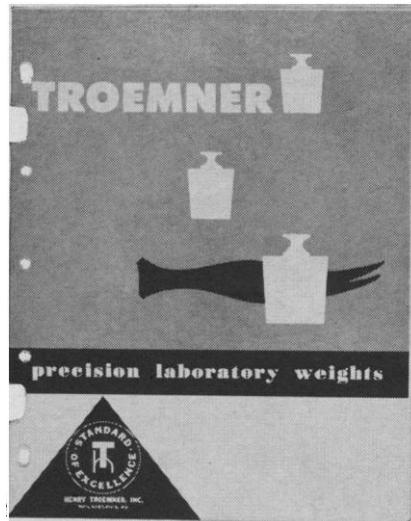
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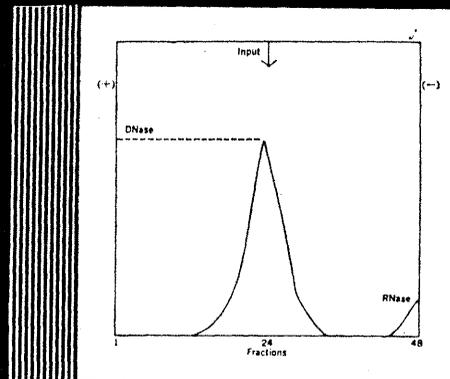


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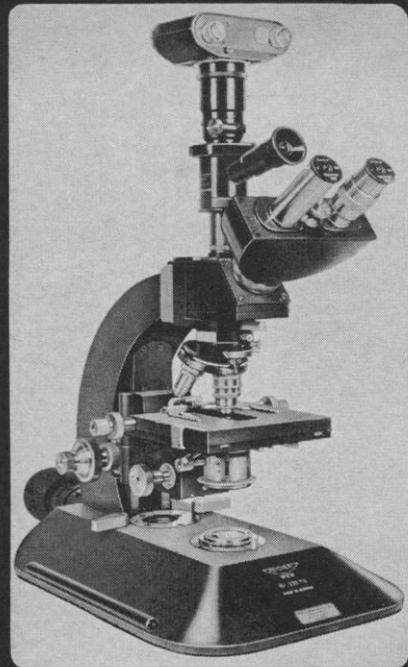


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9-11. Flexural Mechanics of **Reinforced Concrete**, intern. symp., Miami, Fla. (H. A. Sawyer, Dept. of Civil Engineering, Univ. of Florida, Gainesville)

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, Ratsastra 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. Efting, 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.)

15-19. Society of **Exploration Geophysicists**, Los Angeles, Calif. (C. G. Ferris, E. V. McCollum & Co., 515 Thompson Bldg., Tulsa, Okla.)

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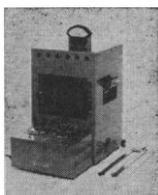
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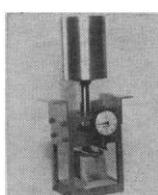
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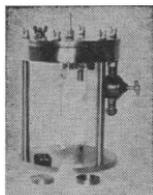
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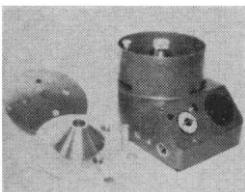
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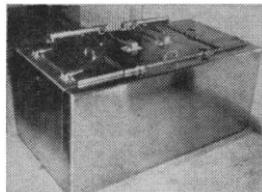
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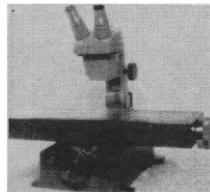
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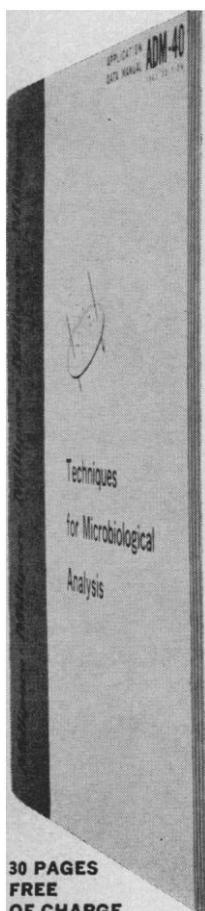
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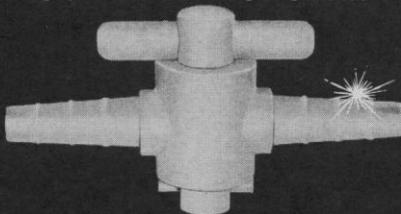
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16-19. Gulf and Caribbean Fisheries Inst., conf., Ocho Rios, Jamaica. (Executive Secretary, Gulf and Caribbean Fisheries Inst., 1 Rickenbacker Causeway, Miami, Fla. 33149)

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'Aircent, 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)

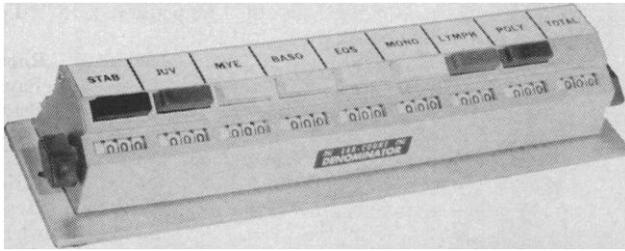
23-28. Internal Medicine, 8th intern. congr., Buenos Aires, Argentina. (Secretariat, Melo 2081, Buenos Aires)

