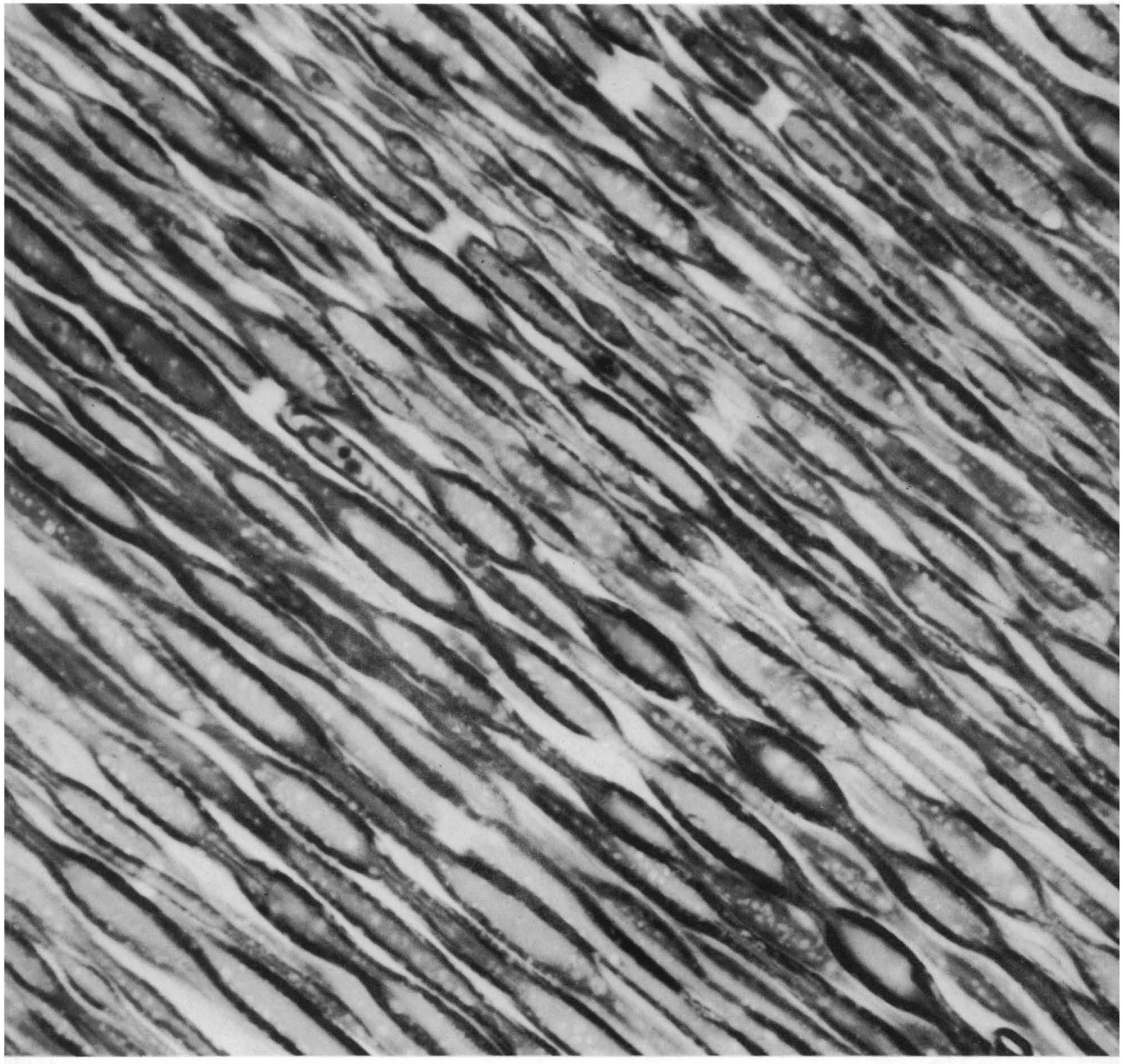
SCIENCE

15 February 1963

Vol. 139, No. 3555

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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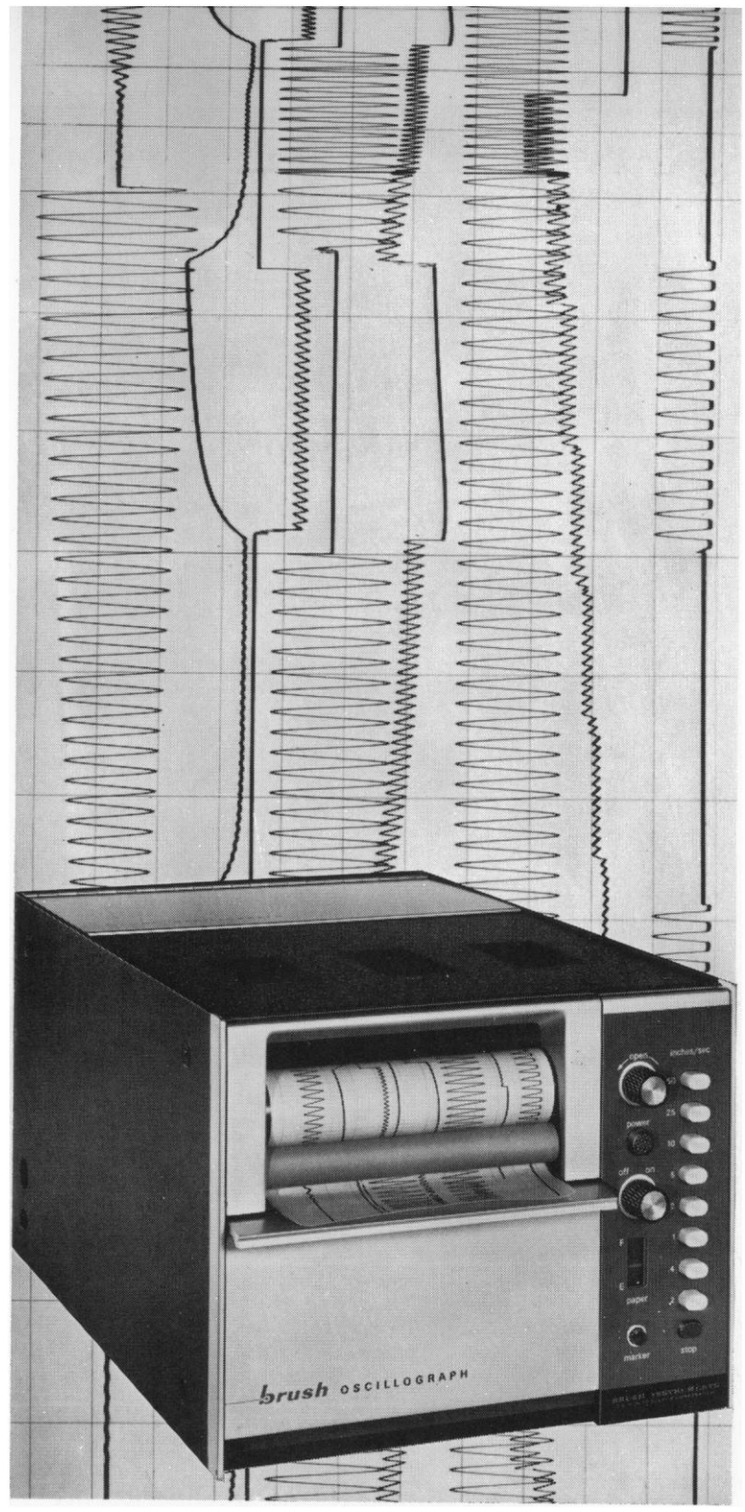
Proceedings Issue

