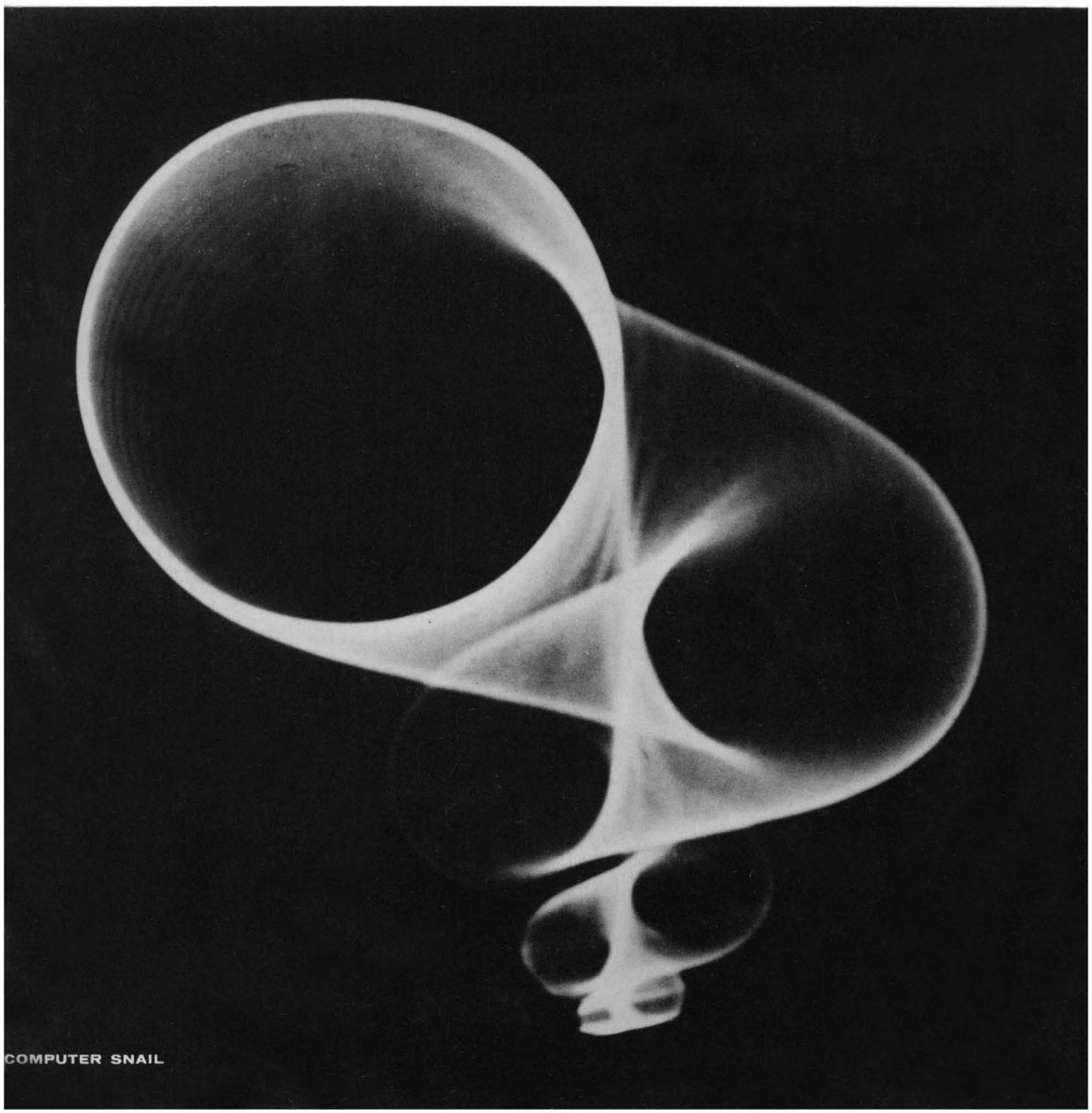
SCIENCE

12 March 1965
Vol. 147, No. 3663

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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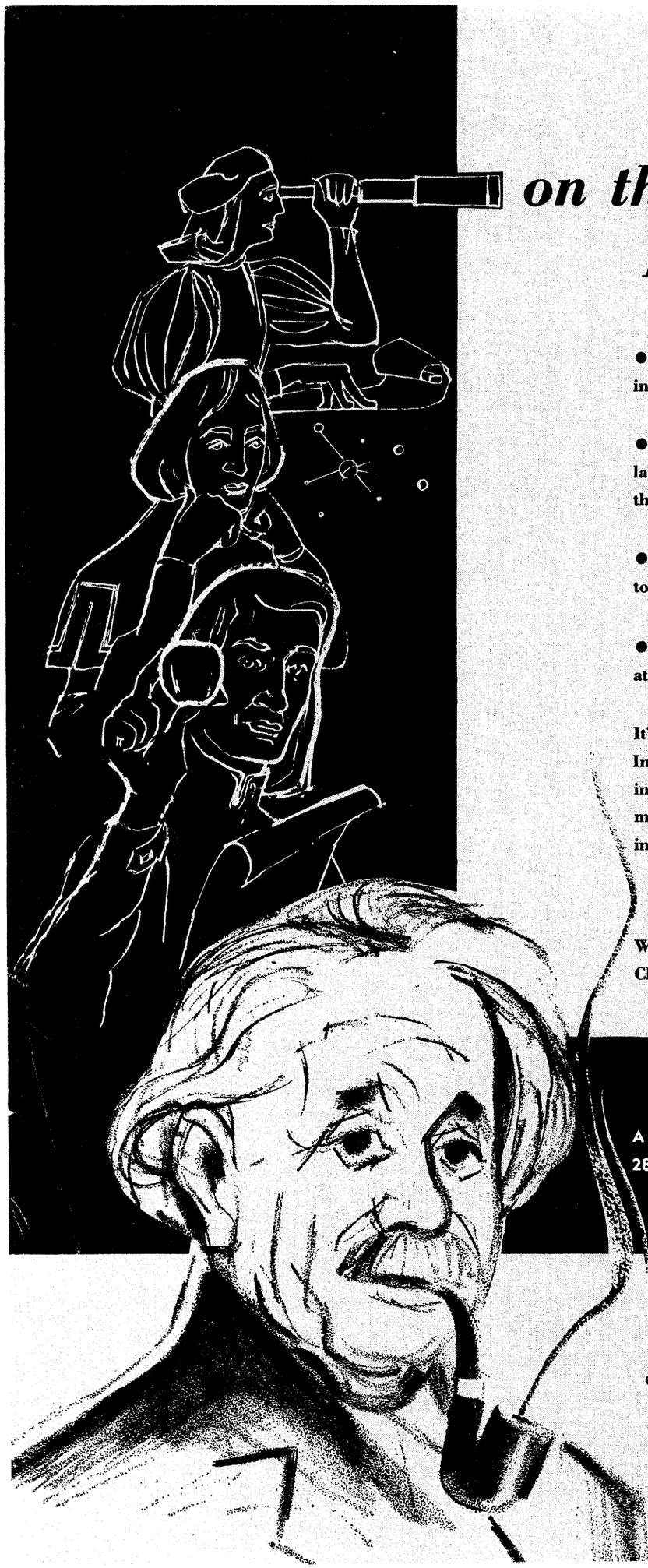

on the subject of Imagination . . .

● *Imagination* stimulated Christopher Columbus in his belief that the world is round . . .

● It was *imagination* that led Copernicus to postulate that the earth rotates daily on its axis and that the planets revolve around the sun . . .

● Again it was *imagination* that inspired Newton to develop the three basic laws of physics . . .

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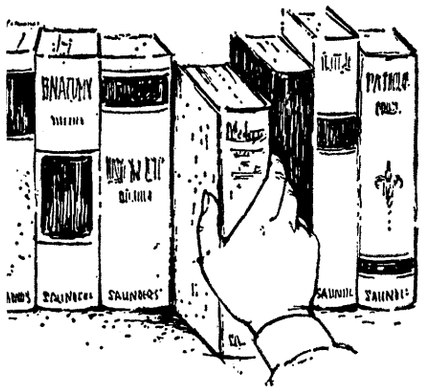

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Vol. 147, No. 3663

SCIENCE

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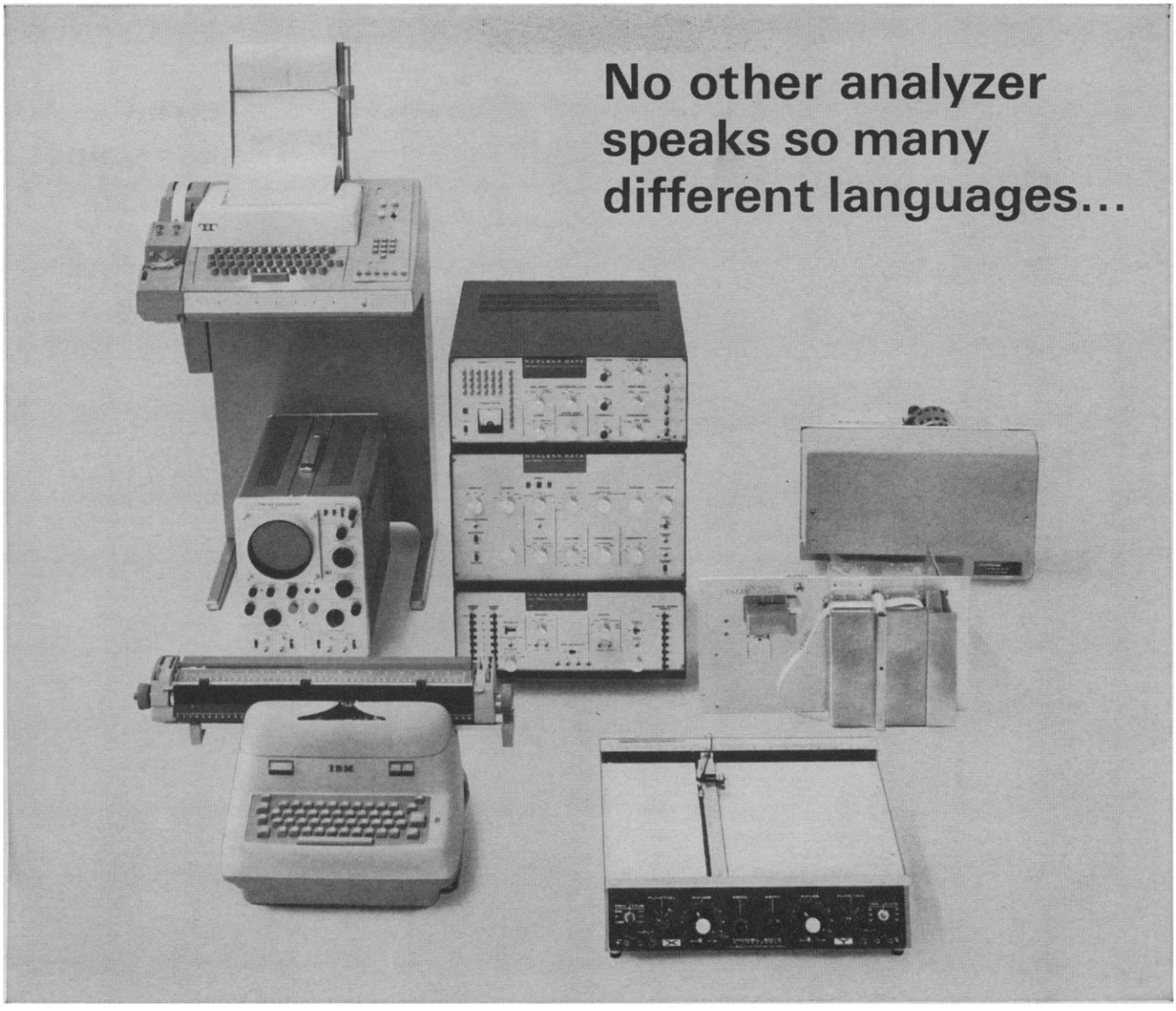
COVER

Oscilloscope trace generated by analog computer (PACE TR-10). The computer was programmed to simulate the spiral growth common in mollusks and other invertebrates. By varying the input constants, it is possible to examine the spectrum of geometrically possible shell forms, including those that do not occur naturally. See page 1294.



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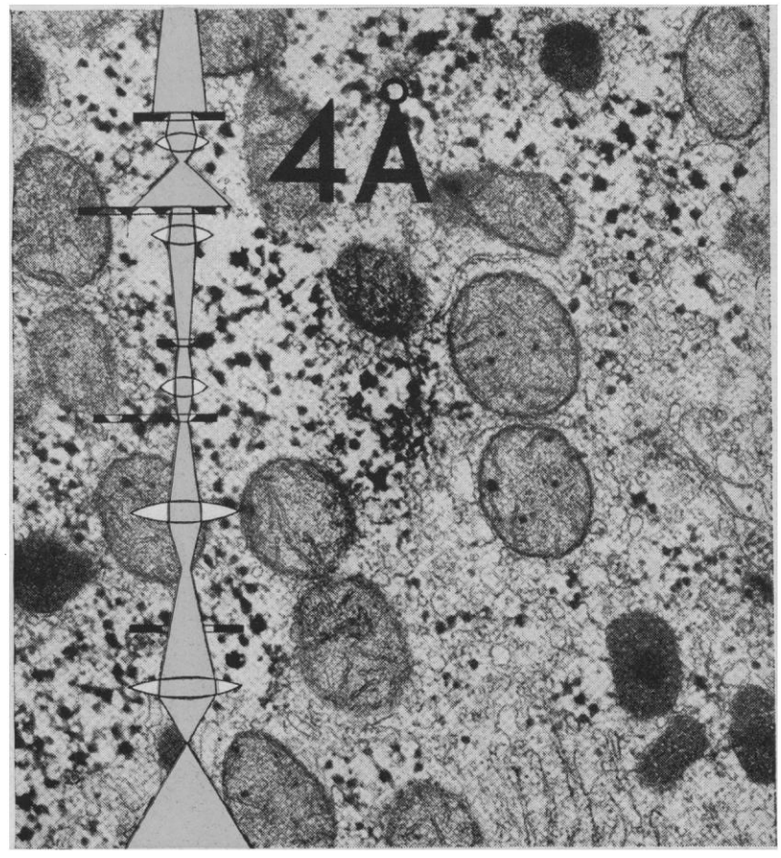

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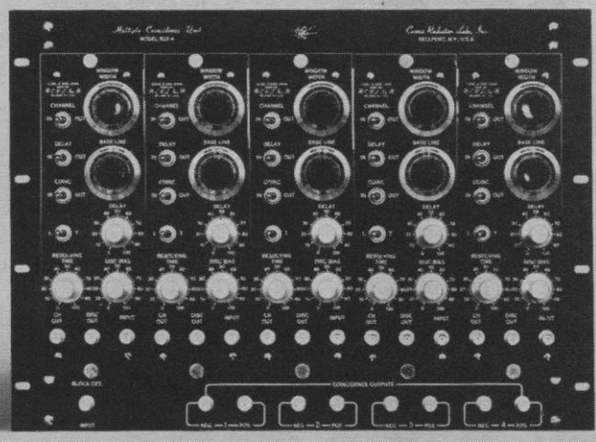

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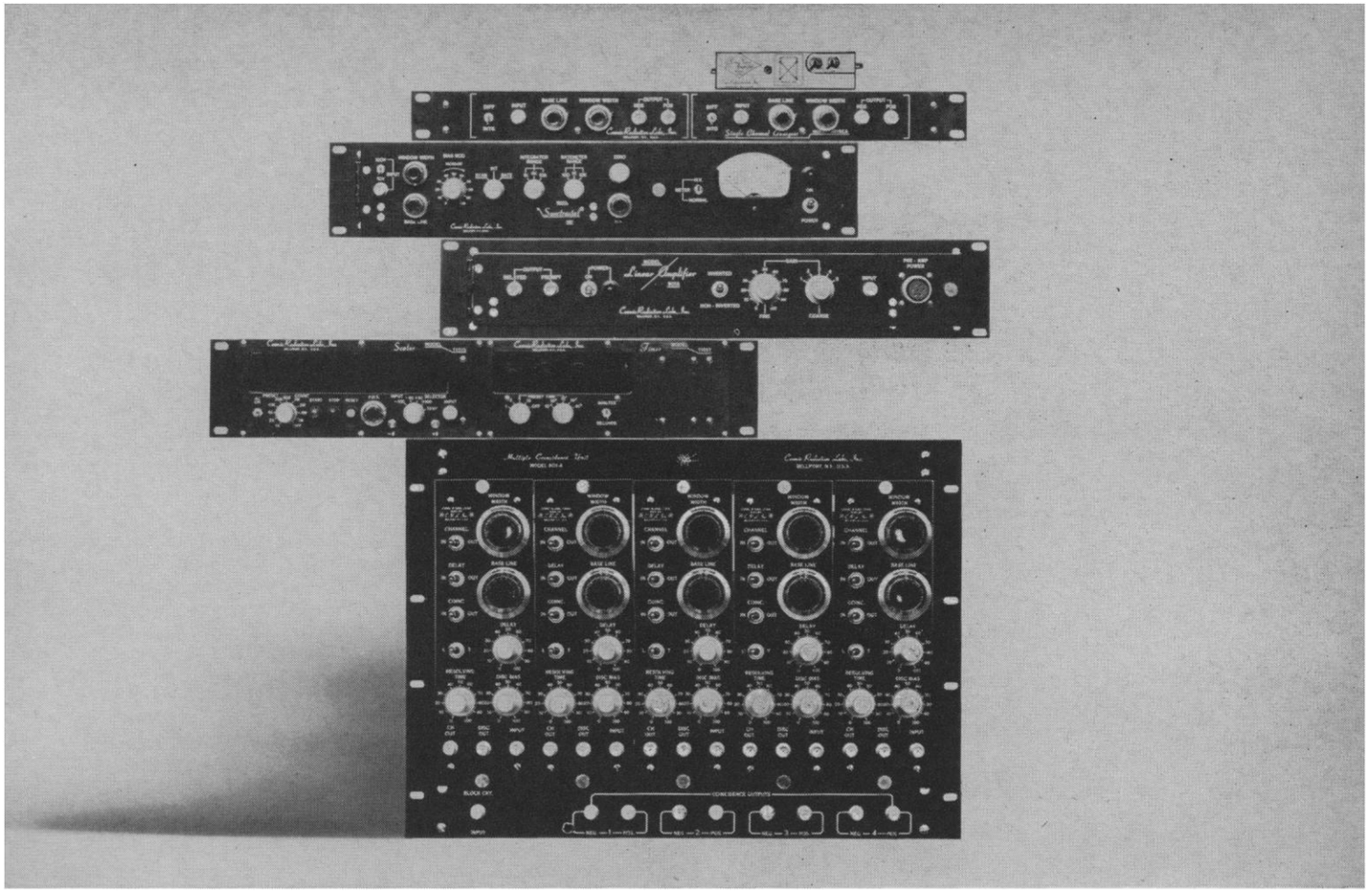
Complete flexibility is achieved by using plug-ins and patch cords similar to that used in computer programming. *You can get as many as 1013 different coincidence combinations with this patch-cord programming.*

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.

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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.

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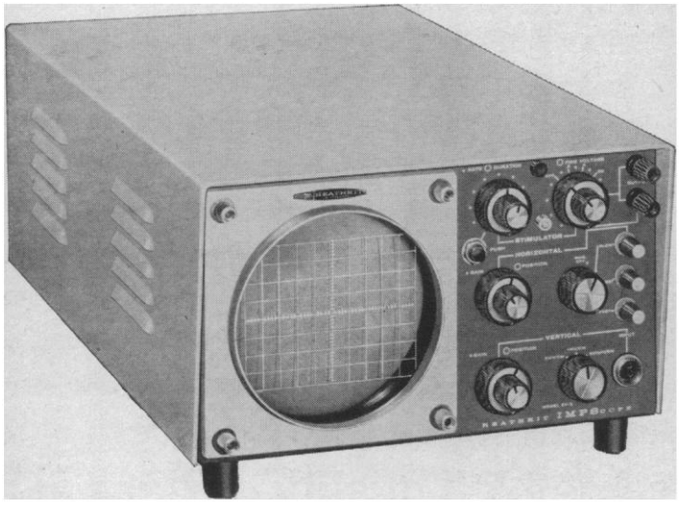

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The Heathkit model EV-3 IMPScope and its associated equipment, including the sourcebook, were developed in conjunction with project IMPS, supported by the National Science Foundation and conducted by Mr. Norman N. Goldstein, Jr. at the University of California, Berkeley. Mr. Goldstein, also is the author of the unique sourcebook containing extensive laboratory experiments.

IMPScope updates and deepens the teaching of contemporary biology to stress the use of instruments as data gathering extensions of the senses . . . experiments which deal almost exclusively with live organisms and tissues . . . and the problem-solving type of laboratory approach with emphasis on quantitative summaries. Such material makes possible the introduction of instrumentation early in science teaching, thus underscoring the advantages and limitations of scientific instruments. For a complete discussion of biology instruction and instruments, see: Goldstein, N. N., Jr., "Science Teaching in An Age of Instrumentation," the *SCIENCE TEACHER (NSTA)*, Vol. 29, No. 6, Oct. 1962. Goldstein, N. N. Jr., "Instrumentation and The Teaching of Biology," the AMERICAN BIOLOGY TEACHER (NABT), Dec. 1963.

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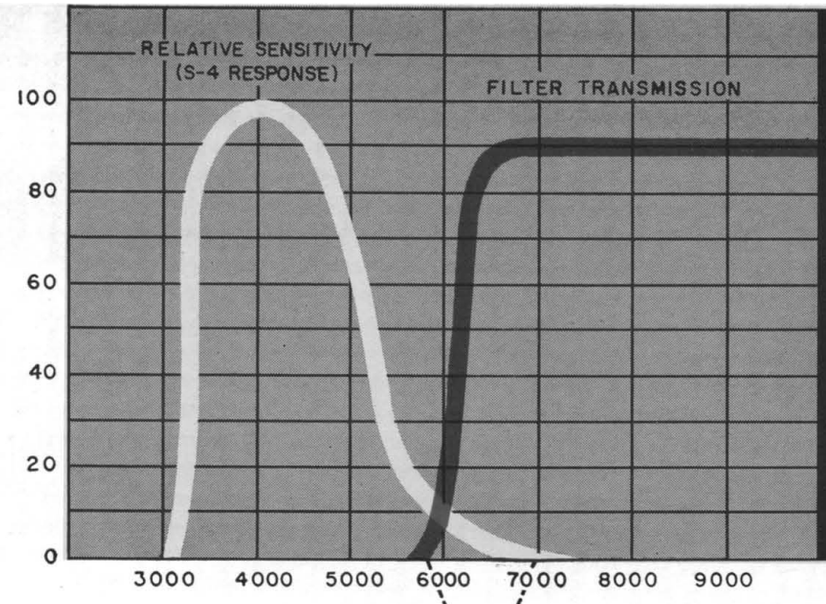

*The anode current comprising the "white" portion of this ratio is measured with a tungsten light source operated at a color temperature of 2870°K. The anode current comprising the "red" portion of this ratio is measured under conditions identical with the "white" measurement except that the light input is transmitted through a specially selected red filter as shown above.

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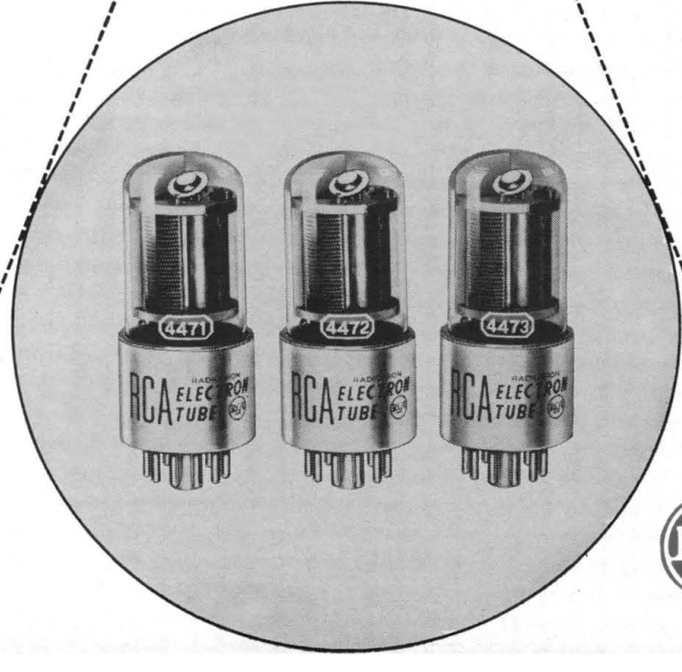

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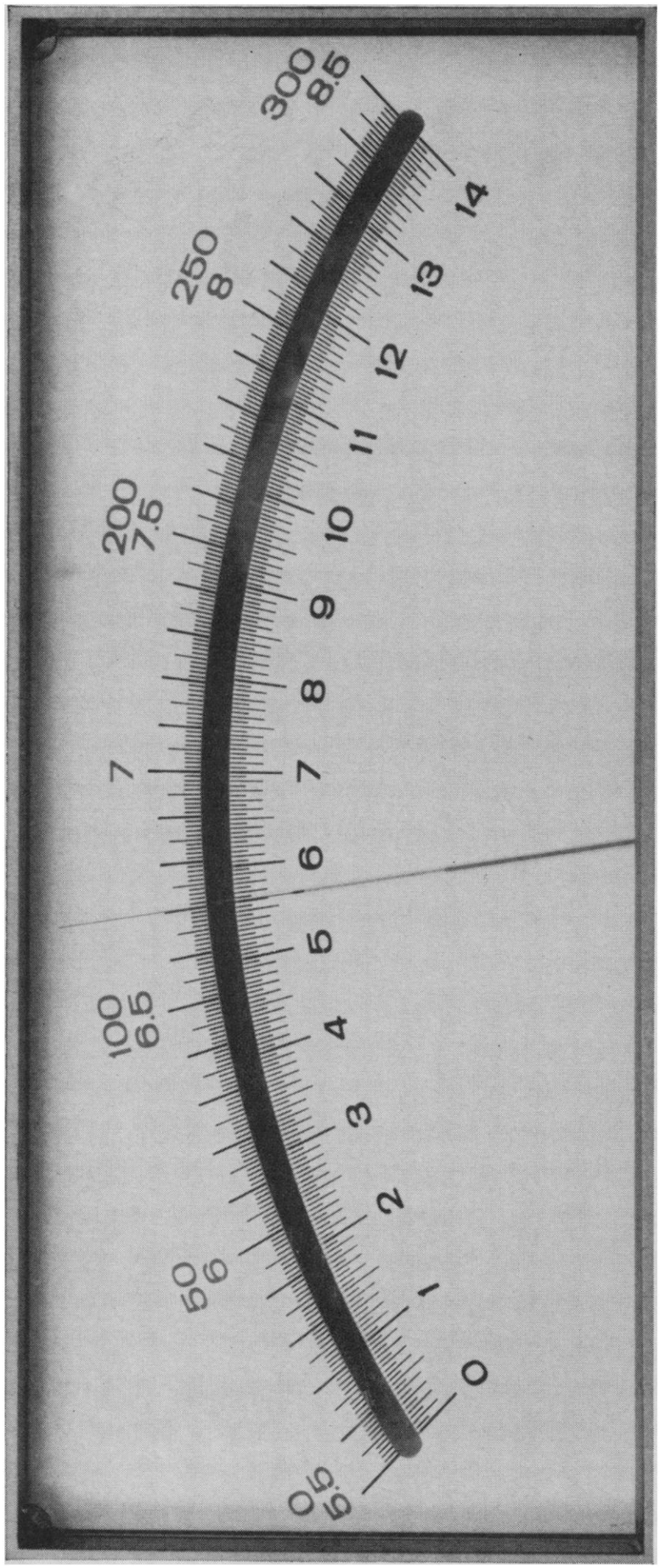
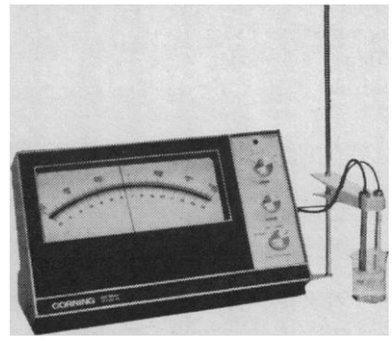


Divisions on the Model 10 meter scale, shown here **actual size**, are 0.05 pH on 0-14 range, 0.01 pH on 3-pH unit expanded-scale range. Repeatability is better than ±0.005 pH; relative accuracy on expanded scale is ±0.01 pH.

Take a long look at the new standard in pH readability



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You can measure 0-14 pH, 0 to ±1400 mv, or expand any 3 pH units or 0 to ±300 mv across the entire scale.

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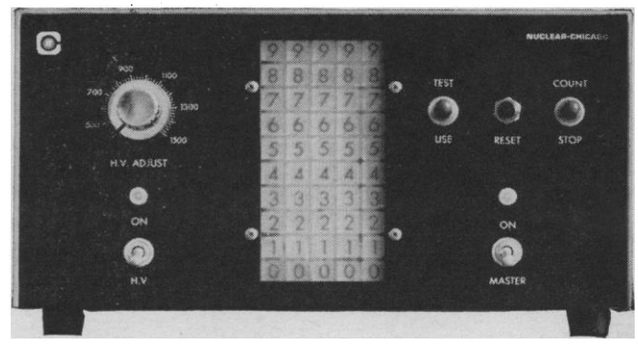
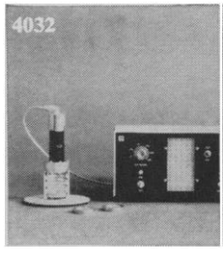
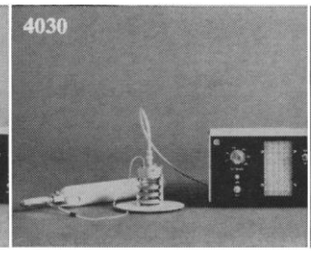
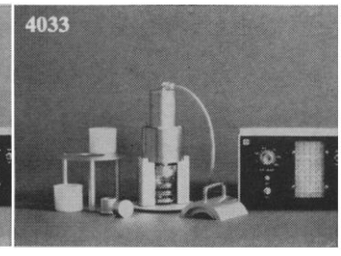


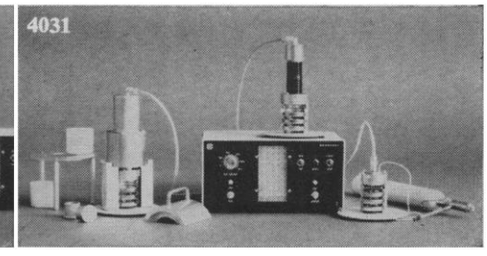
Four to learn from.

