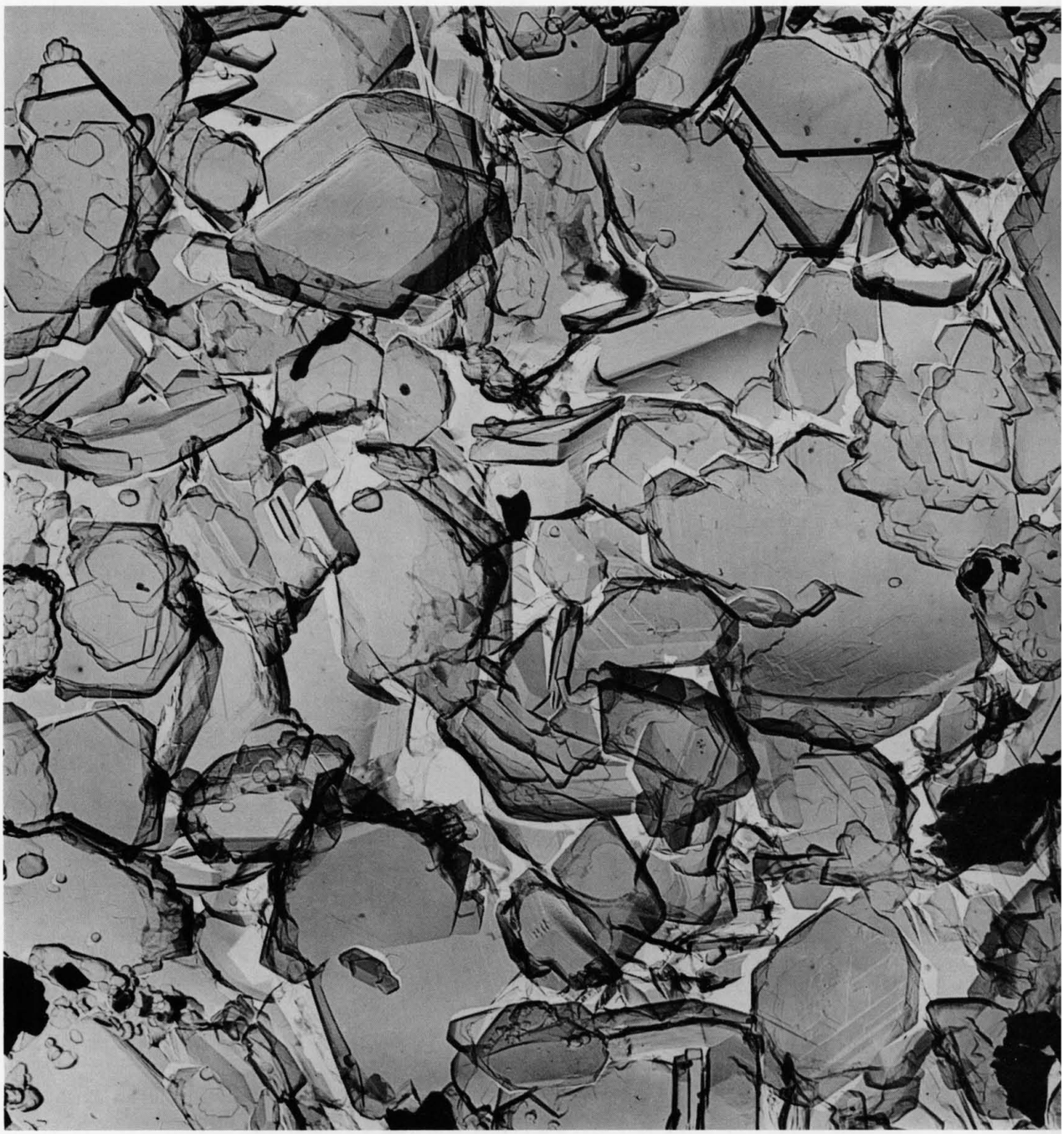
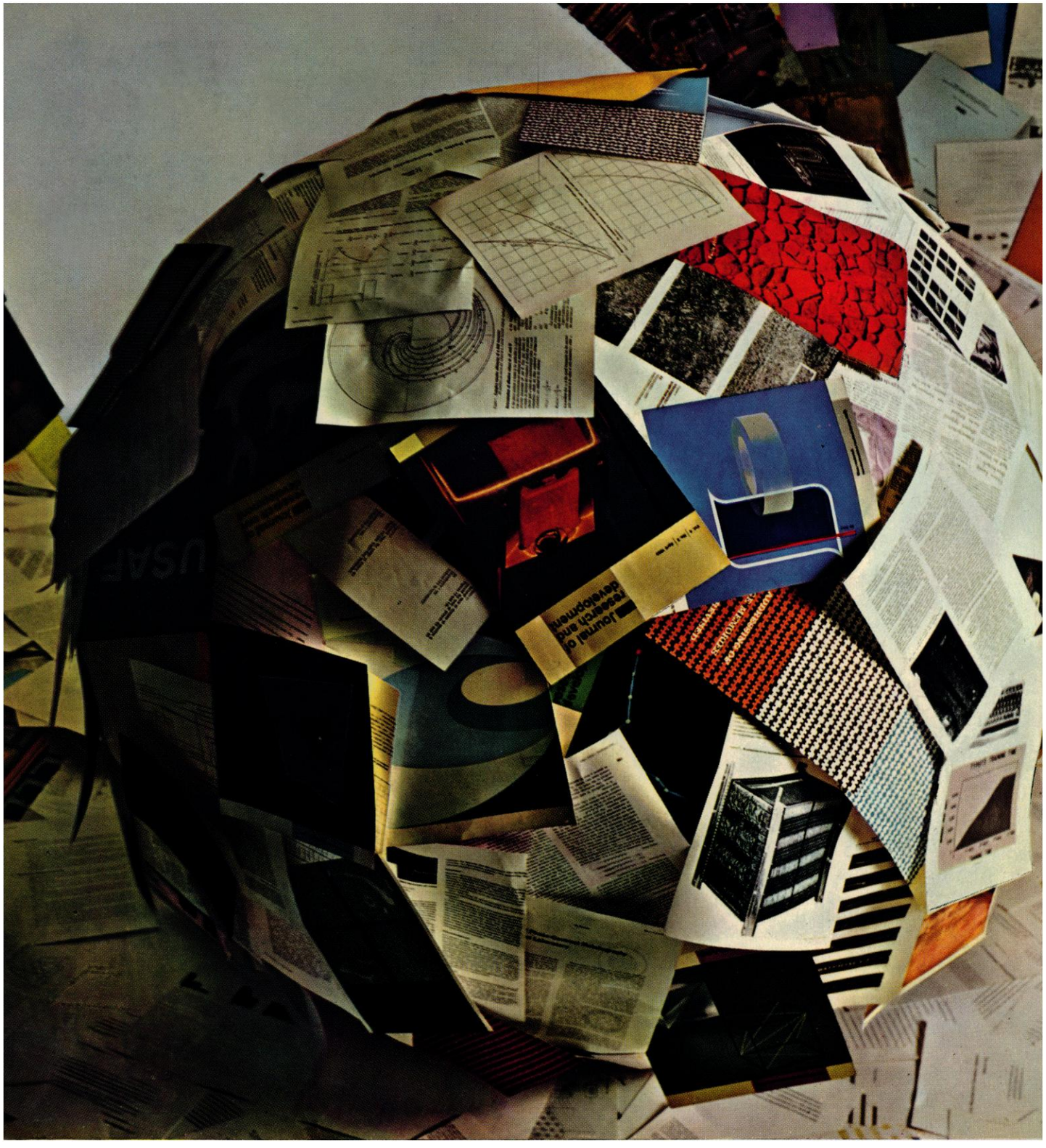
SCIENCE

16 March 1962
Vol. 135, No. 3507

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Gordon Research Conferences



Information is snowballing

IBM® is finding new ways of using computers to cope with the great volume of information that is piling up in science and business today.

One recent IBM development is a computer system that acts as an electronic traffic director for information. From the flood of reports, articles and books received by an organization, the new system selects and routes information to people according to their specific interests and needs.

In another area, IBM has developed a prototype information system that can store millions of document pages, yet is able to find and deliver a copy of any page within seconds. IBM scientists are also investigating new techniques for abstracting and indexing technical articles automatically.

New information-handling systems like these from IBM are urgently needed if scientists and businessmen are to make the best use of man's vast and growing store of information.

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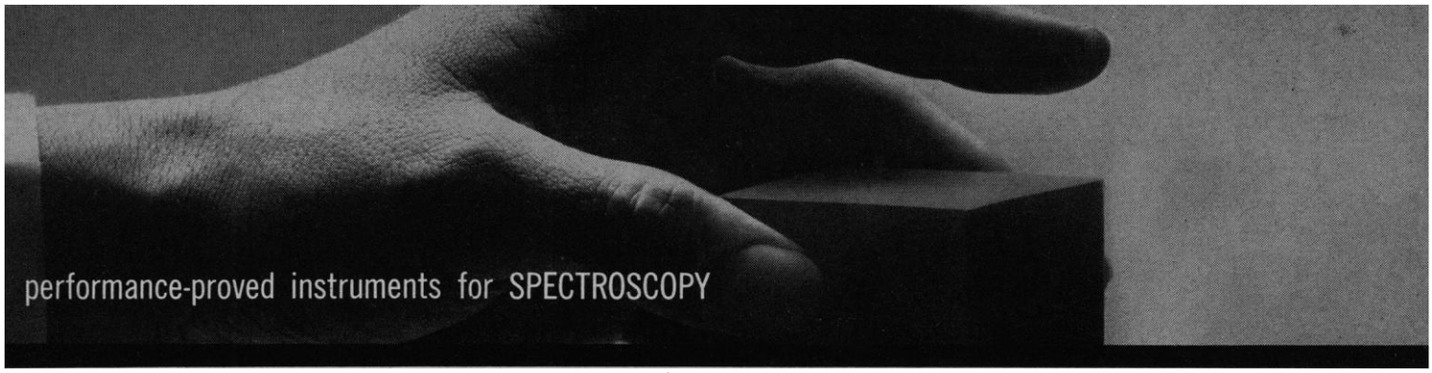


HIGH-ORDER ACCURACY AND VERSATILITY WITH PERKIN-ELMER BUILDING BLOCKS

If your requirements for physical measurement include unique spectroscopic instrumentation, chances are they can be met with Perkin-Elmer building block components, or with special instruments designed around them. Among the "building blocks" are separate sources, a variety of prism and grating monochromators, detectors, and associated optical and electronic components. They afford maximum versatility in tailoring the instrument to the problem.

Typical of the Perkin-Elmer instruments designed from building blocks are:

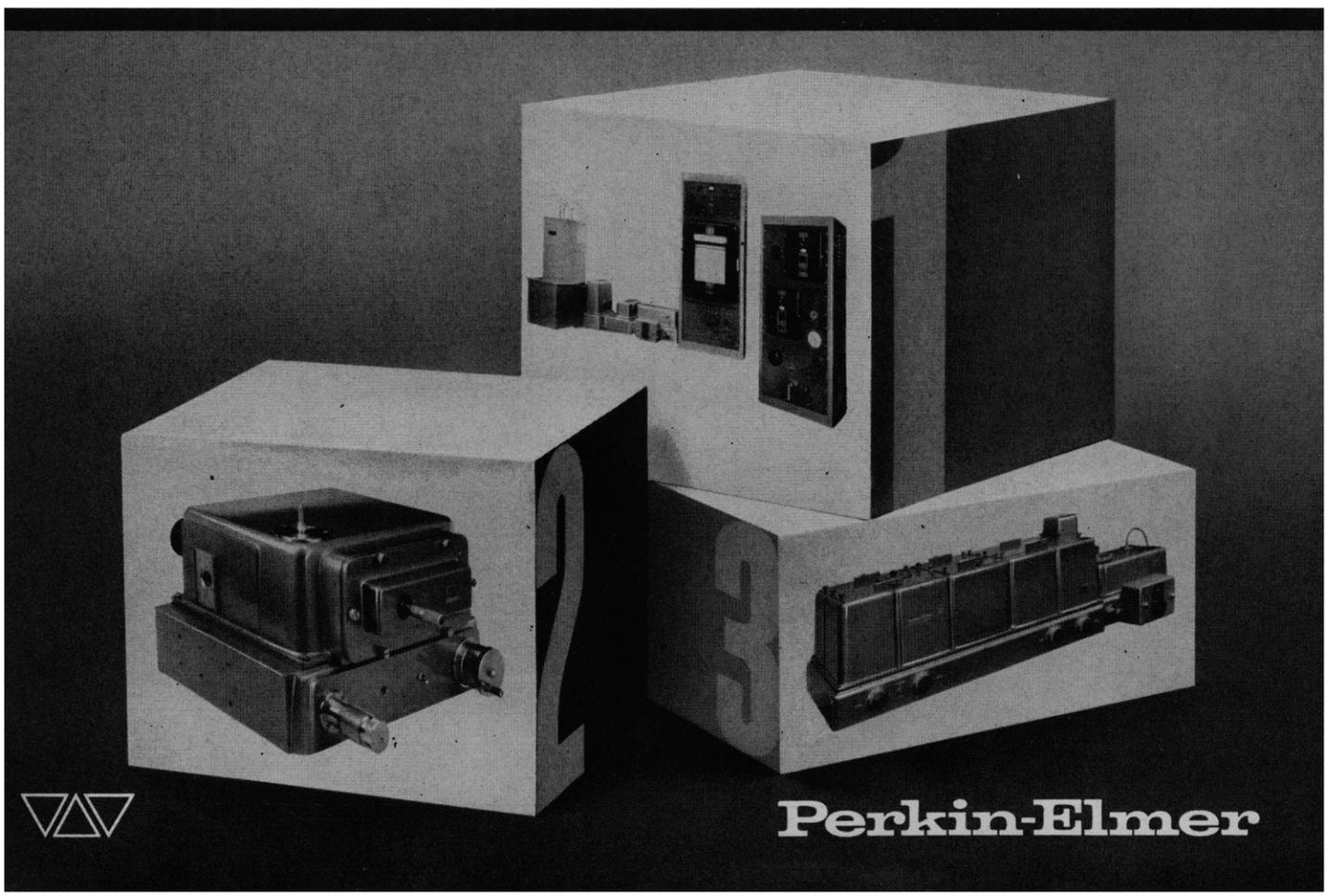
1. Model 205 Infrared Reflectometer, to measure the total diffuse reflectance and emittance of solid materials. Spectral reflectance in the infrared region as well as spectral emissivity as a function of temperature can be measured.

2. Model 108-A Rapid Scan Monochromator, to scan the spectral range of one prism at several discrete frequencies at a rate of 3 to 150 spectra per second, in the study of flame sources, rocket engine exhausts and other transient phenomena.

3. Model 301 Far Infrared Spectrophotometer, a double-beam direct transmittance recording instrument which operates in the region from 15 microns to 180 microns. The linear-in-wavenumber monochromator has a dual grating mount and provides a continuous scan over the first order range of each grating. A complete detector and electronic system with recorder is part of the instrument.

With Perkin-Elmer building block systems, it is possible to compare the spectral response of all types of detectors to a reference thermocouple on a direct recording basis, or to measure the absolute spectral radiance of intense continuous light sources such as solar light simulators.

For details on building blocks and special instruments, contact the Instrument Division, Special Laboratory Instruments, Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Connecticut.



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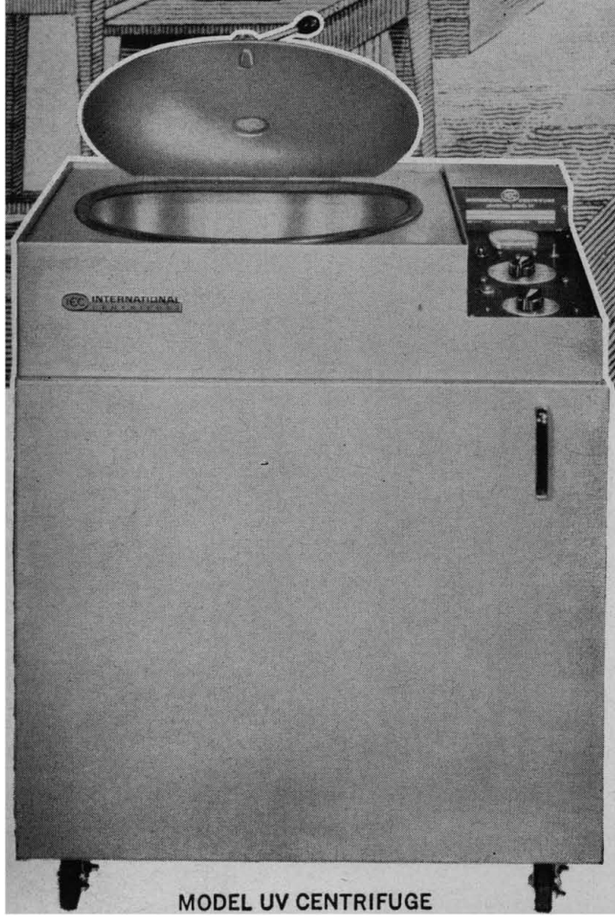
SCIENCE

GREAT IN ITS DAY....



MODEL UV CENTRIFUGE

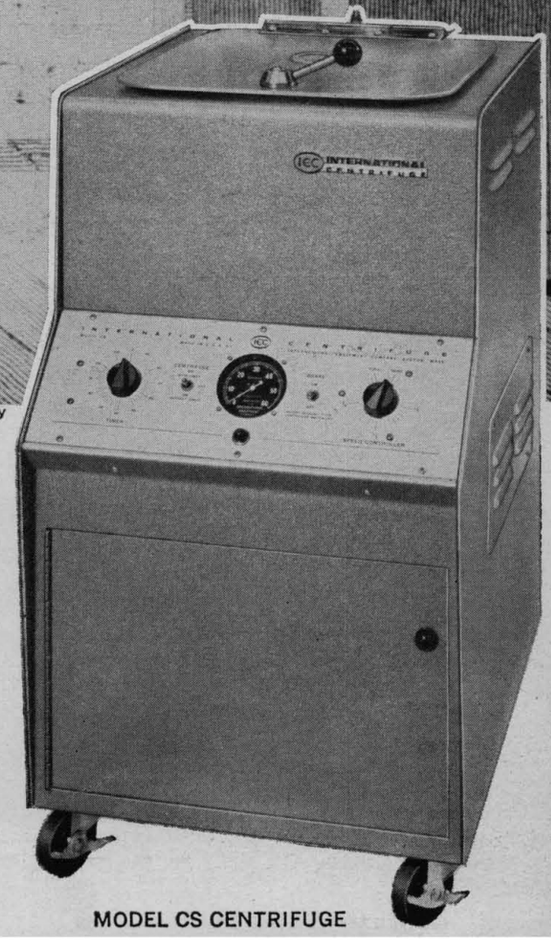
Once the pride of its times, it served Sir Humphrey well but today is hopelessly outmoded.

Centrifuges become obsolete, too... even if still serviceable. But under today's pressures, mere serviceability is insufficient reason for retaining a machine. A laboratory's ability to maintain high standards of quality and service is related directly to its equipment.

That's why there is so much interest in International's modern design CS & UV general purpose centrifuges. They're extremely versatile and convenient, handle a wide range of work easily, efficiently and reliably day after day over a heavy schedule.

Sir Humphrey Davy's Laboratory

Illustration courtesy Harvard Library



Which to select? It's largely a matter of matching your work with centrifuge characteristics. Both are low cost. The CS takes 75 different accessories. Speeds up to 5600 rpm, has an electric brake, 2 hour timer, stainless steel guard bowl, speed controller, continuous reading tachometer and numerous other features. Excellent for swinging medium size volumes.

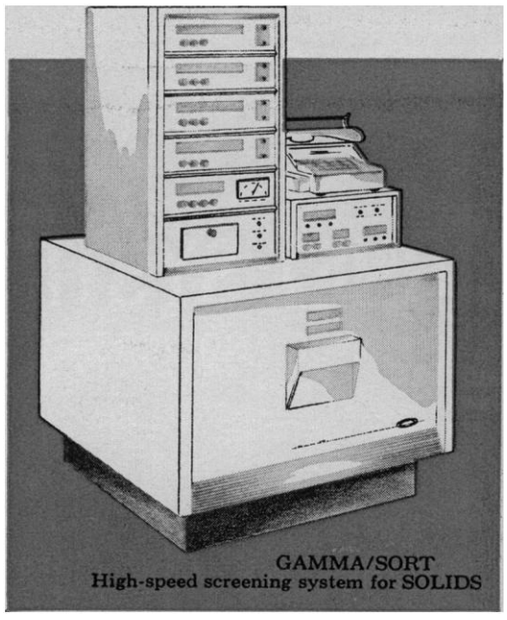
The UV has all these features but accepts more accessories, swings larger volumes, and handles a greater variety of work. Send for bulletins FC and I and make your own comparison.

INTERNATIONAL (IEC) EQUIPMENT CO.

1284 SOLDIERS FIELD ROAD • BOSTON, MASSACHUSETTS

MODEL CS CENTRIFUGE

INTRODUCING th LOW GAMMA LINE



GAMMA/SORT
High-speed screening system for SOLIDS

The GAMMA/SORT – GAMMA/FLO Systems are high-speed radioactivity counting systems designed for the specific purpose of rapidly monitoring large quantities of food and water supplies for fallout contamination.

These Systems are sensitive, reliable, and versatile instruments that can be operated by unskilled personnel. They count radioactivity in all types of bulk and packaged foods, as well as liquid, without sample preparation, measure contamination in each item in shorter time periods than any other available monitoring system. They are also equipped for automatic and permanent recording of all measurements taken.

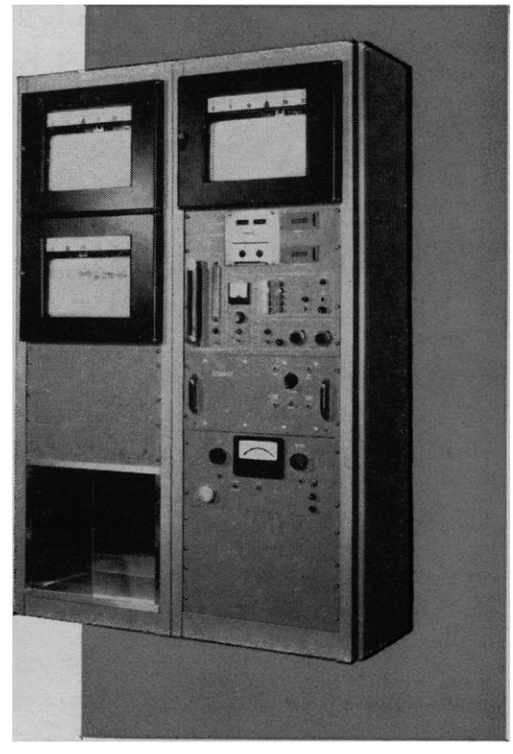
These Systems are available to federal, state, and local governmental agencies which will be responsible for monitoring food supplies and taking regulatory action if hazardous rates of contamination are found. They are also available to commercial food producers, processors, and distributors who wish to establish the safety of their supply sources.

Advantages:

- No sample preparation necessary
- Ultra-high sensitivity (instantaneous reading of fallout concentration)

The GAMMA/SORT and GAMMA/FLO Systems feature:

- Detector geometry better than 3π
- Detector scintillator volume greater than 30 liters
- Unique optical design results in fewer photomultipliers
- Newly designed solid state electronics
- Coincidence and anti-coincidence circuits provide discrimination and cosmic-ray rejection
- Four inches of selected low background lead shielding
- Detect 10 micro-microcuries per liter in less than 3 minutes
- Solid state interrogator, translator, coder and IBM typewriter read-out
- Pre-set alarm system



RESPIRATORY GAS ANALYZERS

(4 different models to choose from)

ADVANTAGES:

- Continuous monitoring, measuring, analysis of exhaled respiratory gases
- Detect and measure key gases such as: $C^{14}O_2$, CO_2, O_2, etc.

FEATURING

- Data computation, such as: Respiratory quotient, C^{14} specific activity
- All vital data continuously integrated, coded and printed
- Precise control of temperature, flow and pressure.

For detailed information write to:

General Measurements
DIVISION OF PRECISION SCIENTIFIC COMPANY
GM

General Measurements
Division of Precision Scientific Company
Garnerville, N. Y.

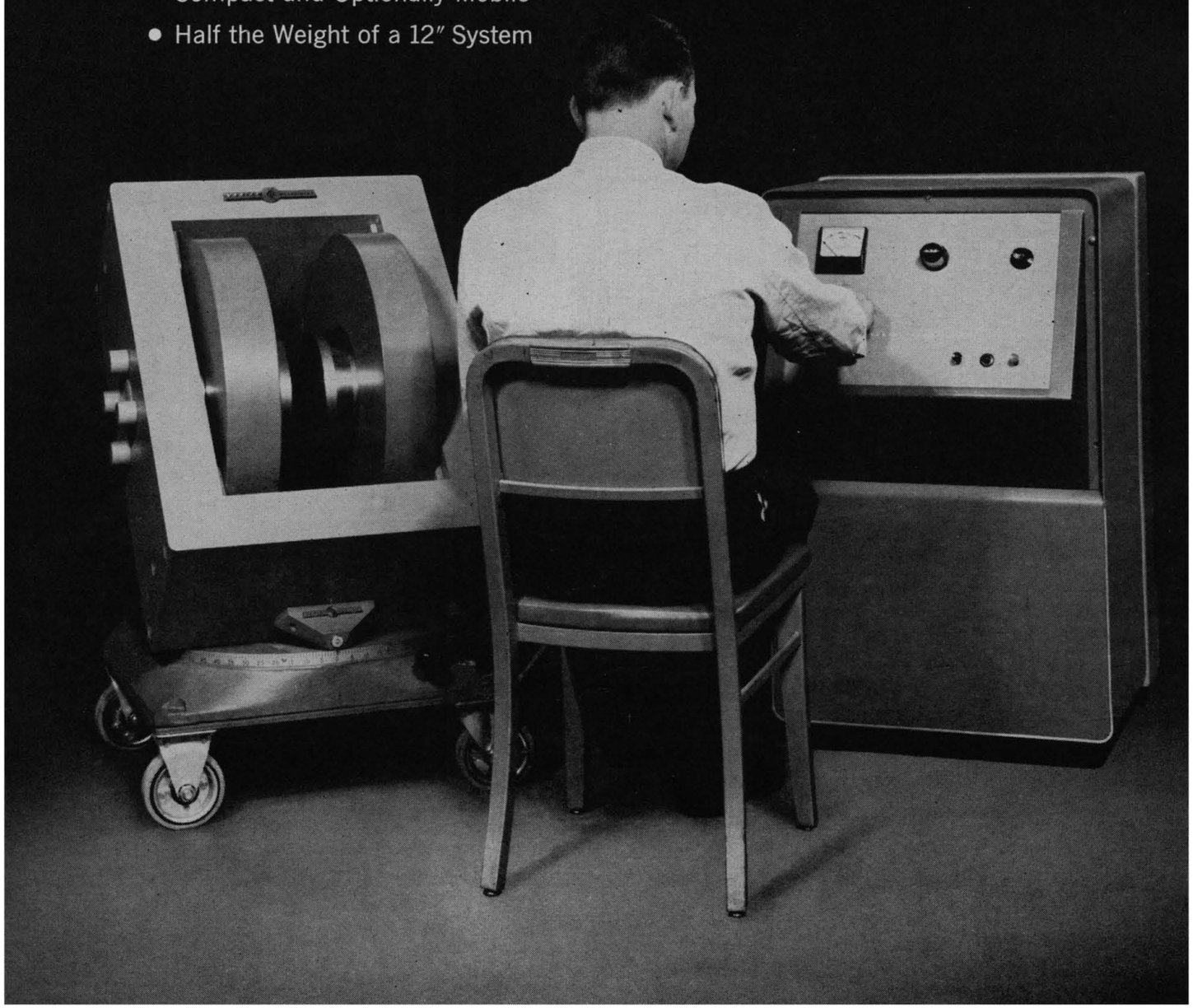
9″

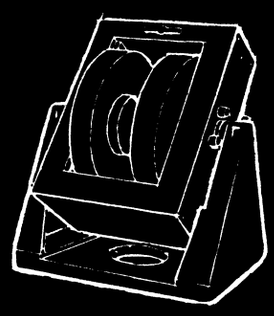
VARIAN
MAGNET
SYSTEM

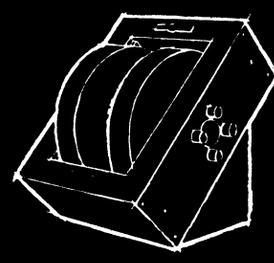
A COMPLETE NEW MAGNET SYSTEM

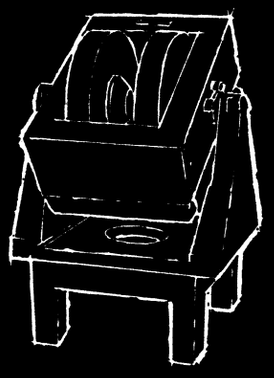
THOROUGHLY DESIGNED FOR HIGH PERFORMANCE AND VERSATILITY

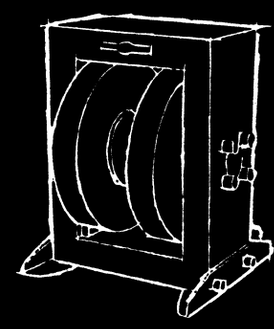
- Homogeneous Fields up to 30 KG
- Stable 7 KW Solid State Power Supply
- Compact and Optionally Mobile
- Half the Weight of a 12″ System

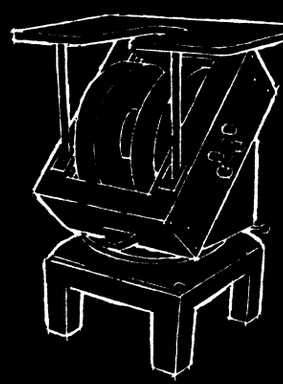










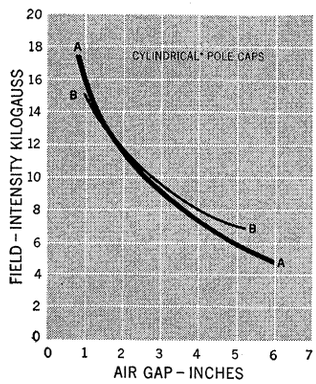


DESIGNED FOR THE MODERN LABORATORY

Even a casual glance at the performance data reproduced below will quickly show you why Varian is proud to add this completely new 9″ Magnet System to what is already the world's most complete and respected line of high-performance laboratory magnets. But high performance was only **one** of the design parameters used in developing this complete new magnet system — versatility and operating convenience were equally important. The result — a magnet system with component construction and a full range of interchangeable accessories designed to give you complete freedom in selecting the exact performance characteristics you need.

AN EXTENSIVE ARRAY OF USEFUL ACCESSORIES

The Varian 9″ Magnet is available as either a vertical, fixed 45° or adjustable magnet, with your choice of a rotating base, fixed or moveable stands, microwave assembly support tables, a wide range of standard and special pole caps plus many other useful accessories.



FIELD INTENSITY WITH CYLINDRICAL* POLE CAPS

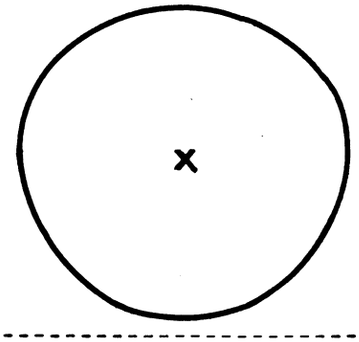
The field intensity vs. air gap curves shown compare the new Varian 9″ Magnet (A-A), using 7 KW of power output from the matched solid state power supply, with the 12″ Varian Model V-4012-3B Magnet (B-B) using full power output of its matched V-2100B Power Supply. **Note the almost identical performance of the two systems except at very large air gaps.**

*Higher fields are attainable in both systems using tapered pole caps.

@ 30 KG

The entire area inside this actual size median plane field plot of the Varian 9″ Magnet is within 1 gauss of central field intensity. Special tapered pole caps were used.

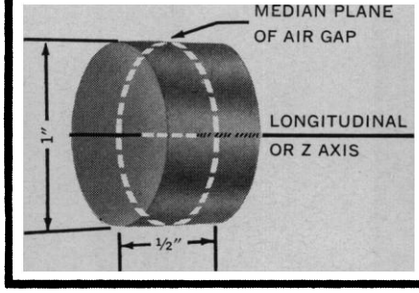
0.5″ Air Gap



@ 20 KG

This actual size median plane field plot shows the area within 0.2 gauss of central field intensity in the Varian 9″ Magnet. Special tapered pole caps were used.

1.0″ Air Gap



@ 10 KG

This actual size three-dimensional field plot obtained with the Varian 9″ Magnet shows a cylindrical volume of magnetic field homogeneous within ±25 milligauss of central field intensity.* Special tapered pole caps were used.

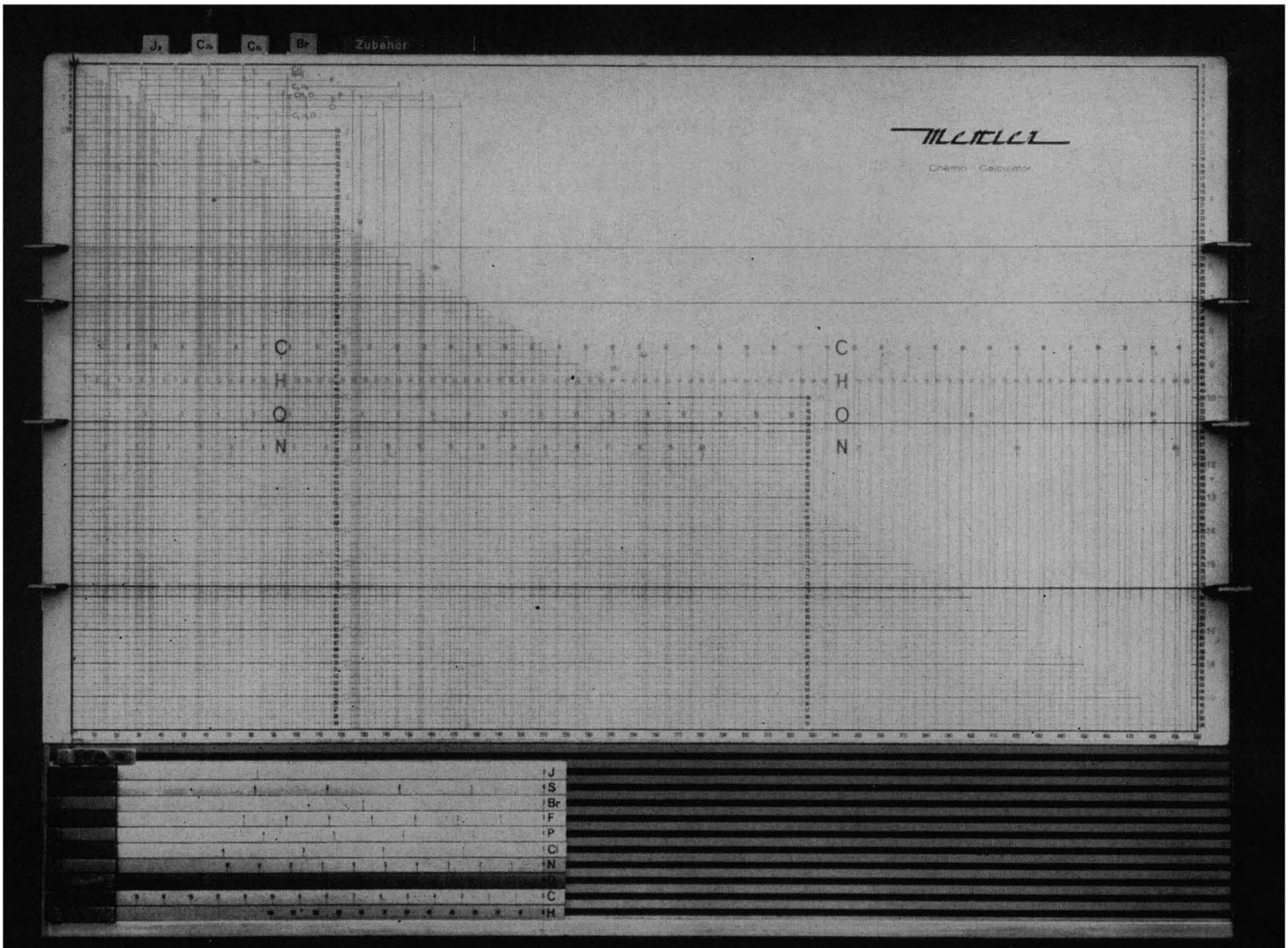
2.0″ Air Gap

*Fields of even greater homogeneity are available upon request.

For complete data on this new magnet system, write INSTRUMENT DIVISION.

VARIAN associates

PALO ALTO 18, CALIFORNIA



Chemo-Calculator

A new practical aid for the analyst in the organic field

Now you can determine organic chemical formulae directly from the percentages of each element found by chemical analysis—without picking up a pencil and without using an adding machine—in a fraction of the time formerly required.

The new Mettler CHEMO-CALCULATOR, designed as a laboratory aid to minimize time lost doing conversions, will save time on 95% of all organic formulae. Virtually any organic formula with a molecular weight of 500 or less which can be derived mathematically, can be found.

The CHEMO-CALCULATOR can also be used to determine molecular weight, and the percentage by weight of each element in a molecule. This is the first development of a slide rule for organic chemistry.

Write today for detailed information on this time saving new product.

Mettler® INSTRUMENT CORPORATION

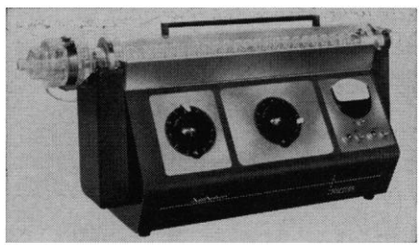
20 NASSAU STREET, PRINCETON, NEW JERSEY

the AutoAnalyzer Announcer

being intelligence on current developments in the automation of wet chemistry

pea-sized sample now suffices for *eight* biotests; all concurrent . . . Last year's dramatic AutoAnalyzer breakthrough announcing *four* simultaneous determinations from a single sample (electrolytes Na, K, CO_2, Cl) is already old hat: we've now racked up four *more* . . . BUN, glucose, total protein and albumin. *All eight going on at the same time, from the same sample, mind you.* No room here to spell out how it's done: but *we'll be glad to send you the methods,* complete with flowchart and all.

Big things are afoot in this fast-breaking multiple determination field . . . readers of this column can count on keeping abreast of developments.



AUTOANALYZER CONTINUOUS DIGESTOR

membrane-happy, indeed . . . Maybe you, too, think we're a little daft on the subject of dialyzing membranes . . . we're used to being kidded about our flared-nostril search for better "better" permeable materials. We don't mind, really, considering how well the never-ending quest pays off in improved analytic results. Our latest hopeful, (something brand new again), promises to *double* previous separatory sensitivity, *plus* improving washout between samples.