Actual width of record is 6 inches

At Brush it's a matter of record



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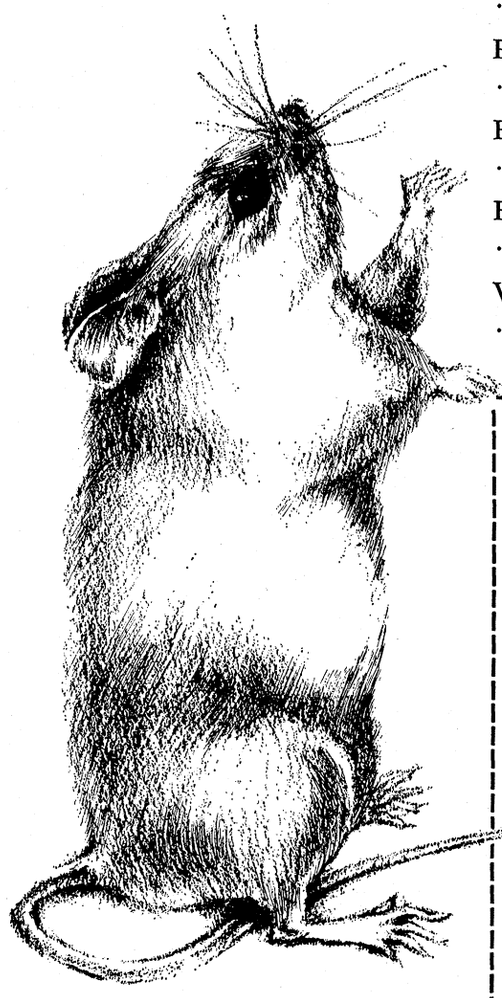

TYPICAL ANALYSIS:

Total Nitrogen (Dry) not less than 14.5%

Total Moisture — maximum.....6.0%

Total Ash — maximum....2.3%

Fat (ether extractables) — maximum 0.01%

pH.....5.85

Lactic Acid does not exceed 0.1%

Thiamine HCl .....0.15 micrograms per gram

Riboflavin .....0.50 micrograms per gram

Niacin .....0.30 micrograms per gram

Pyridoxine HCl .....0.65 micrograms per gram

Pantothenic Acid .....0.15 micrograms per gram

Biotin .....0.0013 micrograms per gram

Folic Acid .....0.030 micrograms per gram

Vitamin B-12 .....0.003 micrograms per gram

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NBCo's large-scale production effects dramatic costs savings, so that the finest quality casein available anywhere can be offered at lower prices. Write for details of NBCo's annual quantity price schedule, by which purchasers of 1000 lbs. or more annually may enjoy special volume prices with shipment in lots of 25 lbs. or more.

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15 February 1963
Vol. 139, No. 3555

SCIENCE

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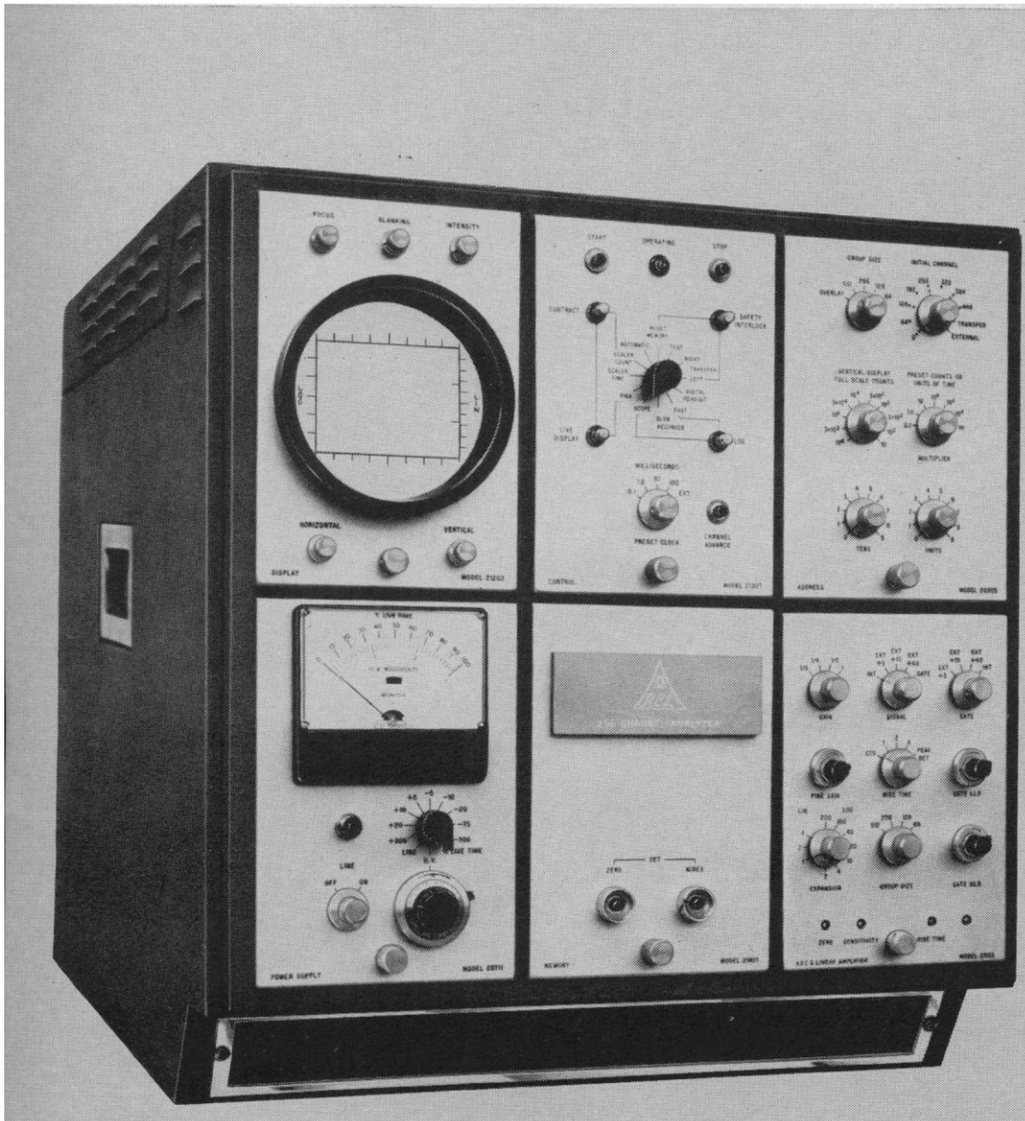
COVER