Four *new* radiation-counting systems for classroom and laboratory use are also offered by Nuclear-Chicago. These systems are based on the Model 8770 Scaler and encompass the fundamental methods of detecting and measuring radiation. Each system is composed of the Model 8770 Scaler, the appropriate detector system, and all the necessary components including: dual timer for preset and elapsed time control of scaler; absorbers and sample pans; solid- and liquid-state sources; and our new Autoradiography Kit for introductory radiation studies. The 4032 Geiger System and the 4030 Gas-Flow System also include manuals detailing 33 experiments and a manual of instructor's notes containing helpful teaching aids.









Model 4032 Geiger Laboratory System
An efficient, end-window, Geiger-tube system for counting many soft-beta isotopes, such as C-14, as well as gammas, hard alphas, and betas. In addition to the components listed above, this system also includes sample preparation set, detector with stand, and C-14 beta source. Complete system, **$695.**

Model 4030 Gas-Flow Laboratory System
For counting soft betas from isotopes such as C-14 and Na-22. Detector uses continuously replenished counting gas for greater stability and efficiency than sealed Geiger tube. Also includes detector with stand, sample preparation kit, one tank of Q-GAS® with pressure regulator, and C-14 source. Complete system, **$795.**

Model 4033 Scintillation Laboratory System
For high-efficiency counting of gammas, as well as alphas and betas. Can be set up for planchet-counting or well-counting of solid or liquid samples. Also includes detector with NaI(Tl) gamma crystal and interchangeable alpha and beta crystals, detector stand, two Marinelli re-entrant beakers, two-piece lead shield for crystal and sample holder, and alpha, beta, and gamma sources. Complete system, **$995.**

Model 4031 Alpha, Beta, Gamma Laboratory System
Consists of all of the items included in the other three systems for Geiger, gas-flow, and scintillation counting. The most complete, versatile, precise system for classroom demonstrations, experiments, and even for graduate work. Complete system, **$1295.**

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Also *new* from Nuclear-Chicago: the Model 4011 Basic Demonstration Laboratory System. Includes everything you need for studies of Geiger-Müller counting, cloud-chamber phenomena, and basic experiments such as plant and animal radioactivity uptake. Complete 4011 System, **$299.**

Full information on all of these components and systems is contained in our new four-page brochure, *Nuclear Science Laboratory Systems for Education.* Please write for your copy.

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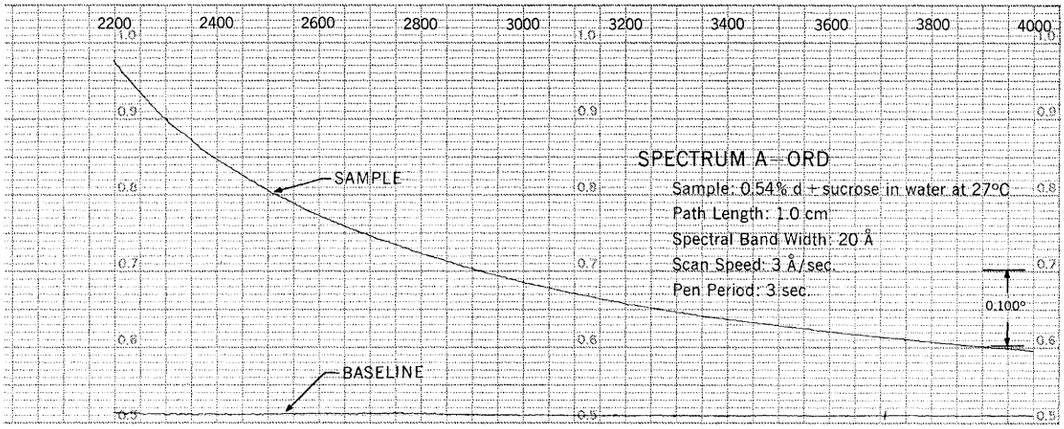
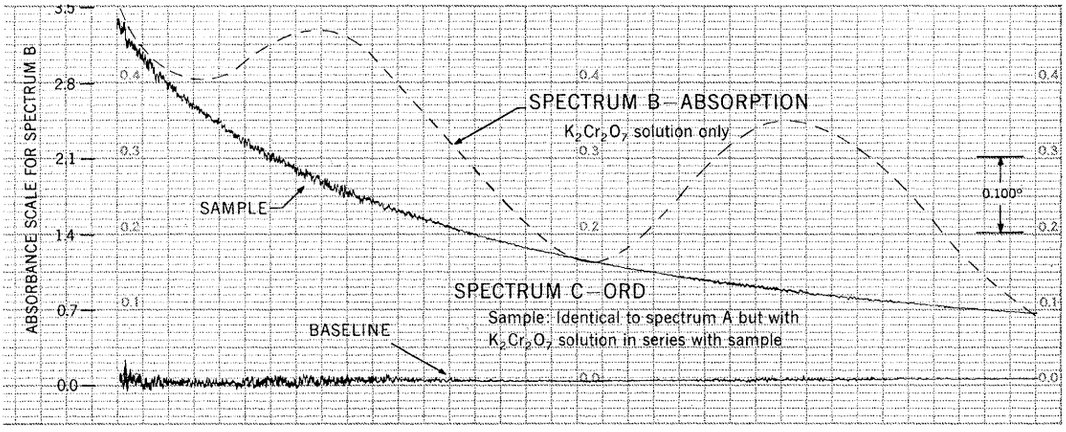
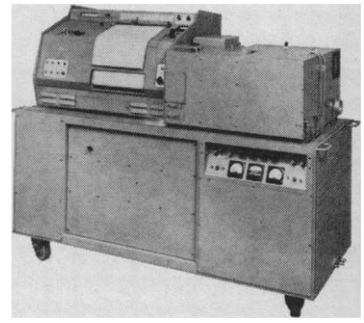
These products are also available from leading distributors of scientific apparatus. Prices shown are for United States and Canada.

Take full advantage of ORD technique...
WITH CARY MODEL 60 SPECTROPOLARIMETER



The comparison spectra, A and C, show a sucrose sample recorded under different absorbance conditions. Spectrum C demonstrates the ability of the CARY 60 to provide valid dispersion data in regions of high total absorbance, so often a critical need. Note that except for the expected increase in noise due to increased absorbance, the original dispersion spectrum is accurately reproduced. Sucrose was chosen because it gives a simple one term Drude curve on which deviations are easily seen.





See CARY MODEL 60 at FASEB Conference, April 10-14.

Make your own analysis of Model 60 performance. A portfolio of ORD spectra for a variety of samples is available by writing for Data File E501-35.

The CARY 60 provides the capability to utilize the ORD technique fully: Its high resolution precisely defines peaks and troughs, minimizes effects of rotation from adjacent bands, provides sharp spectra for more accurate peak-to-trough measurements. High sensitivity permits measurement of very dilute samples. Excellent stability (baseline drift less than 2 millidegrees per 8 hours) assures that precision is maintained even over long periods.

Maximum versatility is achieved with controls that provide operator freedom to utilize superior instrument performance over a variety of sample conditions in either static or kinetic applications.

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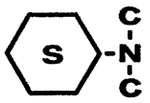
FOR MARCH



N,N-Dimethylcyclohexylamine

Form.....*liquid*
Color.....*water white*
Distilling range, 760 mm.....*157-160°C.*
Assay, by gas chromatography.....*99%*

This is an excellent catalyst for the manufacture of polyurethane foams. It is used as an intermediate in rubber accelerators. The reaction products with halomethyl compounds may be used as a treatment for textiles to enhance shrink resistance, water repellency, and softness.

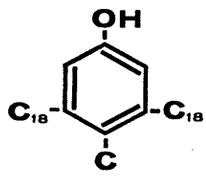
Eastman Chemical Products, Inc.
Kingsport, Tennessee **B18**

1, 4-Cyclohexanebis(methylamine)

Form.....*clear liquid*
Isomer content.....*40% cis, 60% trans*
Boiling range, 760 mm.....*239-244°C.*
Purity.....*99%*

This diamine is versatile: it mixes with water and organic solvents; it reacts with atmospheric CO_2 to form a carbonate insoluble in the parent amine; it should also interest urethane chemists.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B31**

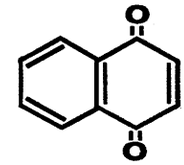


2,6-Dioctadecyl-p-cresol

Form.....*viscous liquid*
Color.....*very slightly yellow*
Solubility.....*soluble in most non-polar solvents*

This effective non-volatile antioxidant for polypropylene and other systems now has FDA clearance for use in polyolefins which are used for packaging certain types of foods. (Federal Register, *29*, No. 184, 13104, Sept. 19, 1964.) It is lawful for use in adhesives under Federal Food Additive Regulation 21 CFR 121.2520.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B58**

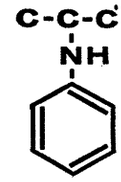


1,4-Naphthoquinone

Form.....*red brown solid*
Melting point.....*125-126°C.*
Purity.....*95%*

Keep the resonating quinoid system intact and you have a useful dyestuff intermediate. Be a little more energetic and you can end up with something that licks tar spot, black spot and powdery mildew.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B59**



N-Isopropylaniline

Form.....*light yellow liquid*
Boiling point.....*206°C.*
Assay, by gas chromatography.....*98%*

What with acrylic fibers creating new interest in cationic dyes, you could try this in synthesizing azo and triphenylmethane types. Look at it, too, as a pesticide or rubber chemical intermediate.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B63**

Chemicals Sales Development Dept.
Eastman Chemical Products, Inc.
subsidiary of Eastman Kodak Company **CS**
Kingsport, Tennessee

Please send more data on these chemicals:

B18 ☐ **B31** ☐ **B58** ☐ **B59** ☐ **B63** ☐

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Company _____

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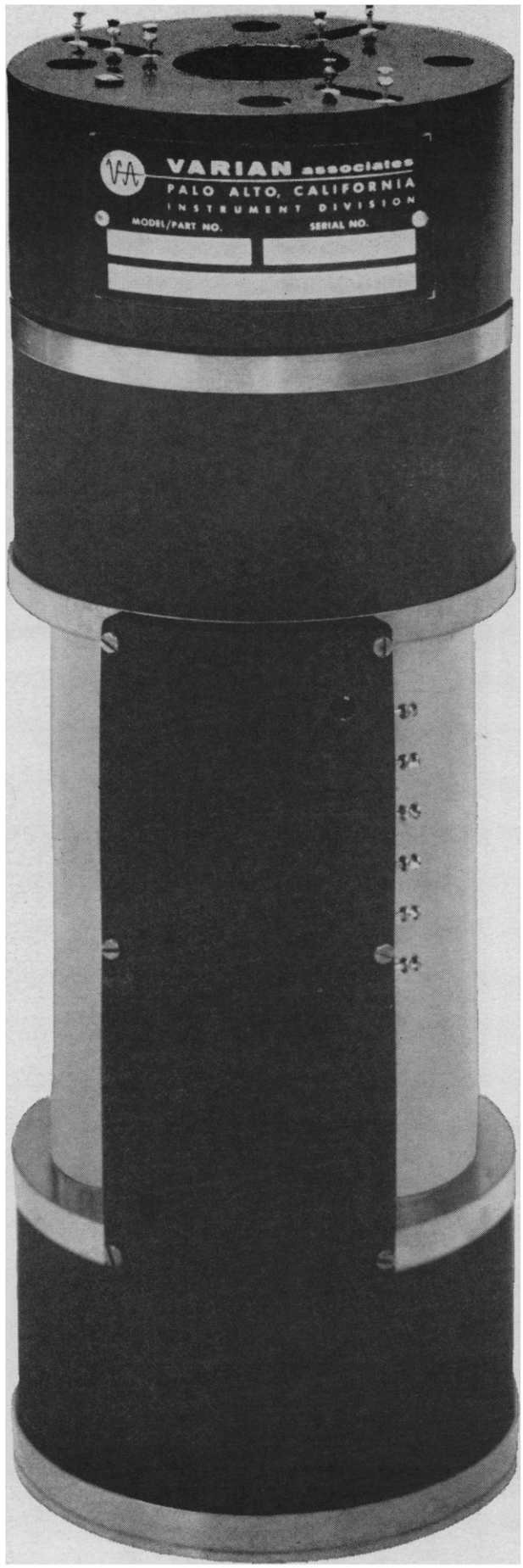
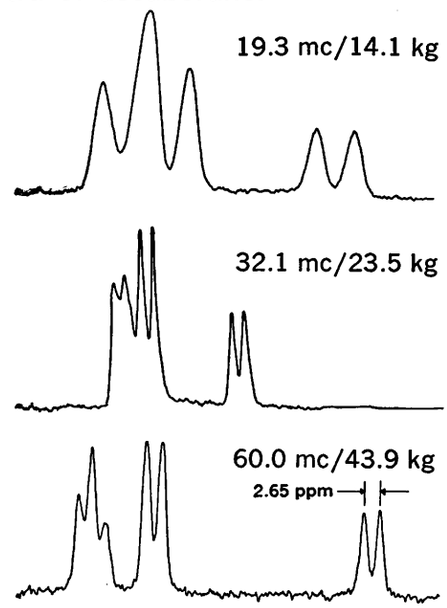


SUPERCONDUCTING SOLENOIDS FOR NMR

Varian has a line of superconducting solenoids that offer interesting possibilities for wide-line NMR.

They produce up to 60 kG fields homogeneous to a few ppm over the sample volume.

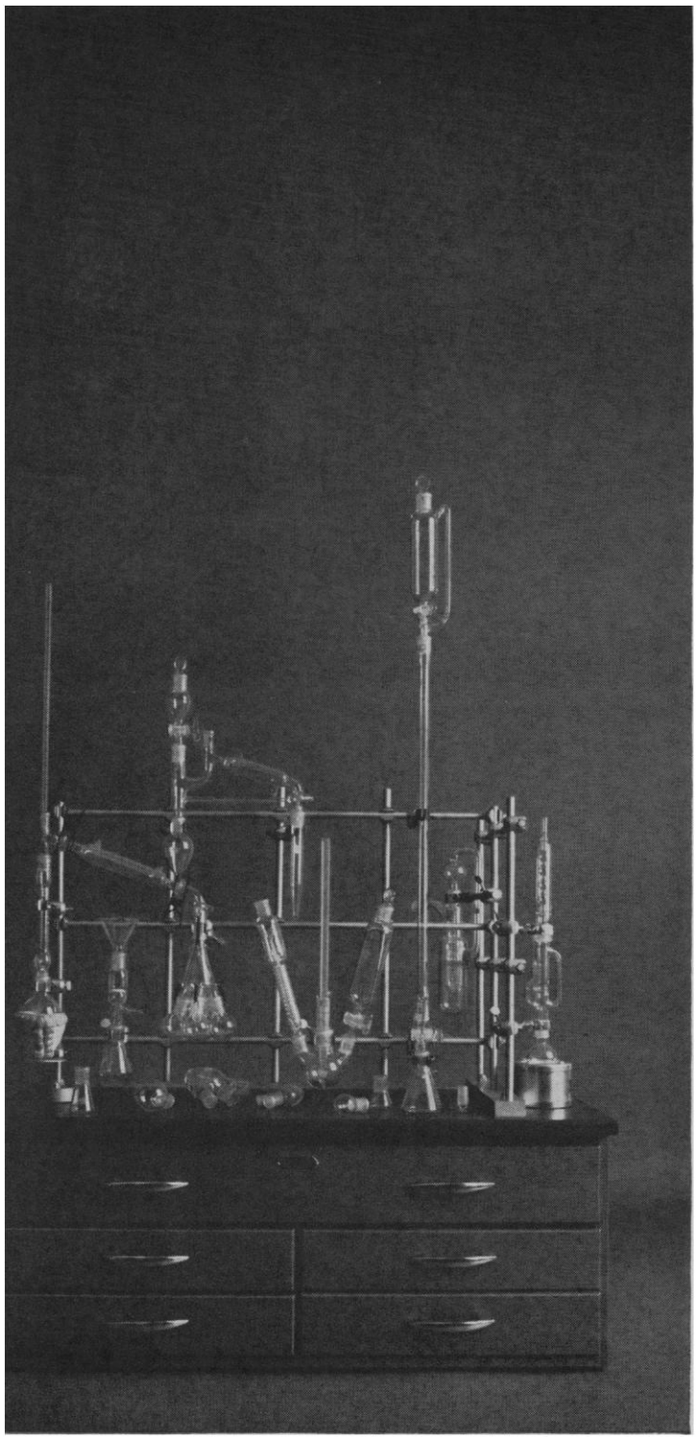
The greater chemical shift obtained with increasing field is illustrated by these three spectra of decaborane:

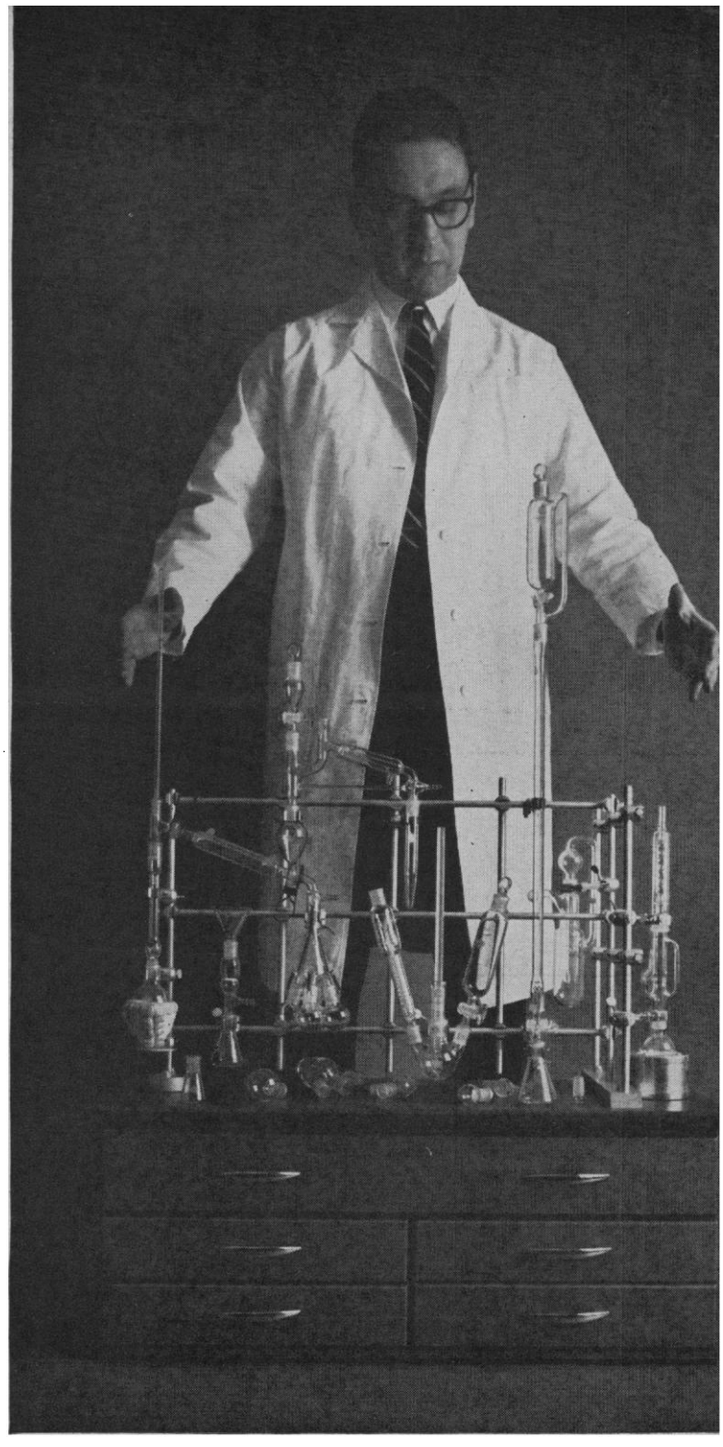


If this starts you thinking about what **you** could do with this solenoid (like studying oxygen-17, phosphorus-31, boron-11, or Knight shift in non-ferrous metals), drop us a line. We'll be glad to help.

VARIAN ASSOCIATES

ANALYTICAL INSTRUMENT DIVISION
PALO ALTO, CALIF. □ ZUG, SWITZERLAND





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Give our bantam-ware semi-micro kit only 2.5 square feet of bench space and it will do anything required of a complete organic laboratory—with smaller quantities and reduced reaction time.

Each kit contains all the apparatus necessary for fractionation; steam, atmospheric, and vacuum distillation; chromatographic analysis; extraction; filtration; reflux; and separation. bantam-ware is convenient—the work area is at chest and eye level, easy to watch and make adjustments. And, when not in use, all components store neatly in the cabinet base.

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bantam-ware glassware is designed to avoid troublesome product-catching bulbs and pockets beneath the ground joints. All components are proportioned for gradual bends and even glass distribution. Unnecessarily long travel paths and wetted surfaces have been eliminated to conserve costly chemicals and give maximum yields. Outer walls of $\overline{\$}$ 14/20 joints are uniformly cylindrical. Butt seals are generously radiused. Glass support rods are used at all potential points of stress.

Kits are available with or without Teflon* stopcock plugs and spherical joints ($\overline{\$}$ 18/9) on inclined condenser connections. Each of four available bantam-ware kits contains equipment for supporting, clamping, agitating, heating.

There's one more point. The kit components are completely interchangeable with our entire bantam-ware line of over 300 items.

For complete information and prices, request Catalog TG-20 b-w.

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Model pHM28

pHM28/TTT11

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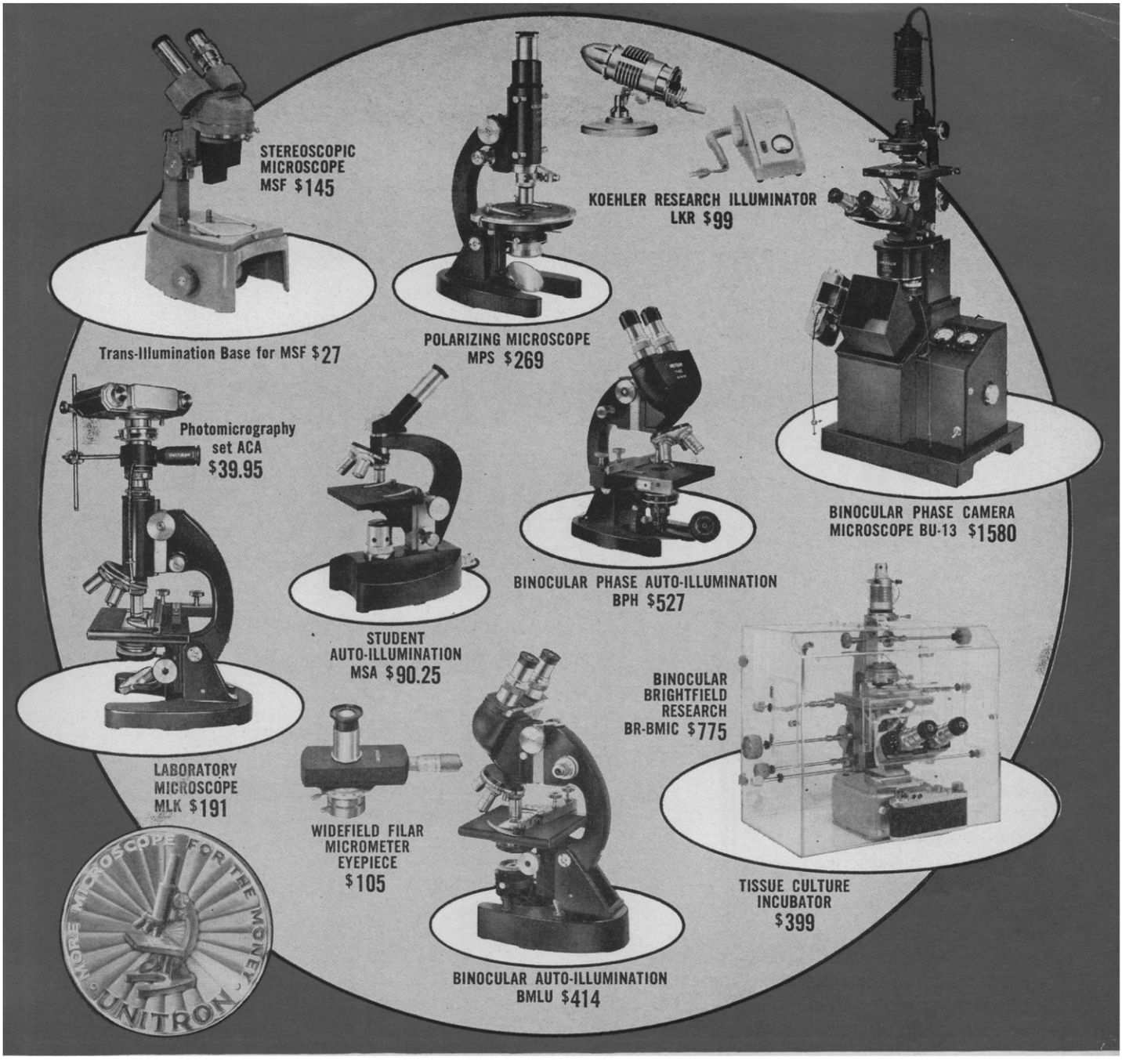

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Most brands of microscopes **promise** quality . . . But UNITRON really **delivers** it.

Some other brands **imply** economy . . . UNITRON **proves** it . . . check our prices!

And a few others **claim** both quality and economy . . . But UNITRON is the brand that **guarantees** both.

What's more, this guaranteed UNITRON quality and economy are offered in a complete line of microscopes, to meet the routine and research needs of modern labs. Choose from brightfield, darkfield, and phase contrast models . . . monocular or binocular . . . familiar upright or unique inverted stands . . . with attachable or built-in cameras and illumination systems.

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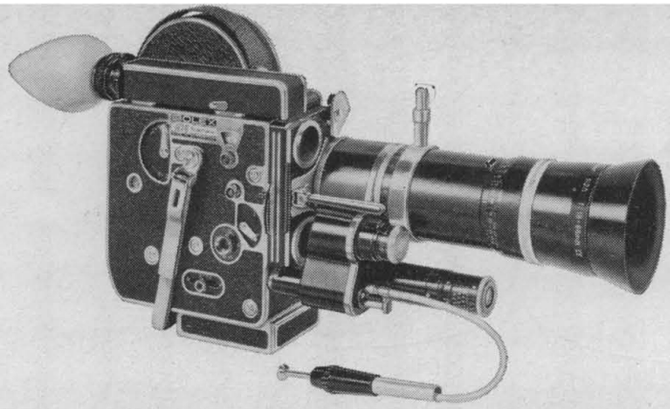

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Take the Bolex H-16 Rex with our Vario-Switar 86EE automatic electric eye zoom lens (shown above). It's the only 16mm electric eye zoom camera made. And for press and TV commercial production there's nothing like it. We realize you can read a light meter and change f/stops. But say you're shooting a parade. And just as you're zooming in on some dignitary the sun goes in. What do you do—take a new reading and readjust? Not with the 86EE. You just keep shooting automatically. Anything from wide angle to telephoto. And automatic loading and spool ejection speedup loading, too.

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Bolex: "the money camera." You can depend on it.

For further information on the Bolex 16 or our free catalog, write: Paillard Incorporated, 1900 Lower Road, Linden, N.J. 07036.

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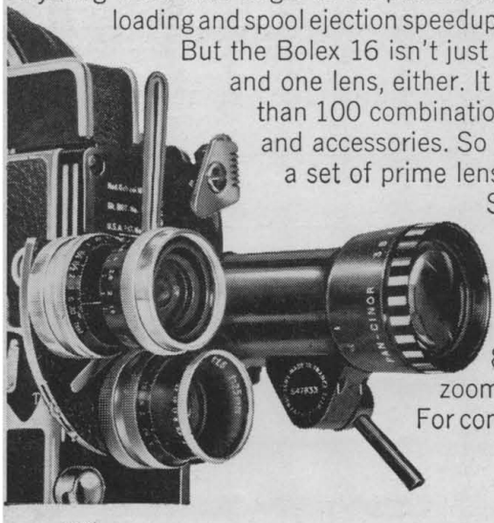

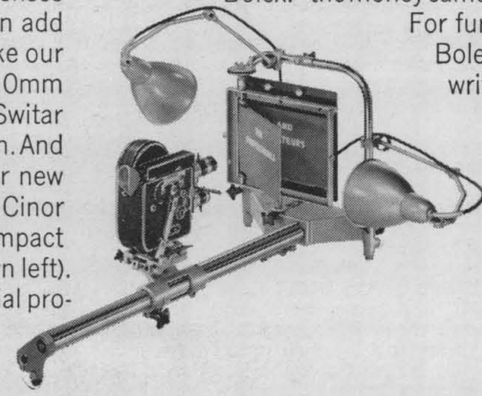

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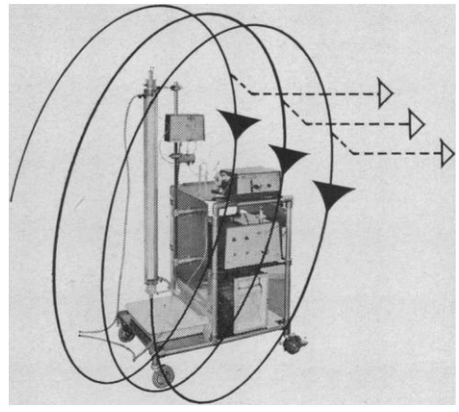
NEW INSTRUMENTATION FOR A NEW TECHNIQUE* IN CHROMATOGRAPHIC SEPARATION



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 operations 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 µl—a reproducible and non-critical method.

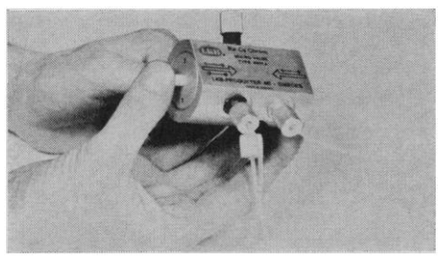
The four main components of the ReCyChrom, namely, a separation column, a peristaltic pump, a selector valve and a flow analyzer are available separately for incorporation into other instrument setups. The specially constructed columns with adjustable plungers at both ends can be sealed completely to 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.

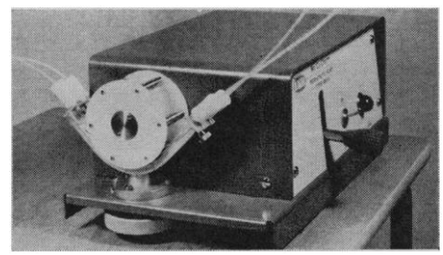
A choice of three flow analyzers, cooling jackets, terminal box, connections and a cart comprise the remainder of the assembly.

Request literature file 4900S-3 for details.