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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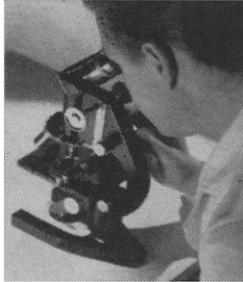
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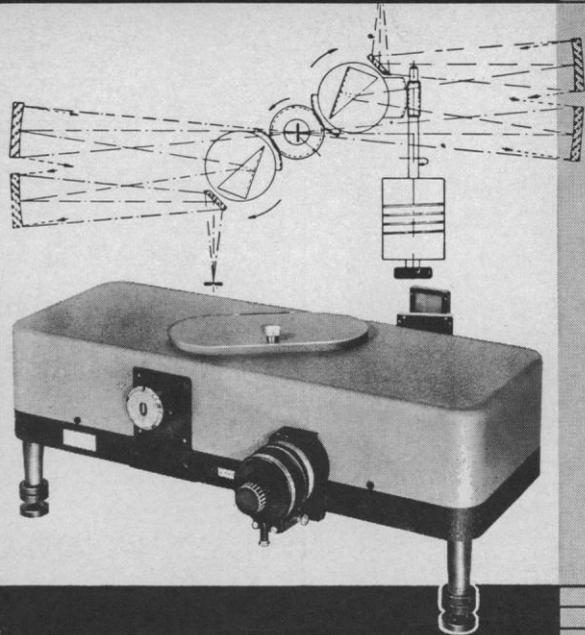
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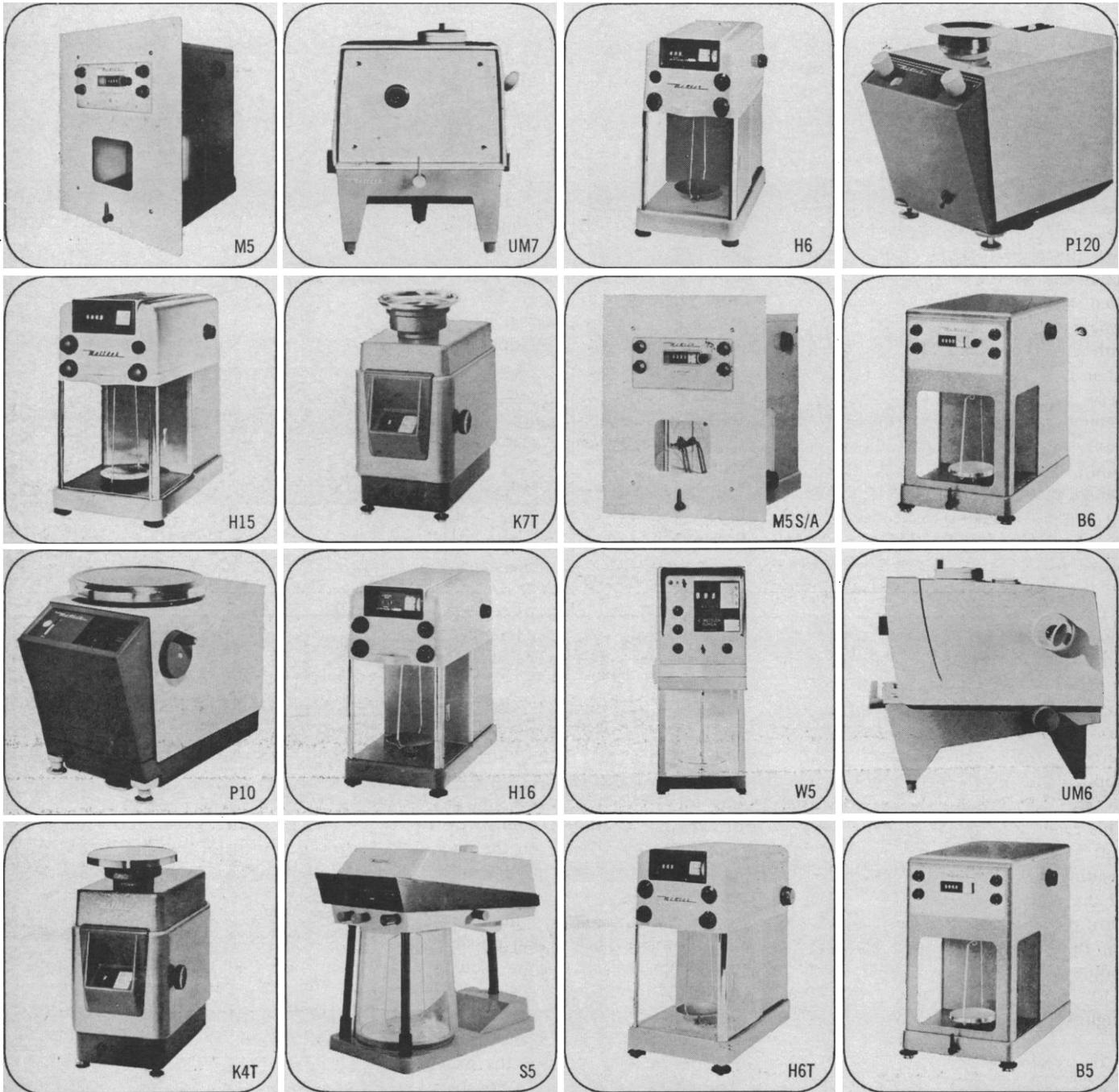
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eter allows the initial steady-state pressure to be suppressed to zero so that small fluctuations can be read on more sensitive scales. A polarity switch reverses the demodulator output so that negative transducer signals can be suppressed during differential pressure measurements. An external output on the rear provides a  $\pm 10$ -volt d-c full-scale signal with a frequency response flat from 0 to 1000 cps ( $\pm 5\%$ ) from a source impedance of 100  $\Omega$ . 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  $\mu$ a) or a resistance ( $\theta$ -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  $\pm 5$  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

The material in this section is prepared by the following contributing writers:

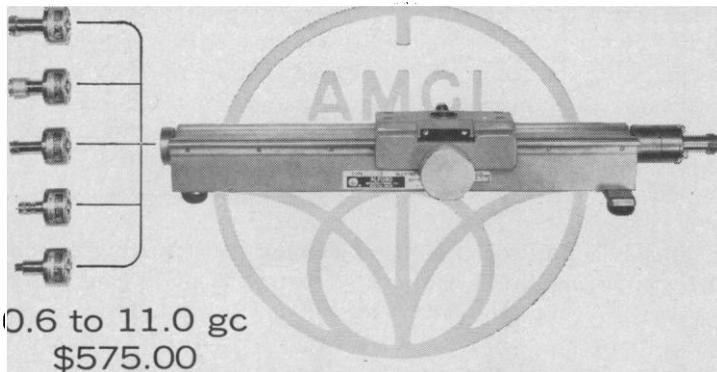
Robert L. Bowman (R.L.B.), with the assistance of Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

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

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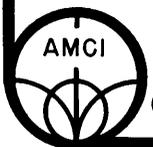
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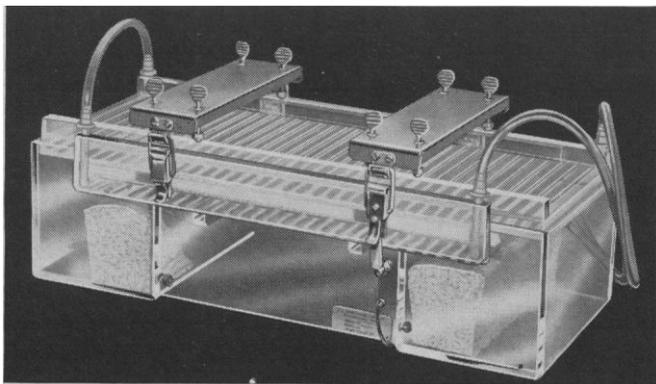
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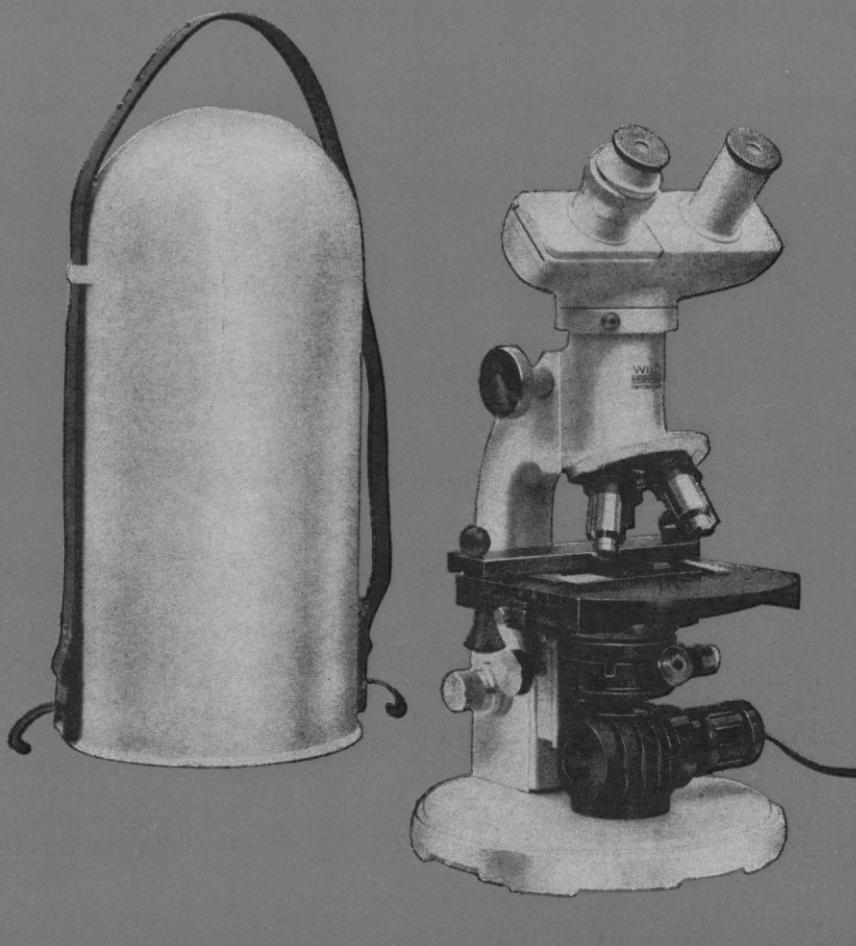
Circle 4 on Readers' Service card