Series of beads in sciatic nerve fibers of a rat. The nerve was subjected to a brief stretch (8 grams) and frozen while it was still stretched. Then, still frozen, it was fixed for 1 week in osmium-acetone before examination. Beads are evident in many of the fibers. The thickness of the myelin sheath, which stains dark, is approximately equal in both the constricted and expanded portions of the beads (× 675). See page 599.

NEW RCL MULTICHANNEL ANALYZER . . .

OUTSTANDING ACCURACY, STABILITY, FLEXIBILITY



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A Lourdes BETA-FUGE *exclusive* . . . Electronically controlled timer sets off visual warning light on control panel when brushes have 5-hours "life" left. Permits selective changing of brushes. Eliminates erratic unit operation found in other centrifuges. Timer is easily re-set when brushes are replaced.

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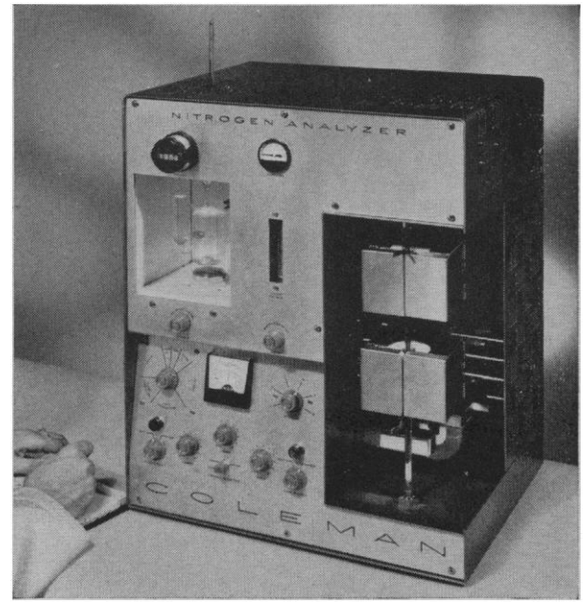

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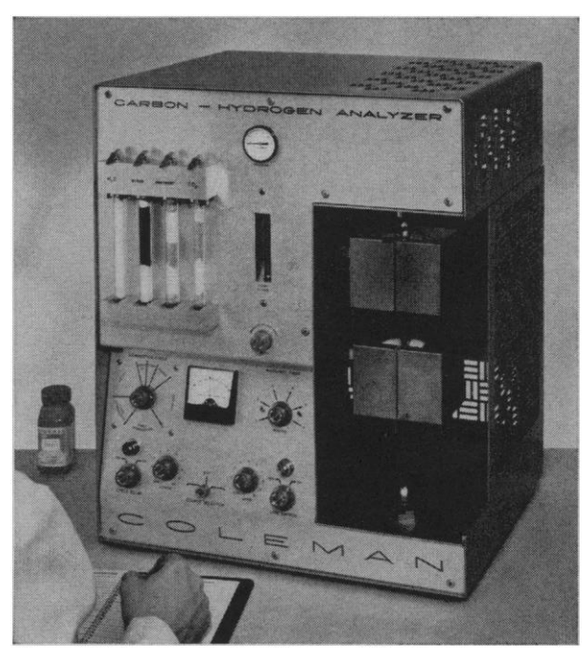

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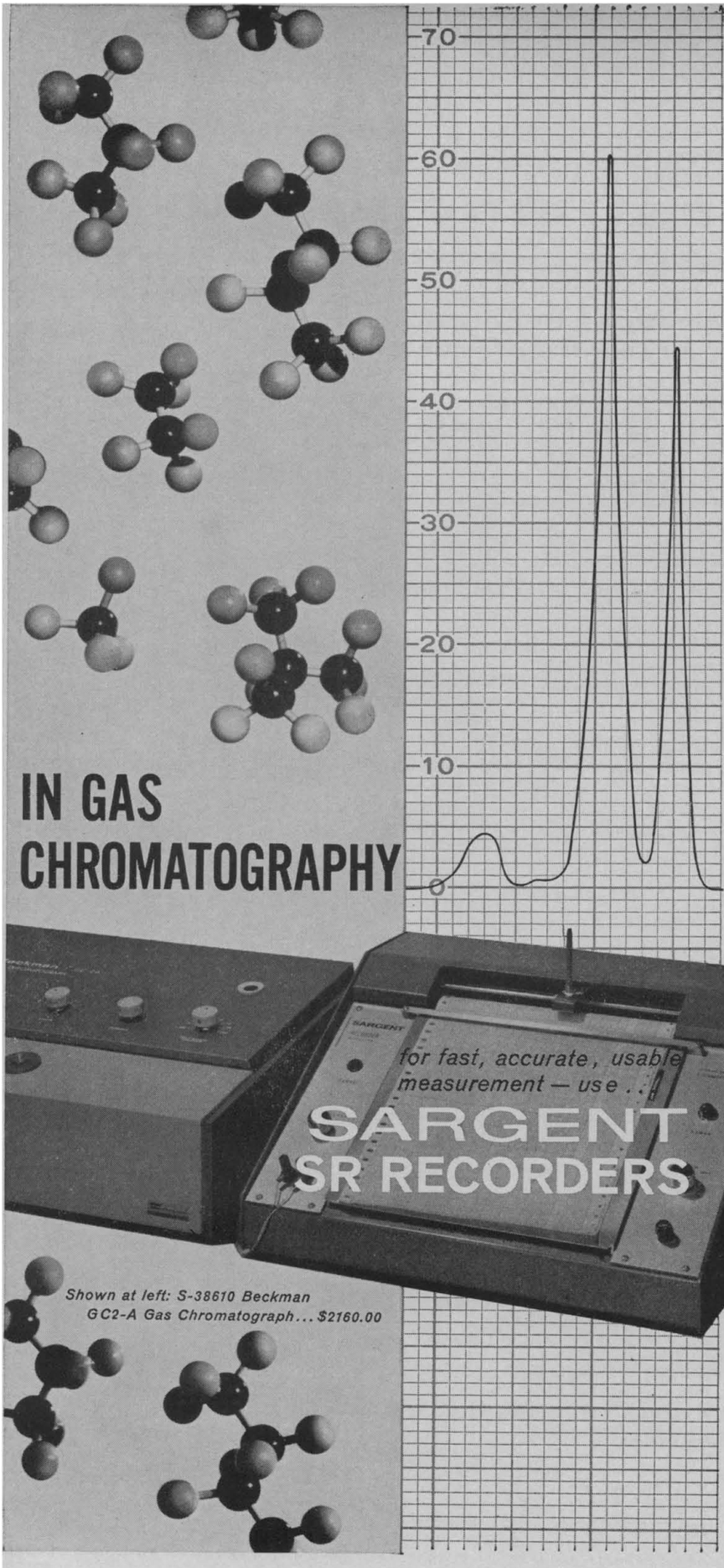