*According to J. Porath and H. Bennich



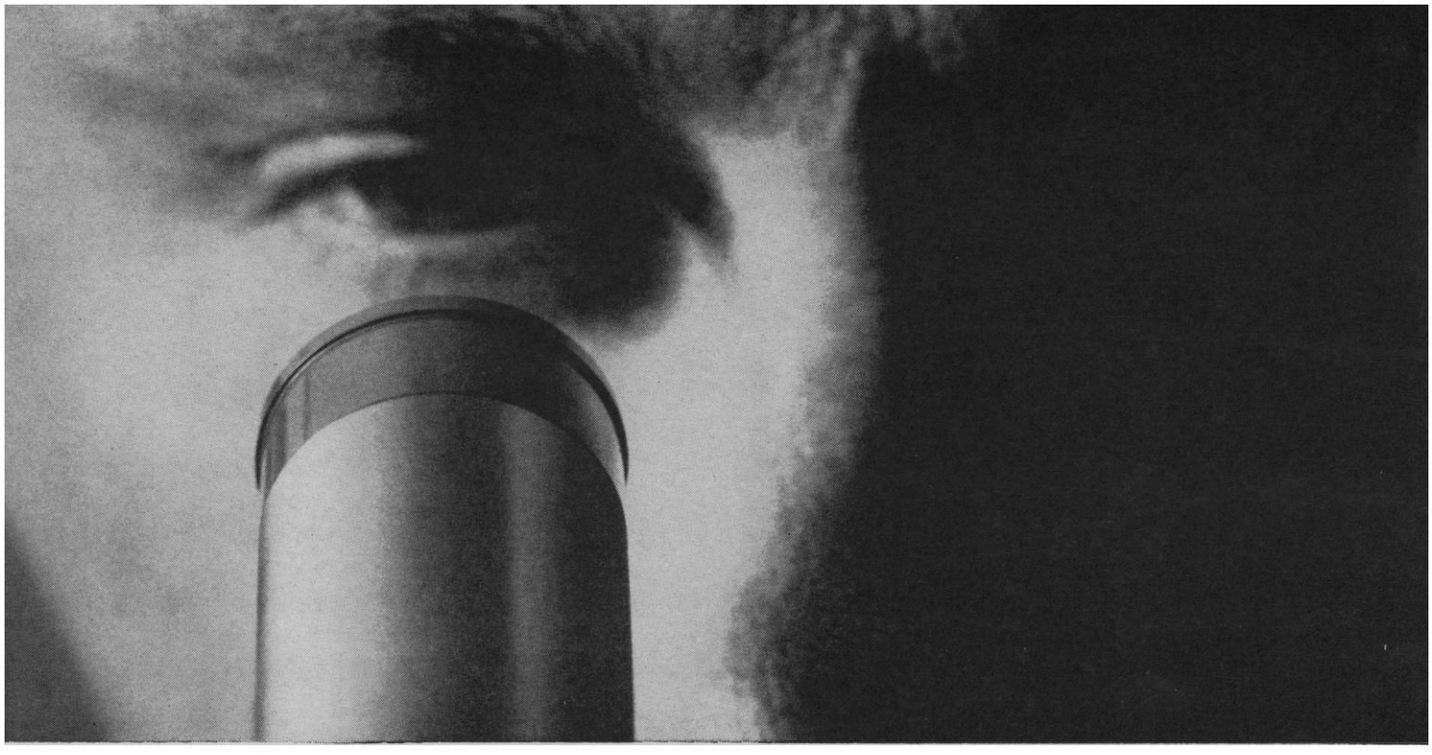
The simple push of a button on the Selector Valve alters the flow circuit from injection or bleeding to recycling.



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

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

LKB PRODUKTER AB, P.O. Box 12220, Stockholm 12, Sweden



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New York 10, N. Y.

Glas-Col Ponchos and mantles shown fitted on Corning-Q.V.F. flasks of (l. to r.) one, 200 and 100-liter capacities. Poncho garment worn by model was hand crafted in Cusco, Peru.

PROCESS HOT FLAMMABLES WITH SEALED-IN SAFETY...WITH THE NEW GLAS-COL

PONCHO*

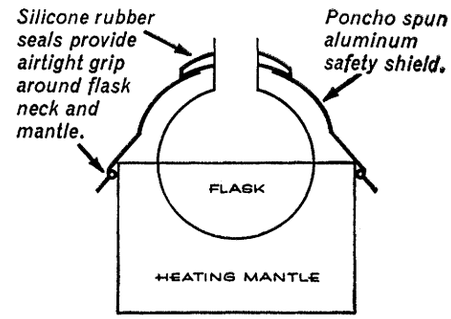
the safety shield that seals the flask into the heating mantle

WHAT IT IS: The Poncho is a spun aluminum safety shield for use with Glas-Col high-wattage heating mantles. The Poncho/Mantle method of high temperature processing of flammable liquids is unequaled for safety . . in the lab . . or in all-glass plants where growing use of large Q.V.F. glass flasks has made ultimate safety an absolute *must.*

WHAT IT DOES: The Poncho protects mantles from spillover, flasks from falling objects, personnel from flying glass in cases of implosion or explosion. And it serves as an efficient heating top.

PROOF: To prove its safety, we fit a glass flask and Glas-Col quartz heating mantle with a Glas-Col Poncho safety shield . . brought to 650°C at full wattage . . then drenched it with ether, acetone, gasoline. *We could not produce a fire.*

REASON: The Poncho actually *seals* the flask *into* the mantle, greatly reducing fire hazards. Nitrogen purging further reduces danger when using flasks 12 liters and larger.



Write for descriptive **Poncho** *Bulletin . . which includes facts on Glas-Col's new Splash Guard* designed for smaller, low-wattage mantle and flask protection. Poncho/Mantle combinations available for flasks 500 ml to 200 liters, single or multiple neck.*

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HEATING MANTLES
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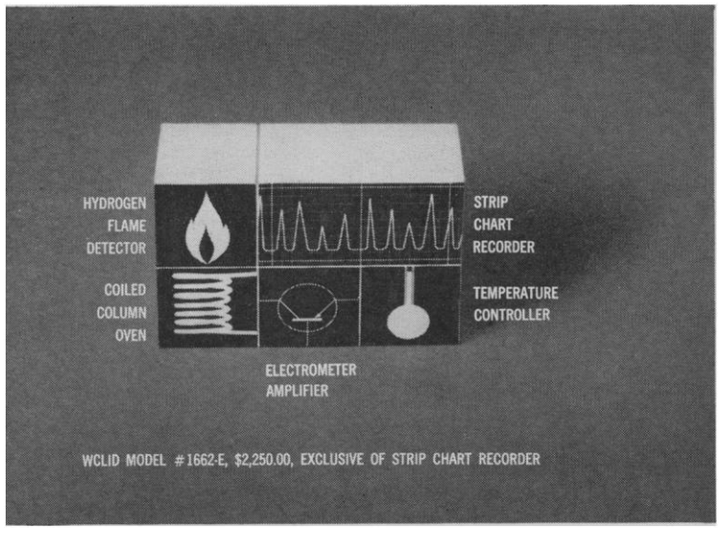
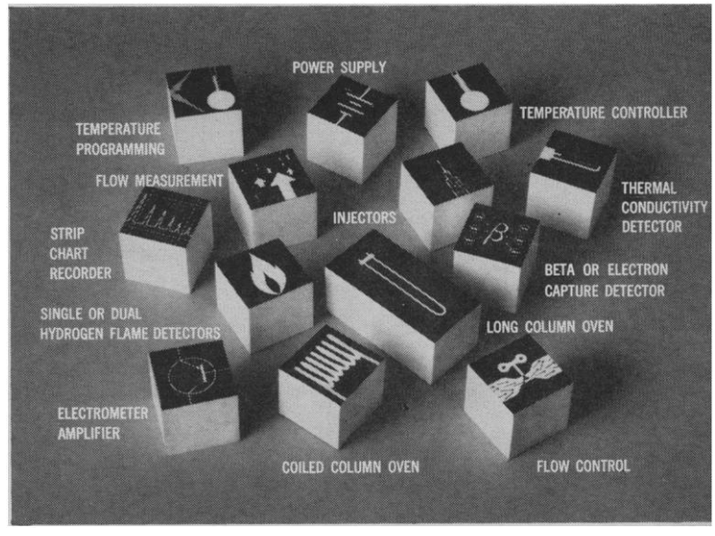
steroids • fatty acids • blood alcohols • barbiturates • alkaloids



Specify a single clinical application—and the 1600 series has a modular system for running your determinations. No need to order components you'll never need or use. If your use of gas chromatography expands, your system expands—with additional modules.

In the industrial laboratory

Applications as diverse as your analytical problems! *(A few of the many substances which have been analyzed gas chromatographically: alcoholic beverages • drugs • pesticides • essential oils • water • atmospheric gases • detergents)*



Adapt the 1600 series to almost any industrial application—simply by changing the modules. Select the type of detector you need: hydrogen flame, thermal conductivity, beta-ionization. Select the sampling valve, input splitter, flow meter. The 1600 series is as adaptable as your needs.

Purchasers of WCLID gas chromatography systems (series 1600) are eligible for a week-long free seminar on practical applications. (Biomedical and Industrial seminars to be held on alternate weeks.) Classes may be attended by any members of your laboratory staff who will be using the chromatography equipment. Interested? Return the coupon.

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I'd like to know more about the WCLID Gas Chromatography system and the seminars on laboratory applications.

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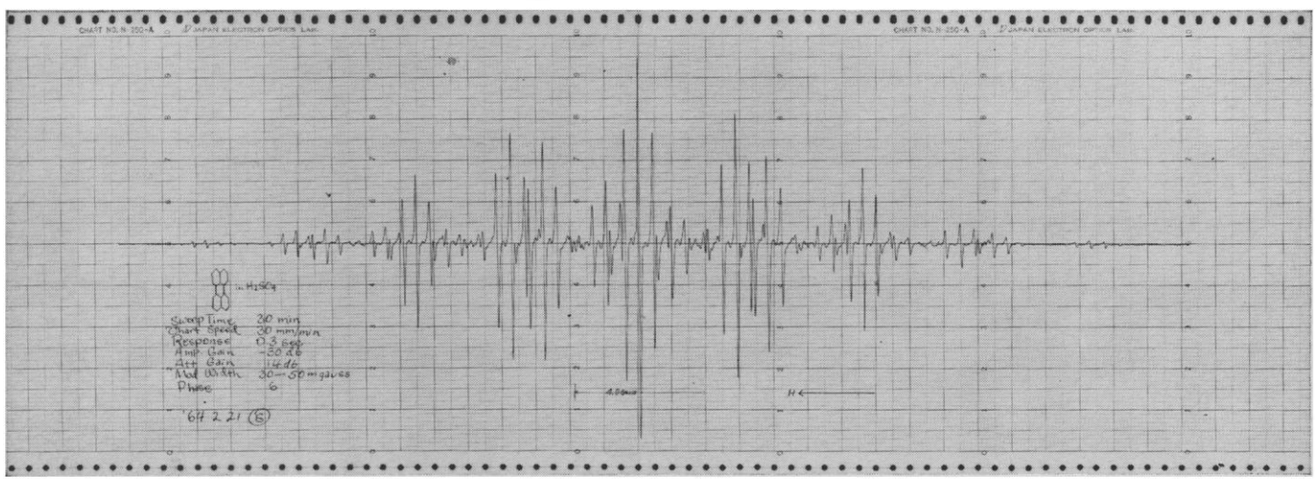
ESR



ESR spectrum of perylene positive ion in sulphuric acid showing highly resolved hyperfine structure due to interaction with proton spins.

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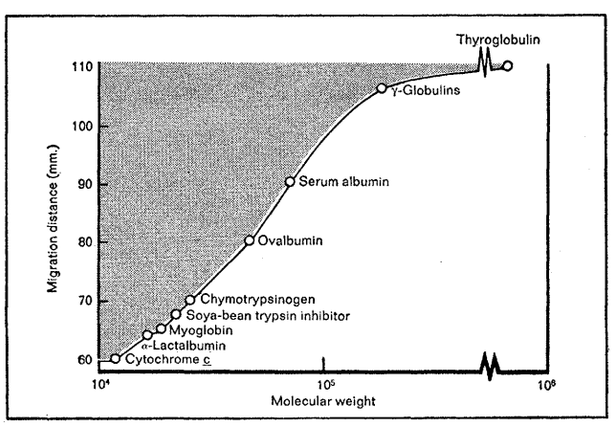

Correlation between the molecular weight of 9 proteins and their migration rate in thin-layer gel filtration on Superfine Sephadex G-100 was investigated. Measurements from separate experiments were correlated by expression on the common basis of 6 cm. migration by cytochrome c.

(Andrews, P., Biochem. J. (1964) 91,222, by permission of the author.)

The fractionation ranges for the different types of Superfine Sephadex are the same as for the other Sephadex grades.

Sephadex Type	Fractionation Range (MW)*
G-25	100- 5,000
G-50	500- 10,000
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G-100	5,000-100,000
G-200	5,000-200,000

**Determined for polysaccharides.*

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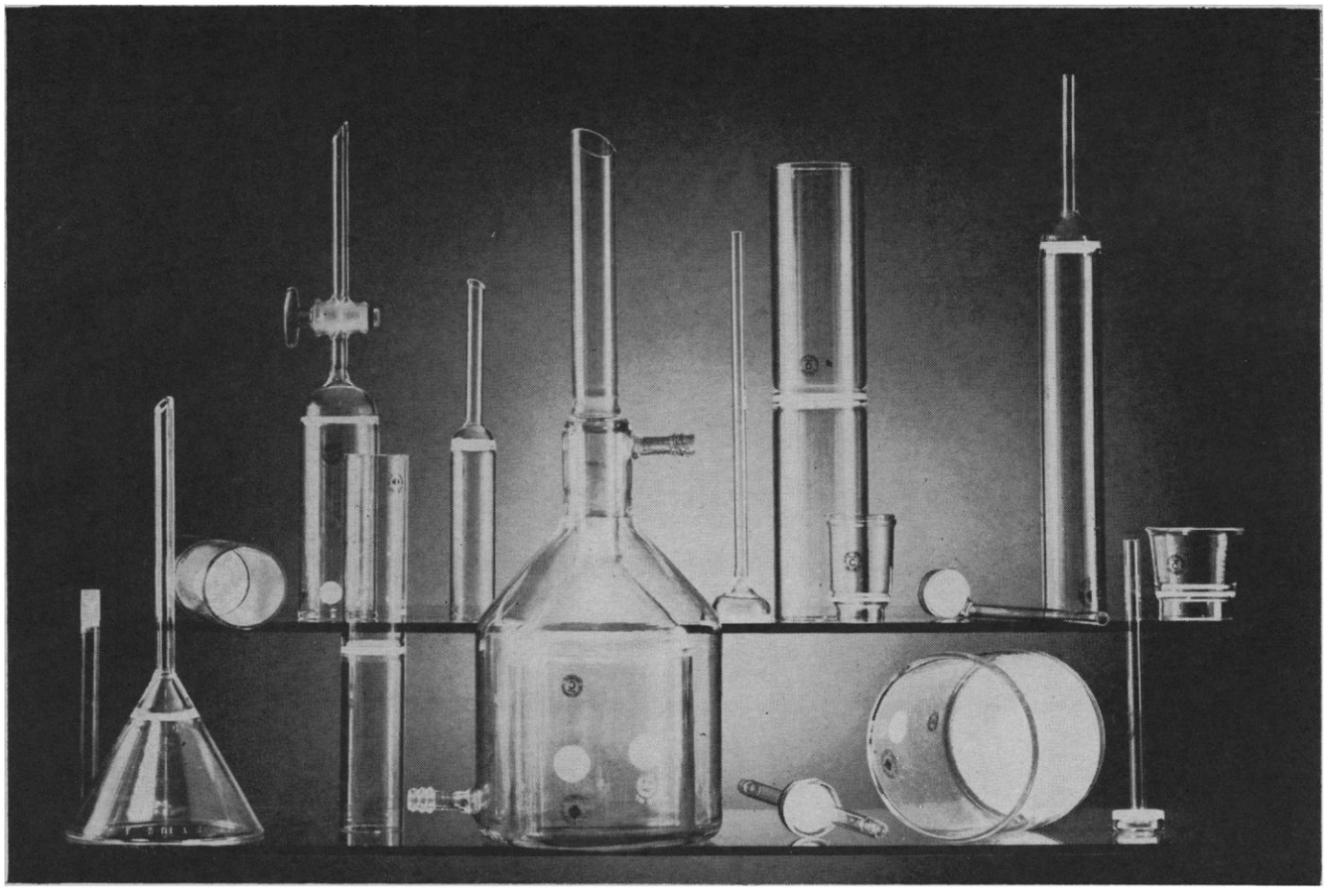

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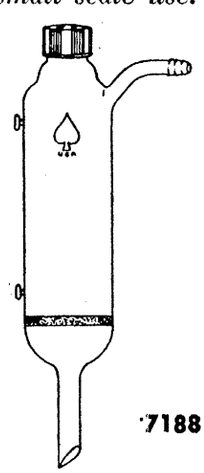

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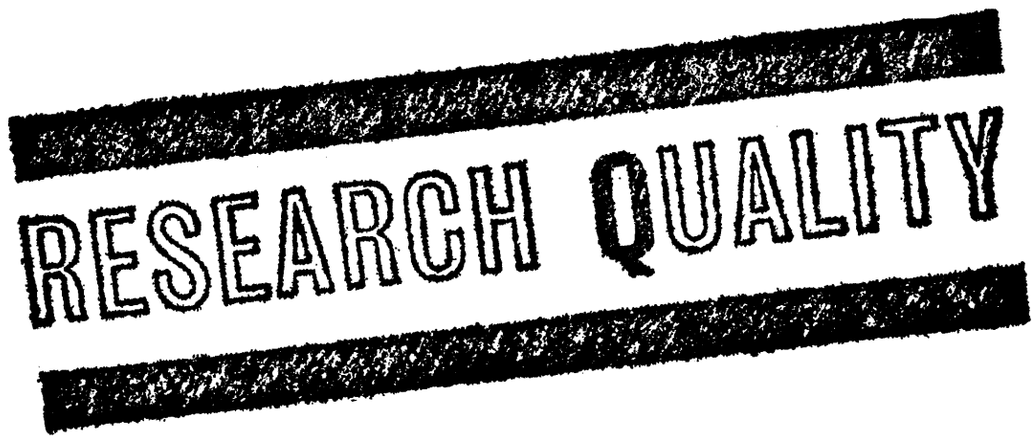

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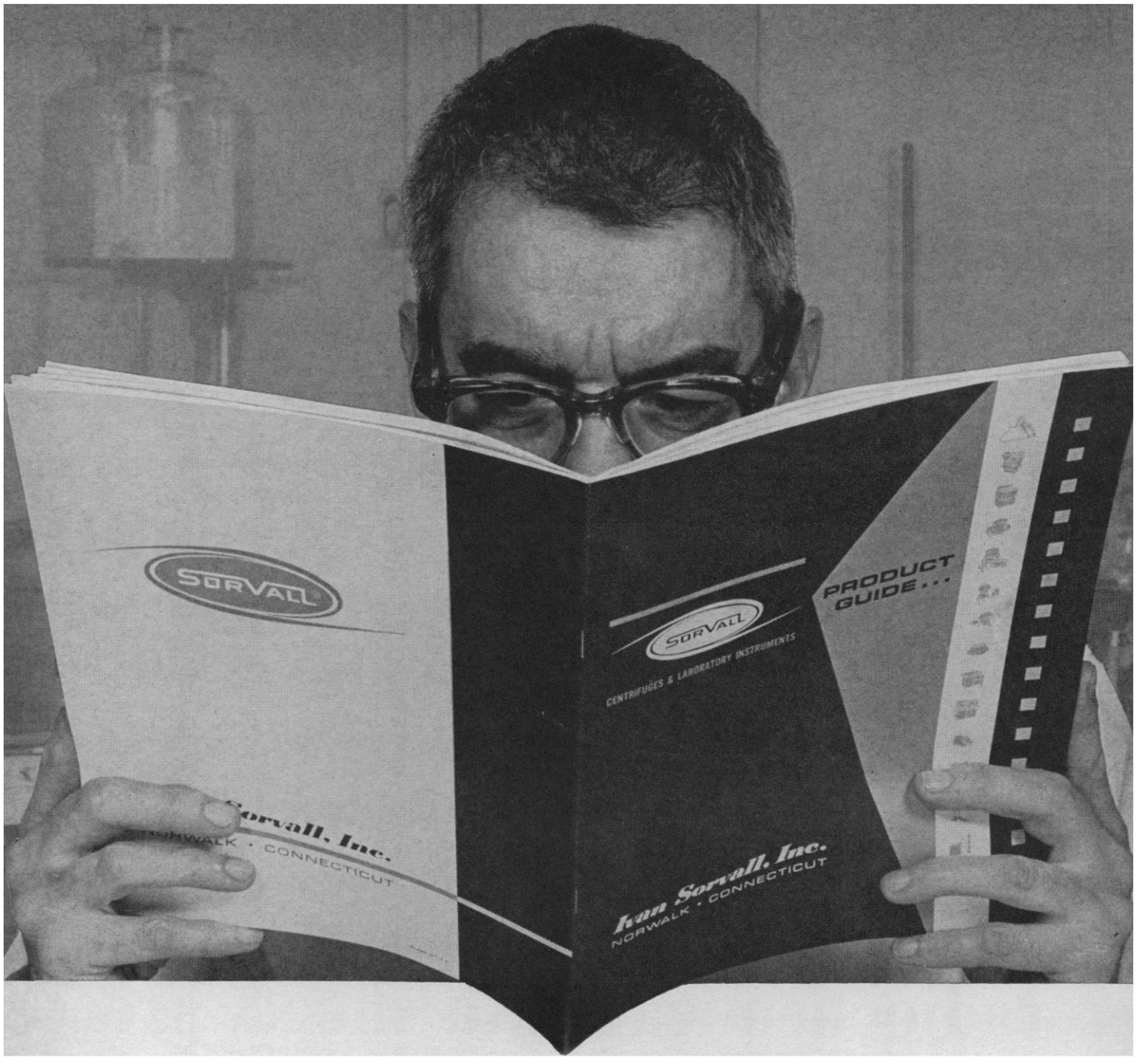

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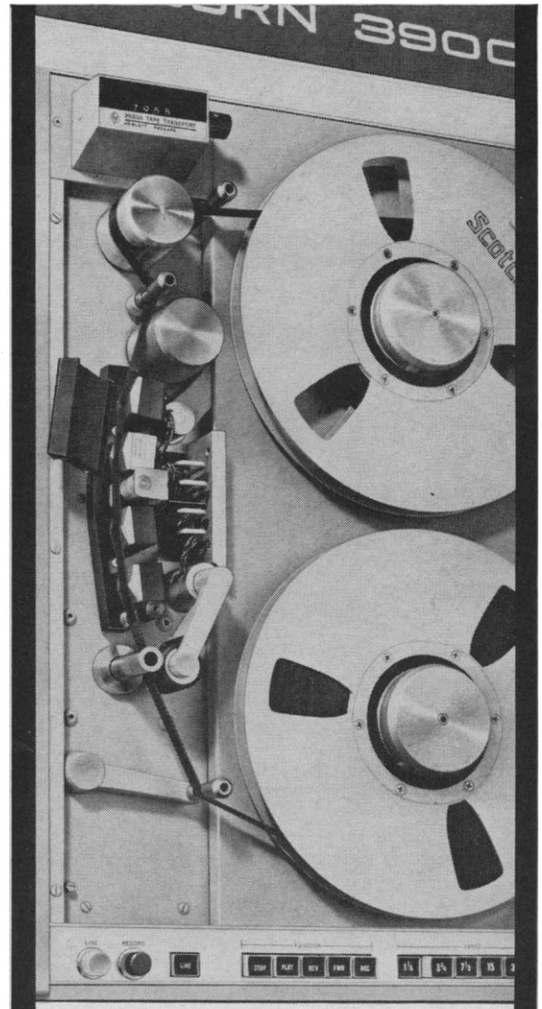

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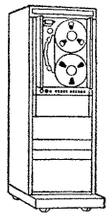

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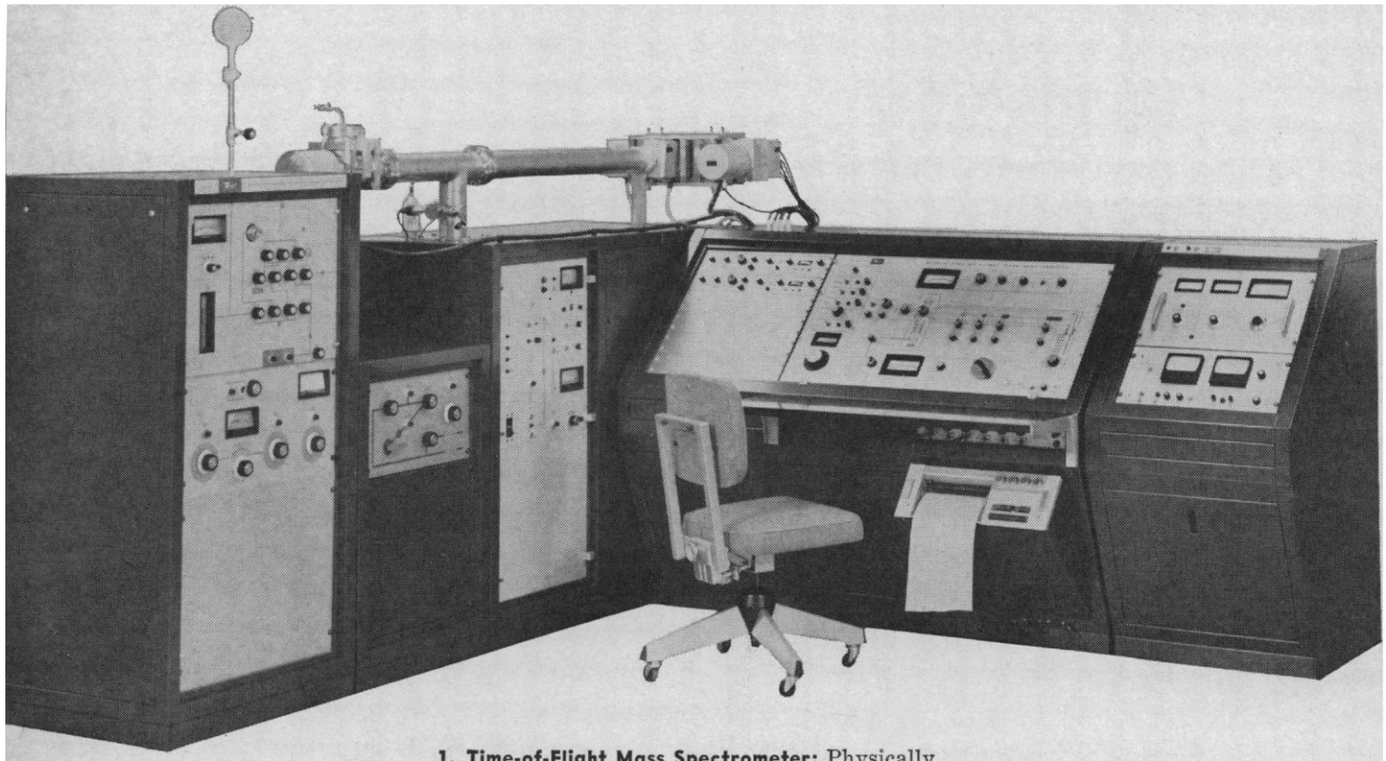

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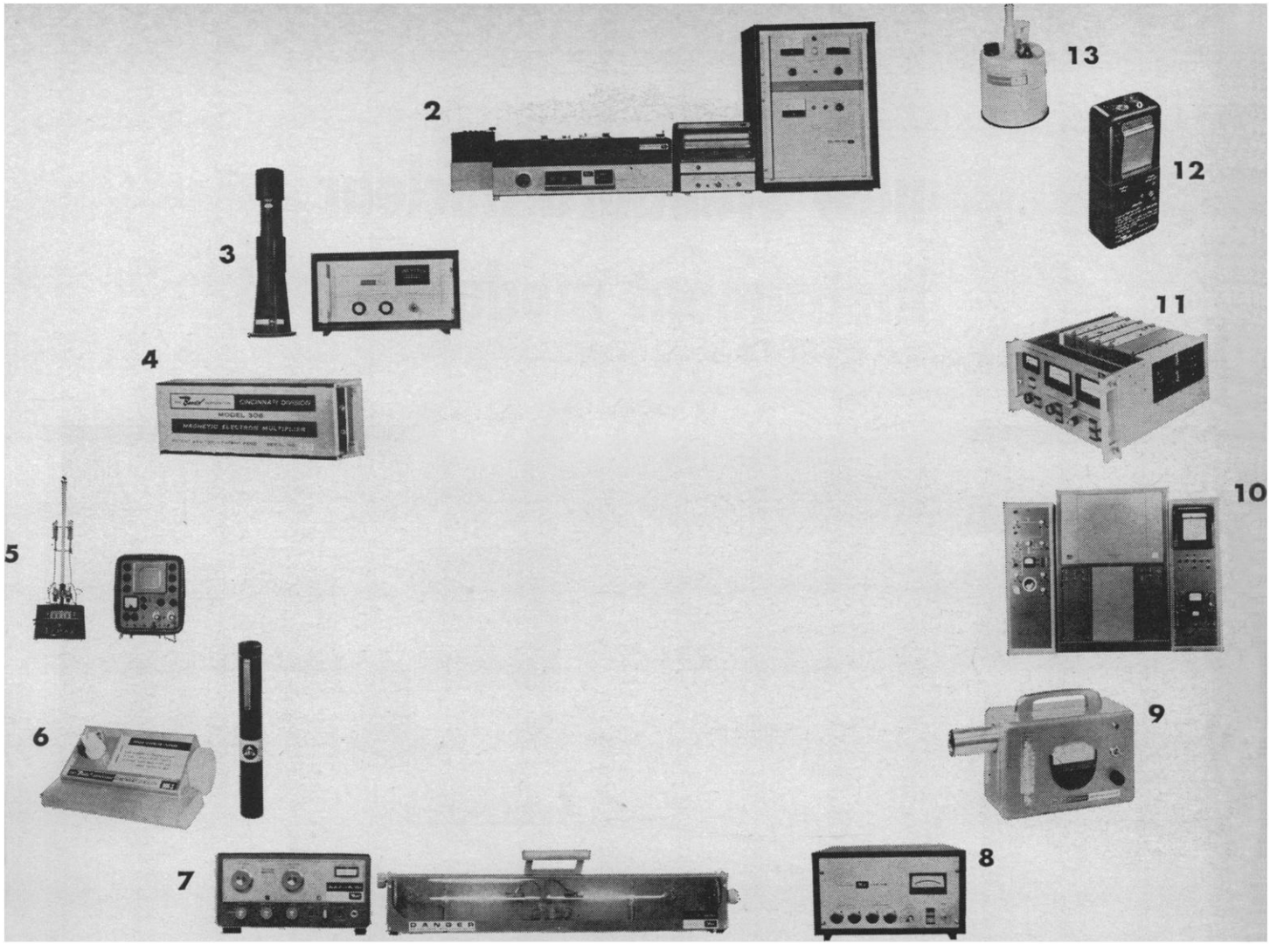