**Proportional temperature controller** is designed to maintain the temperature of constant-temperature baths to within  $\pm 0.01^\circ C$  in the range from  $0^\circ C$  to  $250^\circ C$ . 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  $0.01^\circ C$  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  $\pm 0.02^\circ C$ . 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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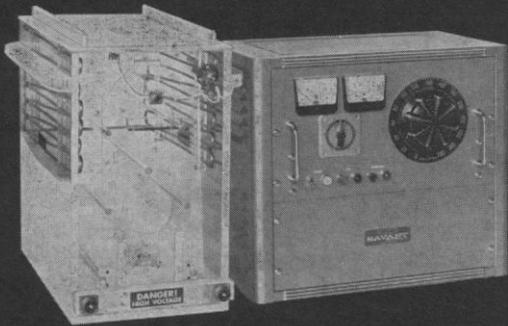
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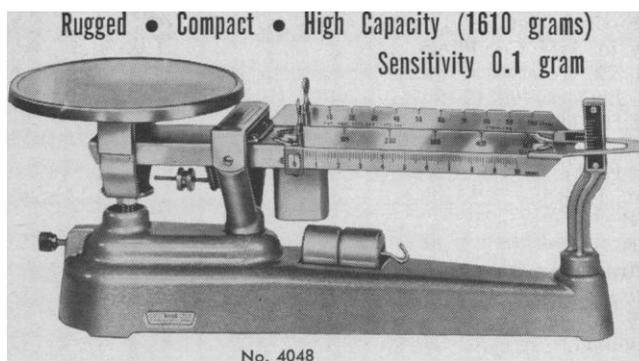


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**Ergebnisse der Limnologie.** vol. 2, *Remains of Animals in Quaternary Lake and Bog Sediments and Their Interpretation.* David G. Frey. Schweizerbart'sche, Stuttgart, Germany, 1964. 116 pp. Illus. Plates. DM 23.

**The Geography of the Flowering Plants.** Ronald Good. Wiley, New York, ed. 3, 1964. 534 pp. Illus. \$13.

**Instrumental Methods of Experimental Biology.** David W. Newman, Ed. Macmillan, New York, 1964. 574 pp. Illus. \$15.

**Laboratory Manual of Human Anatomy and Physiology.** Russell M. DeCoursey and Frank Dolyak. McGraw-Hill, New York, ed. 2, 1964. 239 pp. Illus. Paper, \$3.75.

**The Life of Plants.** E. J. H. Corner. World, Cleveland, Ohio, 1964. 329 pp. Illus. \$12.50.

**Major Problems in Neuroendocrinology.** An international symposium. E. Bajusz and G. Jasmin, Eds. Williams and Wilkins, Baltimore, Md., 1964. 479 pp. Illus. \$18.

**Man in Nature.** Marston Bates. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1964. 128 pp. Illus. Paper, \$1.75; cloth, \$3.95.

**Manual of Procedures in Quantitative Genetics.** Walter A. Becker. Washington State Univ., Pullman, 1964. 78 pp. Illus. Paper, \$2.65.

**Molecular Modification in Drug Design.** A symposium (New York), September 1963. Fred W. Schueler, Ed. American Chemical Soc., Washington, D.C., 1964. 236 pp. Illus. \$5.

**The Natural Geography of Plants.** Henry A. Gleason and Arthur Cronquist. Columbia Univ. Press, New York, 1964. 428 pp. Illus. \$10.

**Nutritional Factors and Enzymological Disturbances in Animals.** C. H. Gallagher. Lippincott, Philadelphia, 1964. 195 pp. Illus. \$7.50.

**Nutritional Factors in Virus Formation.** Kazuo Yamafuji. Lippincott, Philadelphia, 1964. 142 pp. Illus. \$7.

**Our Plant Resources.** Plants and their economic importance. Frederick L. Fitzpatrick. Holt, Rinehart, and Winston, New York, 1964. 173 pp. Illus Paper, \$1.28; cloth, \$2.50.

**pH and Dissociation.** A learning program for students of the biological and medical sciences. Halvor N. Christensen. Saunders, Philadelphia, ed. 2, 1964. 117 pp. Illus. Paper, \$2.25.

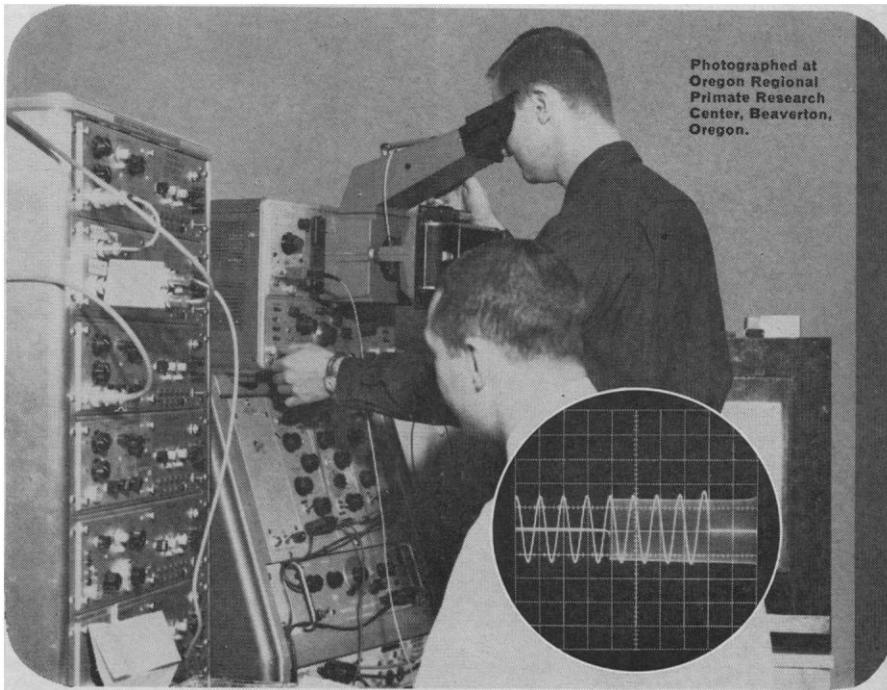
**Pharmacology of Smooth Muscle.** Edith Bülbring, A. Kovaříková, and I. Šeferna, Eds. Pergamon, London; Macmillan, New York, 1964. 171 pp. Illus. \$7.50.

**Phospholipids: Chemistry, Metabolism and Function.** G. B. Ansell and J. N. Hawthorne. Elsevier, New York, 1964. 453 pp. Illus. \$20.