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FAST PEN RESPONSE. Less than one second is required for full scale travel, ensuring faithful reproduction of the sharp slopes and peaks of the chromatogram.

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REPRODUCIBILITY—to a fraction of a millimeter—ensures that the accuracy of analytical measurement is not limited by the measuring instrument, which is accurate to within 20 microvolts.

SPECIAL CHART. Wide 240 mm scale is graduated from 0 to 100 to simplify calculations. Zero point is offset from mechanical zero to show negative signals and simplify adjustment—and is at the right for a logical, conventional presentation of the chromatogram.

VERSATILITY. A variety of accessories permit selection of chart speeds, charts, voltage ranges, pens, etc. for other applications—with true potentiometric measuring (no input dividers to distort the measured circuit).

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Linde Cryobiology NEWS

REPORT NO. 3 FROM LINDE COMPANY, DIVISION OF UNION CARBIDE CORPORATION

New preservation techniques using liquid nitrogen

Notes on...preserving human erythrocytes and leucocytes... plans for establishing tumor and tissue banks for cancer research...new cryobiology equipment.

Some interesting new developments have been reported on the use of liquid nitrogen to preserve biological materials. In the storage of human erythrocytes, it was found that "the original hemagglutinizing activity of the cell was retained 100% after storage frozen in liquid nitrogen for two years". . . Blood samples frozen and stored in liquid nitrogen yielded excellent recoveries with little evidence of hemolysis.(1)

Another research team concluded from their data that . . ."major red cell antigens retain full reactivity when stored in a liquid nitrogen refrigerator for six months." They found that a panel of cells preserved in liquid nitrogen was as satisfactory as fresh cells in defining irregular antibodies encountered in patient sera. Compared to other techniques, erythrocytes frozen and stored in liquid nitrogen had the important advantage of being immediately available for use upon thawing.(2)

RESEARCH AT LINDE

Linde Company is actively investigating several key areas of cryobiology. Cooperative research is being conducted with Roswell Park Memorial Institute on preserving human chronic lymphocytic leukemic leucocytes in liquid nitrogen. Results of these studies indicate that the use of liquid nitrogen preserved leucocytes for routine clinical testing is feasible.(3)

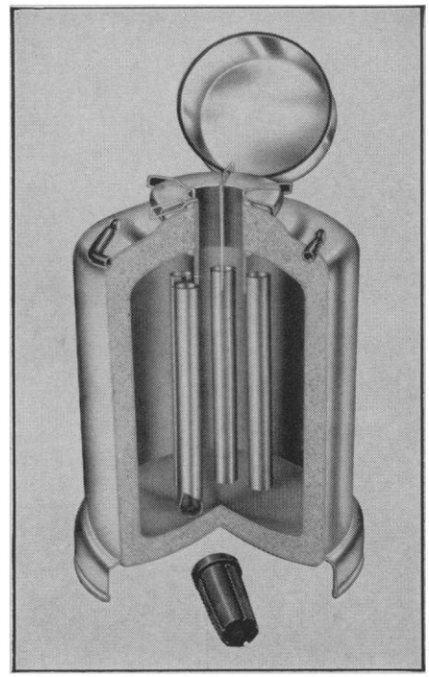
LINDE is also assisting Roswell Park Memorial Institute in setting up a tumor bank which will enable scientists to use original specimens at any time in the future. Such tumor and tissue banks will permit researchers to work on the original specimen now, or ten or more years hence.

In chromatographic or electrophoretic separation techniques, LINDE scientists have used liquid nitrogen to maintain stability of biologic materials sensitive to oxygen. In purifying the enzyme, nitrate reductase, they found that freezing the material soon after collection, followed by storing in a gaseous nitrogen atmosphere at temperatures below −100°C., protected its enzymic activity.(4)

NEW EQUIPMENT FROM LINDE

LINDE has developed the most complete assortment of quality cryogenic equipment. Among these are liquid nitrogen refrigerators, controlled rate freezers, special canister conversion kits for 25- and 10-liter liquefied gas containers, low-loss plastic-handled canisters, and an automatic liquid nitrogen level safeguard. Two recent additions in its line of cryogenic equipment are the LR-10-5 and LR-250 Liquid Nitrogen Refrigerators.

The LR-10-5 is a fully portable liquid nitrogen refrigerator designed for the shipment and storage of small quantities of biological materials safely and economically. When fully charged with 10 liters of liquid nitrogen, it weighs only 31 lb. The refrigerator holds 120 ampules of product in 5 easily accessible canisters at a constant temperature of −196°C. LINDE's patented Super Insulation keeps the liquid nitrogen consumption extremely low — 0.55 liters per day (max.) with canisters inserted, producing a minimum holding time of 17 days without refill.