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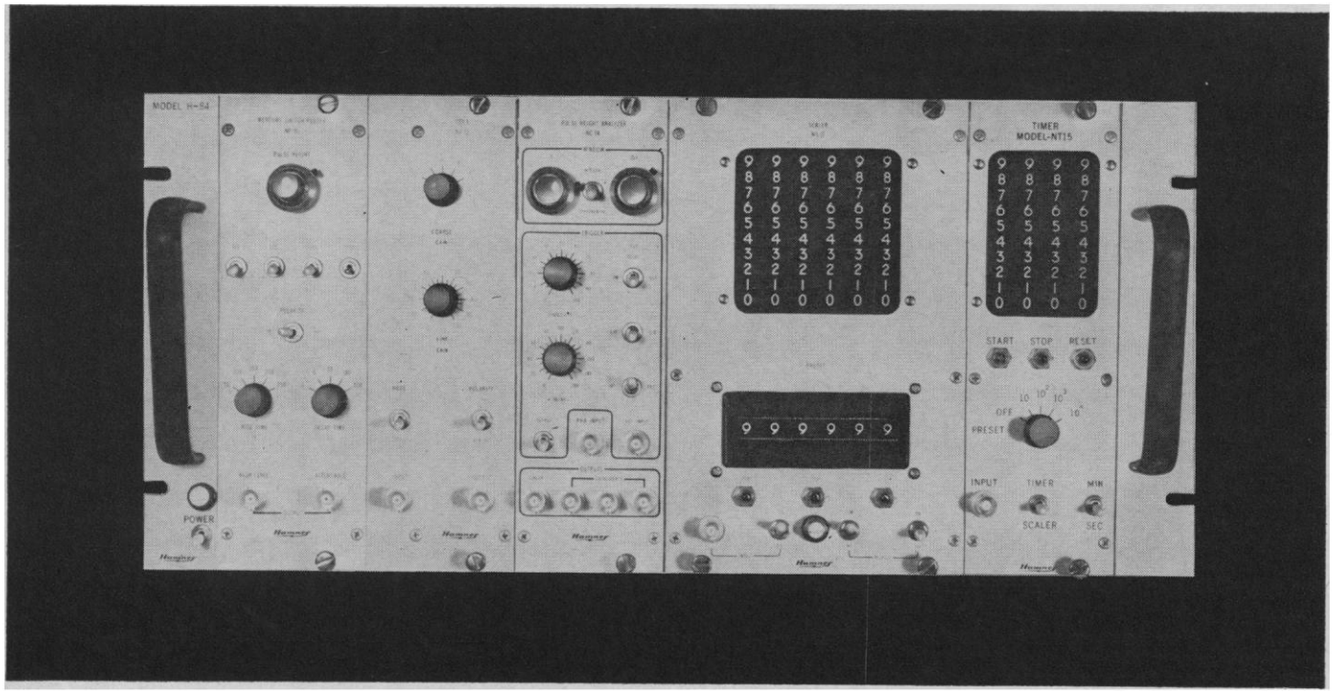

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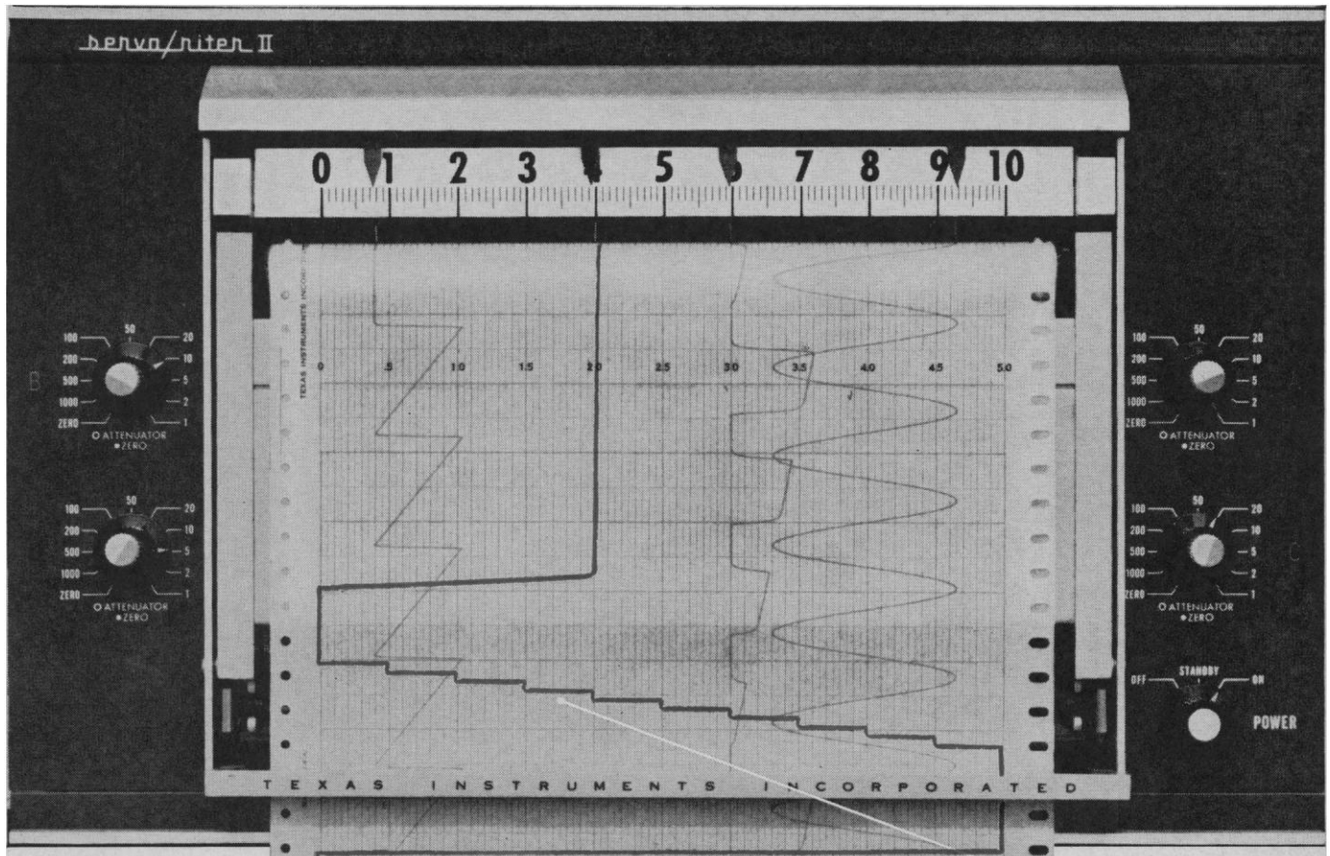

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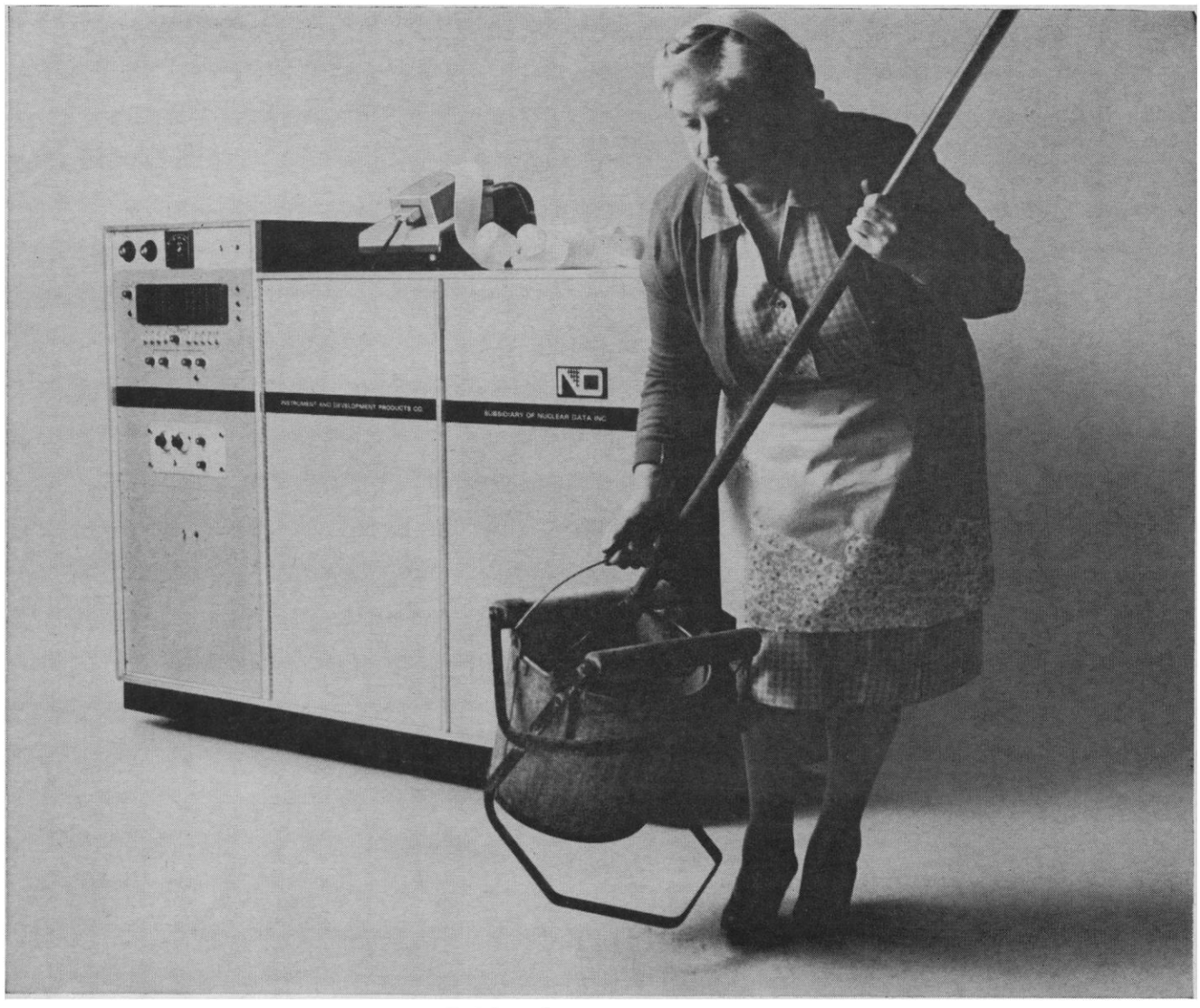

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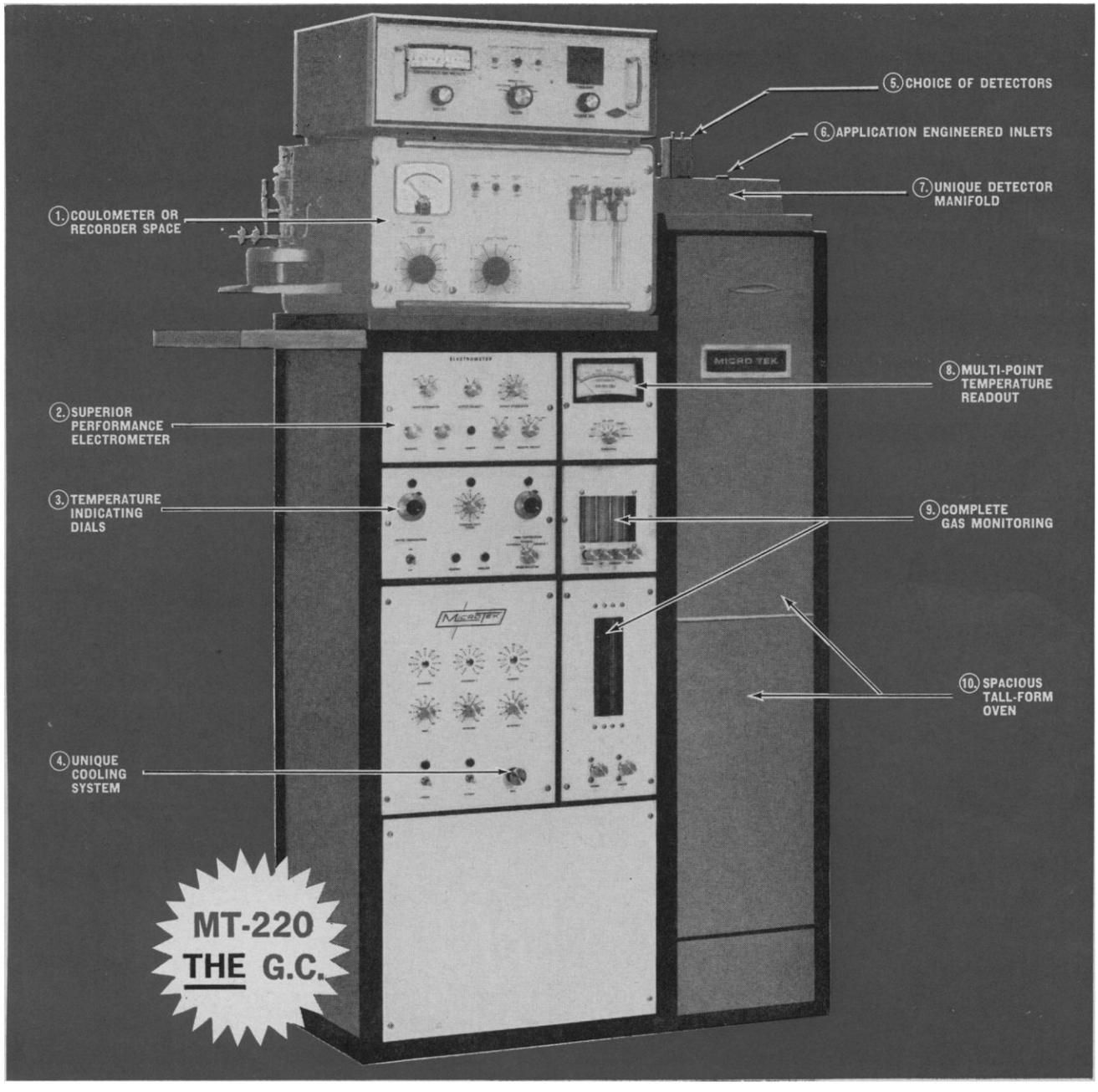

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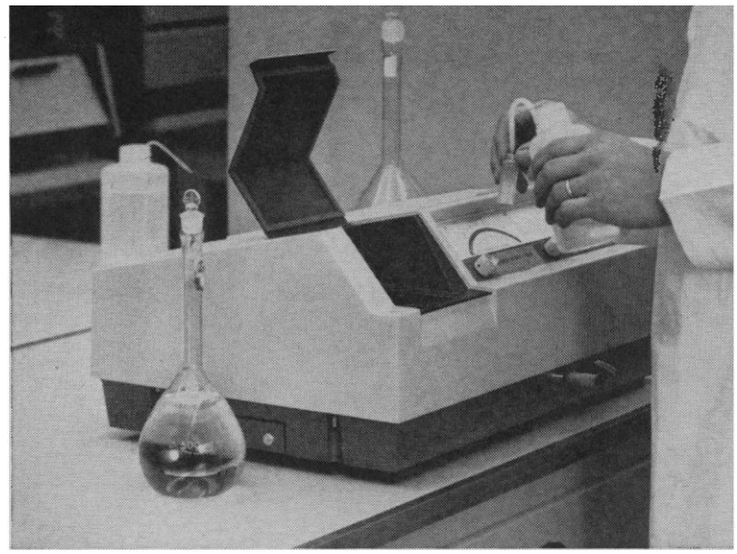

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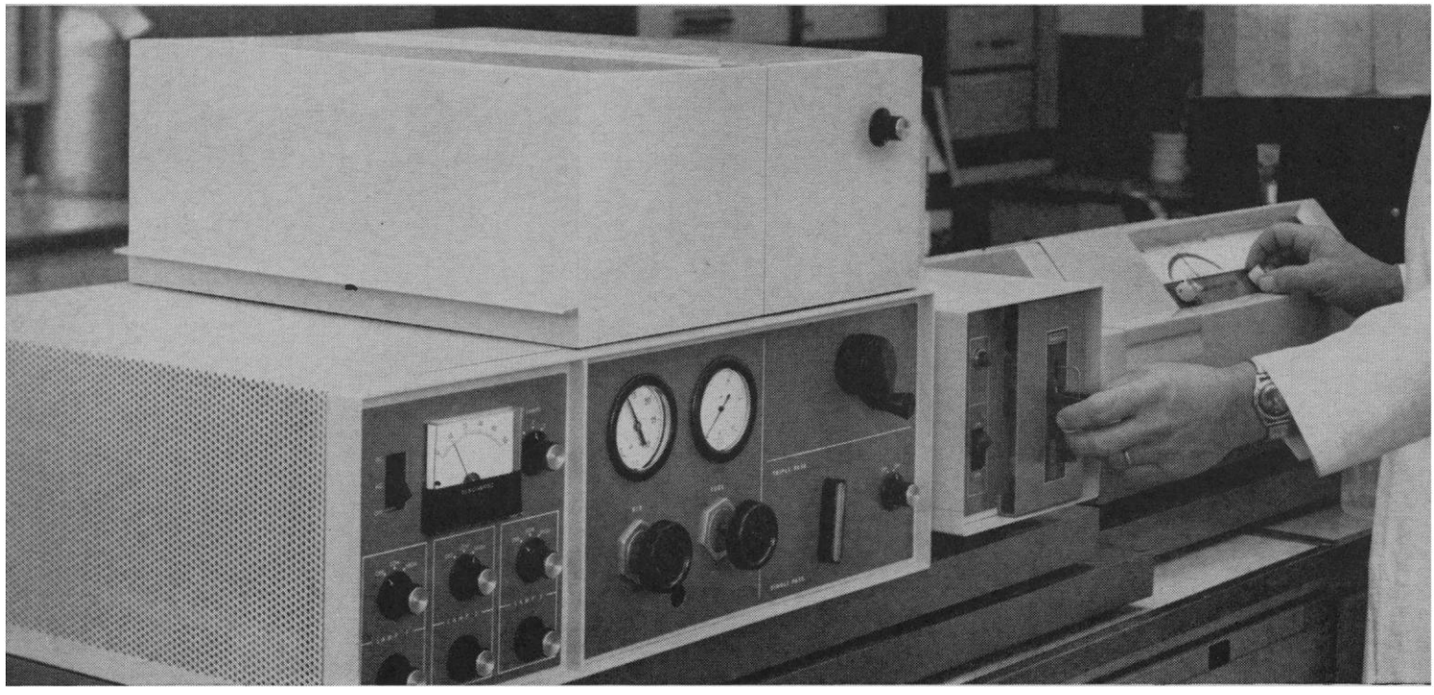

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Recovery of microorganisms, viable platelets, and leukocytes using liquid nitrogen storage techniques.

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_{12} assay. Complete recovery of viable cells was obtained when the suspensions were rapidly frozen by direct immersion in liquid nitrogen and then rapidly thawed by agitating in a 40°C water bath. Assay results on a number of test materials indicated good correlation between freshly prepared suspensions and frozen suspensions stored 3 months in basal medium.

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

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

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

New Products from LINDE

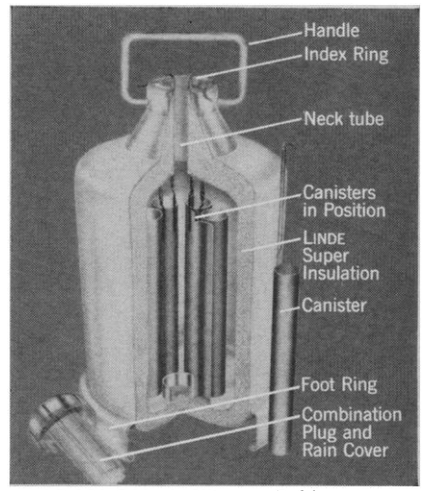
Our new LR-10A-6 portable refrigerator is designed both for economical shipping and small quantity storage of biological specimens. It will hold six canisters with a capacity of 115 cu. in. and has a minimum holding time of 3 weeks at −196°C between refills of liquid nitrogen. Lightweight, rugged, vibration-and-shock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

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

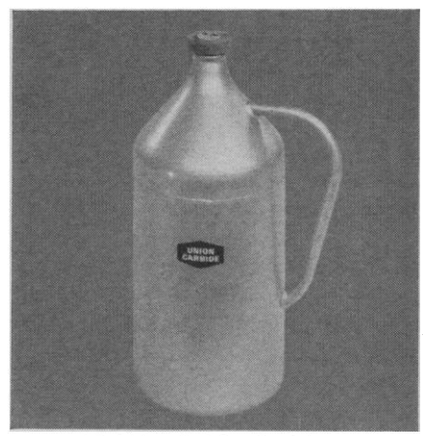
Complete Liquid Nitrogen Capabilities

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

We also provide technical service from knowledge gained over years of leadership in cryogenics, backed up by nationwide delivery of liquid nitrogen.



LR-10A-6 Liquid Nitrogen Refrigerator

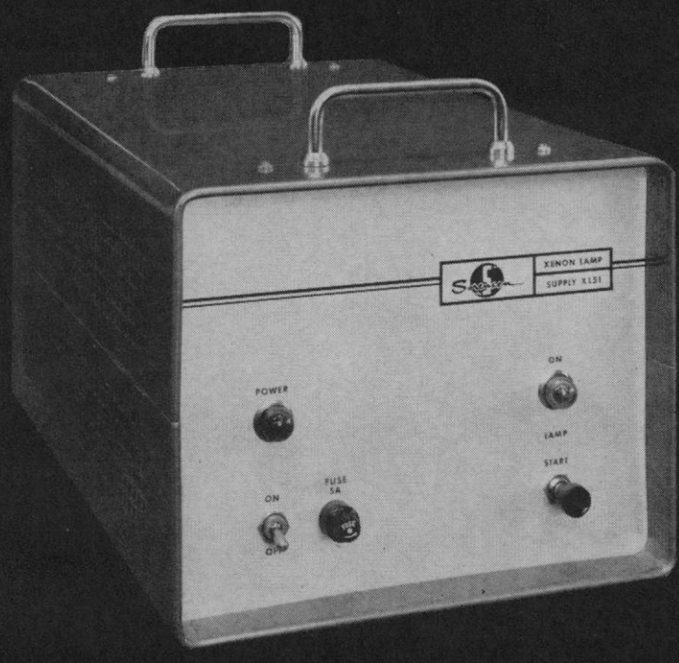


LD-4 Liquefied Gas Container

For data, write to Union Carbide Corporation, Linde Division, Dept. SC32, 270 Park Avenue, New York, N. Y. 10017.

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

Now...a xenon lamp power supply with NO spark gaps or relays



Sorensen's new XLS-1 xenon lamp power supply

The new Sorensen XLS-1 xenon lamp power supply assures high reliability and no lamp downtime by using a pulse ignition circuit instead of relays and spark gaps. These supplies deliver constant current (±1%), with line voltage variation of 100-130 VAC or 200-260 VAC.

The precise light stabilization produced by the Sorensen XLS-1 power supply permits use of the xenon arc lamp in many applications. Some of these are: spectrometers, precision optical systems, spectro-phosphorimetry, spectro-projection systems, solar simulation, spectro-photography and modulated light communication systems.

Other advantages of Sorensen's XLS-1 are: Long lamp life due to minimum starting energy • Conservatively rated • Short circuit protection • Input and output physically and electrically isolated • Ambient temperature range 0-40°C • Portable...simple to operate.

ELECTRICAL SPECIFICATIONS

Input: For model XLS-1A voltage is 100-130 VAC single phase, Current 4A AC maximum; Frequency 60 CPS ± 1% • For model XLS-1B, frequency is 50 CPS ± 1% • For model XLS-1C, frequency is 50 CPS ± 1%, input voltage is 200-260 VAC single phase, and current is 2A AC maximum.

Output: Voltage (starting) 20 KV (starting energy less than 0.5 joules); Voltage (operating) 20 VDC ± 3v; Current (operating) 7.5 ADC; Current regulation better than ± 1.0% for input voltage changes of 100-130 VAC or 200-260 VAC (available with regulation better than 0.5% total at additional cost); Current ripple less than 10% peak to peak, less than 3.5% RMS (available with ripple less than 5% peak to peak and 1.75% RMS at additional cost); Short circuit protection assured. Automatic recovery upon removal of the short circuit with no damage to the power supply; Ambient temperature range 0-40° C.

For full information call your local Sorensen representative or write: Sorensen, A Unit of Raytheon Co., Richards Avenue, South Norwalk, Connecticut. Or use reader service card number 200.

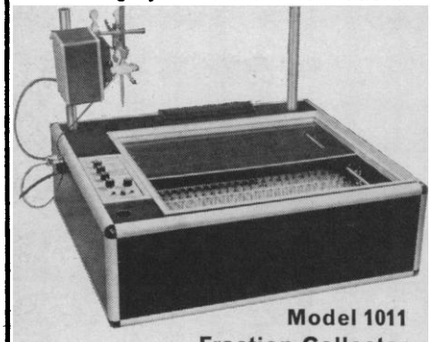
Sorensen

A UNIT OF RAYTHEON COMPANY

VANGUARD

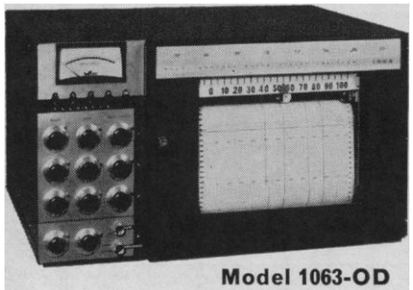
Precision Instruments for Research

When equipping your laboratory, be sure to investigate Vanguard quality, performance, and service. You will find in Vanguard instruments greater compactness, versatility, ease of operation and simplicity of design. Please give our representatives an opportunity to explain in detail the benefits and innovations that will help you speed your experiments with highly accurate information.



Model 1011
Fraction Collector

Time, drop, or volumetric operation. Time range 0-100 minutes in increments of 1/10 minute. Drop range 0-1000 drops in each tube. 400 standard test tube capacity. 8 removable stainless steel trays. Glass dust cover. 2 digital indicators. Available with Model 1012 Refrigeration unit.

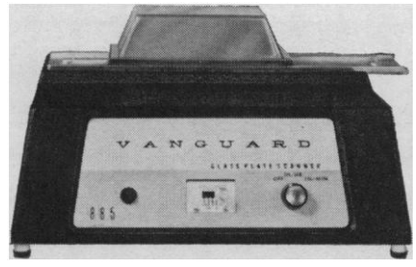


Model 1063-OD
Automatic Multi-Channel Ultra-Violet Analyzer

Presents recording at three different wave lengths. Provides a recording of the ratio of the optical density of the effluent at two of these wave lengths. Space-saving design. Completely transistorized. Detection system completely self-contained and light shielded.

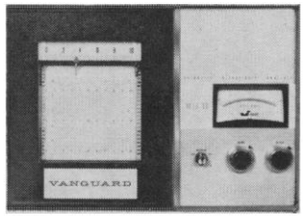
Model 880D
Dual Channel Low Background Autoscanner

Each channel has independent range and time-constant selectors. Recorder provides two 5″ charts on one 10″ strip. Can examine simultaneously intense and weak areas of radioactivity. Completely transistorized. Better than 2% accuracy on all ranges. Adaptable to direct digital quantitation.



Model 885 Glass Plate Scanner for Thin Layer Chromatography

Extends the range and operates in conjunction with the Autoscanner. Assays TLC glass plates with greater accuracy and sensitivity. Sits on top of Model 880. Provides 2 pi window-less detection for tritium, carbon-14, sulphur-35 and other beta-emitting radioisotopes.



Model 1056-OD Automatic Ultra-Violet Analyzer

Provides chart recording of the optical density of the effluent from a chromatographic column. A plane diffraction grating monochromator enables the operator to select any wave length from 200 millimicrons into the visible spectrum. Completely transistorized. Detection system self-contained and light shielded.

Model 1000
Volumetric Fraction Collector

Completely self-contained and transistorized. Compact design. Model 1000 for volumetric control. Model 1010 for time-drop control.

Write for complete detailed specifications. Representatives available to explain and demonstrate Vanguard instruments.

VANGUARD INSTRUMENT CORPORATION
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Designers and Manufacturers of Precision Instrumentation for Research • 441 Washington Ave., North Haven, Conn. 06473

COLEMAN

AUTOMATED NITROGEN ANALYZERS for micro samples; for larger samples

For Micro Samples

Now in use in hundreds of laboratories, the automated Coleman Model 29 Nitrogen Analyzer is providing rapid, exact results for an almost unlimited range of materials.

From foods to fertilizers, from plastics to petroleum derivatives, from biological materials to organic intermediates, the instrument is supplementing or replacing both the manual Dumas and the Kjeldahl methods.

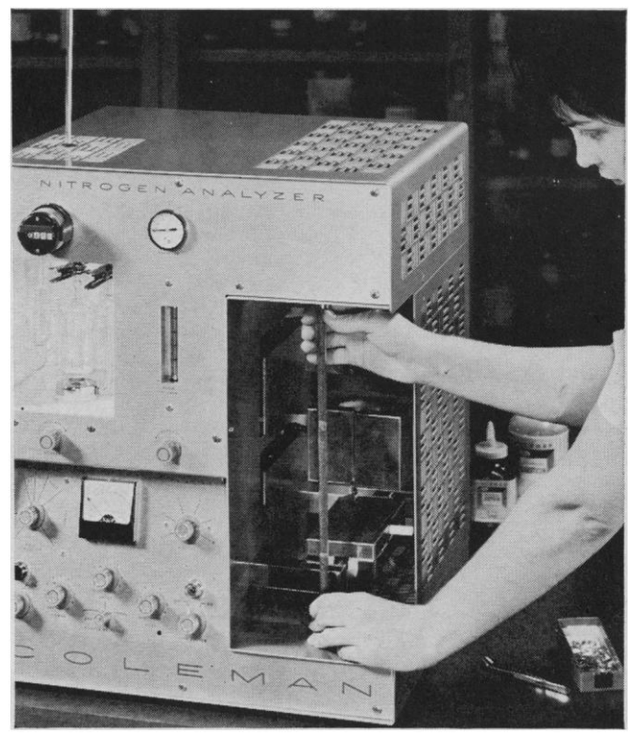
A special extraction technique, announced in a recent issue of ANALYTICAL CHEMISTRY, permits the instrument to be used for trace analysis with materials containing as little as 20 ppm nitrogen.