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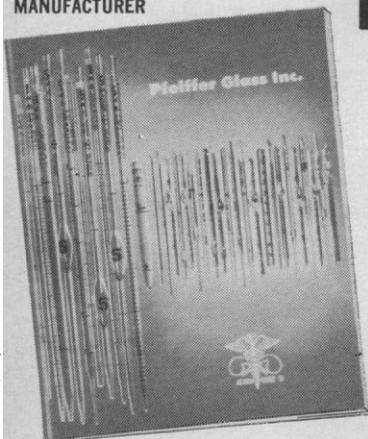
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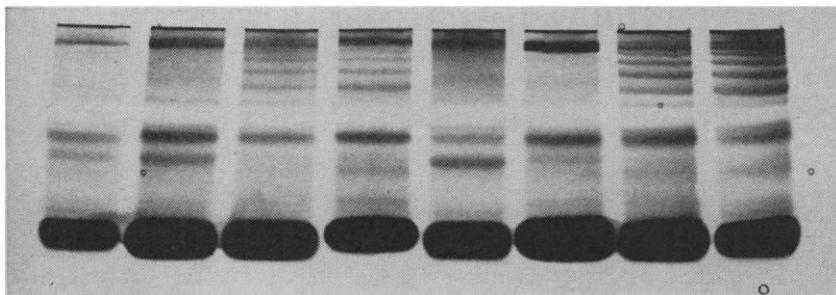


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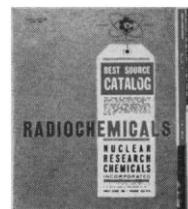
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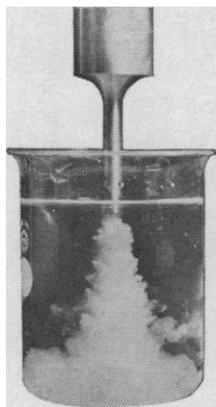
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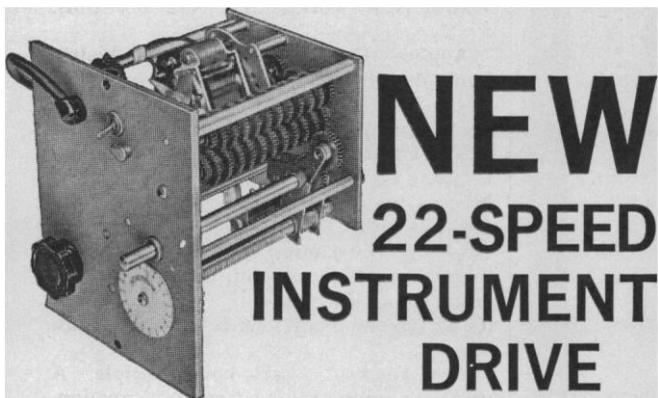
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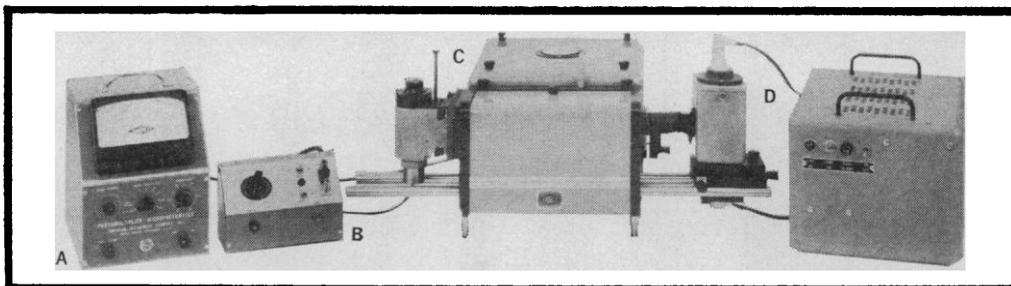
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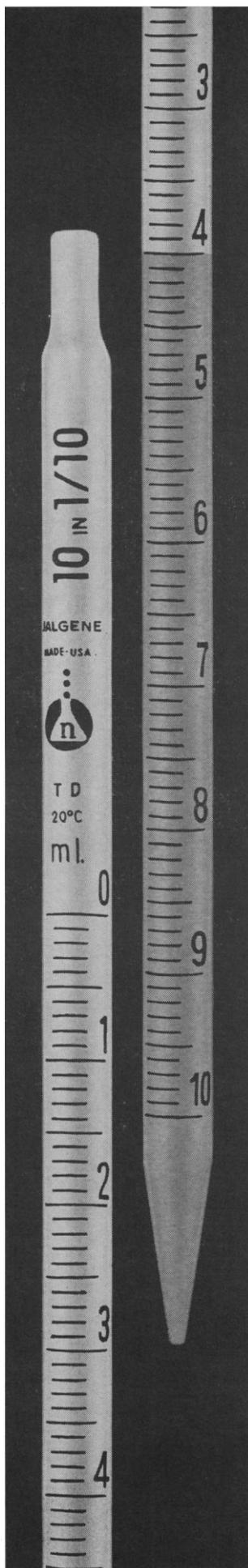
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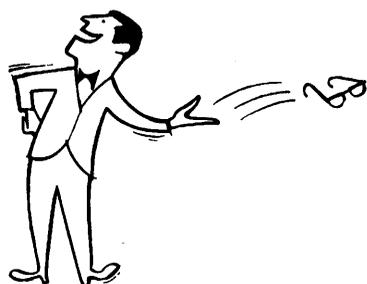


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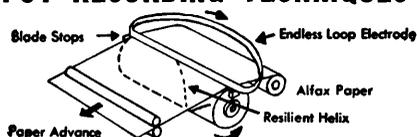


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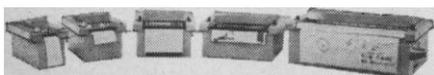


