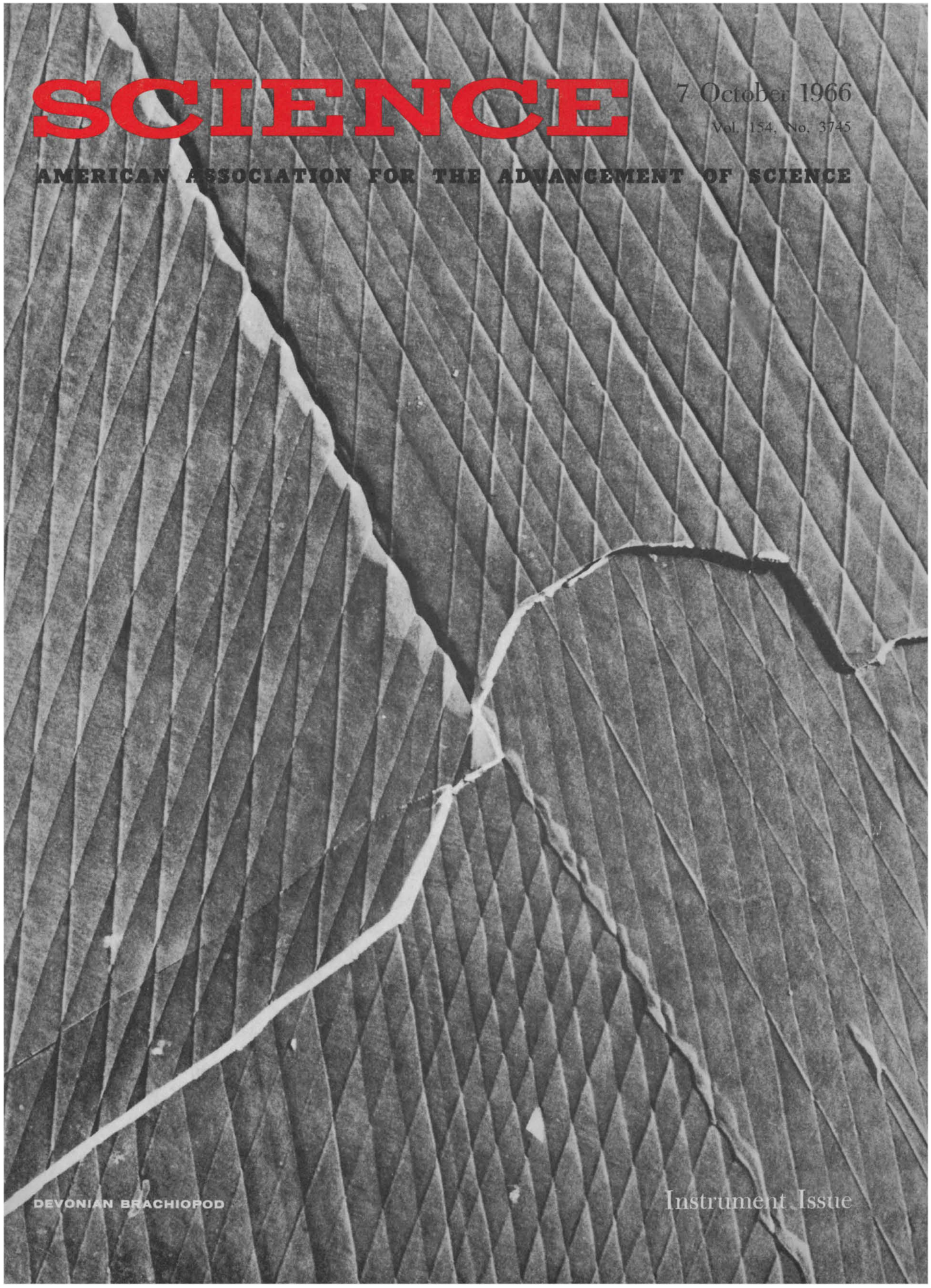
SCIENCE

7 October 1966

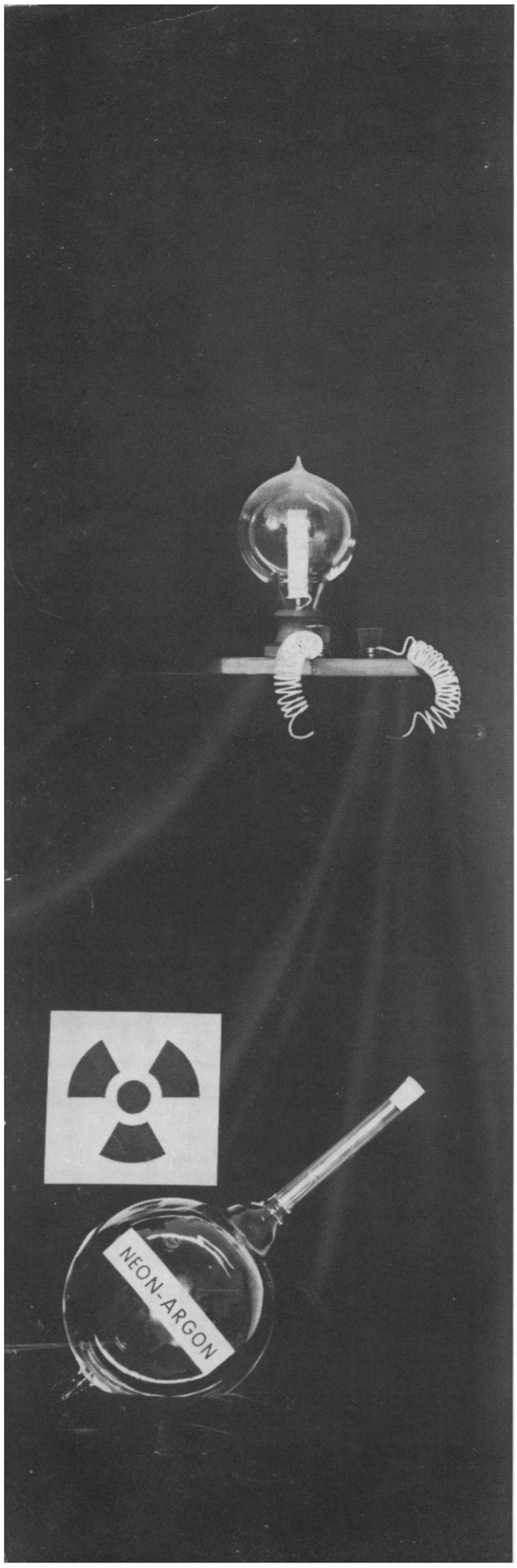
Vol. 154, No. 3745

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



DEVONIAN BRACHIOPOD

Instrument Issue



One of a series briefly describing GM's research in depth

A Noble Approach to an Old Problem

Edison was first.

He converted heat to electricity in a vacuum tube back in '83. But there was a barrier. We're knocking it down.

In a gas-filled thermionic tube, electrons can be boiled off of an emitter and directed to a collector, giving current flow. But only briefly. Then a cloud of electrons forms in the path . . . a space charge inhibiting further flow.

One way to get rid of this barrier is to neutralize it with positive ions, charged atoms of some gas. Many experimenters use vaporized cesium. But its atoms impede electron flow, requiring close interelectrode spacing. So GM Research physicists chose some of the noble gases—argon, neon, and xenon. They offer less impedance.

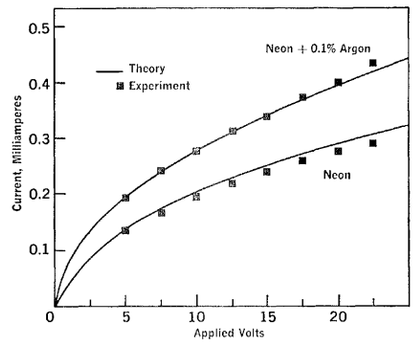
Our experimental emitter is a mixture of fissionable material and good electron-emitting material. Exposed to a neutron barrage in a reactor, the emitter gets hot from its own nuclear fission, sending electrons toward the collector. This same fission produces fragments that bombard the noble gas, generating ions to counteract the space charge.

We have developed a theory to predict the ion generation rate and have experimental data that backs it up. We think we understand why and how things happen.

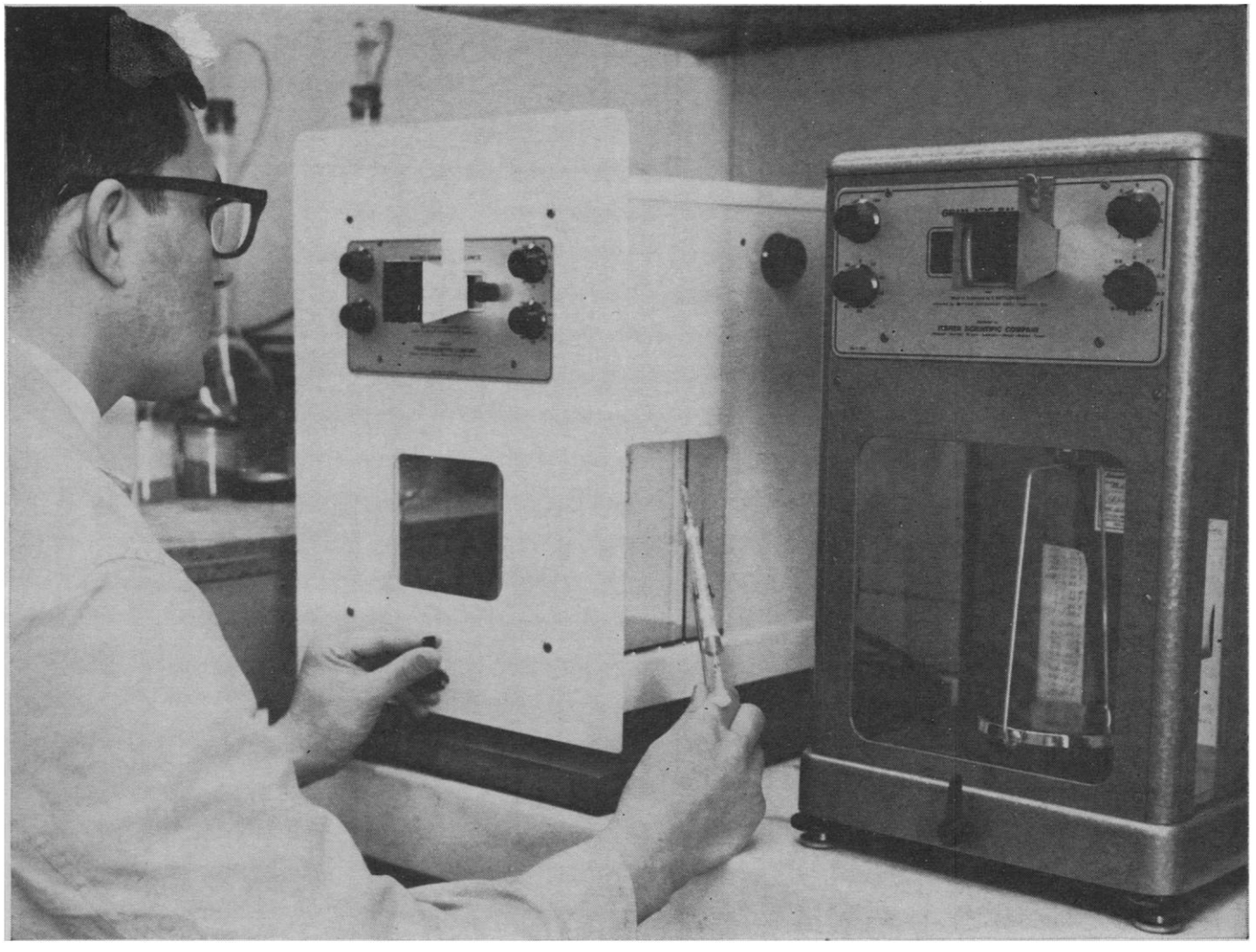
General Motors is in the energy conversion business. The direct conversion of heat to electricity, with a device having no moving parts, interests us.

General Motors Research Laboratories

Warren, Michigan



Characteristics of tubes filled with gases ionized by fission fragments. Resulting current is a function of ion generation rate, which is increased greatly (from 1.8 to 2.6 x 10^{16} ions per cm^3 per sec) by small addition of argon.



AT BETHLEHEM STEEL'S HOMER RESEARCH LABORATORIES . . .

Mettler helps blend raw materials for better steel

Side by side on the same marble table, a Mettler B-6 analytical balance and an M-5 microbalance are in virtually continuous use in the coal chemistry laboratory. Here some of the raw materials used in Bethlehem's blast furnaces are tested to achieve the best blend for the most economical production of high-quality steels.

Precise and rapid analytical information is essential to proper blending. Coal for coking may come from Pennsylvania, West Virginia, or Kentucky; carbon content may vary from 75 to 90%. Each batch of coal poses its own individual problems.

The B-6 is used in proximate analysis to establish the direction for carrying out ultimate analysis. The microbalance is used for weighing absorption tubes in the ultimate carbon-hydrogen analysis, picking up weight differences in the microgram range. Together, they provide Bethlehem with a broad range of information in the shortest time possible.

In addition to raw materials analysis, Bethlehem's Research group also works with experimental materials as part of other research projects. Some of the carbonization and coke testing methods developed here, particularly those dealing with coal in the plastic temperature range, have been widely adopted throughout the steel industry.

More than 100 Mettler balances are found throughout the facilities of the huge Homer Research Laboratories, helping to make best use of the raw materials available, ultimately permitting Bethlehem to make better steel.

Learn about the advantages that Mettler balances can bring to your production as well as to your research projects. Request product information, a demonstration, or an instrument to try out in your own facilities. Write Mettler Instrument Corporation, 20 Nassau Street, Princeton, New Jersey 08540.

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7 October 1966
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SCIENCE

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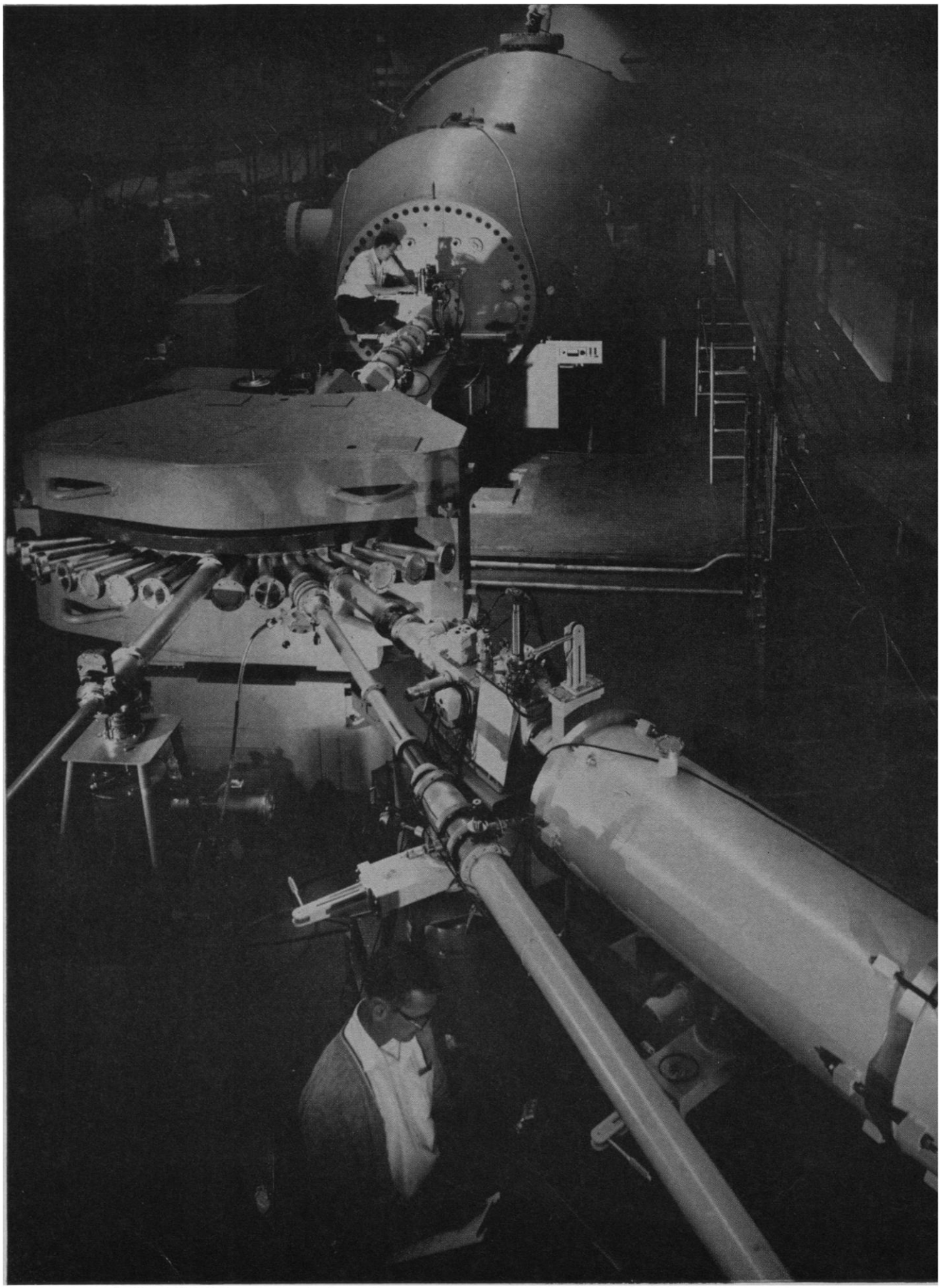
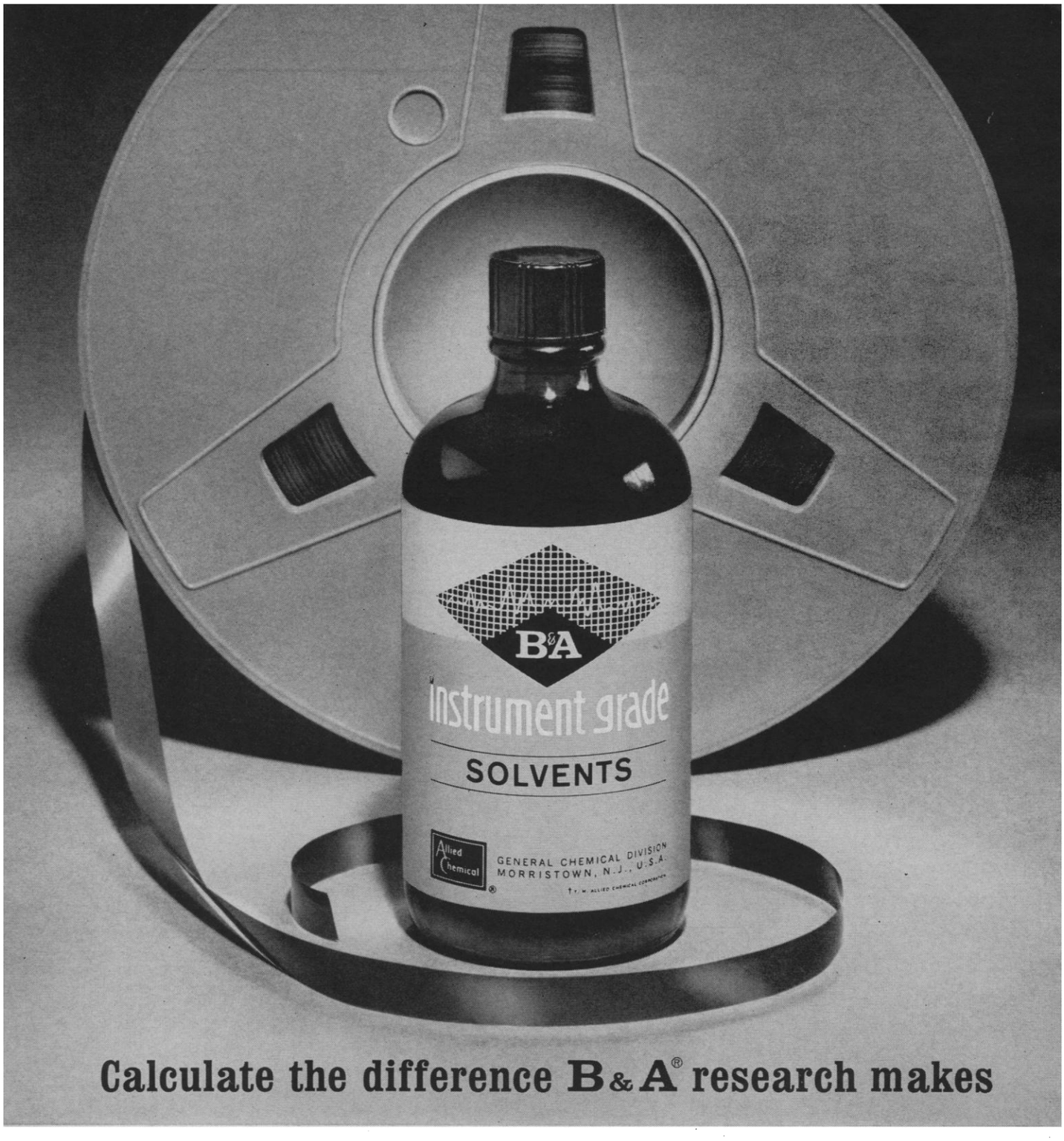
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

The shell of the Devonian brachiopod, *Pholidostrophia nacrea* (Hall), has a layered, crossed, lamellar structure. The calcite needles in each layer commonly indent one another and produce a surface that is an optical diffraction grating; hence the shell has a pseudonacreous luster (× approximately 710). See page 153. [K. M. Towe and C. W. Harper, Jr., Smithsonian Institution]



MP Tandem Test Facility at High Voltage Engineering Corporation.



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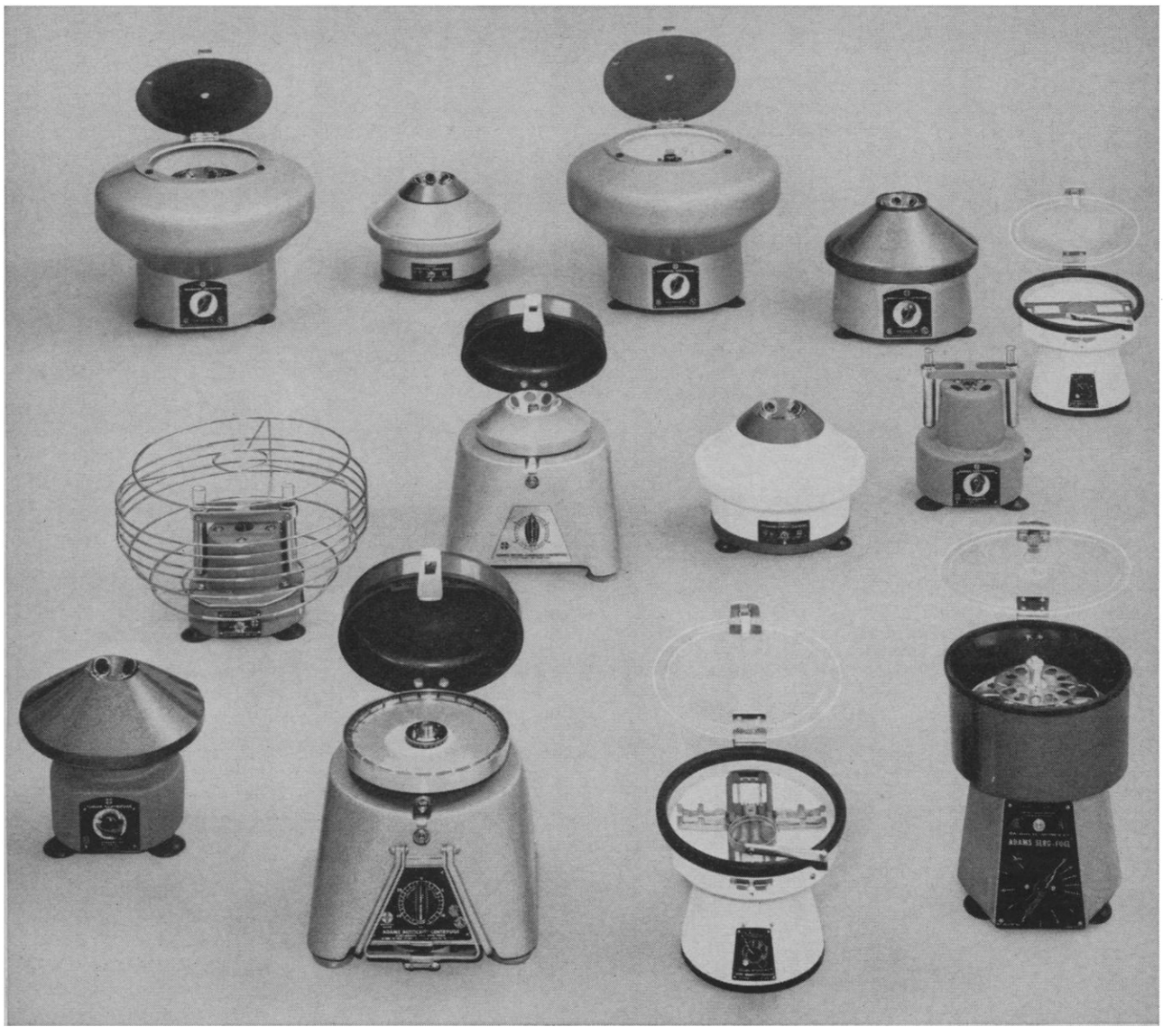

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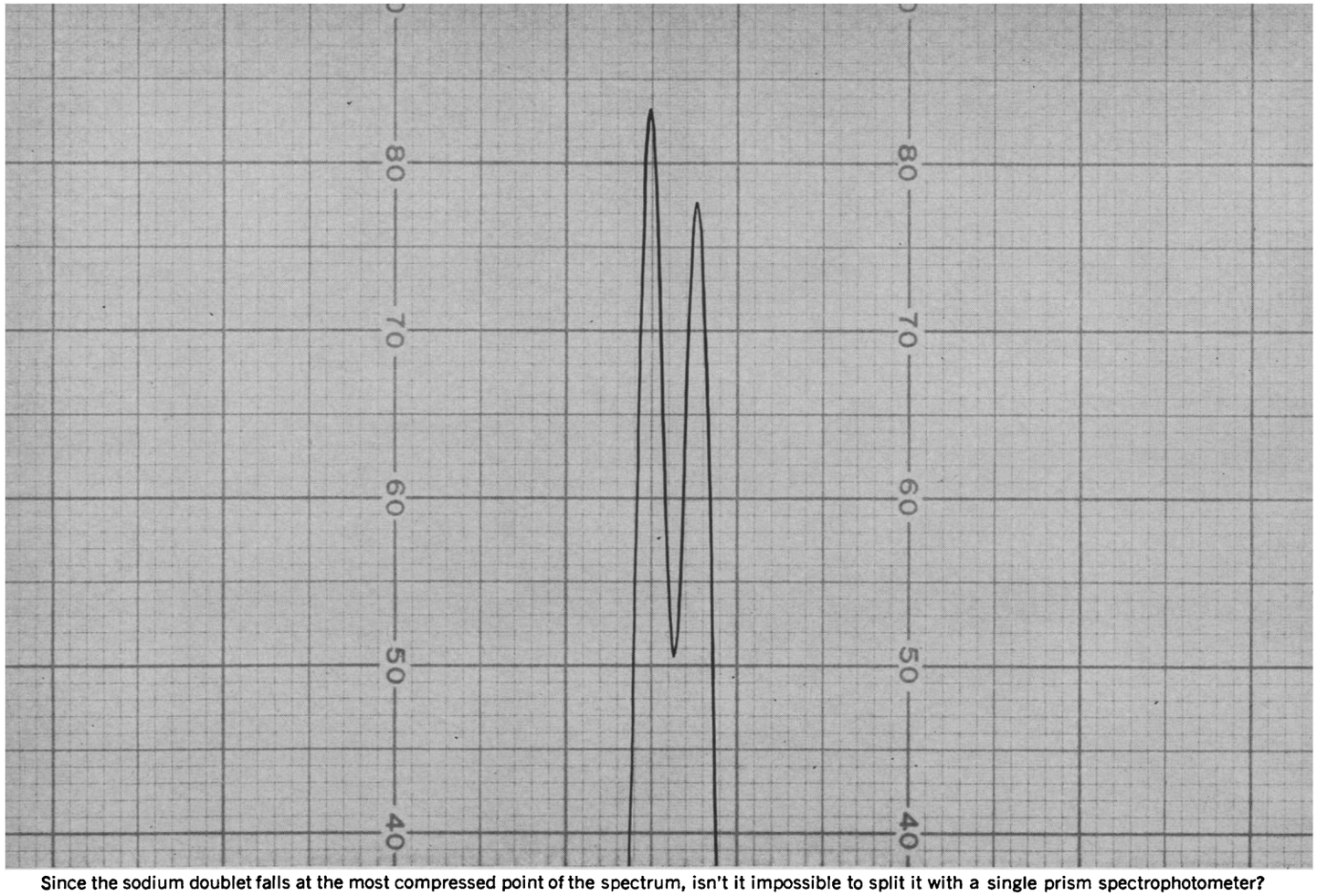

Since the sodium doublet falls at the most compressed point of the spectrum, isn't it impossible to split it with a single prism spectrophotometer? Indeed it is, with one exception—the Zeiss Spectrophotometer PMQ II. Above is an actual PMQ II resolution of the most demanding doublet. Distance between peaks is approximately 6 Å.

You're looking at an impossibility

It goes without saying that the Zeiss Spectrophotometer PMQ II (185 mμ-2500 mμ range) has greater resolving power than any other single prism instrument. The "impossible" proof is at the top of this page.

Here are three other impossibilities made possible by the PMQ II: (1) it reproduces any slit setting within .2 microns, (2) its true wavelength setting remains constant at all times, (3) it changes over from one to any other type of measurement (flame, fluorescence, chromatogram, absorption) in approximately 30 seconds —— much faster than other spectrophotometers.

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ANALOG MONOLOGUE

On Means for Modelling, Measuring, Manipulating, & Much Else

INTENTIONALLY-NONLINEAR ELECTRONIC CIRCUITS

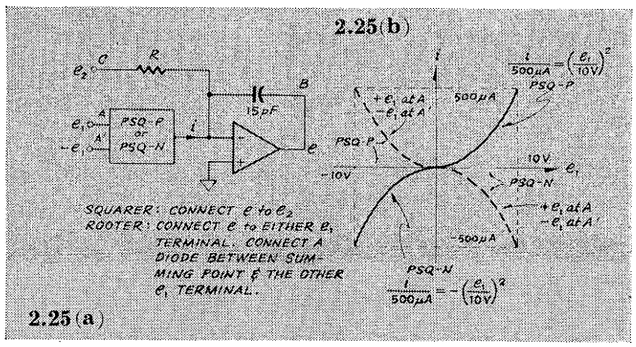
Imagine, for a moment, that your mathematical training had ended somewhere in the first year of Algebra, before you had mastered anything more complicated than a first-order linear equation. Imagine also that you had no knowledge of trigonometry, logarithms, or exponentials. Would such mathematical innocence hamper your present work?

Probably it would — unless your role is supervisory, speculative, or purely empirical. And even then, would you be able to discuss and evaluate the work of others, without a grasp of the everyday mathematical language in which they thought, wrote, and spoke? Of course not.

So it is with electronic measurement and data manipulation . . . for what is measurement, but a form of understanding? (. . . to paraphrase Lord Kelvin.) If the circuits one uses are limited to the handful that are linear in response (useful and powerful as they are), the range of measurement and data processing one can perform with them is correspondingly limited. Fortunately, we need not accept such a crippling restriction; hundreds of practical nonlinear circuits already exist, having been devised and perfected for use in the Analog Computing realm.

The kind of nonlinearity we mean is a deliberate, precisely-controlled relationship in a circuit — for example, a logarithmic input/output response — and *not* the unintentional, unavoidable, and undesired deviation of a nominally-linear circuit from perfect linearity . . . an imperfection to be avoided or minimized by careful design. Useful nonlinearity may be as natural to a circuit as is a linear response, and $y = A (x + B)^2$ may be reproduced with almost as great fidelity as $y = A (x + B)$.

The circuit below, one of more than 200 in the Philbrick *Applications Manual*, shows how the function $A x^2$ may be embodied, using an Operational Amplifier and a Quadratic Transconductor. It also indicates the almost trivial circuit change required for square root computations.



Nonlinear circuits are neither as simple conceptually nor as economical as linear adders or voltage-to-current transducers — but, thanks to the creative efforts of workers in many fields, *they are just as easy to use.* Standard hardware, in the form of nonlinear feedback-network packages, is available for the generation of almost any conventional nonlinear higher-order response, whether or not it can be described by a simple equation.

Table 1 indicates (but by no means covers) the range and variety of useful nonlinear functions and operations that may be constructed with standard Philbrick Amplifiers and Transconductors.