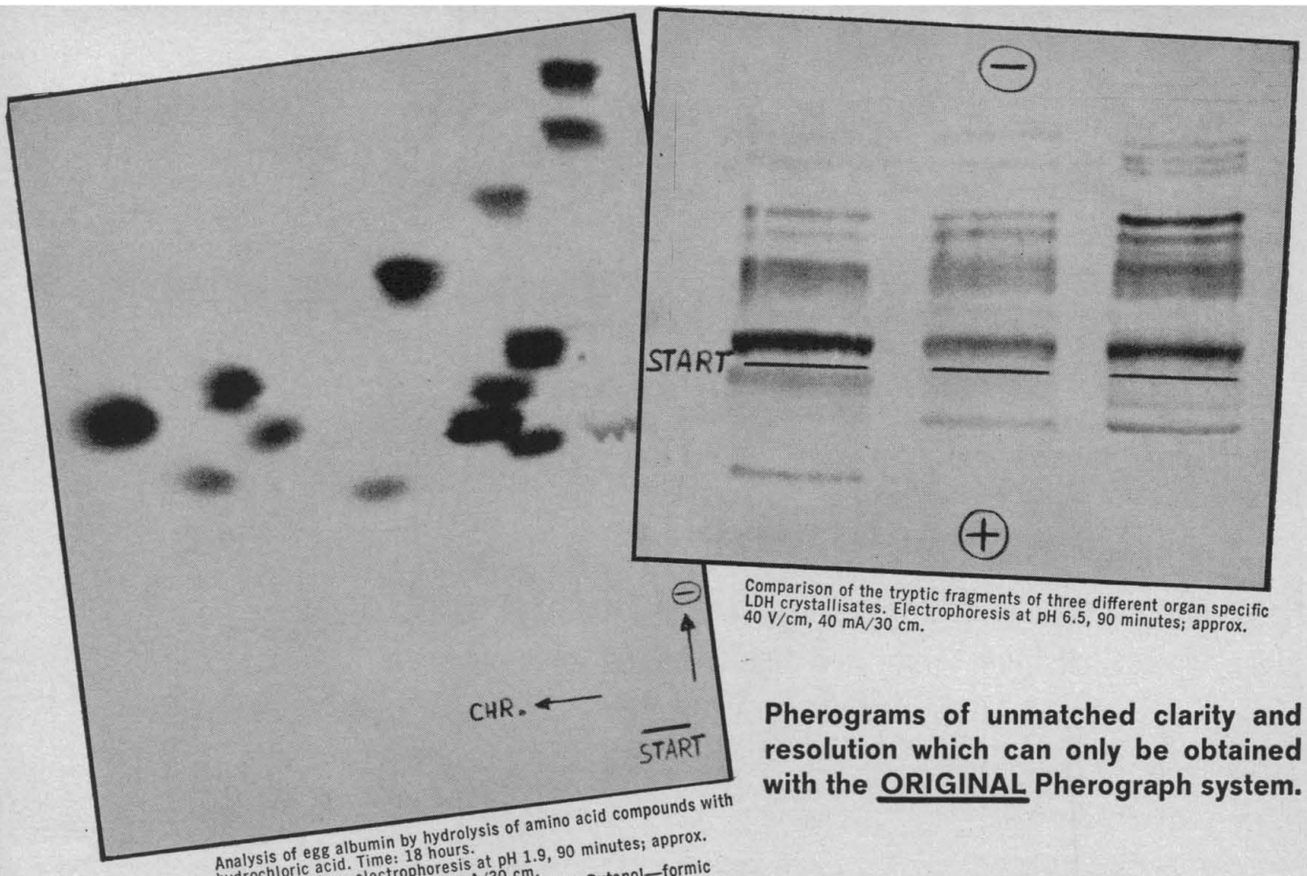
LR-10-5: A fully portable liquid nitrogen refrigerator.

The LR-250 holds 14,400 ampules and has a 250 liter liquid nitrogen capacity. It features a 28.5-in. diameter entrance which affords complete accessibility. Removable baffles divide a stationary storage tray into 90° quadrants. A safety grid designed to hold 2½-in. x 2½-in. boxes can be utilized for indexed storage of biological materials.

In addition, LINDE provides fast nationwide delivery of liquid nitrogen and top-flight technical service.

For further information on recent advances in cryobiology, fill out and return the coupon below.

(1) Gibbs, M. B., McCord, E. B., Collins, W. S. II, Schrider, C. T. Jr., and Akeroyd, J. H., TRANSFUSION, *2*:100 (1962). (2) Bronson, W. R., and McGinnis, M. H., BLOOD, *20*:478 (1962). (3) Cohen, E., and Rowe, A. W., BLOOD, (in press) (4) Schreiner, H. R., *J. Chromatog.*, *7*:573 (1962).



Comparison of the tryptic fragments of three different organ specific LDH crystallisates. Electrophoresis at pH 6.5, 90 minutes; approx. 40 V/cm, 40 mA/30 cm.

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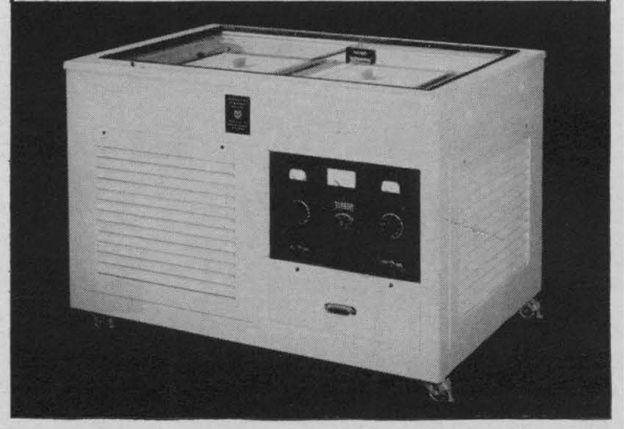