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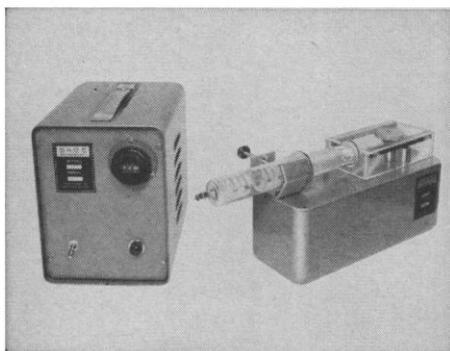
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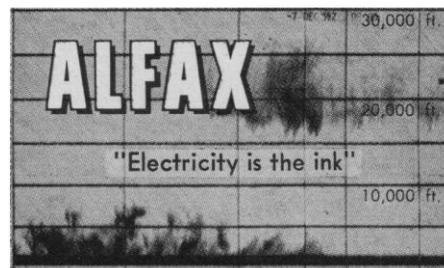
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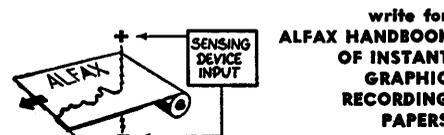
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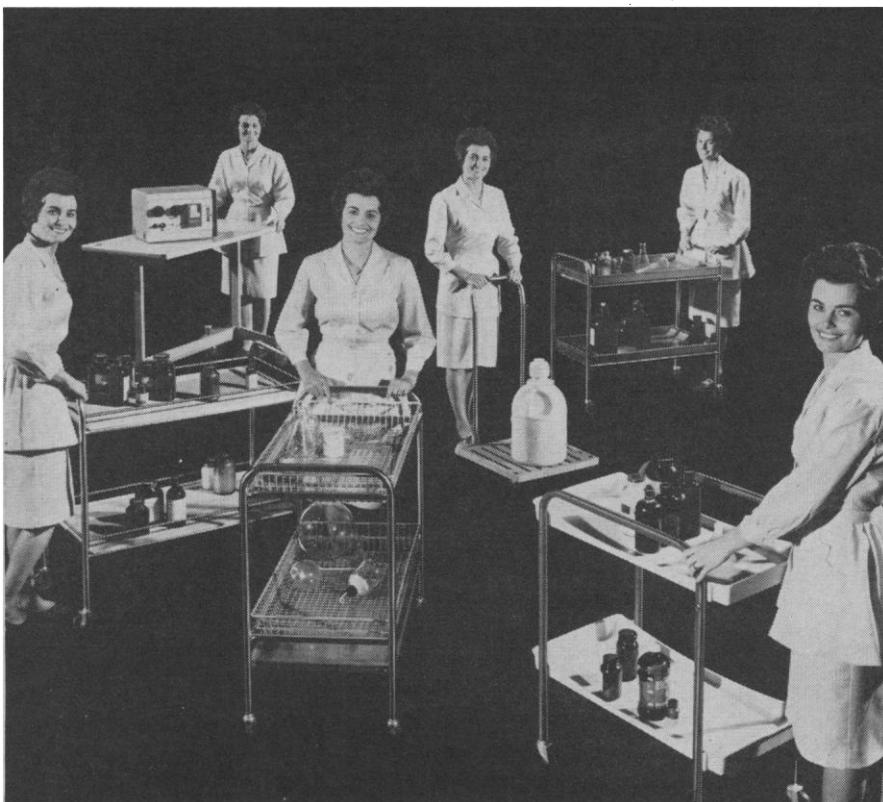
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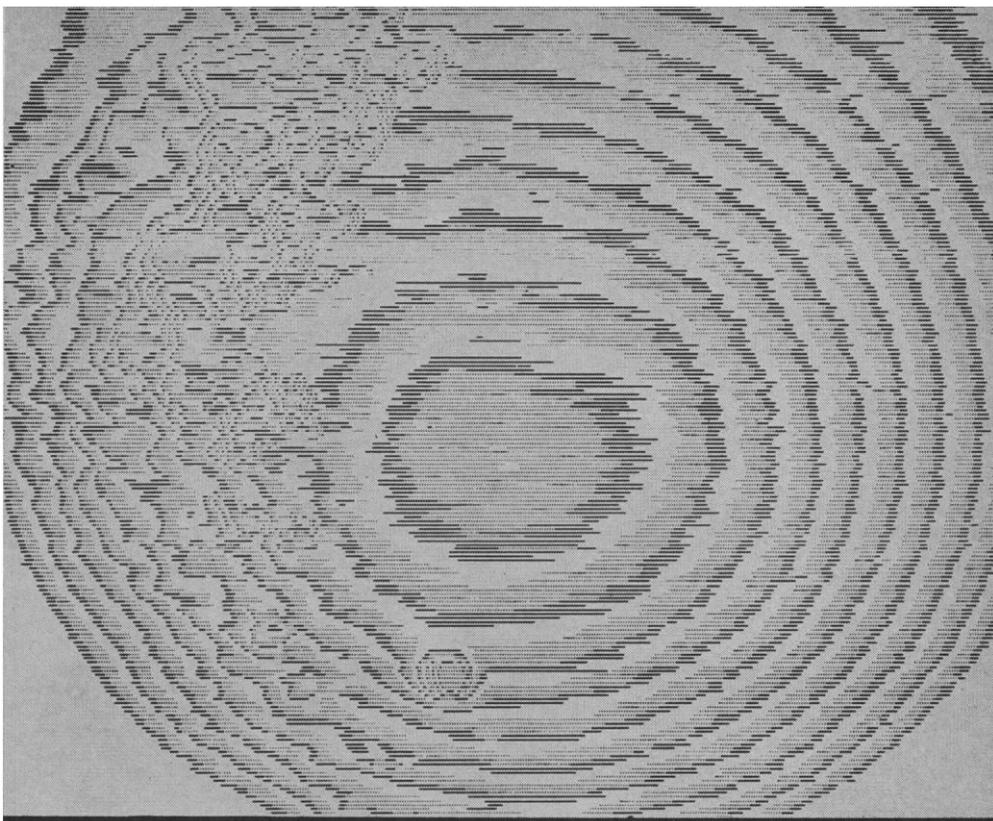
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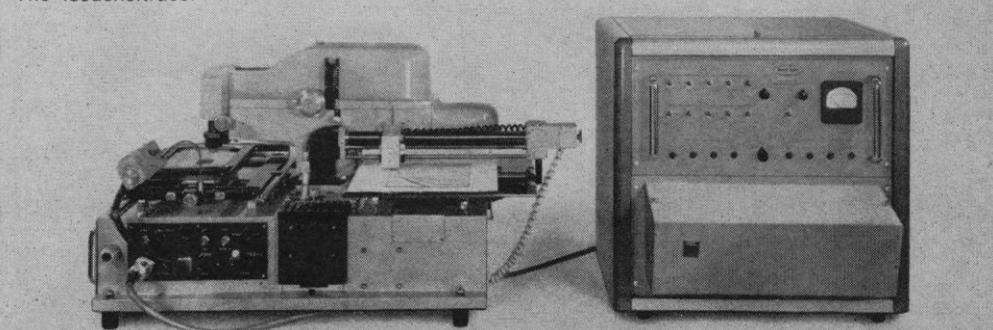
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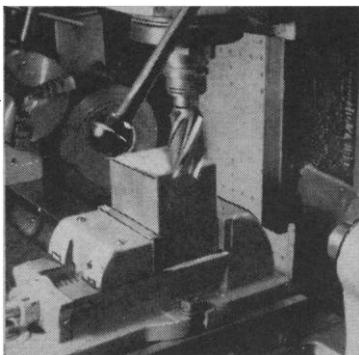
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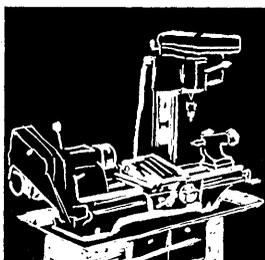
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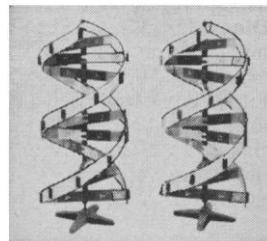
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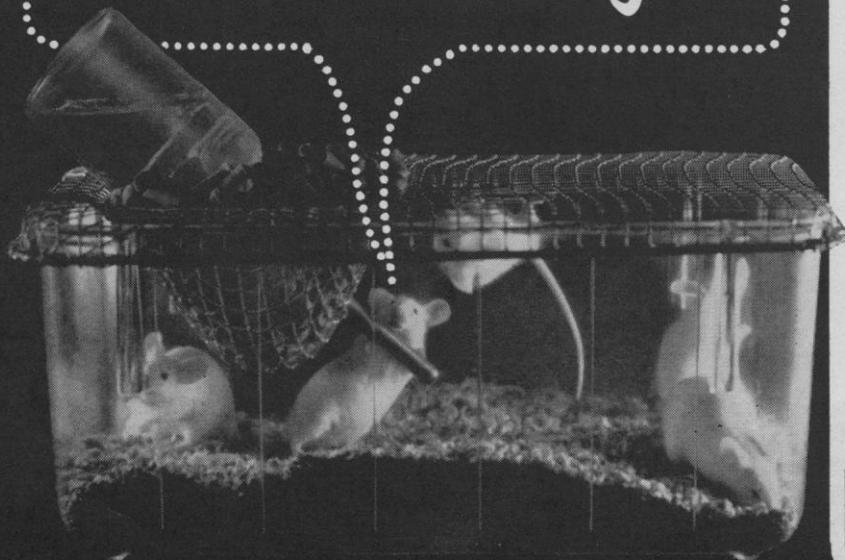
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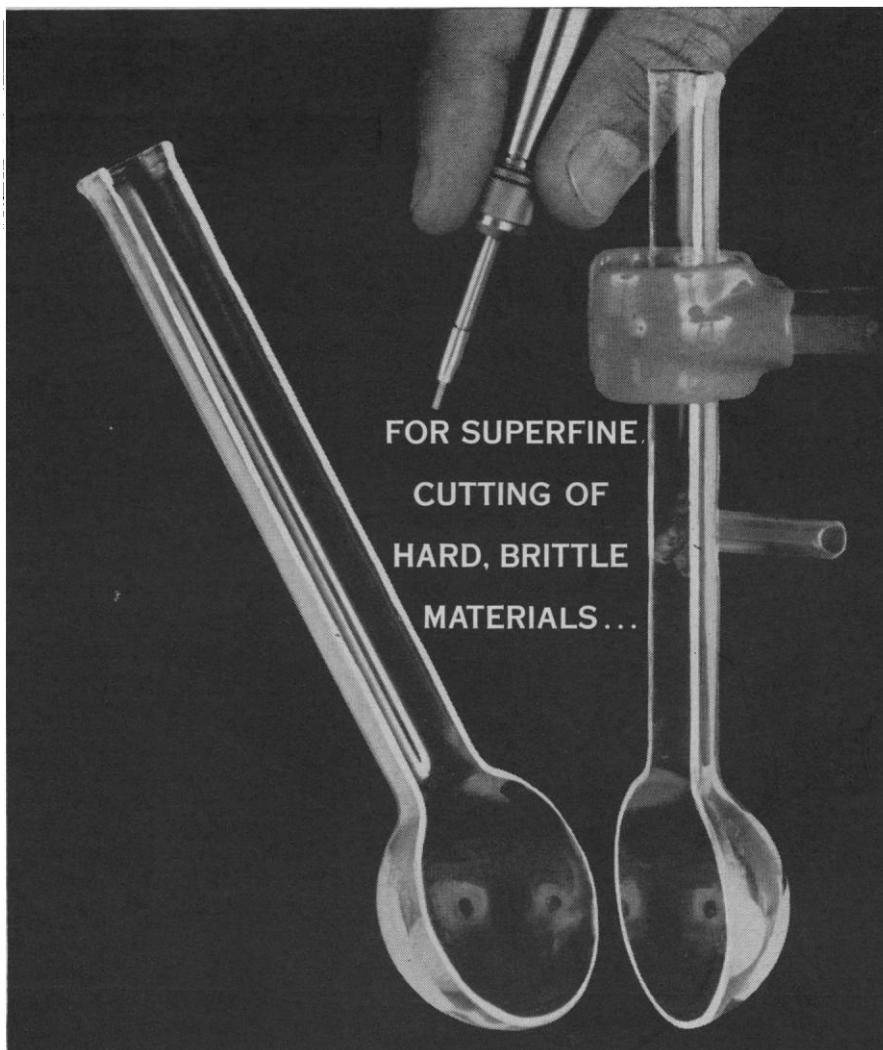
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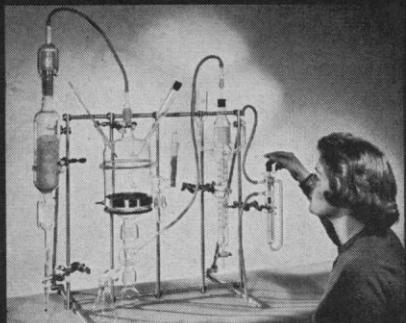