Exponential and Root Functions
Multiplication and Division
Linearization of Transducer Outputs
Trigonometric Functions
Coordinate Transformations
Vector Resolution and Composition
Logarithmic Compression and Expansion
True RMS Computation

Table 1

Table 2 lists the most popular of our Transconductors.

(P)PL1	Dual Logarithmic Transconductor (diode or transdiode)
(P)PL2	Quadruple Logarithmic Transconductor (transdiode)
(P)PL3	Quadruple Logarithmic Transconductor (diode)
PPL4	Logarithmic Transconductor temperature compensated
SPL4	Logarithmic Transconductor temperature compensated (built-in control)
SPL4A	Logarithmic Transconductor — temperature compensated (built-in control and amplifier)
SPLR	Log-Ratio Transconductor
SPLRA	Log-Ratio Transconductor (built-in amplifier)
SPLOG	Logarithmic Transconductor
PSQ	Quadratic Transconductor
SPSIN	Sinusoidal Transconductor
SPCOS	Sinusoidal Transconductor
SPFX	Arbitrary Function Fitter (adjustable)

Note: All standard designs, except (P)PL3 are available in either negative or positive polarity.

Table 2

Perhaps this space has been barely sufficient to communicate to you the power of nonlinear instrument circuits. If so, it only serves to underscore our underlying thesis — that the uses of electronic analog technology deserve far greater exposition, and hence appreciation, than they now enjoy . . . despite their many conquests.

You can start today to put more mathematical versatility into your measurements and data processing. Send for our free literature package MBA 2. Better (and faster) yet — call your nearest Philbrick Field Engineer. He'll give you the straight story on nonlinearity. Or write to Philbrick Researches, Inc., 25-S Allied Drive at Route 128, Dedham, Massachusetts. Phone (617) 329-1600.

**A Transconductor is an active or passive network of which the short-circuit output current is a specific, accurately known, often non-linear function of the input voltage.*

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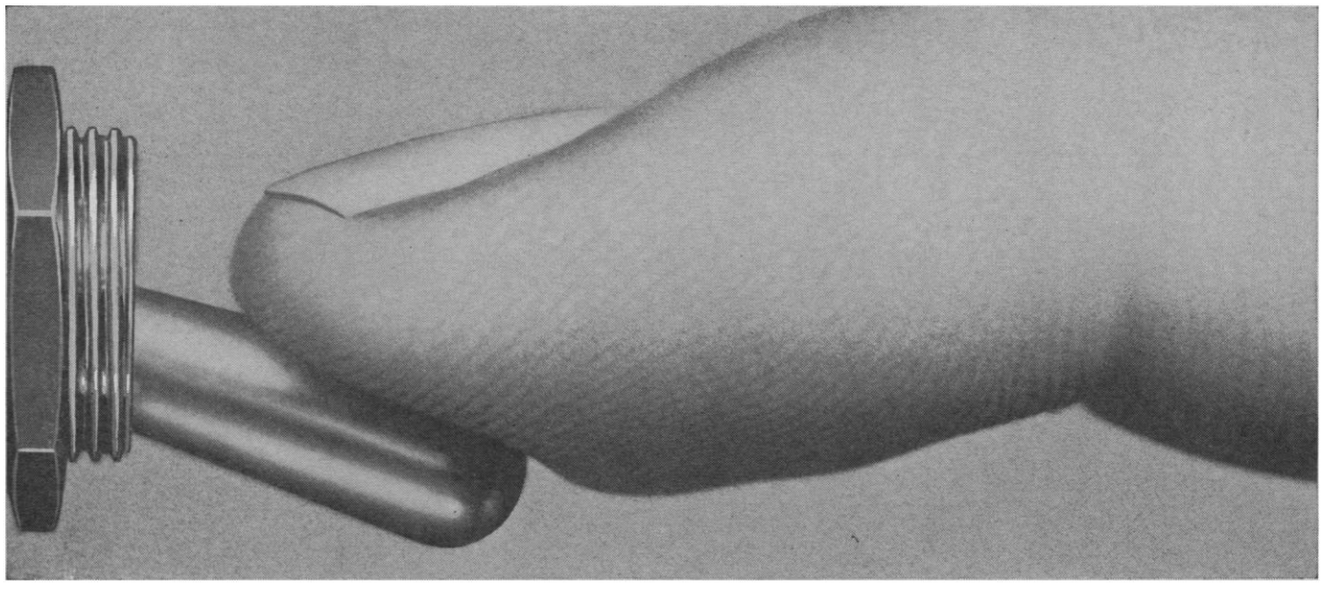
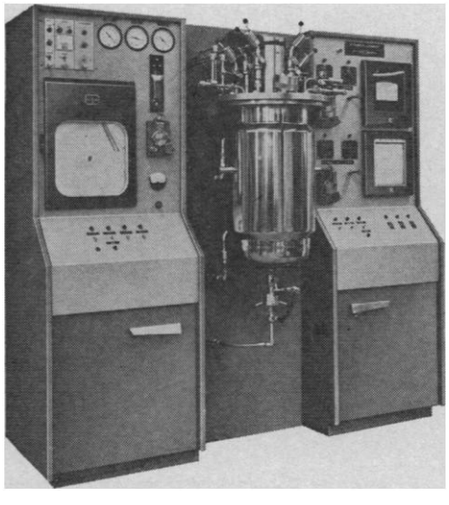


You throw the switches...



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Growing cultures in the new Fermacell fermentor can now be achieved with push-button convenience. Set the dials—throw the switches—and a series of sequential operations control steam sterilization and environmental growth conditions. You enjoy simple, semi-automated, up-front control from initial sterilization to final harvesting—including inlet and outlet sterilization, agitation, aeration, temperature, pressure, foam and pH. The switches are electrically interlocked to operate in perfect sequence no matter which switch is energized first.

Fermacell is available in three sizes for working volumes of 40, 100 or 200 liters. One person can remove the fermentor vessel for cleaning, emptying or refilling in less than 3 minutes. Designed for basic laboratory research, this pilot-plant fermentor is used to grow aerobic and anaerobic bacteria, streptomycetes, molds and yeasts, as well as mammalian and plant tissue cultures. A wide range of accessories is available.

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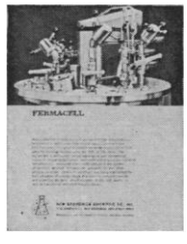

Ready for a switch?
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Thomas announces a new Micro Model...

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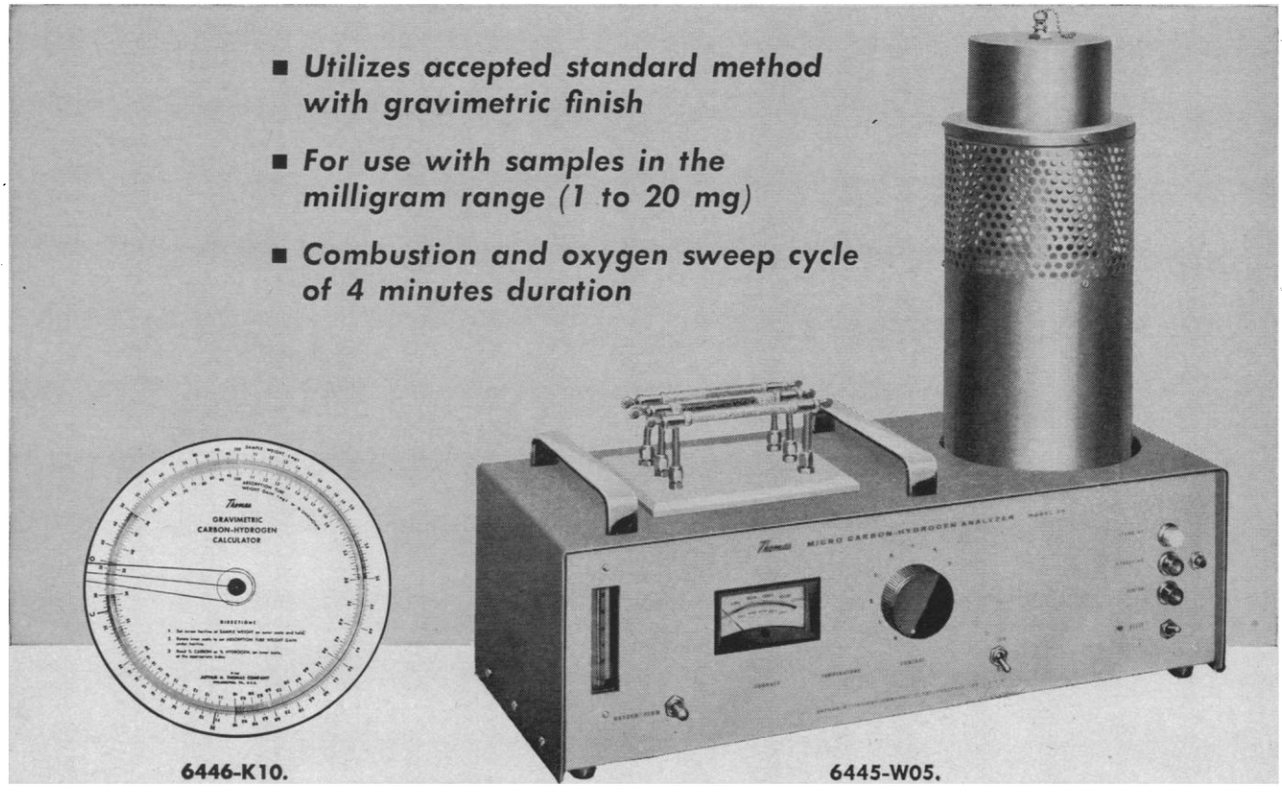
INGRAM COMBUSTION TYPE



Combines rapid, programmed combustion with accepted standard gravimetric finish.

Samples in the 1 to 20 mg range are weighed into inexpensive, one-use aluminum capsules. They are then burned in an excess of oxygen in the alumina combustion chamber in which the temperature is maintained at 900°C. Carbon dioxide and water are collected and weighed in glass absorption tubes filled with Ascarite and Dehydrite. A circular slide rule is included for rapid calculation of results.

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Applicable to a wide variety of solid and liquid samples including those containing boron, fluorine, phosphorus, silicon and metals. Interference from halogens and sulfur is avoided by combustion tube packing of silver gauze and silver tungstate on magnesium oxide. See H. J. Francis, Jr. and E. J. Minnick, *Microchemical Journal, Vol. 8 (1964), p. 245;* also G. Ingram, *Microchemical Techniques, Vol. II (1962),* pp. 495-526.

6445-WO5. Micro Carbon-Hydrogen Analyzer, Thomas, as above described, complete with supply of absorption tubes, sample capsules, absorbents, materials for packing combustion tube, calculator, etc. For 115 volts, 60 cycles, a.c. **1,600.00**

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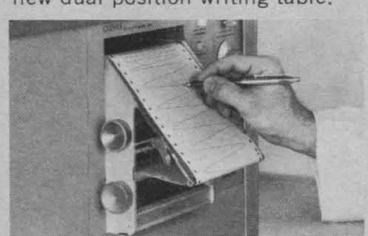
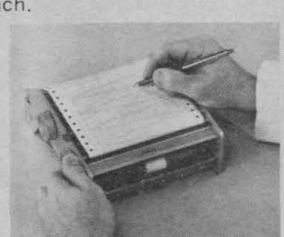


7 Removable chart paper magazine. Great for desk top record reviews. Man-sized manual winding knobs let you roll chart forward *and* back. Chart reloading is a cinch.



See what we mean? The Mark 250 is for the perfectionists of the world. Ask your Brush Sales Engineer for a demonstration. Or, write for chart sample and specifications. Clevite Corporation, Brush Instruments Division, 3633 Perkins Ave., Cleveland, Ohio 44114.

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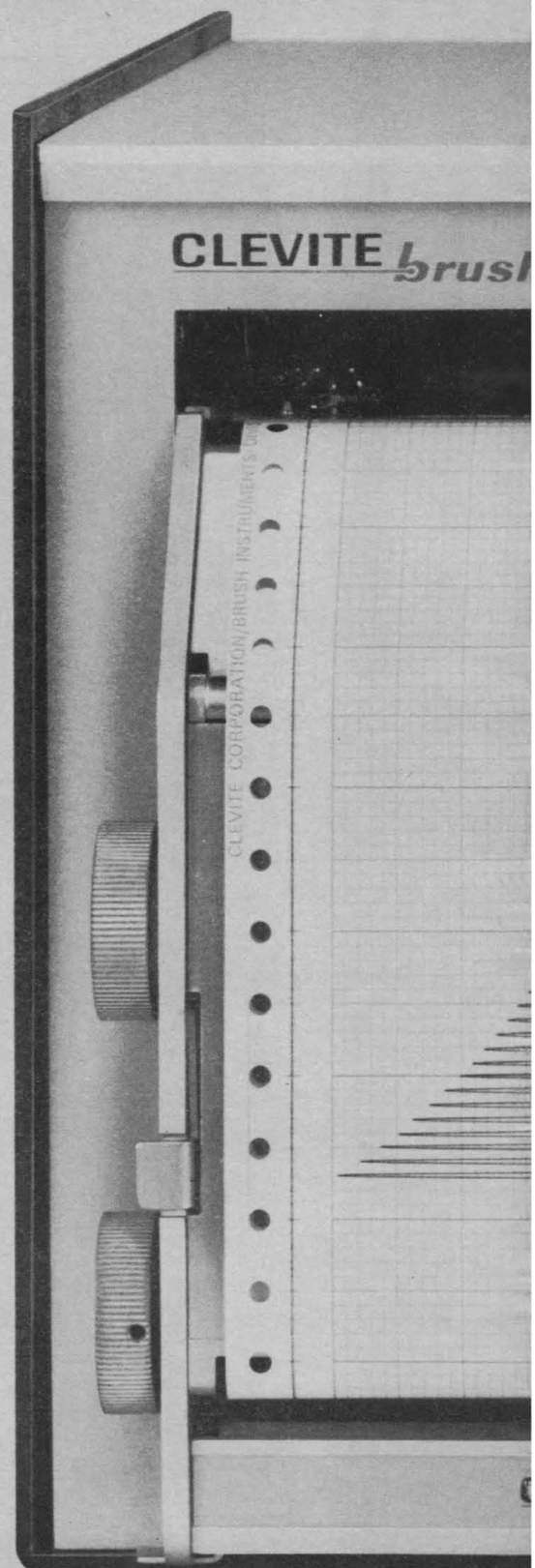
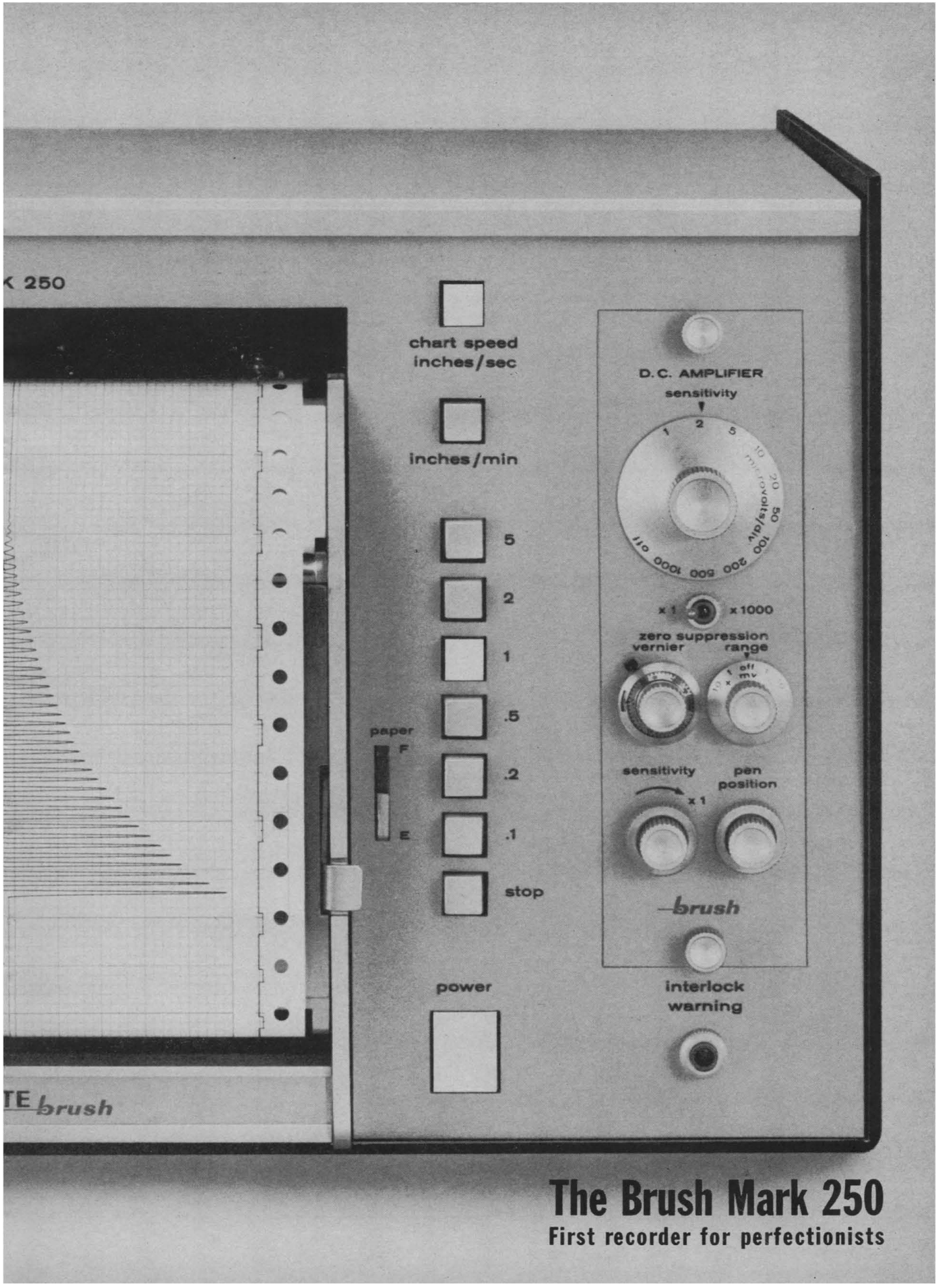


Shown approx. 76% of actual size with 1 μv preamplifier RD 4215-70; event markers optional.



The Brush Mark 250

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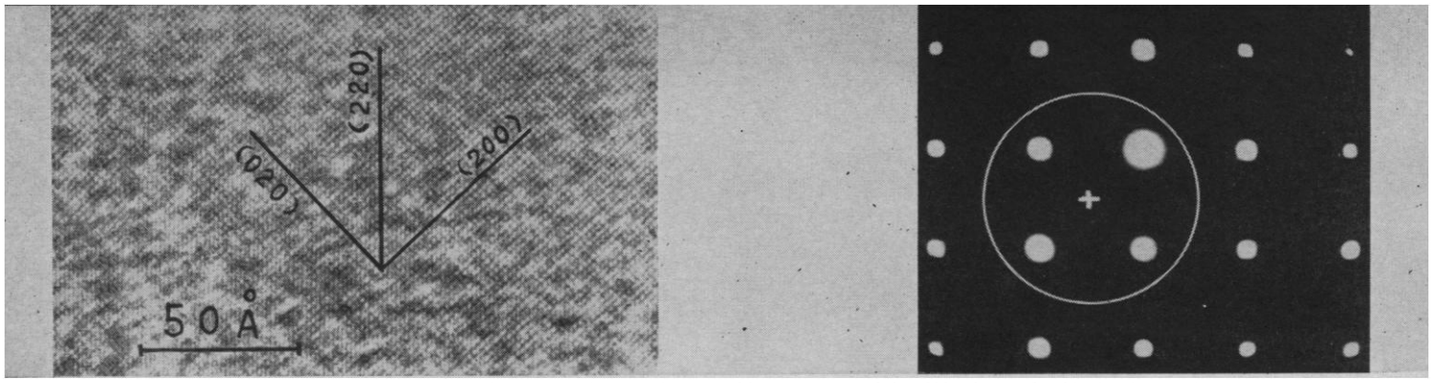

Electron micrograph and diffraction pattern taken on the HU-11C showing the crossed lattice images of the (200) planes of gold. The (020) and (200) planes = 2.04 Angstroms. The (220) plane = 1.44 Angstroms. All important factors such as contamination, stage drift, astigmatism and aberrations must be negligible to achieve this ultra-high resolution. The HU-11C was operated at an accelerating voltage of 100 KV and an electron optical magnification of 270,000 X. The illumination was tilted until the three reflections showed nearly equal intensity in the diffraction pattern; then the micrograph was taken.

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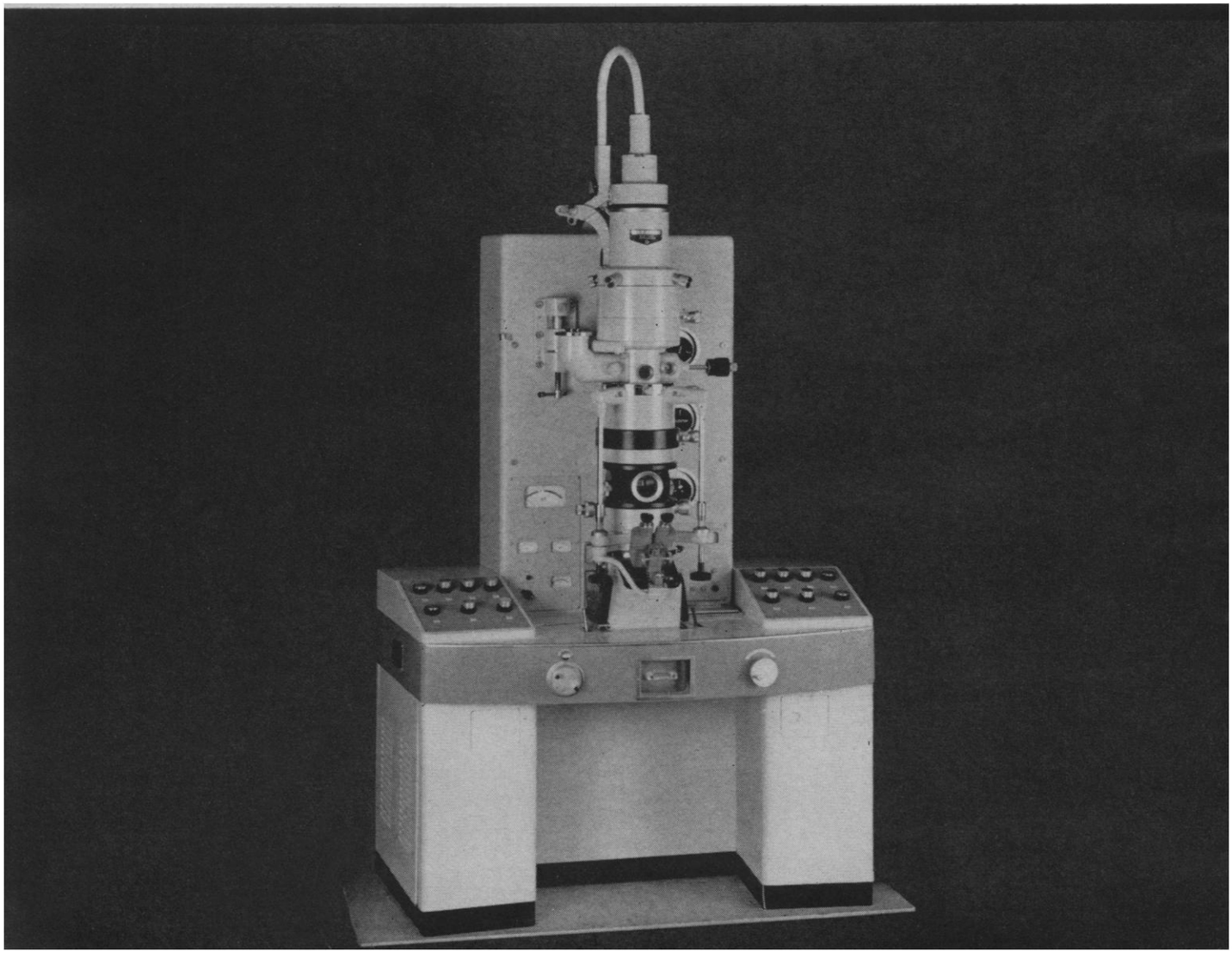
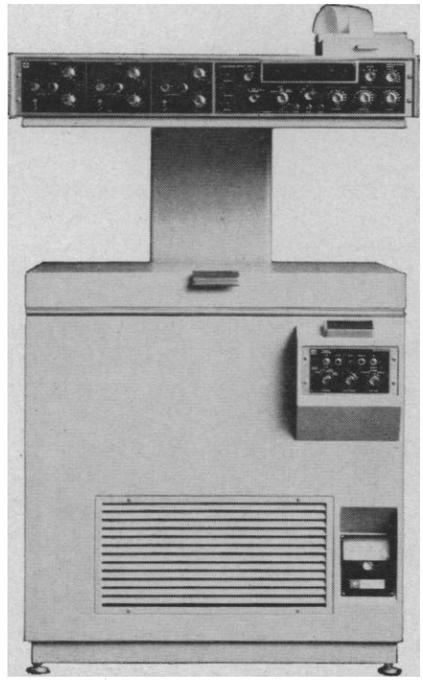


A lot of life scientists who buy our liquid scintillation systems also buy radiochemicals and accessories from us.



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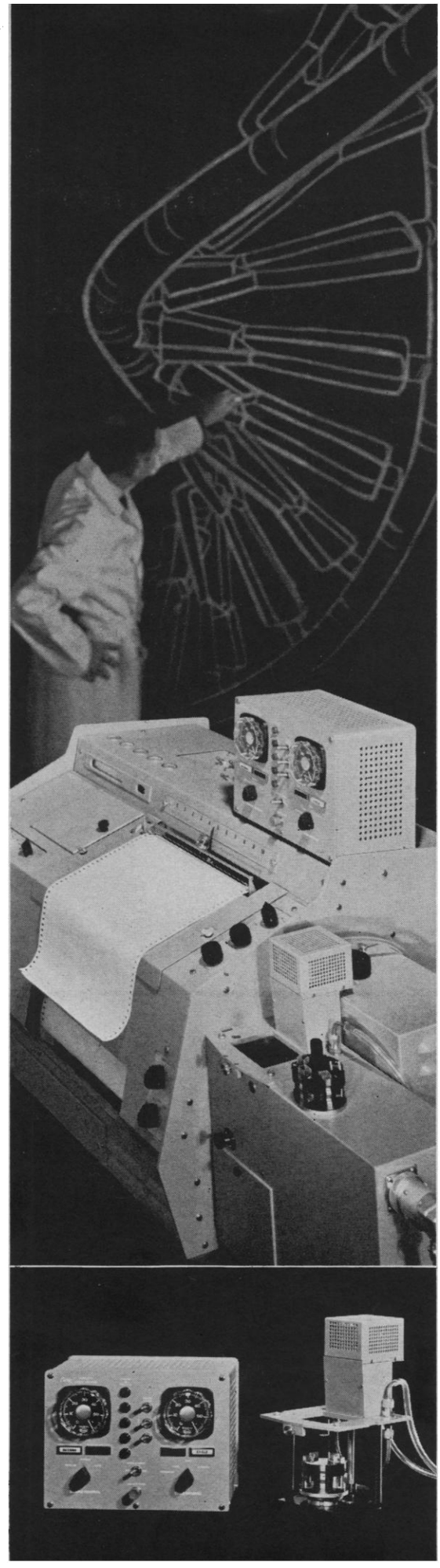

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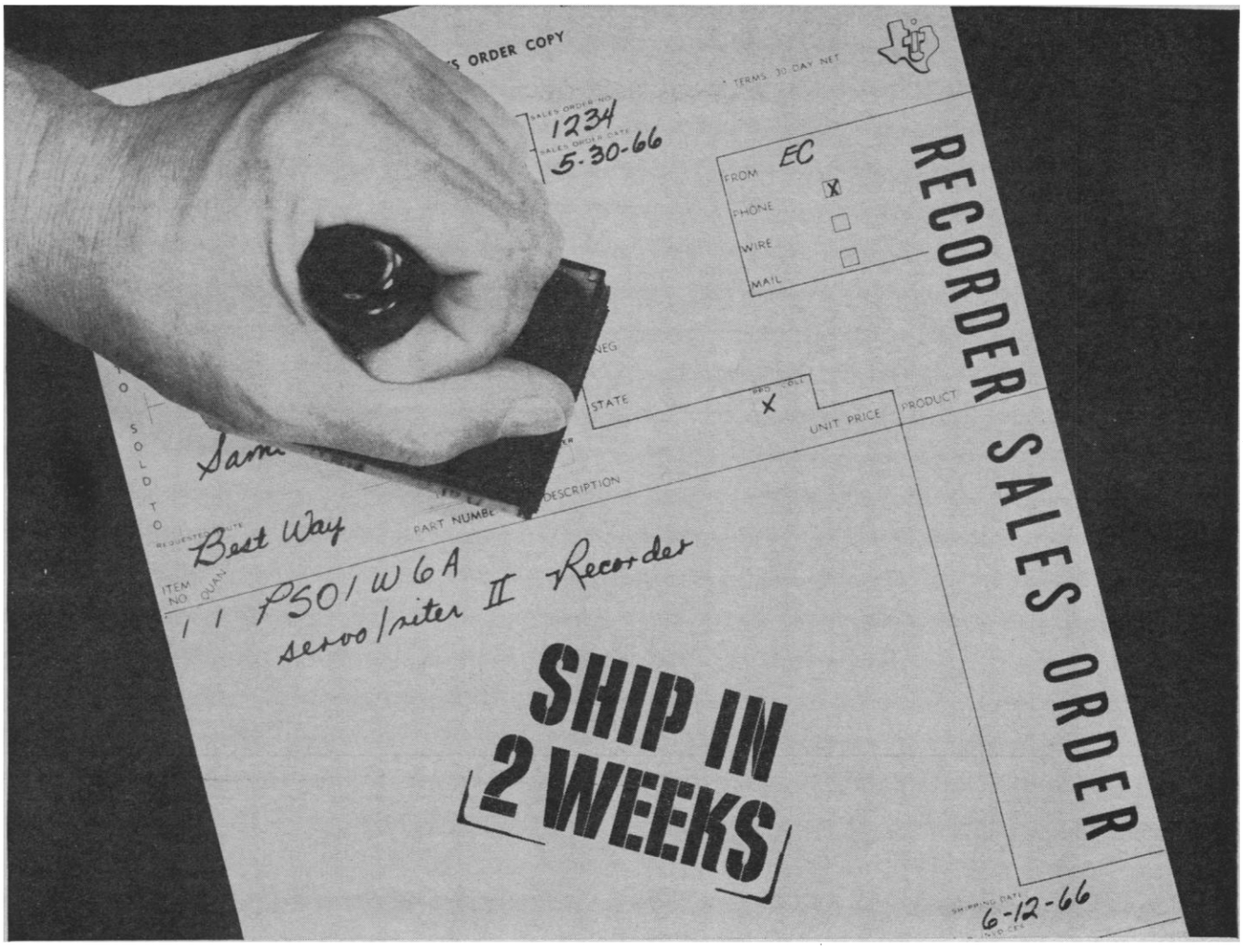

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PORTABLE with fingertip speed changer	1	.4	10	YES	10 from .75 in./hr. to 12 in./min.
PORTABLE with fingertip speed changer	2	1	10	NO	10 from .75 in./hr. to 12 in./min.
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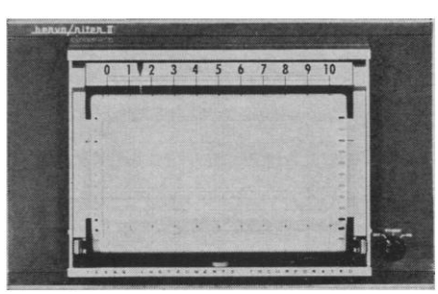

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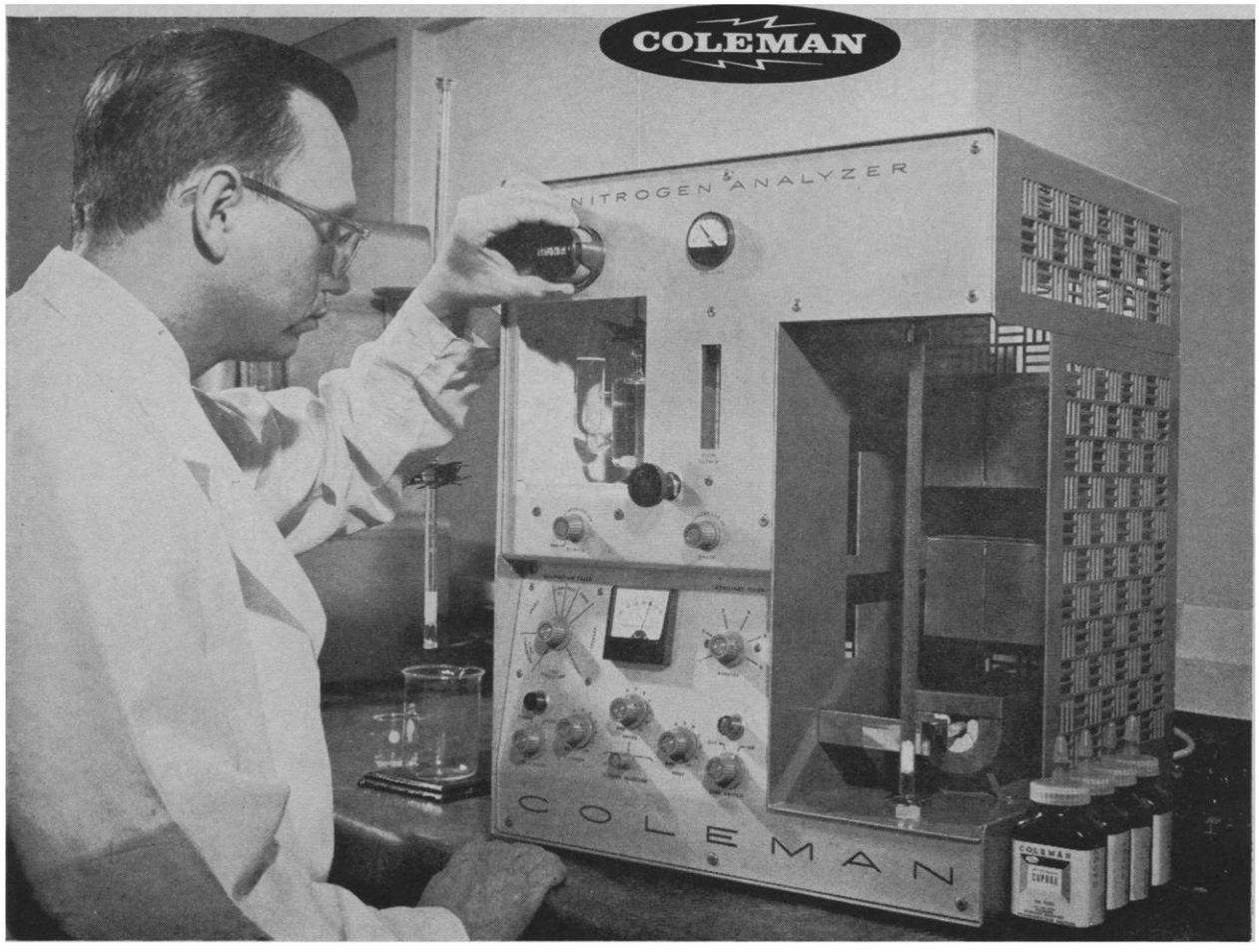

Scope of Coleman Nitrogen Analyzer extended to 20 ppm in trace studies by Chevron Research Company*

* *Chevron Research Company is the research arm of Standard Oil of California. Results of the work are reported in "Automatic Dumas Nitrogen Analysis of Lubricating Oils and Additives," by Farley, Guffy and Winkler, ANALYTICAL CHEMISTRY, Vol. 36, Page 1061, May 1964. Reprints and product literature are available from Coleman Instruments Corporation.*

With the Coleman Model 29 Nitrogen Analyzer, trace quantities of nitrogen in lubricating oils and additives are determined at Chevron Research and in an increasing number of the Chevron Chemical Company** (Oronite) customers' laboratories. With only slight procedure modifications, the instrument is being used with samples containing as little as 0.2% nitrogen.