These new membranes are not yet available generally (they're *so* good we have to work out entirely new methodologies, a job to make strong men quail). Meantime, *researchers* engaged in pursuits where ultrasensitivity is crucial *can find support by writing us.*

add-a-coil doubles heating capacity . . . AutoAnalyzer Heating Baths can now be fitted with a *second* heating coil. The added coil will (a) prolong a single stream's dwelltime within the bath to double the sample/reagent heating period, or (b) handle a separate input so you can heat *two* analytical streams side-by-side simultaneously in the same bath. Any existing AutoAnalyzer bath can be so converted: *ask us for details.*

new tri/pass flowcell amplifies colorimetric sensitivity threefold . . . By traveling the colorimetric lightbeam three times farther in its passage through our new Tri/pass colorimeter flowcell, we can now *triple* sensitivity. The original 15mm lightpath increases to 45mm by being bounced off two internally-oriented mirrors before it exits toward the photocell detector. Use of the new Tri/pass cell entails only a small change in previous dwelltime, and only a slight rise in washout time. Moreover, you need not buy a new colorimeter if you have a standard type . . . *changeover requires minor adaptation of your present AutoAnalyzer colorimeter at Technicon.* Primarily useful for industrial procedures where size of sample is no problem. Can be extremely useful for special biochemical procedures . . . send for your *bulletin.*

new scope for multiple analyses; "piggyback" manifolds can now pump fifteen separate lines . . . Our new two-tier end blocks geometrically suspend big-bore tubes above their small-bore mates so that the whole batch undergoes equally-distributed peristalsis through the pump. By virtually *doubling* the capacity of a single pump, the new manifold opens giddy prospects for extending the range of the complex multiple analyses that are the growing order of the day. *Ready right now.*

digestors are on the march . . . AutoAnalyzer digestor, designed for Kjeldahl analysis, but useful where any strong acid/high heat digestion step is necessary, is now available. The first lot is in the field. This important development opens whole new areas of research for AutoAnalyzer. May we interest you further?

oops! sorry . . . Well, we expected great things of *silastic* tubing for pumping glacial acetic acid in the AutoAnalyzer cholesterol method . . . it stood up nobly to the punishing use-tests we give new materials before releasing them. So much for high hopes . . . field performance turned out to be deplorable (different mix in the constituents, mebbe). Red-faced and apologetic, we counsel resort to tried-and-true *acidflex* tubing . . . while it can't endure *glacial* acetic acid, it handles 95% stuff with aplomb, and you end up with the same analytical result. *Send for the latest cholesterol methodology, if you've been troubled.*

constant volume sampler banishes recording "blips"...The "blip"* effect on the charting, not critical but annoying, can now be put to rout by installing a simple constant-volume pickup device on the AutoAnalyzer sampler module. Dipping and rising as prettily as a well-drilled dance team, a pair of pick-up crooks keeps the stream going full tilt... as the rising crook is finishing its sample delivery, its descending mate begins feeding follow-up wash liquid into the system. The teamwork keeps the tubing always filled: if you're doing non-dialyzing analyses, you'll find this new device indispensable. *Ask about it.*

**Caused by less fluid between samples when no dialyzer is used.*

TECHNICON INSTRUMENTS CORPORATION
46 Research Park, Chauncey, N. Y.

Gentlemen:
Please send me the TECHNICON AUTOANALYZER BROCHURE plus data on the items checked.

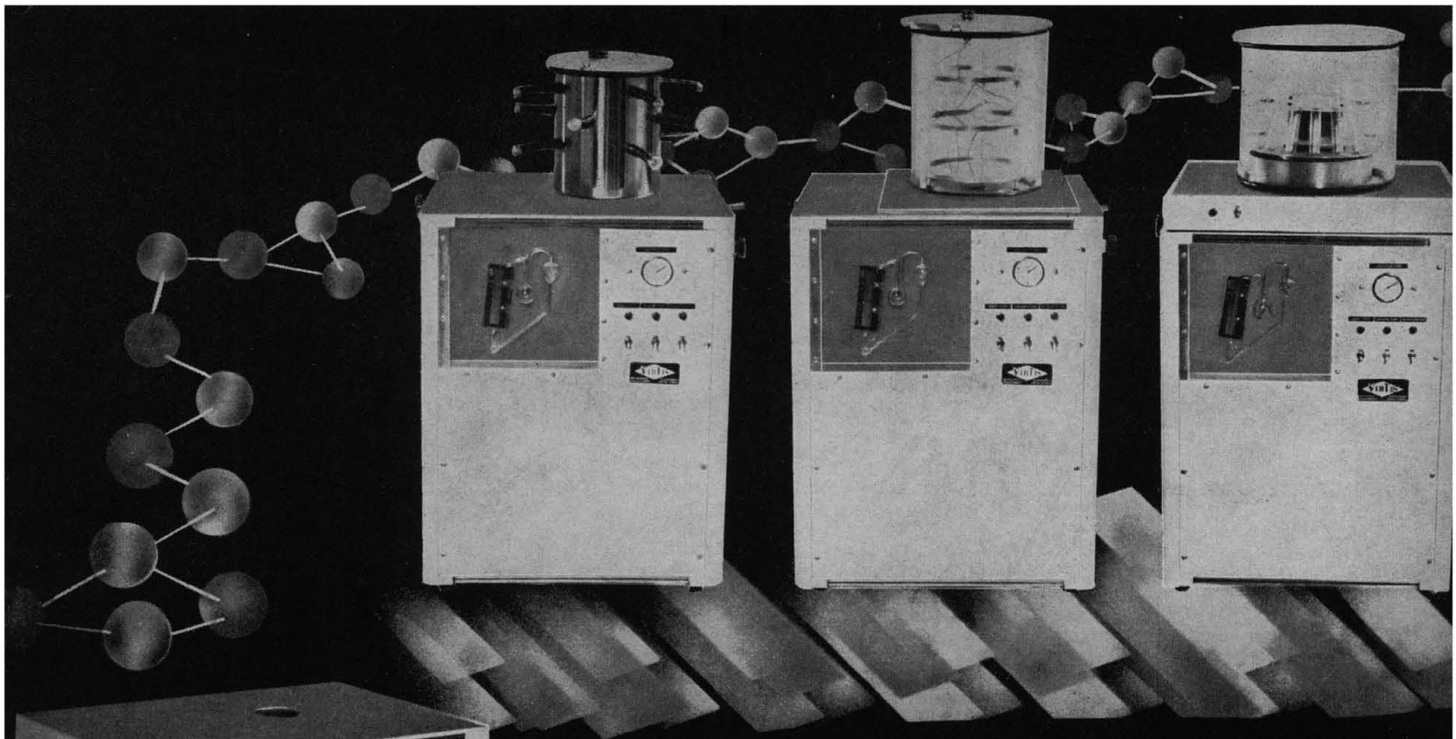
☐ 27 ☐ 28 ☐ 29 ☐ 30 ☐ 31 ☐ 32 ☐ 33

NAME _____

INSTITUTION _____

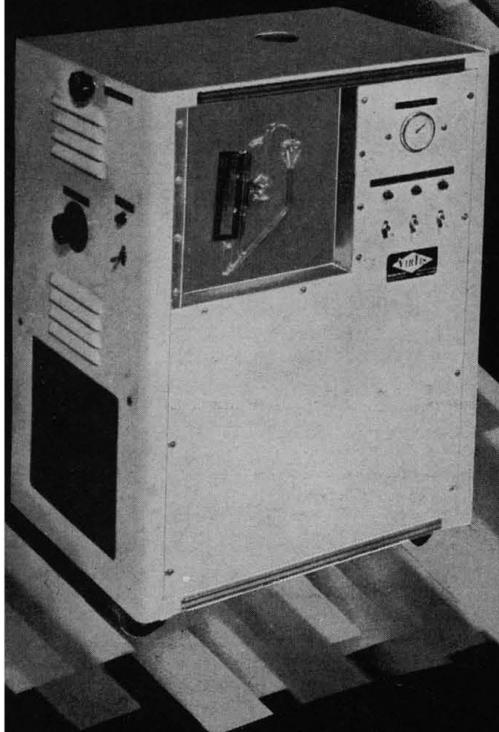
ADDRESS _____

CITY _____ ZONE _____ STATE _____



FREEZE-DRY

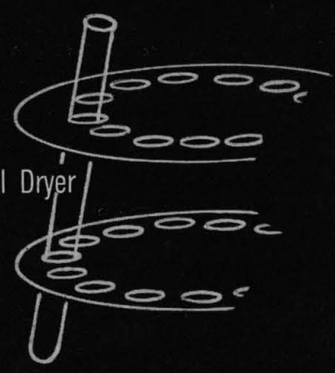
with the Vir Tis Unitrap



Manifold Drying

Bulk Drying

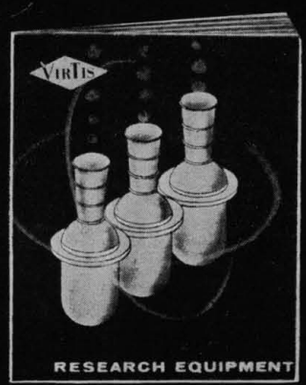
and the New Centrifugal Dryer



Complete flexibility and ease of operation . . . two essentials for research instrumentation. These elements are expertly incorporated into the Unitrap Automatic Freeze-Dryer.

For ease of operation the Unitrap is mechanically refrigerated to a maximum low of −65°F, ending inconveniences and high costs associated with dry ice refrigerated condensers. Controls necessary for freeze-drying are built into the fully mobile cabinet.

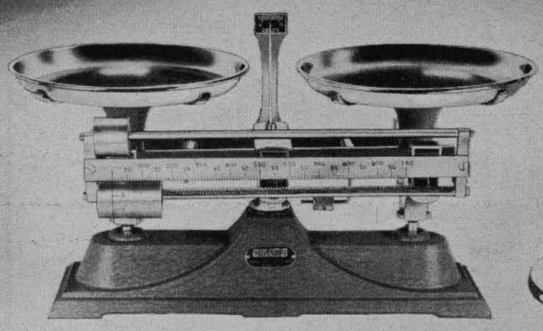
For flexibility nine interchangeable drying chambers are available covering the entire range of freeze-drying applications. The new Centrifugal drying chamber pre-freezes and freeze-dries bacterial cultures yielding higher survival rates than are ordinarily obtained with other techniques. Tissue freeze-drying becomes a routine histological method using the Clear Drum drying chamber. Any of four combination bulk and manifold drying chambers can be connected to the Unitrap. These dual purpose drying chambers permit samples to be dried by connecting them to the external ports or by placing the samples within the vacuum drum on the three tray, electrically heated rack supplied.



NEW CATALOG – We will be pleased to send you your copy of the new VirTis "Research Equipment Catalog" upon request. Illustrations and full details are given regarding freeze-drying equipment, "Hi-Speed" Homogenizers and many other instruments of interest to the clinical sciences.

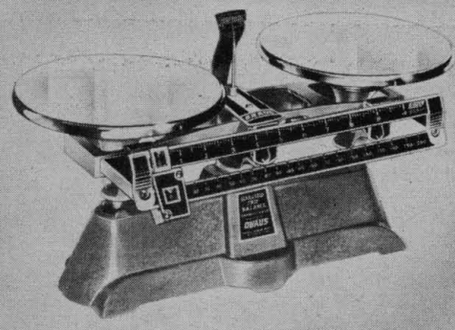
For full details on the VirTis Unitrap and specific recommendations for your application write:

VIRTIS THE VirTis COMPANY, INC. GARDINER, NEW YORK

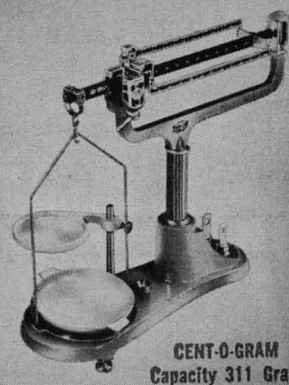


INDUSTRIAL BALANCE
Capacity 5 Kg. Sensitivity 0.5 Gram

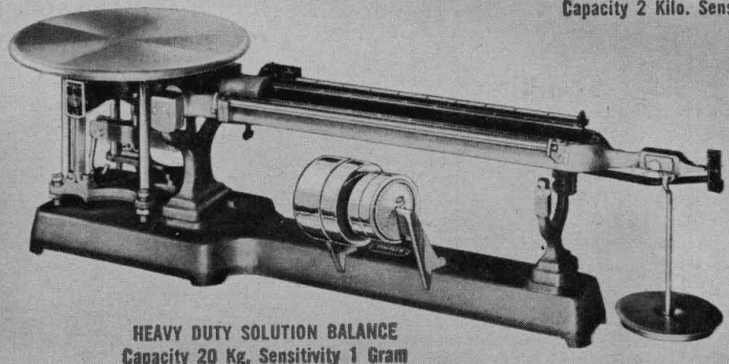
STO-A-WEIGH
WEIGHT SET



HARVARD TRIP BALANCE
Capacity 2 Kilo. Sensitivity 0.1 Gram

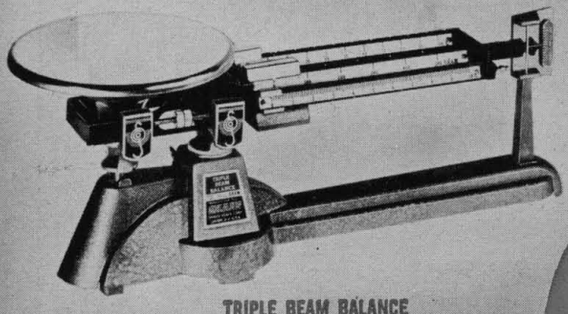


CENT-O-GRAM
Capacity 311 Gram
Sensitivity .01 Gram



HEAVY DUTY SOLUTION BALANCE
Capacity 20 Kg. Sensitivity 1 Gram

DIRECT READING
MOISTURE DETERMINATION
BALANCE
Capacity 10 Gram
Sensitivity .01 Gram—0.1%



TRIPLE BEAM BALANCE
Capacity 2610 Gram. Sensitivity 0.1 Gram

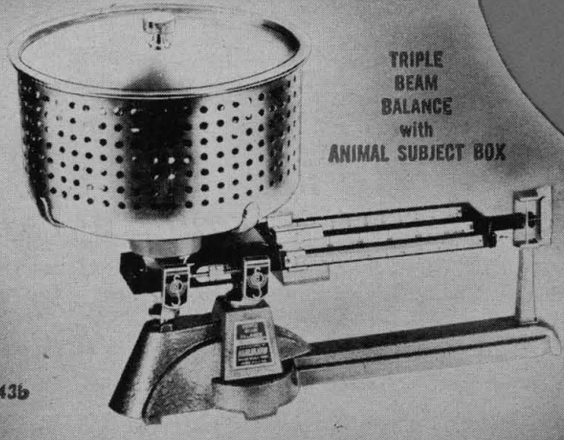
OHAUS

OHAUS BALANCES OF TODAY ARE THE PRODUCT OF OVER 50 YEARS OF EXPERIENCE IN THE EXCLUSIVE MANUFACTURE OF PRECISION SCALES AND WEIGHTS. DURING THIS TIME WE HAVE MADE A CONTINUOUS EFFORT TO IMPROVE THESE BALANCES BY DESIGN CHANGES, BY APPLICATION OF NEW AND BETTER MATERIALS, AND BY USING THE LATEST IN TOOLS AND METHODS. WE FEEL SURE THE PRODUCT WE OFFER IS THE BEST MONEY CAN BUY.

FOR COMPLETE CATALOG WRITE:

OHAUS
SCALE CORPORATION

1050 COMMERCE AVE.
UNION, NEW JERSEY
DEPT. SC



TRIPLE
BEAM
BALANCE
with
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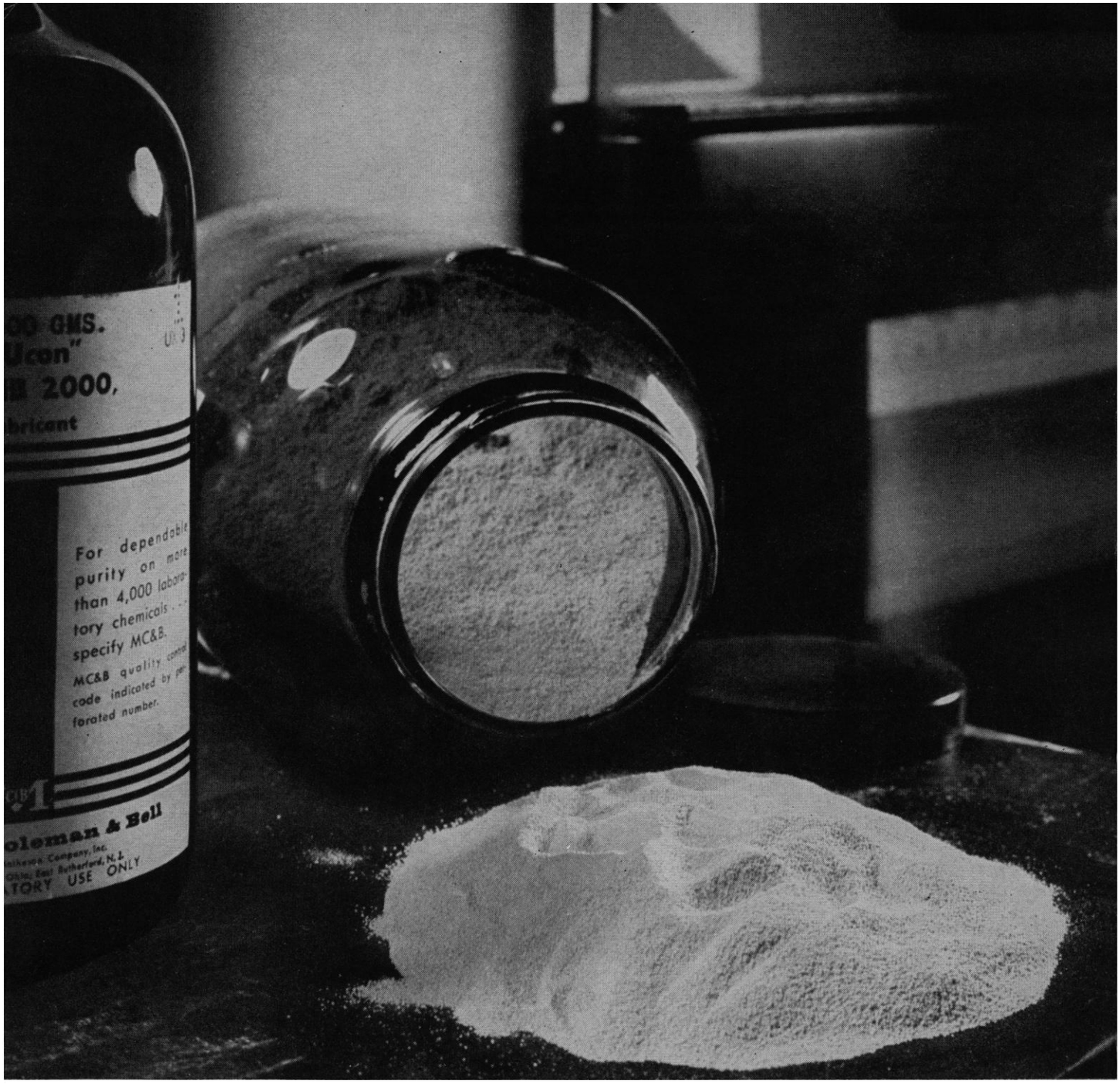

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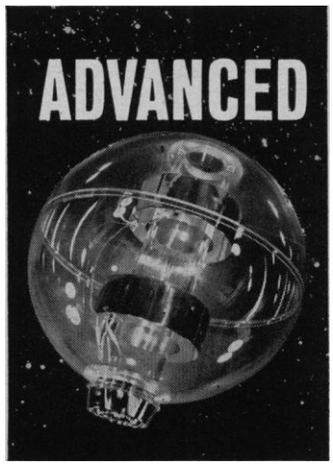

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for

- **Flash-induced chemical catalysis.**
- **High-speed photography of chemical and process reactions.**
- **Motion studies, shock-wave photography.**
- **Cloud chamber Physics.**
- **Deep-sea photography.**
- **U.V. printing and time-marking.**
- **Satellite beacon systems.**
- **Optical Maser (Laser) light pumps.**

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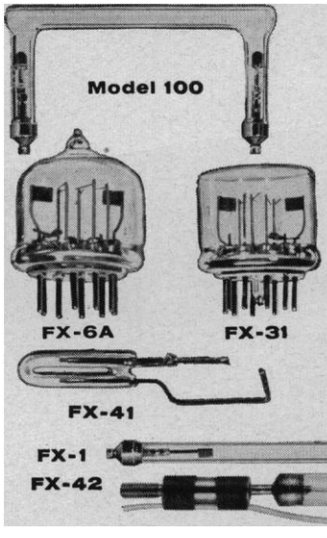

Model 100 Designed for Laser and other special applications. Tube configuration ensures maximum light intensity per unit of rod area. Output: 250 HCPS/flash. Input: 100 ws. Price: $50.

FX-31 Internally triggered. Non wandering arc. Single flash or strobe. Flat-topped for optimum optical characteristics. Output: 2.5 HCPS/flash. Input: 5 ws. Price: $30. Standard **FX-6A** type: $15.

FX-41 Paper-clip size tube now under development. Inquiries invited.

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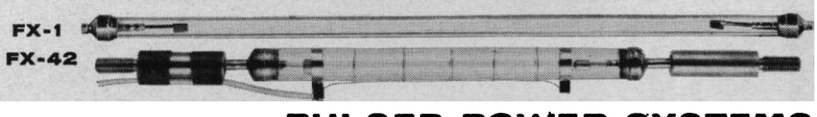

PULSED POWER SYSTEMS

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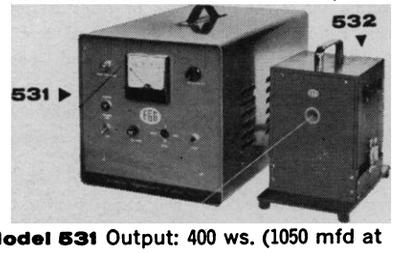

Model 531 Output: 400 ws. (1050 mfd at 900 v.) Input: 115 v. 60 cycle a.c. Price: $795.00. Model 532 Flash Head with 2 Model 100 tubes: $395.00. System will drive polished and multicoated ruby rods with low threshold. System Price: $1190.00.

Model 522 Two unit 1280 ws. system provides up to 4 kv. into 80 mfd. or 160 mfd. Triggered externally or from front panel. Drives Model 511, 512, 513 Flash Heads with 4 to 10 Model 100 tubes. Accommodates crystals 2″ long up to ½″ dia. Input: 110 v. or 220 v. 60 cycle a.c. Price: $3345.00 (complete system with 4 tubes).

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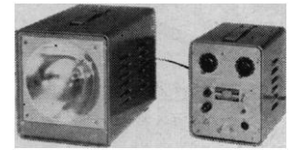

Microflash Flash Duration: 0.5 microsecond. Peak Light: 50×10^6 beam candle power. Energy Input: 8 ws (.05 mfd at 18 kv). Recycle Time: 5 seconds. Time Delay: Adjustable from 3 to 1000 microseconds. Price: $975.00. Point Light Source Attachment: $35.00.

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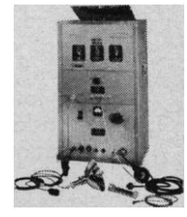
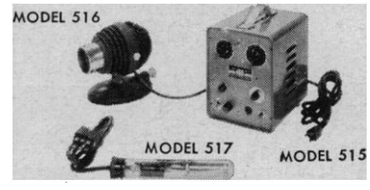


Light source specially developed for use with high-speed cameras for studies of fast-moving objects such as shock waves and projectiles. Flashing Rate: Up to 6000 flashes per second. Flash Duration: As low as 1.2 microsecond. Triggering: From camera, oscillator or contactor. Price: $3500.00.



Microscope Flash Illuminator Model 516 lamp and 515 power supply provides high intensity flashes (150 microseconds at 100 ws) for extreme close-up photography of delicate subjects without heat damage . . . e.g. human eye, insects, botanical specimens, etc. Model 517, separate lamp assembly permits close-ups of underwater subjects in fish tanks, etc.

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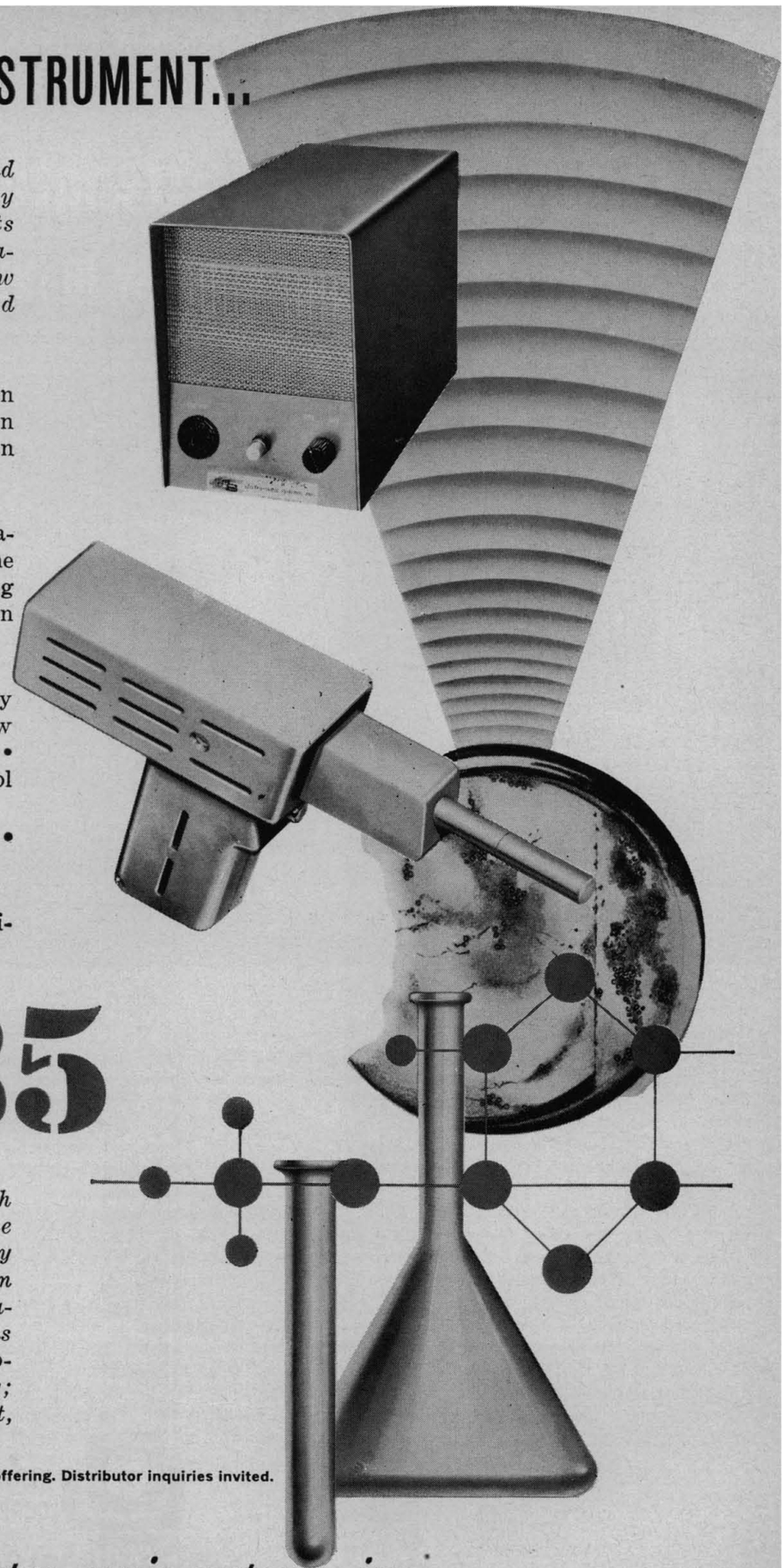

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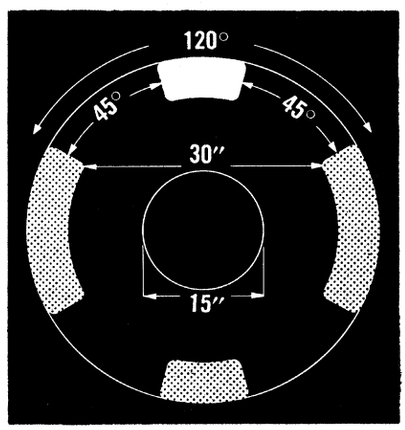

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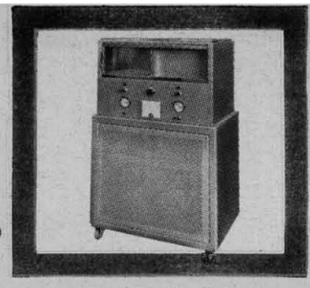

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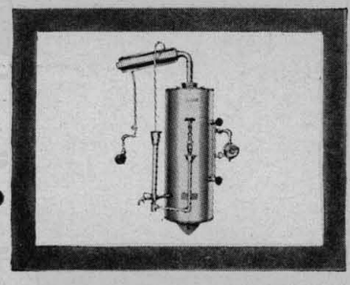

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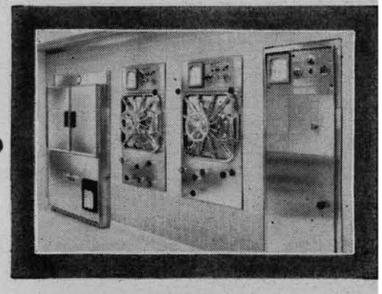

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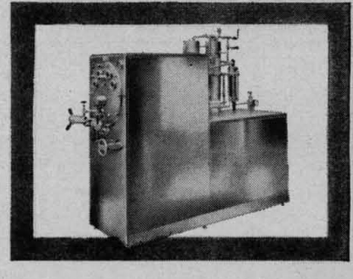

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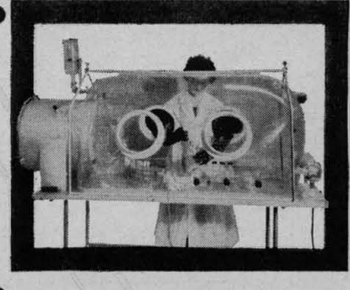

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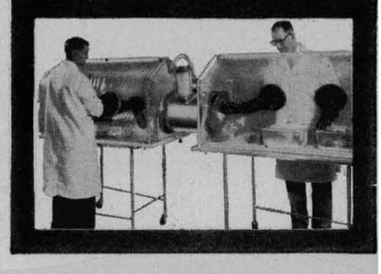

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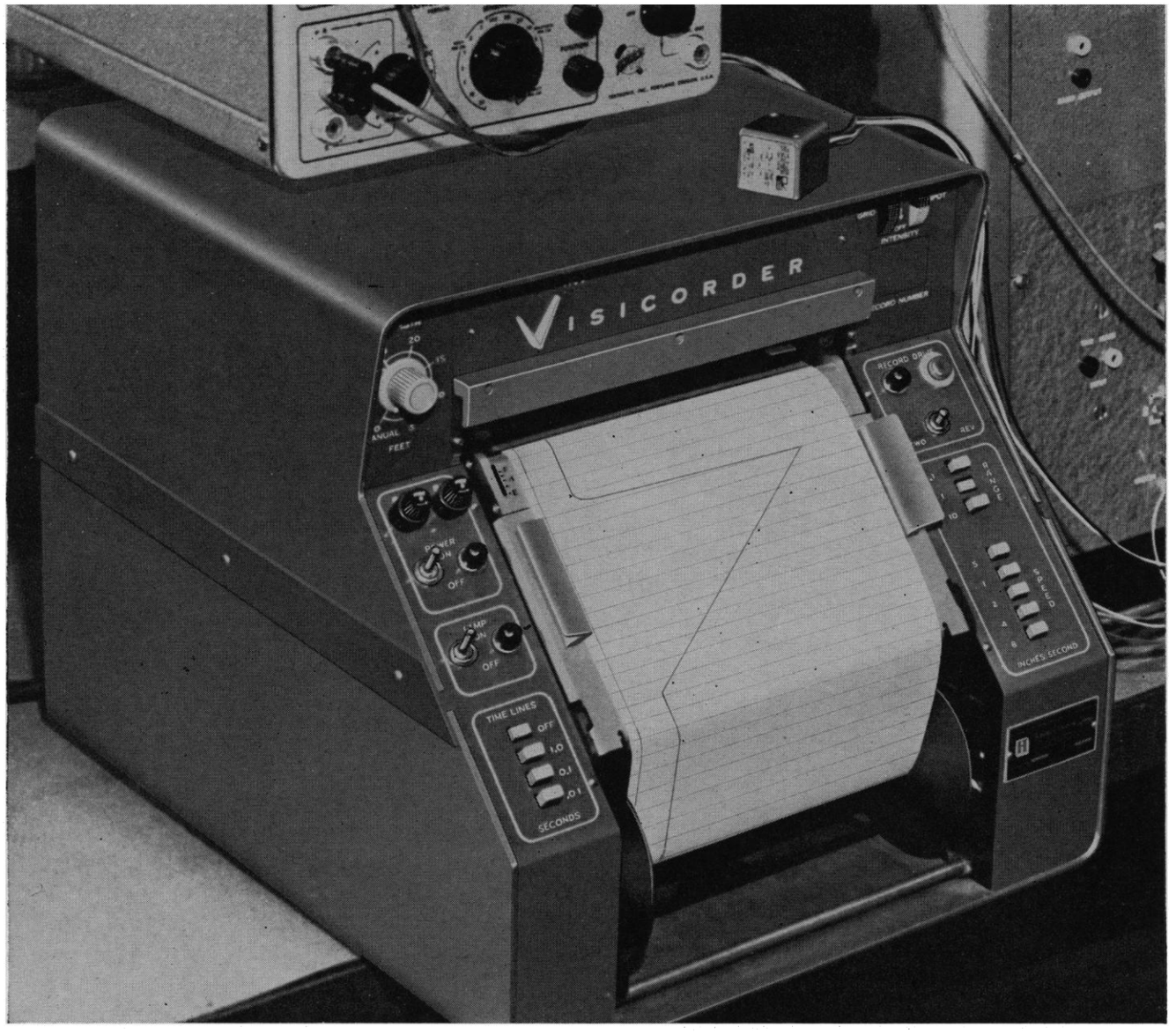

Honeywell Visicorder Oscillograph checks resolution of an event marker

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A missile telemetering system samples each channel only once every 30 milliseconds, but missile engineers want to know when some events occur to an accuracy of better than one millisecond.

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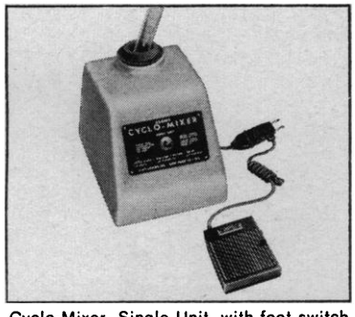
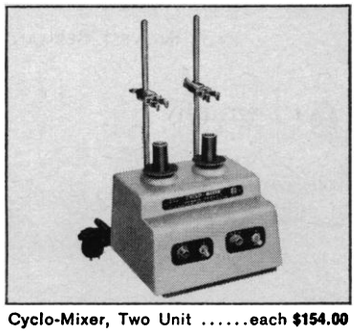


Cyclo-Mixer, Single Unit, with foot switch ....each **$68.50**

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

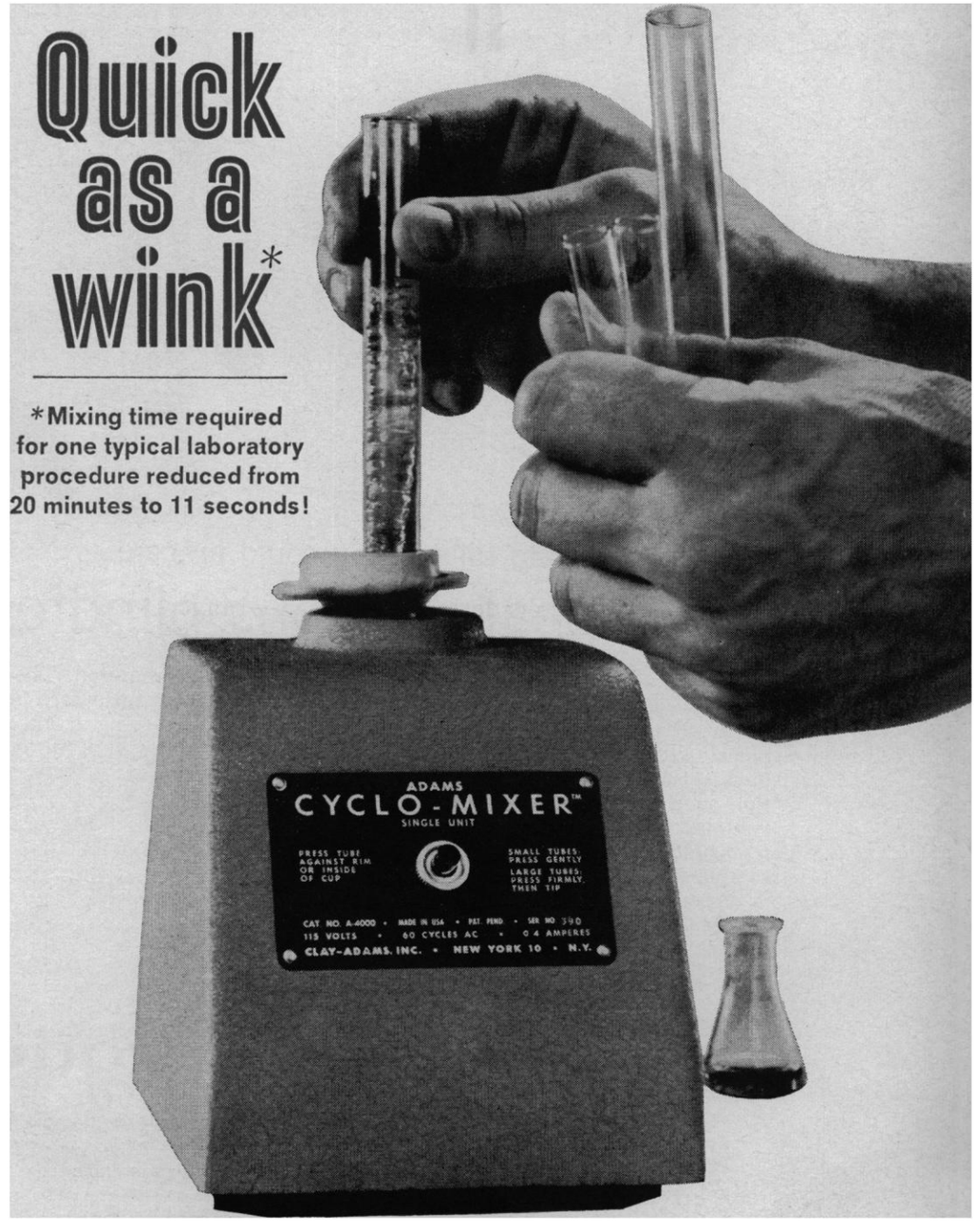


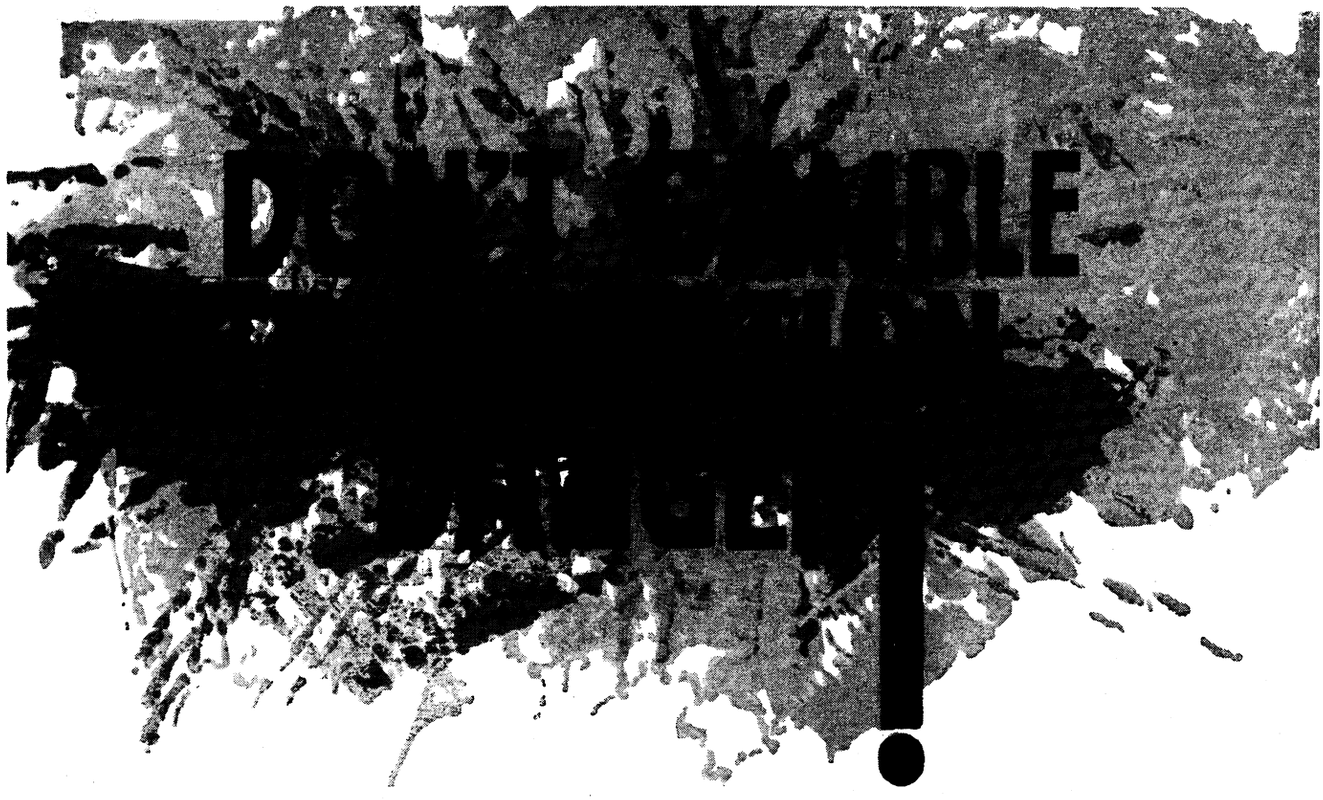
Cyclo-Mixer, Two Unit .....each **$154.00**

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

Quick as a wink*

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





MEASURE IT WITH A PRECISION LIONEL/ANTON RADIATION SURVEY METER

Pictured, below, are 3 types of portable, battery-powered, transistorized radiation survey meters, designed to measure radiation intensity accurately and reliably. No matter which instrument you select to meet your particular requirements, you may rest assured that you will be able to carry on your work with the knowledge and confidence that you are keeping radiation danger under positive, measured control.