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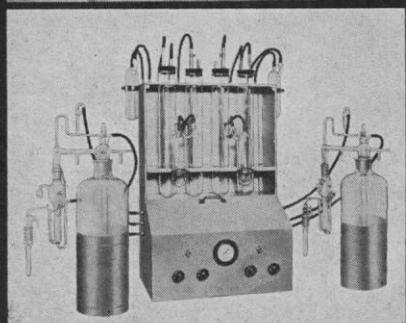


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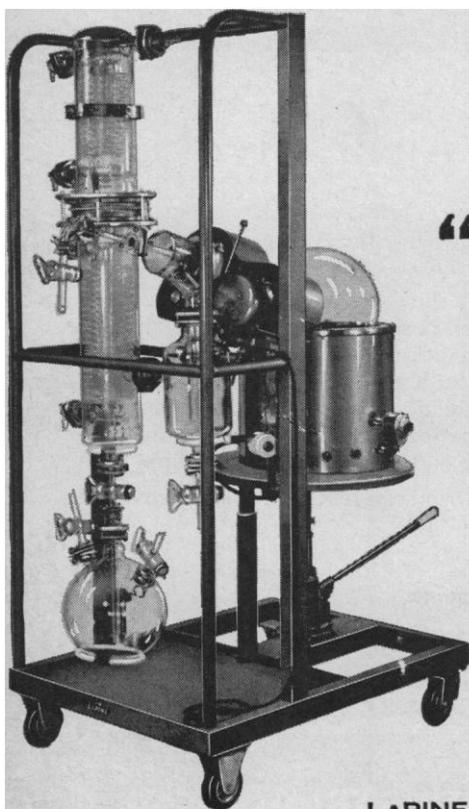
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of *The Aeronautical Annuals* (three volumes, 1895, 1896, and 1897).

**Language and Information.** Selected essays on their theory and application. Yehoshua Bar-Hillel. Addison-Wesley, Reading, Mass.; Jerusalem Academic Press, Jerusalem, Israel, 1964. 398 pp. Illus. \$12.50.

**"M" Project for F.D.R.: Studies on Migration and Settlement.** Henry Field. The Author, Miami, Fla., 1962 (order from Field Research Projects, Miami). 429 pp. \$15.

**Malaria in the Interior Valley of North America.** Daniel Drake. Norman D. Levine, Ed. Univ. of Illinois Press, Urbana, 1964 (reprint of the 1850 edition). 909 pp. \$7.50.

**The Management of Scientists.** Karl Hill, Ed. Beacon Press, Boston, 1964. 159 pp. Illus. \$4.95.

**Metals, Atoms, and Alloys.** Charles Law McCabe and Charles L. Bauer. Natl. Science Teachers Assoc., Washington, D.C., 1964. 128 pp. Illus. Paper, 50¢ (juvenile book).

**A Mission in Action.** The story of the regional hospital plan of New York University. Clarence E. de la Chapelle and Frode Jensen. New York Univ. Press, New York, 1964. 201 pp. \$4.

**Native Freshwater Fishes of Australia.** Gilbert P. Whitley. Jacaranda Press, Brisbane, Australia, ed. 2, 1964. 127 pp. Illus. Paper, 14s. 6d.

**The Nongraded High School.** B. Frank Brown. Prentice-Hall, Englewood Cliffs, N.J., 1964. 223 pp. Illus. \$5.95.

**Nuclear Power, U.S.A.** Walter H. Zim, Frank K. Pittman, and John F. Hogerton. McGraw-Hill, New York, 1964. 214 pp. Illus. \$18.

**Nutrition Science and You.** Olaf Mickelsen. Natl. Science Teachers Assoc., Washington, D.C., 1964. 128 pp. Illus. Paper, 50¢ (juvenile book).

**Optics.** The nature and applications of light. Irvin D. Gluck. Holt, Rinehart, and Winston, New York, 1964. 155 pp. Illus. Paper, \$1.28; cloth, \$2.50.

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**Productive Capacity of Locality as a Function of Soil and Climate, with Particular Reference to Forest Land.** M. S. Czarnowski. Louisiana State Univ. Press, Baton Rouge, 1964. 192 pp. Illus. \$4.

**Protozoa.** The simplest of all animals. Richard P. Hall. Holt, Rinehart, and Winston, New York, 1964. 123 pp. Illus. Paper.