At lower nitrogen levels—down as far as 20 ppm—a specially-developed concentration technique provides adsorption of the nitrogen compounds on alumina. The trace analyses are then made on this nitrogen-bearing absorbent.

Expanded use of nitrogen-containing additives in lubricating oils brought increased interest in nitrogen determination, a convenient method for correct preparation of additives and for proper product blending.

Prior to the use of the Coleman Nitrogen Analyzer in this application, Chevron Research employed alternate methods which left much to be desired from standpoints of speed, convenience and economy.

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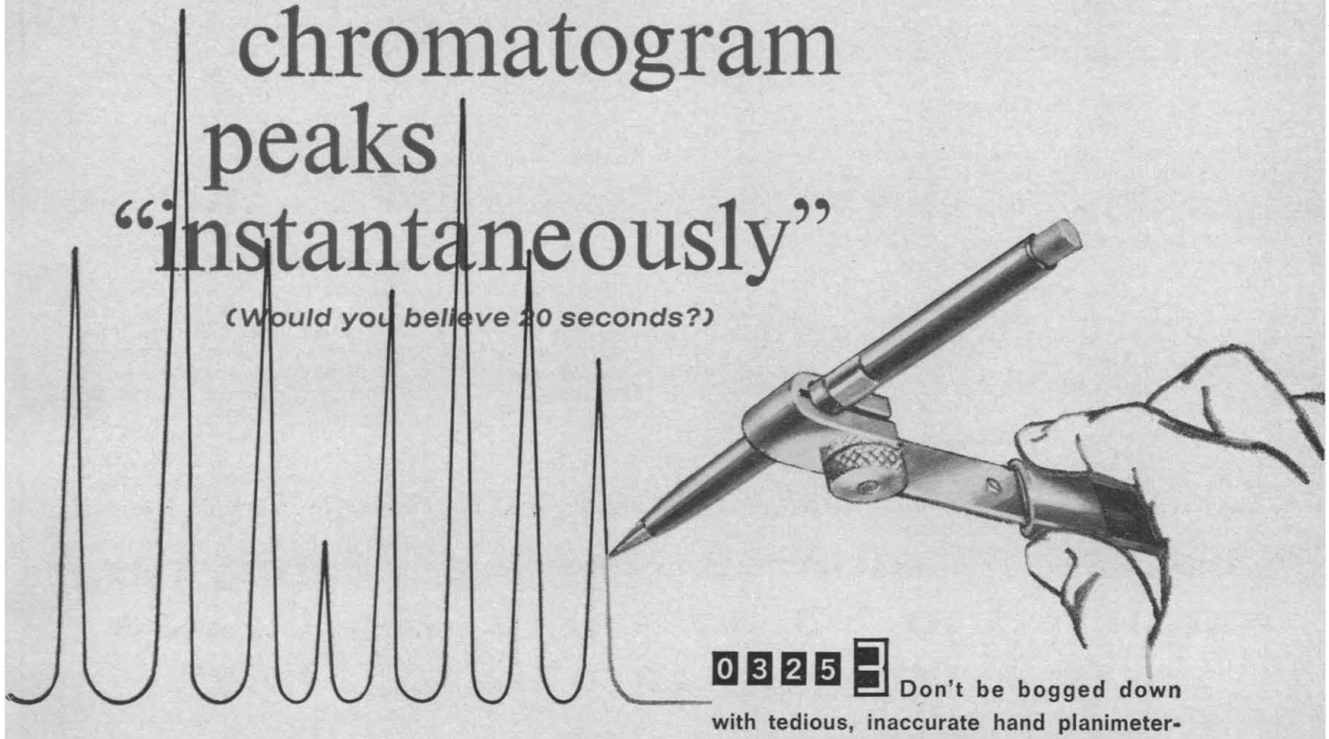

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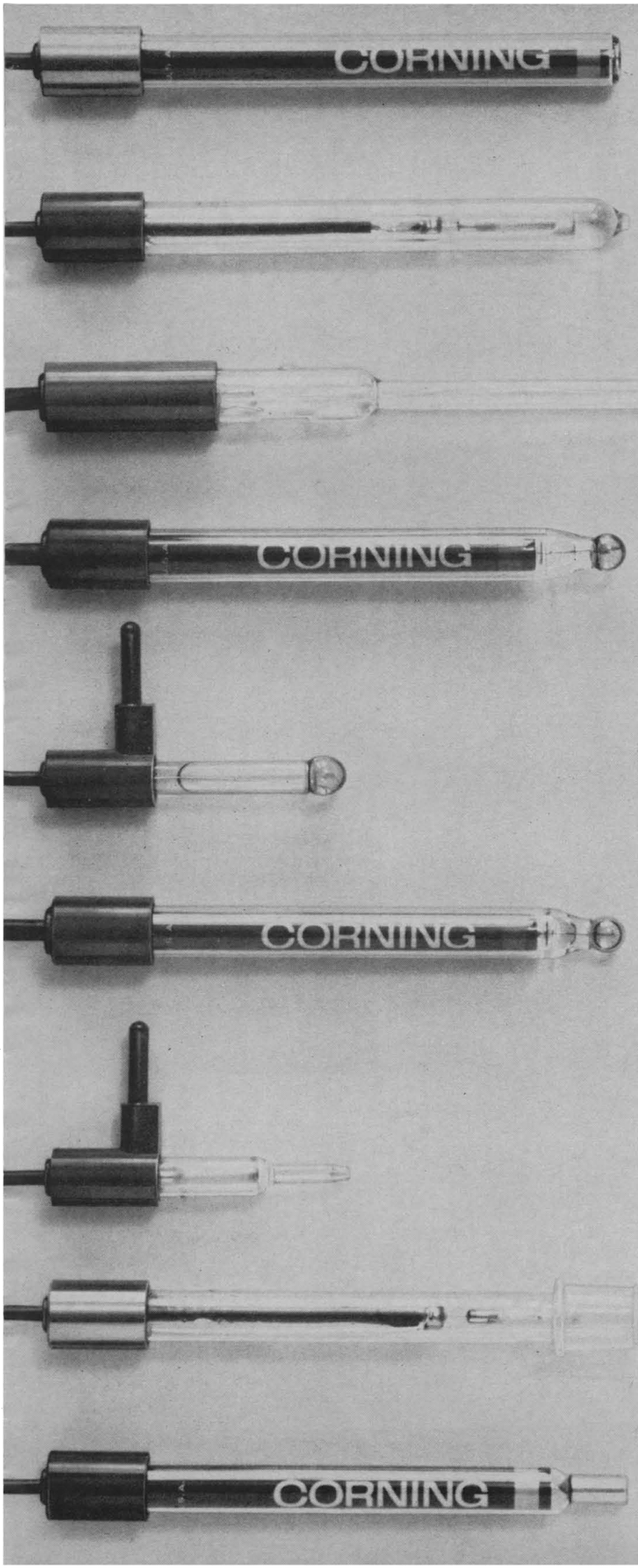

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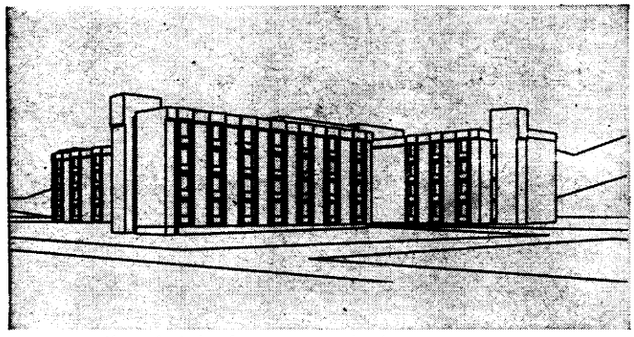

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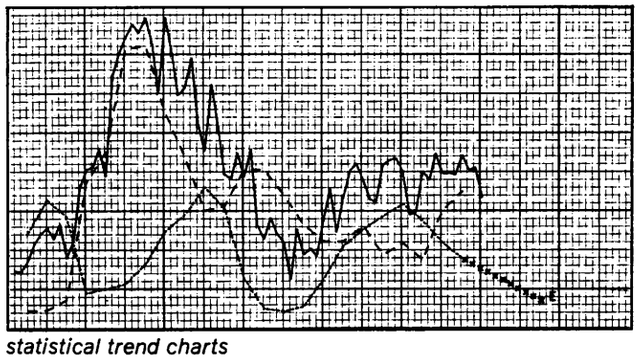

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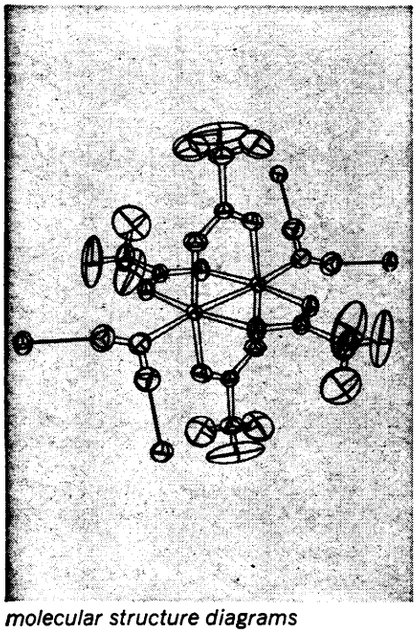

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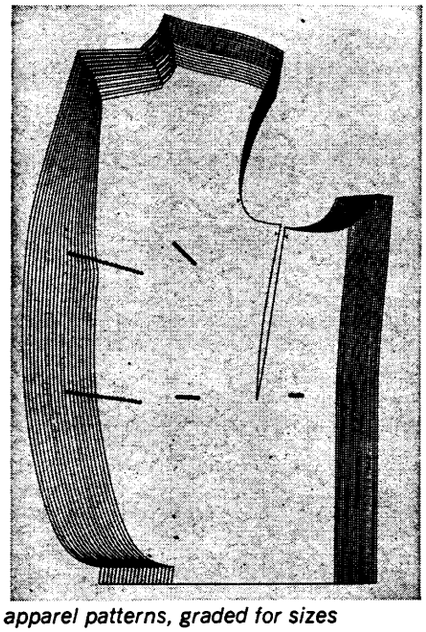

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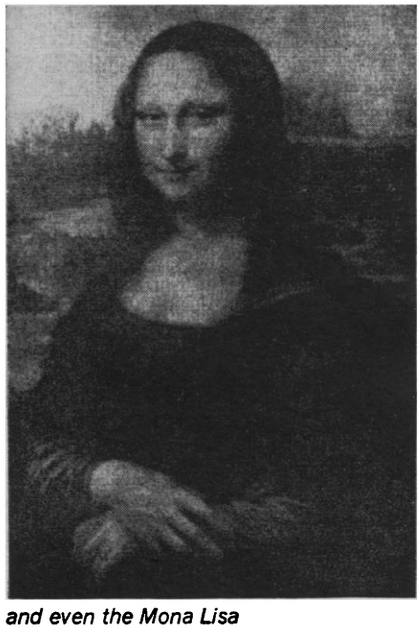

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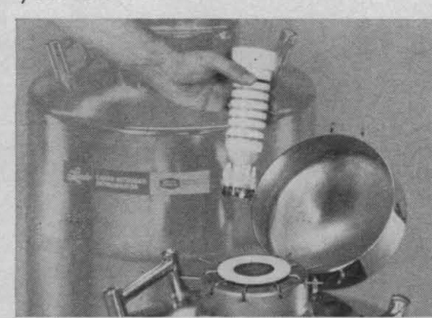

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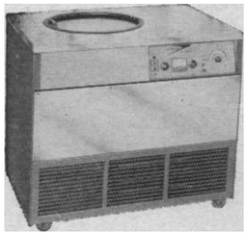

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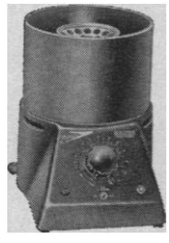

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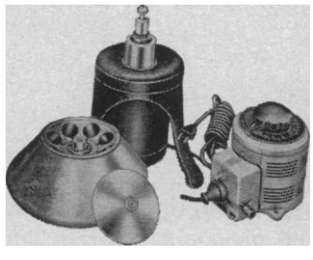

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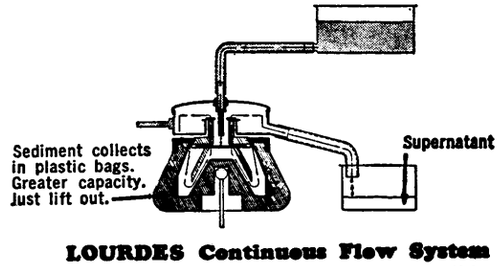

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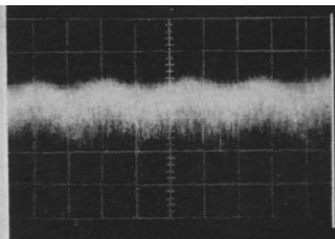

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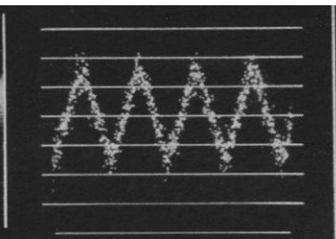

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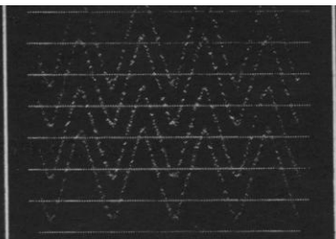

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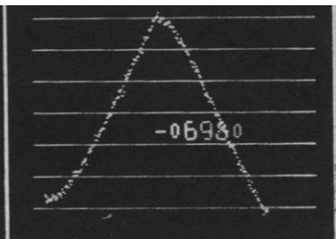

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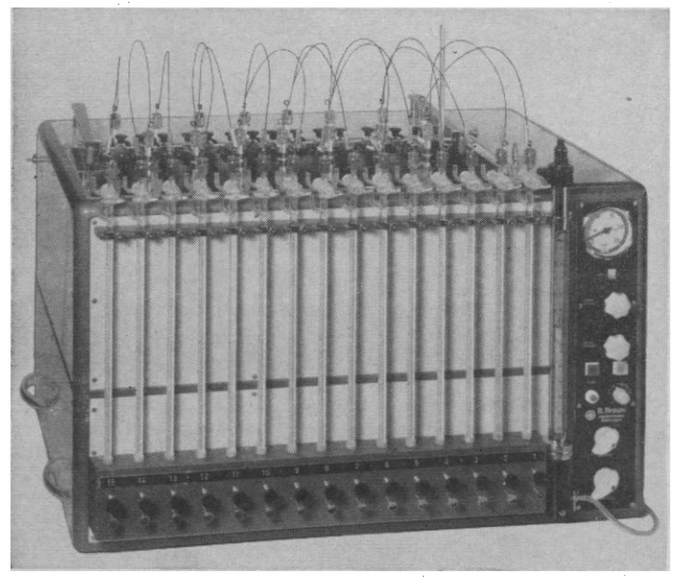

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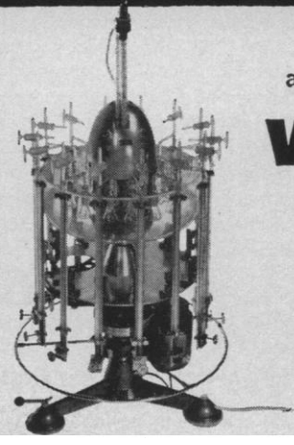

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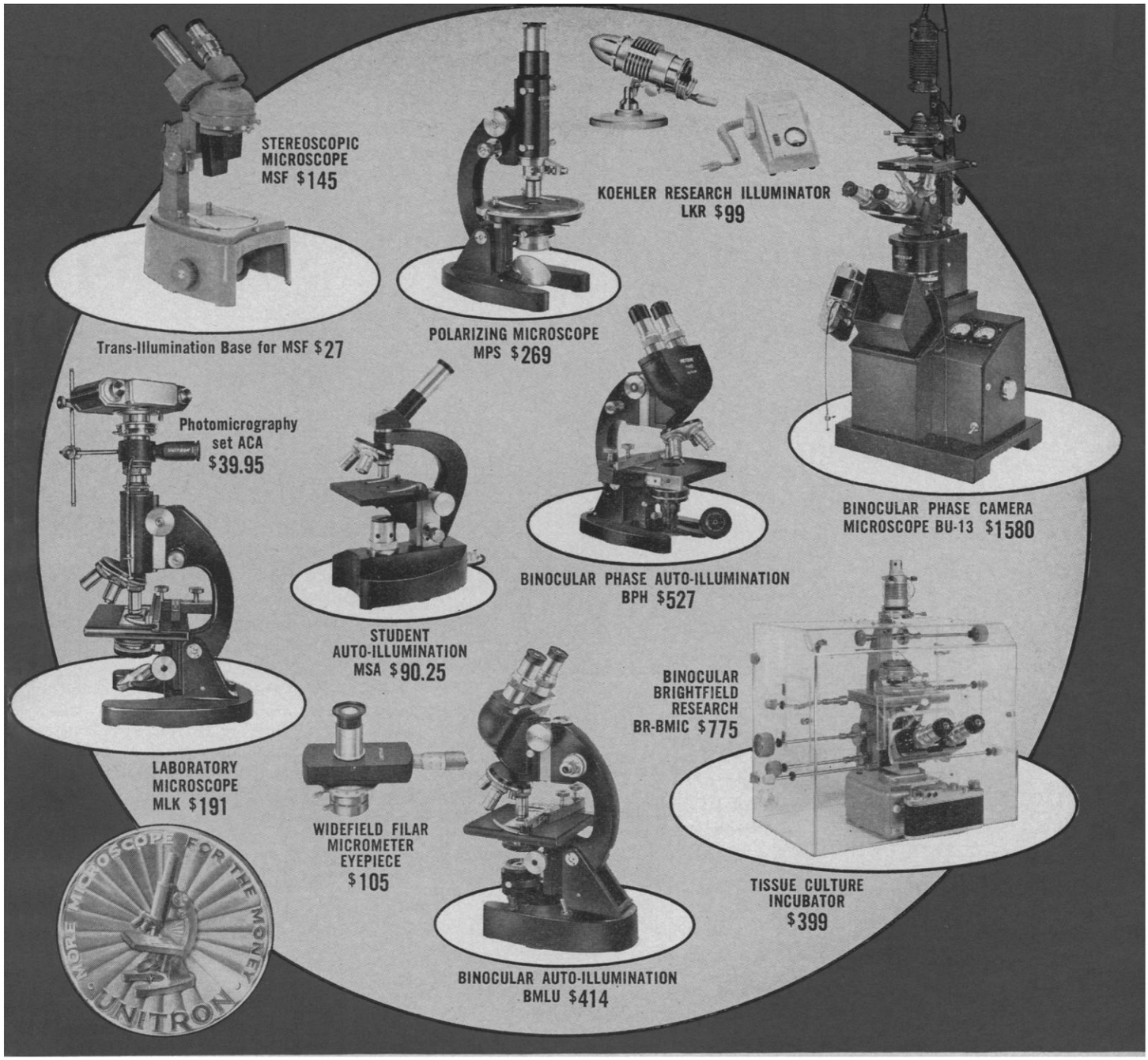

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Some other brands **imply** economy . . . UNITRON **proves** it . . . check our prices!

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.

The **extra**ordinary features of many other brands are the **ordinary** in UNITRON Microscopes. Complete optical and mechanical accessories are standard equipment, rather than hidden extras "at slight additional cost". Coated optics are second to none. Original designs provide easy operation, versatility, lab-proven ruggedness and guaranteed performance. All of these are just routine, normal advantages that customers have learned to expect when they specify UNITRON Microscopes — **plus** attractive prices which are so easy on your budget.

UNITRON MEANS MORE MICROSCOPE for the MONEY. Leading labs throughout the world know this. It's the reason, really, why "UNITRON Microscopes are seen in the best of circles". But why take our word? It's easy to prove for yourself, the advantages and value that UNITRON can offer you. Borrow any model (or models) for **a free 10 day trial** in your own lab. No cost . . . no obligation to buy . . . not even any shipping charges. Why not use the coupon to ask for a free trial, the chance to try before you decide whether or not to purchase. Or, ask us to send a catalog that will give you full details.

☐ Please send UNITRON'S Microscope Catalog. 4-Z

☐ I accept (without cost or obligation) your invitation to try UNITRON Model _____ for 10 days.

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UNITRON

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

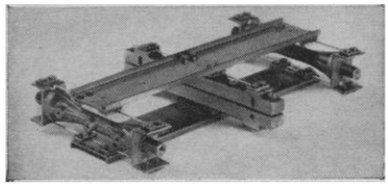
All the finest analytical balances used to have knife edges

until the EA-1

It used to be that the finest analytical balances were of knife-edge construction. (As a matter of fact, The Torsion Balance Company's own Christian Becker Division has made top-quality balances of this type since 1836 and still makes the world's best two-pan knife-edge balances.) But now Torsion, manufacturer of more precision balances than any other company in the world, has found a way to build a balance in the analytical range that eliminates the disadvantages of knife edges—and offers several other desirable features as well:

1 Longer accuracy thanks to friction-free torsion construction

In conventional analytical balances of knife-edge construction, in time the fulcrums become dull or are affected by abrasive or corrosive atmospheres—and initial sensitivity and accuracy suffer. The new Torbal EA-1 is constructed on the unique, proven torsion design principle. In this design there is no movement of parts over one another, hence no friction. Torsion balances retain their initial high sensitivity and accuracy as no other balance can—for 20 years and more!



2 Null Indicator makes accurate weighing easier

The new Torbal EA-1 replaces the conventional optical system with an electronic null indicator; balance beam is always restored to equilibrium position before weight is read. Possibilities of inaccuracies in weighing due to variations in deflection sensitivity (when knife edges become worn, dirty, or damaged) are completely eliminated.

3 Complete digital readout to 0.1 mg.—*without vernier*

Digital presentation of weight without the use of an optical system, micrometer or vernier gives better readability, accuracy and reproducibility.

Write today for a free 4-page bulletin or a demonstration.

THE TORSION BALANCE COMPANY

Department S

Main Office and Factory: Clifton, New Jersey
Sales Offices: Birmingham, Ala., Chicago, Ill., Lynnfield, Mass., Pittsburgh, Pa., Richardson, Tex., San Mateo, Cal., Santa Ana, Cal.

Types 561A & RM 561A TEKTRONIX oscilloscopes easily adapted to particular needs

Here's a Tektronix oscilloscope featuring operational simplicity and versatility through a new series of plug-in units. Presently, you can select from 17 amplifier units and 7 time-base units.

Knowing your application area, you select units to fit your needs. Some of the plug-in unit combinations available include those for low-level, differential, multi-trace, sampling, and spectrum analysis applications. Plug-in units offer capabilities from 100 μV/cm deflection factor (3A3) and 15 MHz bandwidth (3A5) to 0.5 μsec/cm sweep rate (3B1, 3B3) and sweep-delay applications (3B1, 3B2, 3B3).

With any combination of plug-ins including the same type amplifier units in both channels for X-Y displays — this oscilloscope provides you with no-parallax displays for accurate reliable measurements.

features

crt with an internal graticule and controllable edge lighting • regulated power supplies • regulated dc heater supply • Z-axis input • 3.5-kV accelerating potential • amplitude calibrator • and operation from 105 V to 125 V or 210 V to 250 V. (The Type 561A operates from 50-400 Hz and the Type RM561A operates from 50-60 Hz.)

Type 561A Oscilloscope $500

Plug-ins Illustrated:

Type 3A74 Four-Trace Unit $590
(4 identical channels, bandwidth DC-to-2 MHz, deflection factor 20 mV/cm to 10 V/cm)

Type 2B67 Time-Base Unit $210
(Sweep range 1 μs/cm to 5 s/cm, 5X magnifier, single sweep, flexible triggering facilities)

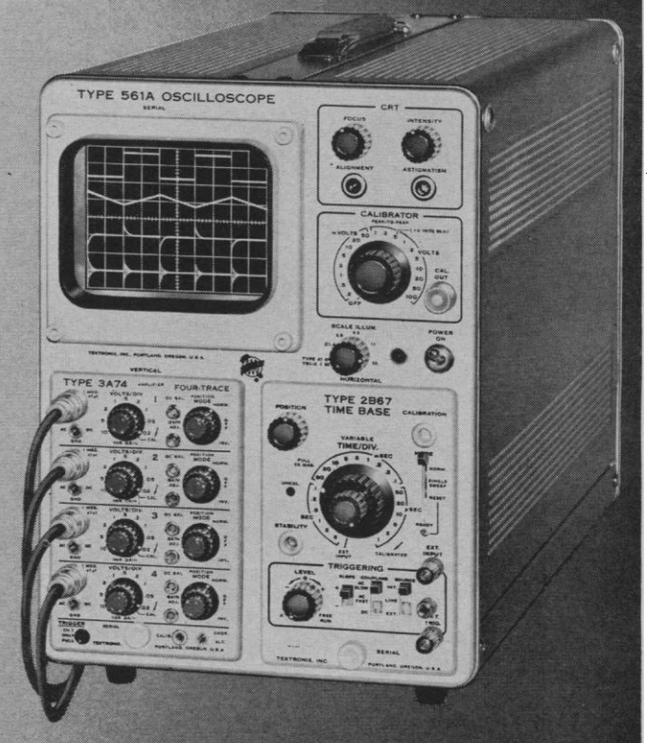
Type RM561A *(7" rack height)* . . $550

Plug-ins illustrated:

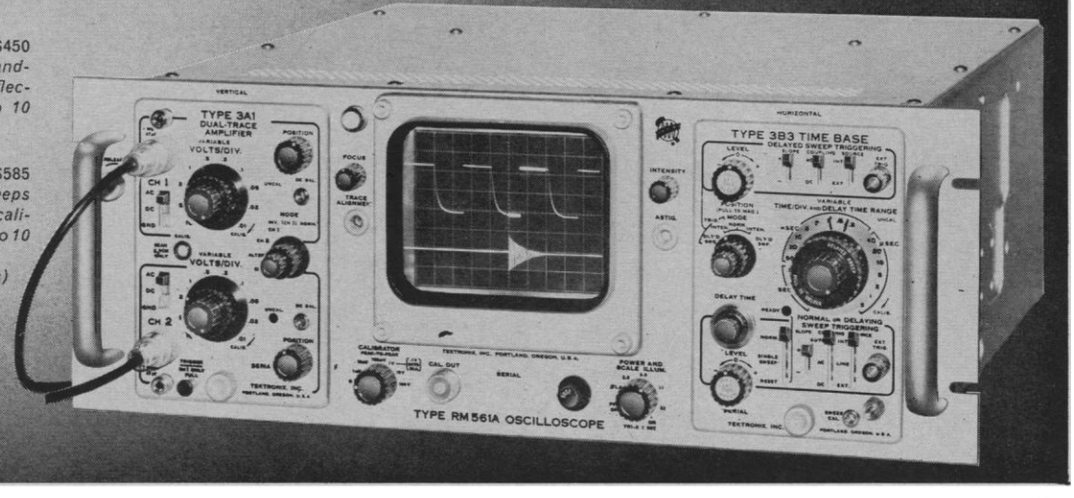
Type 3A1 Dual-Trace Unit $450
(2 identical channels, bandwidth DC-to-10 MHz, deflection factor 10 mV/cm to 10 V/cm)

Type 3B3 Time-Base Unit $585
(Normal and delayed sweeps 0.5 μs/cm to 1 sec/cm, calibrated sweep delay 0.5 μs to 10 sec, single sweep, flexible triggering facilities)

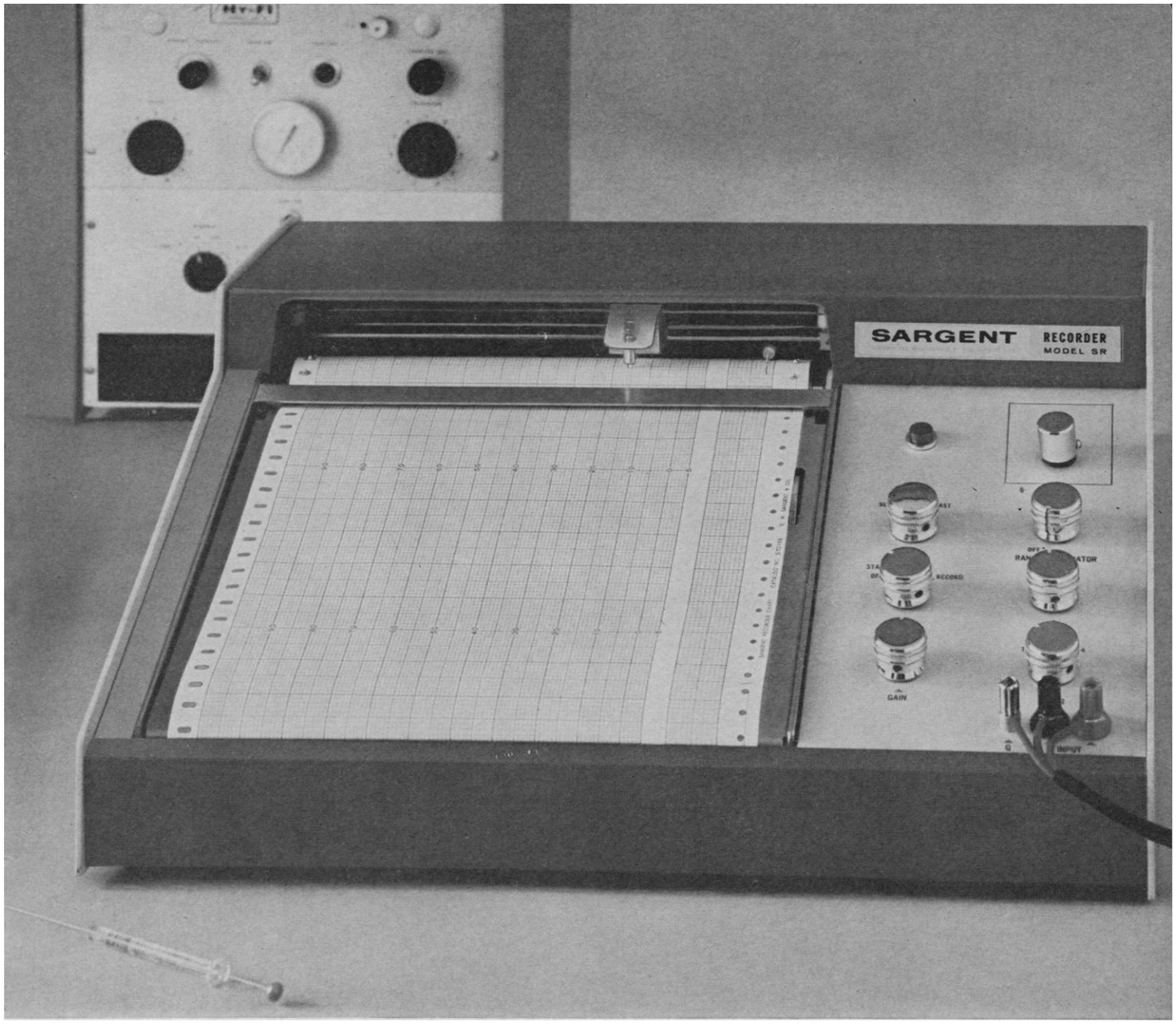
U. S. Sales Prices
f.o.b. Beaverton, Oregon



Tektronix, Inc.