MODEL 700
BETA-GAMMA SURVEY METER

Highly sensitive, yet exceptionally rugged, the Model 700 is capable of measuring radiation intensity as low as ½ of one thousandths R/hr., and has an upper range limit of 50 milli-roentgen per hr. Employs five 1½ Volt conventional flashlight batteries, and comes complete with following accessories: (1) instruction and maintenance manual; (2) probe and detector (stainless steel, halogen-quenched Geiger-Mueller tube); (3) one set of batteries; (4) adjustable carrying strap and quick-disconnect clips; (5) one headset and a self-storing package. **$98.50***

MODEL 715
GAMMA SURVEY METER

Provides measuring ranges of 0-0.5, 0-5.0, 0-50.0 and 0-500.0 R/hr. Employs an ion-chamber detecting element, and only 1 flashlight battery. A "check" position on the range selector tests overall circuit, battery, and all working components; a zero control zeroes the instrument in all radiation fields up to 500 R/hr. **$99.50***

MODEL 701
ALPHA-BETA-GAMMA SURVEY METER

Offers operating ranges of 0-0.5 mr/hr., 0-5 mr/hr., and 0-50 mr/hr. Employs five 1½ Volt flashlight batteries. Utilizes a stainless steel, halogen-quenched Geiger-Mueller tube as its beta-gamma detector, or a Lionel mica end window, stainless steel, halogen-quenched detector as an alpha-beta detector. Highly suited for laboratory or field use. Has an integral, calibrated Ra D+E source for actual operational check, and comes complete with probe and tube for a, B, gamma (B, gamma optional), in addition to the accessories supplied with the Model 700. **$225.00***

*Delivery within 5 days after receipt of order. *F.O.B. Brooklyn, N. Y.*

LIONEL ELECTRONIC LABORATORIES, INC. / FORMERLY ANTON ELECTRONIC LABORATORIES, INC. / 1226 FLUSHING AVE. / BROOKLYN 37, N.Y.

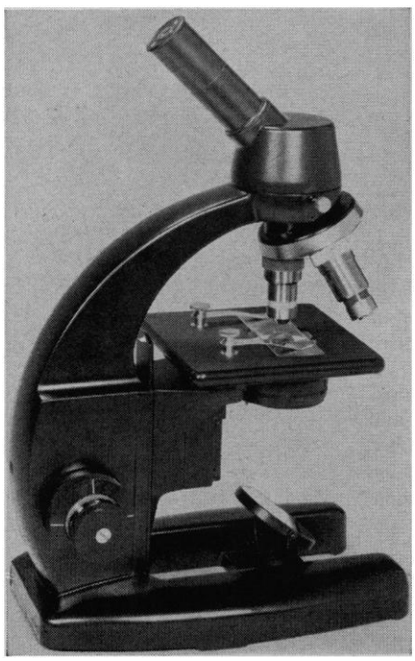
COOKE BRIEFS

Teaching and Routine Microscopes

Cooke Briefs are generally devoted to discussion of research and special optical equipment of our manufacture. This issue will describe some microscopes which have proven most suitable in teaching and routine applications. Prices have been noted.

M15AX Teaching Microscope

The microscope stand and its focusing motions are the same as those used for the M15 Clinical and Research models. We supply a robust, stable stand, designed to meet modern requirements of convenience, which will stand up for many years under hard student use. High strength aluminum alloy pressure die castings and shell moldings (epoxy finished) and ball-bearing motions moving in hardened steel slideways are provided. This is not a "disposable" student microscope.

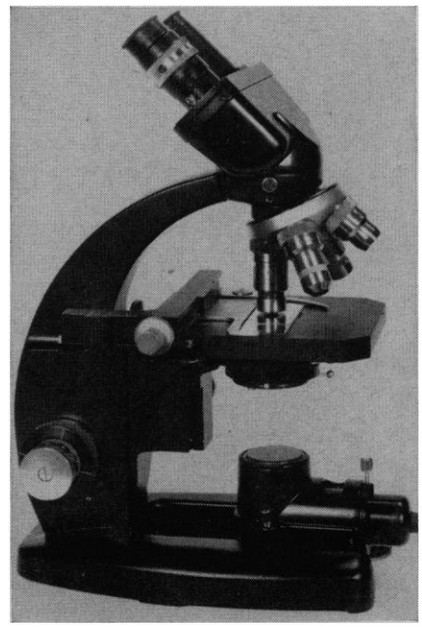


M15AX (Magnifications 100X — 400X) $238.

As protection against misuse by inexperienced students a friction clutch on the coarse adjustment prevents damage to the focusing motions; objectives are spring-loaded to avoid accident to lenses or slides.

The microscope is so designed that a wide selection of body tubes, stages and substages can be easily and quickly interchanged. Thus, a simple instrument may be built up, by acquisitions over a period of time, into a versatile equipment with many research capabilities.

M15BY Medical Microscope

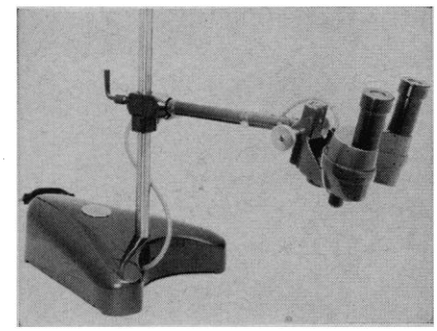


M15BY (Magnifications 30X — 1000X) $494.

By mounting additional objectives, a binocular body and a graduated mechanical stage the student M15 becomes a suitable medical microscope, unexcelled in optical performance. It is ready for further elaboration as a dark ground, phase contrast or photomicrographic instrument, as required.

The MICROPLAN 40X, high-dry objective can be supplied for use with this microscope. This lens is a notable advance in objective design, giving amazingly flat fields at medium powers — without any sacrifice of resolution or contrast.

The Sterimag (Stereoscopic Microscope)



Sterimag (10X or 20X models) $175.

This instrument is widely used in industrial inspection work, but has also an important application as a student tool in elementary botany and biology laboratories and in geology. Image quality is excellent, working distances are unusually large and field of view diameters equal or exceed those obtained with more elaborate and more expensive stereoscopic microscopes.

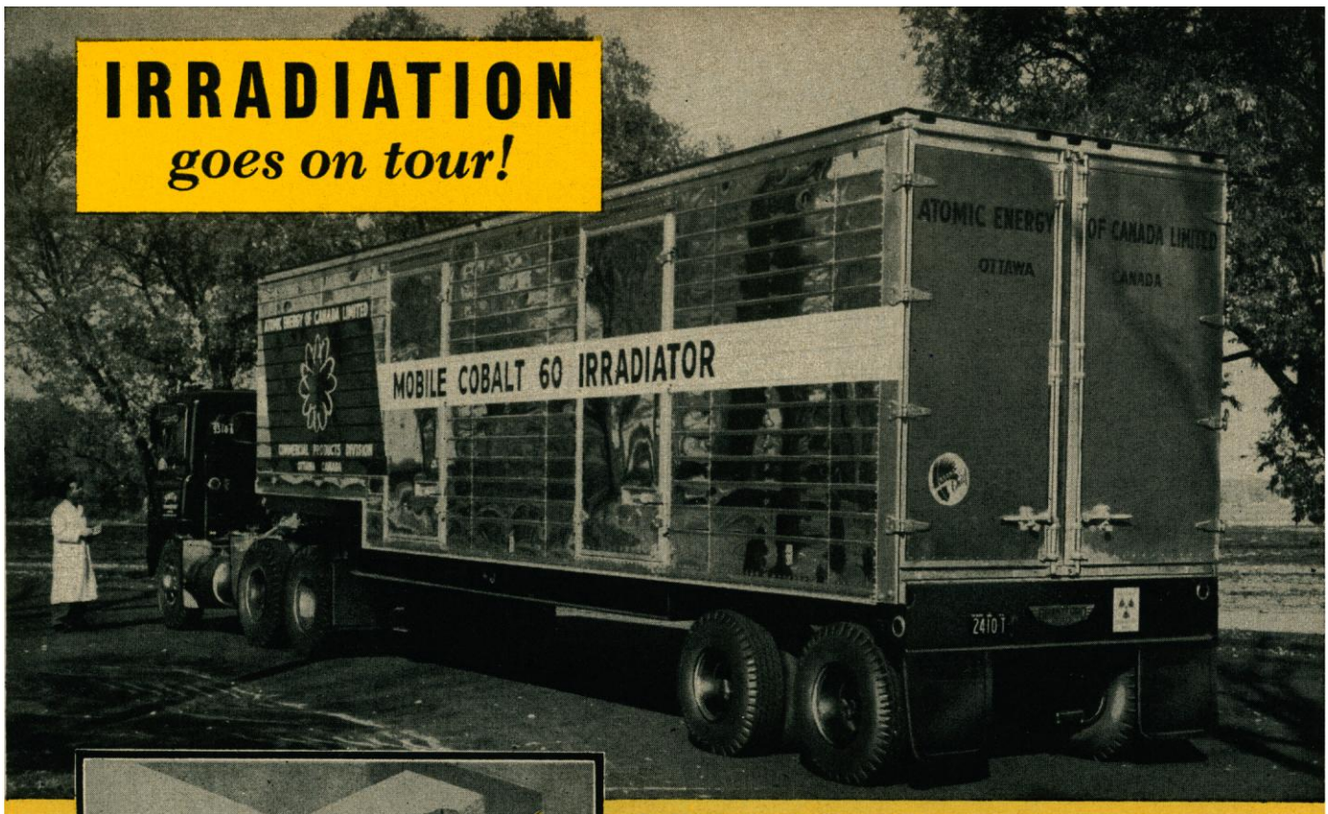
Either a 10X or 20X model can be supplied; magnifications are fixed and cannot be changed. However, for routine observations and dissection, these magnifications are usually sufficient.

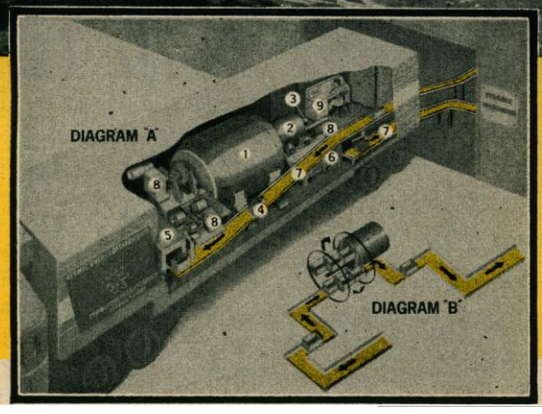
The eyepieces and objectives are locked in place and the instrument is virtually student-proof. A ruggedly constructed, universally adjustable pillar stand with heavy base increases its capabilities, as well as its suitability for student use.

A built-in light source, with focusable condensing system and adjustable mounting, gives high quality illumination conveniently and without the complications which come from use of an exterior lamp. Transformer for the lamp is mounted inside the base. Domestically manufactured bulbs can be used for replacement.

Low-priced, the Sterimag has many positive advantages for student and routine use.

IRRADIATION
goes on tour!





The first use of the Mobile Cobalt 60 Irradiator was to process one million pounds of Canada's 1961 potato crop in a pilot scale program. A low dose of radiation (7500 rads) prevents potatoes from sprouting during storage.

DIAGRAM "A"
Legend

1. MAIN SHIELD ENCLOSING IRRADIATION CHAMBER
2. SOURCE STORAGE CONTAINER
3. SOURCE POSITIONER
4. PRODUCT CONTAINER
5. ENTRANCE MAZE
6. EXIT MAZE
7. CONVEYORS
8. MOTOR DRIVES
9. CONTROL CONSOLE

DIAGRAM "B"

Inside the main shield, a rotating assembly holds 8 containers in pairs. These are suspended like seats on a Ferris Wheel so they will remain upright during rotation. Each container completes two full circles around the Cobalt 60 source and is then ejected by the entrance of a new container.

New horizons were opened for Industry, Food Processors and Research Laboratories when Atomic Energy of Canada put the first MOBILE COBALT 60 IRRADIATOR "on the road".

While this sensational unit was first successfully used for the production processing of potatoes, it can ably demonstrate the practicality of Cobalt 60 Irradiators for many other purposes.

Irradiation is approaching the production stage in several industries devoted to the preservation of foods, sterilization of medical supplies, graft co-polymerization of plastics and has already been applied effectively in other fields. It is also used in a wide variety of scientific research. Irradiation could be a key to open the door to broader fields and a brighter future for your business or research organization. It has possibilities that should not be overlooked by forward thinking Industrialists, Processors and Research Scientists.

With a background of more than a decade of experience in the field of Cobalt 60 Irradiation, AECL offers a complete "package" for your production or research program including—Economic Studies, Irradiator Design, Consulting Services and, of course, a dependable supply of Cobalt 60. (AECL's annual shipments of Cobalt 60 are currently running at one-half million curies.)

May we have the opportunity of placing the experience and resources of our organization at your disposal. Please write to—

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61–5

BARBER COLMAN

THE BARBER-COLMAN

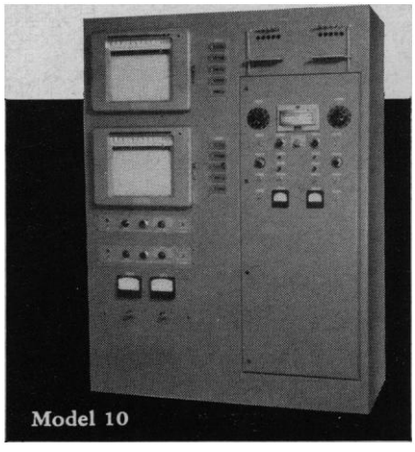
Chromatogram

News Views and Techniques

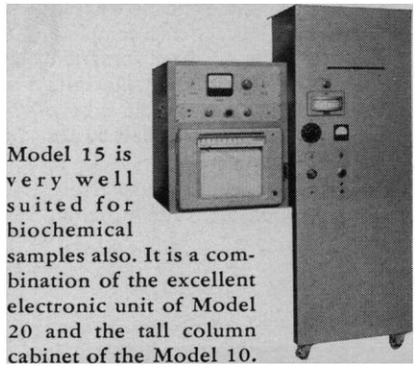
1. Androstane
2. Androstane-17-one
4. △1, 4 Androstadienolone
5. Progesterone
6. Cholesterol

Sample: 0.2 ul Steroids
Chart IPM 1/3 Carrier gas 20 psi
Liq. Phase: S.E. 30 on Anakrom ABS
Column: glass — 6 feet long
OD 1/4" — ID 5 mm
Temp. °C: Column 240; flash heater 320; detector 250
Flow ml./min.: Column 60, scav. 0, Split 0

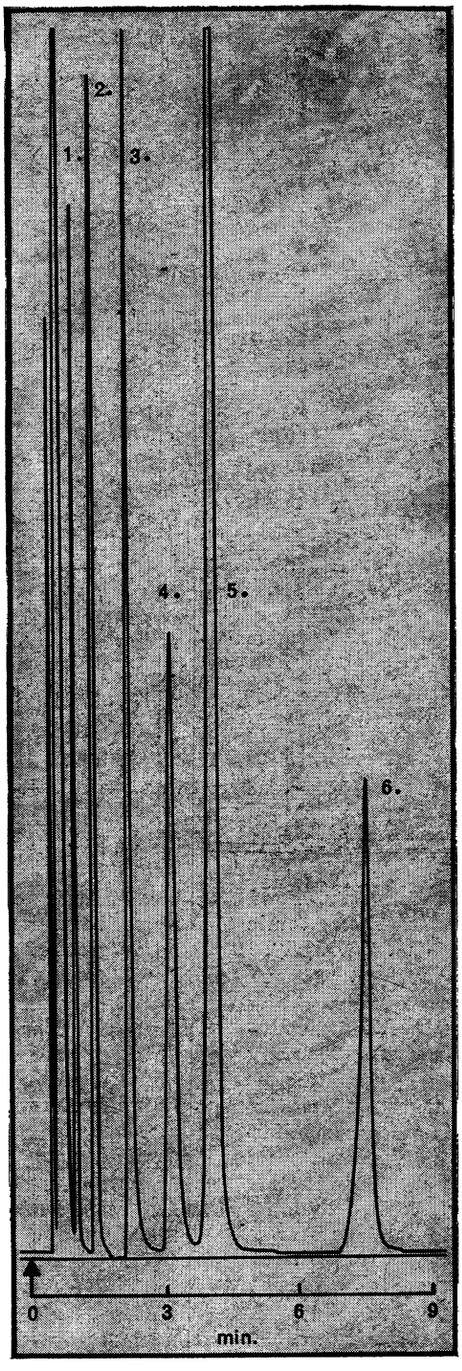
The new column packing gives greater efficiencies with less tailing. Coupled with U-shaped glass columns, it provides new resolving power.



Model 10



Model 15 is very well suited for biochemical samples also. It is a combination of the excellent electronic unit of Model 20 and the tall column cabinet of the Model 10.



MEDICAL CENTER REPORTS: STEROIDS

The Model 10 Chromatogram reproduced here is an excellent example. Since the breakthrough on steroids reported in C&EN July 25, 1960, Barber-Colman researchers at their research center have been widening the breach and establishing data on better phases, solid supports, and operating parameters to analyze the important area of steroids. Incidentally, the Barber-Colman Model 10 was employed on the original breakthrough.

In fact, Model 10 has played a large part in gathering the considerable body of data now available on steroid analysis. It now appears to be "the instrument of choice" for separating steroids, fatty acids, alkaloids, amino acids and similar compounds.

U-shaped, glass-packed columns 9'6" long can be utilized in the Model 10. Close individual temperature control of the sample flash heater, column and the Argon detector equips the Model 10 for stable isothermal runs. A special recorder delivers left-to-right, normal reading chromatograms at fast pen speeds with unmatched accuracy. Most IMPORTANT, Model 10 is a superbly built Argon ionization instrument.

Write to your nearest Barber-Colman office for more data on Model 10 and steroids.

NATION-WIDE NETWORK OF SALES-SERVICE FACTORY BRANCHES

BARBER-COLMAN COMPANY

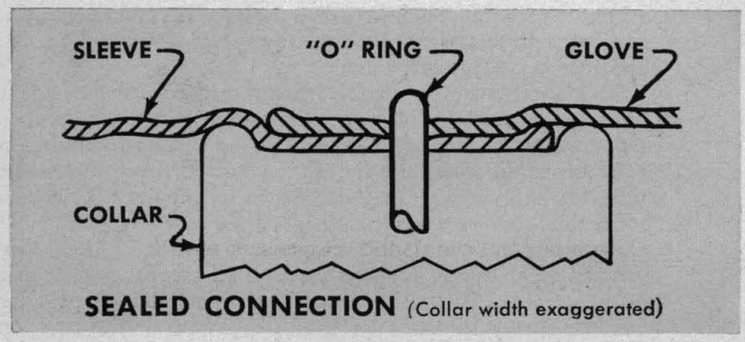
Industrial Instruments Division

Dept. C, 15131 Rock Street, Rockford, Illinois, U.S.A.

BARBER-COLMAN of CANADA, Ltd., Dept. C, Toronto & Montreal • Export Agent: Ad. Auriema, Inc., N.Y.

from the originator of Berkeley Box gloves...

a decisive BREAKTHROUGH in the DRY BOX field!



SEALED CONNECTION (Collar width exaggerated)

Exceptionally strong glove-collar-sleeve connection for extra safety and security

WIL-GARD

Interchangeable Berkeley Box Sleeve and Glove Combination

Imagine—anyone can use your Berkeley Box facilities without changing sleeves! Work in a controlled atmosphere is now simplified by these new sleeves and interchangeable gloves. Most Wil-Gard industrial gloves up to 11-inches long can be mounted on a special collar attached to the sleeve which remains permanently flanged to the box. Changeover is made in seconds! Pin-holed or contaminated gloves can be quickly interchanged individually without replacing the sleeve—saving you money, time and manpower.

Hand temperature suppressors are molded to the inside surface of each sleeve and provide continuous circulation and change of fresh air, minimizing dew-point fluctuations inside the Berkeley Box.

No matter what you handle—radioactive materials, noble gases, chemical dusts, radioisotopes, reactor fuels, or analytical laboratory tests—this new combination makes a perfect team for your Berkeley Box needs!

All of these Wil-Gard Industrial Gloves, up to 11-inch, will fit our "Berkeley Box" Sleeves:

NATURAL RUBBER • SOFT-LINED LATEX • UNLINED LATEX • SOFT-LINED BLACK NEOPRENE • UNLINED BLACK NEOPRENE • UNLINED WHITE NEOPRENE • BUNA-N

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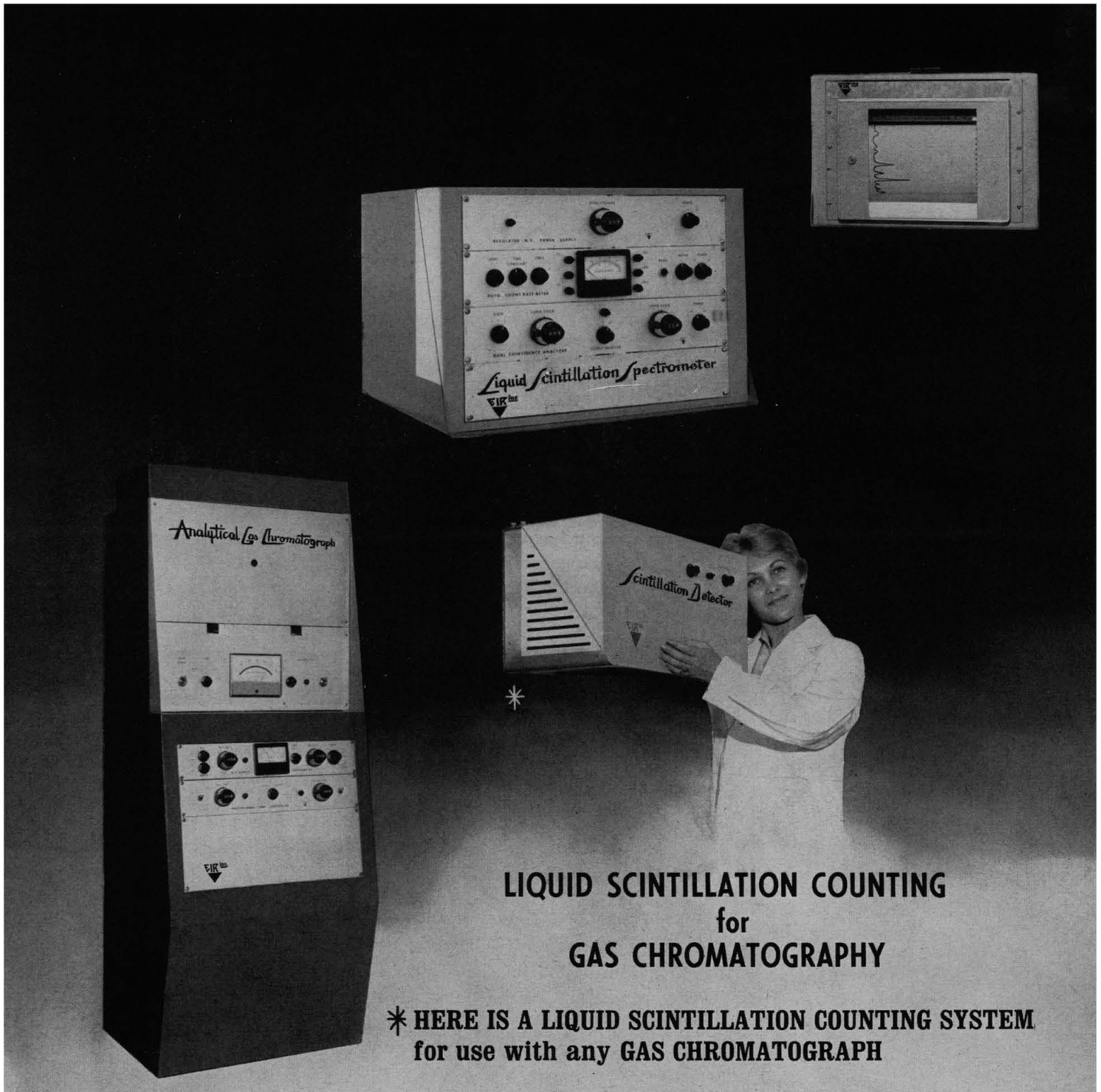

LIQUID SCINTILLATION COUNTING for GAS CHROMATOGRAPHY

*** HERE IS A LIQUID SCINTILLATION COUNTING SYSTEM for use with any GAS CHROMATOGRAPH**

A NEW GAS CHROMATOGRAPH: Scientists set the standards. There is a need for a chromatograph designed especially for the analytical precision required by the Biological and Medical Scientist. They require greater sensitivity than other researchers. This is provided by an ionization detector, along with true isothermal heating and monitoring, precision proportional solid state temperature control and programming, linearity by means of a regulated high voltage supply. Also available are packed and conditioned columns for the analysis of fatty acids, steroids and other materials. The scintillation counter is designed for optimum efficiency in trapping and counting of the radioactive peaks at biological levels. EIR provides all of these features in a mobile and attractive family of precision instrumentation for maximum accuracy.

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electronic instruments for research

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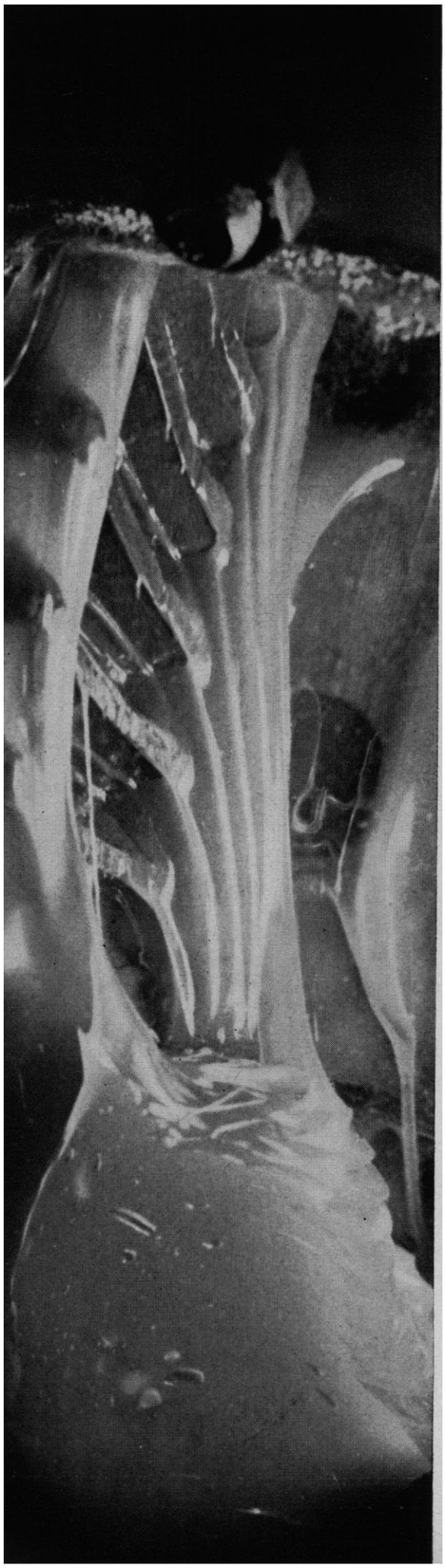


One of a series

Grape Jelly and the Flow of Cold Oil

As freshly made jelly cools, a gel structure forms that resists deformation. The same thing can happen to lubricating oils in extremely cold weather.

Searching for a way to insure that lubricants will function over the complete range of operating temperatures, physical chemists at GM Research have been delving into some interesting research in rheology . . . the science dealing with flow of matter. In particular, they are examining the strange influence of polymers dissolved in mineral oil systems.

Adding long-chain polymer molecules to the already complex mineral oil produces some versatile lubricants. But the polymers further complicate the fluid's viscosity under varying shearing forces and temperatures.

Analyzing such sticky problems has led our researchers to develop new measuring techniques (including a forced-ball viscometer that readily responds to delicate gel structures) . . . to uncover new experimental data (see graph) . . . to form new theories as to why mineral oil gels are made more rigid by some polymers, less rigid by others.

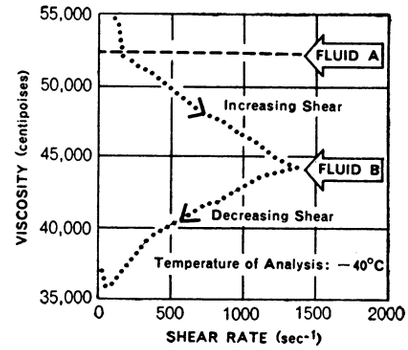
This pioneering work on low temperature oil viscosity started with thoughtful consideration of a practical problem. It is yielding basic new scientific information our technical people can use. We think it typifies General Motors constant resolve to seek and find — A BETTER WAY.

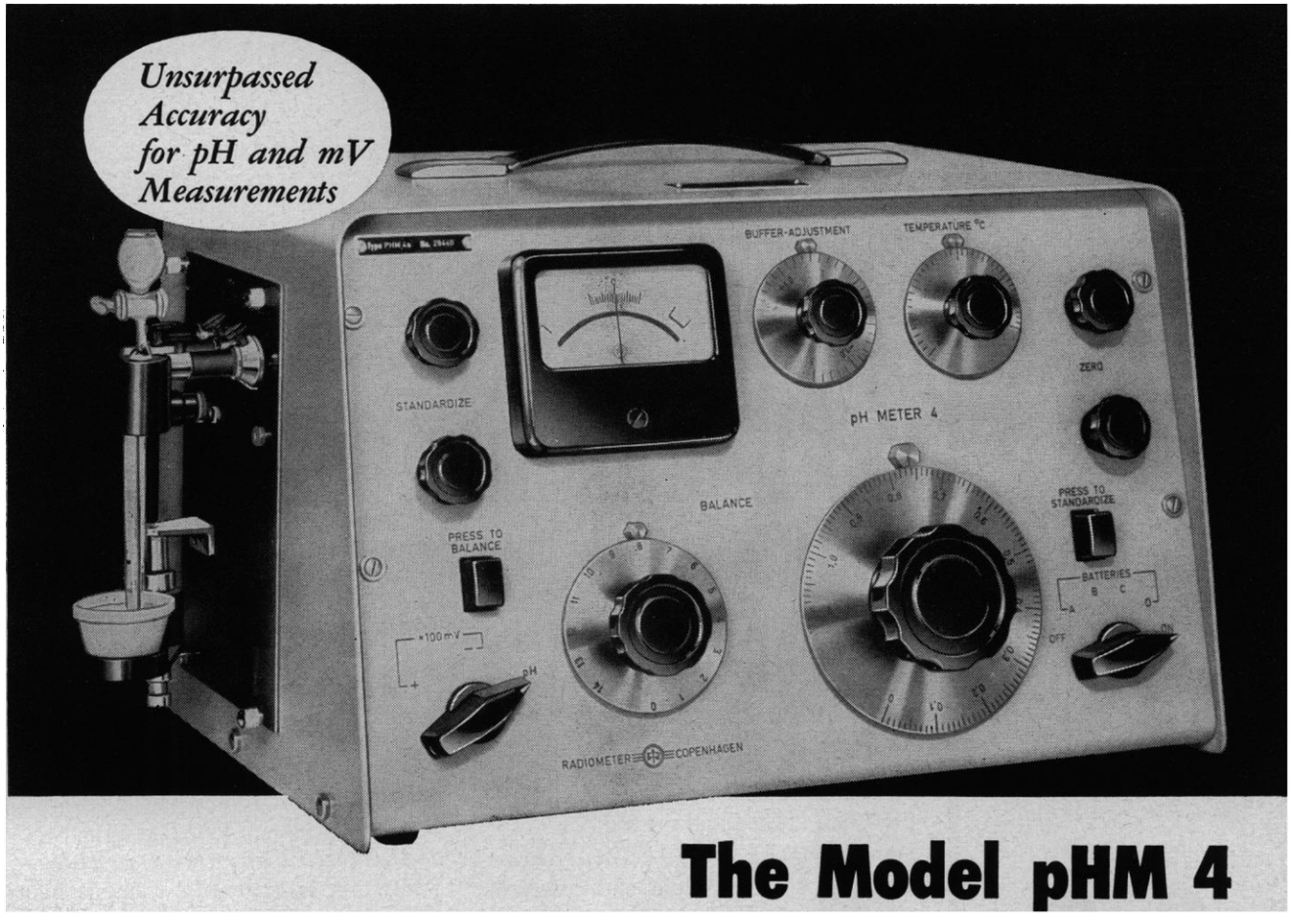
General Motors Research Laboratories

Warren, Michigan

At −25°F a ring gear in a car differential plows through a typical (SAE 90) gear oil.

Fluid A is termed a Newtonian fluid because its viscosity is independent of shearing forces. But note the unusual behavior of Fluid B, a non-Newtonian oil-polymer blend now being investigated.





an All-New **pH meter** *developed for research applications by*

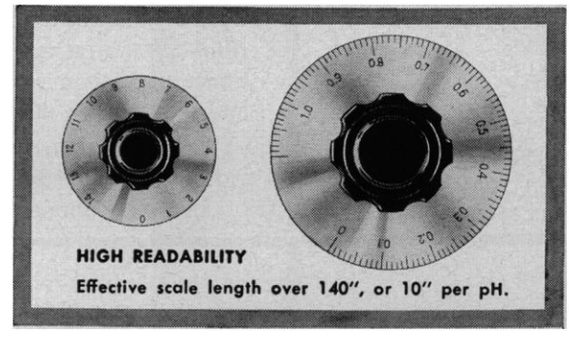
- Transistorized
- Potentiometric

We are exceptionally proud of Radiometers latest achievement — a transistorized pH meter which includes these outstanding attributes:

- **Very low zero drift.**
- **Accuracy for pH differences to ± 0.001 pH.**
- **Accuracy for mV measurements ± 0.2 mV ± 0.05%.**
- **Reads direct in pH (0 to 14) or mV (0 to ± 1500).**
- **Uses wide variety of plug-in or remote electrodes.**
- **Built-in battery condition test and standard cell.**
- **Uses only two types of readily obtainable 1.5 volt dry cells.**
- **Wide buffer adjustment range.**
- **Small view field for minimum eye travel.**
- **Controls conveniently located.**

RADIOMETER

If your requirements are exceptionally demanding, do not fail to evaluate the Radiometer pHM4. By all means write for further information.



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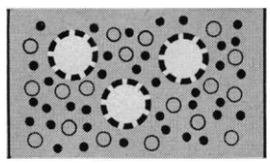
PHARMACIA
LEADING IN DEXTRAN CHEMISTRY

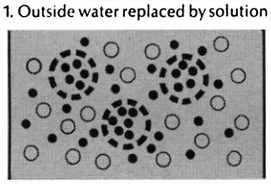
No. 1

Sephadex notes

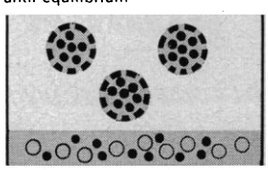
SEPHADEX gel particle with immobile water
○ large molecule
• small molecule



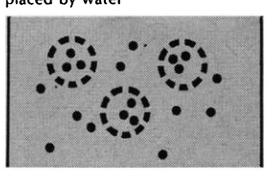
1. Outside water replaced by solution



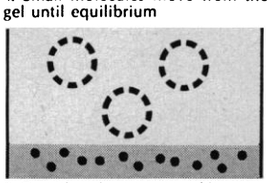
2. Small molecules move into the gel until equilibrium



3. Volume outside gel particles replaced by water



4. Small molecules move from the gel until equilibrium



5. Outside volume replaced by water to empty gel particles completely

Sephadex® GEL FILTRATION

A new analytical and preparative technique

Gel Filtration with SEPHADEX, pioneered by Pharmacia, leader in dextran chemistry, is a significant advance in the methodology of separation and purification.

The adjacent series of pictures indicates a cyclic procedure which is repeated in every SEPHADEX particle to give as a final result the separation of molecules of different sizes.

NUMEROUS APPLICATIONS
. . . tested and proved . . .

a) *Desalting colloid solutions*— SEPHADEX allows rapid and complete desalting, eliminating time-consuming, imperfect dialysis methods.

b) *Exchanging buffer mediums*— SEPHADEX assures easy and fast changing of buffer mediums prior to ion exchange chromatography or electrophoresis.

c) *Fractionating polymers*— SEPHADEX permits accurate and efficient fractionation of homologous polymers by molecular weight.

d) *Purification and group separation*—SEPHADEX makes possible fractionation of complex mixtures, extracts and many other substances.

e) *Concentrating*—SEPHADEX provides simple and effective concentrating of solutions containing high molecular weight solutes, without changing ionic strength or pH.

f) *Partition chromatography*— SEPHADEX is extremely valuable in a two-phase system, when the aqueous phase must be *stationary* and the other *mobile*.

g) *Adsorption chromatography*— SEPHADEX adsorbs some aromatic and heterocyclic compounds, a fact which can be utilized for separation.

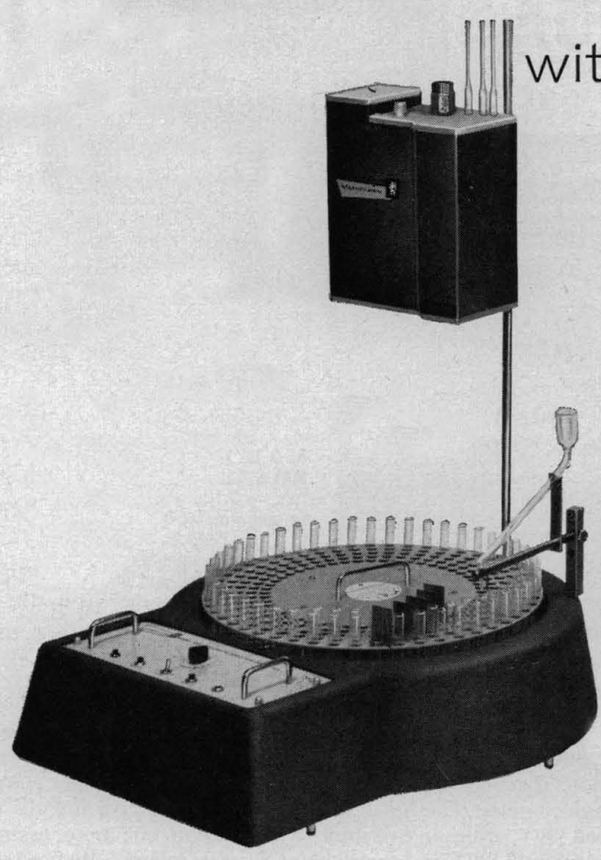
SEPHADEX is supplied in these types: lower limit for complete exclusion—G-25: MW 3,500-4,500; G-50: MW 8,000-10,000; G-75: MW 40,000-50,000.