Operation of the instrument is simple. The operator is required merely to weigh and install the sample, to actuate the instrument, and 8 minutes later, to read and record nitrogen volume from a digital counter.

Thus, an analyst without extensive training in microchemistry can produce excellent results in both routine investigations and in research.

Condensed Specifications:
Sample . . . any material that pyrolyzes at temperatures up to 1000° C.
Sample size . . . from 5 to 50 milligrams, generally.
Operating cycle . . . 8 minutes.
Accuracy . . . results correspond to theory ±0.2% nitrogen.
Readout . . . digital counter in microliters.

Ask for Bulletin SB-291



For Larger Samples

Specially designed to meet requirements of materials that require extensive sample preparation before a representative sample can be obtained, the Coleman Model 29A accepts samples up to 500 milligrams. Even larger samples of inorganic materials are analyzed without difficulty.

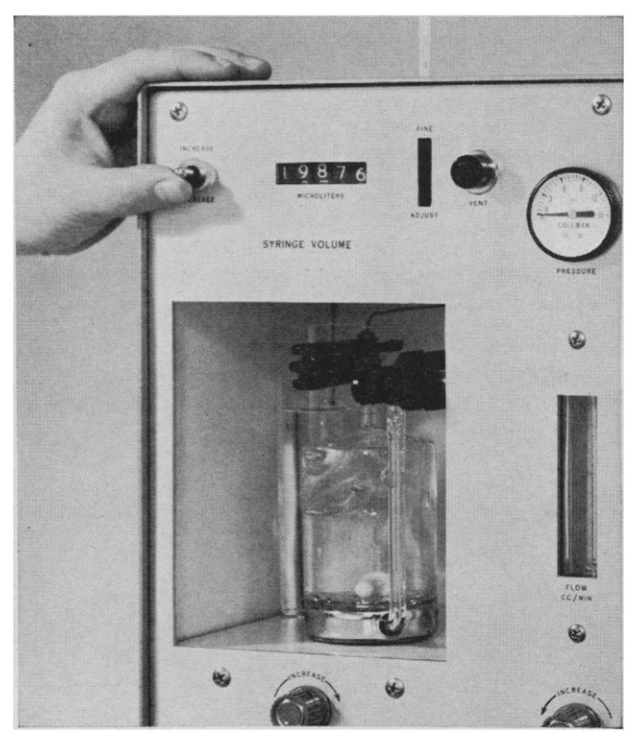
The instrument is finding wide application in laboratories working with such diverse materials as foods, feeds, grains, soils, fertilizers, milk products, and biological materials.

To accept the larger samples, the instrument incorporates an expanded combustion system, extended combustion cycle, and a larger, modified nitrometer for measurement of the greater volumes of nitrogen. The measurement operation is speeded by a reversible electric motor in the precision syringe-and-micrometer screw adjustment.

The Model 29A minimizes the work formerly required in preparing samples of non-homogeneous materials for microanalysis.

Condensed Specifications:
Sample . . . any material that pyrolyzes at temperatures up to 1000° C.
Sample size . . . 50 up to 500 milligrams; up to one gram or more for inorganic materials.
Operating cycle . . . 12 minutes.
Accuracy . . . results correspond to theory ±0.2% nitrogen.
Readout . . . motor-driven digital counter.

Ask for Bulletin SB-291



COLEMAN INSTRUMENTS CORPORATION • MAYWOOD, ILLINOIS 60154

COLEMAN

AUTOMATED ELEMENTAL ANALYZERS
for direct oxygen; for carbon-hydrogen

For Direct Oxygen Determination

The Coleman Model 36 Oxygen Analyzer is an automated combustion instrument for the direct determination of oxygen content in liquid and solid materials. Direct determination provides results which are independent of the errors associated with determination by difference.

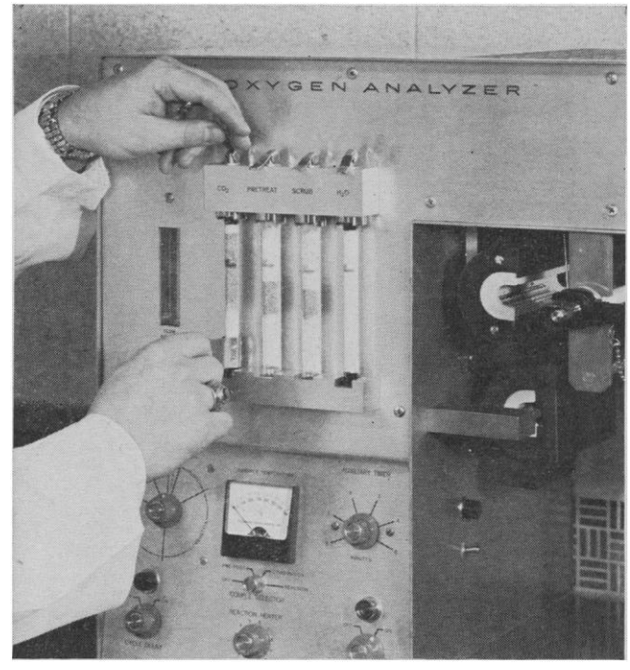
The instrument automatically performs a modified version of the Unterzaucher method for direct oxygen. The use of a special platinized carbon catalyst permits conducting the procedure at 180° C. below the conventional procedure; this improves reproducibility and lengthens component life.

Automatic operation—performing repetitive operations in exactly the same manner, delivers data faster, easier and with considerably more precision than manual methods.

The instrument is ideal for applications in pharmaceutical, rubber, plastics, organics and petroleum research and control laboratories as well as in academic research.

Condensed Specifications:
Sample . . . any material that pyrolyzes at temperatures up to 900° C.
Sample size . . . from 2 to 30 milligrams.
Operating cycle . . . 21 minutes.
Accuracy . . . results correspond to theory ± 0.3% oxygen.
Readout . . . gravimetric.

Ask for Bulletin SB-292



For Carbon-Hydrogen Analysis

An instrument for the laboratory determination of carbon and hydrogen, the Coleman Model 33 automatically performs the accepted Pregl method. It provides great advances in speed, precision, and convenience over the manual method by exactly reproducing the essential conditions of the analysis.

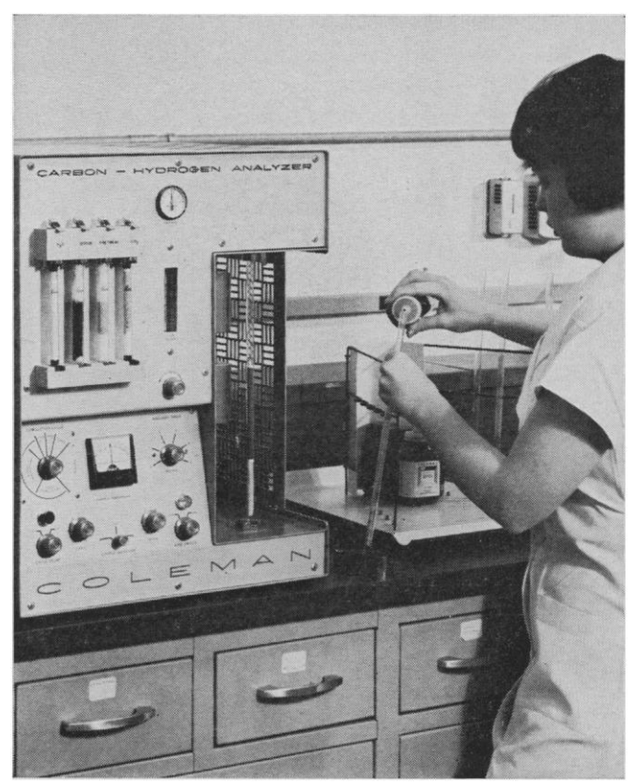
In operation, the instrument burns a micro sample in an atmosphere of high-purity oxygen, separating the sample into its elemental constituents. Hydrogen is converted to water; carbon is converted to carbon dioxide. These compounds are absorbed in separate absorption tubes and the values easily calculated after differential weighing of the absorption tubes.

The instrument makes complete determinations of carbon and hydrogen within an 8-minute operating cycle. Routine analyses can be completed at the rate of 4 to 5 per hour.

The Coleman Model 33 is valuable in research and product control laboratories is working with a wide variety of materials including pharmaceuticals, petroleum, heavy chemicals, plastics and organics.

Condensed Specifications:
Sample . . . any material that pyrolyzes at temperatures up to 1000° C.
Sample size . . . 2 to 50 milligrams.
Operating cycle . . . 8 minutes.
Accuracy . . . results correspond to theory ±0.2% carbon, ±0.2% hydrogen.
Readout . . . gravimetric.

Ask for Bulletin SB-273



COLEMAN INSTRUMENTS CORPORATION • MAYWOOD, ILLINOIS 60154

Almost an electrometer? The new all-silicon Model P2A Differential Operational Amplifier edges one decade closer to the electrometer range than the famous Philbrick Model P2, *at no increase in cost.*

DESCRIPTION

The new Philbrick P2A can be used as an electrometer to measure currents less than 10^{-12} amperes routinely, yet it exhibits unusual voltage stability. Briefly, it is an all-silicon, solid-state, high gain differential operational amplifier with no inherent common mode error and with fully floating input. Model SP2A is a plug-in amplifier with the same circuit as the P2A but has the additional benefit of guarded inputs. The P2A is mounted in a die-cast aluminum case measuring 4 1/16" x 1 5/16" x 1 1/16". Model SP2A is wired on an etched-circuit glass board with 15-terminal gold-nickel edge connectors and shielded by an exoskeletal nickel-plated steel case measuring 3 3/16" x 1 1/2" x 2 3/8".

CHARACTERISTICS:

TYPICAL INPUT OFFSET CURRENT ..... $< 10^{-12}$ amp.

INPUT IMPEDANCE (to common) $> 10^{12}\ \Omega$

CURRENT NOISE .... $< 10^{-13}$ amp.

OUTPUT .....2 ma at ± 10 V

TYPICAL VOLTAGE OFFSET (0°C to 65°C) .....3 mV

DELIVERY .....From Stock

PRICE .....$227.00 each (1-4)

For complete technical data, get in touch with your Philbrick Engineering Representative or

Philbrick Researches, Inc.,
25 Allied Drive at Route 128,
Dedham, Mass. 02026.
Telephone: 617-329-1600.

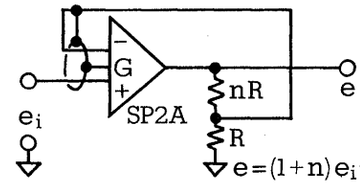
IEEE Show, Booths 3955-3956

ELECTRONIC ANALOG COMPUTING EQUIPMENT for MODELLING MEASURING MANIPULATING and MUCH ELSE

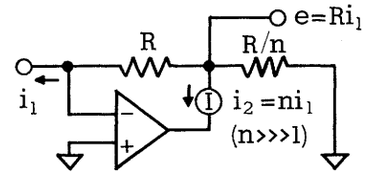
PHILBRICK

APPLICATIONS

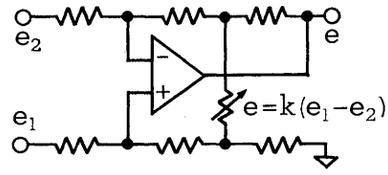
Models P2A and SP2A may be used with virtually any gain in the measurement of voltage or current from high impedance sources, as integrators or sample-and-hold circuits having exceptional holding ability, as wide-range logarithmic amplifiers, for precise differential amplification and for many other applications. Some examples:



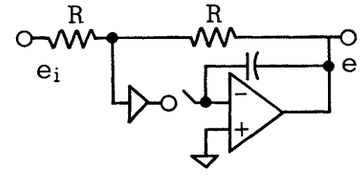
FOLLOWER-AMPLIFIER



CURRENT AMPLIFIER
CURRENT-TO-VOLTAGE TRANSDUCER



ADJUSTABLE-GAIN SUBTRACTOR



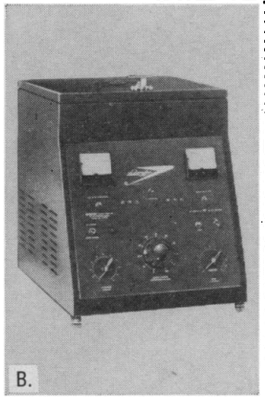
TRACK-AND-HOLD CIRCUIT

SALON des COMPOSANTS ELECTRONIQUES

it's a big world

The continents draw closer together every day in this technological era, and communications are swift as sound. But it is still a big, wide world and Lourdes is in every corner of it! From Tokyo to Paris, from Sydney to Reykjavik, Lourdes Instruments are there . . . serving the needs of science and industry with precision.


A.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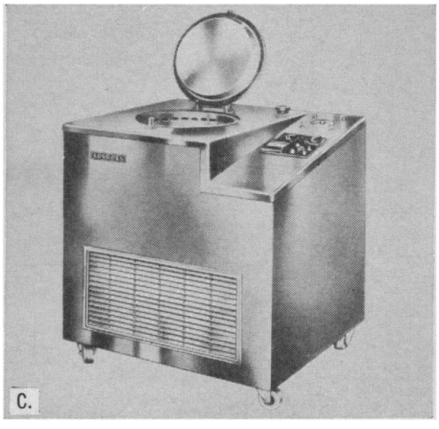
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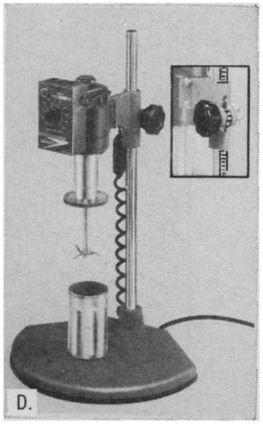
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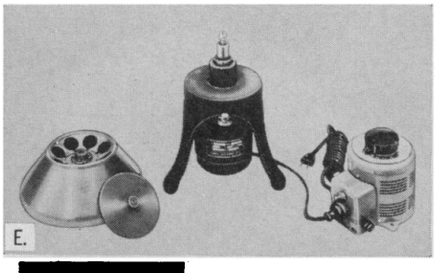
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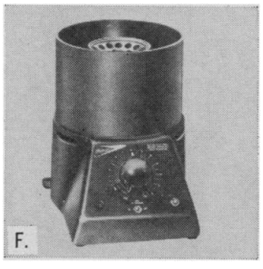
F.

A. Model A "Betafuge", Automatic Superspeed Refrigerated Centrifuge accommodates thirteen interchangeable rotors, including 3300 ml. (6 x 550 ml.) capacity rotor at 14,000 x G; 400 ml. (8 x 50 ml.) rotor at 40,000 x G; temperature control range —20°C to +40°C.

B. Model LCA-2, Non-refrigerated automatic centrifuge, spins 3300 ml. (6 x 550 ml.) capacity rotor at 10,000 x G; 400 ml. (8 x 50 ml.) at 30,000 x G.

C. Model VA-2 "Vacufuge" Automatic Ultraspeed Vacuum Refrigerated centrifuge spins 3300 ml. (6 x 550 ml.) capacity rotor at 33,000 x G; 1500 ml. (6 x 250 ml.) capacity rotor at 65,000 x G. Temperature control range —20°C to +40°C.

D. Model MM-1, Multi-Mix featuring solid state speed control and a rachet and gear mechanism. Sealed homogenizing within stainless steel containers, mason jars, centrifuge bottles, and tubes.

E. Model AX super-speed centrifuge; forces to 34,800 x G; separate RPM-RCF calibrated transformer.

F. Model AA-C "Versa-fuge" table model superspeed centrifuge; spins 400 ml. (8 x 50 ml.) capacity rotor at 34,800 x G; built-in transformer and steel safety guard.

BE SURE ... CHOOSE LOURDES SUPER SPEED CENTRIFUGES

Lourdes

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LOURDES INSTRUMENT CORP.

656-78 MONTAUK AVENUE • BROOKLYN, NEW YORK 11208

What happened when Rubicon crossed the Mississippi?

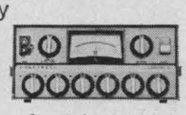
Well, for one thing, the manufacturing of the Rubicon line of Honeywell Laboratory Standards and Test Instruments moved to within 40 miles of the National Bureau of Standards laboratory at Boulder, Colorado. But that was not the main object of moving this important part of Honeywell from Philadelphia to Denver.

Rather, it was to consolidate this division into the scientific instruments manufacturing facilities where Visicorder oscillographs (and tiny precision galvanometers) are being made, along with advanced laboratory magnetic tape systems and other data acquisition and analysis equipment. We certainly agree with Colorado's claim of having an exceptional climate for this type of manufacturing.

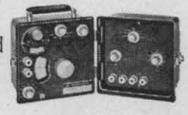
Here, high on a hill overlooking Denver, our metrological engineers, instruments craftsmen, and technicians have been designing, testing, and building several new products in addition to the well-established Rubicon items. Our production line has been nearly doubled in capacity, and appropriate new methods have been employed to make our products ever more precise and reliable.

Some of the old standbys are shown or described here—they are reminders of the fine Rubicon heritage to which we cling. We also want to introduce you to some of our newer products, such as:

Model 852 Guarded Potentiometric Voltmeter. Completely solid-state high-precision DC measurement device for 0 to 1,111.1 volts, with infinite impedance throughout entire range. All six dials of the K-V divider are overranging. Long-term limit of error ±.02% of reading for at least one year. $800.



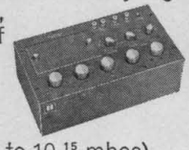
Compact Portable Test Sets. These combinations of portable potentiometers and the Model 2747 Run Up Unit may be used for thermocouple measurements, emf measurements, calibration checks of millivoltmeters and pyrometers.



Model 2802 Laboratory Potentiometer. A four-dial, single range instrument with simplified standardizing procedure and improved single-window readout. Calibrated accuracy ±.0010% of reading +0.1 microvolt. Guaranteed limit of error is ±.003% of reading +0.1 microvolt. Completely self-checking.

Series 1100 NBS Type Standard Resistors. See NBS Bulletin, Vol. 4, p. 121, about these high-precision laboratory resistors. Limit of error will not exceed ±.005%; measurement resolution is ±10 parts per million. Wound from selected low-temperature-coefficient manganin wire. Available from 1 ohm to 10,000 ohms. We also make the Reichanstalt Type Standard Resistors in 0.1, 0.01, and 0.001 ohms.

Model 1700 Conductance Bridge. Measures very high resistance, in terms of conductance, from 10^3 to 10^{15} ohms (10^{-3} to 10^{-15} mhos). Rheostat dials read directly in mhos through in-line panel openings, permitting only the correct settings to be read. Completely shielded and guarded; limit of error is from 0.05%, depending upon conductance of sample.



Model 1630 Precision Kelvin Double Ratio Set. Precisely measures low-value four-terminal resistors and extends the range of Kelvin-type measurements. Provides for lead resistance compensation; has built-in galvanometer damping and sensitivity adjustments. Electrostatically shielded. Limit of error, ratio A/B, ±0.005%.

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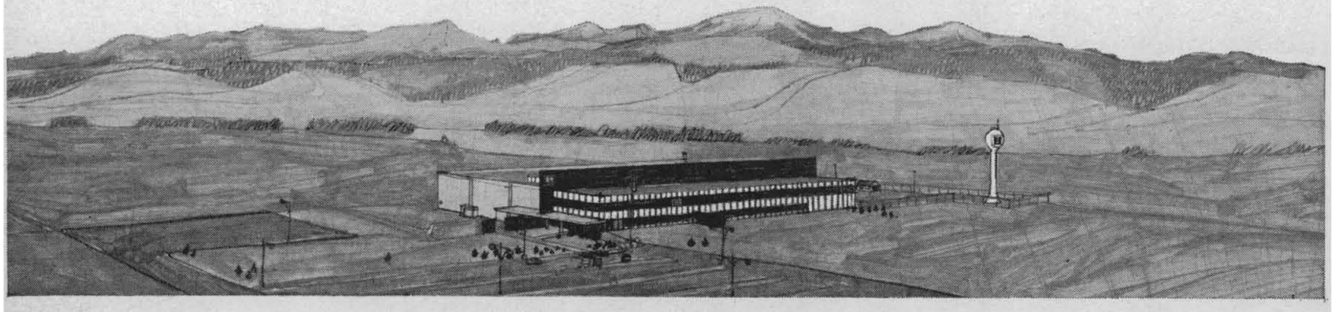

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EPR IN THE WORLD OF BIOCHEMISTRY

MONITORING ASCORBATE LEVELS IN BLOOD SERA

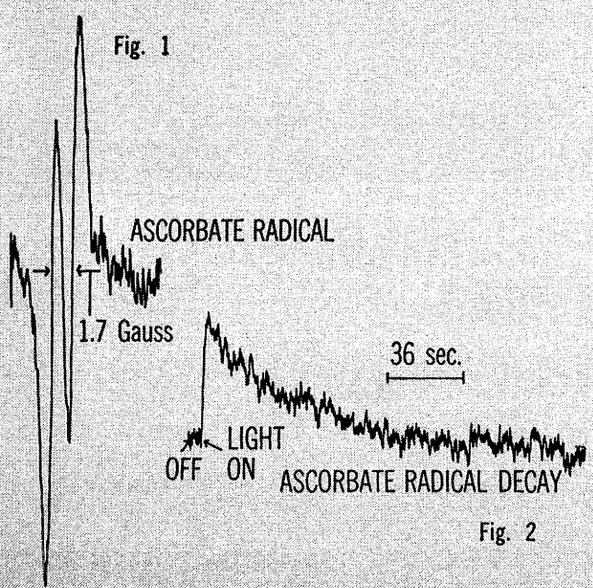

Fig. 2

The monitoring of drug levels of phenothiazine psychotropic drugs in blood sera was demonstrated in our most recent "EPR in the World of Biochemistry." During the course of these experiments, it was also observed that this EPR-photolysis technique could be used as well to detect changes in ascorbate levels — especially when high dosages were used. The EPR signal observed for the ascorbate radical produced during photolysis of serum is quite different from that obtained from the phenothiazine drugs. The signal is a doublet, with a splitting of 1.7 Gauss and a g level of 2.0043. The spectrum is illustrated in Fig. 1. Another distinguishing characteristic of the ascorbate radical is the fact that the intensity of the signal decreases during irradiation. The half life of the signal during irradiation (illustrated in Fig. 2) is approximately 30 seconds. In cases where both drug and ascorbate radicals are present, prolonged irradiation for about three minutes completely removes the signal associated with the ascorbate, leaving only the drug signal. This method should be very effective for studying the effects of ascorbic acid on drug levels.

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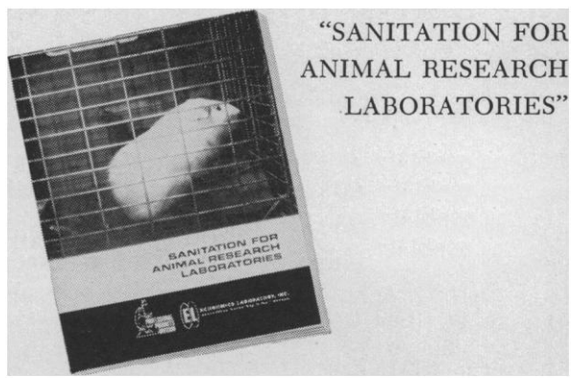

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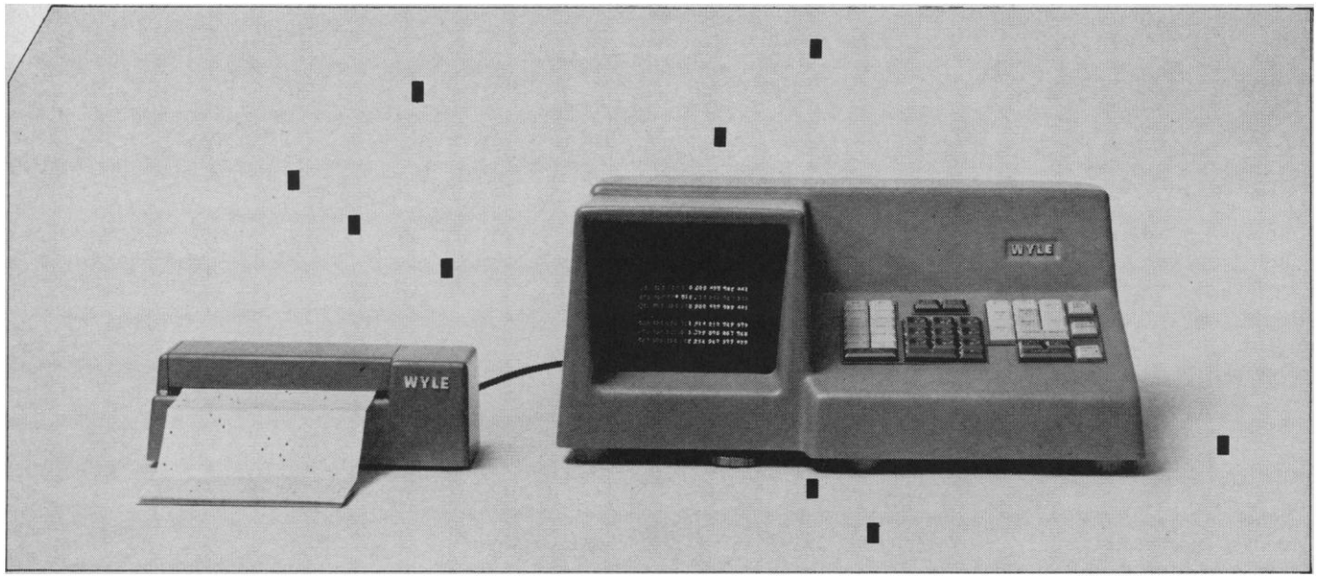

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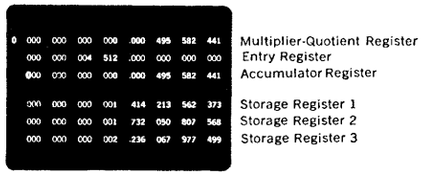

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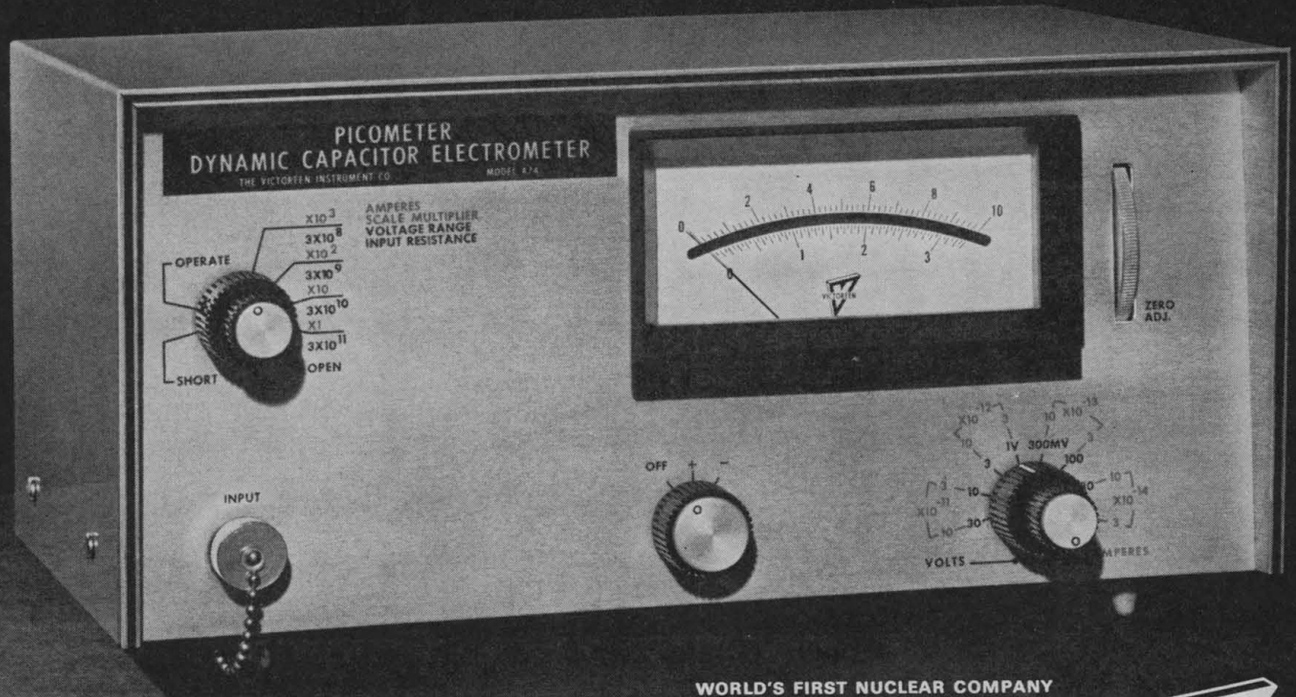

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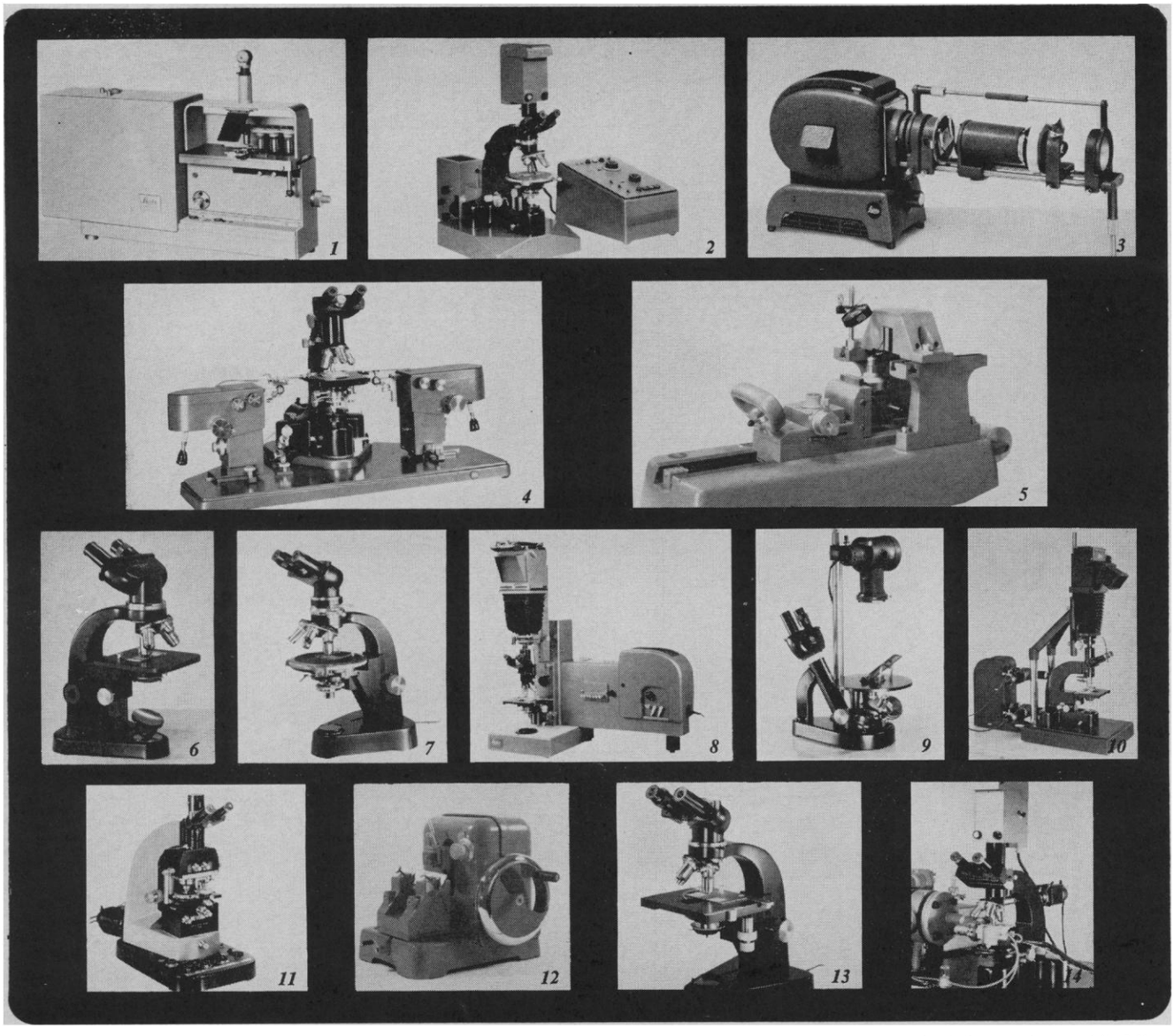

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12 March 1965, Volume 147, Number 3663

SCIENCE

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Natural Beauty and Conservation

Science and technology have led to an affluent society, a population explosion, and a concentration of our people in urban areas. But while the number and concentration of human beings has increased, the quality of living has in some ways diminished. The affluence that provides so many automobiles brings with it air pollution and great parking lots in the form of expressways. Water pollution has robbed us of much potential recreation and simple pleasure; once-beautiful rivers now are little better than open sewers. Disposal of the solid waste of cities is a noxious and growing problem. Discarded automobiles increasingly litter our countryside as low prices for scrap make them practically worthless.