FOR MORE INFORMATION ON EITHER MODEL OF THIS NEW OSCILLOSCOPE AND ANY COMBINATION OF PLUG-IN UNITS, PLEASE CALL YOUR TEKTRONIX FIELD ENGINEER.



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Designing an atmospheric system for physical chemistry, nuclear research, aerospace projects or metallurgy turns into an expensive game called "Nuts, Bolts and Gaskets." Pestiferous minutiae eat up costly technical man hours.

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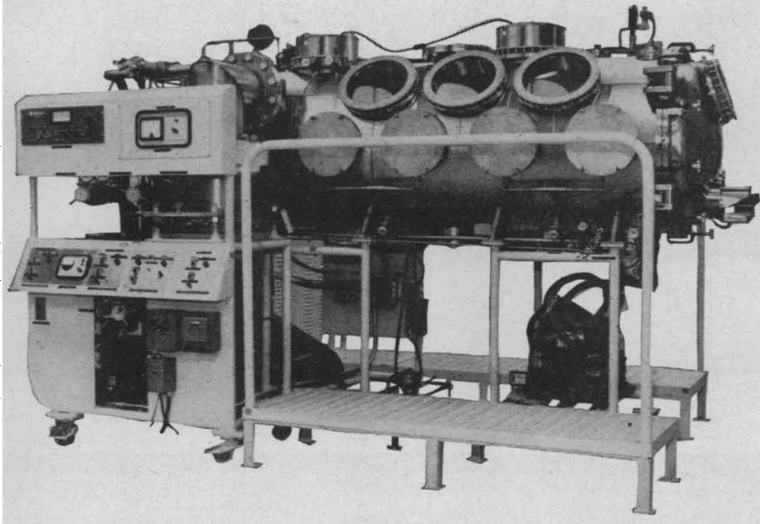

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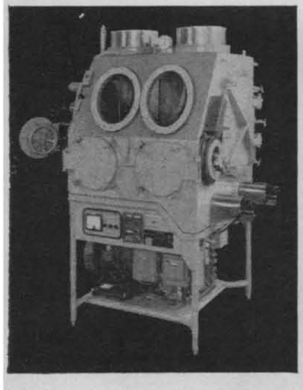

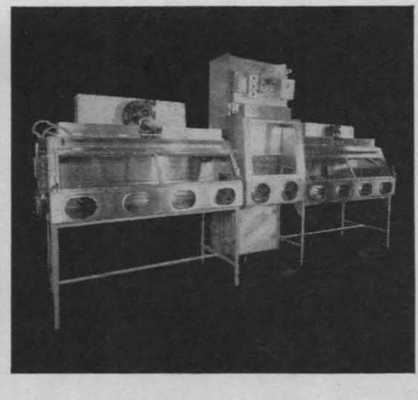

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What this country needs is a good 10-cent pipet!

Could a 10-cent pipet do the same job as a conventional pipet? This new Kimble *disposable* pipet can... for even less than a dime! Made of fine borosilicate glass, it's clean, cotton-plugged, sterile, ready to use. Features a rugged, uniform tip for consistent delivery. Same accuracy as a regular pipet: ±2%. The right length for handling ease; the right price for disposable convenience, and new packaging for added utility. Compare! Write for your complimentary sample and complete information. Address below, c/o Marketing Services Department.

OWENS-ILLINOIS

maker of Kimble Products
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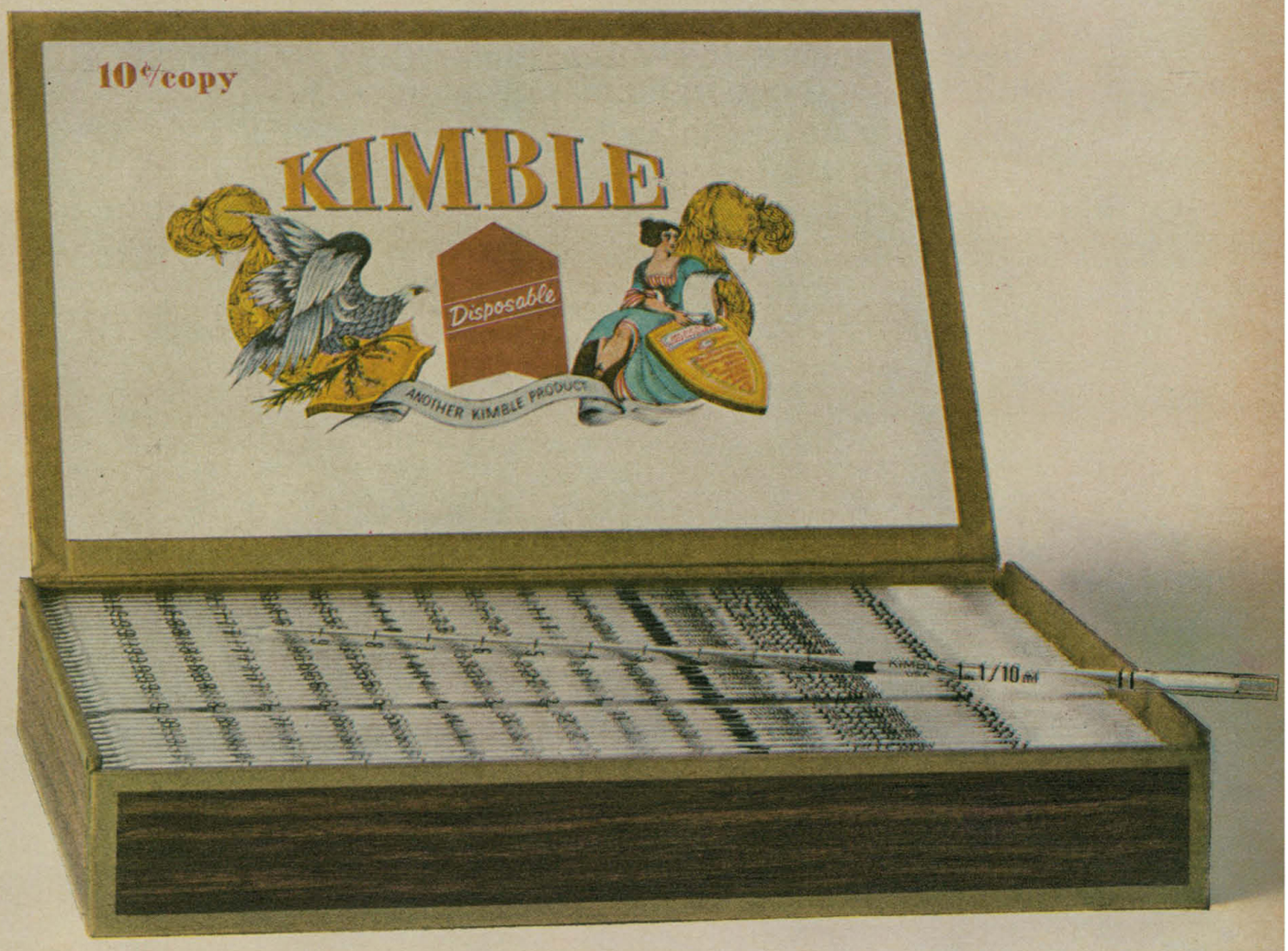
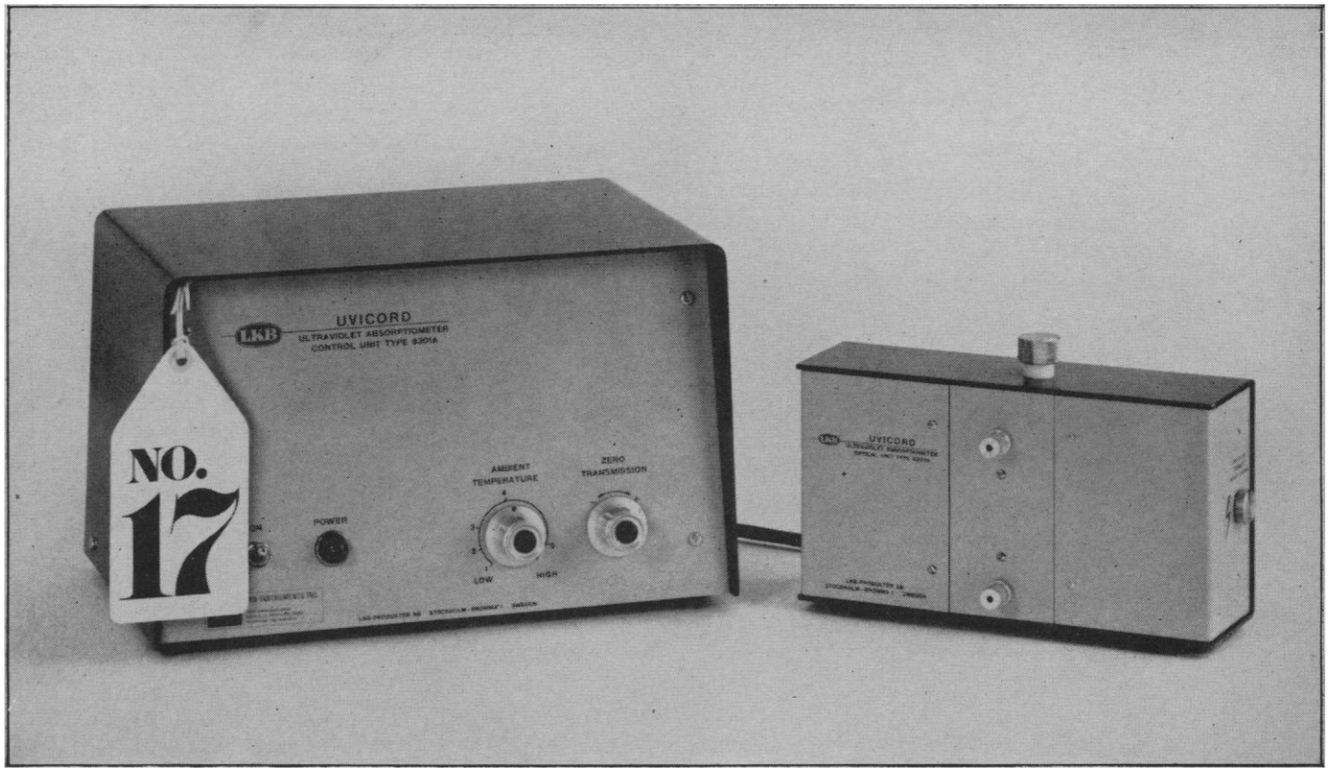




There are at least 16 UV monitors already available (and one of them is even ours). Whatever possessed us to develop number 17?

Unbounded optimism. That, and the rather firm conviction that it was now time for a first-rate, fully quantitative flow analyzer for monitoring UV absorption at either 254 or 280 mμ.

This new analyzer, the Uvicord II, is now available as a particularly useful tool for continuous measurement of the UV absorption of electrophoretic or chromatographic effluents containing fractions which absorb at 254 or 280 mμ. And it is especially suited for cold room use because: (1) the light source compartment is insulated and has its own built-in heating coil, and (2) the control unit *and/or* recorder can be physically separated from the detector unit, thanks to a very long cable. (One of several advantages of a *separate* recorder.)

The primary source of the 254 mμ in the Uvicord II is a stable, long-lived, low-pressure mercury lamp. But then getting the desired 280 mμ was quite another matter and proved to be somewhat of a strain on the aforementioned unbounded optimism. The eventual elegant exclusive solution: the 254 mμ from the mercury lamp is used to excite a transparent rod which has been specially activated to fluoresce strongly. This rod then emits UV in a relatively narrow peak with a maximum at 280 mμ. Unwanted radiation is eliminated by using black glass and selective interference filters. This latter interference filter was also developed by us and provides unique assurance of getting the essentially monochromatic light needed for quantitative measurements.

What is the possibility of harming UV-sensitive materials with the Uvicord II? It's unlikely. The *maximum* UV dose to which a sample can be exposed is a negligible 10^{-11} Einstein/min, equivalent to 0.09 μW.

Then we should probably also tell you that this instrument has a well-designed detector unit, that the very small measuring cells have good flow properties and are easy to get to, and that the circuitry is simple, straightforward and dependable. All true. Or, that the Uvicord II is compatible with our entire line of chromatographic devices, fraction collectors, and recorders. The Uvicord II takes its place comfortably in our complete systems (whose individual units are all LKB-designed and built), or, alternatively, can perform as a versatile UV analyzer when coupled to other equipment. Incidentally, the Uvicord II follows the Uvicord I but doesn't necessarily displace it. You might keep the Uvicord I in mind if your need is solely for 254 mμ; it's still very viable.

(So now there are at least 17 UV monitors, and *two* of them are ours.) For complete specifications on the Uvicord II, ask for bulletin **8300S10.**

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

Why no derating?

Derating of ultracentrifuge rotors is a necessity brought about by the development of progressive metal fatigue as a consequence of long-continued or repeated stressing under extremely high centrifugal forces. This is usually expressed as successive limitations in permissible top speeds.

A key factor in derating is the original strength of the rotor which is largely determined by the nature of the material used, manufacturing processes and design.

IEC ultracentrifuge aluminum and titanium rotors represent a technological breakthrough in which optimum design was achieved through computer techniques. Our manufacturing processes involve advanced forging techniques, stress relieving, specialized alloys, and custom developed machinery.

As a result, IEC rotors withstand repeated stressing over such a protracted period without impairment, derating is eliminated as a factor to consider in use. That's why we say, **no derating.** You buy one of each type you need and that's it. Many years and thousands of use-cycles later, you can still run these rotors at their top rated speed. Just keep them free from corrosion — IEC guarantees them unconditionally without time limit.

No derating. One more significant reason why, if you work anywhere in the ultracentrifuge spectrum you should be prepared to change basic thinking about equipment. Send for brochures on Models B-35 and B-60.

INTERNATIONAL (IEC) EQUIPMENT CO.

300 SECOND AVENUE, NEEDHAM HEIGHTS, MASSACHUSETTS 02194

Karyotyping as easy as:

It's tough enough to catch a good metaphase, break a cell, and hold the chromosomes intact. But even then you're only half way home.

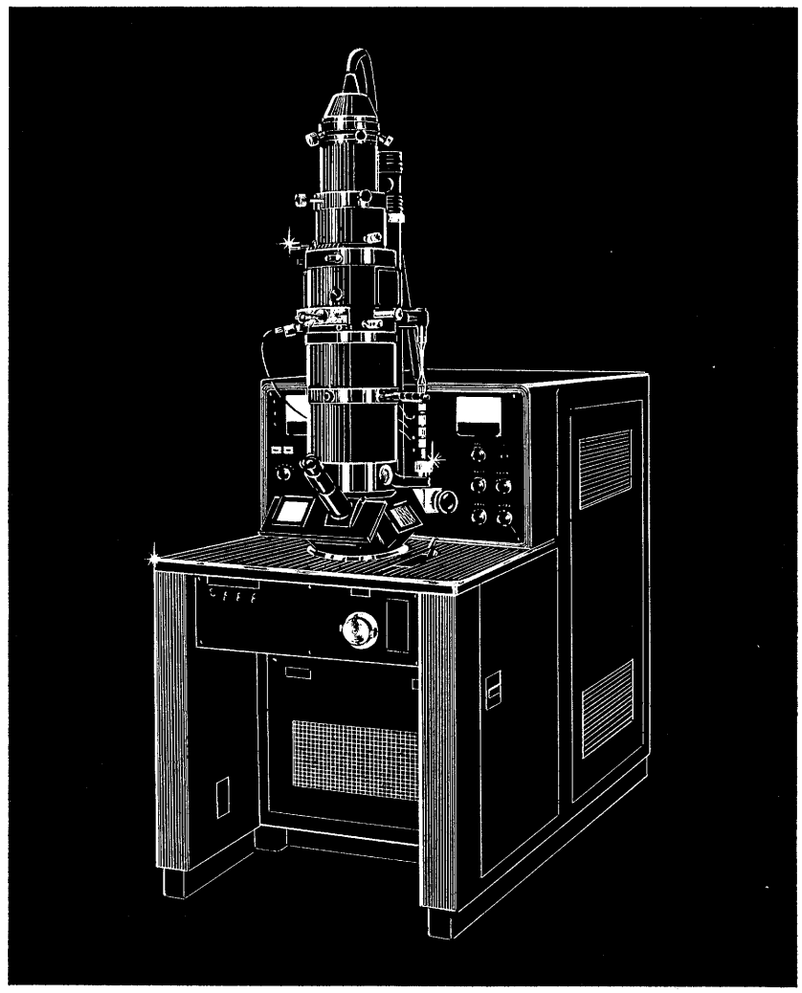
You still have to photograph the specimen, process the negative, and make the enlargement before you can even begin to get down to the real business at hand —the analysis.

In organizing the Nikon Chromosome Photomicrographic Outfit, we didn't presume to simplify the preparative aspects of the technique, though we may have taken some of the uncertainty out of the interpretation. Essentially we reduced the photographic procedure to a simple, standardized routine.

The Nikon Chromosome Photomicrographic Outfit is as complete as you could want it to be. All the necessary equipment is included: Nikon SUR-Ke trinocular microscope with built-in Koehler illumination, Microflex FMB photomicrographic attachment and Nikon M-35 camera body, electro-photometer for exposure determination, daylight film-processing tank, Durst enlarger with lens, Fotorite rapid processor for enlargements, and other accessories.

The outfit also includes a starter set of Karyotype forms, a Difco culture kit and a complete manual of instructions. No darkroom is required.

The Nikon Chromosome Outfit has so simplified the photographic procedure, it can be entrusted to any competent technician, leaving the cytogeneticist free to devote his time to the microscopy and the analysis. For complete details write to Nikon Inc., Instrument Division Garden City, N.Y. 11533 Subsidiary of Ehrenreich Photo-Optical Industries, Inc.



The JEM-T7 Electron Microscope for biological applications . . . resolution — 10Å . . . continuous magnification — 400X to 80,000X without change of pole piece . . . high contrast, wide angle for low magnification work . . . accelerating voltage — 60kv . . . motor driven valve system . . . electromagnetic stigmator . . . automatic exposure system . . . priced at $23,228 (duty free).

JEOLCO (U.S.A.), Inc. • Applications centers at Medford, Massachusetts and Burlingame, California
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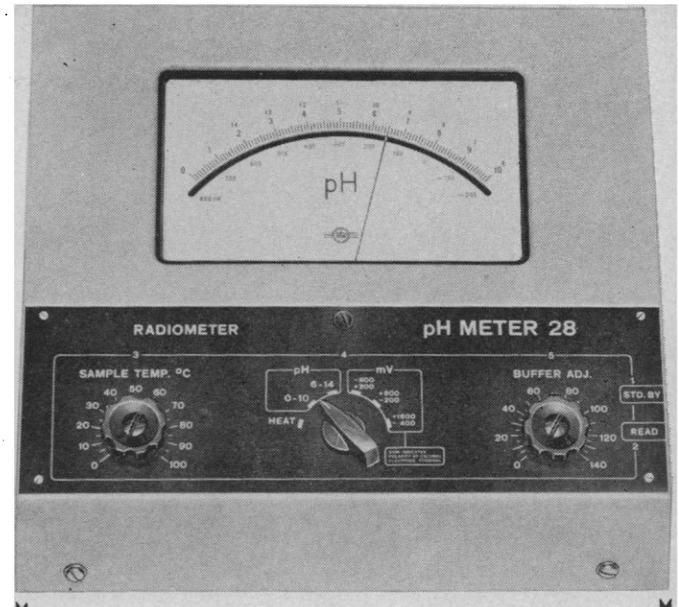
pH Measurement

pH Control

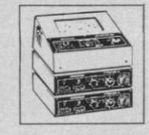


Teamwork: The basis of Radiometer systems for measuring and controlling pH.

The pH meter above is a Model 28, ready to measure pH accurately and dependably. It is typical of the several fine Radiometer models from which the one best meeting your particular requirements can be selected. The Titrators below are designed to team up with the pH meter either singly or in pairs.

One of these economically priced model 11s adds the facility to perform all types of end-point titrations automatically, or to control pH in one direction.

Two of them provide control to maintain a constant pH regardless of which way the pH is changing.



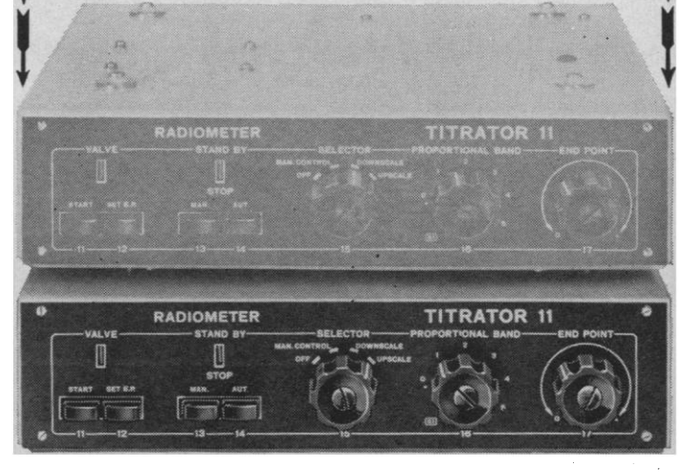
The variety of delivery systems and recording facilities available provides for even more potent combinations. Write for more detailed information on how to put a Radiometer team to work for you.

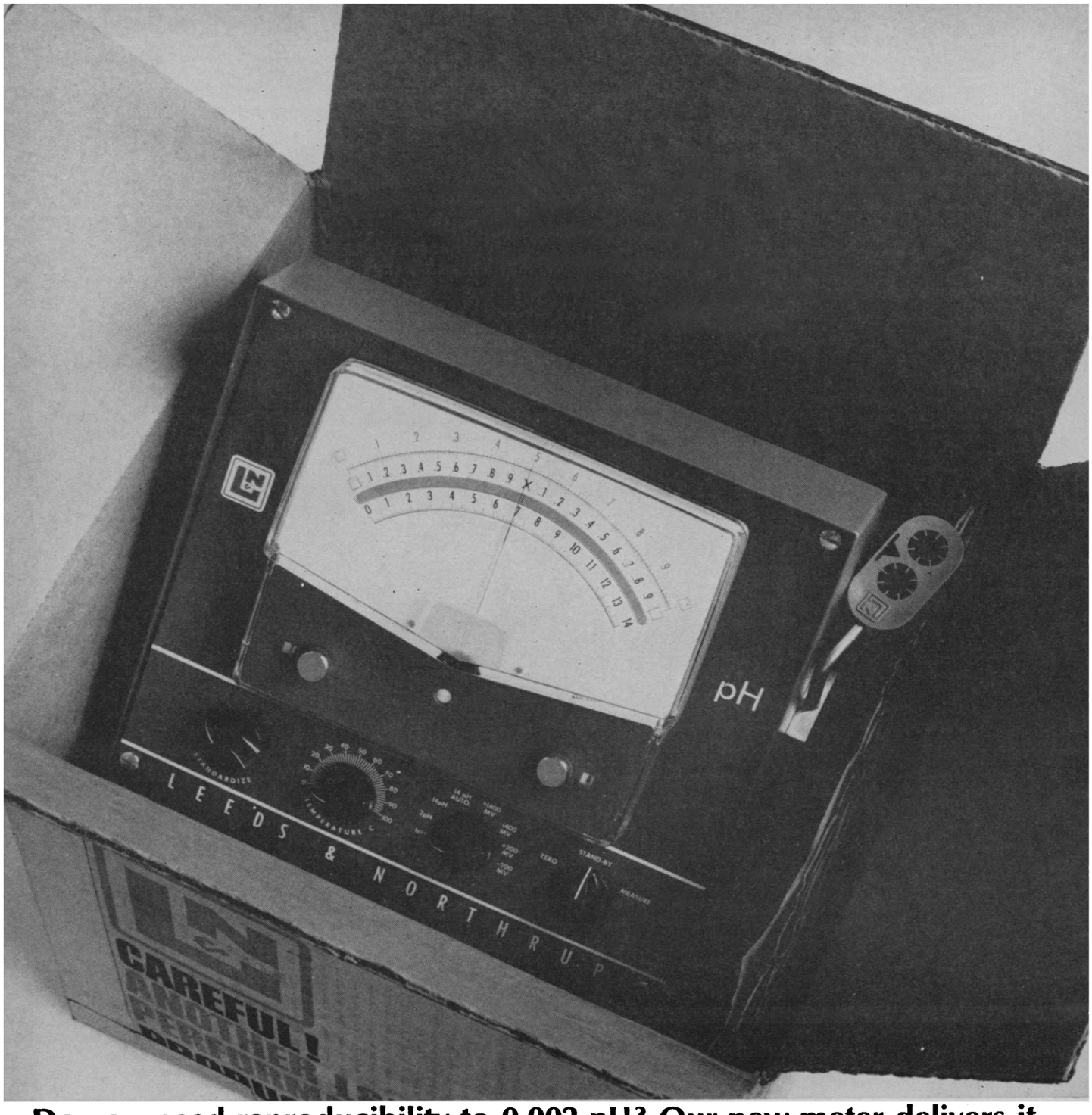
THE LONDON COMPANY

811 SHARON DRIVE, WESTLAKE, OHIO

RADIOMETER COPENHAGEN

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





Do you need reproducibility to 0.002 pH? Our new meter delivers it.

It's far and away the most sensitive device in L&N's entire pH family... the 7407-A2 pH meter... designed specifically for laboratory and clinical research and diagnostic use (flexible enough for general-purpose applications too).

Not only does it give you direct-reading to ± 1/1000 pH on the one-pH span, it also has these capabilities...

- 2-pH span, direct-reading
- 0 to 14 pH range
- ±200-mv spans, direct-reading
- 0 to ± 1400 mv ranges
- Manual temperature compensation on 1, 2, and 14 pH range
- Automatic temperature compensation on 14 pH range

The one-pH span provides the added readability required in such critical measurements as pH of blood and body fluids, where minute changes are highly significant. The two-pH span minimizes range-changing and simplifies checking against buffers. The 0 to 14 pH range and millivolt spans and ranges provide the additional flexibility to meet general-purpose requirements.

And like the other A-2 Series meters, the 7407 also features a photoconductive chopper, feedback-stabilized amplifier, hand-wiring, highly-responsive meter with taut-band suspension and 7" scale, Karl Fischer circuitry, and output terminals for recorder display.

For full details on this or any of the A-2 Series meters, and the name of the laboratory pH dealer nearest you, write to: Leeds & Northrup Co., 4926 Stenton Avenue, Philadelphia, Pa. 19144.

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Disinfect, Deodorize and Clean animal cages with Mikro-Spray as easily as you now hose them down!

A unique device for the in-place cleaning of animal cages and animal rooms, the MIKRO-SPRAY system injects detergent germicides into your waterline at a rate exactly proportional to the flow of water.

Any surface or object that can be washed with water can be cleaned, disinfected and deodorized with the MIKRO-SPRAY just as easily and far more effectively. In fact, MIKRO-SPRAY hooks right into your existing waterline system. It is available in both wall-hung and portable models, which dispense one of two powerful detergent germicides (whichever one is best suited for your needs) in a rate exactly proportional to your flow of water. And gives you your safest, most sanitary, in-place cage cleaning ever, with no mopping or rinsing needed!

The first of these two detergent germicides, MIKRO-QUAT, is a quaternary ammonium detergent germicide. Completely harmless to animals, it disinfects and deodorizes for a full twenty-four hours. It is recommended for normal in-place cage cleaning requirements.

The second, MIKRO KLENE, is an iodophor detergent germicide that gives you the ultimate in disinfection results. It is recommended for use in cages where animals are being used for experimentation with dangerous infectious diseases and a fast, positive bacterial kill is required. Like MIKRO-QUAT, it is completely harmless to animals.

Use of the MIKRO-SPRAY system, of course, is not limited to just in-place cage cleaning. It is equally effective in disinfecting and deodorizing cage racks, walls and floors of the cage room and for general clean-up duties in the incinerator and waste disposal room. Send coupon today for new manual on environmental sanitation, including complete details on application of MIKRO-SPRAY system.

ECONOMICS LABORATORY, INC.

Economics Laboratory, Inc., Dept. 204-K
250 Park Avenue, N.Y., N.Y. 10017

Please send me full details on the disinfecting, deodorizing, and cost-cutting effects of the MIKRO-SPRAY in-place cage cleaning system.

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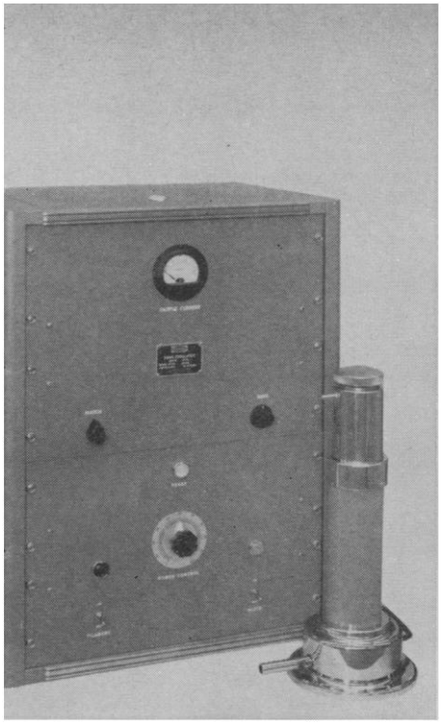
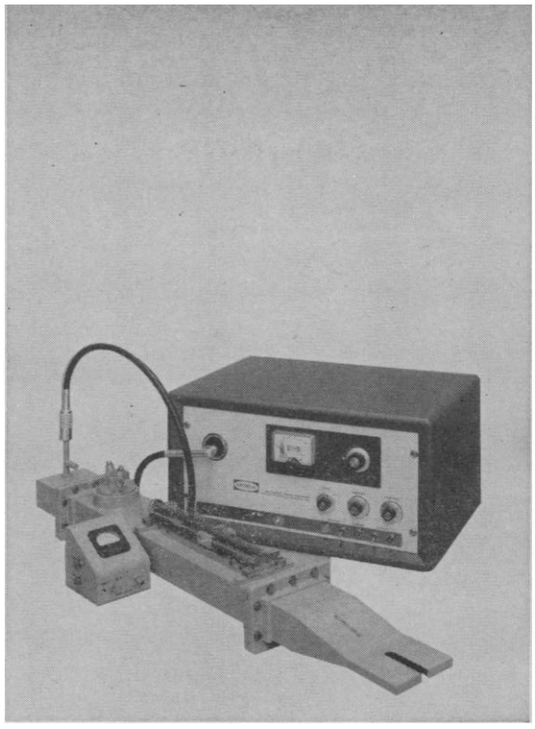




Sonic Oscillators and Microwave Generators for Research Applications

Applications include: Bacterial and cellular disruption, dispersion and homogenization, free radical research, spectroscopy and interferometry.

Model DF 101 sonic oscillator is a low frequency magnetostriction unit designed for the rapid duplication of physiochemical reactions in laboratories. The unit may be used in a wide variety of industrial and laboratory research projects such as studying the effects of sonic energy on liquids, living organisms, mixtures and chemical solutions. Power output (driver to stand) is 250 watts, 1.2 amperes. Frequency is 10 KC (nominal). Power requirements are 110 @ 50-60 cycles, 750 w. Recommended capacity is 50 cc however the stand will contain up to 165 cc.