All of the types are in the following sieve fractions: *Coarse* for industrial uses and when high flow rates are important; *medium* for standard laboratory usage; and *fine* for experiments where high resolution is essential.

For complete information, write for ***Sephadex in Gel Filtration,***

PHARMACIA FINE CHEMICALS, INC.
Headquarters: 501 Fifth Avenue, New York 17, New York
Sales Office: Box 1010, Rochester, Minnesota

monitoring UV ...across the spectrum with just a turn of a **DIAL**



Now with just a turn of a dial you can continuously monitor column effluent for compounds absorbing at any wave length in the ultraviolet spectrum. Vanguard's all-new Model 1056 Automatic UV Analyzer performs with greater sensitivity and versatility than ever thought possible. Dual-beam operation utilizing sample and reference cuvettes provides continuous base line compensation for gradient elutions and for other applications where the optical density of the eluent may change. Operates with minimum supervision and compatible with all Fraction Collectors. Automatic chart recorder marking system speeds identification by quickly and accurately locating test tubes in which absorbing materials are located.

To learn how you can save time while assuring positive identifications—even in the presence of highly absorbing solvents—write direct for complete details on the new Vanguard Model 1056 Automatic UV Analyzer.

- Analyzes across the spectrum—from 200 to 400 millimicrons
- Particularly well-suited for gradient elution techniques—even when highly absorbing solvents are utilized
- Monochromator-coupled hydrogen light source permits selective dialing across UV spectrum
- Automatic chart recorder marking system locates absorbing materials by test tube
- Compatible with all Fraction Collectors—regardless of make or model
- Fully transistorized for long, precision service

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Tracerlab omni/guard

LOW BACKGROUND BETA COUNTING SYSTEM

BACKGROUND AS LOW AS 0.3 CPM

1″ OR 2″ SAMPLES

MANUAL OR AUTOMATIC SYSTEMS

Leading research and environmental analysis laboratories* are now using Tracerlab Omni/Guard Low Background Beta Counting Systems like the one pictured. In addition to setting new standards of reliability, Omni/Guard Systems are performing counting operations never before possible.

The Omni/Guard can assay 1″ or 2″ solid beta samples. Efficiency is high, even for low energy beta rays, C^{14}, S^{35}, etc. This means that less starting material is needed, lower activity levels can be measured, and counting time is substantially reduced. And the new Tracerlab Omni/Guard System is moderately priced and economical to operate and maintain.

In mentioning these advantages we've merely scratched the surface. Write for the Omni/Guard Bulletin. Tracerlab, 1601 Trapelo Road, Waltham 54, Mass., or 2030 Wright Avenue, Richmond 3, California.

*names on request

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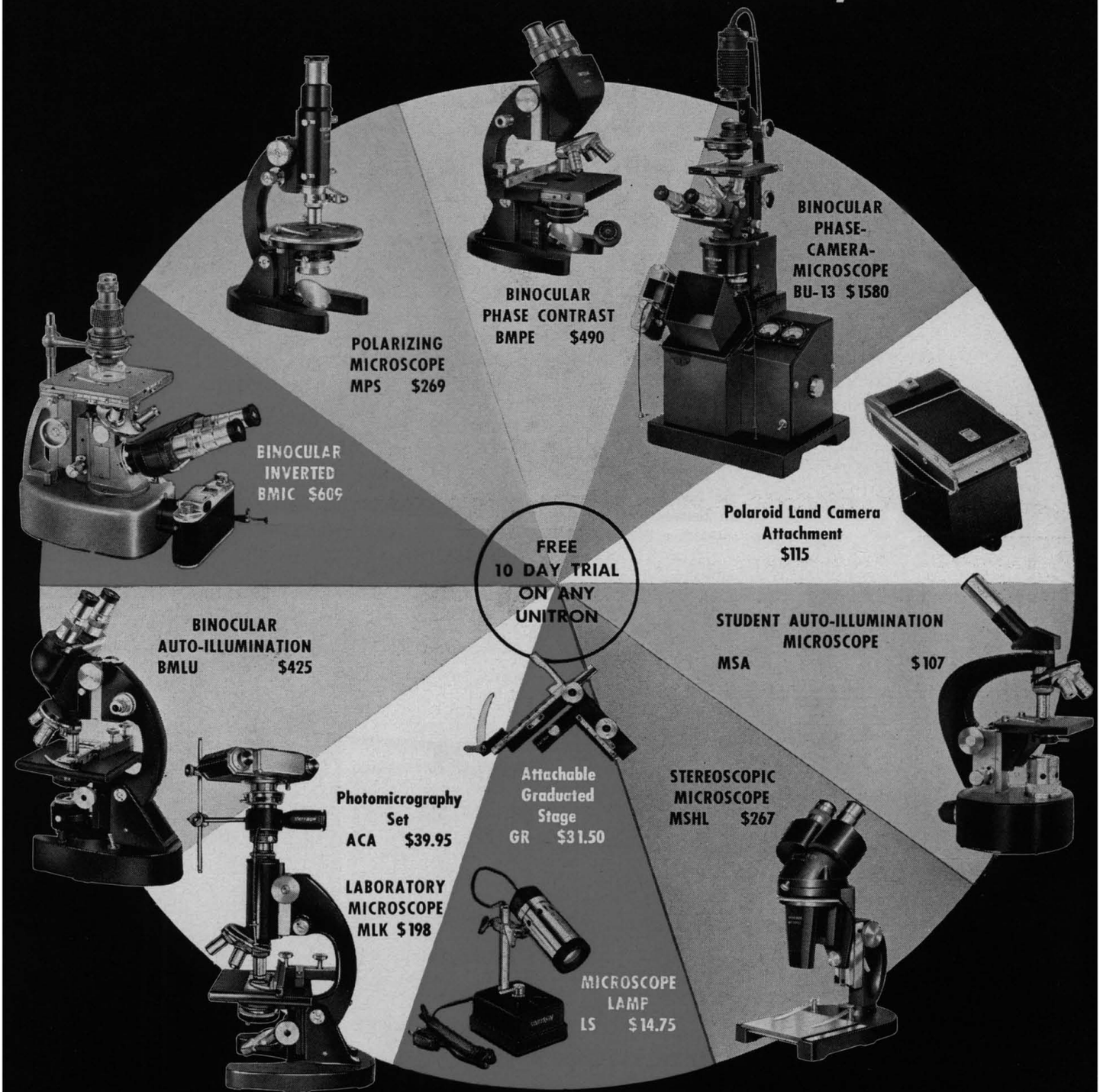

UNITRON offers an extensive line of Laboratory Microscopes & Accessories for Research, Industry and Education. Illustrated is a partial selection for biology, medicine, chemistry and related fields. UNITRON also has companion instruments for the metalworking industries.

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Linde ryobiology

REPORT NO. 1 FROM LINDE COMPANY, DIVISION OF UNION CARBIDE CORPORATION

All-new, practical approach to freezing-storing biologicals insures:

1. Maximum recovery of viable tissues, cells, and microorganisms.
2. Recovery of labile enzymes with minimum loss of activity.
3. Preservation of characteristic cellular morphology.

THE NEED FOR LIQUID NITROGEN

Very low temperatures are needed for long-term, indefinite preservation of biological specimens.

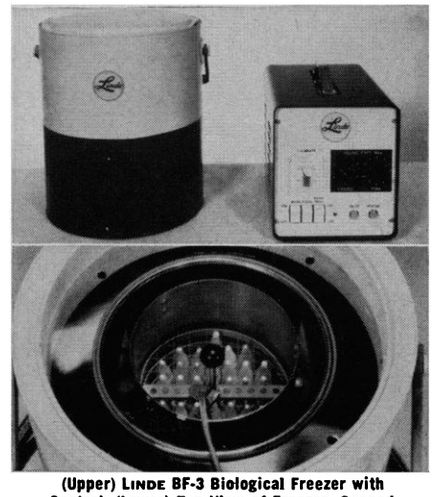
No longer is mere freezing of a specimen considered adequate. Chemical and enzymatic reactions *do not cease when water freezes,* they are merely slowed. Typically, lipase activity has been found at −24.5°C. Invertase can hydrolize sucrose at −18°C. Certain species of microorganisms have multiplied even though held at −8.9°C. for one year.

To be sure a specimen is stored so that there is no degradative activity, recent studies dictate the need for temperatures below −130°C. Ice crystal growth ceases; all chemical and physical activity are reduced to a negligible level.

Liquid nitrogen, which boils at −196° C., provides a storage temperature which prevents ice crystal growth and chemical reactions that damage specimens. Moreover, it is chemically inert and will not react with any material it contacts. It has no effect on the pH of the specimen. It vaporizes without leaving a residue.

LIQUID NITROGEN FREEZING/STORING MADE SAFE, PRACTICAL—BY *LINDE*

Linde Company, pioneer in cryogenics and the only industrial company currently active in cryobiological research and development, supplies field-proven equipment for both freezing and storing biological materials. LINDE, in cryogenics since 1907, now has an integrated group of nearly 40 biologists, biochemists, biophysicists, and engineers engaged in cryobiological research.



(Upper) LINDE BF-3 Biological Freezer with Control. (Lower) Top View of Freezer, Opened.

For successful freezing of biological materials, a proper controlled cooling rate is essential. LINDE's new BF-3 Biological Freezer provides the required precise control of conditions. Optimum cooling rates can be accurately maintained in the range of 0.5°C. to 19.0°C. per minute. Unit requires only simple installation, makes it possible to carry out entire freezing operation on the laboratory bench; consumes as little as 5.9 liters of LN_2 when the cooling rate is 1°C./min. (less as the rate increases).

LINDE LNR-25-B Liquid Nitrogen Refrigerator

For successful storage of specimens, the LINDE LNR-25-B Liquid Nitrogen Refrigerator maintains material between −185°C., and −196°C. Non-mechanical unit eliminates hazard of loss through power failure. Now offered in new 9-canister or in regular 6-canister arrangement. Storage space can be reached easily through large-diameter entrance tube. Fully charged unit has holding time of about 21 days. Stainless-steel welded construction provides a unique combination of light weight, durability, resistance to corrosion.

Free literature and technical data available

Detailed literature is now available on request. For help with your problems, check your area(s) of interest on the coupon below and send.

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270 Park Avenue, New York 17, N. Y.

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- ☐ LINDE Liquid Nitrogen Refrigerators
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UNION CARBIDE

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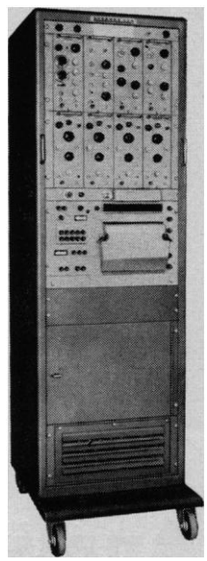
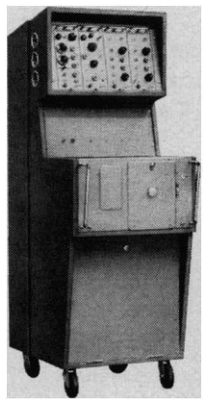
SANBORN® OPTICAL OSCILLOGRAPHS



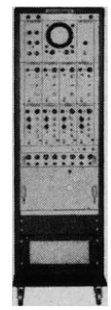
NEW DIRECT-READOUT RECORDING SYSTEM

In addition to wide-deflection traces that can overlap, and high frequency response, this new recorder provides the special advantage of direct readout with no chemical developing necessary. Standard galvanometers cover a frequency range of 0 to 500 cycles, providing more than enough response for heart sounds, blood pressures, EEG, ECG, oximetry, dye dilution studies, plethysmograms, temperatures, etc. The Sanborn 350-1700B Heart Sound Preamplifier provides pre-emphasis to extend the heart sound bandwidth to 1000 cycles per second with standard 500 cycle galvanometers. Galvanometers with a frequency range up to 2000 cps are available upon special request for such phenomena as EMG pulses, nerve pulses, etc. The Model 658T uses an 8″ chart, has 9 speeds from 1000 to 2.5 mm/sec, timing lines at 0.1 and 1.0 sec intervals, beam interrupter for trace identification. Monitoring units may be included.



NEW 4-Channel Photographic System Model 564 Poly-Beam

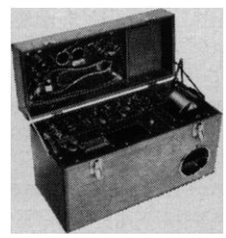
Efficient system for up to 4 channels, with excellent performance at minimum cost; wide application versatility by using "350" preamplifiers; full-scale (15 cm) recording with clear, reproducible traces. Monitoring units may be mounted on cabinet.



8-Channel Photographic Model 558M Poly-Beam

Versatile Poly-Beam system uses up to eight "350" preamplifiers; excellent performance, full-scale (15 cm) recording, reproducible traces; monitor units may be included.

2-Channel Photographic Model 62 Twin-Beam



Convenient table-top system provides 6 cm wide recordings plus electrical auscultation; uses Twin-Beam amplifiers (ECG, Phono) or external amplification for additional phenomena; external monitor units may be used.

The extensive and well-known Sanborn line of heated stylus recording systems is available, of course, in addition to the optical systems outlined above. For complete information call the nearest Sanborn Branch Office or Service Agency — or write Manager, Research Instrument Sales:

MEDICAL DIVISION

SANBORN COMPANY

175 Wyman St., Waltham 54, Massachusetts

nuclear DATA

The "Quiet Entry" Pulse Analog-To-Digital Converter

Without much question, the most difficult problem in the design of analog-to-digital converters, for multichannel pulse height analyzers, has been that of getting the acceptable pulses "into" the converter. The signals are usually random in both amplitude and time of occurrence, and those signals which occur during times that the converter is busy processing an earlier pulse must be blocked. In some way, also, the input pulses which occur during the re-opening of the signal gate must be rejected. Alternatively, the input gate must not be re-opened when a signal pulse is present since that pulse may be distorted in the process. Furthermore, if a signal pulse occurs during a transient produced by a large earlier pulse, that signal pulse should be rejected.

It is almost customary to use a trigger circuit responsive to each input signal pulse and to use the output of this trigger to open the linear signal gate except if the input signal occurred at an inopportune time. The use of such a trigger circuit, we have always felt, is undesirable for numerous reasons. It is complex when designed to carry out all of the rejection functions described above; it is difficult to provide adequate triggering sensitivity so that even very small signals will be allowed to "enter" the converter, and yet be tolerant of the rather extreme ranges of pulse rates and amplitudes encountered in some experiments; and it is not easy to prevent distortion of the signal pulses due to the violence of the triggering action since the voltage signals produced are many times greater than the smallest input signals of interest.

We devised a method, some 300 analyzers ago, in which the trigger circuit is completely eliminated. Our competitors were considerably amused by our reference to this converter as a "quiet entry" converter. Nevertheless, the method has been most successful, and its use accounts largely for both the precision and reliability of our converters. When we recently designed our models ND120 and ND130 analyzers, we re-studied the problems involved in using an input trigger circuit, for certain design considerations made it difficult to provide a "live" cathode ray tube display without advance notice of each impending conversion process. That notice apparently would have to be derived from an input trigger circuit. A few experiments left us even more appreciative of the quiet entry technique which we have continued using. We give more weight to analysis precision and reliability than to a feature which is ordinarily only a convenience.

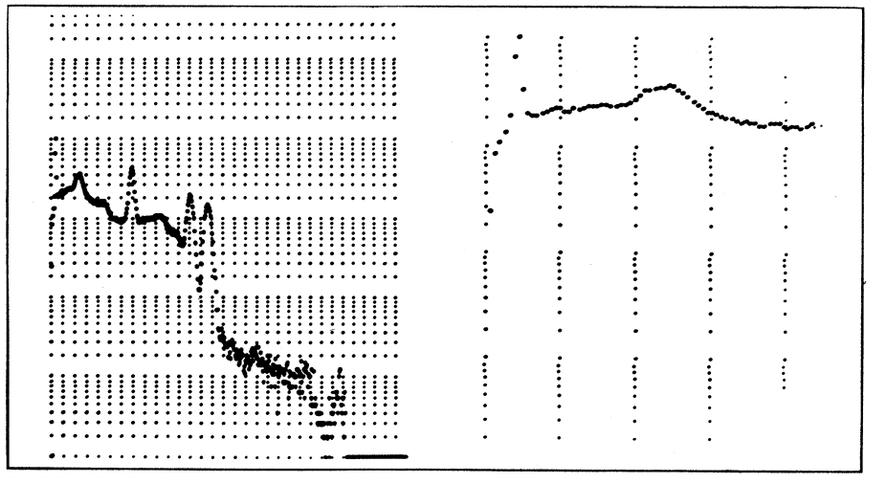


Fig. 1 Analysis of gammas from Co^{60} and Cs^{137}, showing 32 k.e.v. x-ray fully resolved at gain setting of about three m.e.v. full scale. Input pulse rate 4,000/second. Right hand photograph shows detail of x-ray.

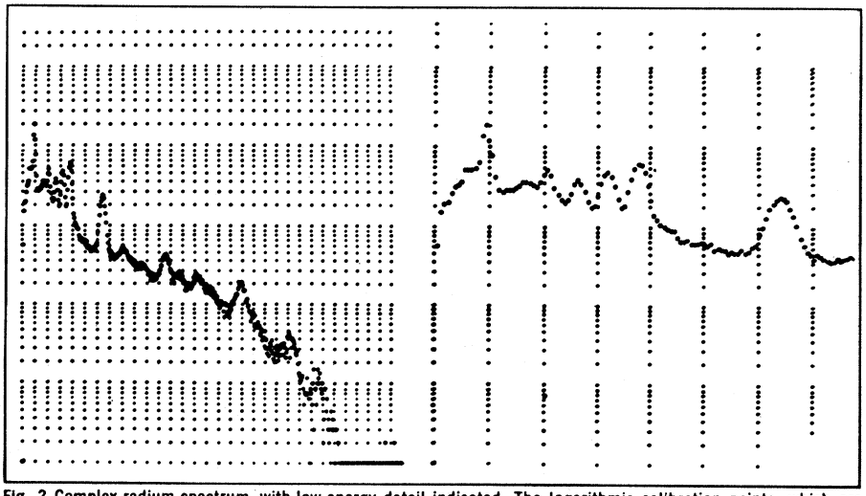


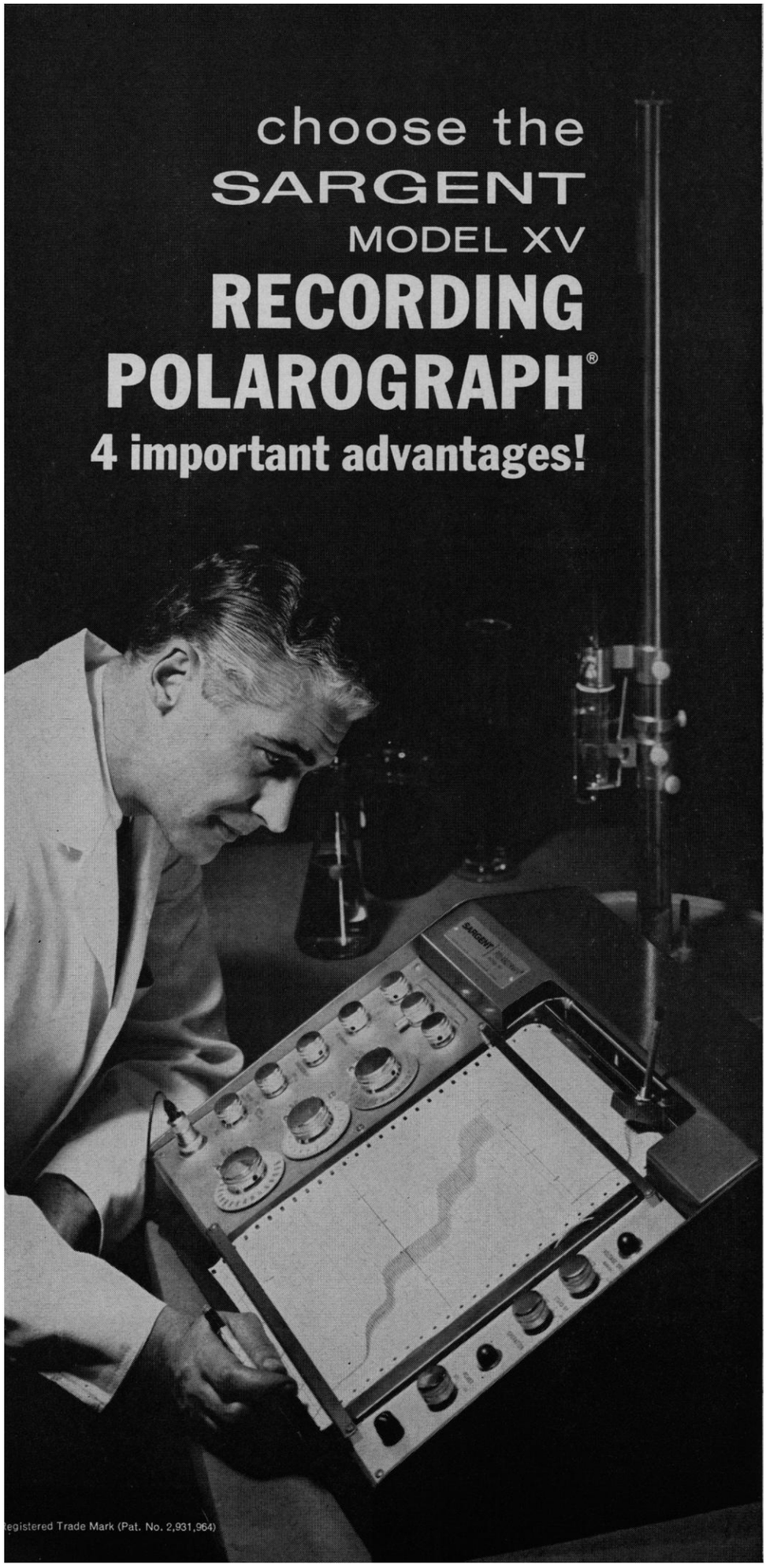
Fig. 2 Complex radium spectrum, with low energy detail indicated. The logarithmic calibration points, which are also channel marker points, are a standard feature in our analyzers. Unretouched Polaroid photographs shown actual size, taken with the Tektronix Model C-12 camera.

In our method, the input signal gate is permitted to remain open at all times, except when the analyzer is busy and, of course, except in coincidence operation. This means that improper pulses, as well as the proper ones, are permitted to enter the converter to be analyzed. If the pulse has entered during or immediately after the gate re-opening, or if a transient due to an earlier pulse exists during the re-opening, the conversion operation invariably starts immediately after that re-opening. Whenever a conversion begins within about two microseconds of the linear gate re-opening, the results of the subsequent analysis are ignored (no count is added to the memory channel involved). It is sufficiently infrequent that this happens that the lost time is not important, providing the dead time effects are properly corrected by the timing circuits, which they are.

There are several immediate benefits. The only circuit which must respond to the input pulses is the circuit used to charge the converter "memory" capacitor. That circuit has invariably been quiescent for about 20 microseconds prior to the gate re-opening, since it is quiescent during the count-storage cycle following its last conversion. It may therefore be adjusted to respond to even very small signal pulses since there is no tendency to "run wild" as would be the case for a trigger circuit continuously exposed to the input pulses. If desired, it may be adjusted to any sensitivity level above noise, but it is normally set at about ½% of the largest signal pulse of interest.

The gamma spectra shown in Figs. 1 and 2 indicate the excellent performance in the low energy regions. This performance is characteristic of all model ND120 and ND130 analyzers under "field" conditions. Unlike the case involving trigger circuits, which must be operator-adjusted to suit conditions, there is no threshold adjustment provided at all, since the capacitor charging circuit has a stability of well under ½% for the life of the instrument. To provide a variable threshold, we would need only provide a variable bias to the capacitor charging circuit. To our considerable surprise, no one has yet asked us to include the variable threshold.

The name "quiet entry" simply means that no signal pulse which enters the converter will result in a count being stored in the memory, unless that pulse entered the converter when *all* analyzer circuits were quiescent. Early rumors had it that there were certain performance limitations introduced by the method. There are none at all. Operation is easier, a complex and sometimes troublesome circuit has been eliminated completely, and analysis is more accurate.



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2. 1/10% Accuracy of Measurement

3. 10″ Standardized Polarizing Ranges

4. Low Cost

This Sargent POLAROGRAPH gives you a large 250 mm (10 inches) chart and the highest accuracy and current sensitivity at the lowest price of any pen writing polarographic instrument meeting these specifications.

It offers you optimum specifications based on over twenty years of leadership in design, manufacture and service in this specialized field of analysis.

The polarographic method is capable of reproducibility to 1/10% and analytical accuracy to ½%. To make use of this facility, the instrument must be accurate to 1/10% and chart space must be provided for recording large steps to achieve measuring precision. We strongly advise against the purchase of any polarographic instrument using miniature (5 inch) charts and low gain balancing systems in the 1% order of precision.

This Model XV is adaptable to 10^{-6}M determinations with the S-29315 Micro Range Extender.

SPECIFICATIONS

Current Ranges: 19, from .003 to 1.0 μA/mm.

Polarizing Ranges, volts: 0 to -1; -1 to-2; -2 to -3; -3 to -4; +.5 to -5; 0 to -2; -2 to -4; +1 to -1; 0 to -3; +1.5 to -1.5.

Balancing Speed: standard, 10 seconds; 1 second or 4 seconds optional.

Bridge Drive: synchronous, continuous repeating, reversible; rotation time, 10 minutes.

Chart Scale: current axis, 250 mm; voltage axis, 10 inches equals one bridge revolution.

Current Accuracy: 1/10%

Voltage Accuracy: ¼%

Chart Drive: synchronous, 1 inch per minute standard; other speeds optional.

Writing Plate: 10½ x 12½ inches; angle of slope, 30°.

Standardization: manual against internal cadmium sulfate standard cell for both current and voltage.

Damping: RC, four stage.

Pen: ball point; Leroy type optional.

Suppression: zero displacement control, mercury cell powered, 6 times chart width, upscale or downscale.

Potentiometric Range: 2.5 millivolts, usable as general potentiometric recorder.

Finish: case, enameled steel; panels, anodized aluminum; writing plate, polished stainless steel; knobs and dials, chromium plated and buffed.

Dimensions: 23 x 17 x 10 inches.

Net Weight: 65 pounds.

S-29310 Sargent Model XV Recording Polarograph with accessories and supplies.....$1585.00

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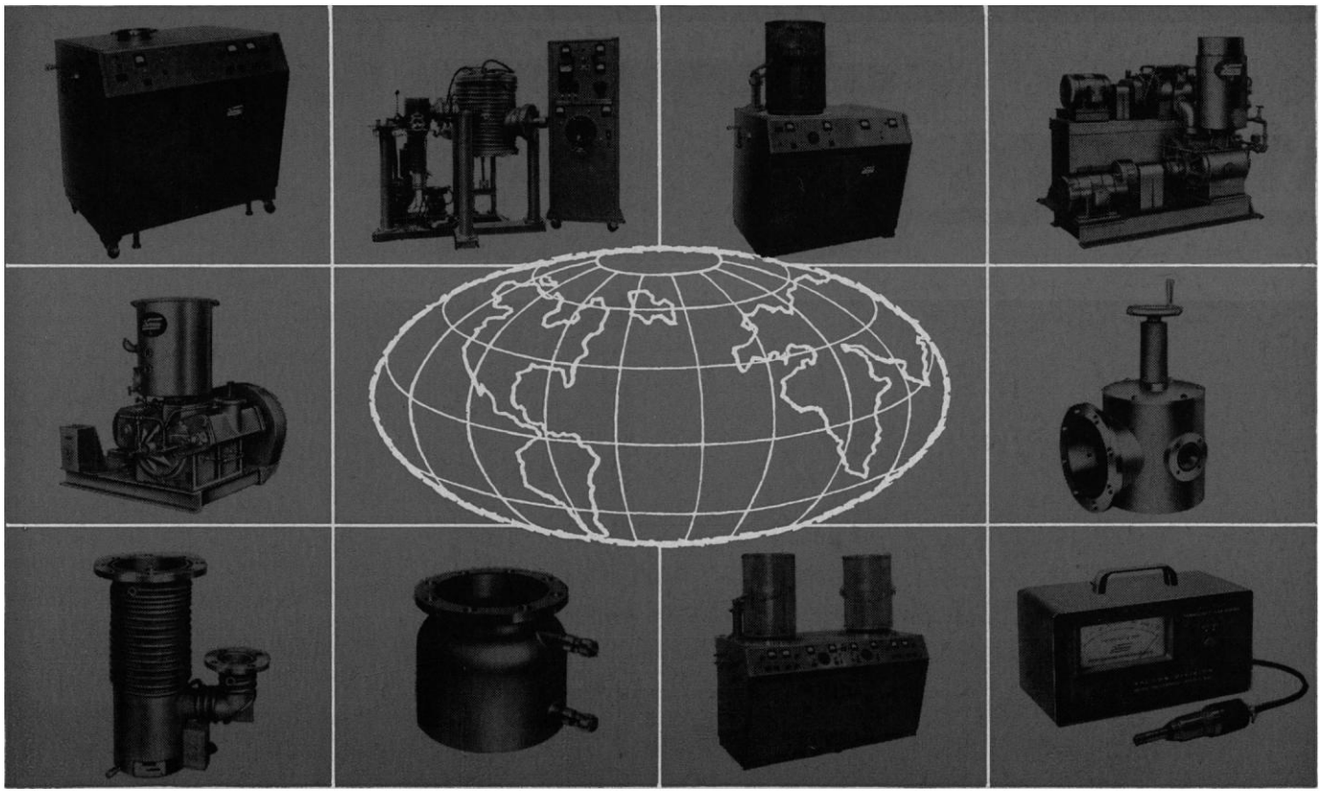

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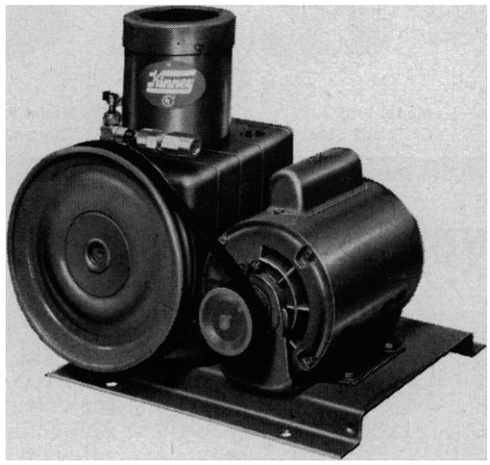

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Kinney vane type high vacuum pumps are expressly developed to provide a laboratory tool that is vibration-free and quiet in operation. Two stage compound pump displacements of 2 to 7 cfm, attain an ultimate of 0.1 micron. Special filter eliminates exhaust smoke. All moving parts are interchangeable for simple operation and maintenance, easily serviced without special tools. The sealing and lubricating oil flows throughout the pump from internal reservoir automatically; no adjustments necessary.

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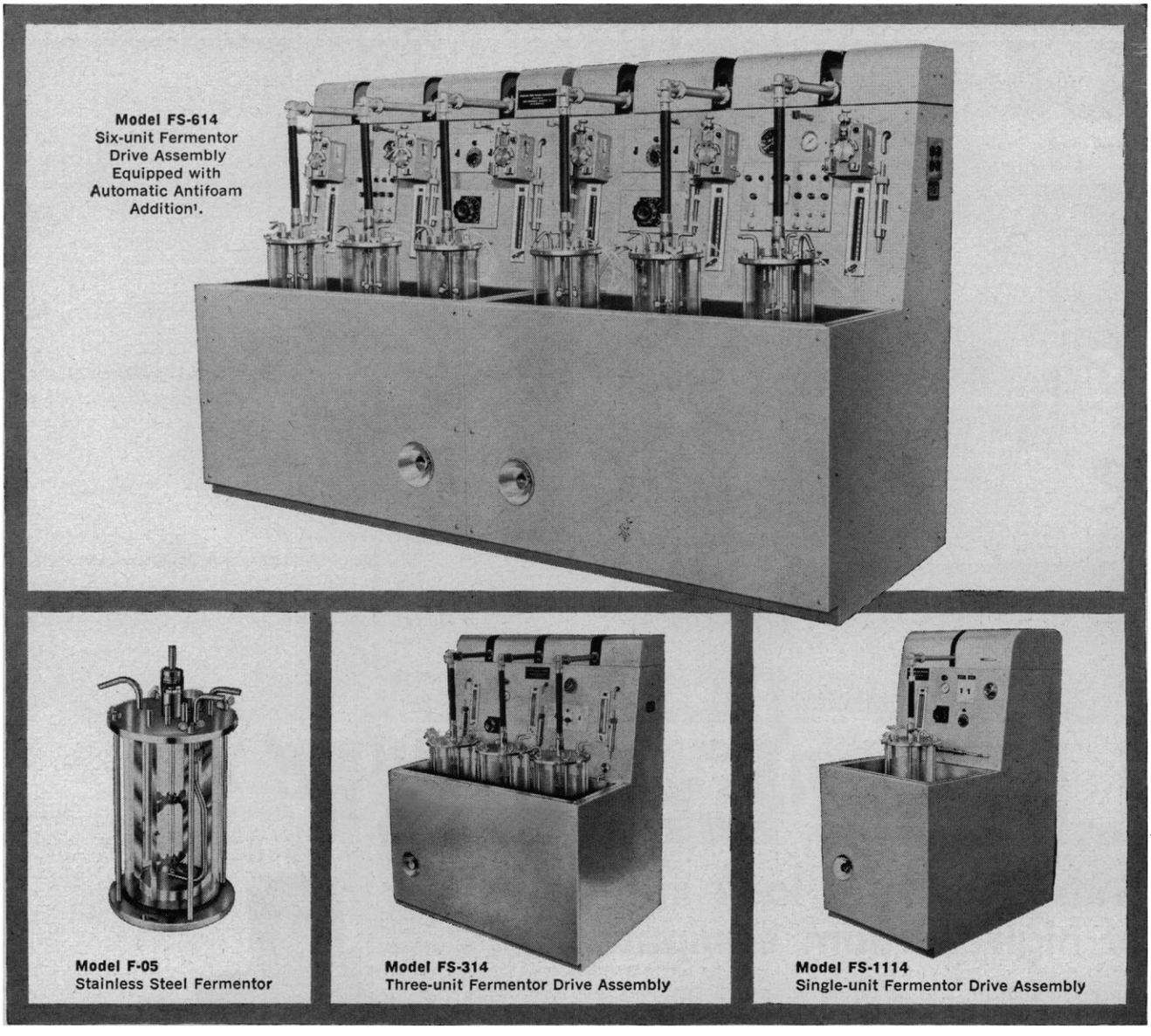

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Equipped with
Automatic Antifoam
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(1) Automatic pH Control and Antifoam Addition optional

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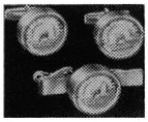

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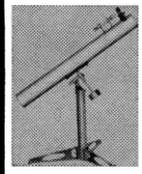

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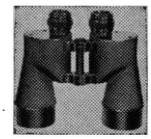

Big savings! Brand new! Crystal clear viewing—7 power. Every optical element is coated. An excellent night glass—the size recommended for satellite viewing. Individual eye focus. Exit pupil 7mm. Approx. field at 1,000 yds. is 376 ft. Carrying case included. American 7 x 50's normally cost $274.50. Our war surplus price saves you real money.

Stock No. 1544-W --**Only $74.80 postpd.** (Tax included)
6 x 30 Binocular—similar to above, a terrific bargain.
Stock No. 963-W --------**$33.00 Pstpd. (Tax included)**

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. . . Point It Out With Arrow Projected

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Built for hard, daily use. Weighs materials from 100 milligrams to 100 grams, can be used for proportionate measuring. Has removable plastic pans 60mm in dia. Features base of rugged cast iron and adjustable on piece beam for balancing. Overall ht. 5½" x 7" long. Comes complete with set of 12 weights ranging from 100mg to 50g and pr. of tweezers in wooden box. Imported.