President Johnson emphasized his concern about these matters in a recent White House message on natural beauty. Recognizing that most of our population resides in urban areas, Mr. Johnson devoted part of his message to a call for improving the beauty of cities. He wrote of the contrasting effects of ugliness and beauty on man's spirit. Perhaps he wrote from a background of personal experience, for many who live in the nation's capital find great pleasure in its numerous vistas. Most cities are not so fortunate as Washington. They are constructed on an ugly pattern, and so they will remain, though the dreariness may be relieved somewhat if the President's recommendations for an Open Space Land Program are implemented. This program would provide matching grants to help urban areas obtain land to serve as open space. In addition, city governments would be helped to acquire and clear areas to create parks and playgrounds.

Part of the President's message was devoted to the countryside. He recommended the establishment of 12 additional national parks. All who have enjoyed the existing parks will support the needed legislation. President Johnson sounded another welcome note when he stated that he is taking steps to encourage a national system of trails. These would include abundant trails for walking, cycling, and horseback riding in and close to our cities.

Another part of the message was devoted to water pollution. In principle, the problems of sewage and industrial wastes can be controlled by legislation. There are other problems of pollution that were not mentioned in the report and that are of scientific interest. The task of revitalizing Appalachia is complicated by the pollution of water there by acid mine water. When exposed to air, sulfides in coal are oxidized, and sulfuric acid is produced. A more subtle kind of pollution occurs in rivers like the Potomac. The clear effluent from a treatment plant provides a rich source of nutrients (fixed nitrogen, potassium, and phosphate) for algae. On sunny days, a great algae bloom occurs in the slow-moving river. Often cloudy days follow, and the algae consume more oxygen than they evolve. The water can become anaerobic; fish die, and the river may become much like a sewer.

The President proposes only limited action on the problem of air pollution; a modest $24 million is budgeted for air pollution programs. In addition, he has promised to discuss with automobile manufacturers means of reducing pollution from liquid-fueled vehicles.

The problems involved in improving the quality of life are difficult; some are almost insoluble. It is good to find that the matter is getting top-level attention.—PHILIP H. ABELSON

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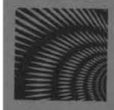

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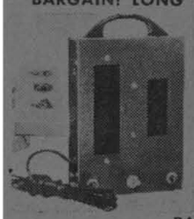

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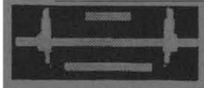

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Glass

Martin Goldstein and C. R. Kurkjian are chairman and vice chairman, respectively.

30 August–3 September. J. W. Cahn, "Nucleation and spinodal mechanisms of phase separations"; W. B. Hillig, (subject to be announced); J. J. Hammel, "The stability of a glass phase on, or near, a glass coexistence curve"; R. C. Charles, "Connectivity of phase separated structures in glass"; E. M. Levin, "Structural interpretation of immiscibility in oxide systems: elaboration and experimentation"; J. A. Williams and G. E. Rindone, "Application of small angle x-ray scattering to studies of phase separation in glass"; R. Roy, "Sequence of phases appearing in some simple and complex glasses"; J. Zarzycki, "X-ray diffraction study of phase separation"; F. Oberlies, "Proof of microheterogeneities on ultra-microtome slices of different glasses"; P. W. McMillan, "Microphase separation in simple glasses"; W. Vogel, "Investigation of the unmixing process and the resulting structure of different glasses"; G. H. Beall, "Crystallization of β-quartz solid solutions from glass."

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John D. Hoffman is chairman.

21–25 June. Dielectric relaxation in polar liquids: Worth E. Vaughan, "Survey of dielectric loss in polar liquids in microwave region"; Robert Zwanzig, "Dielectric friction in fluids"; T. Litovitz and G. D. McDuffie, "Dielectric and mechanical relaxation in nonpolymeric liquids"; Robert S. Cole, "The dielectric relaxation spec-

trum of simple polar liquids." *Dielectric relaxation in organic glasses and polymers*: Julian Gibbs, "On the temperature dependence of cooperative relaxation in glass-forming liquids"; W. Stockmayer, "Dielectric dispersion in dilute polymer solutions"; Hyuk Yu and A. Bur, "Dielectric relaxation of rodlike molecules in solution"; E. Passaglia and J. D. Hoffman, "Dielectric and mechanical relaxation in semicrystalline polymers." *The transition from resonant to nonresonant dielectric absorption (gases)*: A. A. Maryott, "Dielectric relaxation in gases: experimental foundation"; G. Birnbaum, "Microwave relaxation in gases"; A. Ben-Reuven, "Theoretical aspects of line shape and microwave relaxation effects." *Rotation of dipoles in molecular crystals*: Mansel Davies, "Aspects of the dielectric study of molecular rotation in the solid state"; M. Broadhurst, "Model for dielectric relaxation in molecular crystals"; J. G. Powles, "Dielectric and NMR studies of rotation of molecules in molecular crystals."

Environmental Sciences:

Air Pollution

Allen D. Brandt and Frank E. Clarke are chairman and vice chairman, respectively.

Sulfur oxides and related compounds.

28 June. "Sources of sulfur oxides, quantities, forms, etc. (general)" (A. D. Brandt, *chairman*; J. H. Field, *discussion leader*). "Oxidation-reduction reactions; aerosol formation; adsorption on particulates; washout" (A. J. Haagen-Smit, *chairman*; F. E. Gartrell, *discussion leader*).

29 June. "Methods of identification and measurement" (M. D. Thomas, *chairman*; J. P. Lodge, Jr., *discussion leader*). "Physiological effects—experimental" (Leonard Greenburg, *chairman*; Mary Amdur, *discussion leader*).

30 June. "Health effects—epidemiological evaluation" (J. L. Whittenberger, *chairman*; E. J. Cassell, *discussion leader*). "Economic aspects—vegetation, materials and goods" (Ronald Ridker, *chairman*; J. T. Middleton and R. O. McCaldin, *discussion leaders*).

1 July. "Control by decreasing mass emission rate" (T. T. Frankenberg, *chairman*; Harry Perry, *discussion leader*). "Meteorological factors in preventing high sulfur compound concentrations at affected receptors" (G. H. Strom, *chairman*; M. E. Smith, *discussion leader*).

2 July. "Permissible levels in ambient air, and criteria affecting or governing such levels" (V. G. MacKenzie, *chairman*; D. W. Fassett, *discussion leader*). *Summary*: Norton Nelson.

Chemistry and Metallurgy of Semiconductors

G. A. Wolff and R. C. Sangster are chairman and vice chairman, respectively.

12 July. Crystal growth and etching: J. P. Hirth, "Nucleation and growth of crystals"; R. Kern, "Morphology and crystal growth as influenced by crystal structure and matrix"; W. R. Runyan, "Epitaxial growth of semiconductors"; A. Reisman, "The kinetics of vapor phase etching of semiconductors."

13 July. Crystal surfaces: G. Rupprecht, "Semiconductor surface states"; H. E. Farnsworth, "The structure of semiconductor surfaces as determined by low-energy electron diffraction"; R. J. Jaccodine, "Electron microscope studies of semiconductor surfaces"; W. W. Harvey, "Semiconductor surface properties and electrode behavior."

14 July. Semiconductor compounds: R. W. Haisty, "A review of the preparation, properties and applications of semi-insulating III-V compounds"; M. Aven, "Preparation and properties of II-VI compounds"; F. Hulliger, "Crystal chemistry of transition-element compounds TX_2"; E. Parthé, "On the stability of diamond structure materials."

15 July. J. C. Woolley, "Preparation and properties of solid solutions of III-V compounds"; F. A. Trumbore, "Solubilities and electrical behavior of impurities in III-V compounds"; (speaker and subject to be announced).

16 July. R. Roy, "Phase diagrams and materials research"; A. L. McWhorter, "Semiconductor laser."

Biomathematics

L. Stark and G. O. Barnett are chairman and vice chairman, respectively.

19–23 July. Mathematical concepts of central nervous system function (Lawrence Stark, *chairman*): Warren McCulloch and Lewis Sutro. *Nonlinear control system theory* (G. Octo Barnett, *chairman*): Richard Bellman and Otto Smith. *Sensory communication* (Samuel Mason, *chairman*): Gil-

bert McCann and David Lange. *Mathematical biophysics* (Wilfred Rall, *chairman*): Ernst Attinger, Richard FitzHugh, and Arne Troelstra. *Taxonomic approach to pattern recognition* (Earl Gose, *chairman*): Kosei Takahashi and Vincent Giuliano. *Stochastic models in biology* (Anthony Bartholomay, *chairman*): A. T. Bharucha-Reid and John Stephenson. *Potential distribution functions in electrocardiography* (Otto Schmitt, *chairman*): David B. Geselowitz and H. L. Gelernter. *Mathematical biology: past, present, and future* (Herbert Landahl, *chairman*): Nicolas Rashevsky. *Use of computers for training in biomathematics*: Panel, Alan J. Perlis, Samuel Talbot, Bernard Widrow, James Dow, and Donald Perkel.

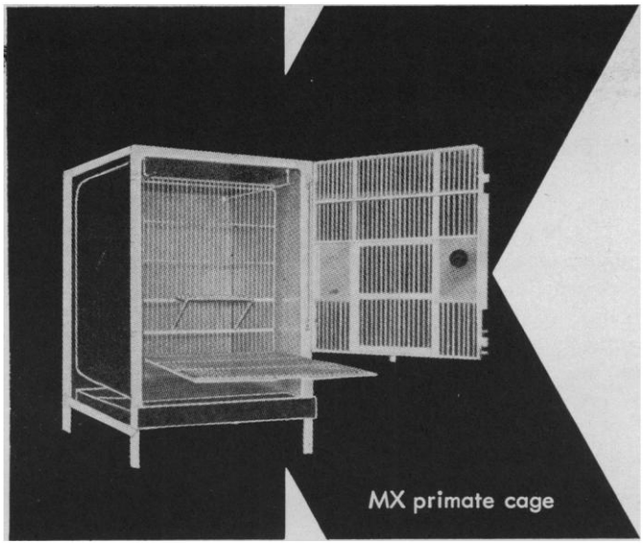
Lasers in Medicine and Biology

Peter Hornby and Leon Goldman are cochairmen.

23 August. Laser instrumentation: Edward Damon, "A review of calorimetric and photodetection techniques together with their anticipated accuracies"; Ronald J. Rockwell, Jr., "Harmonic generation techniques using ruby lasers"; Fred Johnson, "Second and fourth harmonic generation using neodymium"; Paul Mauer, "Characteristics and system parameters necessary for consistent high energy neodymium performance"; Glenn Hardway, "Techniques for expanding Q-switching lasers into higher megawatt outputs with single spiking."

24 August. Experimental retinal studies: Leo Amar, "Generation of elastic waves in the eye"; Arnold Shapiro and Milton Zaret, "Some quantitative methods for the analysis of ocular damage"; William Ham, "Nonthermal effects in the eye due to high power density lasers." *Clinical retinal studies*: A. E. Jones, G. H. Herbener, and A. J. McCartney, "Morphological effects of liminal ruby laser exposures of the retina"; H. Christian Zweng, "Clinical observations and results of laser retinal photocoagulation."

25 August. Laser-tissue interaction models: Samuel Fine, Edmund Klein, and M. Litwin, "Parameters of the interaction of lasers with biological systems"; Janice Mendelson, "Evaluation of the mechanics of some physical effects of laser radiation on tissue"; J. R. Hayes, "Studies of laser interactions in neurosurgery." *Laser applications*: R. C. Rosan, "Applications in quantitative tissue analysis."



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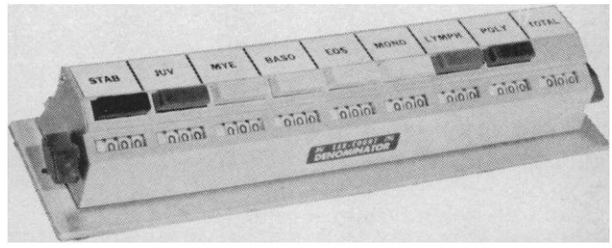

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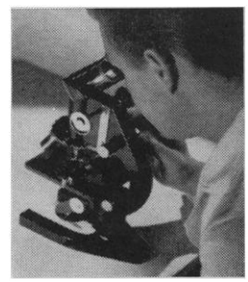

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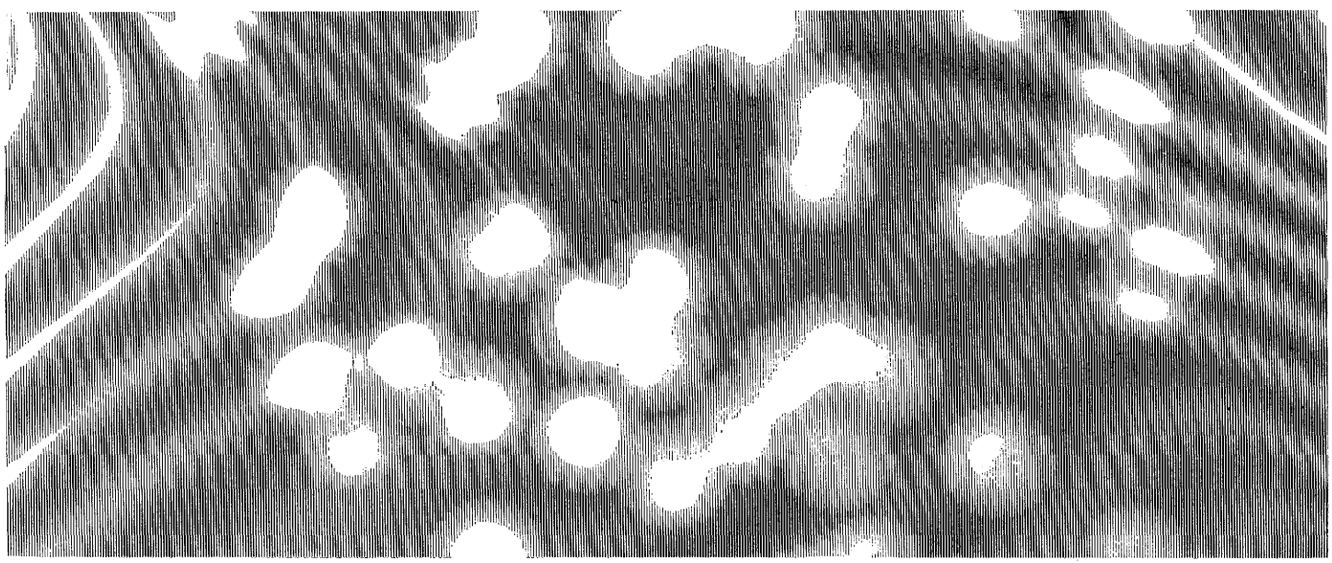

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26 August. Laser cancer studies: John Minton, "Factors in the quantitation of tumor destruction by laser energy"; Paul McGuff, "Experimental and clinical studies in laser tumor destruction"; Donald Rounds, "Basic studies on laser irradiation of tissue culture"; Alfred Ketcham, "Factors relating to the clinical application of laser energy for tumor destruction"; James Helsper, "Low energy clinical use of the laser in tumor surgery."

27 August. Ralph Stern and R. F. Sognnaes, "Laser effects on dental structures"; Leon Goldman, "Review of current and future laser studies."

Energy Coupling Mechanisms

Philip Handler is chairman.

30 August. Microanatomy of phosphorylating structures. Mitochondria: D. E. Green, "The repeating units of the mitochondrial outer and inner membranes"; F. L. Crane, "The relation between mitochondrial membrane structure and electron transport"; D. F. Parsons, "Recent advances correlating structure and function in mitochondria." *Chloroplasts*: L. Bogorad, "Structure and function of chloroplasts"; E. Moudrianakis, "Functional correlations to morphological units revealed by high resolution electron microscopy in spinach chloroplasts." *Photosynthesis. Photochemistry*: R. Clayton, "The significance of emitted light accompanying photosynthesis"; G. Seely, "Mechanisms of chlorophyll sensitized photoreductions"; B. Kok, "Early events in photosynthesis"; G. Hind, "The site and mode of action of uncouplers on chloroplast electron transfer."

31 August. Photophosphorylation: H. Baltscheffsky and M. Baltscheffsky, "Multiple coupling sites in plant and bacterial photophosphorylation"; A. Jagendorf, "A high energy state of illuminated chloroplasts"; E. Racker, "A coupling factor for photophosphorylation"; C. Black and A. San Pietro, "Role of spinach ferredoxin in photophosphorylation"; M. Avron, "Photophosphorylation." *Carbohydrate formation*: M. Gibbs, "Energy requirements for photosynthetic biosynthesis of carbohydrate." *Oxidative phosphorylation. Efficiency*: A. L. Smith, "Increased efficiency of phosphorylation in oxidative phosphorylation of mitochondria"; W. Hempfling, "Electron transport and coupled energy conservation by intact bacteria"; R. H. Eisenhardt, "Uncoupling, respiratory control and the ATP-

jump." *Mechanisms*: W. Wainio, "Iodohistidine in the mitochondrion"; P. D. Boyer, "Phosphorylation mechanisms"; D. D. Tyler, "Studies on the possible role of free radicals in the uncoupling action of chemical compounds."

1 September. Coupling factors: G. Webster, "Mode of action of the site-specific ATP synthetases in mitochondrial oxidative phosphorylation"; R. Sanadi, "Coupling enzymes—single or multiple"; R. E. Beyer, "ATP synthetase II: its purification and function at phosphorylation site II during oxidative phosphorylation." *Associated electron transport*: E. C. Slater, "Mechanisms of energy conservation in mitochondrial oxidoreductions"; L. Ernster, "Mechanisms and pathways of energy conservation in submitochondrial electron transport particles"; H. A. Lardy, "Oxidative phosphorylation and the work of mitochondria"; *Ion transport. Mitochondria*: A. L. Lehninger, "Calcium transport in mitochondria"; J. B. Chappell, "Circumstantial evidence for the existence of a H^+-pump in mitochondria"; H. Rasmussen, "A mitochondrial calcium pump"; G. F. Azzone, "Mechanisms of swelling and shrinkage in mitochondria"; W. S. Lynn, "Cation exchanges in mitochondria—a unified concept for ion transport, oxidative phosphorylation, and hydration of mitochondria"; G. P. Brierley, "Membrane permeability and ion transport in heart mitochondria."

2 September. Chloroplasts: L. Packer, "Energy-coupling of water and ion transport in chloroplasts"; R. Dilley, "Ion and water transport processes in chloroplasts related to light-dependent shrinkage"; N. E. Good, "Photophosphorylation and chloroplast conformation." *Other systems*: T. J. McManus, "Cation transport by erythrocyte membranes"; R. L. Post, "A phosphorylated intermediate in the membrane ATPase pump for sodium and potassium ions"; A. Weber, "Calcium transport by the endoplasmic reticulum."

3 September. Metabolic controls: M. Klingenberg, "Energy transfer in mitochondria: the relation between phosphate transfer and phosphate carrier transfer"; F. A. Hommes, "Oscillatory phenomena during anaerobic glycolysis in yeasts"; B. Chance, "Control of glycolysis"; R. Estabrook, "The pattern of glycolytic intermediates during the Pasteur effect"; I. Harary, "Energy sources for beating heart cells in culture"; Th. Bucher, "Mitochondrial-extramitochondrial interreaction in liver cells."

MEETINGS

Forthcoming Events

March

17–19. **Instrumentation** in the Iron and Steel Industry, 15th natl. conf., Pittsburgh, Pa. (R. P. Trauterman, Allegheny-Ludlum Steel Corp. Research Center, Alabama Ave., Backenridge, Pa.)

17–20. **Medical Schools and Teaching Hospitals**: Curriculum, Programming and Planning, New York Acad. of Sciences, New York, N.Y. (NYAS, 2 E. 63 St., New York 10021)

17–20. American **Orthopsychiatric** Assoc., New York, N.Y. (E. Harrison, 477 FDR Drive, New York, N.Y.)

18. American **Vacuum** Soc., midwestern section, Houston, Tex. (J. H. Kimzey, Manned Spacecraft Center, 2101 Webster-Seabrook Rd., Houston 77058)

18–19. **Zinc Metabolism**, symp., Detroit, Mich. (A. S. Prasad, School of Medicine, Wayne State Univ., Detroit 48207)

18–20. **Michigan Acad.** of Science, Arts, and Letters, Univ. of Michigan, Ann Arbor. (I. J. Cantrall, Museum of Zoology, Univ. of Michigan, Ann Arbor)

19–20. New York **Microscopical** Soc., biennial symp., New York, N.Y. (T. G. Rochow, American Cyanamid Co., Room 467A, Stamford, Conn. 06904)

19–20. British Assoc. of **Physical Medicine**, annual, London, England. (J. P. Mitchell, 21 St. John St., Manchester 3, England)

19–21. American Soc. of **Internal Medicine**, Chicago, Ill. (A. V. Whitehall, 3410 Geary Blvd., San Francisco, Calif.)

20. **Identification of Drugs and Poisons**, symp., Pharmaceutical Soc. of Great Britain, London. (PSGB, 17 Bloomsbury Sq., London, W.C.1)

22–25. **Thermophysical Properties**, 3rd symp., Purdue Univ., Lafayette, Ind. (S. Gratch, Ford Motor Co., P.O. Box 2053, Dearborn, Mich. 48121)

22–26. **Medical Film**, intern. congr., Paris, France. (Dr. Beauchesne, 22, rue Micheli-du-Crest, Geneva, Switzerland)

22–26. Institute of **Electrical and Electronics Engineers**, intern. convention, New York, N.Y. (E. L. Harder, IEEE, Box A, Lenox Hill Station, New York 10021)

22–26. American College of **Physicians**, Chicago, Ill. (E. C. Rosenow, Jr., ACP, 4200 Pine St., Philadelphia, Pa. 19104)

22–26. Physics and Chemistry of **Fission**, symp., Salzburg, Austria. (J. H. Kane, Intern. Conferences Branch, Div. of Special Projects, U.S. Atomic Energy Commission, Washington, D.C. 20545)

23–24. Progress in **Biochemistry and Therapeutics**, 2nd symp., New York, N.Y. (C. Neuberg, Soc. for Intern. Scientific Relations, 600 Lafayette Ave., Brooklyn, N.Y. 11216)

23–25. **Asthma**, world conf., Eastbourne, England. (Secretary, Chest and Heart Assoc., Tavistock House North, Tavistock Sq., London, W.C.1, England)

24–26. Society of the **Plastics** Industry, 22nd conf., western section, Coronado, Calif. (SPI, 611 S. Catalina, Los Angeles, Calif.)

24–26. National Federation of **Science**

Abstracting and Indexing Services, Columbus, Ohio. (C. J. Wessel, Prevention of Deterioration Center, NAS–NRC, 2101 Constitution Ave., Washington, D.C.)

24–27. American **Physical** Soc., Kansas City, Mo. (R. G. Sachs, P.O. Box 344, Argonne, Ill. 60440)

24–27. Society for Research in **Child Development**, biennial, Minneapolis, Minn. (W. Hartup, Inst. for Child Development, Univ. of Minnesota, Minneapolis 55455)

25–26. Advances in **Tracer Methodology**, 10th symp., Zurich, Switzerland. (E. Landegren, New England Nuclear Corp., Ave. de Chailly 28 c, P.O. Box 31, Lausanne 12, Switzerland)

25–27. **Heart and Circulation in the Newborn and Infant**, Chicago, Ill. (D. E. Cassels, Chicago Heart Assoc., 22 W. Madison St., Chicago 60602)

25–27. Mid-Central States **Orthopaedic** Soc., 12th annual, Hot Springs, Ark. (Mrs. P. Lovan, 4101 Westport Lane, Wichita, Kan.)

26. **Marine Environment**, symp. and NDEA workshop, Fullerton, Calif. (M. D. Brown, Fullerton Junior College, Fullerton)

26–27. Association of **Industrial Medical Officers**, spring meeting, London, England. (Joint Secretariat, 47 Lincoln's Inn Fields, London, W.C.2)

26–27. **Louisiana Acad.** of Sciences, Natchitoches. (S. M. Weathersby, Dept. of Zoology, Louisiana Polytechnic Inst., Ruston)

26–27. **Rural Health**, 18th natl. conf., Miami Beach, Fla. (B. L. Bible, 535 N. Dearborn St., Chicago, Ill. 60610)

26–2. **Rehabilitation**, natl. conf., Melbourne, Australia. (Intern. Soc. of Rehabilitation of the Disabled, 701 First Ave., New York, N.Y. 10017)

27–31. National **Science Teachers** Assoc., natl. convention, Denver, Colo. (NSTA, 1201 16th St., Washington, D.C. 20036)

27–3. **Developmental Biology**, U.S.–Japan Cooperative Science Program seminar, Tokyo, Japan. (Office of International Science Activities, National Science Foundation, 1951 Constitution Ave., NW, Washington, D.C.)

28. American College of **Apothecaries**, Inc., Detroit, Mich. (R. E. Abrams, Hamilton Court Hotel, 39th and Chestnut Sts., Philadelphia, Pa. 19104)

28–30. American Assoc. of **Colleges of Pharmacy**, Detroit, Mich. (C. W. Bliven, AACP, 1507 M St., NW, Washington, D.C. 20005)

28–30. **Experimental Dermatology**, 4th symp., Palermo, Italy. (A. Tosti, Intern. College of Experimental Dermatology, Ist Dermatologico dell'Universita, Via del Vespro 131, Palermo)

28–31. American Soc. of **Abdominal Surgeons**, Washington, D.C. (B. F. Alfano, 663 Main St., Melrose 76, Mass.)

28–31. Canadian Inst. of **Mining and Metallurgy**, annual, Toronto, Ontario. (E. G. Tapp, CIMM, 906-117 St. Catherine St., W., Montreal 2, Quebec)

28–1. International **Anesthesia Research** Soc., Washington, D.C. (A. W. Friend, 227 Wade Park Manor, Cleveland, Ohio 44106)

28–2. American Soc. of **Hospital Pharmacists**, Detroit, Mich. (J. A. Oddis, 2215

Constitution Ave., NW, Washington, D.C.)

28–2. Society of **Motion Picture and Television Engineers**, 97th annual, Los Angeles, Calif. (R. J. Goldberg, Technicolor Corp., Research and Development Div., 2800 West Olive Ave., Burbank, Calif. 91505)

28–2. Chemical Aspects of **Electron Spin Resonance**, intern. conf., Cirencester, England. (D. H. Whiffen, Basic Physics Div., Natl. Physical Laboratory, Teddington, England)

28–3. American Soc. of **Photogrammetry**/American Congress on **Surveying and Mapping**, convention, Washington, D.C. (ASP, 44 Leesburg Pike, Falls Church, Va. 22044)

28–4. North American **Clinical Dermatologic** Soc., Las Vegas, Nev. (E. F. Finnerty, 177 E. 75 St., New York, N.Y. 10021)

29–31. American Assoc. for **Thoracic Surgery**, 45th annual, New Orleans, La. (Miss A. Hanvey, 7730 Carondelet Ave., St. Louis, Mo. 63105)

29–2. American Soc. of **Tool and Manufacturing Engineers**, annual conf., Cleveland, Ohio. (ASTM, 20501 Ford Rd., Dearborn, Mich. 48128)

29–30. **Great Lakes Research**, 8th conf., Ann Arbor, Mich. (J. L. Hough, Great Lakes Research Div., 1077 North Univ. Bldg., Ann Arbor, Mich.)

29–29 Apr. **Genito-Urinary Diseases**, symp., Univ. of Kentucky, Lexington. (N. J. Pisacano, Continuation Medical Education, Univ. of Kentucky, Lexington)

30–31. **Formulation of Pesticides**, symp., London, England. (Assistant Secretary, Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1)

30–1. Non-conventional **Electron Microscopy**, Cambridge, England. (Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

31–2. **Corrosion** by Hot Gases and Combustion Products, symp., European Federation of Corrosion, Frankfurt am Main, Germany. [DECHEMA, 6 Frankfurt (Main) 7, Postfach 7746, Germany]

31–2. **Optical** Soc. of America, Dallas, Tex. (M. E. Warga, 1155 16th St., NW, Washington, D.C. 20036)

31–2. **Textile Research** Inst., annual, New York, N.Y. (TRI, Princeton, N.J.)