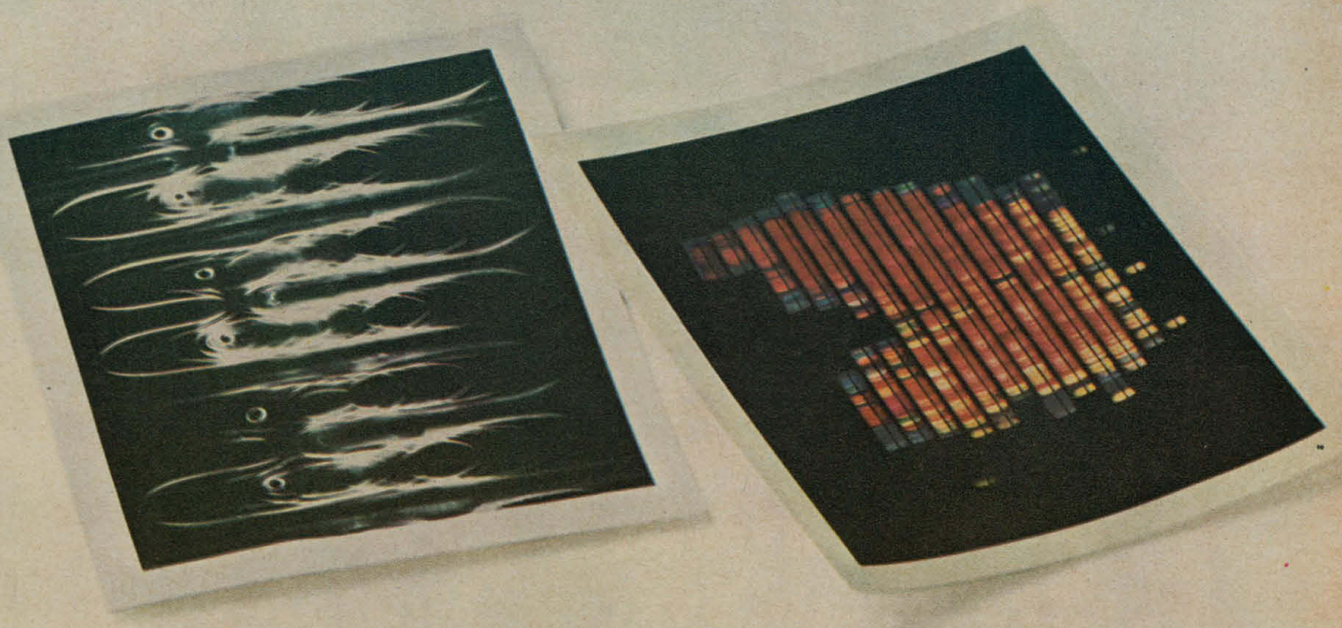
Model PGM-10X2 microwave generator and its accessories are designed for the production of free radicals and the excitation of electrodeless discharge lamps in the fields of spectroscopy, raman spectroscopy and interferometry. Specifications: Power input—105-130 v @ 60 cycles, 385 watts. Power output—85 watts CW power at 2450 ± 25 MHz and/or variable pulse rate between 100—5000 Hz and duty cycle variable between 1% and 80%. The chosen operating frequency minimizes cleanup accumulation on the walls of the electrodeless lamps.

The Model PGM-100 microwave generator fills the need for higher power. Specifications: Standard JAN waveguide RG 104/U • Maximum CW power output 800 watts • Fixed frequency, 2450 ± 25 MHz • Modulation in the order of 10% or 120 Hz pulsed. The power output is constant through normal line fluctuations and variations of magnetron impedance with load and life. The unit contains a filter network that can be switched into the magnetron plate supply to provide a microwave power output with modulation of about 10% in the detected rf envelope.

Contact Raytheon Co., Sorensen Operation, Production Equipment Department, Richards Ave., Norwalk Conn. 06856. Tel: 203-838-6571.

RAYTHEON

It takes time to get a good lab photograph.



15 seconds for B&W

1 minute for color

It's not hard to see the advantages that go with getting pictures this fast.

Polaroid Land photography can give you immediate visual documentation for your research notebook (like the immunoelectrophoretogram on the left). Or fast diagnostic results (like the radiological scan of the thyroid, on the right).

And you're always sure of your picture. If you goof on the first one, you'll know immediately and you can take another right away. You never risk having to repeat a time-consuming setup later.

Now, is there a choice of films, and what kind of results do you get without waiting?

Polaroid color film is available in three formats: roll, pack, and 4 x 5 packets. (The roll and pack films produce 3¼ x 4¼-inch prints.) It gives you everything you want in a color recording: accurate color rendition, excellent contrast and sharpness.

There are three black and white emulsions. One is a 3000-speed film—sensitive enough for virtually all laboratory assignments. It comes in roll, pack, or 4 x 5 packets.

Another black and white film, a 200-speed roll film, produces a fine-grain print with exceptional quality in detail and tone. (A similar emulsion, a 400-speed film, is available in 4 x 5 packets.)

Our third black and white film (only in 4 x 5 packets) gives you a sharply detailed print, and a true film negative which can be enlarged 25 times without losing detail or picking up grain. This one develops in 20 seconds.

We also have an infrared film which gives you a high-contrast infrared recording in 15 seconds. Film speed is 800 without filters—and that's three times faster than conventional infrared film.

Have any more questions? Send them on to us. The minute-or-under men. Polaroid Corp., Dept. 75, Cambridge, Mass. 02139.

Polaroid®

EPR at Work No. 39

EPR Spectroscopy has proven to be a useful technique for studying compounds and radical intermediates which have an unpaired electron. The Varian V-4502 series is a proven workhorse for observations of this kind. The new E-3 is an easy, simple-to-operate system designed specifically for chemical and biological applications.

Biomolecules that do not contain an unpaired electron will not respond in EPR studies. However, with sensitive EPR spectrometers, able to clearly detect the behavior of free radicals, such inert biological and chemical compounds can be studied when they are chemically bonded to a stable free radical. This radical, or spin label, produces a sharp, well-resolved, and simple paramagnetic resonance spectrum highly sensitive to the environment of the molecule.

Spin Labels for Biomolecules

EXAMPLE: "Tagged" molecules by chemical reaction with stable spin systems.

Most materials of biological and chemical interest do not contain an unpaired electron spin (in their ground states) and are not useful for EPR studies. Many of these materials can be studied with EPR methods by either oxidizing or reducing them. Recently, a more general method has been developed by McConnell *et al*,[1,2,3] who have "tagged" molecules by chemical reaction with stable spin systems, somewhat in analogy to customary fluorescence labeling. All tagging or labeling methods are useful in determining the mere presence or absence of the tagged compound. In addition, spin labeling offers several intrinsic advantages over other methods: The EPR technique has very high sensitivity; the spin label provides a microprobe for examination of the local environment; and the motion of the tagged species affects the observed spectrum.

As an example, the reversible change of Bovine Serum Albumin (BSA) as the pH is lowered was studied by spin labeling methods. The molecule BSA was reacted chemically with a spin label, which in this case was a stable nitroxide molecule similar to that shown in Figure 1. In a pure solution of the spin label, three sharp well resolved hyperfine lines are observed, arising from coupling to the nitrogen nucleus (I=1). The lines are sharp because rapid motion in solution averaged the anisotropic hyperfine interactions. The spectrum of spin labeled BSA is shown in Figure 2. McConnell *et al* have shown that this spectrum arises from spin labels bound in two different environments of the BSA molecule, one site where considerable motion of the nitroxide radical is permitted giving rise to 3 narrow lines, and one site where the spin label is more tightly bound to the BSA molecule and an anisotropically broadened spectrum is obtained. Here the spin label presumably is bound to a region of restricted access in the BSA molecule.

As the pH is lowered, the BSA molecule is uncoiled in such a manner that the broad anisotropic portion of the spectrum arising from the tightly bound spin labels decreases in intensity. At the same time the intensity of the 3 narrow hyperfine lines arising from more freely moving spin labels increases. Figure 3 shows the pH dependency for the process, which is envisaged as an opening up of the protein BSA.

Spin labels are currently being considered for other applications such as kinetic rate determinations and study of the environments close to reaction sites, e.g. enzymes.

1. Stone, Buckman, Nordio, McConnell, Proc. Nat'l. Acad. Sci. 54, 1010, (1965);
2. Griffith and McConnell, Proc. Nat'l. Acad. Sci. 55, 8, (1966);
3. Lawrence, Berliner and McConnell, Proc. Nat'l. Acad. Sci. 55, 708, (1966).

Fig. 1

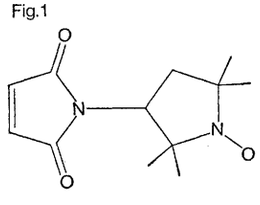


Fig. 2

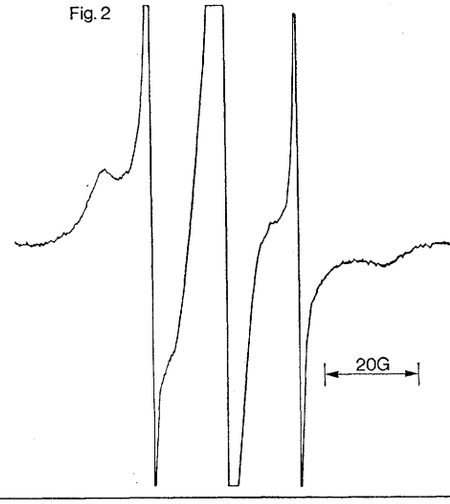
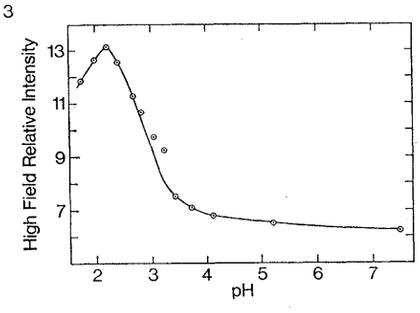


Fig. 3



Would you like reprints of this or previous examples in this series? Or more information about EPR or NMR? Simply write to:
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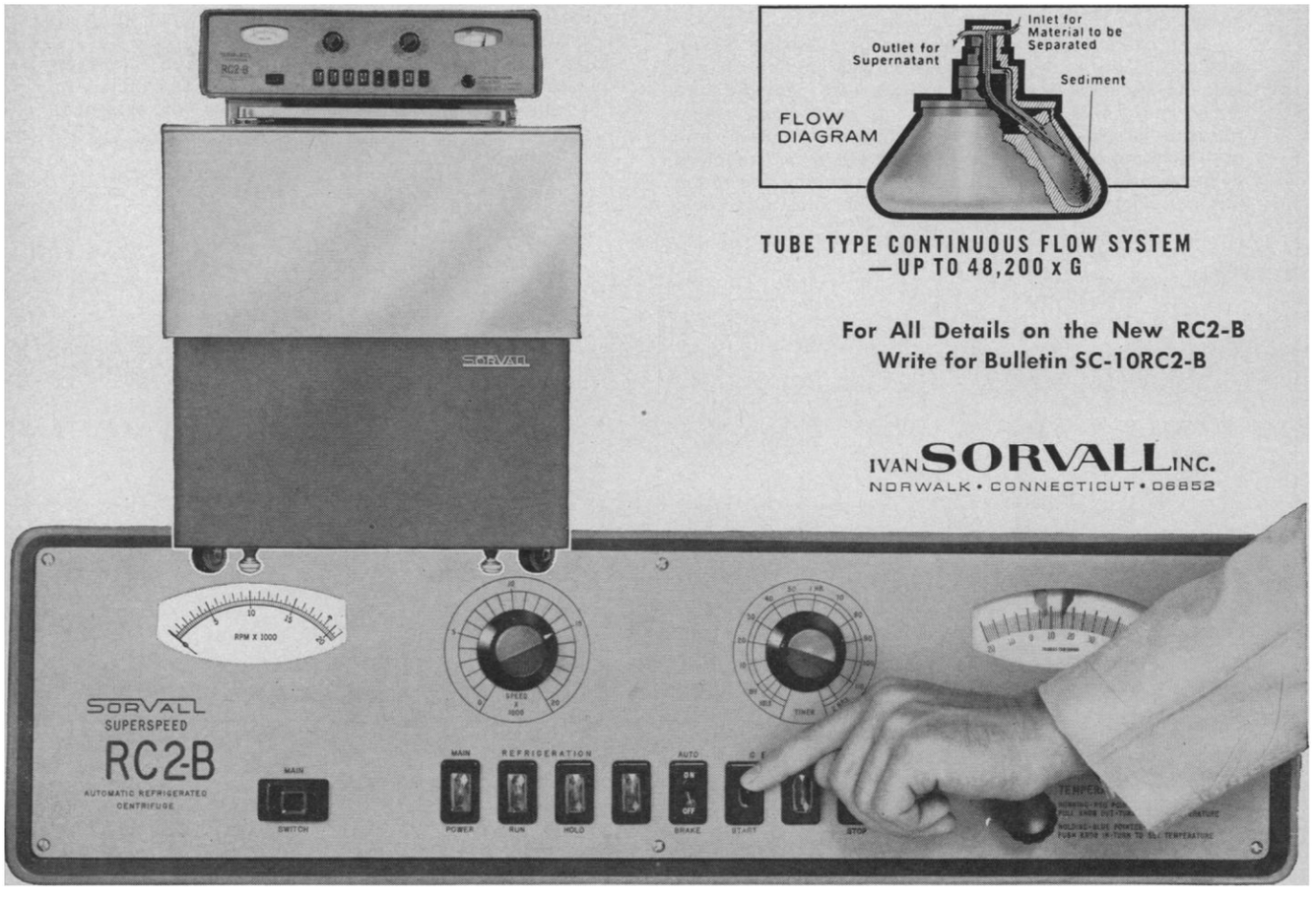

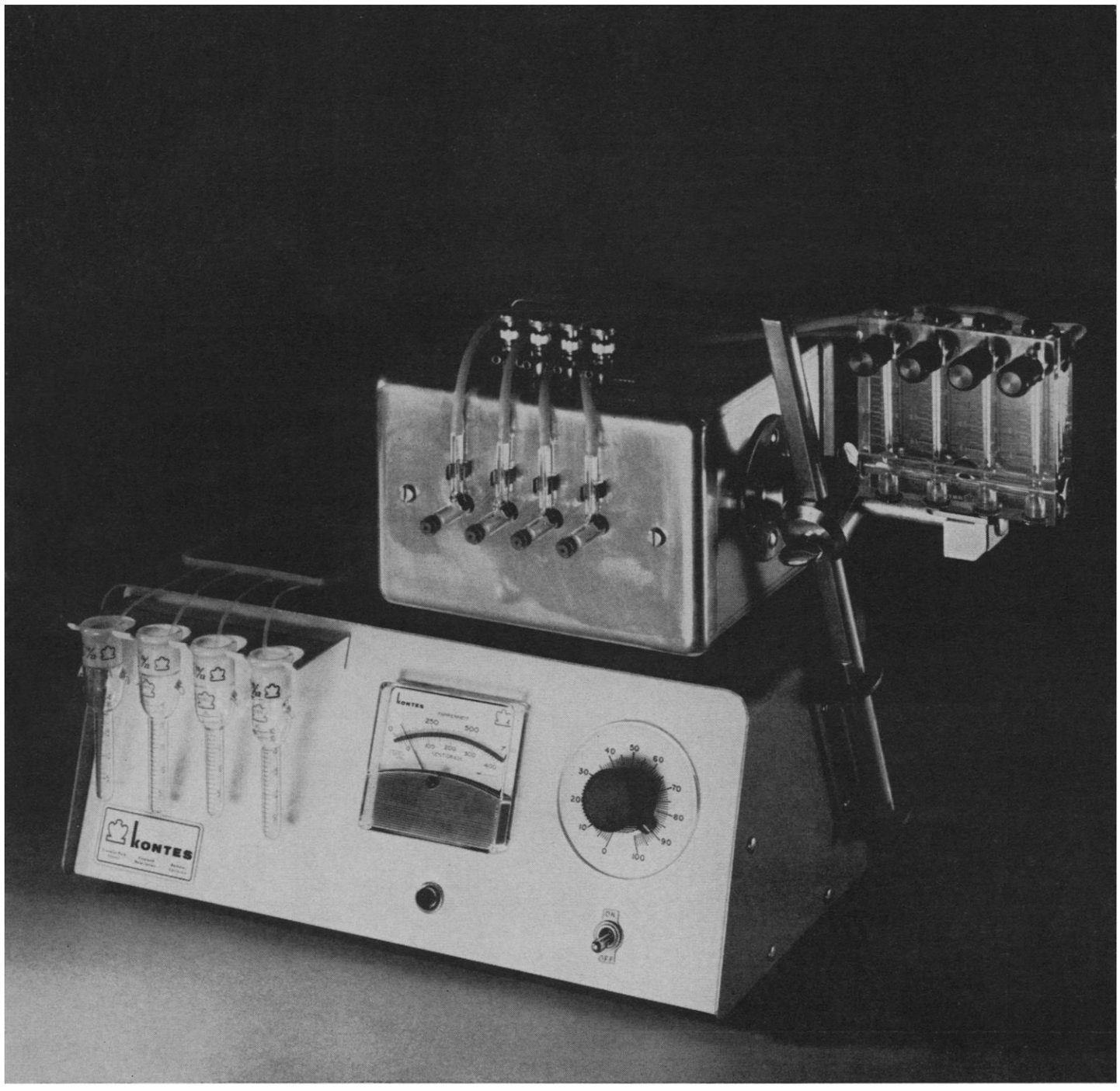

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*Patent pending

**Reference J. O. A. C., Vol. 48, Dec. 1965, "A Sweep Co-Distillation Clean-up Method for Organophosphate Pesticides", by R. W. Storherr & R. R. Watts. ® Trademark of Du Pont

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Form: Diammonium Salt
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Price: $55/10μc $200/50μc $400/0.1mc

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Form: Tetralithium Salt
NEC-432 Sp. Act. >200 mc/mM
Price: $55/10μc $225/50μc $450/0.1mc

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Form: Triammonium Salt
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Form: Diammonium Salt
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Price: $60/10μc $250/50μc $475/0.1mc

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Form: Tetralithium Salt
NEC-442 Sp. Act. 25-30 mc/mM
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Uridine-2-C^{14} 5′-Monophosphate
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Price: $40/10μc $150/50μc $300/0.1mc

Uridine-C^{14} (u.l.) 5′-Monophosphate
Form: Diammonium Salt
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Price: $55/10μc $200/50μc $400/0.1mc

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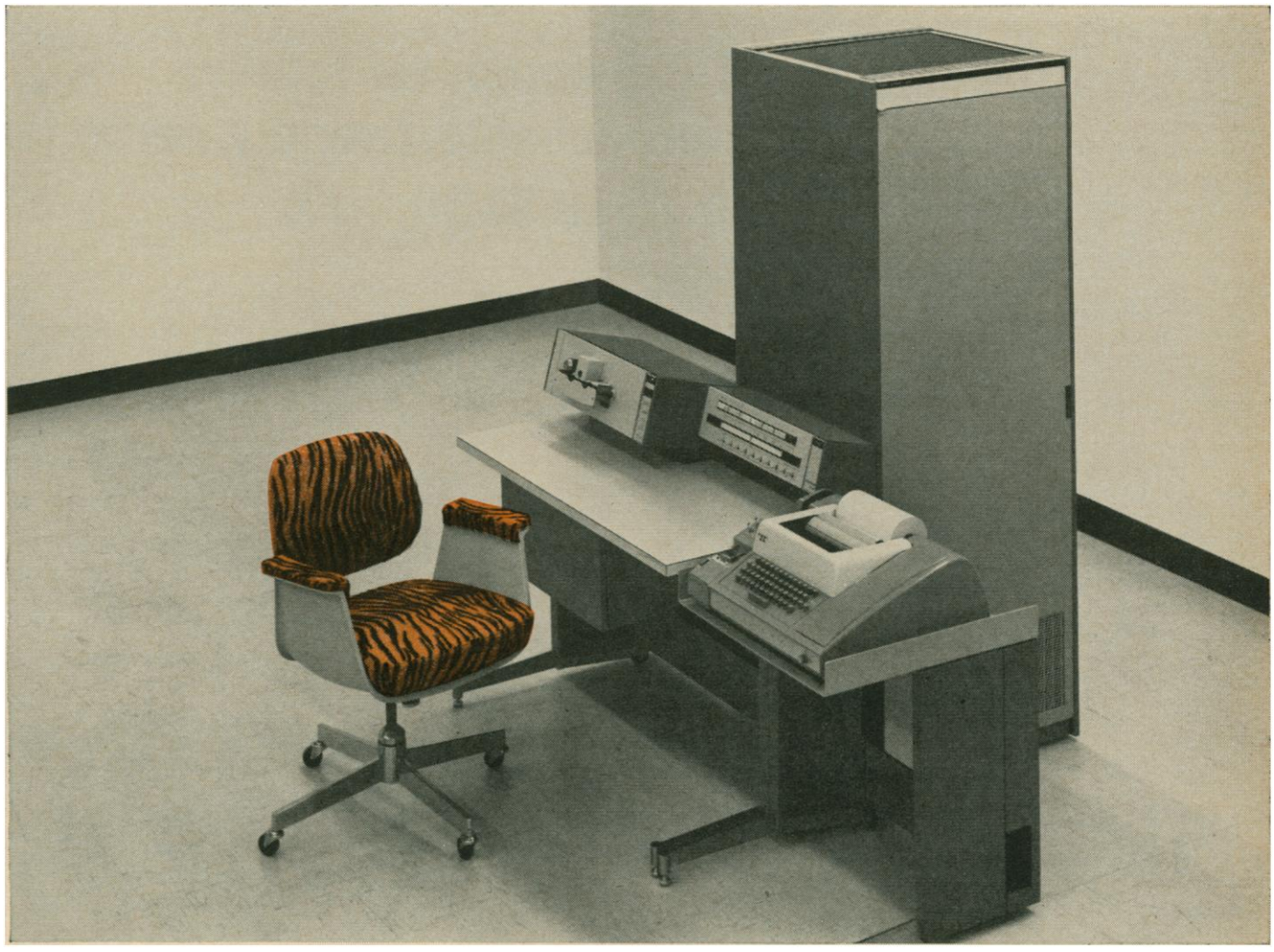

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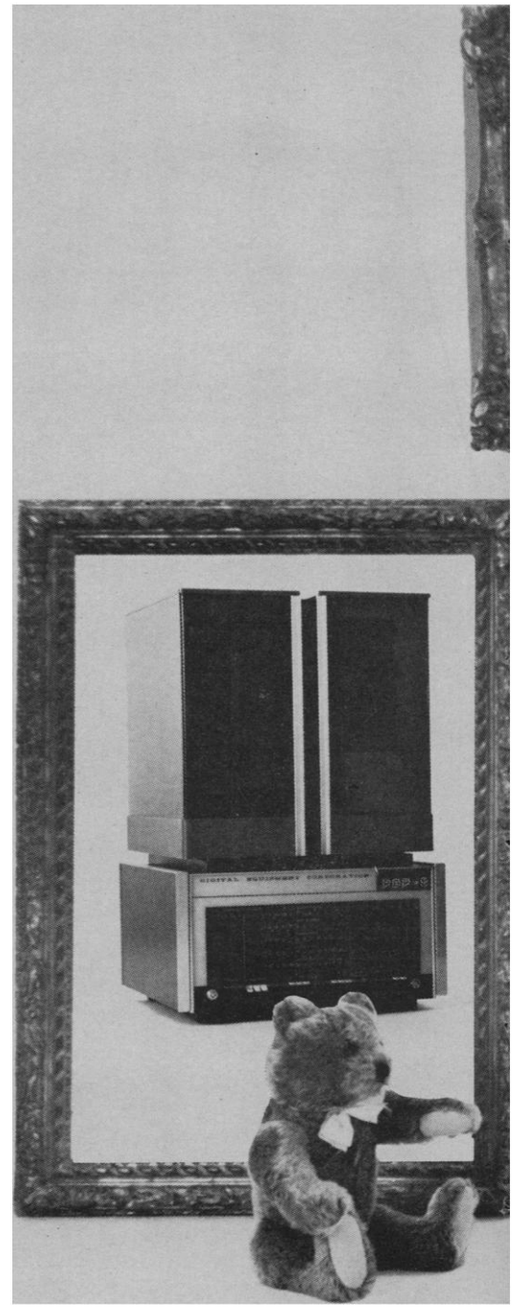

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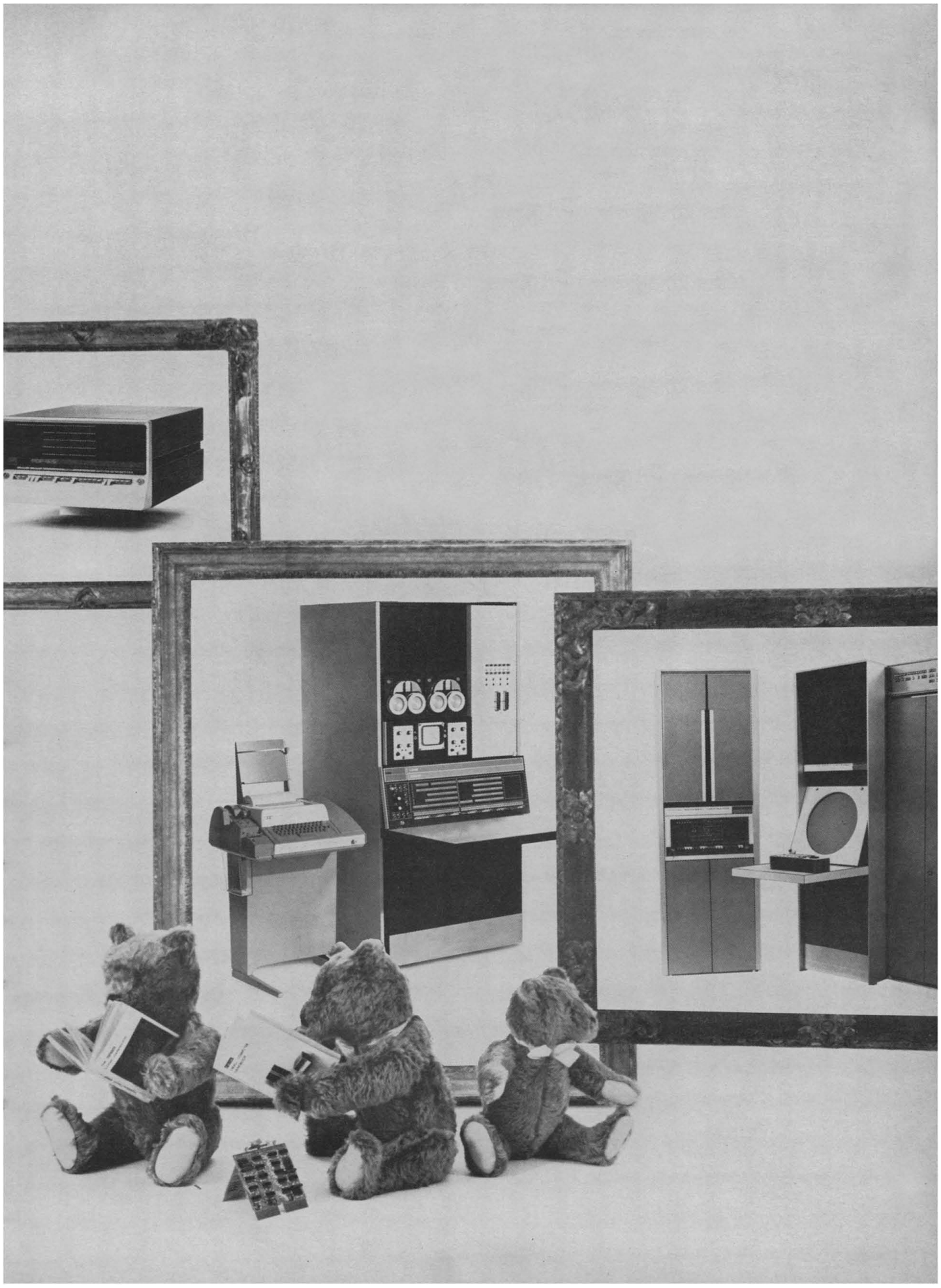

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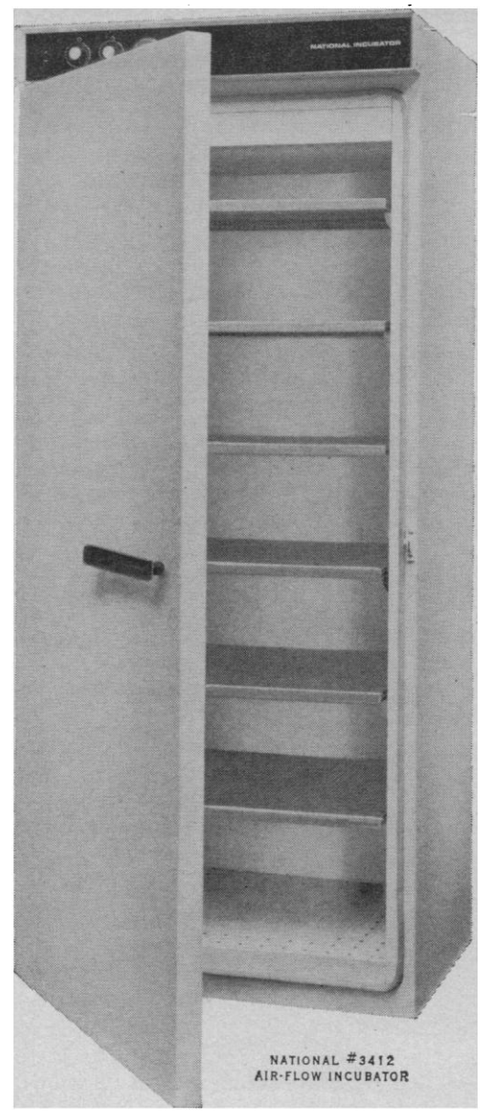

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October, 1966

FISHER PRODUCT REPORT

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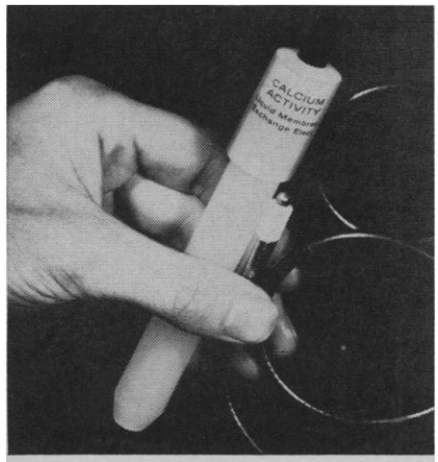

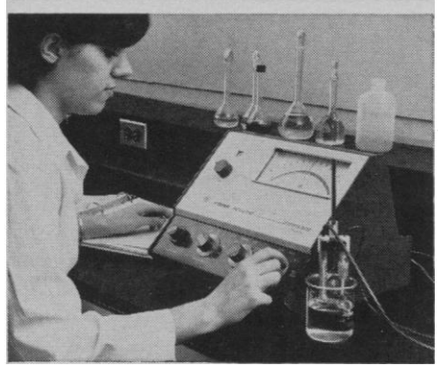

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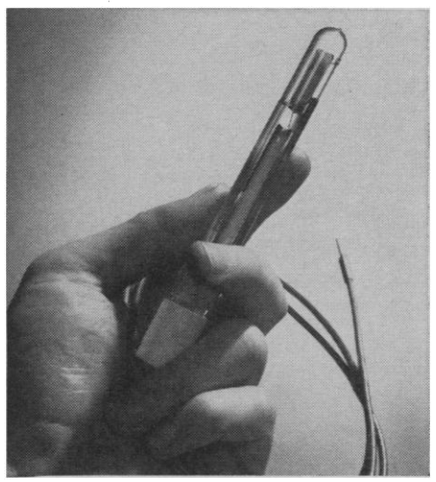

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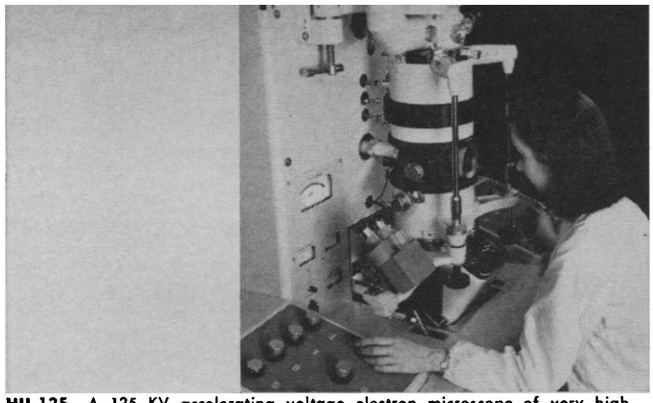