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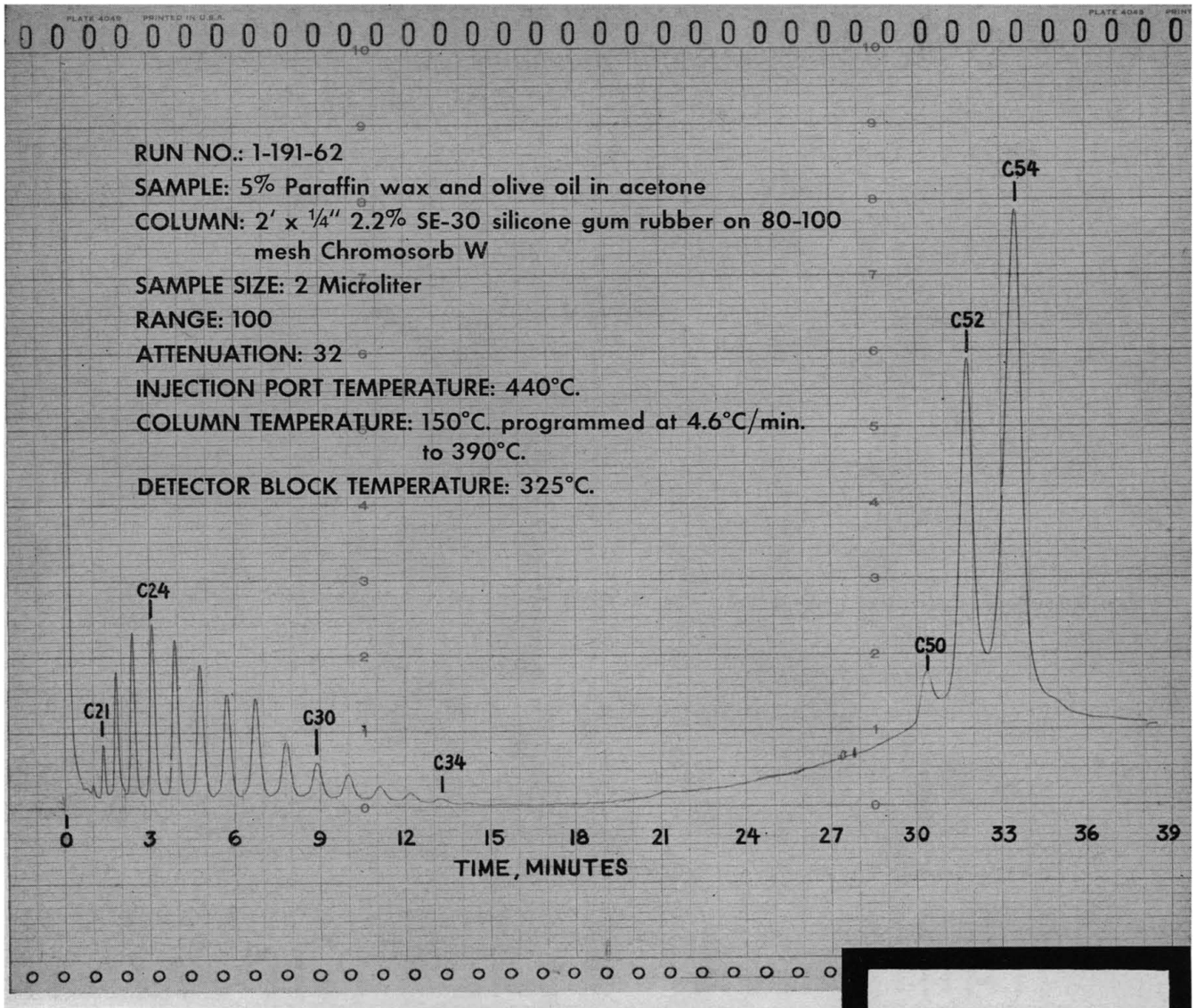

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Sulfates as SO_4	Max. 0.00005%
Iron (Fe)	Max. 0.00002%
Heavy Metals as Pb	Max. 0.00005%
Substances reducing $KMnO_4$	Pass ACS Test
Dilution Test	Pass ACS Test

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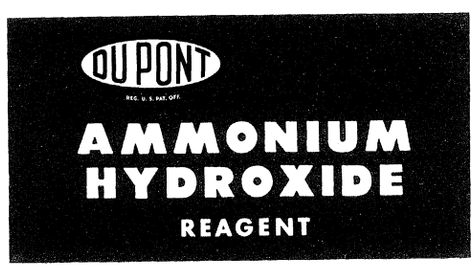
Hydrochloric Acid (HCl)	Min. 36.5%, Max. 38.0%
Sulfites as SO_3	Max. 0.00008%
Sulfates as SO_4	Max. 0.00008%
Free Chlorine (Cl)	Max. 0.00005%
Heavy Metals as Pb	Max. 0.00005%
Residue after Ignition	Max. 0.0004%
Iron (Fe)	Max. 0.00001%
Arsenic (As)	Max. 0.000001%
Ammonium (NH_4)	Max. 0.0003%

NITRIC ACID REAGENT

Nitric Acid (HNO_3)	Min. 69.0%, Max. 71.0%
Chlorides as Cl	Max. 0.00005%
Residue after Ignition	Max. 0.0004%
Heavy Metals as Pb	Max. 0.00002%
Sulfates as SO_4	Max. 0.00008%
Iron (Fe)	Max. 0.00002%
Arsenic (As)	Max. 0.0000005%

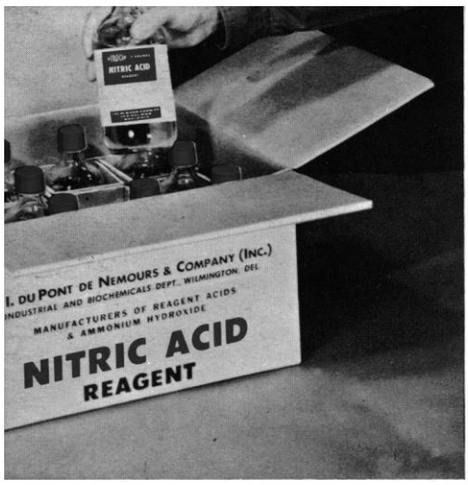
SULFURIC ACID REAGENT

Sulfuric Acid (H_2SO_4)	Min. 95.0%, Max. 98.0%
Nitrogen Oxides (NO_2)	Max. 0.00005%
Chlorides as Cl	Max. 0.00002%
Ammonium as NH_4	Max. 0.0001%
Residue after Ignition	Max. 0.0004%
Iron (Fe)	Max. 0.00002%
Heavy Metals as Pb	Max. 0.00005%
Arsenic (As)	Max. 0.0000005%
Substances reducing Permanganate as SO_2	Max. 0.0001%



AMMONIUM HYDROXIDE REAGENT

Ammonia (NH_3)	Min. 28.0%, Max. 30.0%
Chlorides as Cl	Max. 0.00005%
Phosphates as PO_4	Max. 0.00005%
Heavy Metals as Pb	Max. 0.00005%
Substances reducing Permanganate as SO_2	Max. 0.002%
Carbon Dioxide (CO_2)	Max. 0.002%
Residue after Ignition	Max. 0.0003%
Total Sulfur as SO_4	Max. 0.0002%
Iron (Fe)	Max. 0.00002%



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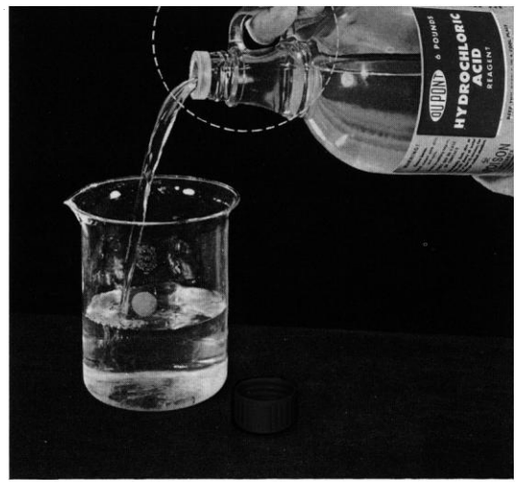

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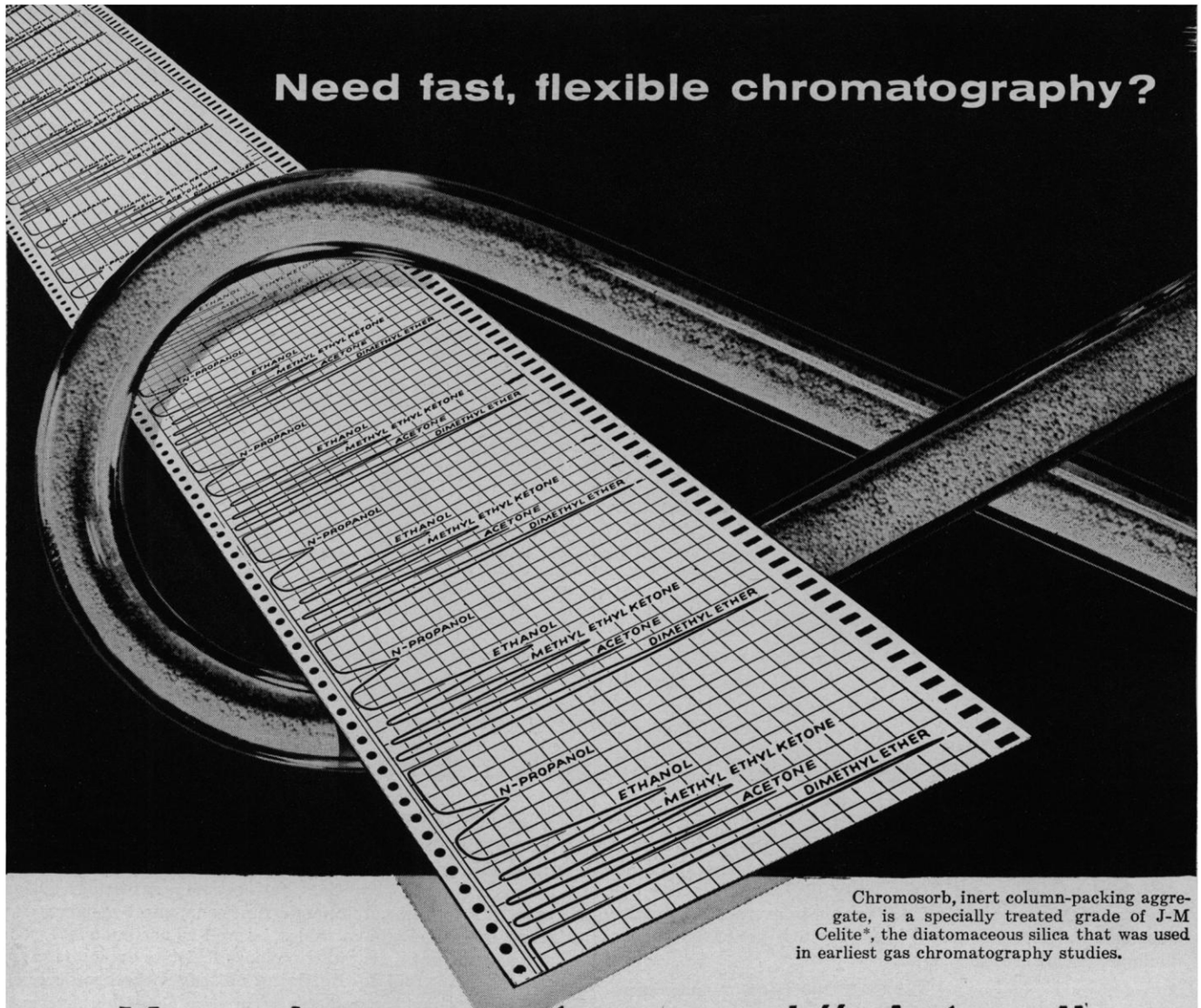

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Moisture—% by weight, maximum	1.0
pH (avg.)	6-7
Surface Area—sq. m./gm. (avg.)	3-5

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Color	white
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Water Absorption—cc./gr. (avg.)	4.0-5.0
Moisture—% by weight, maximum	1.0
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Surface Area (BET Method)—sq. m./gr. (avg.)	3-4

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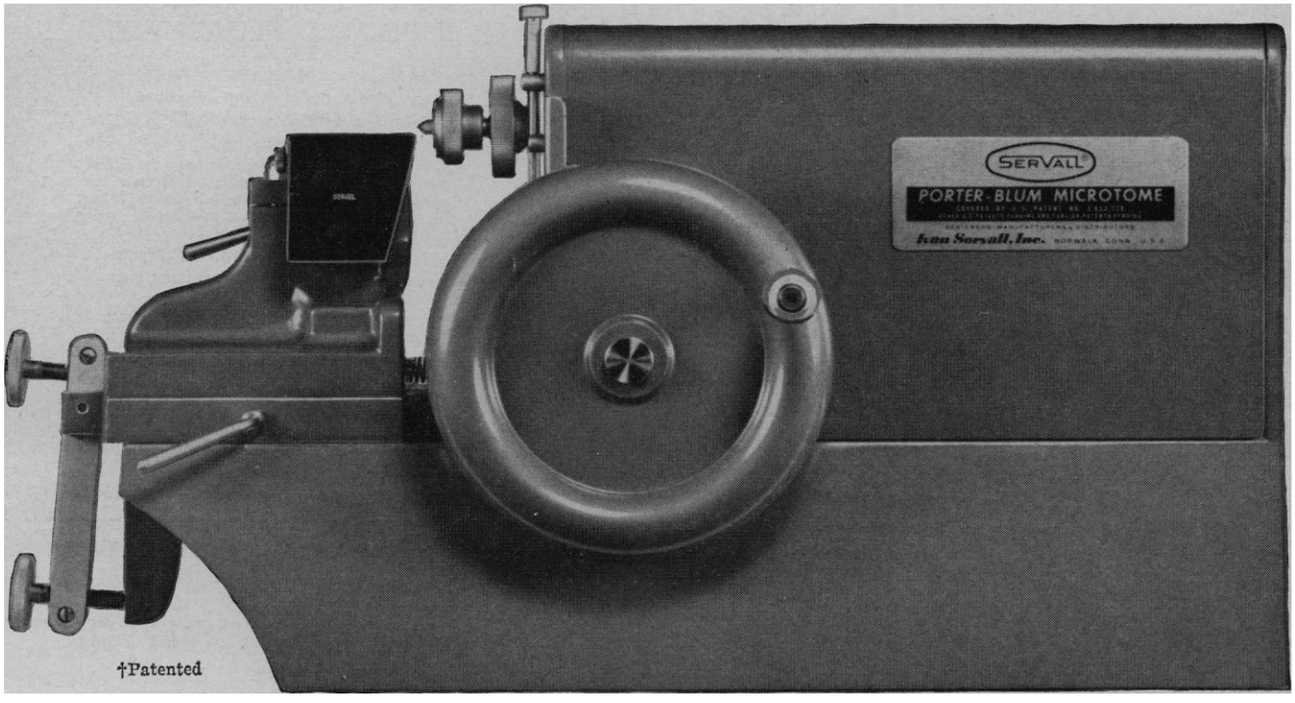

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16 March 1962, Volume 135, Number 3507

SCIENCE

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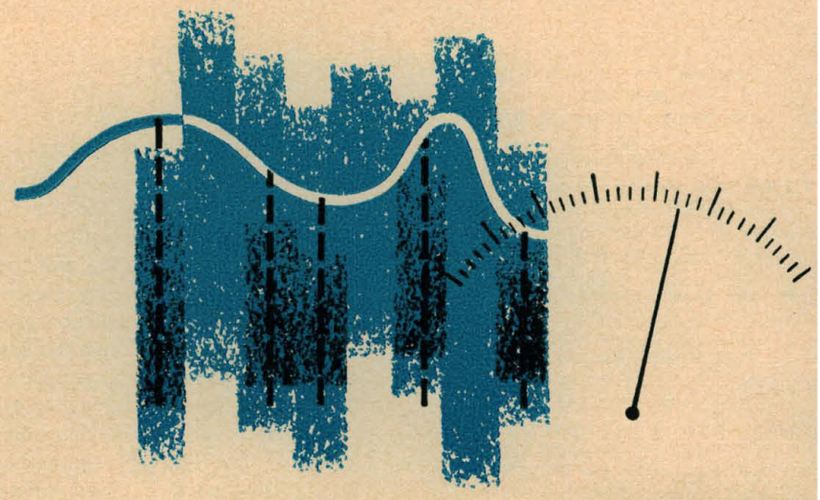
Postal Censorship

Only a year ago, on 17 March 1961, President Kennedy brought to a stop the interception of mail deemed to be foreign political propaganda by the Post Office and the Bureau of Customs. The practice, which was of dubious legality [*Science* **133**, 549 (24 Feb. 1961)], interfered with the free movement of printed matter, including much that by no stretch of the nonbureaucratic imagination could be classified as political propaganda. As a consequence of the lifting of restrictions, research scholars and scientists as well as other citizens have been able to find out, without hindrance, what the iron curtain countries are up to.

The fears of some that the removal of restrictions would open the floodgates to Communist propaganda have not been realized. Actually, the flow has dropped off: the number of printed pieces of mail received in New York from Communist countries, which averaged 1.3 million per month in 1960, has averaged only 865,000 since March 1961.

But those who lack confidence in the good sense and patriotism of our citizens are always ready to shield us from knowledge. In January the House of Representatives passed the massive Postage Revision Act of 1962 (H.R. 7927), designed to bring in enough revenue to reduce the annual postal deficit from a projected $875 million to about $350 million. This is a laudable aim, but, as happens all too often, a good bill carries a bad amendment. If this "Cunningham Amendment" is retained, disruption in the delivery of foreign mail could be much greater than at any time in the past, and even material of domestic origin could be declared nonmailable. The amendment would prohibit the Post Office from the "handling, transportation, or delivery of mail matter determined by the Attorney General to be Communist Political Propaganda financed or sponsored directly or indirectly by any communist controlled government." Political propaganda is defined in the Foreign Agents Registration Act as any communication which is "reasonably adapted to . . . influence a recipient with reference to the political or public interest, policies, or relations of a government of a foreign country or a foreign political party or with reference to the foreign policies of the United States." Under this definition surely Soviet newspapers and many scholarly and scientific journals would be barred from the mails. A recent study of 19,000 pages of Soviet scientific journals showed that although political propaganda constituted less than 1 percent of the total, it was scattered throughout. It could not be readily eliminated without eliminating the scientific content or delaying its publication. If the amendment should pass, such material could not be mailed within the United States from one scientist or library to another.

In the House, Representatives John V. Lindsay and William F. Ryan raised their voices against the amendment, which was carried by a vote of 127 to 2. There were no hearings in the House, but in the Senate, where the amended bill is in the hands of the Post Office and Civil Service Committee, hearings are now being held, and the opposition will have a chance to speak out. Hearings on the amendment itself will be held within the next few weeks, at a time still to be set. The American Council on Education is among the groups that will testify against the amendment, and it will probably be joined by the Post Office, the State Department, the Department of Justice, and the U.S. Information Agency. Let us hope their testimony may be effective.—G.DuS.



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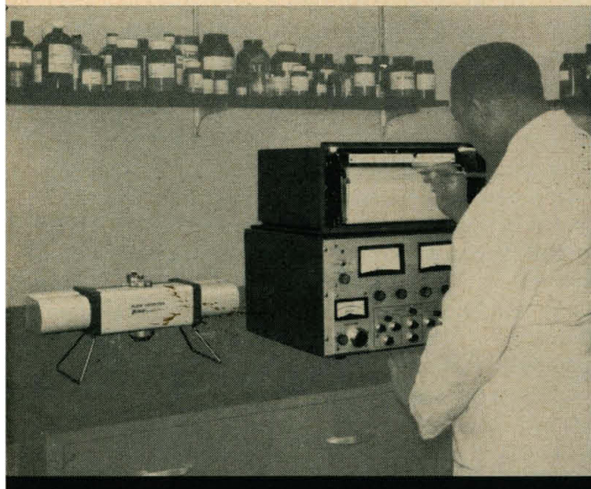

channels permit the simultaneous counting of two isotopes in a mixture. As a measure of sensitivity, a Flow Monitor/Flow Detector system will easily measure 200 dpm in a single peak, when used with an amino acid analyzer. High counting efficiencies (25-30% for C^{14}, 1-2% for H^3) and low backgrounds (20-25 cpm) make this method ideally suited for counting weak beta emitters such as H^3 and C^{14}. For more energetic isotopes such as P^{32} or Cl^{36}, efficiencies are even higher and backgrounds lower. For complete information, call your Packard Sales Engineer or write for Bulletin AD-1003.

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Chemistry and Physics of Space

A. G. W. Cameron, *chairman*
J. R. Arnold, *vice chairman*

2–6 July. Small bodies and particles in space: (speakers to be announced), "Origin and development of meteorites"; "Anomalous isotopic compositions of meteorites"; "Cosmic ray exposure ages of meteorites"; "Tritium in solar cosmic rays"; "Element abundances in meteorites and stars"; "Experimental studies of hypervelocity impacts"; "Shock propagation in solids"; "Shock transformations of minerals"; "Results of the Ranger lunar experiments (if successful)"; "Nature of particles in comet tails"; "The zodiacal light"; "The Gegenschien"; "Measurements of interplanetary dust particles with satellites"; "Examination of interplanetary dust collected from high altitudes"; "Space erosion by dust particles"; "Properties of interstellar grains"; "Formation of H_2 on interstellar grain surfaces"; "Diffuse interstellar lines and their interpretation."

Theoretical Chemistry—Molecular Quantum Mechanics

Harrison Shull, *chairman*

9 July. C. C. J. Roothaan, "Self-consistent calculations on atoms and molecules." (Frank Harris, *discussion leader*.) F. O. Ellison and Robert K. Nesbet, "Qualitative applications of quantitative calculations: population analyses and the magic formula." (Robert S. Mulliken, *discussion leader*.)

10 July. Frank Harris and William T. Simpson, "Configuration interaction calculations on atoms and small molecules." (S. Hagstrom, *discussion leader*.) H. E. Zimmerman and L. C. Allen, "Applications of quantum mechanical calculations to organic chemistry." (L. C. Snyder, *discussion leader*.)

11 July. Robert G. Parr and Oktay Sinanoglu, "Pair functions and density matrices." (F. A. Matsen, *discussion leader*.) Thomas L. Allen, "Non-bonded atom-atom interactions." (Discussion leader to be announced.)

12 July. Martin Karplus and H. F. Hameka, "Hyperfine and external field interactions: theory and small molecules." (John A. Pople, *discussion leader*.) L. C. Snyder and G. G. Hall, "Hyperfine and external field interactions: larger systems." (Martin Karplus, *discussion leader*.)

13 July. Speaker to be announced, "Experimental areas inviting theoretical work." (Discussion leader to be announced.)

Organic Coatings

Raymond R. Myers, *chairman*
Harold Jaffe, *vice chairman*

16 July. Physical chemistry of polymerization: Lester C. Case, "Theoretical considerations in condensation polymerizations"; Myron J. Holm, "A light-induced polymerization occurring in the crystalline phase"; William Burlant, "Ionizing radiation and organic polymers."

17 July. Film-forming systems: John Gibbons, "Methyl glucoside in coatings resins"; Harold Jaffe, "Latex design from theoretical considerations"; James Evans, "The use of starch in the coatings industry."

18 July. Characterization of coatings: Walter K. Asbeck, "Coatings adhesion by knife cutting methods"; E. Jack Kahler, "Magnetic resonance studies of coatings."

19 July. Characterization of coatings (continued): Clara D. Smith and John K. Wise, "The application of special techniques of infrared spectroscopy to coatings problems"; Valeria Artel, "Solvent selection for maximum concinnity in coatings."

20 July. Characterization of coatings (continued): Allen L. Alexander and Robert B. Fox, "The effect of the aerospace environment on organic films."

New Products

Dual trace storage scope and x-y recorder (type 1220) is an oscilloscope that utilizes a newly developed cathode-ray display tube that has a 2- by 10-cm strip of conventional phosphor for preview and a 7- by 10-cm dark trace storage screen. In operation, adjustments are made on the preview screen without marking of the storage screen so that clean traces can be obtained without waiting for the 30 seconds required to erase the storage screen. A high beam current provides high contrast traces on a potassium chloride-coated mica target that persist indefinitely or can be erased by passing a heater current through a transparent conductive coating on the mica. The slow erasure allows one to record and erase continuously so that several lines of information, representing as long as 20 minutes of recording, are continuously presented. Internal circuits provide a raster of up to 2-minute sweeps and automatic indexing of the sweep line for five or ten lines. At any time the storage and erase may be stopped to preserve the data for examination. The continuous-erase feature also makes it possible to control the persistence of the screen during repetitive displays. The oscilloscope has a sensitivity range of 100 μv to 20 v/cm and a bandwidth of d-c to 100 kcy/sec. Dual trace operation is available with arrangements for x-y presentation, and also single or dual trace against calibrated sweeps of 10 μsec to 50 seconds. Uncalibrated sweeps of up to 2-minute duration are also available. The instrument consists of a basic storage tube frame that accepts one of five presently available plug-in units for maximum versatility and convenience.—R.L.B. (Analab Instrument Corp., 30 Canfield Rd., Cedar Grove, N.J.)

(Circle 1 on Readers' Service card)

Portable **viscosity tester** uses a stainless-steel rotor, coupled to the underside of the instrument, which is immersed in the sample for measurement. The rate of rotation of the rotor is coupled to the indicator pointer of the instrument so that viscosity, in poise, is read directly from a logarithmically calibrated scale. Two rotors cover the ranges 3 to 150 and 100 to 4000 poise. The instrument is powered by four penlight batteries for portable operation, but connections are provided for external power. Accuracy is said to be ±5 percent of full scale.—J.S. (S and A Products Co., 120 E. 19 St., Brooklyn 26, N.Y.)

(Circle 2 on Readers' Service card)

Automated microbiological assay of antibiotic samples is performed by an instrument that measures out suitable portions of antibiotic samples, transfers the samples to clean tubes, and adds nutrient solution and test organisms. Predetermined incubation time is followed by addition of growth inhibitor and transfer of the treated samples to a colorimeter where the result is automatically read and recorded. Wash and drain features of the assayer clean the sample pump and cuvette between samples, so that continuous operation over long periods of time is possible with no carry-over problems. Process tubes are washed automatically to eliminate dishwashing and breakage. Capacities of transfer pumps are adjustable up to 10.8 ml; incubation and holding times are adjustable.—R.L.B. (Research Specialties Co., 200 S. Garrard Blvd., Richmond, Calif.)

(Circle 3 on Readers' Service card)

Disposable vacuum pump is a vacuum-tube like device that combines electrical and chemical means to obtain quickly high vacuum said to be better than 10^{-9} mm-Hg. The unit is designed for evacuation of electron tubes, external-anode transmitting tubes, magnetrons, klystrons, or other devices of comparable volume. The tube incorporates two cathodes of the inverted V-type on each side of an anode that consists of a square loop of tungsten wire. One of the tungsten cathodes is wound with titanium wire. The electrodes are enclosed in a hard-glass envelope tubulated at both ends. The gas to be evacuated is absorbed by three processes that occur simultaneously: chemical reaction with titanium, combination of excited or ionized gas with titanium atoms, or occlusion in titanium deposited on the wall of the tube.—J.S. (Amperex Electronic Corp., 230 Duffy Ave., Hicksville, N.Y.)

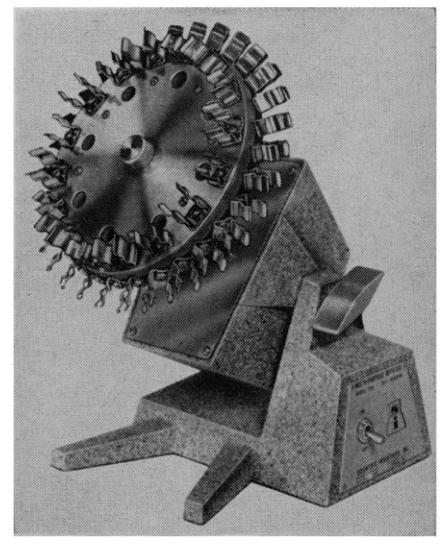
(Circle 4 on Readers' Service card)

Leak detector employs an infrared absorption gas analyzer with variable pumping speed and probe tube. Nitrous oxide is used as the tracer gas. Concentration of nitrous oxide is displayed with accuracy said to be ±2 percent on a 5-inch panel meter.—J.S. (Gelman Instrument Co., Chelsea, Mich.)

(Circle 5 on Readers' Service card)

Multi-purpose rotator (below) for test tubes, syringes, or other containers has been redesigned to allow various arrangements of large and small clips (65 supplied) on an adjustably inclined rotating aluminum disk.—R.L.B. (Scientific Industries, Inc., 220-05 97th Ave., Queens Village, N.Y.)

(Circle 6 on Readers' Service card)



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

Robert L. Bowman (R.L.B.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

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

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writers assume responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on page 843. Circle the department number of the items in which you are interested on this card.

Sterile adapter for Warburg flasks maintains indefinite sterility within the flask. The adapter consists of an inside standard taper that fits on the manometer and an outside standard taper that fits into the Warburg flask. A small center well (3 mm wide by 15 mm deep) with an overhanging lip maintains a tightly packed cotton plug. Movement of the cotton plug out of the center well is virtually impossible because of the overhanging lip. Yet, a cotton plug is easily and quickly packed into or removed from the center well. In addition to adapters for 14/20 and 17/20 standard-taper Warburg flasks, an adapter is also available with which a 17/20 flask can be attached to a 14/20 manometer.—R.L.B. (Microchemical Specialties Co., 1825 East-Shore Highway, Berkeley 10, Calif.)

(Circle 7 on Readers' Service card)

Freezing-point depression apparatus determines the freezing point of milk samples to detect excess water in milk. The sample is frozen by thermoelectric cooling, and temperatures are sensed by means of a thermistor bridge and electronic null detector. In operation a 1-ml milk sample is cooled to 1.2°C below the expected freezing point, and partial freezing is initiated by vibrating a stainless-steel wire in the sample. An oscillating wire loop keeps the ice mixture stirred. The temperature of the mixture is determined by balancing the thermistor bridge calibrated in degrees of freezing-point depression. Calibration against sucrose standards handled by the same procedure as the samples assures accuracy, and comparisons can be made with a reproducibility of better than 0.001°C. The method is intended for milk inspection but is adaptable to other biological and industrial applications. Each determination requires about 3 minutes.—R.L.B. (Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, N.J.)

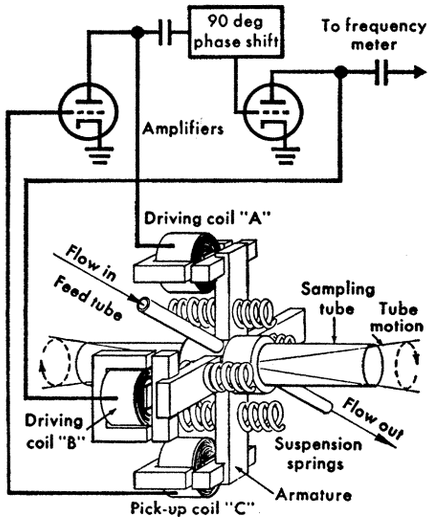
(Circle 8 on Readers' Service card)

Elevation meter is a barometric instrument utilizing an elastic system made entirely of fused quartz with no external friction linkages. The instrument operates over the range 0 to 32 in.-Hg. The span of the reading dial is 2.3 in.-Hg or 2300 feet of elevation without resetting. A vernier makes possible reading of 0.0001 in.-Hg, or approximately 0.1 foot at sea level. The element is enclosed in a vacuum flask, and thermostatting is accomplished with a low-power supply operating at 6 to

12 volts. A chamber valve eliminates barometric change during a reading and allows readings to be related to an exact time to offset minor pressure fluctuations.—J.S. (Texas Instruments Inc., P.O. Box 66027, Houston 6, Tex.)

(Circle 9 on Readers' Service card)

Density-measuring instrument is suitable for continuous or batch measurement. The device employs a vibrating tube as the measuring element. The tube is supported by a spring suspension and is caused to vibrate at its natural frequency by electromagnets. The use of two electromagnets driving at right angles, causes the vibrating tube to execute a nutating motion in which all portions of the tube and its contents



are caused to follow circular paths. To cause the second electromagnet to actuate the motion desired, a signal is picked up from the motion produced by the first coil, shifted 90 deg, and introduced into the second coil. If the sampling tube is filled with fluid, its natural frequency will depend on the density of the fluid. Density is thus measured by observing frequency of vibration. A baffle within the tube insures complete exchange of material with flow making it possible to measure mixtures of liquids, liquid-gas mixtures, and liquid-solid mixtures. Maximum full-scale sensitivity of the standard instrument is 0.1 specific gravity units. Operating temperature range is −60° to +200°F, and fluid pressure range is −15 to +500 lb/in^2. The instrument can be modified to measure the density of finely divided solids.—J.S. (Co-Engineering Co., P.O. Box 194, Boonton, N.J.)

(Circle 10 on Readers' Service card)

Logarithmic or linear recorder (model SRL) is converted by changing conveniently located gears. Thumb screws fasten the gears in place under a hinged cover; log gears provide one full decade over the range selected. Potentiometer measuring system can be used with fixed precalibrated range plugs to provide accurate voltage readings, or a variable range dial on the front panel may be used to adjust the range to any convenient value from 9 to 100 mv. This device may be used with spectrophotometers, photometers, densitometers, and similar instruments to measure either transmittance or absorbance. With a double beam spectrophotometer, transmittance and absorbance are measured directly, the latter providing a record proportional to concentration for solutions which absorb light in conformance with Beer's law. Switches to operate the recorder and select ranges from the Beckman model DB spectrophotometer, and cables to synchronize wavelength drive to the recorder chart are provided. For general log-linear recording applications there are 12 chart-speed options with easy conversion by replacing the chart drive motor assembly. The instrument records with a ball point pen on 250-mm-wide paper rolls. Input circuit resistances up to 10,000 ohms are tolerated for 1 second balance at 1-mv sensitivity, with greater tolerance for higher ranges. A front-panel knob provides up to one full scale movement of the zero position of the pen for either zero-left or zero-right operation. Descriptive bulletin No. SRL is available on request.—R.L.B. (E. H. Sargent & Co., 4647 W. Foster Ave., Chicago 30, Ill.)

(Circle 11 on Readers' Service card)

Capacitor bank consists of 16 capacitors that deliver a current of 20 kv in 3-μsec pulses. Charging time is less than 1 minute for each unit, and as many as 60 separate banks can be connected in parallel, raising the total energy storage to 3×10^6 joules. Current increases as the square root of the energy, so that 2.4×10^7 amp is obtainable from the standard units. Units can be added as the need arises, the same electronic controls will operate 1 to 60 banks. A remote-control cabinet contains a voltmeter, safety warning lights, and charge controls.—J.S. (Plasmanetics Corp., 3086 Claremont Ave., Berkeley, Calif.)

(Circle 12 on Readers' Service card)

Nanovoltmeter (above) has 13 full-scale d-c ranges from ± 0.1 μv to ± 100 mv. Input resistance is 1 megohm on all ranges, and source resistance may range from 0 to 2000 ohms. Amplifier output, for input into recorders, supplies ± 5 volts full scale at 10 ma with a frequency-response range from d-c to 100 cy/sec. Accuracy is said to be ± 2 percent; drift, 0.05 μv/hr, 0.15 μv/day, and 1 μv per 6 months. Amplifier gain is adjustable from 30 to 10^6 with ± 1-percent accuracy. The instrument is powered by rechargeable batteries, and a charger is built in.—J.S. (Astrodata, Inc., 240 E. Palais Rd., Anaheim, Calif.)

(Circle 13 on Readers' Service card)

Power supply (model No. 417 A) provides up to 500 ma at from 0 to 500 volts. Line and load regulation are said to be better than 0.0005 percent + 1.0 mv, and ripple less than 100 μv (r.m.s.) Response time is said to be less than 1 μsec from full load to half load and less than 3 μsec from full load to no load. Additional supplies included are: d-c adjustable from 5 to 12.6 volts, 2.5 amp; two 6.3-volt a-c, 5 amp; and 0- to 150-volt d-c.—J.S. (John Fluke Manufacturing Co., P.O. Box 7428, Seattle 33, Wash.)

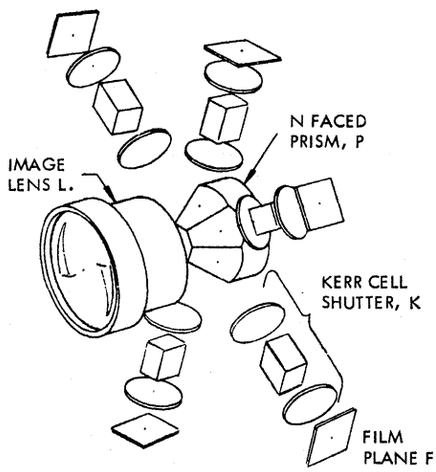
(Circle 14 on Readers' Service card)

Ultrasonic writing instrument is said to be capable of writing at a linear speed of 9000 ft/min while producing high-contrast, high-visibility markings on paper materials. No writing fluids or marking compounds of any sort are required. The device consists of a small generator that generates high-frequency oscillations to actuate a transducer pen

of size and shape comparable to that of a conventional pencil. Operational capability extends over a wide range of temperatures.—J.S. (Ultrasonic Industries, Ames Court, Engineers Hill Plainview, N.Y.)

(Circle 15 on Readers' Service card)

Kerr-cell multiple framing camera incorporates a multifaced prism that directs a portion of the energy collected by a primary objective lens through each of six separate Kerr-cell shutters (see Fig.). Separate images of the same event from the same aspect and through the same set of optical elements can thus be recorded. By use of established triggering techniques, framing rates up to 10^8 per second are said to be achieved at exposure times in the range of 5 to 10,000 nanosec. Exposure time and



resolution are independent of framing rate. Provisions have been made to permit recording on Polaroid film as well as on high-speed, fine-grain cut films.—J.S. (Electro-Optical Instruments, Inc., 2612 E. Foothill Blvd., Pasadena, Calif.)

(Circle 16 on Readers' Service card)

Casella automatic biological assay apparatus consists of an electronic timing and selector unit that opens and closes electromagnetic tubing-clamps to provide a program of the flow of drug to be assayed, standard drugs, and washing solutions to an organ bath. The organ bath, reagent vessels, and associated glassware are also available. Standard assay of posterior pituitary extract on guinea pig uterus, antispasmodics on rabbit intestine, and histamine on guinea pig ileum are examples of procedures which can be carried out with a minimum of attention from the operator. Mechanical response for comparison of standards and unknowns is recorded on

conventional kymographic equipment. Seven adjustable timers set the switching intervals of a master selector switch that cycles the electromagnetic valves. A patch-cord board on the front panel of the cabinet is used to select the sequence of operation. A wide range of times has been provided to make the apparatus adaptable for any isolated preparation likely to be encountered in bioassay work.—R.L.B. (Cooke, Troughton & Simms, Inc., 91 Waite St., Malden 48, Mass.)

(Circle 17 on Readers' Service card)

Rectilinear strip-chart recorders are offered in six models. Each features Zener-diode reference and two-speed motors as standard equipment. Chart speeds are 1 in./min and 16 in./hr; chart width is 5 inches. Three ranges are available: 10 mv fixed span; 10 mv to 100 v; and 1 mv to 10 v. Accuracy is said to be ±0.5 percent, and full-scale response time 0.5 second. The recorders use the null-balance servo-potentiometric system. Available as an accessory is an event marker that marks any selected phenomena in the right-hand margin.—J.S. (Dynatronic Instruments Corp. Division of Labline, Inc., 3070 W. Grand Ave., Chicago, Ill.)

(Circle 18 on Readers' Service card)

Gas chromatography columns available are catalogued in an eight-page bulletin. Tubing materials, lengths, maximum recommended operating temperatures, and maximum usable temperatures are charted for each column. More than 200 columns are listed. Bulletin No. 797 is available from the Technical Information Department.—R.L.B. (Beckman Instruments, Inc., Scientific & Process Instruments Division, Fullerton, Calif.)

(Circle 19 on Readers' Service card)

Compensated thermocouple transducer contains in the transducer body a platinum-resistance temperature sensor placed in close proximity to chromel-copper and alumel-copper junctions. Output of the platinum element is used to compensate the output from the exposed thermocouple. The unit is capable of operation over the range −400° to +1500°F.—J.S. (Trans-Sonics, Inc., P.O. Box 328, Lexington 73, Mass.)

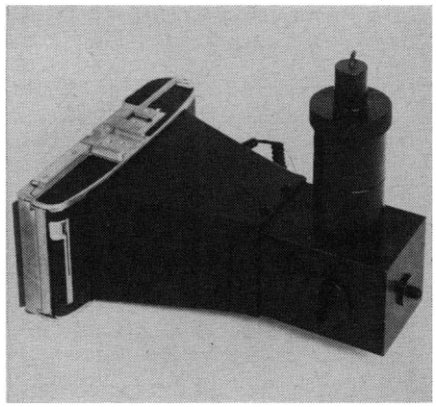
(Circle 20 on Readers' Service card)

Gyroflow flowmeter (model 600) is a true mass flowmeter based in its principle of operation upon gyroscopic effects. The flow to be measured is con-

strained to follow a circular path by the pipeline. Vibratory motion about an axis orthogonal to the spin (flow-path) axis is impressed upon the line, and the resulting torque about the third axis is measured. Pipe size is 1.43 inches and flow range is 10 to 600 lb/min. A density range from 0.5 to 1.5 is accommodated without correction factor. Application of a nominal correction factor removes this density limitation. Viscosity is limited only by pressure restrictions; with water at 600 lb/min, the pressure drop is 4 lb/in^2. Temperature range is 0° to 50°C and maximum inlet pressure is 75 lb/in^2. Response time is 1 to 5 seconds depending on the readout unit used; the output signal is 0 to 60 mv d-c. Accuracy is said to be ±0.5 percent of full scale.—J.S. (Decker Corp., Bala-Cynwyd, Pa.)

(Circle 21 on Readers' Service Card)

Airborne-particle recording camera is a portable instrument designed to provide finished photographic records of particulate distribution and concentration 10 seconds after the sample



is drawn. The operator draws a sample of air into the examination chamber by using a built-in injector. The optical system is prefocused on a cross section of the chamber, and particles in this volume are illuminated by a built-in flash unit. Sensitivity is said to be such that particles 1 micron in size or larger can be studied—J.S. (Royco Instruments Inc., 440 Olive St., Palo Alto, Calif.)

(Circle 22 on Readers' Service card)

Asbestos-polyester insulation (Quinterrabord 880) is recommended by the manufacturer for applications to 50 kv at temperatures in the range 155° to 180°C. Produced in 35- by 72-inch sheets, the material is available in thickness ranging from 1/32 to ½ inch. Density is 110 lb/ft^2, perpendicular dielectric strength 350 v/mil, and tensile strength 30,000 lb/in.^{2} for 1/16-inch thickness. It is said to be easy to machine and fabricate.—J.S. (Johns-Manville, 22 E. 40 St., New York 16, N.Y.)