31–2. Recent Developments in **Heat Treatment of Food**, 2nd European symp., Frankfurt am Main, Germany. [Gesellschaft Deutscher Chemiker, Dr.rer. nat. Wolfgang Fritsche, 6000 Frankfurt (Main), Postfach 9075, Warrentrappstr. 40-42, Germany]

31–2. **Electron Beam**, 7th annual symp., University Park, Pa. (A. B. El-Kareh, Dept. of Electrical Engineering, Pennsylvania State Univ., University Park)

April

1–3. Association of **Surgeons** of Great Britain and Ireland, annual, London, England. (Joint Secretariat, 47 Lincoln's Inn Fields, London, W.C.2)

1–3. **Dermovenereology**, 7th meeting Univ. of Catania, Italy. (Direzione della Clinica Dermosfilopatica, Piazza S. Agata La Vetere 5, Catania, Sicily, Italy)

1–4. **British Medical** Assoc., annual clinical meeting, Dundee, Scotland. (D. Gul-

lick, BMA, Tavistock Square, London, W.C.1, England)

1–15. **Theoretical Chemistry**, NATO Advanced Study Inst., Frascati, Italy. (C. A. Coulson, Mathematical Inst., 10 Parks Rd., Oxford, England)

2–3. **Alabama** Acad. of Science, Florence State College, Florence. (W. B. DeVall, Forestry Dept., Auburn Univ., Auburn, Ala.)

2–3. **Arkansas** Acad. of Science, Univ. of Arkansas, Fayetteville. (G. E. Templeton, Dept. of Plant Pathology, Univ. of Arkansas, Fayetteville)

2–3. **Chemistry Facilities for the Two-Year College**, Junior College Chemistry Roundtable, conf., Dearborn, Mich. (W. T. Mooney, Jr., El Camino College, Via Torrance, Calif. 90506)

2–3. Alexander Graham Bell Assoc. for the **Deaf**, Southeastern regional meeting, New Orleans, La. (G. W. Fellendorf, 1537 35th St., Washington 20007)

2–3. **Pennsylvania** Acad. of Science, 41st annual, Villanova Univ., Villanova. (G. E. Grube, Lock Haven State College, Lock Haven, Pa.)

2–4. Society for Applied **Anthropology**, annual, Lexington, Ky. (SAA, Rand Hall, Cornell Univ., Ithaca, N.Y.)

2–4. American Soc. for the Study of **Sterility**, San Francisco, Calif. (H. H. Thomas, 944 S. 18th St., Birmingham, Ala.)

2–7. **West African Science** Assoc., 5th biennial conf., Freetown, Sierra Leone. (M. M. Anderson, Geology Dept., Fourah Bay College, Freetown)

4. **Chest Disease**, symp., Arizona Acad. of General Practice. (Cardiopulmonary Section, Tucson Medical Center, P.O. Box 6067, Tucson, Ariz. 85716)

4–7. American College of **Obstetricians and Gynecologists**, annual, San Francisco, Calif. (ACOG, 79 W. Monroe St., Chicago, Ill. 60603)

4–9. Division of **Chemical Literature**, American Chemical Soc., Detroit, Mich. (B. M. Davis, Cabot Corp., Concord Rd., Billerica, Mass.)

4–9. American **Chemical** Soc., spring natl. meeting, Detroit, Mich. (ACS, 1155 16th St., NW, Washington, D.C. 20036)

5–7. **Atomic Energy** Soc. of Japan, annual, Kyoto, Japan. (M. Masamoto, Atomic Energy Soc. of Japan, c/o Japan Atomic Energy Research Inst., 1, 1-chome, Shibatamura-cho, Minato-ku, Tokyo, Japan)

5–7. Hormonal Effects of **Cutaneous Structure and Function**, New York Univ., New York, N.Y. (Office of the Recorder, New York Univ. Post-Graduate Medical School, 550 First Ave., New York 10016)

5–7. **Elementary Particles**, conf., Birmingham, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

5–7. **Fission Product Release and Transport** under Accident Conditions, intern. symp., Oak Ridge, Tenn. (C. J. Barton, Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge 37831)

5–7. New Dimensions in **Space Technology**, 2nd space congr., Cocoa Beach, Fla. (L. E. Mertens, RCA Missile Test Project, M.U. 741 Bldg. 423, Patrick AFB, Fla.)

5–7. **Structures and Materials**, AIAA 6th natl. conf., Palm Springs, Calif. (J. E.

Hove, Materials Sciences Laboratory-F/2323, Aerospace Corp., Box 95805, Los Angeles, Calif.)

5–8. American Acad. of **General Practice**, annual, Seattle, Wash. (M. F. Cahal, AAGP, Volker Blvd. at Brookside, Kansas City, Mo.)

5–8. **High Energy Physics**, symp., Birmingham, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

5–8. **Industrial Health**, American conf., Miami Beach, Fla. (American Industrial Health Conf., 55 East Washington St., Chicago, Ill.)

5–9. American College of **Allergists**, seminar and 21st annual congr., Las Vegas, Nev. (Administrative Office, 2141 14th St., Boulder, Colo.)

5–9. **Clean Air**, congr. and exhibition, Dusseldorf, Germany. (Nordwestdeutsche Ausstelungs-und Messe-Gesellschaft mbH, Nowea 5, Dusseldorf, Messegelande, Germany)

5–9. Phenomena in the Neighborhood of **Critical Points**, Washington, D.C. (M. S. Green, Statistical Physics Section, Natl. Bureau of Standards, Washington, D.C. 20234)

5–10. **Nuclear Developments**, 1st intern. congr., Brighton, England. (J. B. Pinkerton, Inst. of Nuclear Engineers, 147 Victoria St., London, S.W.1, England)

5–12. **Large Telescopes**, symp., Pasadena and San José, Calif. (I. S. Bowen, c/o Mt. Wilson Observatory, 813 Santa Barbara St., Pasadena)

5–24. **World Meteorological Organization**, Regional Assoc. VI (Europe), 4th session, Paris, France. (WMO, 41 Avenue Giuseppe Motta, Geneva, Switzerland)

6–8. **Biomathematics and Computer Science** in the Life Sciences, 3rd annual symp., Houston, Tex. (Office of the Dean, Div. of Continuing Education, Univ. of Texas Graduate School of Biomedical Sciences, 102 Jesse Jones Library Bldg., Texas Medical Center, Houston 77025)

6–9. Royal **Aeronautical** Soc., conf., Nottingham, England. (H. Umpleby, Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1, England)

6–9. **Automatic Control**, conv., Nottingham, England. (H. Umpleby, Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1, England)

7–9. American Assoc. for **Cancer Research**, 56th annual, Philadelphia, Pa. (AACR, 7701 Burholme Ave., Fox Chase, Philadelphia 19111)

7–9. The **Chemical** Soc., anniversary meetings, Glasgow, Scotland. (CS, Burlington House, London, W.1, England)

7–9. **Nucleation Phenomena**, intern. symp., Cleveland, Ohio. (A. G. Walton, Dept. of Chemistry, Case Inst. of Technology, University Circle, Cleveland 6)

7–9. **Stress Analysis**, conf., Bristol, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

8–9. **Histochemical** Soc., 16th annual, Philadelphia, Pa. (S. S. Spicer, Natl. Inst. of Health, Bethesda, Md. 20014)

8–9. **Microbiological Deterioration in the Tropics**, symp., London, England. (Secretary, Soc. of Chemical Industry,

14 Belgrave Sq., London, S.W.1, England)

8–9. British Inst. of **Radiology**, annual congr., London, England. (BIR, 32 Welbeck St., London, W.1)

8–9. **X-ray Analysis**, Conf., Inst. of Physics and the Physical Soc., Edinburgh, Scotland. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

8–10. North Pacific Soc. of **Neurology and Psychiatry**, Portland, Ore. (W. W. Thompson, 3300 S.W. Dosch Rd., Portland)

8–10. American **Radium** Soc., New Orleans, La. (J. L. Pool, 444 E. 68 St., New York 10021)

8–14. American Soc. for **Biological Chemists**, annual, Atlantic City, N.J. (K. Bloch, Harvard Univ., Cambridge 38, Mass.)

9–10. American Soc. for **Artificial Internal Organs**, Atlantic City, N.J. (B. K. Kusserow, Dept. of Pathology, Univ. of Vermont College of Medicine, Burlington)

9–10. American Assoc. of **University Professors**, Washington, D.C. (W. P. Fidler, AAUP, 1785 Massachusetts Ave., NW, Washington, D.C.)

9–11. Southwestern **Psychological** Assoc., annual, Oklahoma City, Okla. (O. Parsons, Dept. of Psychiatry, Neurology, and Psychology, Oklahoma Medical Center, Oklahoma City)

9–13. Mediterranean Cooperation for **Solar Energy**, Istanbul, Turkey. (M. Perrot, c/o Faculte des Sciences, Pl. Victor Hugo, Marseilles, France)

9–14. Federation of American Societies for **Experimental Biology**, 46th annual, Atlantic City, N.J. (Mrs. T. C. Heatwole, FASEB, 9650 Wisconsin Ave., Washington, D.C. 20014)

10. **New Mexico** Acad. of Sciences, Socorro. (K. S. Bergstresser, 739 42nd St., Los Alamos, N.M.)

10–12. **Aerospace Electronics**, natl. conf., Dayton, Ohio. (Inst. of Electrical and Electronics Engineers, Dayton Office, 1414 E. 3 St., Dayton)

10–14. American Soc. for **Experimental Pathology**, Atlantic City, N.J. (H. D. Moon, Univ. of California School of Medicine, San Francisco 94122)

10–14. American Inst. of **Nutrition**, annual, Atlantic City, N.J. (O. Mickelsen, Dept. of Foods and Nutrition, Michigan State Univ., East Lansing)

10–14. American **Physiological** Soc., Atlantic City, N.J. (R. G. Daggs, 9650 Wisconsin Ave., Washington, D.C.)

10–16. American Assoc. of **Immunologists**, Atlantic City, N.J. (B. H. Waksman, Massachusetts General Hospital, Boston 14)

11–15. **Calcified Tissues**, 3rd European symp., Davos, Switzerland. (H. Fleisch, Laboratorium für Experimentelle Chirurgie, Schweizerisches Forschungsinstitut, Davos)

12–13. **Inorganic Single Crystals**, symp., London, England. (Asst. Secretary, Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1)

12–13. **Seismological** Soc. of America, annual, St. Louis, Mo. (C. Kisslinger, Dept. of Geophysics and Geophysical Engineering, St. Louis Univ., 3621 Olive St., St. Louis 63108)

12–14. **Atomic Spectra and Radiation**

Processes, conf., Oxford, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

12–14. **Ballistocardiography and Cardiovascular Dynamics**, 1st world congr., Amsterdam, Netherlands. (A. A. Knoop, Physiological Laboratory, Free Univ., Valeriusplein 11, Amsterdam)

12–15. American **College Personnel** Assoc., Minneapolis, Minn. (A. H. Hitchcock, 1605 New Hampshire Ave., NW, Washington, D.C. 20009)

13–14. Kinetics of **Proton Transfer Processes**, Faraday Soc., Univ. of Newcastle-upon-Tyne, England. (FS, 6 Gray's Inn Square, London, W.C.1, England)

13–14. **Thermal Analysis**, symp., London, England. (B. R. Currell, Dept. of Chemistry, Mathematics, Biology, and Geology, Northern Polytechnic, Holloway Rd., London, N.7)

13–15. **Telemetering**, natl. conf., Houston, Tex. (R. W. Towle, Advanced Technology Laboratories, 369 Winsman Ave., Mountain View, Calif.)

13–17. American Soc. of **Parasitologists**, 40th annual, Atlanta, Ga. (F. J. Kruidenier, Dept. of Zoology, Univ. of Illinois, Urbana)

13–17. **Rehabilitation**, Pan Pacific conf., Tokyo, Japan. (Intern. Soc. for Rehabilitation of the Disabled, 701 First Ave., New York 10017)

14. **Programmed Instruction in Medical Education**, symp., Newark, N.J. (A. Krosnick, Div. of Chronic Illness Control, New Jersey State Dept. of Health, Box 1540, Trenton 25)

14–16. **Water Resources and Pollution Control**, 14th southern conf., Raleigh, N.C. (C. M. Weiss, Box 899, Chapel Hill, N.C.)

15–16. **Heat Transfer** at Cryogenic Temperatures, Oklahoma State Univ., Stillwater. (J. D. Parker, Dept. of Mechanical Engineering, Oklahoma State Univ., Stillwater 74075)

15–16. **Programming and Control**, intern. conf., U.S. Air Force Academy, Colorado Springs, Colo. (O. J. Manci, G. B. Dantzig Operations Research Center, Univ. of California, Berkeley)

15–17. American **Ethnological** Soc., Lexington, Ky. (N. F. S. Woodbury, Office of Anthropology, U.S. Natl. Museum, Washington, D.C.)

15–17. Southern Soc. for **Philosophy and Psychology**, Atlanta, Ga. (E. A. Alluisi, Psychology Dept., Univ. of Texas, Austin 78712)

16–17. **Montana** Acad. of Sciences, Montana State College, Bozeman. (L. H. Harvey, Dept. of Botany and Microbiology, Montana State Univ., Missoula)

16–18. Association of **Southeastern Biologists**, annual, Charlottesville, Va. (J. N. Dent, Room 270, Gilmer Hall, McCormick Rd., Charlottesville 22903)

18–22. Association of American **Geographers**, annual, Columbus, Ohio. (E. Taafee, Dept. of Geography, Ohio State Univ., Columbus)

19–21. Nondestructive Evaluation of **Aerospace and Weapons System Components and Materials** (unclassified), San Antonio, Tex. (J. R. Barton, Southwest Research Inst., 8500 Culebra Rd., San Antonio 6)

19–21. **Biomedical Sciences Instrumentation**, 3rd natl. symp., Instrument Soc. of America, Dallas, Tex. (D. R. Stearn, ISA, 530 William Penn Place, Pittsburgh, Pa. 15219)

19–21. Mechanics, Physics, and Chemistry of **Solid Propellants**, Purdue Univ., Lafayette, Ind. (A. C. Eringen, School of Aeronautics, Astronautics and Engineering Sciences, Purdue Univ., Lafayette 47907)

19–22. Modern Trends in **Activation Analysis**, intern. conf., Texas A&M Univ., College Station. (R. E. Wainerdi, Texas A&M Univ., College Station)

19–22. American **Geophysical** Union, annual, Washington, D.C. (W. E. Smith, AGU, 1145 19th St., NW, Washington, D.C. 20036)

19–22. **Nuclear Magnetic Resonance**, 2nd annual workshop, Washington, D.C. (A. J. Rosen, Dept. of Chemistry, Georgetown Univ., Washington, D.C.)

20–22. **Frequency Control**, 19th annual symp., Atlantic City, N.J. (Director, U.S. Army Electronics Laboratories, Headquarters, U.S. Army Electronics Command, Attn: AMSEL-RD-PF, Fort Monmouth, N.J. 07703)

20–22. **Great Plains**, symp., North Dakota State Univ., Fargo. (S. W. Russell, North Dakota State Univ., Fargo)

20–22. **Physics of Solids at High Pressures**, 1st intern. conf., Tucson, Ariz. (C. T. Tomizuka, Dept. of Physics, Univ. of Arizona, Tucson 85721)

20–22. Photochemical Aspects of **Air Pollution**, symp., Cincinnati, Ohio. (A. P. Altshuller, Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 45226)

20–22. **System Theory**, symp., Polytechnic Inst. of Brooklyn, Brooklyn, N.Y. (J. Fox, Polytechnic Inst. of Brooklyn, 333 Jay St., Brooklyn 1)

20–23. American Assoc. of **Anatomists**, annual, Miami, Fla. (R. T. Woodburne, Dept. of Anatomy, Univ. of Michigan, Ann Arbor 48104)

20–23. American **Meteorological** Soc., spring meeting, Washington, D.C. (K. C. Spengler, 45 Beacon St., Boston 8, Mass.)

20–23. U.S. Natl. Committee, Intern. **Scientific Radio Union**/Inst. of **Electrical and Electronics Engineers**, spring meeting, Washington, D.C. (A. T. Waterman, Stanford Electronics Laboratories, Stanford Univ., Stanford, Calif.)

21. **Oral Cancer**, 3rd annual symp., Poughkeepsie, N.Y. (M. A. Engelman, 1 East Academy St., Wappingers Falls, N.Y. 12590)

21–22. **Mathematical Geodesy**, symp., Turin, Italy. (A. Marussi, Univ. of Trieste, Trieste, Italy)

21–23. American Inst. of **Chemists**, 42nd annual, Richmond, Va. (R. E. Anderson, Albemarle Paper Manufacturing Co., Richmond 23217)

21–23. **Cognitive Processes and Clinical Psychology**, 3rd symp., Univ. of Colorado, Boulder. (R. Jessor, Dept. of Psychology, Univ. of Colorado, Boulder)

21–23. **Combustion** Inst., western states section, spring meeting, Hollywood, Calif. (A. S. Gordon, Forrestal Research Center, Princeton Univ., Princeton, N.J.)

21–23. Instititute of **Environmental Sciences**, 11th annual, Chicago, Ill. (IES, 34

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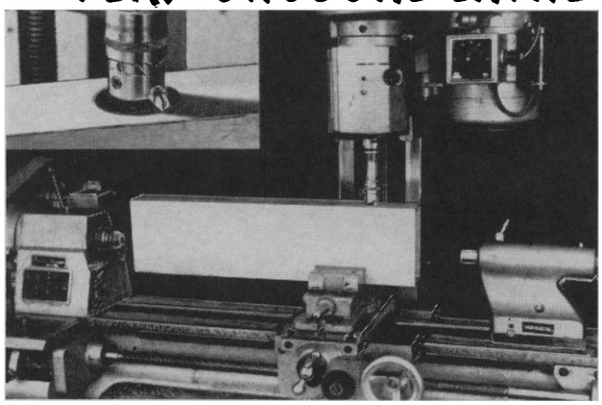

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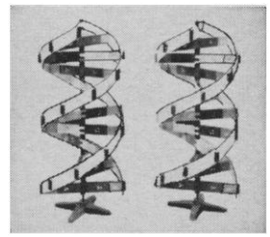

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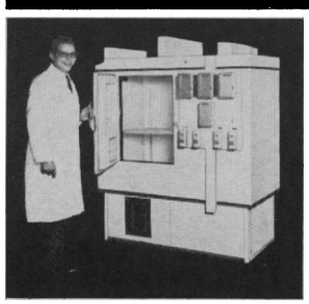

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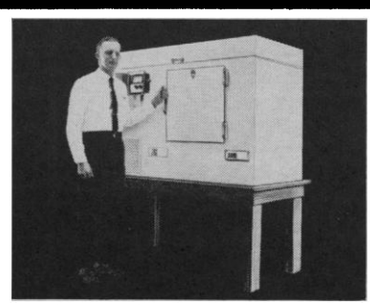

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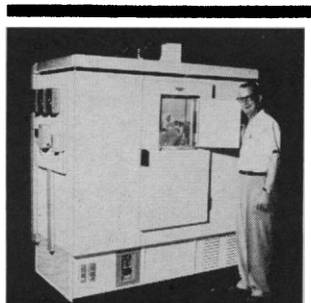

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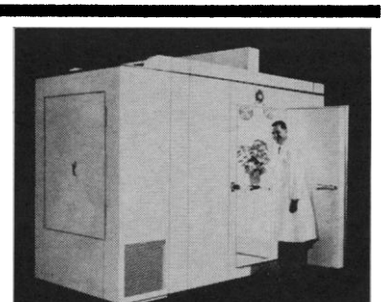

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21–23. Engineering Aspects of **Magnetohydrodynamics**, 6th symp., Pittsburgh, Pa. (E. Reshotko, Div. of Electrical Engineering, Case Inst. of Technology, Cleveland, Ohio 44106)

21–23. Support for **Manned Flight**, conf., Dayton, Ohio. (G. L. Schwarz, Headquarters, AF Logistics Command (MCO), Wright-Patterson AFB, Ohio)

21–23. **Marine Sciences Instrumentation**, 3rd natl. symp., Instrument Soc. of America, Univ. of Miami, Miami, Fla. (H. A. Cook, Airpax Electronics, Inc., P.O. Box 8488, Fort Lauderdale, Fla.)

21–23. **Nonlinear Magnetics**, 3rd intern. conf., (INTERMAG), Washington, D.C. (E. W. Pugh, I.B.M. Components Div., Dept. 231, Bldg. 703-2, Poughkeepsie, N.Y. 12602)

21–23. **Ophthalmological** Soc. of the United Kingdom, annual, London, England. (Joint Secretariat, 47 Lincoln's Inn Fields, London, W.C.2)

21–23. **Optimization Techniques**, symp., Pittsburgh, Pa. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y.)

21–23. **Pulse Radiolysis**, symp., Manchester, England. (M. Ebert, Paterson Laboratories, Christie Hospital and Holt Radium Inst., Withington, Manchester 20, England)

21–24. Federation of European **Biochemical** Societies, Vienna, Austria. (The Secretariat, Alserstr. 4, Vienna 9)

21–24. British **Paediatric** Assoc., Scarborough, England. (E. W. Hart, Hospital for Sick Children, Great Ormond St., London, W.C.1, England)

21–2. **Industrial Chemistry**, 26th intern. congr., Paris, France. (Soc. of Industrial Chemistry, 28 rue St. Dominique, Paris 7)

22–23. **Nondestructive Testing** of Materials, intern. conf., Vienna, Austria. (Firma Gebr. Böhler & Co., A.G., Kapfenberg, Austria)

22–23. Chemistry of **Polymerization Processes**, symp., London, England. (W. R. Moore, Dept. of Chemical Technology, Bradford Inst. of Technology, Bradford 7, Yorkshire, England)

22–24. Eastern **Psychological** Assoc., 36th annual, Atlantic City, N.J. (M. A. Iverson, Queens College, Flushing, N.Y. 11367)

22–24. Role of the **Solvent in Chemical Kinetics**, E. A. Moelwyn-Hughes symp., Univ. of Arkansas, Fayetteville. (A. Fry, Dept. of Chemistry, Univ. of Arkansas, Fayetteville 72701)

22–24. **Wildflower Pilgrimage**, 15th annual, Great Smoky Mountains Natl. Park. (E. E. C. Clebsch, Dept. of Botany, Univ. of Tennessee, Knoxville)

23–24. **Georgia** Acad. of Science, Oglethorpe Univ., Atlanta. (J. T. May, School of Forestry, Univ. of Georgia, Athens)

23–24. **Information Retrieval**, 2nd annual natl. colloquium, Univ. of Pennsylvania, Philadelphia. (Inst. for Scientific Information, 325 Chestnut St., Philadelphia 19106)

23–24. **Iowa** Acad. of Science, Univ. of Dubuque, Dubuque, Iowa. (G. W. Peglar, Dept. of Mathematics, Iowa State Univ., Ames)

23–24. **Mississippi** Acad. of Sciences, Biloxi. (C. Q. Sheely, Mississippi State Univ., State College)

23–24. **Ohio** Acad. of Science, annual, Ohio Univ., Athens. (J. H. Melvin, 505 King Ave., Columbus, Ohio 43201)

23–24. **Parasitism**, colloquium, Oregon State Univ., Corvallis. (J. E. McCauley, Dept. of Oceanography, Oregon State Univ., Corvallis 97331)

23–24. **Population** Assoc. of America, annual, Chicago, Ill. (A. J. Coale, PAA, Office of Population Research, 5 Ivy Lane, Princeton, N.J.)

23–24. **South Dakota** Acad. of Science, Black Hills State College, Spearfish. (T. Van Bruggen, Botany Dept., Univ. of South Dakota, Vermillion)

23–24. **West Virginia** Acad. of Science, Fairmont State College, Fairmont. (J. B. Hickman, 8 Mineral Industries Bldg., West Virginia Univ., Morgantown)

25–26. **Pi Gamma Mu**, natl. social science honor soc., St. Paul, Minn. (E. B. Urquhart, 1719 Ames St., Winfield, Kan.)

25–28. American **Oil Chemists** Soc., Houston, Tex. (C. W. Hoerr, Durkee Foods, 2333 Logan Blvd., Chicago, Ill.)

25–28. Southeastern **Psychiatric** Assoc., annual, Southern Pines, N.C. (H. Brackin, Jr., 1918 Church Ave., Nashville 3, Tenn.)

25–29. American Assoc. of **Cereal Chemists**, Kansas City, Mo. (E. J. Bass, Intern. Milling Co., Inc., 1423 S. 4th St., Minneapolis, Minn. 55404)

25–29. American Soc. for **Microbiology**, annual, Atlantic City, N.J. (R. W. Sarber, ASM, 115 Huron View Blvd., Ann Arbor, Mich.)

25–29. International College of **Surgeons**, North American Federation, Las Vegas, Nev. (Secretariat, 1516 Lake Shore Dr., Chicago, Ill. 60610)

26–27. European Days of **Chemical Engineering**, Paris, France. (Societé de Chimie Industrielle, 28, rue St. Dominique, Paris 7)

26–27. **Electroanesthesia**, 2nd symp., Univ. of Tennessee, Knoxville. (C. E. Short, UT-AEC Agricultural Research Laboratory, 1299 Bethel Valley Rd., Oak Ridge, Tenn.)

26–27. **Environmental Health Problems**, 2nd AMA congr., Chicago, Ill. (Dept. of Environmental Health, AMA, 535 North Dearborn St., Chicago, Ill. 60610)

26–28. **Error in Digital Computation**, symp., Madison, Wis. (L. B. Rall, U.S. Army Mathematics Research Center, Univ. of Wisconsin, Madison 53706)

26–29. **Aerospace Medical** Assoc., 36th annual, New York, N.Y. (Gen. J. M. Talbot, Headquarters USAF, AFMSPA, Washington, D.C. 20333)

26–29. Mechanisms and Therapy of **Cardiac Arrythmias**, 14th Hahnemann symp., Philadelphia, Pa. (L. Dreifus, Dept. of Medicine, Hahnemann Medical College and Hospital, Philadelphia)

26–29. Society of **Economic Paleontologists and Mineralogists**, New Orleans, La. (D. M. Curtis, Shell Oil Co., Box 127, Metairie, La.)

26–29. American Assoc. of **Petroleum Geologists**, 39th annual, New Orleans, La. (G. Atwater, 424 Whitney Bldg., New Orleans)

26–29. American **Physical** Soc., Wash-

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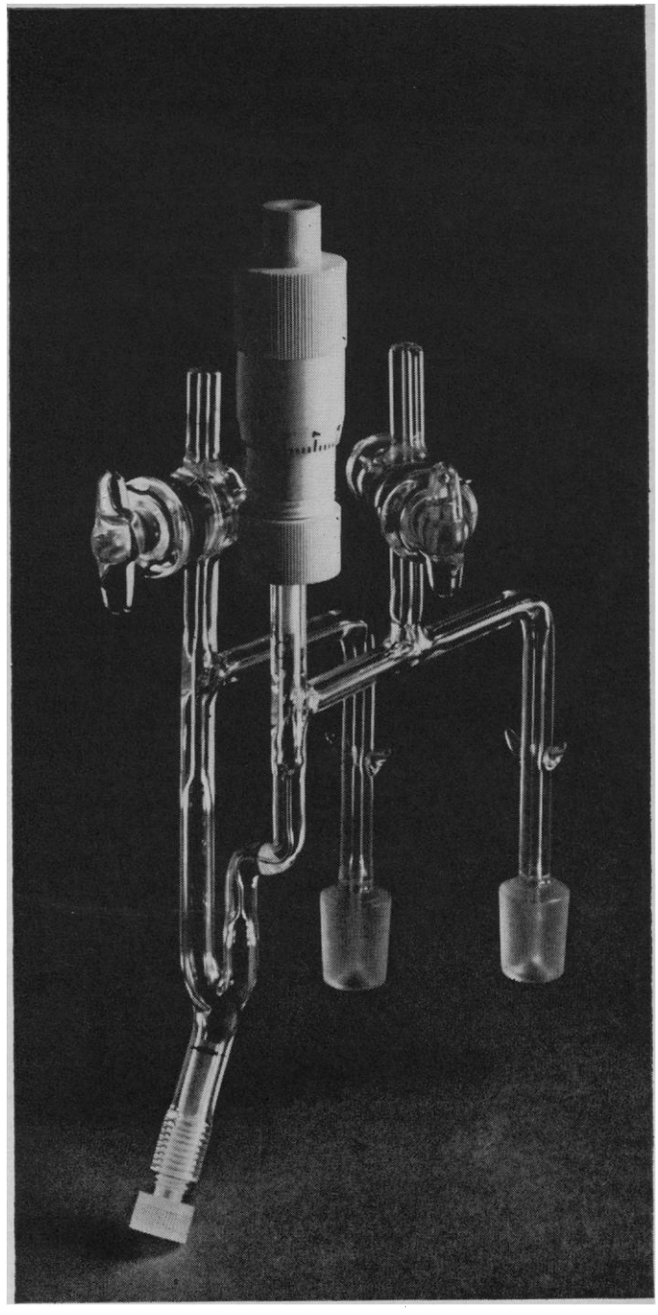

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26–1. **Geodetic Uses of Satellites**, conf., Athens, Greece. (Intern. Organizations Staff, Bureau of Intern. Commerce, U.S. Department of Commerce, Washington, D.C.)

28–30. **Hypnosis and Psychosomatic Medicine**, intern. congr., Paris, France. (H. C. Harding, 2050 NW Lovejoy, Portland 9, Ore.)

28–30. National Soc. for **Prevention of Blindness**, Houston, Tex. (J. W. Ferree, 16 E. 40 St., New York 10016)

28–1. **Biometric** Soc., eastern North America regional, Florida State Univ., Tallahassee. (E. L. LeClerg, 6804 40th Ave., University Park, Hyattsville, Md. 20782)

28–1. American **College Health** Assoc., Miami Beach, Fla. (R. E. Boynton, 5518 Merrick Dr., Coral Gables, Fla.)

29–30. **Space Navigation and Communications**, natl., Houston, Tex. (P. Schrock, Inst. of Navigation, 711 14th St. NW, Washington, D.C. 20005)

29–30. Association for **Symbolic Logic**, Chicago, Ill. (T. Hailperin, Dept. of Mathematics, Lehigh Univ., Bethlehem, Pa. 18015)

29–1. American Assoc. of **Endodontists**, Detroit, Mich. (E. C. Van Valey, 9 Rockefeller Plaza, New York 10020)

29–1. American Assoc. for **History of Medicine**, Philadelphia, Pa. (J. B. Blake, Natl. Library of Medicine, 9600 Wisconsin Ave., Bethesda, Md.)