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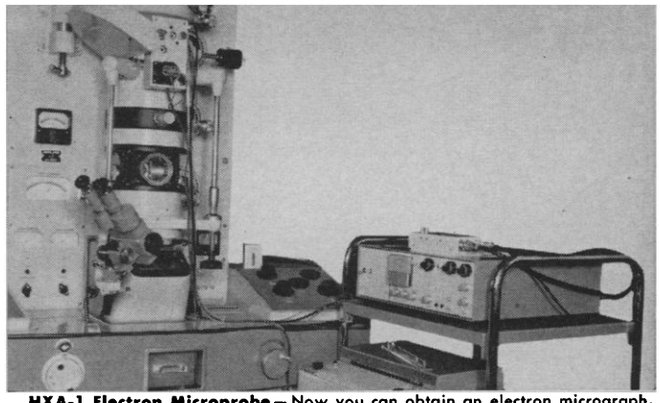

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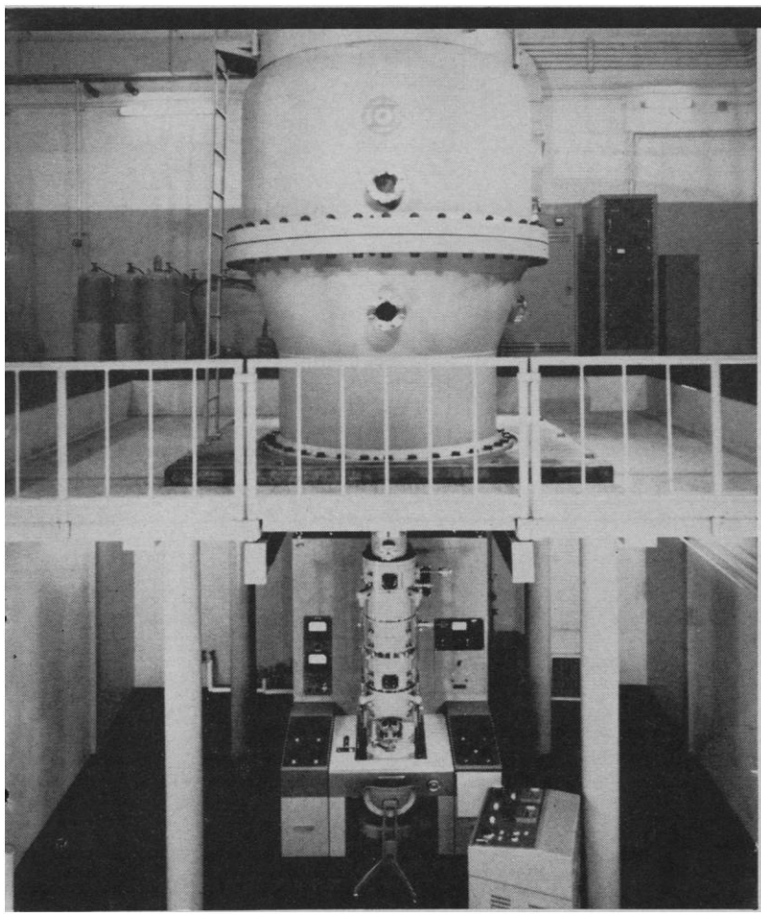

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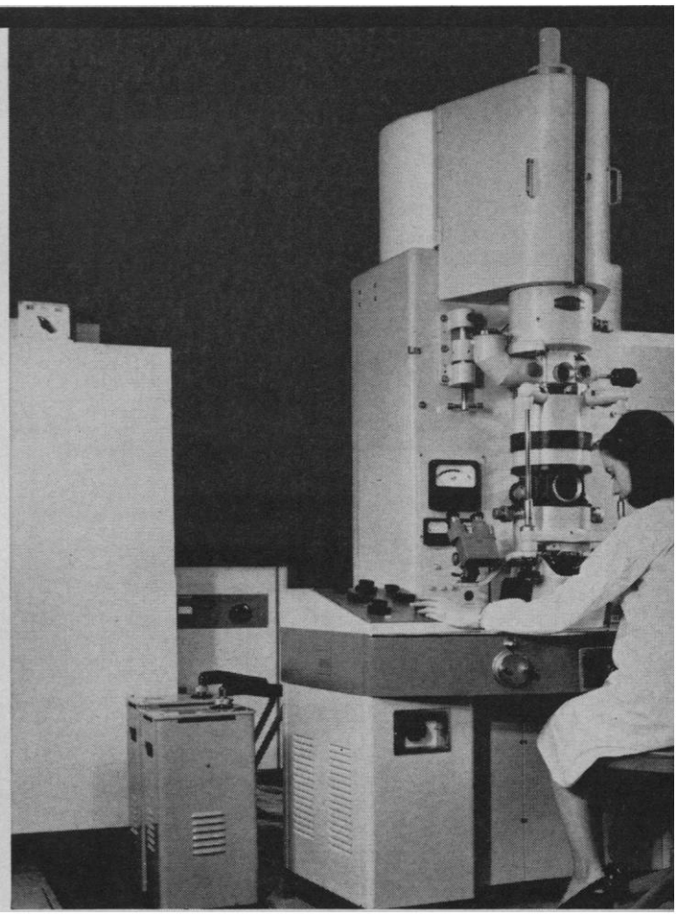

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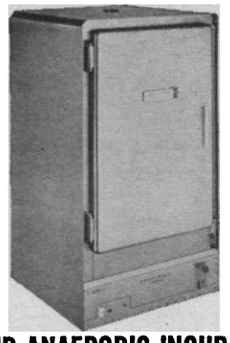

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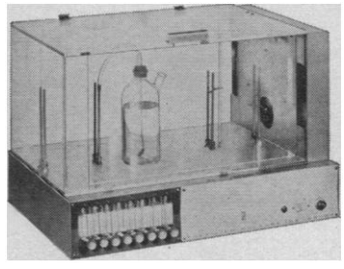

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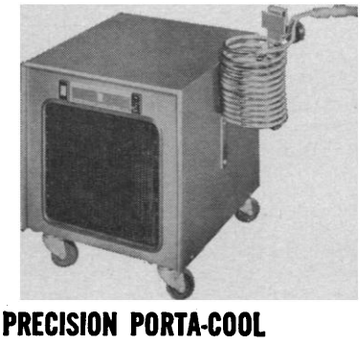

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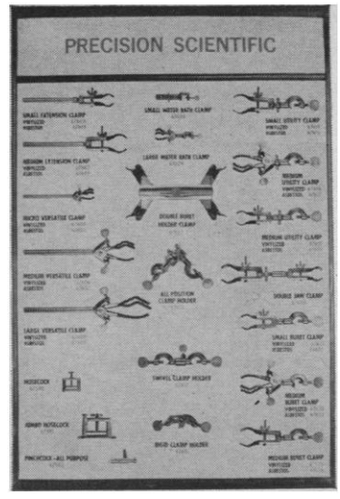

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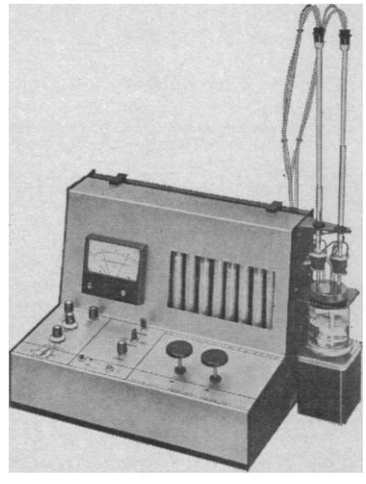

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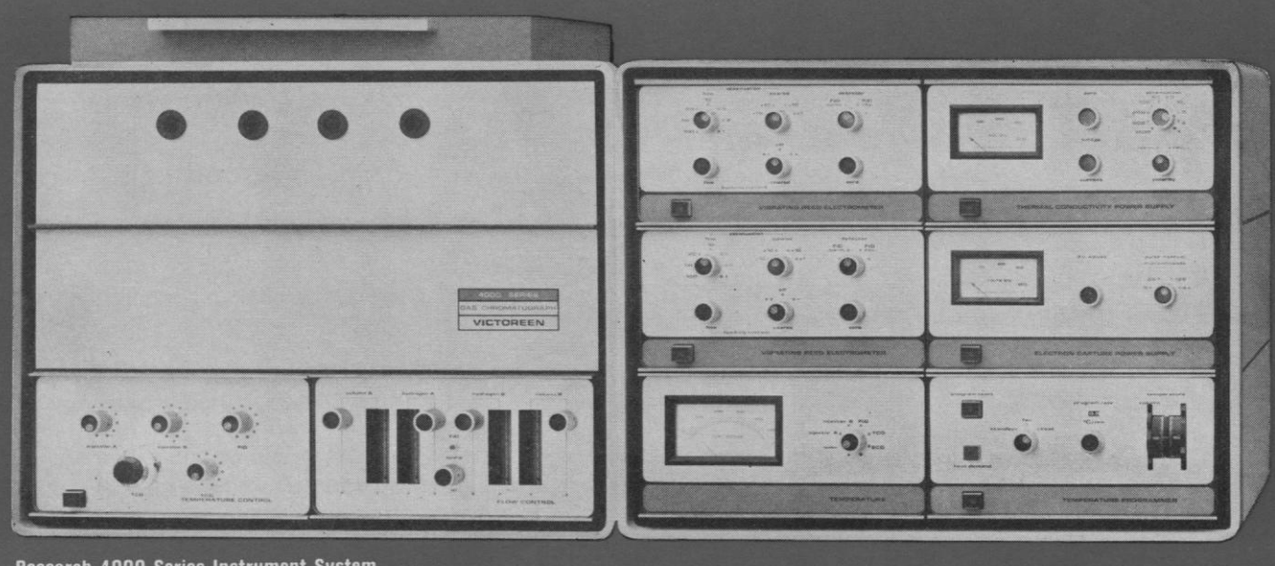

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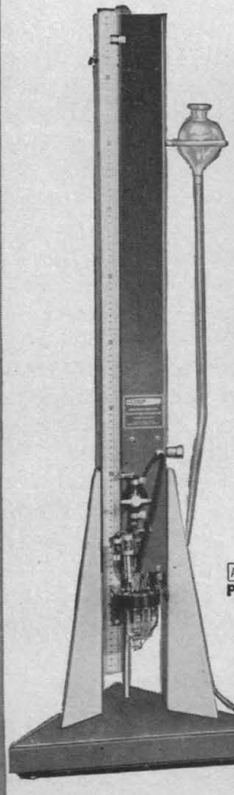
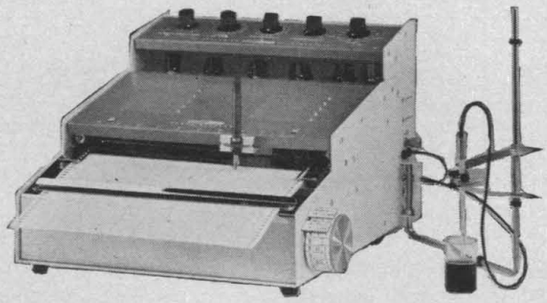
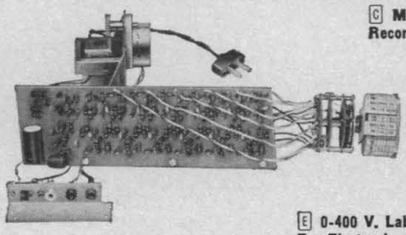
Heath Sets New Value Standards For Laboratory Instrumentation



[B] Professional DC Scope With Triggered Sweep



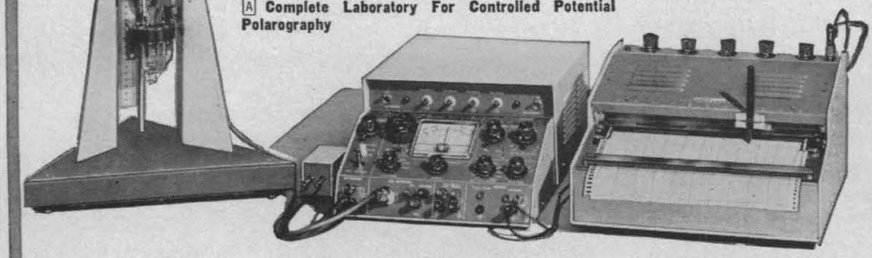
[C] Multi-Speed pH Meter/pH Recorder—Accurate To 0.005 pH



[D] 21-Speed, Multi-Speed Chart Drive Unit For Heath Servo-Chart Recorders. 12"/min. to ½"/hour.

[E] 0-400 V. Laboratory Power Supply—Excellent For Electrophorisis!

[A] Complete Laboratory For Controlled Potential Polarography



[A] **Complete Laboratory For Controlled Potential Polarography . . .** consisting of a highly versatile Dropping Mercury Electrode Apparatus, the Heath/Polarography Module and Operational Amplifier for producing a precision controlled sweep potential, and the Heath EUW-20A Servo Chart/Recorder for strip-chart display of the readout current. The Heath Polarography Laboratory is capable of analysis of ion concentrations as low as 10^{-7} moles . . . It is highly capable of oxygen analysis with most quality oxygen electrodes.

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[D] **21-Speed, Multi-Speed Chart Drive Unit . . .** for the Heath EUW-20A Servo-Chart Recorder and pH adaptation of the Heath recorder. This unit provides chart speeds from 12 inches per minute to 0.5 inches per hour which are as accurate as the 60 cps frequency of the AC line. Auxiliary input allows chart speed to be synchronized to external events. To fully realize its capabilities, send for the free brochure describing this unit.

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[D] **EUA-20-26 Multi-Speed Chart Drive**.....**$ 89.00**
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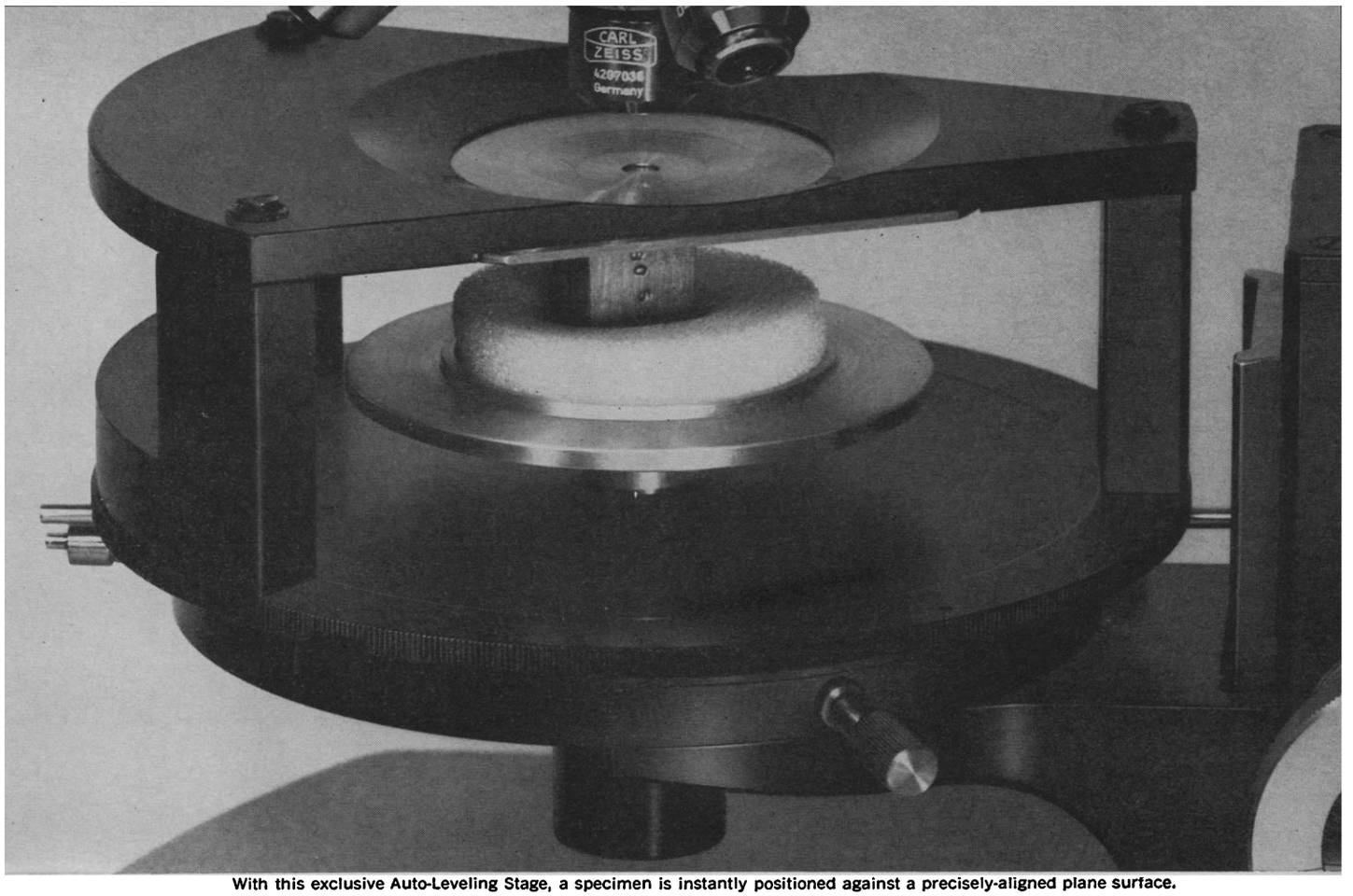
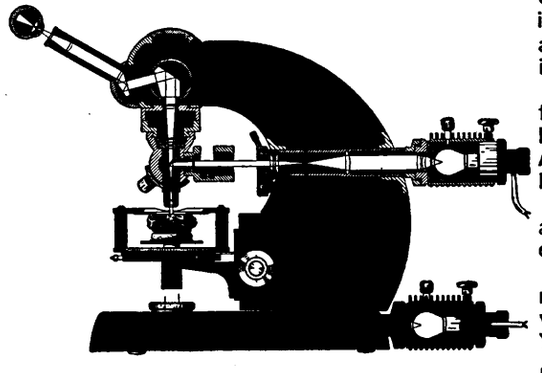


With this exclusive Auto-Leveling Stage, a specimen is instantly positioned against a precisely-aligned plane surface.

The level best upright metallurgical microscope



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The article appears to praise the center. Yet, the care given at the center is described as being no better than that at Denver General Hospital, which, by insinuation, is poor. Or as stated, "neither much better nor much worse than most municipal hospitals."

In the future I would suggest that all relevant sources of information be sought before writing such an article. Visiting Denver General Hospital and discussing the subject with the manager of health and hospitals would have afforded the writer the opportunity to ascertain more of the facts.

DAVID L. COWEN
Department of Health and Hospitals, West Sixth Avenue and Cherokee Street, Denver 4, Colorado

Langer's article strikes me as one of the more perceptive analyses of the importance of local health service programs in the current OEO-sponsored antipoverty programs. Its discussion of the center's impact on the scope, quality, and tone of health services made available to an urban minority group, of its impact on political and professional interest groups, and of its utilization of a combination of nonprofessional and professional personnel, among other points, made the article extremely useful for our classes in social welfare policy.

PHILIP BOOTH
School of Social Work, University of Michigan, Ann Arbor 48104

Population Stabilization

John Walsh's discussion of the food-population balance (News and Comment, 13 May, p. 896) again emphasized the overwhelming need for controlling world population. Wars and famine are but two examples of world problems that are intensified by population pressures. A 1965 Gallup Poll indicated that only 60 percent of Americans regard overpopulation as a major world problem. The Office of Economic Opportunity is reluctant to support progressive family planning programs because of possible negative public response. Therein lies the role and obligation of the scientific community: to learn about and to teach the need for population stabilization.

The combined efforts of the biologist, chemist, mathematician, physicist, geologist and meteorologist could greatly improve community understanding of overpopulation and its consequences. One lecture, or part of a lecture, each semester by each *Science* reader would help shape the political atmosphere that is essential before our government can launch an international program. High school and university students would quickly grasp the seriousness of the situation when confronted with the demographic facts. Though birth control has been commonly considered a personal matter for each individual and his family, this will be less true in the future. Some people believe that a massive international program of family planning methods would corrupt youth. This does not follow. The seeds of morality are planted elsewhere and do not depend on the availability or denial of information for their nourishment. The point is that citizens of every nation must learn about the international consequences of unchecked population increases, and have a knowledge of basic family planning methods. In thirty years, Vietnam, Korea, and Cuba will be incidents in history books, but with a population twice that of the present one, the world may be in interminable chaos.

DAVID B. VAN VLECK
Department of Biology, University of Miami, Coral Gables, Florida 33124

Tenure in 1897

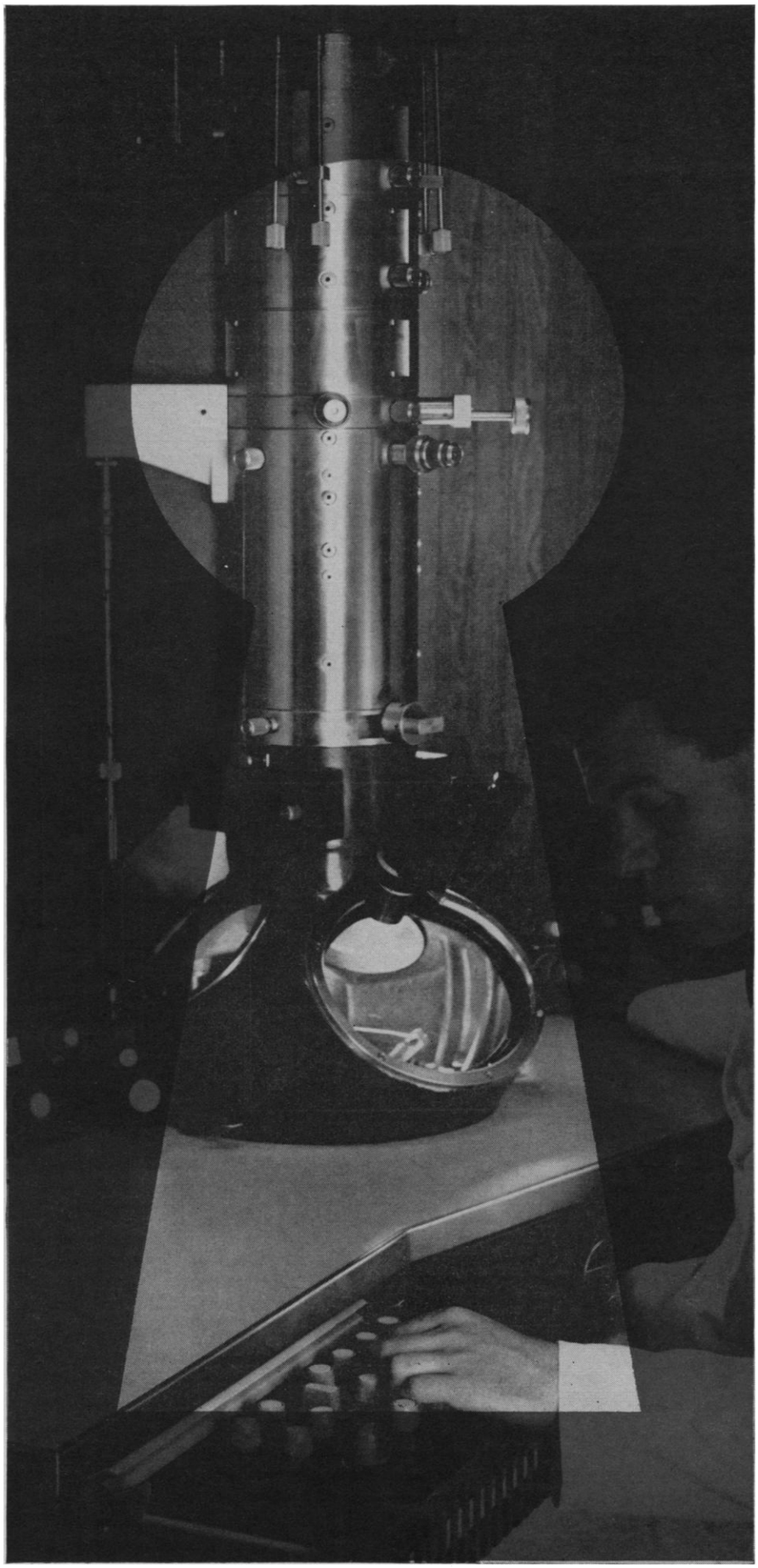
Occasionally, it is almost a relief to look back, perhaps three score years and ten, to find a few real problems existed in those older days as well as today. The following postcard, addressed to the late Frank Smith, then an assistant professor at the University of Illinois, may underscore one such worry about the future:

My dear Smith: I was much pleased to receive your paper on the Oligochaeta yesterday. It rejoices one to realize how you are prospering. I can hardly help but envy you such a good solid place. Zoologists are getting terribly frequent nowadays and it makes me speculate about the future. However, I am having a fine time now. I am expecting to go down to Naples before long, to stay till the middle of July.

Yours,
H. S. Jennings

Jena, Germany
February 22, 1897

WILLIAM R. MURCHIE
Department of Biology, University of Michigan, Flint College 48503



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New Quarks for Physics

Thanks to Willy Ley for pointing out (Letters, 22 July) that "quark" is German for "a somewhat gluey cottage cheese" (or even trash or rubbish). Long ago Goethe foresaw the need for this word when he wrote the prologue to *Faust*. Mephistopheles, sojourning in heaven, cynically describes man's insatiable curiosity and concludes: *"In jeden Quark begräbt er seine Nase."* (He sticks his nose in every *quark*.)

The German and Faustian origin of *quark* is obviously so much more appropriate, despite the slander, that McMillan and Murray Gell-Mann may wish to reconsider the origin of the physicists' quark!

DAVID E. LAIRD

Physics Department,
Cincinnati Country Day School,
6905 Given Road, Ohio 45243

Support the Theoretical Thinkers!

Regarding Greenberg's article (News and Comment, 24 June, p. 1724) on "Basic research: the political tides are shifting" . . . the old category of "basic" ("fundamental," "pure") research is not good because it means different things to different persons. Really there are two kinds of so-called basic science that must be considered—inscribed (trivial, limited)—and theoretical. Inscribed science is simple fact-finding science without any direct thoughts about established theories or without any new set of postulates in mind that might ultimately become a theory. When I try to learn the nutrient conditions that cause the tips of fungus filaments to lyse, I am engaged in inscribed (trivial) science because my thinking has not related the facts to established theory or to a new set of postulates that might develop into a theory. This kind of basic (inscribed, trivial) science is often on the same intellectual level as applied science. It is fascinating work because it satisfies one kind of curiosity. But this kind of nonapplied research should not be confused with truly theoretical work like that which produced the 1 : 1 : 1 hypothesis, the operon hypothesis (both of which should now be called theories), or the like.

Of the different kinds of science, theoretical science is the kind that should receive unstinted financial sup-

port because theories give us command of knowledge whether we choose to use the knowledge in practical applications or in the advancement of science. A quick review of the history of physics, chemistry, or biology will support this contention.

Within theoretical science are those men whose genius and drive permit them to build the frameworks of new incipient theories, new postulational-deductive systems. But who, in politics or in science, has the wit to recognize these men while they are in the early stages of formulating their ideas? Probably only a few other scientists and these men are seldom in a position to grant financial support. The greatest problem in the support of science is not whether you support basic or applied science, but rather, how do you support truly theoretical work?

RALPH W. LEWIS
Department of Natural Science, Michigan State University, Lansing

A Tax-Saving Spin Off

In his contribution to contemporary etymology, Hines (Letters, 12 Aug.) deals successfully with the origins of *A-OK* and *blast off*, but fails with *spin off*, which he suspects is a NASA substitution for *fallout*.

I hasten to inform you that *spin off* has long meant a specific legal corporate fission process, followed when it is desirable to make two corporations out of one. It solves a genuine problem created by the capital gains tax. Some of the assets of the original corporation are *spun off* to the new. If a capital gains tax were assessed, that would be fallout from the fission.

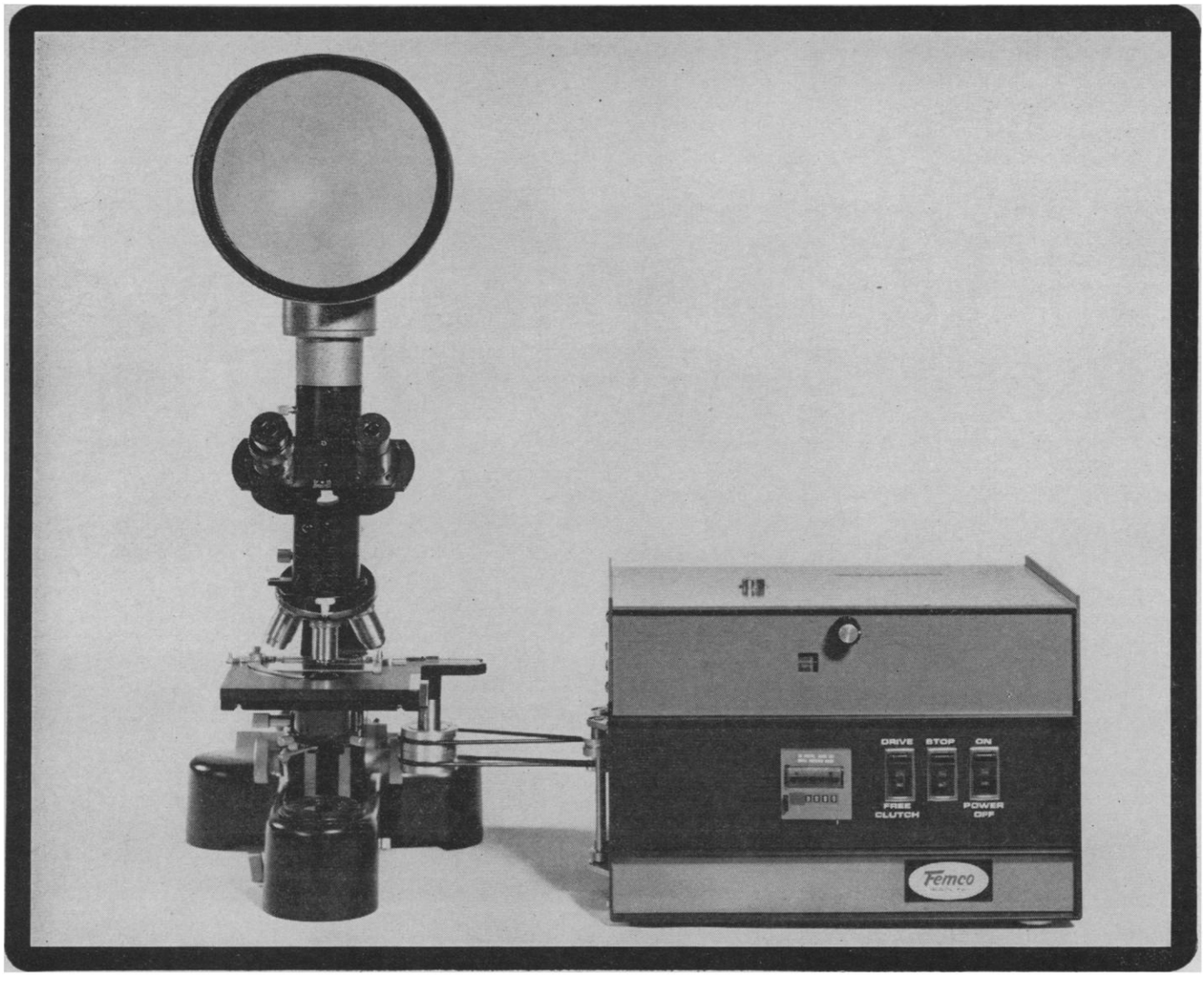
STUART T. MARTIN
P.O. Box 608, Burlington, Vermont

Touché

Non-nonwalking is something I enjoy, but only because I've had a college education. Otherwise, I would like plain walking.

In the same way, "nonincongruity" (Cover, 1 July) can be reduced to "congruity," a term respectable enough to be accepted in dictionaries. "Nonincongruity" seems to be a low character who has been justly ignored by lexicographers.

HELEN CHURCHILL
Hollins College, Virginia



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7 October 1966, Volume 154, Number 3745 **SCIENCE**

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Coping with the Information Explosion

There is divergent opinion concerning the seriousness of the information explosion. Many research workers minimize the importance of the problem. Established investigators find that most of their needs for information are met through participation in invisible colleges and scanning of the relatively few journals in which material of interest to them usually appears. Instead of spending time on more or less fruitless search among a vast number of journals, they gamble that their proposed research will not closely duplicate existing work. Usually their judgment is correct.