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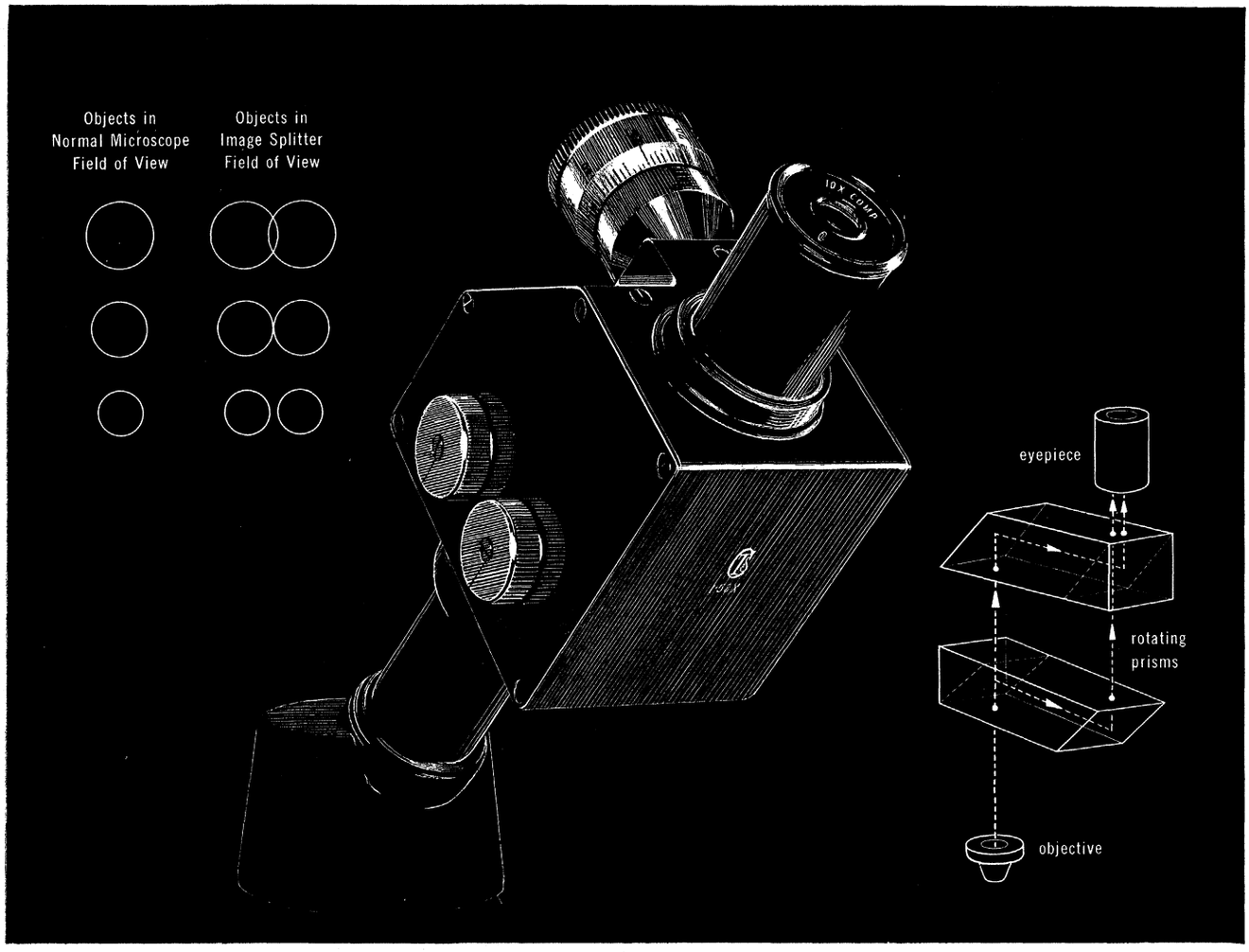

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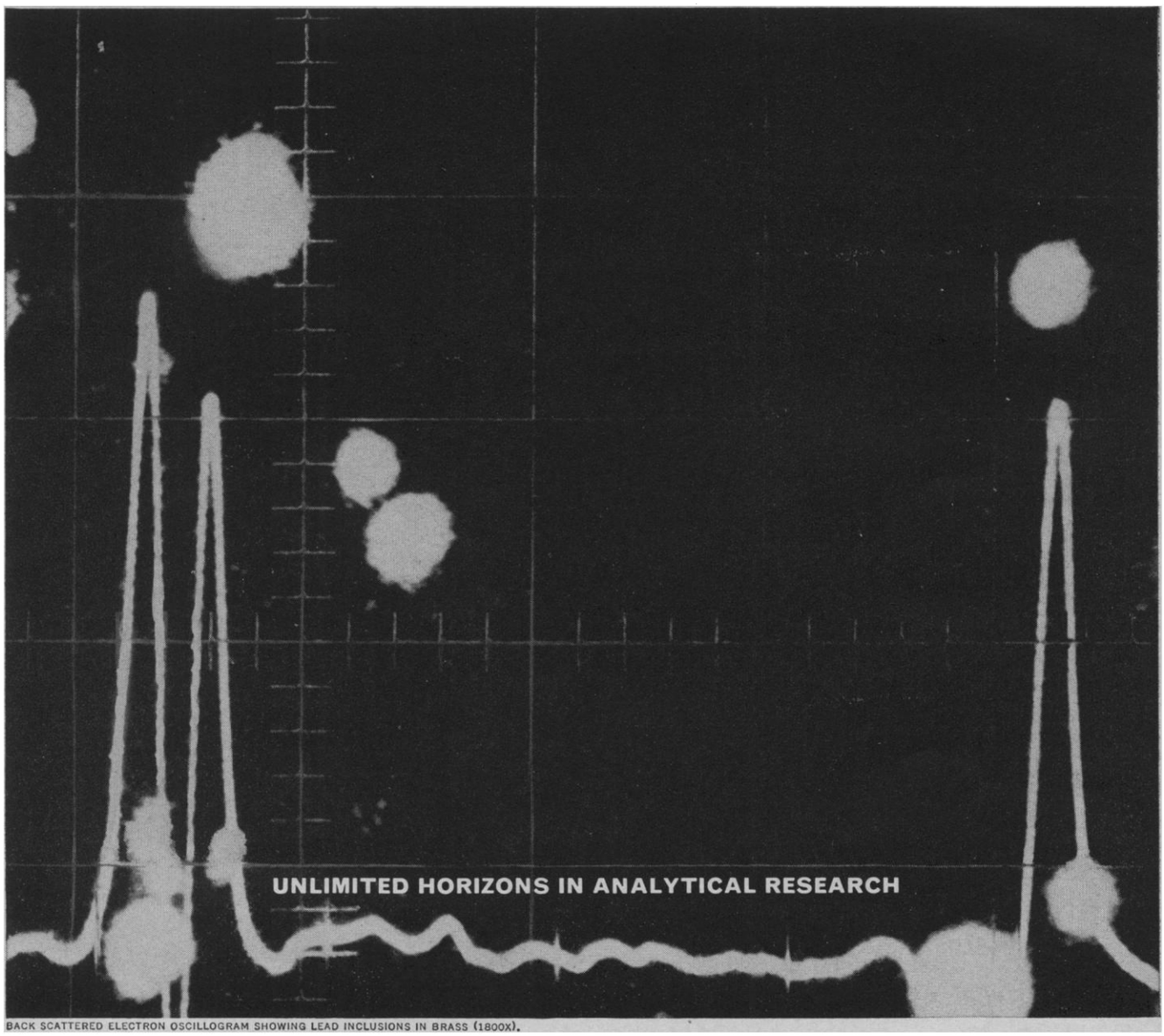