(Circle 23 on Readers' Service card)

Analog-recording dynamic analyzer is a single-channel, transistorized, general-purpose counting system for recording and analysis of static or dynamic variations in nuclear activity. The instrument's single-channel differential pulse-height selector may be operated in either integral or differential mode with 1-percent-of-maximum baseline, 2-, 5-, or 10-percent selected window widths. Gain and baseline are both continuously variable. The transfer-storage type of counter accumulates either count or elapsed time according to preset mode. Display is provided by three edge-reading digital meter indicators that are driven by analog signals derived from the internal electronic storage. The indicators are switched automatically for

each range so that resolution is maintained at a constant 0.1 percent of full scale. Output information may be obtained continuously during the accumulation or extracted incrementally from storage at the end of each sampling interval.—J.S. (Digital Dynamics Inc., 4201 Redwood Ave., Los Angeles 66, Calif.)

(Circle 24 on Readers' Service card)

Rat-rabbit stereotaxic attachment for the standard Lab-Tronics instrument for cats, dogs, and monkeys is now available. A vertically adjustable upper incisor bar is the same for both rats and rabbits, but a different set of ear plugs is supplied for each kind of animal. This instrument allows the animals' heads to be precisely located with respect to fixed anatomical points so that map coordinates can be used to locate a specific point in the brain for insertion of electrodes. Use of the new attachment is described in an authoritative manual available at a cost of $6.—R.L.B. (H. Neuman & Co., 8136 N. Lawndale Ave., Skokie, Ill.)

(Circle 25 on Readers' Service card)

New bulletins on **radiochromatogram scanning systems** describe various systems for scanning strip chromatograms and how both qualitative and quantitative determinations may be made. They also illustrate the sensitivities attainable with different beta detectors that can be used with the systems. Two bulletins, entitled "Actigraph II radiochromatogram scanning systems" and "How to use radioactivity in paper chromatography" are available.—R.L.B. (Nuclear-Chicago Corp., 359 E. Howard Ave., Des Plains, Ill.)

(Circle 26 on Readers' Service card)

WWV preamplifier (model PA-1020) is designed for mounting at the antenna for optimum reception of station WWV standard timing signals. The unit provides a gain of 40 db at 5, 10, 15, and 20 Mcy/sec. It is said to exhibit a Q of 100 at each frequency with no significant spurious responses. Input impedance is 50 ohms. It is powered by a companion unit at the receiver.—J.S. (Aerospace Research, Inc., 153 California St., Newton 95, Mass.)

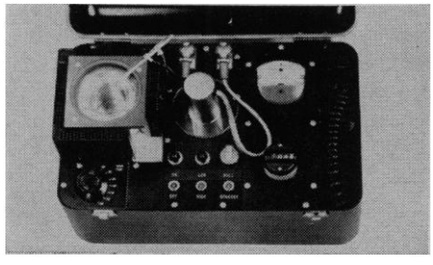
(Circle 27 on Readers' Service card)

A miniature **d-c differential transformer** (model 7 DCDT-050) converts mechanical displacements of ±0.050 inch to ±1.4 volts when energized with 6 volts at 20 ma. It incorporates a

5000-cy/sec oscillator to provide excitation of the differential transformer and a phase sensitive demodulator to convert the differential output back to direct current. The entire transducer with the built-in carrier system is 0.81 inch long by 0.75 inch in diameter; it is hermetically sealed and provided with Teflon insulated leads. Elimination of a-c lines to and from the transducer obviates the need for phase and balance adjustments. The displacement of an 0.56-inch-long by 0.125-inch core can be followed to 200 cy/sec without reduction in electrical output. At about 330 cy/sec the output amplitude drops to 71 percent. This is the first of a series of miniature transducers with built-in carrier systems.—R.L.B. (Sanborn Co., 175 Wyman St., Waltham 54, Mass.)

(Circle 28 on Readers' Service card)

An instrument that measures **liquid density** uses a submerged displacer, of higher density than that of the fluid being measured, suspended from a force coil and differential transformer core. By varying the current in the force coil, the displacer can be raised or lowered. All measurements are made with the displacer in the same position so that the magnitude of the current applied to the force coil is a direct function of the force applied to the displacer which is in turn an indicator of liquid density. The differential transformer detects the position of the displacer and permits adjustment to the same null location. The instrument is operated by placing the measuring-head over the sample with the displacer fully submerged. Current is adjusted until the null indicator shows that the displacer is in the null position. The variable resistor used to adjust current is read either from its digital dial or from a direct reading



printed tape, 144 inches long. Temperature of the sample is controlled by a heater-cooler of the thermoelectric type controlled by a fixed-temperature mercury-in-glass thermometer or by an adjustable temperature proportional controller with a mercury-in-glass thermometer as the sensing element. Ac-

curacy is said to be better than 0.0005 g/ml. More than one displacer float may be used to cover a wide range of densities.—J.S. (Brooks Instrument Co., Inc., Hatfield, Pa.)

(Circle 29 on Readers' Service card)

Solid sample injector (model SI-4) permits the introduction of solid or viscous samples into gas chromatography instruments by introducing a sealed glass capillary containing the sample through a pair of seals into the hot gas stream. When temperature equilibrium is reached a metal plunger cracks the glass and liberates the sample vapor into the column. A stainless-steel tube, with a closed tip and an aperture in its side, is inserted through the silicone rubber seals so that the aperture remains outside the chromatography column. Next, the glass capillary is inserted into the blind end of the tube, and a metal plunger is positioned behind the glass capillary and sealed in place with an O-ring. Then the tube is advanced through the seals so that the aperture in its side is inside the chromatography column. When the plunger is pushed the glass tube breaks, and the volatile contents are introduced into the gas stream. Proper handling leaves the broken capillary in the tip of the tube so that it is withdrawn with the introducer tube.—R.L.B. (F & M Scientific Corp., Starr Rd. and Route 41, Avondale, Pa.)

(Circle 30 on Readers' Service card)

Multi-channel data logger is a 100-channel modular strain-gage recording scanner that can be expanded by the addition of five standard 20-channel scanning modules up to a total of 200 channels. Bridges with one, two, and four arms and gage resistances from 60 to 1000 ohms can be used interchangeably in all channels. Inputs from 10 to 100 mv can be resolved to 1 part in 5000, according to the manufacturer. A wide-range converter reads directly in μin./in. over the entire range of 20,000 μin./in. Strain values are read out by means of an in-line digital display. Printed or punched-card records may also be obtained.—J.S. (Bytrex Corp., 50 Hunt St., Newton, Mass.)

(Circle 31 on Readers' Service card)

Indicator tube (model Z550M) is designed specifically for use with transistors. It is a cold-cathode, gas-filled tube that requires less than 5 volts at less than 50 μa to produce a discharge. The indication is a bright red neon glow

that is viewed through the dome of the tube envelope. According to the manufacturer, the low triggering voltage is due to the molybdenum sputtering technique by which molybdenum is sprayed on the cathode and on a large area of the glass envelope. Electrode geometry consists of a ring-shaped cathode with ten evenly spaced holes into which the trigger electrodes are placed. Clearance between triggers and cathode sectors is about 0.3 mm.—J.S. (Amperex Electronic Corp., 230 Duffy Ave., Hicksville, N.Y.)

(Circle 32 on Readers' Service card)

A new **prothrombin meter** measures the time required for clot formation by photoelectrically sensing a change in opacity of the sample. This time has been shown to be closely related to prothrombin time determinations carried out in the usual manner. Some 500 parallel tests were performed by Quick and Owren's methods, and no discrepancies were found. More accurate results and a saving of about 50 percent in time are also claimed. In operation 0.2 ml of a patient's plasma and 0.2 ml of thromboplastin reagent are kept at 37°C in a thermostatically controlled observation chamber, and after the addition of 0.2 ml of calcium chloride reagent, the time required for the development of a change in the mixture's opacity is measured. A photoelectric cell detects the change and operates a meter-relay that stops a synchronous motor-driven seconds counter to provide a direct numerical readout of prothrombin time. The instrument can make two tests at the same time.—R.L.B. (Gelman Instrument Co., 106 N. Main St., Chelsea, Mich.)

(Circle 33 on Readers' Service card)

Indium-antimonide photoconductive detector (model KH-51C) is provided with self-contained thermoelectric cooling. The detector operates at a temperature of −40°C and requires 30-amp, low-ripple, d-c power at approximately 0.2 volts. This is supplied to the cooler through a pair of cables at the base of the detector housing. The housing base is attached to a suitable heat sink capable of dissipating 6 watts at 30°C. The detector can operate with base temperatures up to 100°C, but this will be accompanied by serious loss in detector sensitivity. Peak spectral response is at 6.0 μ, and spectral range is visible to 7.0 μ.—J.S. (Block Associates, Inc., 385 Putnam Ave., Cambridge, Mass.)

(Circle 34 on Readers' Service card)

used in any given definition. To elaborate further, even the coincidental distribution of any given cultural trait with any given "racial" unit (assuming that such parallel distributions do, in fact, exist and that both trait and unit are independently, not tautologically, defined) does not convert the cultural trait into a "racial" trait; the coincidental distribution remains just that, a *coincidence*, explainable on historical, not biological, grounds.

Human culture has, since the emergence of, at least, *Homo sapiens*, been proved to be a specific, and not in any way, shape, or form, a subspecific—that is, "racial"—phenomenon. The irrelevance of "racial" distinctions to cultural learning and invention is readily established by the familiar and often repeated evidence of culture history.

We do not require the opinions of experts in the biological sciences to make the case *more* definitively for us. The expert most qualified to speak in this matter is the competent cultural anthropologist, precisely because he deals with the origin and growth of cultural behavior and with the cultural interaction of human groups. Once this plain fact is accepted in the scientific community at large—and it is high time that it was—geneticists and other biological specialists will no longer have to waste their time on this unrewarding problem, and contemporary cultural anthropologists can stop apologizing for the certainty that they have long had concerning the cultural indivisibility of the human species.

2) It is perhaps unfortunate, although understandably conceived as a riposte to recent racist utterances, that the resolution passed by the American Anthropological Association used adaptation to modern technological society and our way of life as an implicit evaluative principle, thus inadvertently giving the impression that adaptation to nonliterate cultures is somehow less demanding. Yet a number of anthropologists, myself included, would argue that the individual engages more complexly and more directly in a fuller round of cultural activities in many nonliterate societies than is characteristically the case among ourselves. That is to say, the factor of culture shock aside, a Hottentot would probably experience less difficulty running an elevator in Des Moines than a professor of English would experience in attempting to live with the Hottentots in the Kalahari Desert. No matter what view one takes, however, the "racial" argument remains fallacious.

3) The attitudes and opinions of men like Putnam and George were aired by Margolis beyond the bounds of scientific propriety, objective necessity, or plain good taste. The result was to inflate the significance of what Putnam, and those of similar persuasion, such as Gates or Garrett, have to say. Why should *Science* lean over backwards so far on this issue—if that, indeed, was Margolis's intention?

4) The present spurt of pseudoscientific racism must be viewed as a cultural phenomenon and not as a significant scientific reconsideration of evidence. Let us recall that, domestically, the integration of all "racial" and religious groups seems to be entering a penultimate phase. Internationally, the "emergence" of colored peoples from colonial and quasi-colonial controls is the most dramatic fact of our time. It has often been predicted, with a certain historical justification, that one response

of our society to these phenomena will be a panicky racism. The effusions of men like Putnam and, I am sad to say, the effect of such ambiguous articles as that of Margolis help fulfill that prophecy.

May I conclude by stating that an anthropologist today finds it almost embarrassing to have to repeat the most elementary findings of his discipline before sophisticated audiences.

STANLEY DIAMOND
Laboratory of Socio-environmental Studies, National Institute of Mental Health, Bethesda, Maryland

Margolis's report on "science and segregation" places anthropology in an ugly position regarding racism and American constitutional guarantees, as interpreted by the Supreme Court, in saying that "the scientist speaking on a subject with unavoidable political implications has no comfortable way out . . ." I answer as an individual anthropologist but doubt that any of my colleagues will dispute me.

Margolis discusses two matters which should be wholly separated, even though the American Anthropological Association resolution did not separate them: (i) the political and ethical issue; (ii) the scientific problem.

Our constitution has political and ethical meaning. It is not a scientific document. The Supreme Court may interpret its intent as according Negroes, Jews, the Irish, Puerto Ricans, or other groups equal rights without even considering whether any of these is inferior or superior by any standard. If political rights were accorded on a genetic basis, it is obvious that every individual would have to be examined personally.

The second, and infinitely more crucial, issue for scientists is whether there may be a genetic basis for behavioral patterns. This question now relates, essentially, to small groups. The older concept of racism clearly stated that the races of mankind—which involved at best a very confused taxonomy of races—could be rated in a scale of genetic capacity. Racist views of this kind, which were expressed many decades ago by Madison Grant, Lothrop Stoddard, and others, and which were implemented by Hitler, were negated by a flood of scientific literature. It would be futile, redundant, and absurd to recount the cultural and genetic evidence regarding races as such. If Putnam, whom we have not known to be an anthropologist, could have viewed

the present site of London 5000 years ago, the superiority of our forebears would hardly have been obvious.

The argument among scientists today is not whether the large and dubiously classified races are superior or inferior, but whether the smaller, long-inbreeding groups of mankind—groups much smaller than the conventionally designated races—can be assumed to have behavioral characteristics which are genetically determined.

The argument for genetic factors in the determination of familial, community, or group behavior rests upon several indefensible assumptions.

1) It is asserted that, since domesticated animals, such as dogs, have been bred with predispositions for certain physical and temperamental aptitudes, one must assume that human communities which are long inbred may also have special genetic aptitudes. This reasoning by analogy wholly ignores the long history of cultural achievements, best known to cultural anthropologists, which are similar across breeding-populations but also change radically within such populations. Men are different from all other animals in their incredible capacity for adopting cultural patterns and their lack of specificity.

2) The argument that, since individuals obviously differ in aptitude and temperament, inbreeding groups must also have comparable differences lacks firm evidence of the extent to which individual performance is truly determined by genetic factors. It also fails to demonstrate any range or norms of alleged genetic origin within any designated inbreeding group.

3) The evident genetic basis of certain deleterious traits, such as hemophilia, is cited as proof that positive or beneficial traits are also inherited. That populations may degenerate or even become extinct affords not the slightest insight into how the many patterns of culture are achieved.

Man's genetic constitution is so complicated—authorities claim that man has between 50,000 and 100,000 or more genes—and his behavior so infinitely complex that no one has yet devised a method for relating any aspect of the latter to the former. I categorically assert that no one has ever proved that a single aspect of cultural behavior has a genetic basis. Statements made by eminent biologists to the effect that "the East Africans lack a genetic basis for floriculture" or "the Eskimo could not adopt a tropical forest culture" are the veriest nonsense. And yet such irre-

sponsible statements are opening the door for racists, who would breed an elite and relegate major segments of society to permanently inferior status. In view of the neo-eugenics, members of the self-styled master race should take heed lest many of them, too, be found wanting.

JULIAN H. STEWARD
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Allow me to correct what I believe to be some misleading remarks in the article by Margolis. This article deals with a meeting of the American Anthropological Association in Philadelphia in November at which a resolution was passed "repudiating statements . . . that Negroes are biologically and in innate mental ability inferior to whites." The article also deals with a press conference called by me on 1 December, in which I challenged this resolution specifically and exclusively as to the clause just quoted.

I would like to speak first of the sentence in which Margolis says: "The difficulty the anthropologists faced was the political problem that any recognition that there might be racial differences would be used by racists to support their own side, as is done, for instance, by Putnam, with quotations from authors who think the racist view is preposterous but agree that racial differences probably exist."

It struck me that many people reading this sentence might be led to the conclusion that I have misrepresented the position of some author or authors. Therefore, I called Margolis on the telephone and asked him to name the authors he had in mind. He replied by citing my quotation from Clyde Kluckhohn in *Race and Reason*, page 51, footnote 6. This footnote occurs after a passage (see also pp. 24, 26, and 111) which classifies Kluckhohn as an equalitarian throughout the greater part of his career and makes no claim whatever that he shared my views. The footnote then reads as follows:

In fairness to the memory of the late Clyde Kluckhohn, I should note here that in a review in *The American Anthropologist* in December 1959 (Vol. 61, No. 6) of a book by Walter Goldschmidt, Kluckhohn reversed himself and stated that racial equality in intellect could no longer be assumed. Professor Kluckhohn's words were: "In the light of accumulating information as to significantly varying incidence of mapped genes among different peoples, it seems unwise to assume flatly that 'man's

innate capacity does not vary from one population to another' . . . On the premise that specific capacities are influenced by the properties of each gene pool, it seems very likely indeed that populations differ quantitatively in their potentialities for particular kinds of achievement.

It was Margolis's contention that differences implied by Kluckhohn's statement were not necessarily differences involving inequalities of intellect. He suggested, as an example, that they might involve music. For my part I am willing to leave it to the judgment of any reasonable man whether or not references to "man's innate capacity" and to "potentialities for particular kinds of achievement" do not also in all probability include achievement involving intelligence, and whether or not differences in potentialities for intellectual achievement do not involve inequalities of intellect—in other words, superiority and inferiority in processes important to our Western civilization. Moreover, Kluckhohn's phrase "in the light of accumulating information" clearly suggests a progression or development in a direction away from a position formerly held.

Consequently I can see no grounds for the implication that I misrepresent Kluckhohn in footnote 6. I must also add that Margolis seems to me somewhat confused when he writes of "authors who think the racist view is preposterous but agree that racial differences probably exist." An author who thinks racial differences *in intellect* exist cannot think my view is preposterous unless he also believes that such innate intellectual differences will have no bearing upon the results of intermarriage, a view which would itself be preposterous.

Let me close with a brief reference to two other points in Margolis's article. He refers to the South as a region "where a scientist would presumably feel free to speak out without much fear of being ostracized, or of losing his chances for promotion . . ." I must advise Margolis that I have found that the academic world, South as well as North, is thoroughly infected with the equalitarian virus, and that professors in southern colleges and universities are almost as fearful of persecution as the others. The southern university and the northern-controlled southern newspaper are the advance guard of the equalitarian attack on the South.

Finally Margolis remarks that the great majority of scientists "regard George's views as hokum." I gravely

question this. I have found that men may disagree with George but that his standing as a scientist is unimpeachable. To speak of George's views as hokum is as unwarranted as it would be for me to refer to the views of Herskovits and Dobzhansky as balderdash—in fact I am compelled to say it is less warranted. Moreover, the time is coming when the American people must rouse themselves to the deception in talking about "great majorities" and in taking ballots, secret or otherwise. Instead, let them examine the evidence. Let them begin to read the books of the equalitarian scientists and try to find their proof. It will be one of the most disillusioning experiences of our generation. I have warned the public that these scientists will try to hide behind the screen of numbers in order to mask the emptiness of their arguments, and I reiterate my assurances that the emptiness is real.

CARLETON PUTNAM

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McLean, Virginia

I wish you might have brought out the fact that the question of racial differences, whatever the criteria of differentiation, is irrelevant to the question of segregation. The fact is that Negroes are citizens and for this reason deserve equal opportunity. I am not certain that integration is the necessary solution to the problem of equal opportunity, but since the Supreme Court has so decreed, so be it!

I would hope that the AAAS and perhaps the American Anthropological Association could help separate and isolate the question of racial differences from the problems of segregation.

LEROY VORIS

Food and Nutrition Board,
National Academy of Sciences–National Research Council, Washington, D.C.

Questionable Linguistics in "Bergey's Manual"

The system of nomenclature used in the current edition of *Bergey's Manual of Determinative Bacteriology* includes an innovation that can hardly escape the attention of readers having some knowledge of classic Greek. This is a procedure of transliterating Greek into Latin, described on pages 26 and 27 of the *Manual*. After spending some time evaluating the claim that this pro-

cedure is "probably the most readily understood" by the student, I must confess that I cannot see any such advantage.

Personally, I view handling of a classic language for purposes of expediency as an undesirable practice, partly because, far from helping the uninstructed, it usually adds to the confusion created by previous manipulations.

In this connection I should like to discuss a few typical cases, some of which are cited in the *Manual* in support of the new procedure. Let us take first the Greek noun *theion* (sulfur), which on page 27 is analyzed letter by letter and finally transliterated into *thium*. In paragraph 2 of that page (last sentence), it is stated that *thi* is the stem from which a great number of Latin names of taxa have been constructed, such as Thioploca, Thioderma, and Thiocystis. To the reader who knows little or nothing of Greek this would mean that the above names are composed as follows: *thi*-oploca, *thi*-oderma, *thi*-ocystis. The fact is that they are not so composed. The stem of these names is *thio*-, which represents the Greek noun *theion*, now spelled *thion*. Why would this factual explanation be less easily understood by the student than the elaborate procedure leading to the nonexistent word *thium*?

Let us consider another example. On page 48 it is stated that the name *Rhabdomonas* derives from the Greek nouns *rhabdus* (rod) and *monas* (unit). This explanation confronts the uninstructed reader with the question of why the name is not *Rhabdmonas* or *Rhabdumonas*. If he were told that the name derives from the real Greek noun *rhabdos*, then he would have no problem.

Another interesting application of the new procedure is the suggestion regarding transliteration of *lysodeikticus* (p. 27). After a detailed analysis of this name, the *Manual* writer concluded that the correct transliteration would have been *lysodicticus*. Probably it escaped him that the Greek language includes, together with the adjective δεικτικος, the adjective δηκτικος, pronounced the same but differing both in spelling and in meaning. The first, with ει (epsilon, iota), means "indicating," and the other, with η (eta), means "biting." Consequently, the transliteration of *lysodeikticus* to *lysodicticus* would have concealed the etymology of the name and, as a result, would have been incorrect. This ex-

ample may serve to indicate the kind of pitfall one may step into in trying to force a sophisticated language like Greek into an artificial pattern.

Further, I notice that in certain cases in which the Greek noun could not be latinized, the genitive form of the noun has been changed, regardless of the confusion this entails. On page 262, for instance, we read that the family name Chlamydobacteriaciae derives from the Greek noun *chlamys, chlamydis* (cloak). In fact, this family name derives from the real genitive of this Greek noun, which is *chlamydos*—hence *Chlamydo-*, and not *Chlamydi-* bacteriaceae. The genitive form of the Greek nouns belonging to the third declension, such as *chlamys*, serves as the root of words derived from these nouns. Any change of the original genitive form, therefore, leads to confusion.

As a result of the procedure discussed here, the Greek nouns *bios* (life) and *zōon* (animal), from which derive many everyday English terms such as "biology," "biochemistry," "zoology," and "protozoon," are deformed into *bius* and *zōum*. The fallaciousness of the procedure could not be more clearly illustrated than in the case of the name *Peptostreptococcus micros*. On page 537, with reference to this name, the real Greek adjective *micros* (small) is explained as deriving from the made-up "Greek" adjective *micrus*.

In summary, the procedure of transliteration applied in the current edition of *Bergey's Manual* may be characterized as an arbitrary mass latinization of Greek words that puzzles the proficient and perplexes the uninstructed.

Fortunately, there is an easy way to remedy the situation, and that is reversion to the system applied in the preceding, 6th edition of the *Manual*. This is the system used in the standard English dictionaries.

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Electro-Magnetics of Matter

Transistors and telescopes have a lot in common. Our modern culture depends heavily upon our use of myriads of gadgets—gadgets which often depend in turn upon the interaction of matter with electric or magnetic fields. It is my belief that our present educational arrangements leave a wide gap and do not adequately prepare our college graduates to deal with this situation. I intend to show that this gap can and should be filled, preferably and simply by giving deserved emphasis to a broad discipline which one may term the "electromagnetics of matter."

I submit that a proper function of an education is to prepare the student to enter his contemporary culture well prepared both to participate in and to develop it. Centuries ago it was sufficient, for example, to study history, philosophy, the arts, several "universal" scholarly languages such as Latin or Greek, and a smattering of mathematics, and the individual emerged rather well equipped to grapple with the then current culture. Since then, the times have witnessed large advances in the scientific areas of our culture. Therefore, a well-educated person must also possess at least a modicum of understanding of science to fit the modern culture. Similarly, the

present-day scientist or engineer needs to be well acquainted with the fundamentals of all presently useful branches of scientific knowledge. Since so great a number of our present-day machines, the substructure of our modern culture, depend upon the interaction of matter with electro-magnetic fields, it appears to me that we must not minimize that aspect of our education, at least in educating scientists and engineers.

The gadgets of our civilization which depend upon the interaction of matter with electric and magnetic fields are numerous. Consider the transistor, the resistor, semiconductors, photoconductors, insulators, crystal microphones, regular electric lights, fluorescent lights, neon lights, x-ray machines, magnets, large computers, thermocouples, electric wiring, electric motors, and telescopes, to name a few. The electrical and magnetic properties of our earth, the ionosphere, and the Van Allen belts are important in this age of space. Plasmas such as the ionosphere, the Van Allen belts, the sun, and the stars are of great importance in our dealings with nature. Diverse as all these are, there is an underlying interconnection, for all obey the laws of quantum mechanics and all are manifestations of the effects of electromagnetism upon matter. It would seem wasteful, educationally speaking, to treat each item as a separate, special case and to neglect our opportunity to unify our approach in trying to understand them.

Teaching the interaction of matter with electromagnetic fields as a unified discipline, at least as a 1-year course, seems to me to offer the following advantages.

1) It would give college students a well-rounded approach to current scientific and engineering problems dealing with materials and devices.

2) It would provide a necessary part of the course structures in materials science and materials engineering.

3) It would provide an excellent background for advanced engineering physics, advanced physics, and mathematical physics courses.

4) It would provide a complementary background for courses in physical chemistry, which now have to introduce as isolated and nearly unrelated subjects such things as x-ray diffraction, electron spin resonance, nuclear magnetic resonance, dielectric loss, and electric polarization, diamagnetism, and electron diffraction.

5) It would provide a complementary background for teaching electrical engineering courses, which now introduce as isolated and little-related subjects such items as gas discharge, solid-state devices, electron emitters, corona, and real magnetic components.

There may be some disadvantages to such a unified approach, but as yet these have not become forcefully apparent to me. I am sure that there are some, and that further thought will undoubtedly disclose them.

The type of course I am talking about is one which would deal not just with the solid state but also with the liquid state, the gaseous state, the phase-boundary states, and the inhomogeneous mixture states (solid particles in liquid, and so on). It would deal with insulators, semiconductors, and conductors; with ferroelectrics, piezoelectrics, and photoelectrics; with dia-, para-, ferro-, ferri-, and antiferroelectrics; and with plasmas. It would be, as I see it, a survey course, designed to do for the physical science courses what advanced calculus courses, as

now given, do for mathematics courses.

If what has been said about the need for such a course seems reasonable, then we should proceed to make such a unified presentation. There remains a problem as to just what to call such a course. I submit that an appreciable part of such teaching has been given for some years at various schools under the name of "dielectrics" courses. It therefore seems reasonable, although perhaps not entirely unobjectionable, to suggest that the name "electromagnetics of matter" be used for the broader unified discipline which includes the study of the interaction of matter with electric and magnetic fields. This would release the restrictions upon the study of dielectrics which previously held—restrictions which precluded study of the effects of other than "adiabatic" electrical polarization and dipolar influences. This release of the restrictions would be an advantage, for we now know that electronic processes such as conduction, incipient corona, avalanching, and ionization play major roles in real materials, roles that cannot be incorporated in the older, classical considerations.

The phenomena of polarization, excitation, conduction, and magnetization would be the essence of the newer, unified discipline.

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On Cause and Effect in Biology

In the thoughtful article on cause and effect in biology [*Science* **134**, 1501 (1961)], Ernst Mayr mentions some difficulties presented by the classical concept of final cause. He acknowledges that this concept was introduced by Aristotle in order to explain the goal-directed activities of organisms and to account for the over-all harmony of the world. However, the definition of final cause which Mayr quotes and seems to accept—namely, "the cause responsible for the orderly reaching of a preconceived ultimate goal"—is not easily harmonized with the letter of Aristotle or with his natural realism.

Aristotle frequently refers to the final cause as that for which or for the sake of which something is made or done. He defines the final cause as the goal of action and says that it is recognizable as such when we see that it is regularly

attained by either natural or purposive agents and is something worth acting for—that is, something better than what was before the action took place. According to Aristotle, the cause at work for the orderly reaching of a goal is the efficient cause, not the final cause. In order to attain a goal regularly, not by accident, the efficient cause must be oriented toward the goal and act for it, but it need not have any knowledge of the goal. Man is the only natural being capable of acting for a preconceived goal which he understands as such and freely chooses to pursue. The activities most characteristic of man are purposive in this sense, but man performs many other activities which are naturally determined, not freely chosen, some of which require sense knowledge for direction to the goal, as in maintaining balance, while others, such as digestion, do not require knowledge of the goal.

Goal-directed action is more manifest and more marvelous in living organisms than in the chemical elements and compounds, but even these tend to preserve and protect themselves and to promote the general harmony of the world. Organisms are composed of elements and compounds united in a very complex and orderly system, and many of their goal-directed activities, as Mayr points out, have an analyzable physicochemical basis. However, it is by no means clear that physicochemical activity is purely mechanistic, and much less clear that the behavior of an organism is mechanistic. We understand machines better than organisms, and we know that a machine is not a natural unit but an artifact made from suitable but not specifically determined materials joined together by the maker working from without and aimed or directed to his goal. On the other hand, an organism is a natural and primary whole, not a mere aggregate, with complex but highly specific composition of parts joined and unified from within, and possessing an active nature by which it preserves and perfects itself and reproduces its kind. Mayr uses the word *individual* in such a broad sense that he includes both an organism and a machine, as if there were no essential differences, and then concludes that the purposiveness of the organism is purely mechanistic.

How organisms came to be as they are is a very interesting question. Mayr notes that the Aristotelians and their successors asked themselves what goal-directed process could have produced such a well-ordered design in nature.

It is no secret that they interpreted the evidence as pointing ultimately to divine wisdom. Human art does not suffice to produce a natural thing, nor does any man know exactly how natural things are produced now, or how new species were produced in the past. We are gradually learning more about natural processes, as Mayr's article shows, but he does not enlighten us very much by appealing to natural selection and excluding "Nature" or "God," who created a superior design or plan. Evolutionary adaptation may not require a special divine intervention, but it does seem to require more than chance variation and fortuitous preservation of the fittest.

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Ernst Mayr emphasizes that the phenomena of development and evolution, which were always the domain of teleologic concepts, are actually "teleonomic." This term is supposed to cover purposiveness programmed by a preformed code of information contained in DNA. Since it seems that this code was formed simply by a long historic process of an interplay between chance events (in the form of mutations) and natural selection, the "purposiveness" programmed by this code and appearing on the level of an individual is purely mechanistic. In conformity with the opinion now prevailing among biologists that there is no evidence for "plan and design" in nature, Mayr rejects any form of Aristotelian teleology as it appeared in the nonscientific ideologies of vitalism and finalism of Driesch, Bergson, and Lecomte du Noüy.

Without entering into a discussion of the philosophical implications of this view, I would like to point out, from the sense of historical justice, that vitalism and finalism were not so unscientific as one is led to believe. When Driesch, Bergson, or Lecomte du Noüy spoke about entelechy, élan vital, or telefinalism, they wanted to designate by one word an unknown x that presides over biological processes, unable as they were to convince themselves that mechanistic physics is a sufficient basis for a biological theory. It was not realized at that time how well suited the language of information theory is to formulation of the problems of biology. Had, for instance, Driesch realized that, from the viewpoint of the

second law of thermodynamics, biological phenomena are distinguished by a high degree of improbability, and had he known that thermodynamics was to be made the backbone of information theory of virtue of Szilard's recognition of the correlation between information and entropy, he could then have spoken about "negative entropy" instead of "entelechy" and would thus have avoided being accused of autonomizing biology. Of course, even then Driesch would probably have spoken about entelechy, Bergson, about élan vital, and Lecomte du Noüy, about telefinalism simply to emphasize that the manner by which biological open systems increase their information content is largely unknown. These men would probably have pointed out that there must be some unknown factor involved in the processes of development and evolution, of the type postulated, for example, by Prigogine and Wiame [*Experientia* **2**, 451 (1946)], which would come close to what they meant by those specific terms they chose for the unknown x. In any case, it was mainly because Driesch, Bergson, and Lecomte du Noüy were not dogmatists, because they looked upon the phenomena of life as something which can be gradually revealed in a never-ending inquiry rather than by a simple reduction to the physics of the day, that they subscribed to vitalism and finalism. This, to me, seems to be the crucial point.

The word *teleonomy*, suggested by Pittendrigh and used by Mayr, was coined on the opposite grounds—those of a dogma, which, moreover, rests upon a mere hypothesis. It is an established fact that development is programmed by an inherited code. But the assumption that this code is only a result of the interaction between the chance events of mutation and natural selection is an unproved hypothesis. It is dangerous to accept this hypothesis as a dogma only because, at the present time, we have no idea about the real mechanism. It means closing the door where it should have been left open. It is true that, at the present time, the only safe abode for theories of evolution is in Darwinism, but one should not assign to this abode more territory than it can cover. With all due recognition of the greatness of Darwin's achievement, we cannot remain blind to the fact that not a single step in the evolutionary mechanism has been clarified. Evolution means primarily an increase in the content of information in the code of DNA, but natural selection

means only the elimination of an error in information, or mutation (in the most favorable case, only a modification of information), not an increase in the quantity of information. Correcting a misspelled word or substituting one word for another one is, after all, something quite different from writing down a sentence, an article, a whole book.

For these reasons it seems to me that a teleonomic concept of biological end-directed processes in development and evolution is not any more "scientific" than a teleologic concept. It is only more dogmatic. The use of mechanical models for the representation of biological problems had in the past a rather comical effect on the thinking of a certain segment of scientific circles. When the great successes of mechanistic physics became obvious, concepts of free will and purpose disappeared from the writing and the theoretical (but not the practical) thinking of biologists. It was only when engineers constructed devices with prefabricated purposeful behavior in the form of computing machines, electronic brains, and so on, that the same scientific public felt that it may be, after all, legitimate to speak again about purposeful behavior, provided that we are machines with the information code built in by shuffling and reshuffling and by natural selection.

Of course, a man-made machine can be of excellent pedagogical value for demonstrating a point in physiology, but to expect that one can derive the principles of biological causality from these man-made models rather than from the study of biological systems themselves may seem rather far-fetched to those who are not dogmatically set upon mechanical models. The following proposal may illustrate the situation: When the biologist borrowed from the engineer the intellectual capital for the construction of his (the biologist's) theory, he might as well have repaid the engineer by suggesting that the latter construct the machines by a simple process invented by the biologist—namely, by shuffling and reshuffling and by selection—and then await the engineer's answer.

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The very interesting article by Mayr (*1*) seems to call for some comment. Mayr distinguishes between an unacceptable and an acceptable form of finalistic explanation; the former is teleological or vitalistic, the latter "teleonomic," or, in the phrase I have used, "quasi-finalistic." But having made this distinction between types of hypothesis, Mayr proceeds to assert that there is a corresponding cleavage between types of phenomena. "The development or behavior of an individual," he writes, "is purposive" [that is, in the acceptable sense], natural selection is definitely not"; and by "is not" he seems to mean "cannot be," since in another place he writes, "Historical processes, however, can *not* act purposefully." I have for some years been urging that quasi-finalistic types of explanation are called for in the theory of evolution as well as in that of development (*2*).

If any process is set going (for example, if two chemical substances are allowed to start reacting with one another) it will eventually reach some end. The question of "finalism" arises when there is something interesting about the end—in particular, when it is both complex and definite in character. We then have three main types of explanation available: (i) that the end itself acts as a cause, directing the process so that it terminates at the pre-

determined end state; this is Aristotelian finalism, which we reject because it involves a concept of causation quite outside our accepted range of ideas; (ii) that some nonmaterial agency directs the process to the predetermined end; this is "vitalism," which we also reject; (iii) that the end state of the process is determined by its properties at the beginning; this is "mechanism," and our recent experience of such mechanical systems as computers has led us to realize that it is a more powerful type of hypothesis than it had previously appeared to be. We can set up a process in such a way that it will reach an assigned end state by building into the initial situation a set of conditions which act as a "programme," and by providing suitable negative-feedback relations to bring the process back onto the right course if it should diverge from it. Conversely, if we find any process to be characterized by a programme and feedbacks, we can deduce that it will proceed towards some end which should in principle be ascertainable from the nature of the programme and the feedbacks (the degree of precision with which the end is determined will depend, of course, on the particular characteristics of the programme and feedbacks).

Mayr accepts the theory (*3*) that ontogenetic development depends on a quasi-finalistic mechanism of this type, the programme and feedback relations both being incorporated in the genotype which has been moulded by natural selection. But there is nothing in the nature of such quasi-finalistic mechanisms which makes it impossible to suppose that the evolutionary process itself is also of this kind. It is obviously characterized by a programme, that involved in the theorem of natural selection. This in itself suffices to determine, to a certain degree, the nature of the end towards which evolution will proceed; it must result in an increase in the efficiency of the biosystem as a whole in finding ways of reproducing itself. And there are, surely, many feedback relations which will serve to determine ends in a more precise fashion. The two to which I have previously directed attention are (i) that involved in the fact that an organism's behavior influences the nature of selection pressures which will operate on it (loosely, an animal selects its environment before its environment selects it), and (ii) that arising from the fact that selection of previous generations for stability or flexibility of development will influence the type of

phenotypic effect likely to be produced by new mutation. There are certainly many others. For instance, increasing phenotypic diversification of a population to fit it to deal with different habitats will eventually be counterbalanced by the development of barriers to interbreeding of the different varieties.

It seems to me that it is becoming inadequate to point out, as Mayr does, that natural selection is not purposive. In itself it is of course no more purposive than is the process of formation of interatomic chemical bonds. But just as the latter process is the basic mechanism underlying the protein syntheses which are integrated into the quasi-finalistic mechanism of embryonic development, so natural selection is the basic mechanism of another type of quasi-finalistic mechanism, that of evolution. The need at the present time is to use our newly won insights into the nature of quasi-finalistic mechanisms to deepen our understanding of evolutionary processes.

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1. E. Mayr, *Science* **134**, 1501 (1961).
2. C. H. Waddington, *The Strategy of the Genes* (Allen and Unwin, London, 1957); *The Nature of Life* (Allen and Unwin, London; Atheneum, New York, 1961).
3. ———, *Organisers and Genes* (Cambridge Univ. Press, Cambridge, England, 1940).

Father Kane would have a valid point if he were right in his belief that the "preservation of the fittest" was purely "fortuitous." The evidence is, of course, all opposed to this assumption. Natural selection is merely another word for differential reproduction, and the probability of successful reproduction is not strictly a matter of luck but is correlated with properties of the genotype. Both the observational and the experimental evidence for this is quite overwhelming. Naturally, reproductive superiority is true only in a statistical sense, and this is what makes the understanding of natural selection so difficult for one who is used to typological thinking. This is why the term *survival of the fittest* is so inappropriate and not used by modern evolutionists.

Evolution is a two-stage phenomenon. The first stage is the production of an enormous variety of different genotypes through mutation, recombination, and so on, and at this stage accident is rampant. The second stage, the selection of those genotypes that give rise

to the next generation, is to a large extent controlled by the quality of these genotypes. Genetic recombination puts together in each generation unique novel gene combinations which in turn are exposed to natural selection in the next generation. This is why geneticists like Muller and Fisher have emphasized the remarkable capacity of natural selection to make the highly improbable in the course of time a certainty, and this is why evolutionists like Simpson and Dobzhansky have quite rightly used the epithet "creative" for natural selection. Nothing is known, in the living universe, the evolutionary interpretation of which is inconsistent with the theory of natural selection. As a matter of fact, natural selection is not even a theory but, as differential reproduction, an easily demonstrable universal phenomenon.

I plead guilty to a less than precise definition of Aristotle's "final cause." But then Aristotle's own ambivalence makes such a definition a tough task. Aristotle used *final cause* both for the completed result of a process (obviously not a cause in the modern sense nor even strictly an *aition* in Aristotle's sense) and for the goal which was incipient in the process from its beginning. The latter meaning dominated medieval philosophy, as I see it, and has dominated finalistic ideologies ever since. It was the object of my discussion to show that there is a fundamental difference between those seemingly goal-directed processes that are based on a built-in program (teleonomic) and those that are not (teleological).