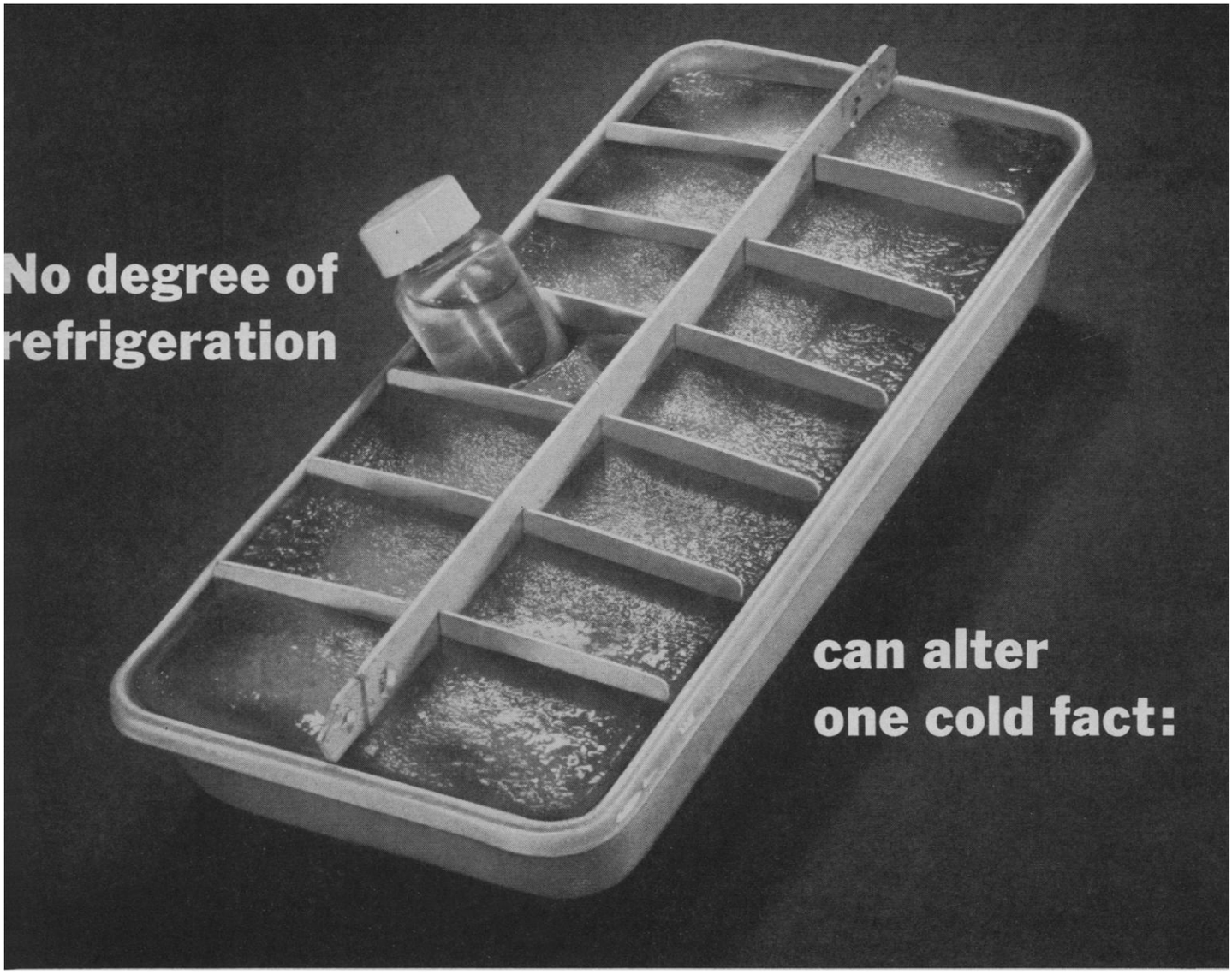
On the other hand, some administrators believe that we are failing to utilize much of the vast amount of information available in 50,000 scientific journals. Some politicians seem to have an almost pathologic fear that research may be unwittingly duplicated. As a result, they have been willing to support all kinds of attempts to make scientific and technical information more readily available. Currently the federal government annually devotes $250 million to such efforts. This sum substantially exceeds the funds allocated for all research project grants supported by the National Science Foundation.

In spite of the divergence of opinions concerning the information explosion, scientists and politicians agree that quick, selective information retrieval and dissemination are desirable. Progress toward these goals is being made by scores of organizations. One of the most interesting approaches has been made by a commercial concern, the Institute for Scientific Information, of Philadelphia. The Institute has, on magnetic computer tape, comprehensive information concerning current scientific periodicals, and it has devised effective means of using this resource. The coverage includes more than 1500 of the world's leading scientific journals, which in a year print more than 300,000 articles and perhaps over 90 percent of those reporting significant advances. The information concerning each article includes title, author or authors, and literature cited. Associated with the 300,000 articles are more than 3.3 million citations, 576,000 authors, and titles containing 2.1 million words. Altogether there are almost 10 million stored index items pertaining to the articles. A particularly useful tool in a search for significant articles in a particular field is the Citation Index. Authors usually cite literature that they feel is particularly relevant to their work. To learn what is new in a field one merely asks the computer for a list of published items that contain citations to previous important articles in that field. The computer can also be asked to supply a list of articles written by authors known to be active in a given area. Words or combinations of words in the title can also serve to identify items of interest.

A complete Citation Index, available quarterly, is bulky and contains more material than the average scientist wants. The Institute has a service much better designed to meet the needs of individuals. It is called Automatic Subject Citation Alert (ASCA). This service provides a weekly list of articles that have appeared in any of the 1500 scientific journals and that meet citation, author, or other indexing criteria that the user has provided.

An interesting by-product of the Citation Index is a new method of evaluating scientific productivity. Instead of counting a man's reprints, one counts citations of his work by others. Already sociologists are examining the value of this new analytical tool. They note some limitations but find that a citation index is a valuable aid to management.

—PHILIP H. ABELSON



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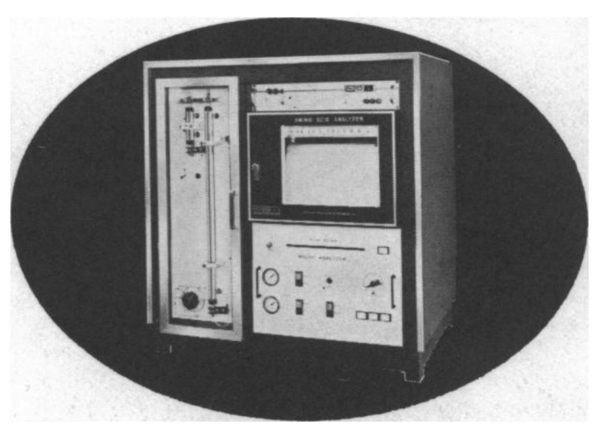

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Atlas of Planetary Solar Climate. vol. 5. Clyde J. Bollinger. Bollinger Climatic Research Service, Norman, Okla., 1966. 112 pp. Illus. Paper.

Atomic Absorption Spectroscopy. James W. Robinson. Dekker, New York, 1966. 216 pp. Illus. $9.75.

Atoms to Andromeda. S. T. Butler and H. Messel, Eds. Pergamon, New York, 1966. 301 pp. Illus. Paper, $3.50. The Commonwealth and International Library. Fifteen lectures given at the 1966 Nuclear Research Foundation Summer Science School for High School Students.

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Basic Matrix Analysis and Synthesis: With Applications to Electronic Engineering. G. Zelinger. Pergamon, New York, 1966. 244 pp. Illus. $7.50.

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Cold Cleaning with Halogenated Solvents. Prepared by Committee D-26 on Halogenated Organic Solvents. American Soc. for Testing and Materials, Philadelphia, 1966. 37 pp. Paper, $2.75; members, $1.95.

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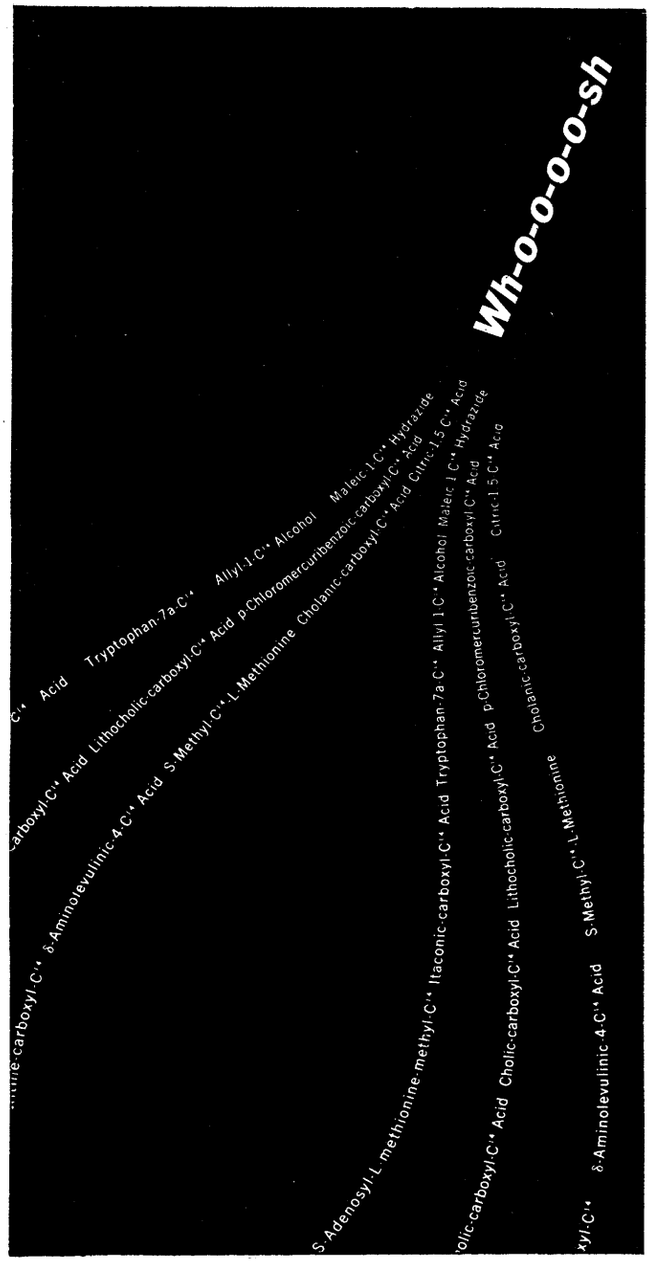
Encyclopedia of Polymer Science and Technology: Plastics, Resins, Rubbers, Fibers. vol. 4, *Collagen to Dialysis.* Herman F. Mark, Norman G. Gaylord, and Norbert M. Bikales, Eds. Interscience (Wiley), New York, 1966. 876 pp. Illus. $50.



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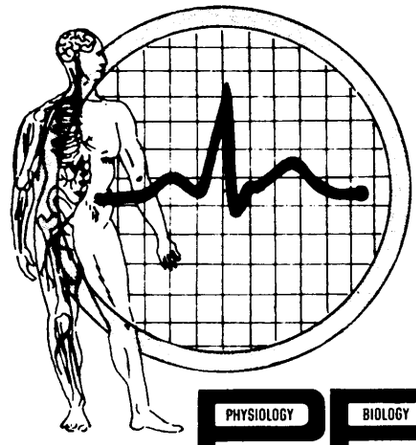

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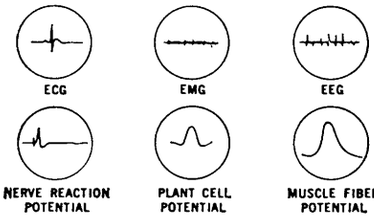

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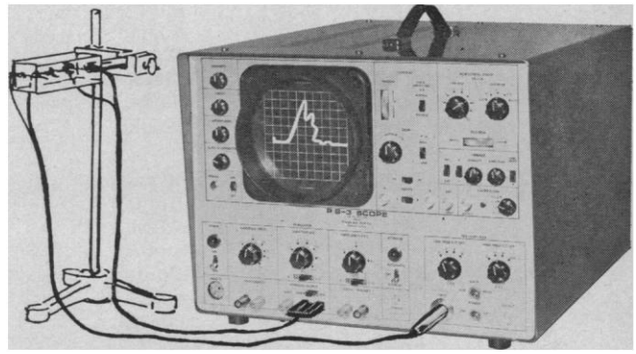

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Infrared Spectra of Cellulose and Its Derivatives. Rostislav Georgievich Zhbankov. Translated from the Russian edition (1964) by A. B. Densham. B. I. Stepanov, Translation Ed. Consultants Bureau, New York, 1966. 347 pp. Illus. $16.

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Introduction to Nucleic Acids: And Related Natural Products. T. L. V. Ulbricht. Oldbourne Press, London; Davey, New York, 1966. 107 pp. Illus. $7. Oldbourne Chemistry Series.

Introduction to Ordinary Differential Equations. Albert L. Rabenstein. Academic Press, New York, 1966. 443 pp. Illus. $9.95.

Introduction to Statistical Thermodynamics. Eldon L. Knuth. McGraw-Hill, New York, 1966. 256 pp. Illus. $7.95.

An Introduction to the Rock-Forming Minerals. W. A. Deer, R. A. Howie, and J. Zussman. Wiley, New York, 1966. 540 pp. Illus. $11.

An Introduction to the Theory of Molecular Structure. Jean-Joseph Charette. Reinhold, New York, 1966. 200 pp. Illus. $7.50.

Introductory Computer Programming. Fredric Stuart. Wiley, New York, 1966. 167 pp. Illus. $5.95.

The Kinetics of Free Radical Polymerization. Alastair M. North. Pergamon, New York, 1966. 136 pp. Illus. $6.50. The International Encyclopedia of Physical Chemistry and Chemical Physics.

Kirk-Othmer Encyclopedia of Chemical Technology. vol. 9, *Ferroelectrics to Foams.* Herman F. Mark, John J. McKetta, Jr., and Donald F. Othmer, Eds. Interscience (Wiley), New York, ed. 2, 1966. 917 pp. Illus. $50.

Laser Receivers: Devices, Techniques, Systems. Monte Ross. Wiley, New York, 1966. 417 pp. Illus. $14.95. Wiley Series in Pure and Applied Optics.

Lasers: A Series of Advances. vol. 1. Albert K. Levine, Ed. Dekker, New York, 1966. 377 pp. Illus. $14.50. Five papers: "Pulsed ruby lasers" by V. Evtuhov and J. K. Neeland; "Optically pumped pulsed crystal lasers other than ruby" by L. F. Johnson; "Organic laser systems" by A. Lempicki and H. Samuelson; "Q modulation of lasers" by R. W. Hellwarth; and "Modes in optical resonators" by Herwig Kogelnik.

Lectures on Curves on an Algebraic Surface. David Mumford, with a section by G. M. Bergman. Princeton Univ. Press, Princeton, N.J., 1966. 212 pp. Illus. Paper, $4.50. Annals of Mathematics Studies, No. 59.

Lectures on Functional Equations and Their Applications. J. Aczél. Translated from the German edition (Basel, 1961) by Scripta Technica. Hansjorg Oser, Translation Ed. Academic Press, New York, 1966. 532 pp. Illus. $19.50. Mathematics in Science and Engineering, vol. 19.

Linear Framed Structures. Malcolm S. Gregory. Wiley, New York, 1966. 356 pp. Illus. $10.

Manual on Industrial Water and Industrial Waste Water. Sponsored by Committee D-19 on Industrial Water. American Soc. for Testing and Materials, Philadelphia, ed. 2, 1966. 958 pp. Illus. $16.75; members, $11.75.

Mass Spectrometric Analysis of Solids. Arthur J. Ahearn, Ed. Elsevier, New York, 1966. 183 pp. Illus. $10.75. Five papers: "Introductory survey" by A. J. Ahearn; "The production of ions from solids" by Richard E. Honig; "Photographic emulsions as ion detectors in quantitative mass spectrography" by Edward B. Owens; "Analysis of special samples" by J. W. Guthrie; and "Mass spectrographic microprobe analysis" by W. M. Hickam and G. G. Sweeney.

Mathematical Methods for Physicists. George Arfken. Academic Press, New York, 1966. 672 pp. Illus. $12.75.

Mathematics for Electrical Circuit Analysis. D. P. Howson. Pergamon, New York, 1966. 180 pp. Illus. Paper, $3.50. Commonwealth and International Library.

Matrices and Linear Transformations. Charles G. Cullen. Addison-Wesley, Reading, Mass., 1966. 237 pp. Illus. $8.95.

Matrix Algebra for Physicists. R. K. Eisenschitz. Plenum Press, New York, 1966. 132 pp. Illus. $4.95.

The Mechanical and Physical Properties of the British Standard En Steels (B.S. 970-1955). vol. 2, *En 21 to En 39*. Compiled by J. Woolman and R. A. Mottram. Pergamon, New York, 1966. 508 pp. Illus. $20.

Methods and Techniques in Geophysics. vol. 2. S. K. Runcorn, Ed. Interscience (Wiley), New York, 1966. 324 pp. Illus. $11.50. Seven papers: "Electromagnetic scale modeling" by David W. Strangway; "High-pressure techniques" by P. J. Wylie; "Techniques for measuring high-frequency components of the geomagnetic field" by H. J. Duffus; "Fourier methods in geophysics" by N. F. Barber; "Methods and apparatus for alternating current and thermal demagnetization" by E. Thellier; "Seismic prospecting" by C. Hewitt Dix; and "Precision methods of potassium-argon isotopic age determination on young rocks" by Ian McDougall.

Microcosm and Macrocosm. An approach to the synthesis of the real. Michael M. Hare. Julian Press, New York, 1966. 317 pp. Illus. $15.

Modern Electronics: A Practical Guide for Scientists and Engineers. Hendrik de Waard and David Lazarus. Addison-Wesley, Reading, Mass., 1966. 368 pp. Illus. $9.75.

Modern Metallography. R. E. Smallman and K. H. G. Ashbee. Pergamon, New York, 1966. 223 pp. Illus. Paper, $2.95. Commonwealth and International Library.

Modulation, Resolution and Signal Processing in Radar, Sonar and Related Systems. R. Benjamin, Pergamon, New York, 1966. 196 pp. Illus. $8.50. International Series of Monographs in Electronics and Instrumentation.

Network Analysis and Synthesis. Franklin F. Kuo. Wiley, New York, ed. 2, 1966. 533 pp. Illus. $11.95.

Nonlinear Differential Equations. T. V. Davies and Eleanor M. James. Addison-Wesley, Reading, Mass., 1966. 284 pp. Illus. $12.75.

Nonlocal Problems of the Theory of

Oscillations. V. A. Pliss. Translated from the Russian edition (Moscow, 1964) by Scripta Technica. Harry Herman, Translation Ed. Academic Press, New York, 1966. 318 pp. Illus. $13.50.

Oxyacids. M. W. Lister. Oldbourne Press, London; Davey, New York, 1966. 142 pp. Illus. $7. Oldbourne Chemistry Series.

The Particle Kinetics of Plasmas. I. P. Shkarofsky, T. W. Johnston, and M. P. Bachynski. Addison-Wesley, Reading, Mass., 1966. 528 pp. Illus. $17.50.

Phase Diagrams of Multicomponent Systems: Geometric Methods. Fanya Moiseevna Perel'man. Translated from the Russian edition (Moscow, 1965) by David A. Paterson. Consultants Bureau, New York, 1966. 92 pp. Illus. Paper, $12.50.

Physical Organic Chemistry. Owen H. Wheeler. Elsevier, New York, 1966. 182 pp. Illus. $10. Principles of Modern Chemistry Series, vol. 2.

The Principles and Practice of Surveying. vol. 1, *Elementary Surveying.* Charles B. Breed and George L. Hosmer. Wiley, New York, ed. 10, 1966. 743 pp. Illus. $7.75.

Principles of Aerial Design. H. Page. Iliffe, London; Van Nostrand, Princeton, N.J., 1966. 172 pp. Illus. $8.75.

Principles of Defect Chemistry of Crystalline Solids. W. Van Gool. Academic Press, New York, 1966. 160 pp. Illus. $7.

Principles of Desalination. K. S. Spiegler, Ed. Academic Press, New York, 1966. 582 pp. Illus. $21. Eleven papers: "Desalination research and water resources" by W. S. Gillam and W. H. McCoy; "Thermoeconomic considerations of sea water demineralization" by Robert B. Evans, Gary L. Crellin, and Myron Tribus; "Distillation" by R. S. Silver; "Vapor reheat distillation" by Teynham Woodward; "Solar distillation" by George O. G. Löf; "Electrodialysis" by L. H. Shaffer and M. S. Mintz; "Freezing methods" by A. E. Snyder; "Hyperfiltration (reverse osmosis)" by James S. Johnson, Jr., Lawrence Dresner, and Kurt A. Kraus; "Preparation of ultrapure water" by C. Calmon and A. W. Kingsbury; "Scale formation and prevention" by J. Louis York and Bernard J. Schorle; and "The cost of conventional water supply" by Louis Koenig.

Principles of Physical Oceanography. Gerhard Neumann and Willard J. Pierson, Jr. Prentice-Hall, Englewood Cliffs, N.J., 1966. 557 pp. Illus. $30.

Progress in Heat Transfer. P. K. Konakov, Ed. Translated from the Russian edition (Moscow, 1965) by James S. Wood. Consultants Bureau, New York, 1966. 167 pp. Illus. Paper, $20. Twenty-two papers.

Progress in Inorganic Chemistry. vol. 7. F. Albert Cotton, Ed. Interscience (Wiley), New York, 1966. 480 pp. Illus. $14.50. Six papers: "High-pressure inorganic chemistry" by H. Tracy Hall; "Recent progress in sulfur-fluorine chemistry" by Stanley M. Williamson; "Metal complexes of Schiff bases and β-ketoamines" by R. H. Holm, G. W. Everett, Jr., and A. Chakravorty; "The cotton effect in coordination compounds" by R. D. Gillard; "Nitric oxide compounds of transition metals" by B. F. G. Johnson and J. A. McCleverty; and "Metal β-ketoenolate complexes" by John P. Fackler, Jr.

Progress in Nuclear Energy. Series 9. vol. 6, *Analytical Chemistry*. D. C. Stewart and H. A. Elion, Eds. Pergamon, New York, 1966. 266 pp. Illus. $14. Five papers: "Ion exchange in mixed and non-aqueous media" by Johann Korkisch; "Some neutral bifunctional organophosphorus compounds as solvent extractants" by Jerome W. O'Laughlin; "Anion exchange in nitrate solutions" by John Faris and Robert F. Buchanan; "Analytical chemistry of neptunium" by G. A. Burney, E. K. Dukes, and H. J. Groh; "The analytical chemistry of polonium" by Robert C. Lange.

The Properties of Gases and Liquids: Their Estimation and Correlation. Robert C. Reid and Thomas K. Sherwood. McGraw-Hill, New York, ed. 2, 1966. 668 pp. Illus. $27.50.

Purification of Laboratory Chemicals. D. D. Perrin, W. L. F. Armarego, and Dawn R. Perrin. Pergamon, New York, 1966. 370 pp. $11.

Quantum Mechanics. Philip Stehle. Holden-Day, San Francisco, 1966. 271 pp. Illus. $9.75. Holden-Day Series in Physics.

Quantum Mechanics. vol. 2, *New Quantum Theory*. Sin-Itiro Tomonaga. Translated from the Japanese by Koshiba. Interscience (Wiley), New York, 1966. 486 pp. Illus. $15.50.

Refractory Semiconductor Materials. Yu. V. Shmartsev, Yu. A. Valov, and A. S. Borshchevskii. N. A. Goryunova and D. N. Nasledov, Eds. Translated from the Russian edition (Moscow, 1964) by Albin Tybulewicz. Consultants Bureau, New York, 1966. 103 pp. Illus. Paper, $12.50.

Relativistic Kinematics. Henri Arzeliès. Translation based on the French edition (Paris, 1965). Pergamon, New York, 1966. 310 pp. Illus. $12.

Relativistic Theory of Reactions (Model Independent Methods). J. Werle. North-Holland, Amsterdam; Interscience (Wiley), New York, 1966. 475 pp. Illus. $17.50.

Reliability Handbook. W. Grant Ireson, Ed. McGraw-Hill, New York, 1966. 702 pp. Illus. $22.50.

Research in Electric Power. Philip Sporn. Pergamon, New York, 1966. 80 pp. Paper, $1.50. The Commonwealth and International Library.

Research in Surface Forces. vol. 2, *Three-Dimensional Aspect of Surface Forces*. B. V. Deryagin, Ed. Translated from the Russian edition (Moscow, 1964) by Paul Porter Sutton. Consultants Bureau, New York, 1966. 328 pp. Illus. Paper, $27.50. Forty papers.

Sandwich Construction: The Bending and Buckling of Sandwich Beams, Plates, and Shells. Frederik J. Plantema. Wiley, New York, 1966. 268 pp. Illus. $14.95.

Seismo-Acoustic Methods in Mining. M. S. Antsyferov, Ed. Translated from the Russian edition (Moscow, 1964) by S. E. Hall. George V. Keller, Translation Ed. Consultants Bureau, New York, 1966. 142 pp. Illus. Paper, $17.50.

Sequences. vol. 1. H. Halberstam and K. F. Roth. Oxford Univ. Press, New York, 1966. 311 pp. Illus. $10.10.

Shock Waves and Detonations in Gases. R. I. Soloukhin. Translated from the Russian edition (Moscow, 1963) by Boris W. Kuvshinoff. Mono Book Corp., Baltimore, 1966. 192 pp. Illus. $7.

Simulation Techniques for Design of Water-Resource Systems. Maynard M. Hufschmidt and Myron B. Fiering. Harvard Univ. Press, Cambridge, Mass., 1966. 230 pp. Illus. $7.50.

Solid Surfaces and Interfaces. H. Mykura. Routledge and Kegan Paul, London; Dover, New York, 1966. 80 pp. Illus. Paper, $1.35.

Some Problems in the Theory of Creep. N. Kh. Arutyunyan. Translated from the Russian edition by H. E. Nowottny. A. Graham, Translation Ed. Pergamon, New York, 1966. 302 pp. Illus. $12.50. International Series of Monographs in Civil Engineering, vol. 1.

Statics. J. L. Meriam. Wiley, New York, 1966. 338 pp. Illus. $7.50.

The Statics of Particles and Rigid Bodies. vol. 1. John Hersee. Pergamon, New York, 1966. Unpaged. Illus. Paper, $4.50. The Commonwealth and International Library.

Stoichiometry: Atomic Weights, Molecular Formulas, Microcosmic Magnitudes. Leonard K. Nash. Addison-Wesley, Reading, Mass., 1966. 192 pp. Illus. Paper, $2.95; cloth, $3.95. Addison-Wesley Series in the Principles of Chemistry.

Strength of Materials: A Course for Students. Peter Black. Pergamon, New York, 1966. 466 pp. Illus. $7.50.

The Structure of Polymers. M. L. Miller. Reinhold, New York, 1966. 720 pp. Illus. $27. Polymer Science and Engineering Series.

Supplemental Report on the Elevated-Temperature Properties of Chromium-Molybdenum Steels. Prepared by John A. VanEcho and Ward F. Simmons. American Soc. for Testing and Materials, Philadelphia, 1966. 70 pp. Illus. Paper, $2.25.

Tables of Laguerre Polynomials and Functions. V. S. Aizenshtadt, V. I. Krylov, and A. S. Metel'skii. Translated from the Russian edition (Minsk, 1963) by Prasenjit Basu. Pergamon, New York, 1966. 166 pp. Illus. $8. Mathematical Tables Series, vol. 39.

Tchebycheff Systems: With Applications in Analysis and Statistics. Samuel Karlin and William J. Studden. Interscience (Wiley), New York, 1966. 604 pp. Illus. $16. Pure and Applied Mathematics, vol. 15.

A Textbook of Chemistry. Stella Goostray and J. Rae Schwenck. Macmillan, New York, ed. 9, 1966. 527 pp. Illus. $6.95.

Theory of Elementary Gas Reaction Rates. Don L. Bunker. Pergamon, New York, 1966. 127 pp. Illus. $5.50. The International Encyclopedia of Physical Chemistry and Chemical Physics.

The Theory of Neutron Slowing Down in Nuclear Reactors. Joel H. Ferziger and P. F. Zweifel. Pergamon, New York, 1966. 320 pp. Illus. $12.50. International Series of Monographs in Nuclear Energy.

Thermodynamics of Certain Refractory Compounds. vol. 2, *Thermodynamics Tables, Bibliography, and Property File. Sections VII, VIII, and IX.* Harold L. Schick. Academic Press, New York, 1966. 295 pp. $23.

Thermodynamics of Molten Salt Mixtures. J. Lumsden. Academic Press, New York, 1966. 359 pp. Illus. $13.

Transform and State Variable Methods in Linear Systems. Someshwar C. Gupta. Wiley, New York, 1966. 444 pp. Illus. $12.75.

Treatise on Analytical Chemistry. pt. 2, *Analytical Chemistry of Inorganic and Organic Compounds.* vol. 4, *Aluminum, Calcium, Gold, Radon-Radium, Silver, Strontium-Barium.* Section A, *Systematic Analytical Chemistry of the Elements.* I. M. Kolthoff and Philip J. Elving, Eds. Interscience (Wiley), New York, 1966. 472 pp. Illus. $17. Contributors are Ernst Bolter, G. H. Farrah, Nathaniel Herz, M. L. Moss, Edwin P. Przybylowicz, Jacob Sedlet, Karl K. Turekian, and Carl W. Zuehlke.

Tufflavas and Ignimbrites: A Survey of Soviet Studies. Earl F. Cook, Ed. Translated from the Russian by Miriam Carty. Elsevier, New York, 1966. 224 pp. Illus. $7. Thirty papers on the following topics: General Problems (7 papers); Descriptions of Tufflavas and Ignimbrites Found in and Near the Soviet Union (19 papers); and The Practical Use of Tufflavas and Ignimbrites (4 papers).

Twilight: A Study in Atmospheric Optics. Georgii Vladimirovich Rozenberg. Translated from the Russian edition (Moscow, 1963) by Richard B. Rodman. Plenum Press, New York, 1966. 368 pp. Illus. $20.

Ultraviolet Spectra of Elastomers and Rubber Chemicals. V. S. Fikhtengol'ts, R. V. Zolotareva, and Yu. A. L'vov. Translated from the Russian edition (Moscow, 1965) by A. Eric Stubbs. Plenum Press, New York, 1966. 180 pp. Illus. $9.

Unsteady State Heat Transfer. Y. V. Kudryavtsev. Translated from the Russian edition (Moscow, 1961) by Scripta Technica. Iliffe, London; Elsevier, New York, 1966. 160 pp. Illus. $7.50.

Vector Spaces of Finite Dimension. G. C. Shephard. Oliver and Boyd, Edinburgh; Interscience (Wiley), New York, 1966. 208 pp. Illus. $3.25. University Mathematical Texts.

Water and Wastewater Engineering. vol. 1, *Water Supply and Wastewater Removal.* Gordon Maskew Fair, John Charles Geyer, and Daniel Alexander Okun. Wiley, New York, 1966. Unpaged. Illus. $13.50.

Wave and Oscillatory Phenomena in Electron Beams at Microwave Frequencies. V. N. Shevchik, G. N. Shvedov, and A. V. Soboleva. Translated from the Russian edition (1962) by O. M. Blunn. B. Meltzer, Translation Ed. Pergamon, New York, 1966. 380 pp. Illus. $15. International Series of Monographs in Electronics and Instrumentation, vol. 34, edited by D. W. Fry, L. Costrell, and K. Kandiah.

Wave Mechanics for Chemists. C. W. N. Cumper. Academic Press, New York, 1966. 392 pp. Illus. $11.50.

X-Ray Diffraction Tables. J. H. Fang and F. Donald Bloss. Southern Illinois Univ. Press, Carbondale, 1966. Unpaged. $12.75.

X-Ray Emission Spectrography in Geology. Isidore Adler. Elsevier, New York, 1966. 270 pp. Illus. $16. Methods in Geochemistry and Geophysics Series.

Ylid Chemistry. A. William Johnson. Academic Press, New York, 1966. 398 pp.

Illus. $12.50. Organic Chemistry, A Series of Monographs.

Zahlentheorie. Senon I. Borewicz and Igor R. Safarevič. Birkhäuser, Basel, Switzerland, 1966. 468 pp. Illus. F. 56.

Zone Melting. Hermann Schildknecht. Translated from the German edition by Express Translation Service. Verlag Chemie, Weinheim; Academic Press, New York, 1966. 234 pp. Illus. $9.

Biological and Medical Sciences

Advances in Radiation Biology. vol. 2. Leroy G. Augenstein, Ronald Mason, and Max Zelle, Eds. Academic Press, New York, 1966. 381 pp. Illus. $15. Six papers: "Reactivation after photobiological damage" by Claud S. Rupert and Walter Harm; "The study of labile states of biological molecules with flash photolysis" by Leonard I. Grossweiner; "Repair of premutational damage" by R. F. Kimball; "The genetic control of radiation sensitivity in microorganisms" by Howard I. Adler; "A physical approach to the visual receptor process" by Barnett Rosenberg; and "The role of genetic damage in radiation-induced cell lethality" by D. R. Davies and H. J. Evans.