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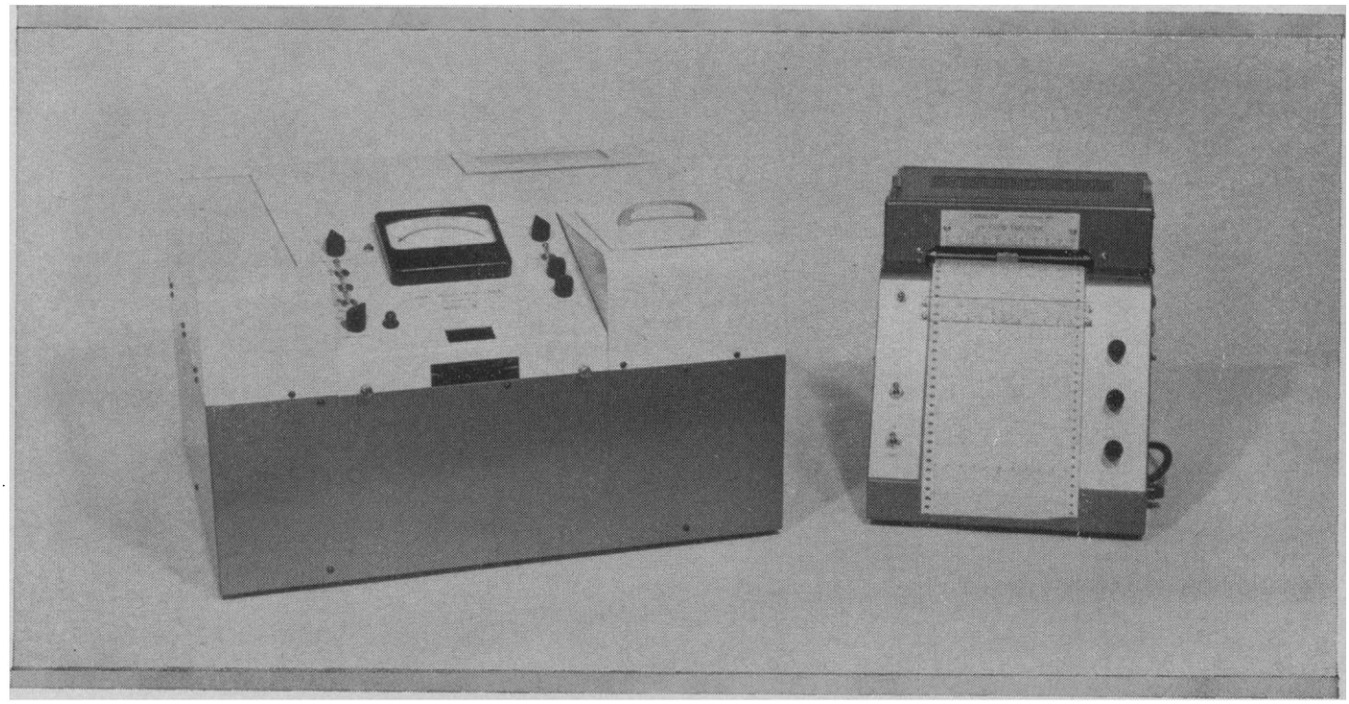

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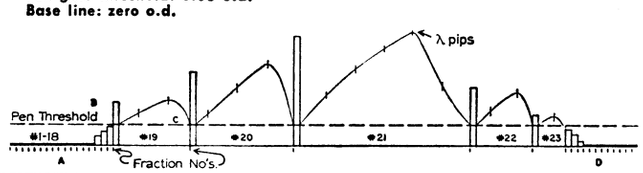

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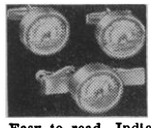

Ruggedly precise new style item in matched set of cuff links and tie bar—featuring non-breakable, accurately calibrated thermometers. Sensitive to a tolerance of 1 degree (although some wearers have noted violent fluctuations when worn in close proximity to certain blondes and redheads of the warmer sex"). Easy to read. Indicia range from 20 (degrees) to (plus) 120 (degrees) Fahrenheit on circular dial. Silver plated, gift boxed—Tie Bar and Cuff Links also available separately.

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Photographers! This is an actual photograph of the moon taken through our Astronomical Telescope by a 17-year-old student.

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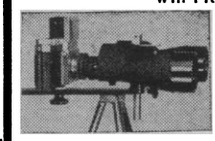

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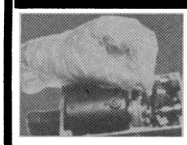

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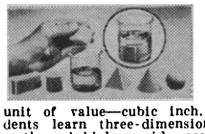

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INc. electric clock drive, setting circles, equatorial mount, pedestal base, 4 eyepieces for up to 576X.
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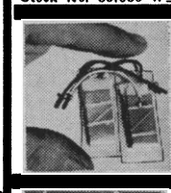

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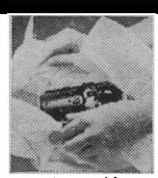

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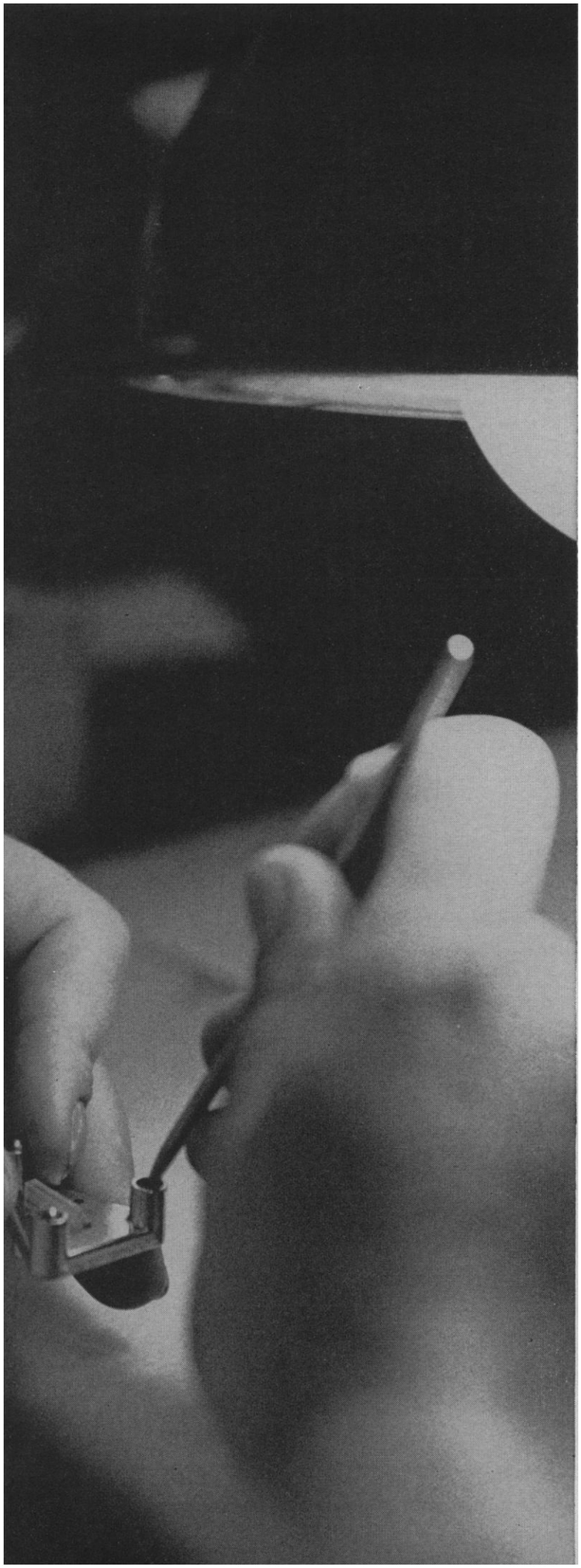
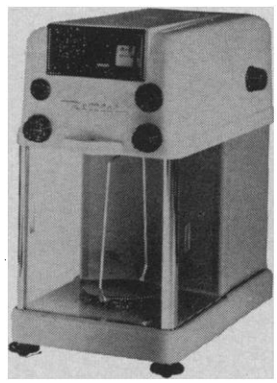


DETAIL

The photograph shows jewel bearings being mounted on the H balance suspension platelet. The platelet has three jewel pins and a synthetic sapphire bearing plane mounted on it. In the release position, the platelet bearing plane rides on the front knife of the beam and supports the calibrated weights and the pan.