Fiala, by stating that I had labeled the phenomena of development *and evolution* teleonomic, by saying that "not a single step in the evolutionary mechanism has been clarified," and by implying that the biologist has derived his ideas on causation from a study of machines rather than of biological systems, reveals a mode of thinking so far removed from my own that we cannot, in the Letters column of *Science*, achieve a common basis for discussion. It is true that Driesch and other vitalists of his day had been provoked by exceedingly naive attempts to describe biological processes in grossly mechanistic terms. Modern vitalists cannot make this accusation against modern biologists. Indeed, one of the conclusions of my recent article was that the simplifications of classical mechanics were not applicable to biology.

In the case of the points raised by Waddington, it is evident that there is no disagreement as to facts, nor even a disagreement as to emphasis, but merely one of classification. Ultimately, the difference of opinion between Waddington and myself boils down to the question of what is deterministic. Waddington stresses the unquestioned fact that the complete interdependence of the gene-physiological and developmental processes sets severe limits to the evolutionary potential. No evolutionist would expect a line of tetrapods to develop suddenly a six-legged side line. A line of terrestrial animals that has become aquatic or has acquired the power of flight will go its merry way until it has either reached near-perfection in the adaptation to this new adaptive zone, or invaded a new zone, or become extinct. No good biologist would deny the pseudofinalistic nature of such processes. It was precisely observations such as these which led earlier biologists to sponsor theories of orthogenesis. And yet any detailed analysis of a single evolutionary line demonstrates the complete absence of any truly finalistic aspect to these

changes, no matter how regular they appear to be. But evolution is usually very capricious. Evolutionary lines may become stagnant, the trends may change their direction, the rates may accelerate for one organ and slow down for another, and one is forever impressed by the evident opportunism of evolution. When lines split it is quite impossible to predict how similar or different the independent lines will become in due time. In other words, one can often specify for an evolutionary line what it will not do (I would not expect any evolutionary line of cats to develop horns), but one cannot specify for a line what it will do.

Waddington states that if any process is set going, it will eventually reach some end. As far as evolution is concerned, he claims, only three ends are possible. Here I disagree with him. In addition to the three possibilities admitted by Waddington, there is a fourth one—namely, that the end state of the process is determined neither by the end itself nor by a supernatural agency nor by the properties at the beginning but by a general principle (natural selection) interacting successively with materials ever new in every generation.

Perhaps the difference between Waddington and myself is that we define *process* differently. He says "that the end state of the process is determined by its properties at the beginning; this is 'mechanism'." Where is the beginning and the end in a concrete case? Is the development of man from a primitive protozoan such a process? Does the development of man from marine prechordates qualify, or the development of man from primitive anthropoids? As soon as we list such illustrations, it becomes apparent how dangerous it is to say that "the end state of the process is determined by its properties at the beginning." The development of an adult organism from a fertilized or unfertilized egg cell can be considered a single process. For this, all that Waddington says about the quasi-finalistic nature of this process is correct. On the other hand, it seems inescapable to me that the change in an evolutionary line is not such a process —its end is not determined by its beginning and it is not finalistic, nor even quasi-finalistic. To my mind, the similarities between the changes in an evolutionary line and those of a developing individual are pure analogies. Surely there are evolutionary feedbacks, surely the biosystem tends to increase in efficiency (but there are countless ways of doing so), surely behavior plays a great role in evolution, but it seems to me that nothing is gained and much is lost by trying to imply that the changes in an evolving evolutionary line are of the same nature as those in a developing individual. I am sorry that somehow I cannot see how one can designate as "quasi-finalistic" a phenomenon as unpredictable as evolution.

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Resistance to Discovery

The article "Resistance by scientists to scientific discovery" by Bernard Barber [*Science* **134**, 596 (1961)] is provocative. Could it be that such resistance is a proper and desirable function of the scientist? To distinguish between fact and fallacy can be difficult. A scientist's bias toward acceptance or rejection can be influenced by some or all of the factors noted by Barber. It is possible for a correct new development to be introduced with insufficient

or even erroneous "proof." It has taken centuries to provide calculus with a rigorous basis, and some say the job is not yet completely accomplished. Right now there are eminent men on both sides of the Krebiozen contest. Only in the future can we find out whether the worthy doctors are standing against a dangerous fallacy or resisting medical progress.

In connection with the Abel incident cited in Barber's article, let it be said that the problem of the solution of the fifth-degree equation was in the air at the time. It was one of those problems that sounded easy enough to be tackled by incompetent enthusiasts. Gauss had probably received many manuscripts that were not worth the time it would have taken to decipher them. There was no way for him to recognize a genius from a cursory glance at the work of an unknown.

I wonder if investigation would not reveal that there has been more resistance to the ideas that contradicted accepted theory than to those that extended or complemented it.

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The article by Barber was most interesting. However, I would like to point out that he utilized a common misconception to illustrate his thesis that substantive theories held by scientists prevent their acceptance of new ideas. The illustration used was the rejection of the heliocentric theory of Copernicus by the astronomers of his era because they firmly believed that the earth was motionless and at the center of the universe.

At the time of Copernicus the heliocentric theory could no more be justified than could the geocentric theory. Neither could be chosen as superior on the basis of observations accumulated up to that date. The rejection of the Copernican universe, therefore, did not imply a stubborn and blind clinging to outdated concepts on the part of the comtemporaries of Copernicus. Indeed, it was only after the formulation of the Newtonian synthesis, which presented mechanical reasons for believing the heliocentric theory superior, that this theory began to gain wider acceptance. Both were taught at Harvard and Yale in the 18th century. The first observational evidence from which the motion of the earth could be inferred was not obtained until 1838, when several observers were able to determine annual stellar parallax.

Many new theories are rejected because there is no way in which a firm decision may be made at that particular time, due to lack of evidence in favor of either theory. Either may be satisfactory, and it is only after criticism, discussion, and further investigation have produced more definite evidence that the more adequate theory will survive.

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Racial Differences and Witch Hunting

In a recent issue of *Science* (*1*), Santiago Genovés of the University of Mexico discourses at some length concerning a paper of mine published in the *Mankind Quarterly* last year (*2*). Genovés objects to my criticism of Klineberg's chapter "*Race and psychology*," included in the UNESCO publication *The Race Quesion in Modern Science* (ed. 2, 1956). He confuses the issues through bad logic and too much vehemence. What I actually did in my paper was to show, I think conclusively, that the evidence for no race differences presented by Klineberg is far too meager, too ambiguous, and too inconclusive to justify his sweeping assertion that "the scientist knows of no relation between race and psychology." My paper would have been "unscientific racism" (Genovés's term) only if its main purpose had been to support the doctrines of a "master race" or "chosen people." As its aim was simply to point out the flimsy nature of Klineberg's data, it is a legitimate enterprise, unless one considers *any* criticism of equalitarianism to be morally untenable.

Genovés is critical of my view that widespread Negro-white hybridization has in the past led to illiteracy, social and economic backwardness, and degeneracy. He assumes that I condemn all race mixing, which is untrue. Most racial hybrids are viable, and many are successful people, as witness the Hawaiian-Chinese and Japanese-American crosses in Hawaii. But one need go no farther afield than the West Indies, Central America, and parts of South America to be convinced of the bad effects of Negro-white crosses when these are numerous. My concern was

—and is—that American whites, under the prodding of the equalitarians and moralistic social reformers, will become convinced that it is their duty to absorb the 18 or so million Negroes and Negroids in this country. No matter how low (in a socioeconomic sense) an American white may be, his ancestors built the civilizations of Europe; and no matter how high (again in a socioeconomic sense) a Negro may be, his ancestors were (and his kinsmen still are) savages in an African jungle. Free and general race mixture of Negro-white groups in this country would inevitably be not only dysgenic but socially disastrous.

Genovés becomes quite vehement in his denunciation of a review by A. James Gregor (*3*) of Juan Comas's *Racial Myths* (published by UNESCO). He calls it "a review which is full of totally unjustified personal attacks and insinuations of a political type, without basis and completely outside the framework of the problem under discussion." This statement so blatantly distorts Gregor's review as to be a complete caricature of what he said. Gregor pointed out, with appropriate references and in relevant detail, that that Comas is guilty of shoddy and pretentious scholarship, is unfamiliar with the movements and people whom he criticizes, does not know his primary sources, borrows (often inaccurately) from secondary sources, and is ill informed even in those matters in which he claims special competence. Gregor's paper is a masterly piece of scientific debunking.

Genovés's letter would be pathetic were it not at once tragic and dangerous—tragic because it represents the utterly illogical attitude of many present-day social scientists toward race; dangerous because it implies that equalitarianism is somehow sacrosanct and that its denial is heresy. When racial differences are found, especially those between Negro and white groups, they must be explained away, distorted, belittled, or ignored. And scientists reporting such differences must be discredited and maligned.

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1. S. Genovés, *Science* **134**, 1928 (1961).
2. H. E. Garrett, *Mankind Quart.* **1**, 15 (1960).
3. A. J. Gregor, *ibid.* **2**, 30 (1961).

Santiago Genovés took the time, at the close of his long communication to *Science*, to gratuitously add his judgment concerning my review of Juan Comas's pamphlet *Racial Myths*, carried in a recent issue of the *Mankind Quarterly* (*1*). In his considered judgment, the review was full of (i) "totally unjustified personal attacks" and (ii) "insinuations of a political type, without basis and completely outside the framework of the problem under discussion."

Ultimate appeal, of course, should be made to the review itself, but for the benefit of the readers of *Science*, who will not, in all probability, ever see the review, I should like to briefly consider Genovés's contentions.

If Genovés understands a "totally unjustified personal attack" to mean the exposure of gross errors in scholarship on the part of a man selected to write a brochure to be given international circulation, then my review constituted such an "attack." Comas, in the course of his brief pamphlet, misspelled the proper names of at least ten of the authors he was ostensibly "criticising." He was cavalier in the use of dates, arch in his criticism of

men whose books he had obviously not read, and given to broad and unqualified pontifications about matters of fact and theory still in legitimate dispute. These are, of course, serious charges. I have documented them in my review. I was shocked that a scholar of Comas's reputation could have produced so shoddy a piece of work.

To anticipate, perhaps, I should like to say that my professional concern has been with critical analysis of theory constructions in the social sciences. My objections to Comas's work arise from this concern. Similarly, the current issue of *Phylon* will carry my critical discussion of the "racist" theories of Hans F. K. Guenther (whom Comas deals with only through secondary references). Furthermore, *Sociological Quarterly* will, in the near future, carry my review of Ludwig Winter's *Der Begabungsschwund in Europa* (Paehl, Hohe Warte, 1959), an attempted "racist" analysis of the decline of European potential. My criticisms are, in both cases, as sharp as those I directed against Comas's "antiracist" pamphlet. My concern, fundamentally, has been with respectable scholarship rather than "racism" or "antiracism" (whatever those expressions might mean).

Concerning Genovés's second point, I should like to say that there was very little in the way of insinuation in my review. I said specifically that Comas had rested a substantial part of his case on a rather trivial book written by a notorious Communist, whose work, in itself, has been characterized as "completely lacking in academic self-respect" (the expression is that of Dobzhansky).

Both Genovés and Comas know that orthodox Marxism conceives of science (both natural and social science) as "partisan." Science, for the Marxist, is an element of the "ideological superstructure" of society (*2*, pp. 11, 39, 54, 78) and as such serves the interests of determinate classes (*3*). One of the criteria for the validation of a scientific theory is, therefore, its utility in the class struggle (*2*, p. 87; *4*). We know what effect such conjectures have had on genetics, anthropology, psychology, biology, and even nuclear physics in the Soviet Union. The influence of this kind of thinking in the social sciences is particularly deleterious (*5*).

While it would not be legitimate to simply dismiss Marxist works in this specific area, their materials are to be employed with more than a little circumspection. Comas, on the other hand,

employed the analysis of an avowed and orthodox Communist (in fact, he did little more than paraphrase his conjectures) to level the most serious charges against a number of academicians (Alexis Carrel among them).

All these things, I am convinced, are quite to the point. Comas's little pamphlet was, and is, objectionable for a number of reasons: its evident lack of scholarship, its devious documentation, its theoretical poverty, and its almost abject dependence upon as questionable a source as Marcel Prenant.

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References and Notes

1. A. J. Gregor, *Mankind Quart.* **2**, 30 (1961).
2. See P. Judin and M. Rosental, *Diccionario de Filosofia y Sociologia Marxista* (Seneca, Buenos Aires, 1959).
3. See G. Wetter, *Dialectical Materialism* (Praeger, New York, 1958), pp. 268–74; F. V. Konstantinov, *Los Fundamentos de la Filosofia Marxista* (Grijalbo, Mexico, 1959), p. 529, note 1; I. M. Bochenski, *Die dogmatischen Grundlagen der sowjetischen Philosophie* (Reidel, Dordrecht, 1959), p. vi.
4. See N. Lenin, *On Socialist Ideology and Culture* (Foreign Languages, Moscow), p. 53.
5. See my review of I. A. Gejewski, *Die Rassenpolitik des amerikanischen Imperialismus* (Dietz, Berlin, 1956), A. I. Demidenko, *Die Rassentheorien im Dienste der amerikanisch-englischen Imperialisten* (Dietz, Berlin, 1954), and A. P. Gagarin, *Die amerikanische buergerliche Philosophie und Soziologie im Dienste des Imperialismus* (Dietz, Berlin, 1953), in *Problems of the Peoples of the USSR*, No. 11 (1961).

This matter has come to such a point that review of a little of its history is justified. On the appearance in the first number of the *Mankind Quarterly* of Garrett's criticism of Klineberg's work (*1*), several biologists and anthropologists expressed their amazement and disagreement (*2*, *3*). Moreover, several scientists on the honorary advisory board of the *Mankind Quarterly* resigned.

What happens then? The editors (*4*) of the *Mankind Quarterly*, and others in sympathy with its views (*5*), devote themselves by all available means to discrediting those who from a strictly scientific point of view agree in their opposition to the *Quarterly*'s position—all this without presenting a single scientifically proved fact to support their position. Furthermore, they ascribe to us sympathy for political ideas which we simply do not have, gratuitously making us partisans of what they call "the equalitarian dogma." Disagreement with Garrett's second article (*4*) was wide and explicit (*6*). Now Garrett tells us that his racism is not "un-

scientific" because he does not explicitly propose a "master race" or a "chosen people." However, a few lines later, without any factual basis, he alleges the bad effects of Negro-white hybridization in the West Indies, Central America, and parts of South America, stating that the white, "no matter how low (in a socio-economic sense)," will always be better than the Negro, "no matter how high (again in a socioeconomic sense)."

I may point out that the major percentage of delinquency found among the Negroes in the United States was interpreted by Garrett as caused by racial characters (*1*). That is, according to Garrett and others, Negroes possess a genetic factor that induces prostitution, crime, robbery, and so on: "Haiti is an unhappy example of what the Negro can do when left to govern himself"; "The weak, disease-ridden population of modern Egypt offers dramatic evidence of the evil effects of a hybridization which has gone on for 5000 years" (*1*), and so on and on (*7*). According to Garrett, the Negro is incapable of governing himself, and the same holds for the Indian. Hitler *et al.*, supported by similar theories—which sprouted from the views of pseudoscientists—murdered many millions of Jews because their hybridization with "Aryans" were also not "viable," to use Garrett's expression. We all remember the result, but if Garrett has forgotten it, he should read the impressive story by Miklos Nyiszli, *Médecin à Auschwitz*, which appeared in October 1961.

Garrett misquotes me in affirming that I subscribe to "racial equalitarianism." No anthropologist or biologist with average knowledge maintains such a position. I repeat what I said: "Racial differences exist. These differences should be and are being studied. A whole branch of anthropology is concerned with this study in an effort to determine what the differences are and how they may be used—to understand them from every possible angle (genetic, morphological, social, and so forth) but always within the framework of serious and scientific investigation. The 1952 UNESCO Statement on Race is quite clear on this point" (*3*).

I hold that from the viewpoint of human biology and of human genetics it is just as unscientific to support an equalitarian dogma as it is to maintain that the actual cultural superiority or inferiority of a certain human group is due to morphological or possibly psychological differences. I do not belong to the group that takes the first position, but Garrett does belong to the group that takes the second.

At the last meeting of the American Anthropological Association, in November 1961, the assembled anthropologists approved, by a vote of 192 to 0, the following resolution (*9*):

> The American Anthropological Association repudiates statements now appearing in the United States that negroes are biologically and in innate mental ability inferior to whites. . . . According to present knowledge there is no proof that the groups of mankind differ in their innate mental characteristics, whether in respect of intelligence or temperament. The scientific evidence indicates that the range of mental capacities in all ethnic groups is much the same. No doubt the myth of racial inferiority will continue to be believed by those who are able to find in it a fortification against their personal insecurity and lack of status. But for the good of mankind in general the myth ought to be recognized for what it is—a pretext for bigotry and discrimination.

No further comment is needed. But I should like to repeat what I said in

my earlier note (*3*): "I am now formally addressing *Science*, as the official voice of the American Association for the Advancement of Science, to ask that the Association urge the scientists who are accessible to it (I would suggest, among others, Medawar, Haldane, Simpson, Huxley, Neel, Wright, Dunn, Dobzhansky, and de Beer), United States citizens or not, to take action, in the name of the Association, against this unwelcome, ill-founded, unbiological outgrowth of racism."

I accorded Gregor only 12 meager lines in my earlier letter (*3*). My judgment, however, was justified. I have carefully read Comas's work and Gregor's criticism and have also seen Comas's reply to Gregor, to be published shortly. Because of this, not only do I continue to maintain my expressed opinion of Gregor's trivial criticism of Comas's brochure but, on reading his present comments on my letter to *Science*, note that he as well as Garrett attributes to me, in an effort to influence the reader, political ideas which I do not support. The "witch-hunting" of "McCarthyism"—to quote the expression of Garrett, his colleague —fortunately has disappeared. Gregor, utilizing as a pretext various typographical errors in the last edition of *Racial Myths*, for which Comas is not responsible (this edition was published in the United States, without the knowledge or revision of the author; the original manuscript, in Spanish, was commissioned and published by UNESCO in 1951), proceeds to discredit it, as well as Comas's competence in the field of anthropology. I refer Gregor and the reader to Comas's reply, which will appear in a forthcoming issue of *Current Anthropology*.

SANTIAGO GENOVÉS

Institute of History, University of Mexico, Mexico City

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7. There is no necessity for further discussion of the subject, but I wish to cite D. D. Jackson's comments in *Science* [134, 1910 (1961)] with reference to another article: "Indeed, Passamanick . . . has recently suggested that his studies show the human brain to be so highly adaptable that the lower end of the I.Q. scale is related not to heredity but to opportunity—including the circumstances of birth and early rearing."
8. M. Nyiszli, *Medecin à Auschwitz* (Julliard, Paris, 1961).
9. American Association of Anthropologists, *Fellow Newsletter* 3, 1 (Jan. 1962).

The Search for Other Civilizations

The article by Sebastian von Hoerner, "The search for signals from other civilizations" [*Science* **134**, 1839 (1961)], contains at least one statement that seems to be so out of line with observed facts that it should not go unchallenged. This is the statement that the ancient Greeks could have found the distances between neighboring stars to within 5 percent.

Let us accept, for the moment, von Hoerner's statement that by assuming the earth to be an "average" planet—that is, comparable to the average for the five planets visible to the naked eye—the Greeks could have obtained a value for the distance of the sun too large by a factor of 2, and thus a value for its luminosity too high by a factor of 4. By subsequently comparing the brightness of the "ten brightest" stars (presumably the brightest ten are meant) with that of the sun and assuming the average luminosity for these stars equal to the luminosity of the sun, the Greeks could have "determined" the average distance of these stars—but they would have been way off. The brightest ten stars visible from Athens 2400 years ago would have been the same as the brightest ten in the sky now, except for Achernar which was then not really visible north of Khartoum; the ten would have been Sirius, Canopus, Alpha Centauri, Arcturus, Vega, Capella, Rigel, Procyon, Beta Centauri, and Betelgeuse. At about 450 B.C. Alpha and Beta Centauri had declinations around −49°; Canopus had a declination of −52°, but since the Greeks presumably named this star, they must have been aware of its existence, and it must have been easily visible from Alexandria. If, however, one does not include it, Altair would be added to the list.

Using the latest available data—and for at least four stars these are none too good even now—we find the average luminosity of the brightest ten to

be 3300 (with Canopus) or 3100 (with Altair), or something like 800 times the value which von Hoerner thinks the Greeks would have got for the luminosity of the sun. Hence, instead of obtaining distances too small by 5 percent, the Greeks, had they gone about it in this manner, would have obtained distances requiring an upward correction of 2700 percent! It is possible that von Hoerner meant that if the Greeks had used their erroneous distance to the sun, had further assumed (erroneously) that the average luminosity for the brightest ten stars was equal to the luminosity of the sun, and had still further assumed (also erroneously) that the brightest ten were also the nearest ten, *then* they would have come out only 5 percent off, instead of 2700 percent.

It is always easy, in the light of hindsight, to show what erroneous assumptions should have been made in order to come out with the right answer—but isn't such a procedure tantamount to saying that if one makes a large enough number of assumptions, all of them erroneous, the "wrongness" of these is bound to cancel out and one will inevitably get the correct answer? This may work in economics, but it is thoroughly unscientific, and brings to mind Kettering's famous definition of logic as "an organized way of going wrong with confidence."

With one statement of von Hoerner's I am in complete agreement: "the search for other civilizations will have either a tremendous result or none at all." But it seems to me that any scientist should feel duty bound to add that at the present time not only are we completely and totally ignorant of the relative probabilities of either occurrence but most scientists have a strong feeling that the odds are strongly against the former occurrence. If this is not said, someone may cite d'Alembert's easy definition of probabilities (that since all events either can or cannot happen, the probability of any event's happening is 50 percent) and come up with the conclusion that *therefore* project OZMA has a 50–50 chance of immediate success.

W. J. LUYTEN
Department of Astronomy, University of Minnesota, Minneapolis

First, it is nice to see that my suggestion of what the ancient Greeks should have guessed has been taken *seriously*; but this should not be done to such an extent that the ***fun*** in it is overlooked.

Second, I must apologize for not having mentioned explicitly the assumption involved, that the brightest stars are the nearest ones. That this assumption was used might have been seen from the phrase "the distance between *neighboring* stars" (the goal of this estimate), but I should, of course, have mentioned it.

Third, that we draw conclusions from assumptions which later on turn out to be erroneous—this is true but unavoidable in the whole realm of science; just the degree of error varies from one case to another. Take, for example, such an important figure as the cosmic distance scale (the Hubble constant). If Sandage's latest value is right, then Hubble's original one was wrong by about a factor of 8. But many even of our well-established and most accurate figures would never have become available if nobody had dared to make the first guess.

In many instances we even use assumptions when we know definitely that they are wrong. For example, the whole theory of stellar dynamics is based on assumptions of this type; they are necessary in order to avoid unbearable complications, and it is hoped but not proved that they will not in-

fluence the results too greatly (I am prepared to give details on request).

Fourth, I did not mean to give the impression that "one will inevitably get the correct answer" by these methods of estimating. Instead, I said: "The resulting estimate can be, of course, completely wrong, but the probability that it will be is very small, and the probability that the result will be right is high." And, later in the article: "only by trying can we tell whether it is valid or invalid."

Fifth, as to the strong feeling of most scientists, I would like to reply that there are a number of good scientists, too, who have criticized my paper the other way, for being too pessimistic, as I have learned from various discussions and letters.

SEBASTIAN VON HOERNER
Astronomisches Rechen-Institut, Heidelberg, Germany

UNESCO's Role in the Indian Ocean Expedition

I have read the recent article on the International Indian Ocean Expedition by Knauss [*Science* **134**, 1674 (1961)] with great interest. One significant omission should be pointed out. This concerns the role of UNESCO, which in addition to sponsoring the Indian Ocean Biological Center in India is also cosponsor of the expedition. This sponsorship was authorized by a resolution of the 11th session of the general conference of UNESCO in 1960.

Sponsorship of the expedition by UNESCO has been, and continues to be, more than nominal. Working in close collaboration with the International Council of Scientific Unions' Special Committee on Oceanic Research, organizer of the expedition, UNESCO has provided the financial means for bringing together participating scientists in the fields of marine meteorology (Bombay, July 1961), zooplanktology (Cochin and New Delhi, August 1961), and nutrient chemistry and primary productivity (Honolulu, September 1961). During the meeting in Honolulu, scientists from seven nations worked together, ashore and aboard the research vessels *Vitiaz* (U.S.S.R.) and *Gascoyne* (Australia), in a comparison of methods to be used during the expedition. Scientific equipment is being provided for research vessels of India and Pakistan. Fifteen fellowships have been awarded young scientists

from the Indian Ocean region to permit them to gain practical experience by working aboard ships of the expedition. Several experts are being recruited to work with local scientists on programs related to the expedition. All told, UNESCO will spend in 1961 and 1962 about $250,000 on various projects concerned with coordination and other international aspects of the expedition, somewhat more than half of its total budget in marine science.

It should also be noted that at its first session (19 to 27 October 1961) the Intergovernmental Oceanographic Commission adopted a resolution directing its secretary (directer of UNESCO's Office of Oceanography) to assume additional coordinating functions for the expedition. Hence, by the time the expedition is in full swing, the role of UNESCO may be even more significant.

WARREN S. WOOSTER
Office of Oceanography, United Nations Educational, Scientific, and Cultural Organization, Paris

The Competitive World of the Scientist

F. Reif's stimulating article, "The competitive world of the pure scientist" (*1*), brings to mind an earlier discussion of this theme—namely, Robert K. Merton's presidential address to the American Sociological Society in 1957, on "Priorities in scientific discovery" (*2*). Like Reif, Merton points out that the "selfish" motives of scientists may be both functional or dysfunctional for the progress of science, and, moreover, that the competition for originality is by no means a modern phenomenon. Thus, he quotes François Arago, one of the permanent secretaries of the French Academy of Sciences, who wrote in 1839, apropos a priority controversy involving Cavendish and Watt, that "to describe discoveries as having been made 'about the same time' proves nothing; questions as to priority may depend on weeks, on days, on hours, on minutes" (*3*).

My purpose in writing this letter is twofold: (i) to make Reif and the readers of *Science* aware of another treatment of the priorities problem—a treatment both exhaustive and delightful; and (ii) to point out that competition for originality may occur not only between the practitioners of a discipline but also between the ad-

herents of different disciplines which are ordinarily not in close competition with each other—for example, physics and sociology.

WALTER HIRSCH
Department of Sociology, Purdue University, Lafayette, Indiana

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2. *Am. Sociol. Rev.* **22**, 635 (1957).
3. F. M. Arago, *Historical Eloge of James Watt* (London, 1839), p. 106.

Reif has let the cat out of the bag. Most of the readers knew about this state of affairs, but this is the first time, to my knowledge, that such statements have appeared in print.

This article brings to mind a story told me about 2 years ago by a professor of chemistry at a large southern university. I have put it into dialog form, with suitable disguise for the characters.

MERIT OR DEMERIT
OR
Crank Out Those Papers

Characters in order of appearance.

PROFESSOR A, chairman of the department of chemistry of a large southern university, late middle-aged, expects to retire in 10 to 15 years.

ASSOCIATE PROFESSOR C, early middle-aged, expects his professorship next year.

ASSISTANT PROFESSOR D, new Ph.D., full of vim and vigor. Aspires to promotion and administrative position.

Dean B: the villain in this story, who does not appear but whose pervading spirit is always present. He is dean of arts and sciences.

SCENE I

Chemistry department staff meeting in the late autumn, about two years ago.

Prof. A. I have just returned from a meeting of department chairmen of the college, with Dean B. He says that in the future all promotions and pay raises will be based on merit and merit alone.

Assoc. Prof. C. [*Somewhat bored; he has seen deans come and go*] How is he going to determine merit?

Prof. A. The dean will base merit on publications. Not quantity but quality.

Asst. Prof. D. [*Eagerly*] How is he going to determine quality?

Prof. A. He is going to count the number of papers.

Lights dim as evening falls over the campus. All hurry back to their desks to see what data and articles can be reworked to get one more publication out before the next review of the faculty for promotions and raises.

CURTAIN

H. P. LEIGHLY, JR.
School of Mines and Metallurgy, University of Missouri, Rolla

Standards of Ethical Conduct

Khrushchev does not set off atomic explosions all by himself. They are the work of a team of highly competent, professionally distinguished scientists and technologists. Surprisingly enough, nobody seems to think of these. Apparently, everybody takes it for granted that it is perfectly natural and proper for them to do whatever they are bid to do. Presumably, they are entitled to expect a warm welcome in the "great brotherhood of science," once they again appear at international scientific gatherings, bedecked with the medals they have won by their recent dirty work.

But have not men been judged for crimes against humanity because they did precisely that: share conscientiously and competently in whatever crimes they were ordered to perform? What difference is there between the chemist perfecting poison gas for Auschwitz and the nuclear physicist perfecting a 50-megaton bomb for Novaya Zemlya?

Is it not high time the scientific community, and specifically the great international scientific societies, acknowledge that the age of romantic innocence in science is dead? Is it not high time for them to set up standards of ethical conduct for the members of their professions, so that it may become plain for all the world to see that, whatever their professional skill, the scientific accomplices of test-ban cheating and atmosphere poisoning and nuclear blackmail are *not* honored colleagues among them?

The world has urgent need of whatever moral pressure can be brought to bear in this way on scientists and future scientists. Even more is this true of the scientific world. Nothing less than the claim to respect, and to self-respect, of every scientist is at stake in this issue of drawing a clear line between the scientist who cures cancer and the one who willfully induces it through nuclear fall-out. No longer should the first gladly suffer the insult of being a fellow to the other.

ALEXANDER WITTENBERG
Faculty of Science, Laval University, Quebec, Canada

What follows is a quotation from my letter of 1 November 1961 to Professor V. Zhdanov of the Soviet Union, setting forth my reasons for not attending the 8th International Cancer Congress in Moscow next summer. I thought that

others besides Professor Zhdanov might be interested in these reasons.

"I am honored to have your invitation and would normally have been delighted to attend the Congress, to visit some of the cancer research laboratories in the U.S.S.R., and to participate in your program. However, the resumption of the atmospheric bomb testing by the U.S.S.R. some 2 months ago has caused me deep concern, and this has given way to indignation within the past week, when it was announced that a bomb of about 30-megaton size was first exploded, and then, in direct defiance of an urgent plea signed by 87 members of the United Nations, a second bomb estimated at about 60 megatons was exploded on October 30.

"I am convinced that this series of explosions, culminating in this latest one of frightful magnitude, will cause the premature and unnecessary death of at least a few individuals in the world from leukemia or bone cancer and must therefore be considered an outrage against society. In protest, I must forego attending the VIII International Cancer Congress and am therefore forced regretfully to decline your kind invitation."

HENRY S. KAPLAN
Department of Radiology,
Stanford University School of Medicine,
Palo Alto, California

Auditory-Oculomotor Reflexes at Birth

Wertheimer has made an interesting and significant discovery in finding that the newborn infant will move his (or in this case, her) eyes toward the side on which auditory stimulation is received [*Science* **134**, 1692 (1961)]. But he then goes on to say: "This finding is not compatible with the view that space perception, and particularly cross-modal spatial coordination, is based upon a long and arduous learning process." In saying this he either attacks an enemy who no longer exists or he goes way beyond his data.

If Wertheimer means that not *all* aspects of perceptual organization involve learning, I can agree without reservation; but this has been shown repeatedly, and no one now holds this view (it has not been defended in the past 30 years). Alternatively, however, showing that there are reflexively coordinated and unlearned components obviously does not show that the full

normal development of space perception is independent of the stimulation normally received from a varied environment.

It is apparently still difficult to escape from the false dichotomy of an extreme nativism versus an extreme empiricism. Neither view can be taken seriously today.

D. O. HEBB
Department of Psychology,
McGill University, Montreal, Canada

I must agree with Hebb: the demonstration that a human neonate was able to turn her eyes to the side on which auditory stimulation was produced does not in any way exclude the possibility that space perception in the human adult is greatly influenced by experience. But one need not share his optimism—much as one might wish to—about the demise of extreme views.

In his stimulating *The Organization of Behavior* (Wiley, New York, 1949), Hebb himself concludes that all that is present perceptually at birth is discrimination of the "primitive unity" of figures, not their shape or identity as distinctive wholes—these, and by implication other aspects of adult perceptual performance, are "slowly acquired through learning." My little experiment demonstrates that, without learning, more is present than primitive unity: primitive space perception.

MICHAEL WERTHEIMER
Department of Psychology,
University of Colorado, Boulder

Scientific Consultants

Your item in "Science and the news" on scientific consultants [*Science* **134**, 1739 (1 Dec. 1961)], their high pay, their conflicts of interest, and so on, neglects a point.

The highly paid employees of the nonprofit corporations can also be fired without regard to Civil Service regulations. They can be promoted and shuffled around, likewise. Their work is subject to the criticism and approval not only of congressional committees but of the Service and Civil Service employees of the Department of Defense. The impending investigation, so long as it avoids excesses and abuses, is merely a normal exercise of prudence that should be welcomed by all.

WILLIAM GEORGE MACKENZIE
Blue Bell, Pennsylvania

Meetings

Shallow-water Oceanography

The First Coastal and Shallow-water Research Conference, which was supported by the National Science Foundation and the Office of Naval Research through grants to Florida State University, appears to have been a unique event for at least two important reasons. In order to reduce the aggregate of individual travel, especially of graduate students, and to provide meetings of appropriate size and still permit as many American students and scientists as possible to share the knowledge and opinions of foreign participants, the conference was convened successively on three university campuses. And though the conference title was couched in broad terms to accommodate the interests of other than strictly marine aquatic scientists, principal emphasis centered in an endeavor that has come to be called shallow-water oceanography. To my knowledge this field has not been featured before in a conference of international or national scope. It is evident now, however, that a significant number of investigators wish to be identified with this field, but it seems likely that no attempts will (or should) be made to formalize the group.

There appears to be general agreement that the domain of shallow-water oceanography lies between the point of maximum penetration of sea salt into river systems and the outer edge of the continental shelf. Moreover, even though this field has solid academic bonds to deep-sea investigation and training, it does have in practice special interests, techniques, and facility requirements that cannot be disregarded.

The conference met at Johns Hopkins University from 19 to 21 October, at Florida State University from 23 to 25 October, and at the University of Southern California from 27 to 29 October 1961. Donn S. Gorsline served as general chairman, led the Florida State meeting, and will edit the proceedings volume. D. W. Pritchard and R. B. Tibby were regional chairmen at the Baltimore and Los Angeles meetings, respectively. Admittedly, the formal parts of the regional programs were choked by a steady flow of papers, with little time for discussion, but many participants joined informal discussion groups that dealt with problems of curriculum at the undergraduate and grad-

uate level and the relative merits of the institute or department affiliation of an oceanographic group with a university.

The participants were separable into two categories: (i) scientists from the United States and abroad who received special invitations to comprise the Traveling Group that attended all regional meetings, and (ii) the Regional Groups, constituted of scientists who, for the most part, attended only the regional meeting nearest their home institutions. The Traveling Group had 19 members, but only 17 were able to complete the circuit. Members of this group delivered papers at all three meetings and thus provided a unifying thread. Members of the Traveling Group, in addition to the general and regional chairmen, were as follows: W. W. Anderson, chief, U.S. Bureau of Commercial Fisheries Biological Laboratory, Brunswick, Georgia; J. L. Barnard, associate director, Beaudette Foundation for Biological Research, Solvang, California; R. A. Bryson, head, department of meteorology, University of Wisconsin; A. M. Christensen, Marine Biological Laboratory, Elsinore, Denmark; P. E. Cloud, Jr., head, department of geology, University of Minnesota; K. O. Emery, department of geology, University of Southern California; G. Gunter, director, Gulf Coast Research Laboratory, Ocean Springs, Mississippi; J. W. Hedgpeth, director, Pacific Marine Station, Dillon Beach, California; W. Krauss, Institute for Marine Studies, University of Kiel; D. F. Leipper, head, Department of Meteorology and Oceanography, A & M College of Texas; H. Niino, Tokyo University of Fisheries; H. T. Odum, director, Institute of Marine Science, Port Aransas, Texas; W. E. Pequegnat, head, department of biological sciences, State University of New York, Oyster Bay; E. L. Pruitt, chief, Geography Branch, Office of Naval Research; R. J. Russell, director, Coastal Studies Institute, Louisiana State University, Baton Rouge; and A. Voipio, Marine Institute, Helsinki, Finland.

A total of 586 participants, of whom 164 were graduate students, registered at the three regional meetings; they were about equally distributed among the three meetings. The breadth of institutional interest in shallow-water oceanography is demonstrated by the breakdown in affiliation of the approximately 200 registrants at the southern California meeting: colleges and universities, 34; industrial laboratories, 21; federal laboratories, 16; state, county, and

municipal laboratories, 6; private laboratories, 4.

Federal agencies demonstrated considerable interest in the conference. Representatives of no less than eight agencies presented papers. The list of these agencies, together with the number of papers sponsored by each, is as follows: U.S. Geological Survey (several branches), 11; U.S. Coast and Geodetic Survey, 3; U.S. Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, U.S. Naval Electronics Laboratory, 2 each; and Office of Naval Research (Geography Branch), 1. In addition, there were representatives from the National Science Foundation, the Atomic Energy Commission, other branches of the Office of Naval Research, and numerous state agencies.

It is not possible to give here even brief descriptions of the 120 different papers presented; it is possible, however, to give some idea of the coverage, by classifying the papers and citing a few examples in each category. The papers can be divided into three groups, according to the principal emphasis of the subject.

1) Description in broad terms of the research and training activities planned or in progress at a given institution. Examples here, by title and author, are as follows: "Shallow-water research at the Chesapeake Bay Institute," D. W. Pritchard; "Teacher participation in research at the Pacific Marine Station," J. W. Hedgpeth; "Marine biological research in Scandinavia," A. M. Christensen; and "Shallow-water oceanography," D. F. Leipper.

2) Discussion of individual or group research projects, or reviews of relatively narrow areas of research. Examples are: "Origin of beach rock," R. J. Russell; "A physical control of sublittoral epifaunas," W. E. Pequegnat; "Spectra of turbulence and internal waves in the Baltic Sea," W. Krauss; and "Relation of seaward and landward flow of groundwater to the salinity of Biscayne Bay," F. A. Kohout.

3) Description of new techniques or instruments applicable to shallow-water oceanography. Examples in this category are: "The Savonius Rotor current meter," R. D. Gaul; "New instruments in use by the U.S. Coast and Geodetic Survey," A. C. Poling; "An empirical method of determining momentary discharge of tide-affected streams," S. E. Rantz; and "Applications of soil analytical techniques to sediments," B. W. Nelson.

One special paper, delivered by L. A. Walford, called for establishment of a committee to develop a plan for a comprehensive study of the oceanography of the Atlantic continental shelf. Such a committee was created, and meetings have already been scheduled.

The distribution of the papers among the principal subdisciplines of oceanography is of considerable interest. Geology accounted for 33 percent of the total, biology for 27 percent, physics and meteorology for 17 percent, and chemistry for 7 percent; 16 percent were truly interdisciplinary.

The geological papers ranged in scope from "Mineralogy of carbonate sediments along the western margin of Florida Bay" (W. Taft), through "Recent history of San Quintin Bay, Baja, California" (D. S. Gorsline), to "Sediments of continental shelves" (K. O. Emery). Topics of direct interest to biologists were exceedingly diverse; a number of the papers dealt with matters of economic concern. The majority were more nearly referable to biological oceanography than to marine biology. Typical of the biological component were "Biological shrimp studies conducted by the Florida State Board of Conservation Marine Laboratory"

(B. Elred); "Research on productivity" (H. T. Odum); and "Results in benthic biology in Southern California" (O. Hartman). Physical oceanography and meteorology were represented by an interesting array of papers, among which were "Internal waves" (E. C. LaFond) and "Oceanographically oriented research in the University of Wisconsin department of meteorology" (R. A. Bryson). Chemists rounded out the program by discussing "The distribution of silicate in the Baltic" (A. Voipio) and "Continuous recording of salinity in an estuary" (N. H. Beamer).