29–1. American Acad. of **Neurology**, annual, Cleveland, Ohio. (AAN, 7100 France Ave. S., Minneapolis, Minn. 55410)

29–1. Midwestern **Psychological** Assoc., 27th annual, Chicago, Ill. (F. A. Mote, Psychology Bldg., Madison, Wis. 53706)

29–1. American **Philosophical** Assoc., western div., Chicago, Ill. (L. E. Hahn, Dept. of Philosophy, Southern Illinois Univ., Carbondale)

29–2. Protides of the **Biological Fluids**, 13th colloquium, Bruges, Belgium. (P.O.B. 71, Bruges 1)

29–2. Association of **Clinical Scientists**, New York, N.Y. (R. P. MacFate, ACS, 300 N. State St., Chicago, Ill. 60610)

29–2. **Pan American Medical** Assoc., 40th annual congr., Grand Bahama Island. (PAMA, 745 Fifth Ave., New York 10022)

29–2. **Roentgen**, 46th German congr., Nuremberg, Germany (A. Jakob, c/o Strahleninstitut der Städt, Krankenanstalten, Flurstr. 17, 85 Nuremberg)

30–1. **Colorado-Wyoming** Acad. of Science, annual, Univ. of Denver, Denver, Colo. (C. Norton, Dept. of Botany and Plant Pathology, Colorado State Univ., Fort Collins)

30–1. **Indiana** Acad. of Science, Culver. (C. F. Dineen, St. Mary's College, Notre Dame, Ind. 46556)

30–1. **Nebraska** Acad. of Sciences, Lincoln. (C. B. Schultz, Morrill Hall 101, Univ. of Nebraska, 14th and U St., Lincoln 68508)

30–2. Society of **Biological Psychiatry**, New York, N.Y. (G. N. Thompson, 2010 Wilshire Blvd., Los Angeles, Calif.)

30–2. Academy of **Psychoanalysis**, annual, New York, N.Y. (A. H. Rifkin, 125 E. 65 St., New York 10021)

New Products

Laboratory controller, Matheson Lab-Stat, versatile, capable of proportional, on-off, and high-limit operation; controls any variable which can be expressed as a change in liquid level. Change is sensed by a variable-capacitance probe which clips to the tube in which liquid level is to be regulated. Variations in level around the set-point change the capacitance of the probe which is part of a tuned circuit in a crystal-controlled, solid-state oscillator. Resulting change in oscillator frequency affects the duration of constant-amplitude pulses which power heating or cooling devices or both. Probe is sensitive to both proximity and direction of the liquid level, so that the proper output is supplied to the control device to correct deviation. Power output is 115 volt, 50 to 60 cy/sec, and $\leq$ 15 amp. As a proportional controller, it controls level to within 1 mm. A switch selects on-off or high-limit operation; in the latter mode, the instrument opens or closes output contacts when the preset level is reached and must be manually reset. Temperature is controlled by clipping the probe to a mercury-in-glass thermometer; pressure or vacuum are controlled by using mercury- or water-filled manometers; liquid level in closed containers is controlled by monitoring level in sight-gauge glass. Any liquid having a dielectric $\geq$ 20 can be used. Probes available for tubes up to 6 or 12 mm in diameter (larger probes on request). Front-panel meter indicates whether level is at, above or below set point; switch selects control mode, knob regulates gain. In side are: plug for probe, a-c outlets for heating and cooling systems, and output terminal for millivolt recorder. Instructions permanently printed on box. Dimensions: 11.5 by 6.25 by 4 inches deep (30 by 15 by 10 cm). Teflon-coated 6-foot coaxial probe cable. List: $197.50.—D.J.P. (Matheson Co., Inc., Jackson and Swanson Sts., Philadelphia, Pa.)

Circle 1 on Readers' Service Card

Microflow valve, for controlling extremely low flows of gas or liquid, combines a small-bore glass capillary and a close-fitting, precision-ground stainless rod to achieve laminar flow through the capillary over a 10 to 1 range of flow. In this laminar region, flow is directly proportional to pressure drop and, for different fluids at a given pressure drop, is inversely porportional to viscosity; this facilitates calculation of estimated flows. Fine screw provides 20 turns in the 0.5 inch (1.25 cm) of stem travel. First ten turns provide a laminar-flow range of 10 to 1; transitional (laminar to turbulent) flow occurs over the next five turns, another 10 to 1 range. Because the end of the rod is ground to a needle point, the final five turns provide conventional needle-valve orifice-flow with another 10 to 1 range. Overall range in flow is thus $\geq$ 1000 to 1 [for 2-lb/in.^{2} (.14 bar) differential, range is in fact 0.25 to 6000 cm^3 of air per minute]. Valve available in chromed brass or 303 stainless. Capillary is pyrex; rod, stainless. O-ring seals make valve tight against pressure (6000 lb/in.^{2}) and vacuum (10^{-6} torr). Male pipe thread (¼ inch) on inlet, standard ⅛-inch tubing adapter on outlet. A filter is recommended to prevent fouling of valve by dust or dirt. List: model 150B (chromed brass), $21.65; model 150S (stainless steel), $29.50.—D.J.P. (Matheson Scientific, Inc., Jackson and Swanson Sts., Philadelphia, Pa.)

Circle 2 on Readers' Service Card

Laboratory recorder, Honeywell Electronik 19, records d-c voltages on 19 full-scale spans from 0.01 mv to 100 volts; accurate within 0.25 percent full scale or 1 μv, whichever is greater. Convenient for recording a wide range of d-c signals in analytical or biological laboratories. The null-balance, servo-type, measuring system gives true potentiometric measurement from 0.01 to 100 mv; input impedance is infinite at null, 25,000 ohm/mv off null; constant 4 Mohms on all voltage ranges. Solid-state circuitry incorporates constant-voltage source referenced to a double Zener-diode bridge. Dead band, 0.15 percent of span; frequency response down 1 percent at 5 cy/sec (measured on sine-wave signal, 10 percent of full scale). Thumb-wheel selected chart speeds of 10, 5, 2, and 1 min/in. and 40, 20, 10, 5, 2, and 1 sec/in., with standby position. Zero displacement continuously adjustable from -100 to $+100$ percent of full scale, with accurate calibration of zero value. Jewel-tipped pen uses disposable ink cartridges. Reloading of paper is easy. Has tilting writing table (locks at 30 and 45 deg), mechanical pen lifter, carrying handle, 7-foot cord. Dimensions: 8.75 inches square by 11 inches deep (22.3 by 28 cm). Weight: 20 lb (9 kg).—D.J.P. (Honeywell Industrial Products Group, Wayne and Windrim Ave., Philadelphia, Pa.)

Circle 3 on Readers' Service Card

Ice-point calibration standard, automatically maintains an immersion well at 0° $\pm$ 0.01°C, replaces the common ice bath in precise calibration procedures. The reference well, 7 mm internal diameter by 150 mm, is immersed in a hermetically-sealed chamber of water cooled thermoelectrically. The reference temperature, 0°C, is established by the physical equilibrium of ice and water; this is sustained by a thermoelectric cooler automatically controlled by a sensing device (bellows-microswitch) which responds to the relative volumes of ice and water in the chamber. Well is thus continually surrounded by ice and water in equilibrium. Instrument is ready for plugging in to a 110-volt, 60-cy/sec a-c source. Eliminates inconveniences of ice baths and triple-point methods. Reference is automatic at 0°C and sustained. Simplicity of thermoelectric coolers and their power supplies makes the device virtually maintenance-free. Model RCS1 has a single well; stability, $\pm$0.01°C. Model RCS4 has four wells

The material in this section is prepared by Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writer assumes responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on page 1169. Circle the department number of the item in which you are interested on this card.

with stabilities of ±0.025°C; one well stable within 0.005°C. Both operate in ambients from 35°F to 100°F. Dimensions: 14.38 by 9.75 by 8.07 inches high (36.5 by 25 by 20.5 cm). Designed for use in standards laboratories in the fine calibration of thermocouples, thermocouple wire, and other temperature-sensing devices. List: model RCS1, $395.00; model RCS4, $550. —D.J.P. (Joseph Kaye & Co., Inc., 737 Concord Ave., Cambridge, Mass.

Circle 4 on Readers' Service Card

Electrodeless conductivity meter, which measures the conductance of liquids without direct contact between solution and metallic electrodes, is particularly suitable for titrations in both aqueous and nonaqueous solvents, as well as for monitoring conductance in flowing fluids. The solid-state variable oscillator provides three frequencies; one is selected to meet the range of conductance under measurement. For each frequency, the instrument responds to changes in conductance over at least a hundredfold range of solution concentrations; total range is from 10^{-7} to 10^{-2} mho/cm. Oscillator output is coupled with the solution at a metallic sleeve and is carried by ion flow to a second sleeve which couples the attenuated signal with the solid-state amplifier. An eight-position attenuator permits a 3000-to-1 range of full-scale measurements. The amplifier output drives the panel meter and the recorder jack; meter (calibrated 0 to 100 μa) has a repeatability of 0.5 percent. The standard titration cell provided includes a reservoir for titrants and a gas intake port for gas mixing; a flow-through cell is optional. The front panel jack provides 0 to 100 mv for driving a constant delivery-rate buret or standard strip-chart recorder. Dimensions: 13.75 by 8.75 by 7 inches high (35 by 22.3 by 18 cm).—D.J.P. (Melabs, 3300 Hillview Ave., Stanford Industrial Park, Palo Alto, Calif.)

Circle 5 on Readers' Service Card

Constant-speed drive system and power stirrer, Servo-Dyne, comprises a d-c motor and solid-state controller; provides constant-speed output regardless of load variations. Speed is continuously variable from 5 to 3000 rev/min in two ranges (0 to 300 rev/min, 0 to 3000 rev/min). Maximum torques: 4 inch-lb (4600 g-cm) from 5 to 1500 rev/min; 1 inch-lb at 3000 rev/min. Within these ratings, speed is maintained within 3 percent. Separate winding on the motor arma-

ture provides a voltage proportional to motor speed, which voltage is compared with a reference voltage determined by setting the speed control knob; the difference voltage is amplified in a transistor circuit and used to signal the motor power-supply to provide the more or less voltage required to maintain the set speed. Recorder-output terminals provide a voltage which varies with motor torque; a chart correlates this signal with torque, enabling rheologists and polymer chemists to follow changes in viscosity while stirring at constant speed. Motor is 3 inches in diameter by 6 inches long (7.6 cm by 15.2 cm); has permanently lubricated ball bearings, and 1-inch drive-shaft extension. Key-type chuck, with 0.375-inch capacity. Separate control-box (10 by 6.5 by 7 inches high) has tachometer calibrated from 0 to 3 in 1/10-divisions; × 100 for 0 to 300-rev/min range, × 1000 for 0 to 3000 range. Range switch, recorder-output terminals, circuit breaker, on-off switch, and pilot light on front panel. Circuit components are fan cooled. Motor, controller, key chuck, 6-inch vertical support-rod for motor for $245.—D.J.P. (Cole-Parmer Instrument and Equipment Co., Chicago, Ill. 60626)

Circle 6 on Readers' Service Card

Neutralized-capacitance amplifier, PICO-metric model 181, is a completely solid-state amplifier for use with high-impedance electrodes in applications requiring optimum signal-to-noise ratio and fast rise time. Its input impedance has a negative capacitance which compensates for positive capacitance across the electrode, reducing time constant (resistance times capacitance) and rise time of the electrode output. High-impedance sources such as nerve-cell probes, with resistances from 10 to 1000 Mohm shunted by $\leq$ 12 pf, can be compensated to show rise times of from 3 to 10 μsec. Amplifier has: input impedance of 10^{13} ohm (minimum), +1 to −12 pf; input offset-current adjustable to 10^{-13} amp. Output-voltage range, ±1 volt, with a rate limit of 10^{5} volt/sec. Temperature coefficient, 200 μv/°C (viewed at output); long-term stability, 100 μv/day. Battery life, 1500 hours. Dimensions: 3 by 3 by 2.25 inches (7.5 by 7.5 by 5.6 cm). List: $345.—D.J.P. (Instrumentation Laboratory, Inc., 9 Galen St., Watertown Square, Boston 72, Mass.)

Circle 7 on Readers' Service Card

NEW BOOKS

(Continued from page 1278)

Peithmann. Thomas, Springfield, Ill., 1964. 320 pp. $7.50.

The Communication Systems of the Body. David F. Horrobin. Basic Books, New York, 1964. 224 pp. Illus. $4.95.

Concise Dictionary of Atomics. Alfred del Vecchio. Philosophical Library, New York, 1964. 272 pp. $6.

Contemporary Physics. David Park. Harcourt, Brace, and World, New York, 1964. 185 pp. Illus. Paper, $2.45; cloth, $4.95.

The Cube Made Interesting. Aniela Ehrenfeucht. Translated from the Polish edition (Warsaw, 1960) by Waclaw Zawadowski. Pergamon, London; Macmillan, New York, 1964. 91 pp. Illus. $3.75.

The Deep and the Past. David B. Ericson and Goesta Wollin. Knopf, New York, 1964. 315 pp. Illus. $6.95.

Descripción Sumaria del Templete Semisubterráneo de Tiwanaku. Carlos Ponce Sanginés. Centro de Investigaciones Arqueológicas en Tiwanaku, Tiwanaku, Bolivia, 1964. 90 pp. Illus. Plates.

Direct Use of the Sun's Energy. Farrington Daniels. Yale Univ. Press, New Haven, Conn., 1964. 392 pp. Illus. Paper, $2.45; cloth, $7.50.

Documents on Disarmament, 1963. Compiled and annotated by Robert W. Lambert, Ruth Ihara, and Charles R. Gellner. U.S. Arms Control and Disarmament Agency, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 756 pp. Paper, $2.

Early Electrical Communications. E. A. Marland. Abelard-Schuman, New York, 1964. 220 pp. Illus. $6.

The Earth Beneath Us. Kirtley F. Mather. Random House, New York, 1964. 320 pp. Illus. $15.

An Essay Concerning Human Understanding. John Locke. Abridged and edited with an introduction by A. D. Woozley. World, Cleveland, Ohio, 1964. 475 pp. Paper, $2.65.

Exploring the World of Fossils. William H. Matthews, III. Childrens Press, Chicago, 1964. 157 pp. Illus. $4.50 (juvenile).

Family and Kinship in East London. Michael Young and Peter Willmott. Penguin Books, Baltimore, Md., 1964 (reprint of 1962 edition). 222 pp. Paper, $1.25.

The Flammarion Book of Astronomy. Camille Flammarion. Prepared under the direction of Gabrielle Camille Flammarion and André Danjon. Translated from the French edition (1955–60) by Annabel and Bernard Pagel. Simon and Schuster, New York, 1964. 670 pp. Illus. $22.95.

The Flying Trapeze: Three Crises for Physicists. J. Robert Oppenheimer. Oxford Univ. Press, New York, 1964. 75 pp. Illus. $2.75.

The Friendly Stars. Martha Evans Martin. Revised by Donald H. Menzel. Dover, New York, 1964 (revised and enlarged version of the 1907 edition). 159 pp. Illus. Paper, $1.

Genetics and Man. C. D. Darlington. Macmillan, New York, 1964. 382 pp. Illus. $7.50. A revised and expanded edition of *The Facts of Life* (1953).

Glossaire de Biologie Animale. Roger Husson. Gauthier-Villars, Paris, 1964. 280 pp. Paper, F. 28.

The Hospitals, 1800–1948. A study in social administration in England and Wales. Brian Abel-Smith. Harvard Univ. Press, Cambridge, Mass., 1964. 528 pp. Illus. $9.

Indians of Southern Illinois. Irvin M. Peithmann. Thomas, Springfield, Ill., 1964. 141 pp. Illus. $6.50.

Industrial Espionage and Mis-Use of Trade Secrets. Worth Wade. Advance House, Ardmore, Pa., 1964. 140 pp. Paper, $12.50.

Inference and Disputed Authorship: The Federalist. Frederick Mosteller and David L. Wallace. Addison-Wesley, Reading, Mass., 1964. 303 pp. Illus. $12.50.

Insect Pests of Livestock, Poultry, and Pets and Their Control. Rudolph Seiden. Springer, New York, 1964. 174 pp. Illus. Paper, $4.

Inside the Nucleus. Irving Adler. New American Library, New York, 1964. 157 pp. Illus. Paper, 60¢.

Islands in Space: The Challenge of the Planetoids. Dandridge M. Cole and Donald W. Cox. Chilton, Philadelphia, 1964. 298 pp. Illus. $6.95.

The Land and Wildlife of Africa. Archie Carr and the Editors of *Life*. Time, New York, 1964. 200 pp. Illus. $3.95.

Leonardo da Vinci and a Memory of His Childhood. Sigmund Freud. Translated from the German by Alan Tyson. James Strachey, Ed. Norton, New York, 1964. 101 pp. $3.50.

Life and Death of the Sun. John Rublowsky. Basic Books, New York, 1964. 176 pp. Illus. $4.50.

The Life and Times of Emil H. Grubbe. The biography of a pioneering Chicago radiologist. Paul C. Hodges. Univ. of Chicago Press, Chicago, 1964. 151 pp. $3.95.

Life Histories of North American Cuckoos, Goatsuckers, Hummingbirds, and Their Allies. pts. 1 and 2. Arthur Cleveland Bent. Dover, New York, 1964 (reprint of Smithsonian Institution *Bulletin* 176, 1940). pt. 1, 256 pp.; pt. 2, 270 pp. Plates. Paper, $2.50 each.

Life Histories of North American Jays, Crows, and Titmice. pts. 1 and 2. Arthur Cleveland Bent. Dover, New York, 1964 (reprint of Smithsonian Institution *Bulletin* 191, 1946). pt. 1, 224 pp.; pt. 2, 287 pp. Plates. Paper, $2.50 each.

The Living Battery. An introduction to bioelectricity. E. E. Suckling. Macmillan, New York, 1964. 160 pp. Illus. $3.95.

Louis Pasteur. Founder of bacteriology. John Mann. Scribner, New York, 1964. 160 pp. $3.50 (juvenile book).

Man and Space. Arthur C. Clarke and the Editors of *Life*. Time, New York, 1964. 200 pp. Illus. $3.95.

Management and Mathematics. The practical techniques available. Allan Fletcher and Geoffrey Clarke. Gordon and Breach, New York, 1964. 247 pp. Illus. $7.50.

The Many Worlds of Man. Jack Conrad. Crowell, New York, 1964. 319 pp. Illus. $6.95.

Mathematical Bafflers. Compiled and edited by Angela Dunn. McGraw-Hill,

New York, 1964. 231 pp. Illus. $6.50.

Medical Illustration. A guide for the doctor-author and exhibitor. William E. Loechel. Thomas, Springfield, Ill., 1964. 355 pp. Illus. $14.50.

Methods of Forensic Science. vol. 3. A. S. Curry, Ed. Interscience (Wiley), New York, 1964. 356 pp. Illus. Nine papers: "Lead poisoning" by S. L. Tompsett; "Non-biological applications of neutron activation analysis in forensic studies" by Vincent P. Guinn; "Biological applications of activation analysis" by Hamilton Smith and J. M. A. Lenihan; "Forensic chemical analysis of urine for drugs" by Elliott B. Hensel; "The administration of a forensic science laboratory" by Robert F. Borkenstein; "Examination of fiduciary counterfeits and forgeries" by P. Fauconnier, J. Cogniard, and P. F. Ceccaldi; "The toxicology of cyanides" by Manuel A. Guatelli; "The acid phosphates test" by S. S. Kind; and "Erasures" by Wilson R. Harrison.

My View of the World. Erwin Schrödinger. Translated from the German edition (Hamburg, 1961) by Cecily Hastings. Cambridge Univ. Press, New York, 1964. 118 pp. $3.50.

A New System of Chemical Philosophy. John Dalton. Philosophical Library, New York, 1964. 182 pp. Illus. $6. A reprint with a brief (2⅓ pp.) introduction.

Organic Name Reactions. A contribution to the terminology of organic chemistry, biochemistry, and theoretical organic chemistry. Helmut Krauch and Werner Kunz. Translated from the second revised German edition by John M. Harkin. Wiley, New York, 1964. 644 pp. Illus. $16.

The Origins and Growth of Physical Science. vols. 1 and 2. D. L. Hurd and J. J. Kipling, Eds. Penguin Books, Baltimore, Md., 1964 (reprint of the 1958 edition). vol. 1, 343 pp.; vol. 2, 427 pp. Illus. Paper, $1.45 each.

Our Work in Space. Willy Ley. Macmillan, New York, 1964. 143 pp. Illus. $3.95.

Physics-Electronics Titles, 1960. Bibliography and key-words index of titles of leading articles in about 200 journals. Boston Technical Publishers, Lexington, Mass., 1964. 463 pp. $12.50.

Proceedings of the Royal Institution of Great Britain. S. K. Runcorn and others. Royal Institution, London, 1964. 118 pp. Illus. Paper, 10s. 6d. Nine papers: "How the continents drift" by S. K. Runcorn; "A baby's first breaths" by K. W. Cross; "Noise and hearing" by W. Burns; "The law of disorder" by George Porter; "Infectious heredity and man's future (Woodhull lecture)" by R. Dulbecco; "Minerals" by Sir Lawrence Bragg; "Control and behaviour in the honeybee colony" by C. G. Butler; "Hugh Miller: Geologist and man of letters" by James Lawrie, and "Writers and libraries: The dependence of the scientific writer on library facilities" by J. G. Crowther. Two Royal Institution Notes are included.

Pulp and Paper Research and Technology in the Middle East and North Africa. Proceedings, UNESCO/FAO regional symposium (Beirut, Lebanon), December 1962. Jan Smid, Ed. UNESCO Middle East Science Cooperation Office,

Cairo, Egypt, 1963. 489 pp. Illus. Paper. The purpose of the meeting was to consider the best existing production methods and to motivate research and training activities that would effect low-cost paper production in the Middle East and North Africa. The papers were divided into the sections: Country Statements (10 papers); The Use of Short-Fibred Raw Materials for Pulp and Paper (9 papers); Statements on Waste Paper, Rags, and Cotton Linters as Raw Materials for Paper Making (2 papers); Water Requirements and Pollution Problems (3 papers); Research Needs in Pulp and Paper (3 papers).

San Francisco Port Study. vol. 2, *Tests of Modified Cargo-Loading Methods and the Port as a System*. Natl. Acad. Sciences–Natl. Research Council, Washington, D.C., 1964. 127 pp. Illus. vols. 1 and 2, $12. Volume 1 was published in the spring. Available only as a set.

The Savage Cell. A report on cancer and cancer research. Pat McGrady. Basic Books, New York, 1964. 448 pp. $8.50.

Science. John H. Pomeroy. Holt, Rinehart, and Winston, New York, 1964. 336 pp. Illus. Paper, $2.48.

The Science of Smell. R. H. Wright. Basic Books, New York, 1964. 176 pp. Illus. $4.95.

Semiconductor Devices. James J. Brophy. McGraw-Hill, New York, 1964. 140 pp. Illus. Paper, $2.95.

Star Names: Their Lore and Meaning. Richard Hinckley Allen. Dover, New York, 1964 (reprint of the 1899 edition). 577 pp. Paper, $2.35.

Taiwan–ilha Formosa: A Geography in Perspective. Chiao-min Hsieh. Butterworth, Washington, D.C., 1964. 380 pp. Illus. $11.50.

Waterfowl Tomorrow. Joseph P. Linduska, Ed. U.S. Department of the Interior, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 784 pp. Illus. $4.

Ways of Thought of Great Mathematicians. An approach to the history of mathematics. Herbert Meschkowski. Translated from the German edition (Berlin, 1961) by John Dyer-Bennet. Holden-Day, San Francisco, Calif., 1964. 120 pp. Illus. Paper, $3.95; cloth, $5.95.

Wood Machining Processes. Peter Koch. Ronald, New York, 1964. 540 pp. Illus. $15.

The World of Probability: Statistics in Science. Solomon Diamond. Basic Books, New York, 1964. 205 pp. Illus. $4.95.

Worlds Without Ends. A reflection on planets, life, and time. N. J. Berrill. Macmillan, New York, 1964. 250 pp. $5.95.

Mathematics, Physical Sciences, and Engineering

Advanced Plasma Theory. Course 25, International School of Physics "Enrico Fermi". M. N. Rosenbluth, Ed. Academic Press, New York, 1964. 280 pp. Illus. $9.75. Eight papers: "Kinetic theory of plasma" by W. B. Thompson; "General stability theory in plasma physics" by Russel Kulsrud; "Gas discharge theory" by G. Ecker; "Topics in microinstabilities" by M. N. Rosenbluth; "Instabilities due to

finite resistivity or finite current-carrier mass" by H. P. Furth; "Nonlinear theory of electrostatic waves in plasmas" by P. A. Sturrock; "Equilibre et stabilité des systèmes toroidaux en magnétohydrodynamique au voisinage d'un axe magnétique" by C. Mercier; and "Boundary layer problems in plasma physics" by B. Bertotti. Three papers presented at a seminar are also included: "Introduction for papers on adiabatic invariance" and "Adiabatic invariant of the harmonic oscillator" by R. M. Kulsrud and "The gyration of a charged particle" by M. Kruskal.

Advances in Computers. vol. 5. Franz L. Alt and Morris Rubinoff, Eds. Academic Press. New York, 1964. 413 pp. Illus. $14. Seven papers: "The role of computers in election night broadcasting" by Jack Moshman; "Some results of research on automatic programming in Eastern Europe" by Władysław Turski; "A discussion of artificial intelligence and self-organization" by Gordon Pask; "Automatic optical design" by Orestes N. Stravroudis; "Computing problems and methods in x-ray crystallography" by Charles L. Coulter; "Digital computers in nuclear reactor design" by Elizabeth Cuthill; and "An introduction to procedure-oriented languages" by Harry D. Huskey.

Advances in Mathematics. vol. 1, pt. 2, Herbert Busemann, Ed. Academic Press, New York, 1964. 164 pp. Illus. Paper, $5.50. Three papers: "Die Theorie der geometrischen Ordnungen" by Hermann Künneth; "Lie groups in the foundations of geometry" by Hans Freudenthal; and "Some results on surface theory in the large" by A. V. Pogorelov.

Analysis of Essential Nuclear Reactor Materials. Clement J. Rodden, Ed. U.S. Atomic Energy Commission, Oak Ridge, Tenn., 1964 (order from Superintendent of Documents, Washington, D.C.). 1294 pp. Illus. Paper, $4.25. Fourteen chapters contributed by C. J. Rodden; Charles F. Metz and Glenn R. Waterbury; Robert Z. Bachman and Charles V. Banks; R. W. Bane; G. L. Booman and J. E. Rein; F. E. Clark; M. W. Lerner and J. Rynasiewicz; C. E. Anderson and D. G. Ebenhack; W. C. Judd, D. Dutina and C. J. Rodden; Harold R. Mullin and Clara Gale Goldbeck; A. E. Cameron and C. M. Stevens; S. A. Reynolds; W. N. Carson, Jr.; and C. G. Goldbeck.

Applied Mathematics for Engineers and Scientists. S. A. Schelkunoff. Van Nostrand, Princeton, N.J., ed. 2, 1965. 508 pp. Illus. $9.50.

Auroral Phenomena: Experiments and Theory. First Lockheed Research Symposium on Space Science (Palo Alto, Calif.), January 1964. Martin Walt, Ed. Stanford Univ. Press, Stanford, Calif.; Oxford Univ. Press, London, 1965. 180 pp. Illus. $6.50. Ten papers: "Morphology of auroral displays" by C. T. Elvey; "Television cinemaphotography of auroras" by T. Neil Davis; "Optical measurements of auroras" by A. Vallance Jones; "Interaction of energetic charged particles with the atmosphere" by A. Dalgarno; "Balloon measurements of x-rays in the auroral zone" by Kinsey A. Anderson; "Precipitation of energetic particles into the atmosphere" by B. J. O'Brien; "Electromagnetic measurements of auroras" by R. L. Leadabrand; "Co-

ordinated measurements on auroras" by J. E. Evans; "The present status of auroral theory" by Joseph W. Chamberlain; and "Summary of auroral symposium" by Anders Omholt.

Boolean Algebras. Roman Sikorski. Academic Press, New York; Springer, Berlin, ed. 2, 1964. 247 pp. Illus. $9.50.

Chemical Reactions in Shock Waves. Edward F. Greene and J. Peter Toennies. Academic Press, New York, 1964. 369 pp. Illus. $11.

Cloud Structure and Distributions over the Tropical Pacific Ocean. Joanne S. Malkus and Herbert Riehl. Univ. of California Press, Berkeley, 1964. 239 pp. Illus. $7.50.

Controlled Thermonuclear Reactions. L. A. Artsimovich. Translated from the Russian edition (Moscow, 1961) and edited by P. Kelly and A. Peiperl. A. C. Kolb and R. S. Pease, Translation Eds. Gordon and Breach, New York, 1964. 421 pp. Illus. $19.50.

Cosmic Radiation and High Energy Interactions. V. D. Hopper. Logos Press, London; Prentice-Hall, Englewood Cliffs, N.J., 1965. 244 pp. Illus. $12.95.

Design in Structural Steel. John E. Lothers. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1965. 599 pp. Illus. $17.35.

Electrons and Chemical Bonding. Harry B. Gray. Benjamin, New York, 1964. 239 pp. Illus. Paper, $3.95; cloth, $8.

The Equilibrium Theory of Classical Fluids. Harry L. Frisch and Joel L. Lebowitz. Benjamin, New York, 1964. Unpaged. Illus. Paper, $5.95; cloth, $10.

First Course in Functional Analysis. Casper Goffman and George Pedrick. Prentice-Hall, Englewood Cliffs, N.J., 1965. 296 pp. Illus. $16.

Fundamental Astrometry: Determination of Stellar Coordinates. V. V. Podobed. Translated from the Russian edition (Moscow, 1962) by Scripta Technica. A. N. Vyssotsky, Translation Ed. Univ. of Chicago Press, Chicago, 1965. 248 pp. Illus. $7.50.

Gas-Chromatographie, 1963. A symposium (Leuna, East Germany), May 1963. Hans Georg Struppe and Hans-Peter Angelé, Eds. Akademie Verlag, Berlin, 1964. 384 pp. Illus. Paper, MDN. 44. Forty-six papers.

Generalized Functions. vol. 4, *Applications of Harmonic Analysis*. I. M. Gel'fand and N. Ya. Vilenkin. Translated from the Russian edition (Moscow, 1961) by Amiel Feinstein. Academic Press, New York, 1964. 398 pp. Illus. $11.50.

Group Theory and Solid State Physics: A Selection of Papers. vol. 1. Paul H. Meijer, Ed. Gordon and Breach, New York, 1964. 303 pp. Illus. $5.95. Papers by H. A. Bethe, L. P. Bouckaert, R. J. Elliott, C. Herring, H. A. Kramers, W. Opechowski, F. Seitz, R. Smoluchowski, B. A. Tavger, L. Tisza, F. C. Von Der Lage, E. Wigner, T. Yamanouchi, and V. M. Zaitsev.

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