**The Psychology of Learning and Techniques of Teaching.** James M. Thyne. Philosophical Library, New York, 1964. 240 pp. \$7.50.

**Red Men of Fire.** A history of the Cherokee Indians. Irvin M. Peithmann. Thomas, Springfield, Ill., 1964. 181 pp. Illus. \$6.50.

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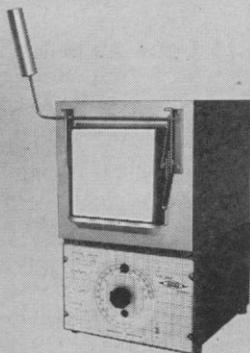
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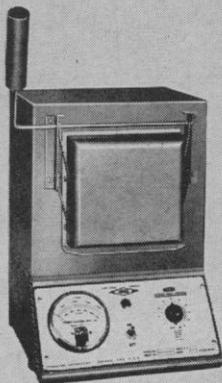
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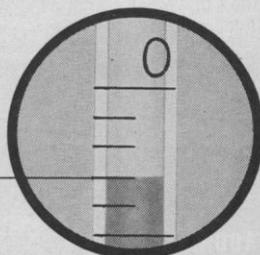
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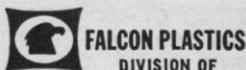
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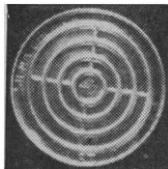
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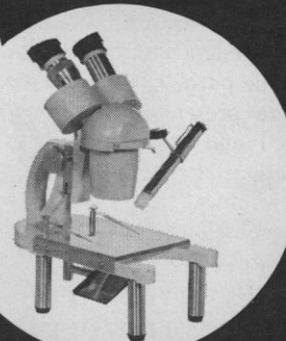
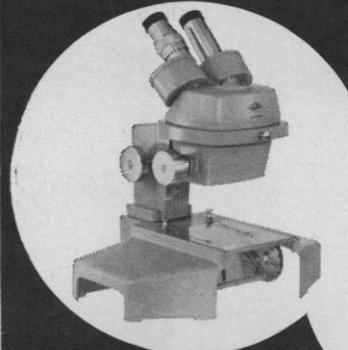
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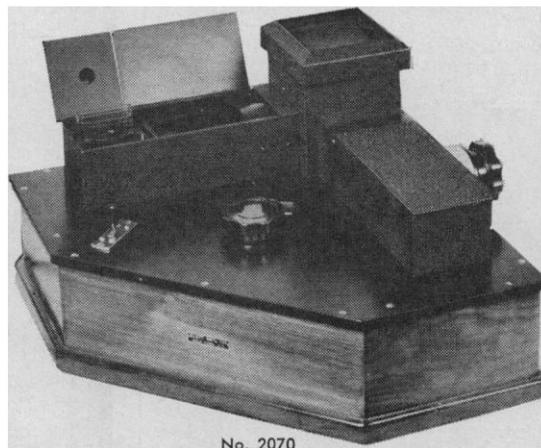
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**NEWS AND COMMENTS**

(Continued from page 236)

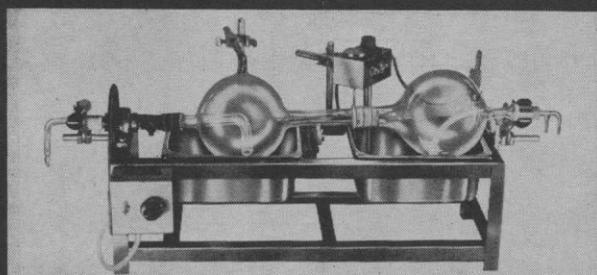
denly accumulated during the summer. One of these findings was an apparent break-through of researchers at Roswell Park and elsewhere in attempts to grow the virus particles cited by Endicott in large quantities. Another was the discovery by a team of researchers from the Pfizer laboratories, the South 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

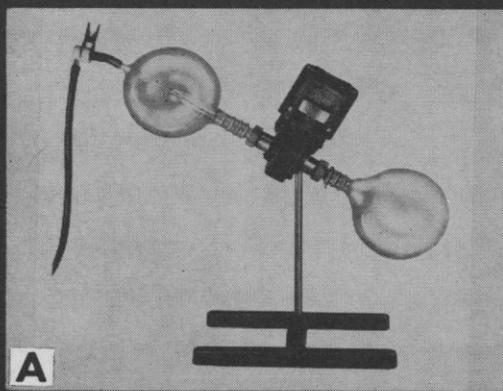
**Announcements**

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

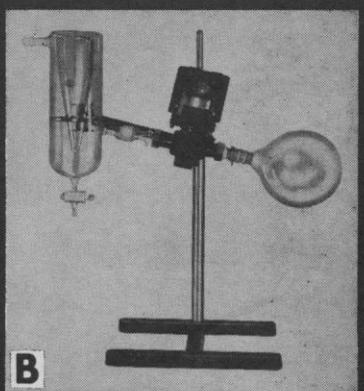
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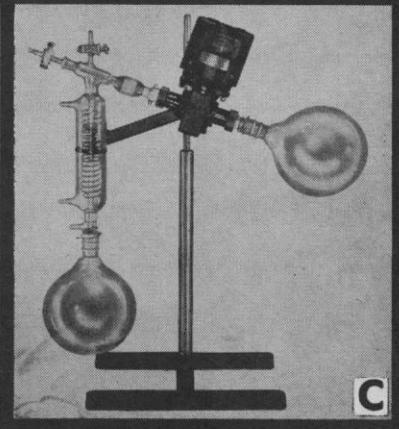
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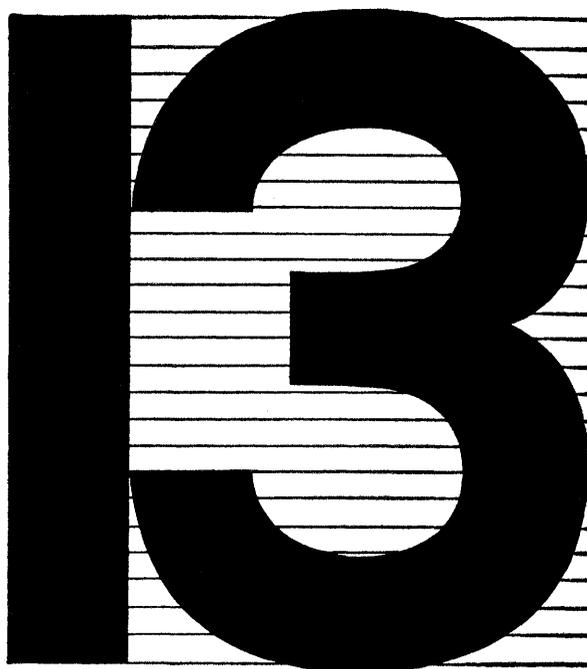
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### Grants, Fellowships, and Awards

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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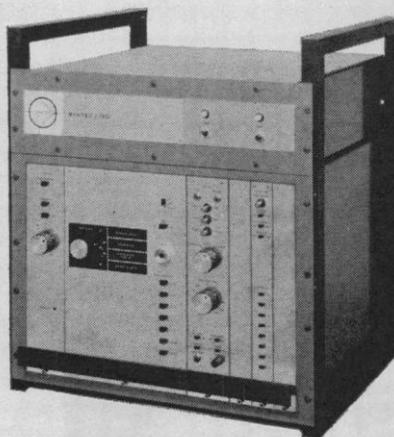
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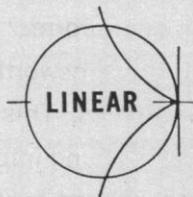
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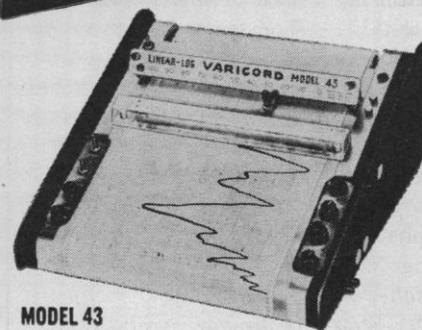


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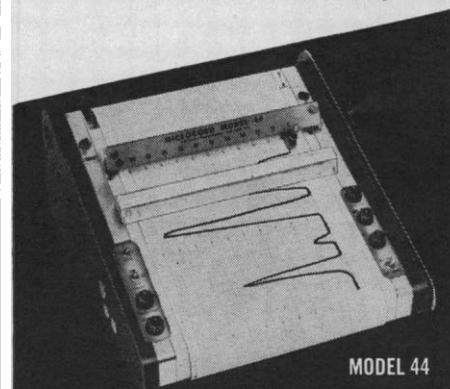
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## Courses

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.