Several other features of the conference contributed to its success. At each regional meeting there was a banquet, open to all participants, followed by a special lecture delivered by one of the foreign members of the Traveling Group. At two conference sites the Traveling Group was privileged to confer with the university staff on educational problems and inspect the facilities of the host institution the day before the plenary sessions. Of considerable value, also, were the displays of oceanographic equipment arranged by industrial organizations and the host schools.

When the conference was first envisaged in the form described here, the following objectives were set forth: (i) to obtain some conception of the number of scientists who consider themselves to be engaged in shallow-water oceanographic research and training; (ii) to review the nature of the work in this field currently being carried out; (iii) to review methods of sampling, observing, and data handling presently employed; and (iv) to serve as a stimulus for future research and training in the field. It appears that these objectives were met quite adequately. We can now estimate that the number of scientists in the United States who are active in this field lies between 200 and 300. The nature of the current work has been only briefly outlined here. Soon a more complete survey will be available to all interested persons—the proceedings volume, scheduled to appear early in 1962. In addition to approximately 200 abstracts of papers devoted to training and research, the volume will contain individual reports on the conference by members of the Traveling Group. It will provide a permanent record of the types, scope, and geographic distribution of coastal and shallow-water studies and of the persons active in the special fields. Requests for the proceedings volume

should be directed to Donn S. Gorsline.

Written comments received by the general chairman since the close of the conference have been overwhelmingly laudatory. Furthermore, unexpected interest in holding another meeting has been expressed by a large number of correspondents. In response to this interest, tentative plans have been made for a single-site conference on the Atlantic Coast to be held in the spring of 1963, possibly with the University of Georgia acting as host; this will be followed by a similar meeting at an as yet undesignated place on the Pacific Coast, in the fall of 1964.

WILLIS E. PEQUEGNAT
National Science Foundation, Washington, D.C.

Forthcoming Events

March

24–31. Symbolic Languages in Data Processing, symp., Rome, Italy. (Secretary, Provisional Intern. Computation Center, Palazzo degli Uffici, Zona dell'-EUR, Rome)

25–30. National Education Assoc., Dept. of Audio-Visual Education, Kansas City, Mo. (Chief of Information, Dept. of the Army, Washington 25)

26–27. High Energy Nuclear Physics, symp., London, England. (C. C. Butler, physics Dept., Imperial College, London, S.W.7)

26–29. Circum-Pacific Petroleum Exploration, Amer. Assoc. of Petroleum Geologists–Soc. of Economic Paleontologists and Mineralogists, annual, San Francisco, Calif. (G. B. Oakeshott, State Div. of Mines and Geology, Ferry Bldg., San Francisco 11)

26–29. Institute of Radio Engineers, intern., New York, N.Y. (E. K. Gannett, IRE, 1 E. 79 St., New York 21)

26–29. Recent Advances in Acarology, symp., Ithaca, N.Y. (J. Naegele, Dept. of Entomology, Cornell Univ., Ithaca)

26–20. World Meteorological Organization, Commission for Synoptic Meteorology, Washington, D.C. (WMO, 41, Avenue Giuseppe Motta, Geneva, Switzerland)

27–29. American Physical Soc., Div. of High-Polymer Physics, Baltimore, Md. (H. D. Keith, Bell Telephone Laboratories, Murray Hill, N.J.)

27–29. American Power Conf., American Soc. of Mechanical Engineers, Chicago, Ill. (A. B. Conlin, Jr., ASME, 29 W. 39 St., New York 18)

27–30. Cellular Basis and Aetiology of the Late Somatic Effects of Ionizing Radiations, symp., London, England. (P. Alexander, Chester Beatty Inst., Inst. of Cancer Research, Royal Cancer Hospital, Fulham Rd., London, S.W.3)

28–12. International Conf. on the Prevention of Pollution of the Sea by Oil, London, England (Intergovernmental Maritime Consultative Organization, Chancery House, Chancery Lane, London, W.C.2)

28–29. Engineering Aspects of Magnetohydrodynamics, symp., Rochester, N.Y. (G. W. Sutton, Massachusetts Inst. of Technology, Room 3-254, Cambridge 39)

29–30. Electron Beam Symp., annual, Boston, Mass. (Dr. Bakish, c/o Alloyd Electronics Corp., 35 Cambridge Pkwy., Cambridge 42, Mass.)

29–31. Kappa Delta Pi, Lafayette, Ind. (E. I. F. Williams, 238 E. Perry St., Tiffin, Ohio)

30–1. American Psychosomatic Soc., annual, Rochester, N.Y. (S. Wolf, APS, 265 Nassau Rd., Roosevelt, N.Y.)

30–1. American Soc. for the Study of Sterility, annual, Chicago, Ill. (Scientific Liaison Office, Natl. Research Council, Sussex Dr., Ottawa, Ont., Canada)

April

1–3. International College of Surgeons, Las Vegas, Nev. (Secretary, ICS, 1516 Lake Shore Dr., Chicago 10, Ill.)

1–4. American Radium Soc., annual, New York, N.Y. (C. G. Stetson, Dept. of Radiology, Englewood Hospital, Englewood, N.J.)

1–6. American Soc. of Abdominal Surgeons, clinical congr., Chicago, Ill. (B. F. Alfano, ASAS, 663 Main St., Melrose 76, Mass.)

2–5. American College of Obstetricians and Gynecologists, Chicago, Ill. (Chief of Information, Dept. of the Army, Washington 25)

2–5. Instrument Soc. of America, instrument-automation conf. and exhibit, Pittsburgh, Pa. (W. H. Kushnick, ISA, 313 Sixth Ave., Pittsburgh 22)

2–13. Photogrammetry Week, Munich, Germany. (H. Bischoff, Zeiss–Aerotopograph G.M.P.H., Ismaniger Str. 57, Munich 27)

3–5. Organic, Inorganic, and Physical Chemistry, symp., annual, Chemical Soc., Sheffield, England. (General Secretary, Burlington House, London, W.1, England)

3–5. Plasma Sheath, symp., Boston, Mass. (C. Ellis, Air Force Electronics Research Directorate (CRRD), L. G. Hanscom Field, Mass.)

3–6. Society of Automotive Engineers, natl. aeronautic, production forum and engineering display, New York, N.Y. (R. W. Crory, SAE, 485 Lexington Ave., New York 17)

3–7. Inter-American Nuclear Energy Commission, Mexico City, Mexico. (IANEC, Pan American Union, Washington 6)

4–6. Institute on Rehabilitation of the Mentally Ill, New York, N.Y. (B. J. Black, Altro Health and Rehabilitation Services, Inc., New York)

4–6. Physics of Graphite-Moderated Reactors, symp., Bournemouth, England. (Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

4–6. Short Run Production Techniques, intern. seminar, American Soc. of Tool and Manufacturing Engineers, Mexico City, Mexico. (Conf. Director, ASTME, 10700 Puritan Ave., Detroit 38, Mich.)

5–7. Pacific Sociological Assoc., annual, Sacramento, Calif. (R. Nisbet, Univ. of California, Riverside)

6–8. American Soc. of Internal Medi-

cine, annual, Philadelphia, Pa. (S. O. Krasnoff, ASIM, 3410 Geary Blvd., San Francisco 18, Calif.)

6–8. Association of Clinical Scientists, Chicago, Ill. (R. P. MacFate, 323 Northwood Rd., Riverside, Ill.)

6–8. Biological Photographic Assoc., midwestern sectional, Des Moines, Iowa. (BPA, 551 W. Grant Place, Chicago 14, Ill.)

7. New Jersey Acad. of Science, annual, West Long Branch. (H. L. Silverman, NJAS, 361 Highland Ave., Newark 4, N.J.)

7. New Mexico Acad. of Science, Socorro. (K. G. Melgaard, P.O. Box 546, Mesilla Park, N.M.)

7. Paleontological Research Institution, Ithaca, N.Y. (R. Harris, PRI, 109 Dearborn Pl., Ithaca)

7–9. Impact of Physical Metallurgy on Technology, symp., San Carlos de Bariloche, Argentina. (J. A. Sabato, National Atomic Energy Commission, Avda. Libertador General San Martin 8250, Buenos Aires, Argentina)

9–10. Chemical and Petroleum Instrumentation Symp., natl., Instrument Soc. of America, Wilmington, Del. (C. W. Sanders, E. I. du Pont de Nemours & Co., Louviers Bldg., Newark, Del.)

9–12. Aerospace Medical Assoc., annual, Atlantic City, N.J. (W. J. Kennard, c/o Washington National Airport, Washington, D.C.)

9–12. American Acad. of General Practice, annual, Las Vegas, Nev. (AAGP, Volker Blvd., Kansas City 12, Mo.)

9–12. International Feigl Symp. on Analytical Chemistry, Birmingham, England. (M. L. Richardson, c/o John & E. Sturge Ltd., Lifford Chemical Works, Kings Norton, Birmingham 30)

9–13. American College of Physicians, Philadelphia, Pa. (Chief of Information, Dept. of the Army, Washington 25)

9–13. American Welding Soc., annual, Cleveland, Ohio. (F. L. Plummer, AWS, 33 W. 39 St., New York 18)

9–13. Greater New York Safety Council, annual regional convention and exposition, New York, N.Y. (A. F. Fuller, Aetna Insurance Co., 161 Millburn Ave., Millburn, N.J.)

9–13. Inter-American Symp. on the Peaceful Application of Nuclear Energy, Mexico City, Mexico. (J. D. Perkinson, Jr., Inter-American Nuclear Energy Commission, c/o Pan American Union, Washington 6)

9–13. International Soc. for Fat Research, London, England. (Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1)

9–13. Physiology, Behavior, and Ecology of Orthoptera in Relation to Metamorphosis, intern. colloquium, Paris, France. (F. O. Albrecht, Laboratory of Natural Evolution, Natl. Scientific Research Center, 16 rue Pierre Curie, Paris)

9–14. Nutritional Absorption in Vegetables, intern. symp., Pisa, Italy. (Instituto di Chimica Agraria, Università degli Studi di Pisa, Via S. Michele degli Scalzi, 2, Pisa)

10–12. American Industrial Health Conf., Chicago, Ill. (M. E. Fairbank, Eastman Kodak Co., Rochester 4, N.Y.)

10–13. European Symp. on Size Reduction, European Federation of Chemical

Engineering–Processing Technology Soc., Frankfurt am Main, Germany. (Verfahrentechnische Gesellschaft im V.D.I., Rheingau-Allee 25, Frankfurt am Main 7)

10–14. International Conf. on Stress Analysis, Paris, France. (Secretary, 10, rue Vauquelin, Paris 5e)

11–13. Institute of Environmental Sciences, annual meeting and equipment exposition, Chicago, Ill. (J. P. Monroe, Lear, Inc., Grand Rapids, Mich.)

11–13. Institute of Radio Engineers, southwest conf. and electronic show, Houston, Tex. (IRE, 1 E. 79 St., New York 21)

12. Symposium on Non-Conventional Nuclear-Engineering Lubricants and Bearing Materials, symp., London, England. (Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1)

12–13. Histochemical Soc., annual, Atlantic City, N.J. (M. Wachstein, St. Catherine's Hospital, Bushwick Ave., Brooklyn 6, N.Y.)

12–13. International Assoc. for Dental Research, British Div., annual, Sheffield, England. (C. H. Tonge, c/o Dept. of Anatomy, King's College Medical School, Newcastle-upon-Tyne, England)

12–14. Association of Southeastern Biologists, Wake Forest, N.C. (H. J. Bennett, Dept. of Zoology, Louisiana State Univ., Baton Rouge 3)

12–14. Experimental Arithmetic, symp., American Mathematical Soc., Chicago, Ill. (N. C. Metropolis, Inst. for Computer Research, Univ. of Chicago, Chicago)

13–14. American Soc. for Artificial Internal Organs, annual, Atlantic City, N.J. (E. C. Peirce, II, ASAIO, 514 W. Church Ave., Knoxville 1, Tenn.)

13–14. Iowa Acad. of Science, Waverly. (P. F. Romberg, Iowa State Univ., Ames)

13–14. Nebraska Acad. of Sciences, Lincoln. (C. B. Schultz, Univ. of Nebraska, Lincoln 8)

13–15. Alabama Acad. of Science, Inc., Troy. (W. B. DeVall, Forestry Dept., Auburn Univ., Auburn, Ala.)

13–15. American Assoc. for Cancer Research, annual, Atlantic City, N.J. (H. J. Creech, Inst. for Cancer Research, Fox Chase, Philadelphia 11, Pa.)

13–19. Federation of American Societies for Experimental Biology, Atlantic City, N.J. (M. O. Lee, 9650 Wisconsin Ave., Washington 14)

14–16. Kinetics, Equilibria, and Performance of High Temperature Systems, 2nd conf., Los Angeles, Calif. (G. S. Bahn, 16902 Bollinger Dr., Pacific Palisades, Calif.)

14–19. American Inst. of Nutrition, Atlantic City, N.J. (A. E. Schaefer, Bldg. 16-A, Natl. Institutes of Health, Bethesda 14, Md.)

14–19. American Soc. of Biological Chemists, Inc., Atlantic City, N.J. (F. W. Putnam, Dept. of Biochemistry, Univ. of Florida College of Medicine, Gainesville)

15–18. American College Personnel Assoc., Chicago, Ill. (B. A. Kirk, Counseling Center, Univ. of California, Berkeley)

15–18. National Education Assoc., Council of Mathematics Teachers, San Francisco, Calif. (Chief of Information, Dept. of the Army, Washington 25)

16–18. Flight Test Instrument Symp., intern., Cranfield, England. (College of Aeronautics, Cranfield)

16–18. Reactor Safety and Hazards Evaluation Techniques, symp., Vienna, Austria. (Intern. Atomic Energy Agency, 11 Kaerntnerring, Vienna 1)

16–18. Spins and Phonons, conf., Bristol, England. (P. M. Llewellyn, H. H. Sills Physics Laboratory, Royal Fort, Bristol 8)

16–19. American Personnel and Guidance Assoc., annual, Chicago, Ill. (J. Fishbein, Science Research Associates, 259 E. Erie St., Chicago 11)

16–19. Interactions between Mathematical Research and High-Speed Computing, symp., American Mathematical Soc.–Assoc. for Computing Machinery, Atlantic City, N.J. (E. Pitcher, AMS, 190 Hope St., Providence 6, R.I.)

16–19. Paleoclimatology and Paleopedology, symp., International Soc. for Plant Geography and Ecology, Stolzenau, Germany. [R. Tüxen, Intern. Vereinigung für Vegetationskunde, Stolzenau (Weser)]

16–19. Vacuum Ultraviolet Radiation Physics, intern. conf., Los Angeles, Calif. (G. L. Weissler, Univ. of Southern California, Los Angeles 7)

16–20. American Physiological Soc., Atlantic City, N.J. (R. G. Daggs, APS, 9650 Wisconsin Ave., Washington 14)

16–20. American Soc. for Pharmacology and Experimental Therapeutics, Atlantic City, N.J. (H. G. Mandel, George Washington Univ. School of Medicine, 1337 H St., NW, Washington 5)

17–18. Conference on Permafrost, Ottawa, Ont., Canada. (R. J. E. Brown, Div. of Building Research, Natl. Research Council, Ottawa 2)

17–20. International Mineralogical Assoc., Washington, D.C. (D. J. Fisher, Dept. of Geology, Univ. of Chicago, Chicago 37, Ill.)

17–20. Sector-Focused Cyclotrons, conf., Los Angeles, Calif. (B. T. Wright, Dept. of Physics, Univ. of California, Los Angeles 24)

18–20. American Inst. of Electrical Engineers, Fort Wayne, Ind. (R. S. Gardner, AIEE, 33 W. 39 St., New York 18)

18–20. Information Retrieval in Action, conf., Cleveland, Ohio. (Center for Documentation and Communication, Western Reserve Univ., 10831 Magnolia Dr., Cleveland 6)

18–28. World Seed Congr., Rome, Italy. (Intern. Agency Liaison Branch, Office of the Director General, Food and Agriculture Organization of the U.N., Viale delle Terme di Caracalla, Rome)

19. Southern California Acad. of Sciences, Los Angeles. (G. Sibley, Los Angeles County Museum, 900 Exposition Blvd., Los Angeles 7)

19–20. Southern Municipal and Industrial Waste Conf., Chapel Hill, N.C. (Dept. of Sanitary Engineering, Univ. of North Carolina, Box 899, Chapel Hill)

19–21. Southern Soc. for Philosophy and Psychology, Memphis, Tenn. (D. R. Kenshalo, Dept. of Psychology, Florida State Univ., Tallahassee)

20–22. Czechoslovak Soc. of Arts and Sciences in America, 1st natl. congr., Washington, D.C. (M. Rechcigl, Jr., 1703 Mark Lane, Rockville, Md.)

21. Pennsylvania Acad. of Science, Pittsburgh. (K. B. Hoover, Messiah College, Grantham, Pa.)

21–21 Oct. World's Fair of Science, Century 21 Exposition, Seattle, Wash. (J. Rockey, c/o Seattle World's Fair, Seattle)

22–26. Association of American Geographers, Miami Beach, Fla. (M. F. Burrill, AAG, 1785 Massachusetts Ave., NW, Washington, D.C.)

23–25. Canadian Inst. of Mining and Metallurgy, annual, Ottawa, Ont. (C. Gerow, CIMM, 1117 St. Catherine St., W. Montreal 2, Quebec, Canada)

23–25. Meteorological Uses of Rockets and Satellites, symp., Washington, D.C. (World Meteorological Organization, 41, Avenue Giuseppe Motta, Geneva, Switzerland)

23–25. Pan American Congr. of Gastroenterology, New York, N.Y. (C. A. Flood, 180 Fort Washington Ave., New York 32)

23–26. American Physical Soc., Washington, D.C. (K. K. Darrow, APS, Columbia Univ., New York 27)

23–27. International Conf. on Palynology, Tucson, Ariz. (G. O. W. Kremp, Geochronology Laboratories, Univ. of Arizona, Tucson)

23–5. Television Arts and Sciences, intern. symp. and festival, Montreux, Switzerland. (Intern. Television Symp., 8, Grand-Rue, Montreux)

24–25. Managing Petroleum and Petrochemical Operations, conf., San Antonio, Tex. (J. Harmon, Southwest Research Inst., 8500 Culebra Rd., San Antonio 6)

24–26. Building Research Inst., spring conf., Washington, D.C. (M. C. Coon, Jr., BRI, 2101 Constitution Ave., NW, Washington 25)

24–26. Mathematical Theory of Automata, intern. symp., New York, N.Y. (Symposium Committee, Polytechnic Inst. of Brooklyn, 55 Johnson St., Brooklyn 1, N.Y.)

25. Rocket Propulsion, symp., Cranfield, Bletchley, England. (Secretary, British Interplanetary Soc., 12 Bessborough Gardens, London, S.W.1, England)

25–27. International Federation of Associations of Textile Chemists and Colorists, annual, Amsterdam, Netherlands. (J. Boulton, Dean House, 19, Piccadilly, Bradford 1, Yorks, England)

25–27. Present Status and Future Prospects of Television and Motion Pictures as Media for Medical Education, intern. conf., Milan, Italy. (L. L. Leveridge, Medical Television Unit, New York Univ. Medical Center, 550 First Ave., New York 16)

25–27. Pulp and Paper Instrumentation Symp, natl., Jacksonville, Fla. (L. G. Good, Systems Service Corp., P.O. Box 952, Charlotte, N.C.)

27–28. Idaho Acad. of Science, annual, Moscow. (L. M. Stanford, College of Idaho, Caldwell)

27–29. Oklahoma Acad. of Science, Woodward. (A. D. Buck, Northern Oklahoma Junior College, Tonkawa)

27–29. West Virginia Acad. of Science, Bethany. (J. D. Draper, Dept. of Chemistry, West Virginia Univ., Morgantown)

28. Mississippi Acad. of Sciences, Inc., Jackson. (C. Q. Sheely, Mississippi State Univ., State College)

29–2. International Acad. of Pathology–American Assoc. of Pathologists and Bacteriologists, Montreal, Canada. (F. K. Mostofi, c/o Armed Forces Inst. of Pathology, Washington 25)

29–2. National Workshop on Aging, American Home Economics Assoc., Lafayette, Ind. (A. J. Bricker, AHEA, 1600 20th St., NW, Washington 9)

29–3. American Ceramic Soc., annual, New York, N.Y. (C. S. Pearce, ACS, 4055 N. High St., Columbus 14, Ohio)

30–1. International Acad. of Pathology, annual, Montreal, Canada. (M. Davis, Intersociety Committee on Pathology Information, 1785 Massachusetts Ave., NW, Washington 6)

30–1. International Acetylene Assoc., annual, Toronto, Canada. (L. Matthews, 30 E. 42 St., New York 17)

30–2. American Soc. of Mechanical Engineers, Design Engineering Div., Philadelphia, Pa. (A. B. Conlin, Jr., ASME, 29 W. 39 St., New York 18)

30–2. Association of Iron and Steel Engineers, Detroit, Mich. (T. J. Ess, AISE, 1010 Empire Bldg., Pittsburgh 22, Pa.)

30–2. Instrumental Methods of Analysis, natl. symp., Instrument Soc. of America, Pittsburgh, Pa. (E. E. Buckston, Works Engineering Dept., Union Carbide Chemicals Co., P.O. Box 8004, S. Charleston 3, W.Va.)

30–2. Role of Food in World Peace, intern. symp., Columbus, Ohio. (R. M. Kottman, College of Agriculture, Ohio State Univ., Columbus 10)

30–3. Mid-America Spectroscopy, annual symp., Soc. for Applied Spectroscopy, Chicago, Ill. (J. R. Ferraro, Argonne, Natl. Laboratory, 9700 S. Cass Ave., Argonne, Ill.)

30–4. Compressed Air and Hydraulics, intern. conf. and exhibition, London, England. (W. G. H. Chesher, c/o John Trundell and Partners Ltd., St. Richard's House, Eversholt St., London, N.W.1)

30–4. Society of Motion Picture and Television Engineers, annual, Los Angeles, Calif. (H. Teitelbaum, SMPTE, 55 W. 42 St., New York 36)

30–5. Automobile Technical Congr., intern., London, England. (Automobile Div., Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1)

May

1–3. Biologistics for Space Systems, symp. and workshop, Dayton, Ohio. (Col. A. I. Karstens, Aerospace Medical Research Laboratories, Aeronautical Systems Div., Wright-Patterson AFB, Ohio)

1–3. Joint Computer Conf., San Francisco, Calif. (R. I. Tanaka, Computer Systems-Logical Design, Lockheed Missiles & Space Co., Palo Alto, Calif.)

1–4. Conference on Radiodiagnosis and Radiotherapy, Southern Rhodesia. (P. E. S. Palmer, P.O. Box 958, Bulawayo, Southern Rhodesia)

1–4. Gamma Alpha Graduate Scientific Fraternity, St. Paul, Minn. (W. T. Keeton, Dept. of Entomology, Cornell Univ., Ithaca, N.Y.)

2. International Symp. on Crop Protection, Ghent, Belgium. (I. J. Van den Brande, Institut Agronomique de l'Etat, Coupure Gauche 233, Ghent)

2–3. Iron and Steel Inst., annual, London, England. (ISI, 4 Grosvenor Gardens, London, S.W.1)

2–4. American Assoc. of Pathologists and Bacteriologists, annual, Montreal, Canada. (Intersociety Committee on Pathology Information, 1785 Massachusetts Ave., NW, Washington 6)

2–4. European Corrosion Conf., Paris, France. (Société de Chimie Industrielle, 28, rue St. Dominique, Paris 7e)

2–4. Institute of Management Sciences, Toronto, Canada. (T. Fabian, c/o *Mathematica*, 76 Nassau St., Princeton, N.J.)

2–5. Air Force Systems Command Management Conf., Monterey, Calif. (Office of Information, AFSC, Andrews AFB, Washington 25)

2–5. Midwestern Psychological Assoc., Chicago, Ill. (D. R. Meyer, 1314 Kinnear Rd., Columbus 12, Ohio)

2–5. National Science Fair-International, Seattle, Wash. (Science Service, 1719 N St., NW, Washington 6)

2–6. Film Techniques, conf., Budapest, Hungary. (Hungarian Soc. of Optics, Acoustics and Film Techniques, Szabadság tér 17, Budapest V)

2–8. Space Science Symp., intern., Washington, D.C. (Secretary, Committee on Space Research, 28 Nieuwe Schoolstraat, The Hague, Netherlands)

3. Electronic Marketing Seminar, intern., San Diego, Calif. (E. T. Clare, Cohu Electronics, Inc., Box 623, San Diego)

3–4. Human Factors in Electronics, intern. congr., Long Beach, Calif. (C. Hopkins, Hughes Aircraft Co., Culver City, Calif.)

3–5. Institute of Hospital Administrators, annual, Cardiff, Wales, England. (J. F. Milne, 75 Portland Pl., London, W.1)

3–5. Kansas Acad. of Science, Pittsburgh. (G. A. Leisman, Dept. of Biology, Kansas State Teachers College, Emporia)

3–5. Ohio Acad. of Science, Toledo.

(G. W. Burns, 505 King Ave., Columbus 1, Ohio)

3–5. Society for American Archaeology, Tucson, Ariz. (J. B. Wheat, Univ. of Colorado Museum, Boulder)

3–5. University Computing Centres, intern. conf., Mexico, D.F., Mexico. (Centro Electrónico de Cálculo, Universidad Nacional Autónoma de México, México, D.F.)

4. North Carolina Acad. of Science, Winston-Salem. (J. A. Yarbrough, Meredith College, Raleigh, N.C.)

4–5. Colorado-Wyoming Acad. of Science, Greeley, Colo. (R. G. Beidleman, Zoology Dept., Colorado College, Colorado Springs)

4–5. Minnesota Acad. of Science, annual, Winona. (J. P. Emanuel, 206 E. Howard, Winona)

4–5. North Dakota Acad. of Science, Fargo. (B. G. Gustafson, Box 573, Union Station, Grand Forks, N.D.)

4–5. Population Assoc. of America, Madison, Wis. (K. B. Mayer, Dept. of Sociology and Anthropology, Brown Univ., Providence, R.I.)

4–5. South Dakota Acad. of Science, Vermillion. (T. Van Bruggen, Dept. of Botany, Univ. of South Dakota, Vermillion)

4–6. Protides of the Biological Fluids, colloquim, Bruges, Belgium. (H. Peeters, Sint Jans Hospitaal, Bruges)

4–6. Wisconsin Acad. of Sciences, Arts and Letters, La Crosse. (T. J. McLaughlin, Univ. of Wisconsin, 3203 N. Downer Ave., Milwaukee 11)

5–6. Academy of Psychoanalysis, annual, Toronto, Canada. (J. H. Merin, 125 E. 65 St., New York 21)

5–6. Society of Biological Psychiatry, annual, Toronto, Canada. (G. N. Thompson, 2010 Wilshire Blvd., Los Angeles 57, Calif.)

5–7. International Congr. of Medical Laboratory Technologists, Cologne, Germany. (M. Gesunsheitsverwaitung, Intern. Assoc. of Medical Laboratory Technologists, Cologne)

6–9. Bockus Alumni Intern. Soc. of Gastroenterology, annual, Geneva, Switzerland. (J. L. A. Roth, Graduate Medical Bldg., Suite 302, 419 S. 19 St., Philadelphia 46, Pa.)

6–9. National Power Instrumentation Symp., Fort Worth, Tex. (C. W. Macune, Westronics, Inc., 3605 McCart, Fort Worth 10)

6–10. American Soc. for Microbiology, annual, Kansas City, Mo. (P. Gerhardt, Dept. of Bacteriology, Univ. of Michigan, Ann Arbor)

6–10. Electrochemical Soc., annual, Los Angeles, Calif. (R. K. Shannon, 1860 Broadway, New York 23)

6–10. French Soc. of Ophthalmology, Paris. (M. A. Dollfus, FSO, 27, rue du Faubourg-Saint-Jacques, Paris 16e)

6–12. World Congr. of Gastroenterology, Munich, Germany. (G. A. Martini, Martinstr. 52, Hamburg 20, Germany)

7–8. American Inst. of Mining, Metallurgical and Petroleum Engineers, Soc. of Petroleum Engineers' Secondary Recovery Symp., Wichita Falls, Tex. (E. O. Kirkendall, AIME, 29 W. 39 St., New York 18)

7–9. American Oil Chemists' Soc., annual, New Orleans, La. (W. O. Lundberg,

Hormel Inst., Univ. of Minnesota, 801 16 Ave., NE, Austin)

7–9. Implications of Organic Peroxides in Radiobiology, intern. symp., Argonne, Ill. (R. N. Feinstein, Div. of Biological and Medical Research, Argonne Natl. Laboratory, Argonne)

7–9. National Watershed Congr., annual, Columbus, Ohio. (C. R. Gutermuth, Wildlife Management Inst., Washington, D.C.)

7–11. American Psychiatric Assoc., Toronto, Canada. (C. H. H. Branch, 156 Westminster Ave., Salt Lake City, Utah)

7–11. American Soc. of Tool and Manufacturing Engineers, annual convention and tool exposition, Cleveland, Ohio. (A. Cervenka, Vanderbilt Blvd., Oakdale, N.Y.)

7–11. Radiation Damage in Solids and Reactor Materials, symp., Intern. Atomic Energy Agency, Venice, Italy. (IAEA, 11 Kärntner Ring, Vienna 1, Austria)

7–11. Society of Photographic Scientists and Engineers, annual, Boston, Mass. (E. S. Cobb, Box 1609, Main Post Office, Washington, D.C.)

7–12. International Conf. of Marine Engineers, London, England. (Inst. of Marine Engineers, Memorial Bldg., 76 Mark Lane, London, E.C.3)

7–12. International Seed Testing Assoc., annual congr., Lisbon, Portugal. (A. F. Schoorel, ISTA, Binnenhaven 1, Wageningen, Netherlands)

8. American Soc. of Safety Engineers, Chicago, Ill. (A. C. Blackman, ASSE, 5 N. Wabash Ave., Chicago 2)

8–10. American Soc. of Lubrication Engineers, annual, St. Louis, Mo. (A. E. Cichelli, Bethlehem Steel Co., 701 E. Third St., Bethlehem, Pa.)

8–10. World Commission on Vocational Rehabilitation, annual, Washington, D.C. (D. Warms, Intern. Soc. for Rehabilitation of the Disabled, 701 First Ave., New York 17)

8–19. Latin American Meeting on Higher Agricultural Education, Medellín, Colombia. (Intern. Agency Liaison Branch, Office of Director General, U.N. Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome, Italy)

8–26. World Health Assembly, annual, Geneva, Switzerland. (World Health Organization, Palais des Nations, Geneva)

9–11. Conference on Mucous Secretions, New York, N.Y. (S. Jakowska, Natl. Cystic Fibrosis Research Foundation, 521 Fifth Ave., New York 17)

9–11. Operations Research Soc. of America, Washington, D.C. (G. D. Shellard, New York Life Insurance Co., 51 Madison Ave., New York 10)

9–12. Science Writers Seminar, intern., Seattle, Wash. (Intern. Press Inst., Münstergasse 9, Zurich 1, Switzerland)

9–12. Virginia Acad. of Science, Norfolk. (P. M. Patterson, Hollins College Branch, Roanoke)

10–12. Meetings on Diabetes, University of Paris, Paris, France. (M. Rathery, Hotel-Dieu, Paris)

10. Glass Container Technology, seminar, New York, N.Y. (Packaging Inst., 342 Madison Ave., New York 17)

10. Vitamins and Transplantation Immunity, Assoc. of Vitamin Chemists, Chi-

cago, Ill. (H. S. Perdue, Abbott Laboratories, N. Chicago)

10–11. American Inst. of Chemists, Inc., Chicago, Ill. (J. Kotrady, c/o AIC, 60 E. 42 St., New York 17)

10–12. Food Protection, intern. symp., Ames, Iowa. (J. C. Ayres, Dept. of Dairy and Food Industry, Iowa State Univ., Ames)

12. International College of Surgeons, clinical meeting, London, England. (Secretary, ICS, 1516 Lake Shore Dr., Chicago 10, Ill.)

13–16. American Acad. of Dental Medicine, annual, Baltimore, Md. (P. Block, 36 N. Luzerne Ave., Baltimore)

13–16. Transfer of Calcium and Strontium across Biological Membranes, conf., Ithaca, N.Y. (R. H. Wasserman, Dept. of Physical Biology, New York State Veterinary College, Cornell Univ., Ithaca)

13–17. American Industrial Hygiene Assoc., conf., Washington, D.C. (W. S. Johnson, Bethlehem Steel Co., Bethlehem, Pa.)

14–16. National Aerospace Electronics Conf., Dayton, Ohio. (Inst. of the Aerospace Sciences, 2 E. 64 St., New York 21)

14–16. Technical Assoc. of the Pulp and Paper Industry, coating conf., annual, Cincinnati, Ohio. (TAPPI, 155 E. 44 St., New York 16)

14–18. American Soc. of Civil Engineers, convention, Omaha, Neb. (W. H. Wisely, 345 E. 47 St., New York 17)

14–18. Hormonal Steroids, intern. congr., Milan, Italy. (L. Martini, Instituto de Farmacologia e Terapia, 21 Via A. del Sarto, Milan)

14–18. Reactor Safety and Hazards Evaluation Techniques, symp., Vienna, Austria. (IAEA, 11 Kärntner Ring, Vienna)

15–16. Council on Medical Television, annual, Bethesda, Md. (J. F. Huber, CMT, Inst. for Advancement of Medical Communication, 33 E. 68 St., New York 21)

15–17. World Food Forum, Washington, D.C. (J. K. McClarren, U.S. Dept. of Agriculture, 409 Administration Bldg., Washington 25)

15–19. International College of Surgeons, European federation, surgical congr., Amsterdam, Netherlands. (J. Blazenburg, ICS Netherlands Section, A. Perkstraat 57, Hilversum, Netherlands)

16–17. Navy Medical-Dental TV Workshop, Bethesda, Md. (Inst. for Advancement of Medical Communication, 33 E. 68 St., New York 21)

16–26. Large Electric Systems, intern. conf., Paris, France. (ICLES, 112 Boulevard Haussmann, Paris 8e)

17–19. American Inst. of Industrial Engineers, annual, Atlantic City, N.J. (W. J. Jaffe, Newark College of Engineering, Newark, N.J.)

17–19. Eccrine, Apocrine, and Holocrine Glands, symp., Madison, Wis. (Div. of Postgraduate Medical Education, University of Wisconsin Medical School, Madison 6)

17–19. Nepiology, intern. conf., Catania, Sicily. (S. Rapisardi, Via Mavilla 37, Catania)

17–19. Paralanguage and Kinesics, conf., Bloomington, Ind. (T. A. Sebeok, Research Center in Anthropology, Rayl House, Indiana Univ., Bloomington)

17–31. Special Libraries Assoc., Washington, D.C. (J. B. North, Missile and Space Div., Lockheed Aircraft Corp., 50-14, Palo Alto, Calif.)

18–19. Indiana Acad. of Science, Mitchell. (W. W. Bloom, Valparaiso Univ., Valparaiso, Ind.)

18–29. European Plastics and Rubber Conf., Paris, France. (Du Mont Publicity Co., 18 Queensberry Place, London, S.W.7, England)

19–20. International Assoc. for the Study of the Liver, Munich, Germany. (G. A. Martini, c/o Universitäts Krankenhaus, Eppendorf, Hamburg, Germany)

20–23. American Inst. of Chemical Engineers, natl., Baltimore, Md. (F. J. Van Antwerpen, AICE, 345 E. 47 St., New York 17)

20–23. Radiation Research Soc., annual, Colorado Springs, Colo. (E. L. Powers, RRS, Argonne Natl. Laboratory, Argonne, Ill.)

20–24. Air Pollution Control Assoc., annual, Chicago, Ill. (D. A. Sullivan, APCA, 4400 Fifth Ave., Pittsburgh 13, Pa.)

20–24. American Assoc. of Cereal Chemists, Saint Louis Park, Minn. (B. S. Miller, Dept. of Flour and Feed Milling, Kansas State Univ., Manhattan)

21–22. Society of American Military Engineers, annual, Washington, D.C. (SAME, 808 Mills Bldg., Washington 6)

21–23. National Aerospace Instrumentation Symp., Washington, D.C. (C. Creveling, Goddard Space Flight Center, Greenbelt, Md.)

21–24. Air Pollution Instrumentation Symp., Chicago. Ill. (D. F. Adams, Div. of Industrial Research, Washington State Univ., Pullman)

21–25. Max Planck Inst. for the Advancement of Science, general assembly, Düsseldorf, Germany. (MPIAS, Kaiserswerther Str. 164, Düsseldorf)

21–25. Plastic and Reconstructive Surgery of the Eye and Adnexa, intern. symp., New York, N.Y. (R. Troutman, Manhattan Eye, Ear & Throat Hospital, 210 E. 64 St., New York 21)

21–25. Thermodynamics of Nuclear Materials, symp., Vienna, Austria. (Intern. Atomic Energy Agency, 11 Kärntner Ring, Vienna 1)

21–26. Ceramic Congr., intern., Copenhagen, Denmark. (Arbejdsgivere, Indenfor de Keramiske Industrier, Nørre Volgade 34, Copenhagen K)

21–26. Rubber Technology Congr., annual, London, England. (Secretary, Institution of the Rubber Industry, 4, Kensington Palace Gardens, London, W.8)

21–1. Prediction of Volcanic Eruptions and the Relationship between Magmas and the Nature of Volcanic Eruptions, symp., Tokyo, Japan. (Secretary, Organizing Committee, c/o Science Council of Japan, Ueno Park, Tokyo)

22–24. National Microwave Theory and Techniques, symp., Inst. of Radio Engineers, Boulder, Colo. (L. G. Cumming, IRE, 1 E. 79 St., New York 21)

22–24. Self-Organizing Systems, conf., Chicago, Ill. (G. T. Jacobi, Armour Research Foundation, 10 W. 35 St., Chicago 16)

22–25. Rationalizing Consumption of Electric Power, intern. symp., Warsaw, Poland. (Ministry of Mines and Power, Krucza 36, Warsaw)

22–25. Rubber Technology Conf., Scarborough, England. (Institution of the Rubber Industry, 4 Kensington Palace Gardens, London, W.8)

22–26. Disposal and Utilization of Solid Domestic and Industrial Wastes, intern. congr., Essen, Germany. (Haus der Technik, Schliessfach 668, Essen)

23–24. Forming and Testing of Sheet Metal, intern. colloquium, Düsseldorf, Germany. (J. Hooper, Intern. Deep Drawing Research Group, John Adam St., Adelphi, London, W.C.2, England)

23–25. American Soc. for Quality Control, annual, Cincinnati, Ohio. (A. W. Wortham, Texas Instruments, Inc., P.O. Box 5474, Dallas 22)

24–25. Diseases in Nature Transmissible to Man, conf., annual, Dallas, Tex. (M. B. Starnes, Univ. of Texas Southwestern Medical School, 5323 Harry Hines Blvd., Dallas 35)

24–26. Institute of Radio Engineers, conf. on space communications, Seattle, Wash. (IRE, 1 E. 79 St., New York 21)

24–26. International Medico-Athletic Federation, congr., Santiago, Chile. (G. La Cava, Via A. Serra, 104, Rome, Italy)

26–30. International Federation for Hygiene and Preventive Medicine, intern. congr., Vienna, Austria. (E. Musil, IFHPM, Mariahilfer Strasse 177, Vienna XV)

27–30. Chemical Inst. of Canada, annual conf. and exhibition, Edmonton. (CIC, 48 Rideau St., Ottawa 2, Ont.)