The Amino Sugars: The Chemistry and Biology of Compounds Containing Amino Sugars. vol. 2B, *Metabolism and Interactions.* Endre A. Balazs and Roger W. Jeanloz, Eds. Academic Press, New York, 1966. 534 pp. Illus. $22. Fourteen papers: "Metabolism of amino sugars" by Eugene A. Davidson; "Metabolism of glycosaminoglycans" by Harry Boström and Lennart Rodén; "Metabolism of glycoproteins, glycopeptides, and glycolipids" by Ikuo Yamashina; "Effect of steroid hormones on the glycosaminoglycans of target connective tissues" by J. A. Szirmai; "Hexosaminidases" by P. G. Walker; "Neuraminidases" by Max E. Rafelson, Jr., Michael Schneir, and Vannie W. Wilson, Jr.; "Enzymes degrading glycosaminoglycans" by Heinz Gibian; "Sulfatases of glycosaminoglycans" by K. S. Dodgson; "Activation and inhibition of enzymes by polyanions containing amino sugars" by Peter Bernfeld; "Chemical and physical changes of glycosaminoglycans and glycoproteins caused by oxidation-reduction systems and radiation" by Lars Sundblad and Endre A. Balazs; "Interaction of polyanions with blood components" by Peter Bernfeld; "Immunochemistry" by Georg F. Springer; "Interaction between glycoproteins and viruses" by Alfred Gottschalk; and "Interaction of amino sugars and amino sugar-containing macromolecules with viruses, cells, and tissues" by Endre A. Balazs and Bernard Jacobson.

Annual Review of Medicine. vol. 17. Arthur C. DeGraff, Ed. Annual Reviews, Palo Alto, Calif., 1966. 571 pp. Illus. $8.50. Thirty-one papers contributed by D. Gitlin; B. B. Levine; G. Edsall; H. A. Azar; C. M. Pearson; J. Berkman and H. Rifkin; P. M. Hartroft; S. S. Waldstein; W. L. Nyhan and P. Tocci; M. Cornblath; E. C. Easson; R. Katzman; S. J. Yaffe; B. Becker and N. Ballin; D. H. Present, A. E. Lindner, and H. D. Janowitz; I. M. Arias; J. R. O'Brien; R. B. McConnell; A. E. Szulman; W. C. Levin and S. E. Ritz-

mann; J. B. Zabriskie; W. Lester; C. H. Andrewes; B. R. Forsyth and R. M. Chanock; C. M. Kunin; J. H. Menkes and B. R. Migeon; A. L. Hyman; T. Killip, III, and C. T. Lambrew; B. Eiseman, F. C. Spencer, and W. G. Malette; G. Fletcher and J. P. Bunker; and J. H. Bloch, C. H. Pierce, and R. C. Lillehei.

Atlas of Histology: Normal Microscopic Anatomy of Man. Ernst von Herrath. Translated from the first German edition (Stuttgart, 1950) by C. Hans Keysser and Peter H. Bartels. Hafner, New York, 1966. 188 pp. Illus. $22.50.

Biochemical Engineering. Shuichi Aiba, Arthur E. Humphrey, and Nancy F. Millis. Academic Press, New York, 1965. 339 pp. Illus. $15.

Biochemistry Laboratory Techniques. Sterling Chaykin. Wiley, New York, 1966. 177 pp. Illus. $5.95.

Biological Techniques: Collecting, Preserving, and Illustrating Plants and Animals. Jens W. Knudsen. Harper and Row, New York, 1966. 539 pp. Illus. $12.

Biology. E. Lendell Cockrum, William J. McCauley, and Newell A. Younggren. Saunders, Philadelphia, 1966. 817 pp. Illus. $9; **Laboratory Exercises in Biology.** Russell Davis, James R. Dawson, E. Lendell Cockrum, and William J. McCauley. 395 pp. Paper, $4.95.

Biology: Its Principles and Implications. Garrett Hardin. Freeman, San Francisco, ed. 2, 1966. 781 pp. Illus. $9.50. (**Teachers Manual,** 61 pp.)

Biorganic Mechanisms. vol. 1. Thomas C. Bruice and Stephen J. Benkovic. Benjamin, New York, 1966. 370 pp. Illus. $25. Frontiers in Chemistry Series, edited by Ronald Breslow and Martin Karplus.

Cell Water. D. A. T. Dick. Butterworth, Washington, D.C., 1966. 165 pp. Illus. $6.95. Molecular Biology and Medicine Series, edited by E. Edward Bittar.

Chemistry of Vegetable Tannins. E. Haslam. Academic Press, New York, 1966. 187 pp. Illus. $8.

The Diatoms of the United States: Exclusive of Alaska and Hawaii. vol. 1, *Fragilariaceae, Eunotiaceae, Achnanthaceae, Naviculaceae.* Ruth Patrick and Charles W. Reimer. Acad. of Natural Sciences, Philadelphia, 1966. 702 pp. Illus. $18.50.

Drug and Tracer Kinetics. Aldo Rescigno and Giorgio Segre. Translated from the Italian edition (Torino, 1961) by Piero Ariotti. Blaisdell (Ginn), Waltham, Mass., 1966. 219 pp. Illus. $7.50.

Ecology and Field Biology. Robert Leo Smith. Harper and Row, New York, 1966. 700 pp. Illus. $12.75.

Electrophoresis: A Practical Laboratory Manual. S. T. Nerenberg. Davis, Philadelphia, 1966. 280 pp. Illus. Paper, $9.50.

Enzyme and Metabolic Inhibitors. vols. 2 and 3. vol. 2, *Malonate, Analogs, Dehydroacetate, Sulfhydryl Reagents, o-Iodosobenzoate, Mercurials* (1259 pp. $34); vol. 3, *Iodoacetate, Maleate, N-Ethylmaleimide, Alloxan, Quinones, Arsenicals* (1048 pp. $32). J. Leyden Webb. Academic Press, New York, 1966. Illus.

Essays in Biochemistry. vol. 2. P. N. Campbell and G. D. Greville, Eds. Published for The Biochemical Society. Academic Press, New York, 1966. 241 pp. Illus. Paper, $4.20. Five papers: "Ana-

plerotic sequences and their role in metabolism" by H. L. Kornberg; "The nature and function of hexokinases in animal tissues" by D. G. Walker; "The metabolism of animal phospholipids and their turnover in cell membranes" by R. M. C. Dawson; "Steroidal oral contraceptive agents" by V. Petrow; and "Mechanisms of protein evolution" by G. H. Dixon.

Functional Organelles. John H. Morrison. Chapman and Hall, London; Reinhold, New York, 1966. 128 pp. Illus. Paper, $1.95. Selected Topics in Modern Biology, edited by Peter Gray.

General Endocrinology. C. Donnell Turner. Saunders, Philadelphia, ed. 4, 1966. 593 pp. Illus. $10.

Guide to the Analysis of Pesticide Residues. vols. 1 and 2. Prepared by H. P. Burchfield and Donald E. Johnson. U.S. Department of Health, Education, and Welfare, Washington, D.C., 1965 (order from Superintendent of Documents, Washington, D.C.). Unpaged. Illus. $12.75 set.

Handbook of Experimental Pharmacology. vol. 18, *Histamine and Anti-Histaminics*. Pt. 1, Histamine. Its Chemistry, Metabolism and Physiological and Pharmacological Actions. Mauricio Rocha e Silva, Ed. Springer-Verlag, New York, 1966. 1027 pp. Illus. $46. Thirty-five papers; in English or German.

Integral Animal Behavior. David E. Davis. Macmillan, New York, 1966. 128 pp. Illus. Paper, $1.95. Current Concepts in Biology, edited by Norman H. Giles, Walter Kenworthy, and John G. Torrey.

The International Handbook of Group Psychotherapy. J. L. Moreno, Ed. Philosophical Library, New York, 1966. 747 pp. Illus. $17.50.

Introduction to Agricultural Botany in India. vol. 1. G. V. Chalam and J. Venkateswarlu. Asia Publishing House; Taplinger, New York, 1966. 480 pp. Illus. $18.

Leitfaden der Trink-und Brauchwasserbiologie. Herbert Beger. Revised and enlarged by J. Gerloff and D. Lüdemann. Fischer, Stuttgart, Germany, ed. 2, 1966. 368 pp. Illus. $10.50.

Maize in Tropical Africa. Marvin P. Miracle. Univ. of Wisconsin Press, Madison, 1966. 345 pp. Illus. $7.50.

Manual for the Classification and Determination of the Anaerobic Bacteria. Andre R. Prevot. Translated from the third French edition (Paris, 1957) by V. Fredette. Lea and Febiger, Philadelphia, 1966. 402 pp. $15.

Medical Microbiology: A Guide to the Laboratory Diagnosis and Control of Infection. Robert Cruickshank, Ed. Williams and Wilkins, Baltimore, ed. 11, 1965. 1079 pp. Illus. $11.

Microbial Models of Cancer Cells. G. F. Gause. Saunders, Philadelphia, 1966. 109 pp. Illus. $4.50. Frontiers of Biology, vol. 1, edited by A. Neuberger and E. L. Tatum.

Modern Topics in Biochemistry. Structure and function of biological molecules. Thomas Peter Bennett and Earl Frieden. Macmillan, New York, 1966. 192 pp. Illus. Paper, $2.95.

Neurophysiology: A Primer. Charles F. Stevens. Wiley, New York, 1966. 192 pp. Illus. $6.95.

Normality: Theoretical and Clinical Concepts of Mental Health. Daniel Offer and Melvin Sabshin. Basic Books, New York, 1966. 266 pp. $5.50.

An Outline of Developmental Physiology. Chr. P. Raven. Translated from the Dutch edition (1948) by L. de Ruiter. Pergamon, New York, ed. 3, 1966. 236 pp. Illus. $5.

Perspectives in Experimental Gerontology. Compiled and edited by Nathan W. Shock. Thomas, Springfield, Ill., 1966. 419 pp. Illus. $16.75. Thirty papers on the following topics: Fritz Verzár: The Man and His Work (3 papers); Aging at the Molecular Level (4 papers); Aging in Tissues (6 papers); Models of Aging (5 papers); Environmental Factors in Aging (5 papers); Theories of Aging (6 papers); and The Future (1 paper).

Perspectives in Mental Retardation. Thomas E. Jordan, Ed. Southern Illinois Univ. Press, Carbondale, 1966. 372 pp. Illus. $8. Thirty-three papers on the following topics: The Dimensions of Retardation (3 papers); The Family (3 papers); The Institution (3 papers); Characteristics (3 papers); Language (3 papers); Psychodiagnostics (3 papers); Sources of Mental Retardation (3 papers); Patterns of Development (3 papers); Therapeutic Considerations (3 papers); Instruction (3 papers); and Independent Living (3 papers).

Peptide Synthesis. Miklos Bodanszky and Miguel A. Ondetti. Interscience (Wiley), New York, 1966. 304 pp. Illus. $9.50.

The Pituitary Gland. vols. 1 to 3. vols. 1 and 2, *Anterior Pituitary* (vol. 1, 600 pp.; vol. 2, 684 pp.); vol. 3, *Pars Intermedia and Neurohypophysis* (692 pp.). G. W. Harris and B. T. Donovan. Univ. of California Press, Berkeley, 1966. Illus. $75 set. Fifty-eight papers.

Principles of Hematology. James W. Linman. Macmillan, New York, 1966. 635 pp. Illus. $12.50.

The Principles of Pollination Ecology. K. Faegri and L. van der Pijl. Pergamon, New York, 1966. 258 pp. Illus. $9.50.

Procedures in Nucleic Acid Research. G. L. Cantoni and David R. Davies, Eds. Harper and Row, New York, 1966. 683 pp. Illus. $25. Sixty-one papers.

Progress in the Chemistry of Fats and Other Lipids. vol. 8, pt. 3. Ralph T. Holman, Ed. Pergamon, New York, 1966. 124 pp. Illus. Paper, $6.50. Three papers: "Recent developments in the thin-layer chromatography of lipids" by Donald C. Malins; "Paper chromatography of lipids" by James G. Hamilton; and "Column chromatography of lipids" by Robert A. Stein and Vida Slawson.

Psychology for Psychiatrists. C. G. Costello. Pergamon, New York, 1966. 340 pp. Illus. Paper, $3.75.

Pursuit of Agreement: Psychiatry and the Law. Jonas B. Robitscher. Lippincott, Philadelphia, 1966. 270 pp. $8.

The Rumen and Its Microbes. Robert E. Hungate. Academic Press, New York, 1966. 543 pp. Illus. $19.75.

Sensory Mechanisms. James Case. Macmillan, New York, 1966. 123 pp. Illus. Paper, $1.95. Current Concepts in Biology.

Shock: Pharmacological Principles in Treatment. Robert J. Marshall and Thomas D. Darby. Thomas, Springfield, Ill., 1966. 113 pp. Illus. $5.50. American Lectures in Living Chemistry Series, edited by I. Newton Kugelmass.

Thermobacteriology in Food Processing. C. R. Stumbo. Academic Press, New York, 1965. 254 pp. Illus. $10.50. Food Science and Technology Series, edited by M. L. Anson, C. O. Chichester, E. M. Mrak, and G. F. Stewart.

Tissue Grafting and Radiation. H. S. Micklem and John F. Loutit. Academic Press, New York, 1966. 240 pp. Illus. $7.

Topographic Brain Chemistry. Reinhard L. Friede. Academic Press, New York, 1966. 557 pp. Illus. $22.

Underwater Guideposts: Homing of Salmon. Arthur D. Hasler. Univ. of Wisconsin Press, Madison, 1966. 167 pp. Illus. $6.

Vitamins and Hormones: Advances in Research and Applications. vol. 23. Robert S. Harris, Ira G. Wool, and John A. Loraine, Eds. Academic Press, New York, 1965. 436 pp. Illus. $14. Seven papers: "Adrenal steroids and carbohydrate metabolism" by Bernard R. Landau; "Hormone antibodies in endocrinology" by Peter H. Wright; "The regulation of the synthesis and release of ACTH" by Joan Vernikos-Danellis; "Secretion of steroid hormones in vivo" by Kristen B. Eik-Nes and Peter F. Hall; "Interrelations between progesterone and the ovary, pituitary, and central nervous system in the control of ovulation and the regulation of progesterone secretion" by Irving Rothchild; "Hormone assays in human breast cancer" by R. D. Bulbrook; and "Biologically active substances in royal jelly" by Heinz Rembold.

Wave Mechanics and Molecular Biology. Louis de Broglie, Ed. Translated from the French edition. Addison-Wesley, Reading, Mass., 1966. 192 pp. Illus. $8.75. Adiwes International Series in Biology.

Weeds of the World: Biology and Control. Lawrence J. King. Leonard Hill, London; Interscience (Wiley), New York, 1966. 558 pp. Illus. $18. Plant Science Monographs Series, edited by Nicholas Polunin.

Wissenschaftliche Arbeiten. vol. 15, pt. 1. Fakultat fur Ackerbau, Landwirtschaftliche Hochschule "Wassil Kolarow." Staatlicher Verlag "Christo G. Danow," Plovdiv, Bulgaria, 1966. 455 pp. Illus.

Economics and the Social Sciences

Applied Regression Analysis. N. R. Draper and H. Smith. Wiley, New York, 1966. 417 pp. Illus. $11.75.

Comparative Functionalism. An essay in anthropological theory. Walter Goldschmidt. Univ. of California Press, Berkeley, 1966. 163 pp. $3.95.

Cost Estimating and Contract Pricing. Thomas F. McNeill and Donald S. Clark. Elsevier, New York, 1966. 524 pp. Illus. $15.

Federal Tax Policy. Joseph A. Pechman. Brookings Institution, Washington, D.C., 1966. 343 pp. Illus. Paper, $2.45. Studies of Government Finance.

International Opportunities for Advanced Training and Research in Psychology. Sherman Ross, Irving E. Alexander and Harold Basowitz, Project Directors. American Psychological Assoc., Washington, D.C., 1966. 405 pp. Illus. Paper.

Managerial Thinking; An International

Study. Mason Haire, Edwin E. Ghiselli, and Lyman W. Porter. Wiley, New York, 1966. 308 pp. Illus. $7.95.

Odour Preferences. R. W. Moncrieff. Leonard Hill, London, 1966. 357 pp. Illus. 90s.

Public Health and Population Change. A symposium on Research Issues in Public Health and Population Change sponsored by the Graduate School of Public Health, Univ. of Pittsburgh (Pittsburgh, Pa.), June 1964. Mindel C. Sheps and Jeanne Clare Ridley. Univ. of Pittsburgh Press, Pittsburgh, Pa., 1966. 575 pp. Illus. $10.

Research Papers in Statistics. F. N. David, Ed. Wiley, New York, 1966. 476 pp. Illus. $16.75. A volume of 26 papers presented to Jerzy Neyman on the occasion of his 70th birthday in 1964.

Role Theory: Concepts and Research. Bruce J. Biddle and Edwin J. Thomas, Eds. Wiley, New York, 1966. 467 pp. Illus. $8.95. Fifty-one papers.

Room to Grow: A Study of Parent-Child Relationships. Carroll Davis. Univ. of Toronto Press, Toronto, 1966. 240 pp. Illus. $6.

Studies in Cognitive Growth. A collaboration at the Center for Cognitive Studies. Jerome S. Bruner and others. Wiley, New York, 1966. 361 pp. Illus. $7.95. 14 papers.

Textbook of Elementary Psychology. Eugene Galanter. Holden-Day, San Francisco, 1966. 433 pp. Illus. $7.95.

The Theory of Road Traffic Flow. Winifred D. Ashton. Methuen, London; Wiley, New York, 1966. 186 pp. Illus. $5. Methuen's Monographs on Applied Probability and Statistics.

This Land Was Theirs: A Study of the North American Indian. Wendell H. Oswalt. Wiley, New York, 1966. 576 pp. Illus. $9.95.

Reprints

The Broken Image: Man, Science and Society. Floyd W. Matson. Doubleday, Garden City, N.Y., 1966. 356 pp. Paper, $1.45. Reprint, 1964 edition.

Cathode Ray Tube Displays. Theodore Soller, Merle A. Starr, and George E. Valley, Jr., Eds. Dover, New York, 1966. 764 pp. Illus. Paper $3.25. Reprint, 1948 edition.

Cell Biology: A Current Summary. John Paul. Stanford Univ. Press, Stanford, Calif., 1966. 207 pp. Illus. Paper, $1.95. Reprint, 1965 edition.

Differential Geometry. William C. Graustein. Dover, New York, 1966. 242 pp. Illus. Paper, $2. Reprint, 1935 edition.

Electronic Time Measurements. Britton Chance, Robert I. Hulsizer, Edward F. MacNichol, Jr., and Frederick C. Williams, Eds. Dover, New York, 1966. 558 pp. Illus. Paper, $3. Reprint, 1949 edition.

First Footsteps in East Africa. Sir Richard Burton. Edited with an introduction and additional chapters by Gordon Waterfield. Praeger, New York, 1966. 334 pp. Illus. $10. Reprint, 1894 edition. Travellers and Explorers Series.

Generalized Harmonic Analysis and Tauberian Theorems. Norbert Wiener. M.I.T. Press, Cambridge, Mass., 1966. 248 pp. Illus. Paper, $2.95. Two papers origi-

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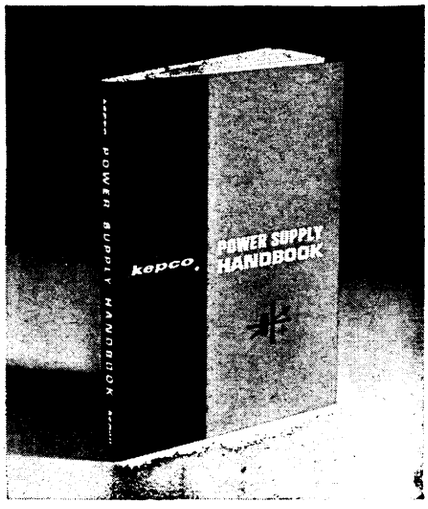

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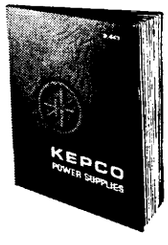

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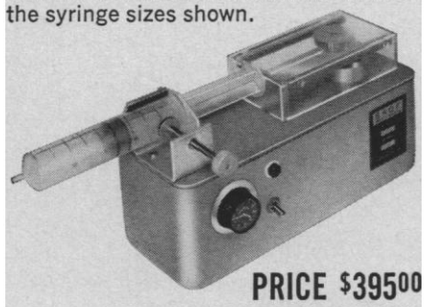

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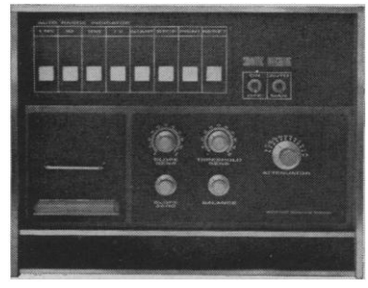

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nally published in 1930 and 1932, respectively.

Handbook of Birds of Eastern North America. Frank M. Chapman. Dover, New York, 1966. 617 pp. Illus. Paper, $3. Reprint of ed. 2, 1939.

The Identity of Man. J. Bronowski. Published for the American Museum of Natural History. Natural History Press, Garden City, N.Y., 1966. 119 pp. Paper, 95¢. Reprint, 1965 edition.

An Introduction to the Logic of the Sciences. R. Harré. Macmillan, London; St. Martin's Press, New York, 1966. 189 pp. Illus. Paper, $2.50. Reprint, 1960 edition.

Klystrons and Microwave Triodes. Donald R. Hamilton, Julian K. Knipp, and J. B. Horner Kuper. Dover, New York, 1966. 547 pp. Illus. Paper, $3. Reprint, 1948 edition.

Microwave Receivers. S. N. Van Voorhis, Ed. Dover, New York, 1966. 636 pp. Illus. Paper, $3. Reprint, 1948 edition.

A Mission to Gelele, King of Dahome. Sir Richard Burton. Edited with an introduction and notes by C. W. Newbury. Praeger, New York, 1966. 382 pp. Illus. $10. Reprint, 1864 edition. Travellers and Explorers Series.

The Moon. V. A. Firsoff. New American Library, New York, 1966. 127 pp. Illus. Paper, 60¢. Reprint, 1964 edition.

Nonlinear Problems in Random Theory. Norbert Wiener. M.I.T. Press, Cambridge, Mass., 1966. 141 pp. Illus. Paper, $2.45. Reprint, 1958 edition.

North American Trees (Exclusive of Mexico and Tropical United States. Richard J. Preston, Jr. M.I.T. Press, Cambridge, Mass., 1966. 429 pp. Illus. Paper, $2.95. Reprint of ed. 2, 1961.

Pregnancy, Birth and Abortion. Paul H. Gebhard, Wardell B. Pomeroy, Clyde E. Martin, and Cornelia V. Christenson. Wiley, New York, 1966. 298 pp. Illus. Paper, $1.65. Reprint, 1958 edition.

Principles of Human Relations: Applications to Management. Norman R. F. Maier. Wiley, New York, 1966. 484 pp. Illus. Paper, $2.65. Reprint, 1952 edition.

Probability and Experimental Errors in Science. An elementary survey. Lyman G. Parratt. Wiley, New York, 1966. 271 pp. Illus. Paper, $1.65. Reprint, 1961 edition.

Radar Aids to Navigation. John S. Hall, Ed. Dover, New York, 1966. 403 pp. Illus. Paper, $2.75. Reprint, 1947 edition.

Recollections of My Life. Santiago Ramón y Cajal. Translated from the third Spanish edition (1923) by E. Horne Craigie and Juan Cano. M.I.T. Press, Cambridge, Mass., 1966. 650 pp. Illus. $10. Reprint, 1937 edition.

The Remaking of a Culture: Life and Education in Puerto Rico. Theodore Brameld. Wiley, New York, 1966. 494 pp. Paper, $2.65. Reprint, 1958 edition.

Scientific Creativity: Its Recognition and Development. Selected papers from the Proceedings of the First, Second, and Third University of Utah Conferences. Calvin W. Taylor and Frank Barron, Ed. Wiley, New York, 1966. 443 pp. Paper, $2.65. Reprint, 1963 edition.

The Six-Cornered Snowflake. Johannes Kepler. Edited and translated by Colin Hardie. Oxford Univ. Press, New York,

1966. 90 pp. Illus. $3.40. Reprint, 1611 edition. Essays by L. L. Whyte and B. F. J. Mason.

Technique of Microwave Measurements. vols. 1 and 2. Carol G. Montgomery, Ed. Dover, New York, 1966. vol. 1, 500 pp.; vol. 2, 480 pp. Illus. Paper, $2 each volume. Reprint of 1947 edition (one volume).

Turkistane. Notes of a journey in Russian Turkistan, Kokand, Bukhara and Kuldja. Eugene Schuyler. Edited with an introduction by Geoffrey Wheeler, Praeger, New York, 1966. 341 pp. Illus. $10. 1876 edition abridged. Travellers and Explorers Series.

The Viruses. Helena Curtis. Published for the American Museum of Natural History. Natural History Press, Garden City, N.Y., 1966. 238 pp. Illus. Paper, $1.45. Reprint, 1965 edition.

Conference and Symposium Reports

The Computer in Physics Instruction. Report of the Conference on the Uses of the Computer in Undergraduate Physics Instruction (Irvine, Calif.), November 1965. Commission on College Physics, Ann Arbor, Mich., 1966. 90 pp. Illus. Paper. 13 papers.

Intermediate Energy Physics. vols. 1 and 2. Proceedings of a conference (Williamsburg, Va.), February 1966. Sponsored by National Aeronautics and Space Administration, U.S. Air Force Office of Scientific Research, U.S. Atomic Energy Commission, and U.S. National Science Foundation. H. O. Funsten, Ed. Department of Physics, College of William and Mary, Williamsburg, Va., 1966. vol. 1, 486 pp.; vol. 2, 342 pp. Illus. Paper. 45 papers.

Methods of Teaching Physics in Soviet Secondary Schools. Proceedings of the Institute of Teaching Methods. V. F. Yus'kovich, Ed. Translated from the Russian edition (Moscow, 1959) by A. Moscona. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1966. 189 pp. Illus. $7.50. Eight papers: "The present situation in the method of high-school physics and its bearing on the polytechnical instruction system" by D. D. Galanin; "The development of rational thought in students during the teaching of physics in secondary school" by V. F. Yus'kovich; " 'The electrical properties of the solid state' in school physics" by B. M. Yavorskii; "Experimental findings in teaching 'heat and work' in the 9th grade and 'direct current' in the 10th grade" by E. E. Evenchik; "Some methodological aspects of teaching electromagnetic field phenomena in secondary school" by N. M. Shakhmaev; "The use of analogy in the secondary-school physics course" by S. E. Kamenetskii; "The training of students for practical work in physics" by I. M. Rumyantsev; and "Technical creativity of students in physics hobby groups" by V. G. Razumovskii.

Molecular Architecture in Cell Physiology. A symposium (Woods Hole, Mass.), September 1964. Teru Hayashi and Andrew G. Szent-Györgyi, Eds. Prentice-Hall, Englewood Cliffs, N.J.,

1966. 260 pp. Illus. $7.50. Eleven papers.

Native Plants and Animals as Resources in Arid Lands of the Southwestern United States. A symposium (Flagstaff, Ariz.), May 1965. J. Linton Gardner, Ed. Committee on Desert and Arid Zones Research, Southwestern and Rocky Mountain Division, AAAS, Flagstaff, Ariz., 1966. 86 pp. Paper. Eleven papers: "Landholder responsibilities in management of native plants and animals" by Charles H. Stoddard; "Utilization of desert plants by native peoples: An overview of southwestern North America" by Robert L. Burgess; "Possible medicinal uses of native plants" by Mary E. Caldwell; "Grazing and watershed values of native plants" by Charles P. Pase; "Ecological effects of management of vegetation" by F. W. Went; "Management of native animals on federal lands" by Robert J. Smith; "Native fishes as natural resources" by W. L. Minckley; "Game animals as a resource in Arizona, U.S.A., and in Uganda, Africa" by Wendell G. Swank; "International cooperation in managing animals" by S. E. Jorgensen; "Esthetic values of native animals" by William H. Woodin; and "Desert dimension in outdoor recreation" by Frank S. Sylvester.

Nerve as a Tissue. Proceedings of a conference (Philadelphia), November 1964. Kaare Rodahl and Bela Issekutz, Jr., Eds. Harper and Row, New York, 1966. 480 pp. Illus. $18.50. Seventeen papers on the following topics: morphology (4 papers); biochemistry (5 papers); physiology and pharmacology (4 papers); and pathophysiology (4 papers). See Meeting Reports, *Science* **147**, 414 (1965).

Neuroblastomas Biochemical Studies. C. Bohuon, Ed. Springer-Verlag, New York, 1966. 82 pp. Illus. $4. Recent Results in Cancer Research Series, vol. 2. Eleven papers presented at a Colloque (Paris), May 1964.

Neurosciences Research Symposium Summaries. vol. 1. Francis O. Schmitt and Theodore Melnechuk, Eds. M.I.T. Press, Cambridge, Mass., 1966. 590 pp. Illus. $7.50. Twenty-five papers that were given at nine work sessions held in 1963 and 1964 by the Neurosciences Research Program.

Neutron Dynamics and Control. Proceedings of a symposium (Tucson, Ariz.), April 1965. David L. Hetrick and Lynn E. Weaver, Eds. U.S. Atomic Energy Commission, Oak Ridge, Tenn., 1966 (available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.). 619 pp. Illus. Paper, $4.50. Thirty-two papers.

Nuclear Spin-Parity Assignments. Proceedings of a conference (Gatlinburg, Tenn.), November 1965. Norwood B. Gove and Russell L. Robinson, Eds. Academic Press, New York, 1966. 475 pp. Illus. $7.50. Sixty papers.

Numerical Solution of Partial Differential Equations. Proceedings of a symposium (College Park, Md.), May 1965. James H. Bramble, Ed. Academic Press, New York, 1966. 389 pp. Illus. $16.50. Twenty papers.

Optical Properties and Electronic Structure of Metals and Alloys. Proceedings of

the International Colloquium (Paris), September 1965. F. Abelès, Ed. North-Holland, Amsterdam; Interscience (Wiley), New York, 1966. 655 pp. Illus. $18.50. 53 papers.

Perturbation Theory and its Applications in Quantum Mechanics. Proceedings of an advanced seminar conducted by the Mathematics Research Center, U.S. Army, and the Theoretical Chemistry Institute, University of Wisconsin (Madison), October 1965. Calvin H. Wilcox, Ed. Wiley, New York, 1966. 438 pp. Illus. $6.95. Fourteen papers.

Polarography 1964. vols. 1 and 2. Proceedings of the Third International Congress (Southhampton, England), July 1964. Graham J. Hills, Ed. Interscience (Wiley), New York, 1966. vol. 1, 713 pp.; vol. 2, 507 pp. Illus. $49.50 set. Ninety-one papers; most of the papers are in English; some are in French or German.

Proceedings of the Ninth International Conference on Cosmic Rays (London), September 1965. vols. 1 and 2. Institute of Physics and the Physical Society, London, 1966. vol. 1, 619 pp.; vol. 2, 530 pp. Illus. Paper, £10 10s.; members, £5 per set. 317 papers.

Process Simulation and Control in Iron and Steelmaking. Proceedings of a symposium (New York), February 1964. J. M. Uys and H. L. Bishop, Eds. Gordon and Breach, New York, 1966. 350 pp. Illus. Paper, $9; cloth, $19.50. Eleven papers.

Quantum Fluids. Proceedings of the Sussex University Symposium (Brighton, England), August 1965. D. F. Brewer, Ed. North-Holland, Amsterdam; Interscience (Wiley), New York, 1966. 368 pp. Illus. $13.50. Thirty-four papers.

Recent Advances in Biological Psychiatry. vol. 8. Proceedings of the twentieth annual convention (New York), April-May 1965. Joseph Wortis, Ed. Plenum Press, New York, 1966. 381 pp. Illus. $16.50. Twenty-seven papers on the following topics: clinical models and formulations (3 papers); the laboratory animal as model (4 papers); model psychopathologic states (1 paper); cholinergic mechanisms in mental illness: anticholinergic hallucinogens (7 papers); animals and molecules (2 papers); the neurophysiologic model (6 papers); and computer analysis and models with special reference to EEG (4 papers).

Refractory Metals and Alloys 3: Applied Aspects. Proceedings of the third conference (Los Angeles), December 1963. Robert I. Jaffee, Ed. Gordon and Breach, New York, 1966. 1038 pp. illus. Paper, vol. 1, $10.80; vol. 2, $9.50; cloth, $59.50. Seventy papers.

The Solar Wind. Proceedings of a conference (Pasadena, Calif.), April 1964. Sponsored by the Jet Propulsion Laboratory, California Institute of Technology. Robert J. Mackin, Jr. and Marcia Neugebauer, Eds. Pergamon, New York, 1966. 449 pp. Illus. $17. 28 papers.

Space Power Systems Engineering. Based on the American Institute of Aeronautics and Astronautics Third Biennial Aerospace Power Systems Conference (Philadelphia), September 1964. Academic Press, New York, 1966. 1322 pp. Illus. $13. Fifty-seven papers.

Stellar Evolution. Proceedings of an international conference (New York), No-