*Measuring Oxygen Consumption* (6 minutes; \$77). Construction and use of a simple apparatus to measure oxygen consumed by small mammals; can be measured in cubic centimeters per hour, per gram of body weight.

*Bacteriophage Growth* (4 minutes; \$53). Presence and growth of T<sub>2</sub> bacteriophage, and a method for determining its concentration in a culture of *Escherichia coli* B.

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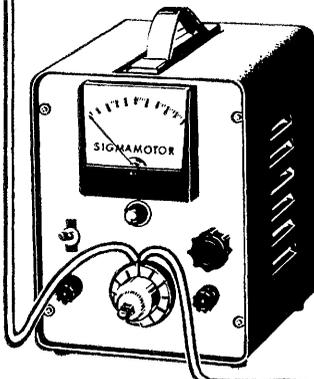
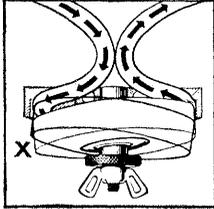
- Definition of terms
- Analytical balances
  - Substitution types
  - Equal-arm types
- Semi-micro balances
  - Substitution and equal-arm types
- Micro-balances
- Recording balances
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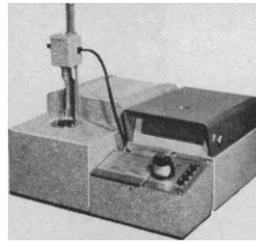
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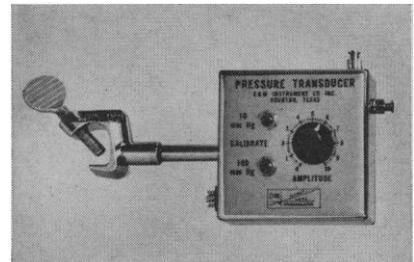
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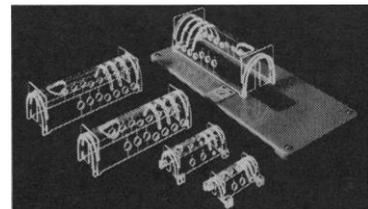
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**James G. Kelly**, chief of the community projects section at the NIH Mental Health Study Center, has been appointed associate professor of psychology at Ohio State University.

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:

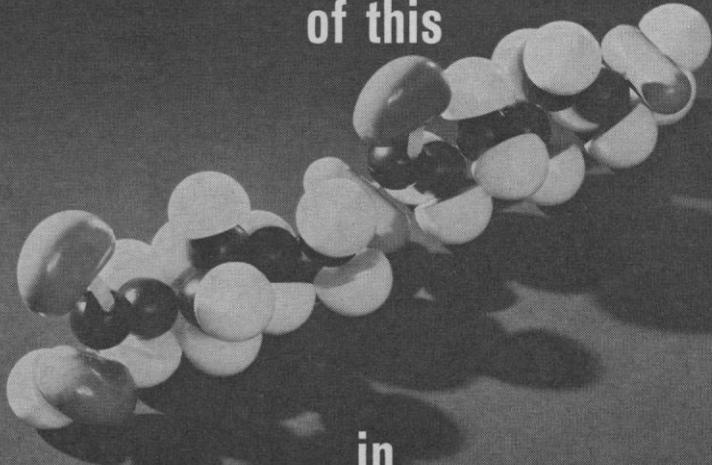
**Thomas L. Nelson**, former professor in the University of Kentucky college of medicine, has become professor and chairman of the pediatrics department.

**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

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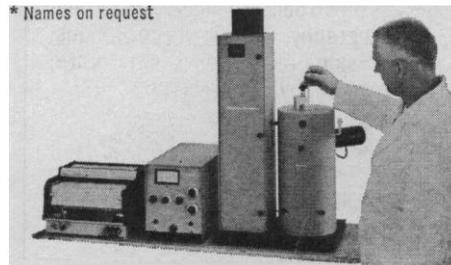
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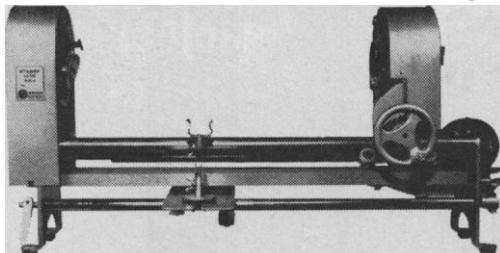
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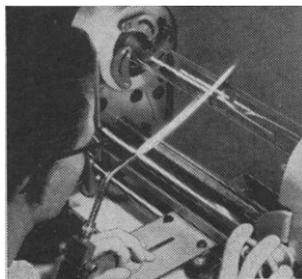
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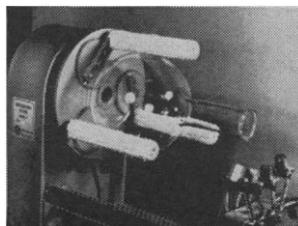


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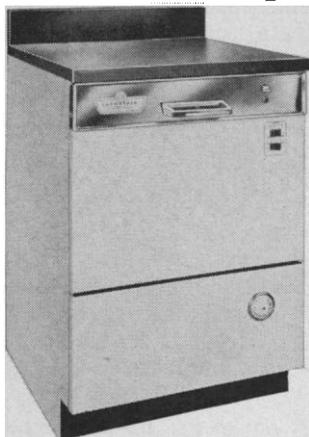


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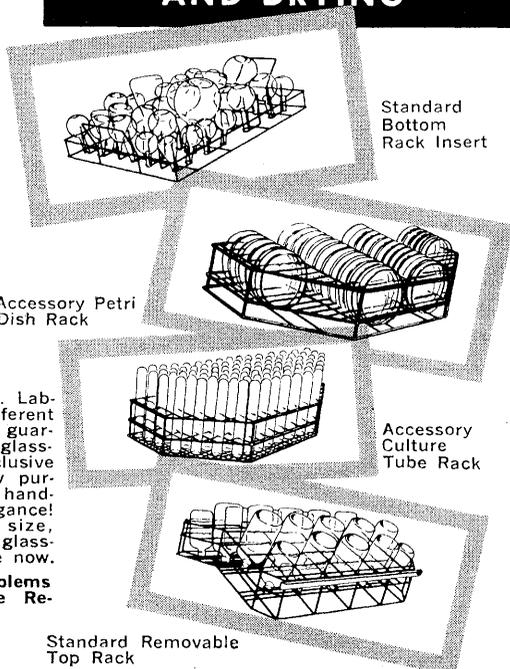
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Arecibo Ionospheric Observatory in Puerto Rico. Members of the Cornell faculty who have joined the center are:

**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'."