Mettler craftsmanship requires attention to the minutest detail of every part which goes into the H balances manufactured at the Mettler plant in Hightstown, New Jersey. These balances include such unique Mettler features as concentric ring weights for better equilibrium, self compensating top and bottom air damping to reduce the effects of air movement, and a plastic housing for improved insulation. They conform in every respect to the high standards of quality expected from all Mettler instruments.



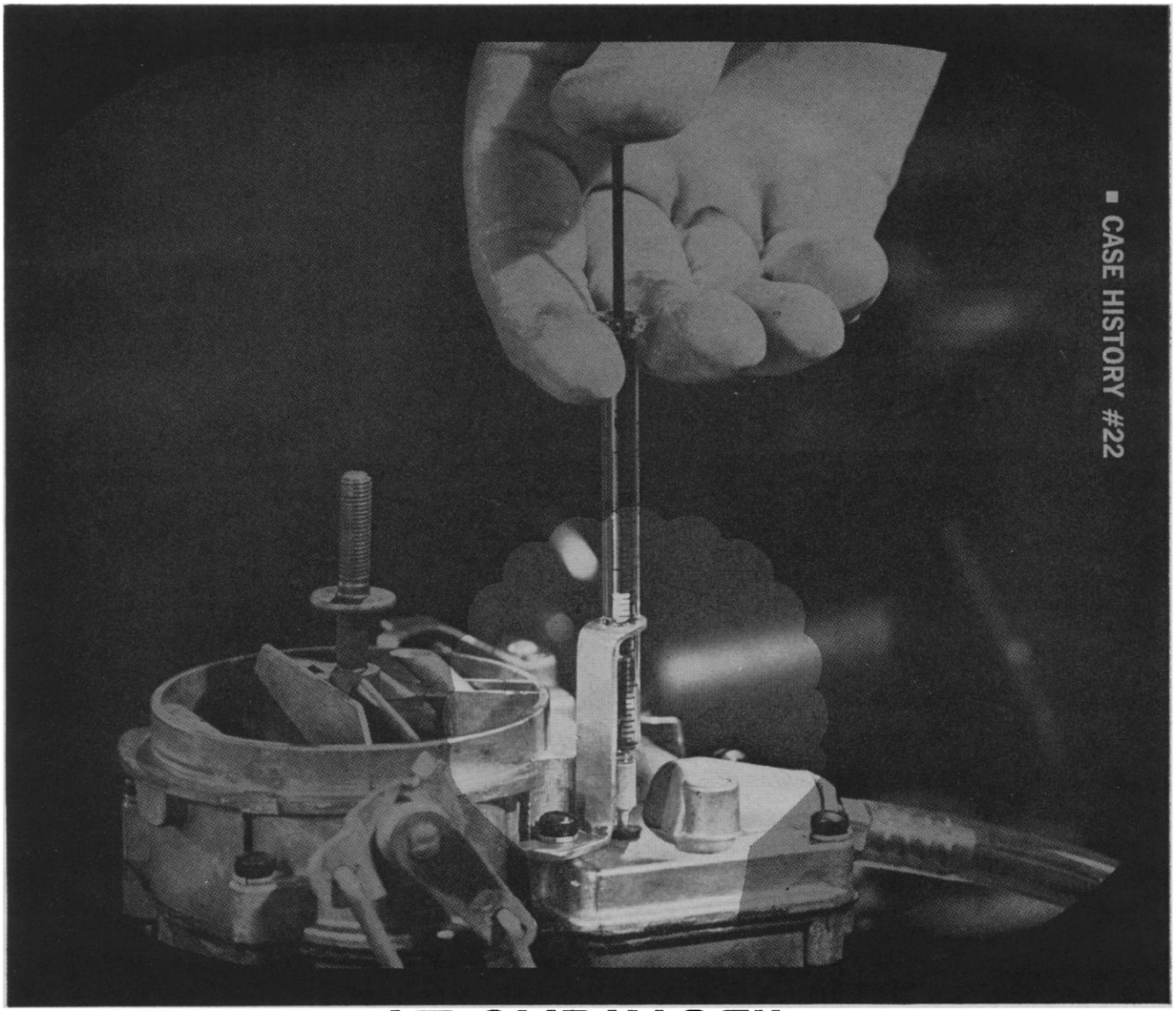
TYPE H-5

TPYE	CAPACITY	OPTICAL RANGE	PRECISION	PRICE
H-16	80 g	200 mg	±0.01 mg	$895.00
H-15	160 g	200 mg	±0.03 mg	770.00
H-5	160 g	1200 mg	±0.1 mg	650.00
H-4	160 g	1200 mg	±0.3 mg	585.00
H-3	160 g	1200 mg	±0.5 mg	550.00

PRECISION is given as the standard deviation of repeated weighings of one and the same quantity.

For more information about Mettler detail, write:

Mettler®
INSTRUMENT CORPORATION
20 NASSAU STREET, PRINCETON, NEW JERSEY



"WATCH THAT SYRINGE"

. . . says an announcer in a current Shell Oil Company television demonstration. Naturally, Shell is not selling Hamilton microliter syringes . . . but they are using one to inject an accurate 0.01 ml of antiknock mix directly into a carburetor containing 90 ml of gasoline. Filmed at Shell Development Company Laboratories, Emeryville, California, this demonstration shows the almost instantaneous benefit of this tiny portion of antiknock mix in Super Shell gasoline. Quick mixing was provided by the high velocity stream produced by the syringe needle. No loss of liquid or vapor to the surrounding air was a stringent but necessary requirement. Shell says that without the inherent handling safety provided by the syringe, this television demonstration would not have been possible. Like Shell scientists, research people in many fields of science and industry have discovered that they can depend on Hamilton for precision measuring equipment. **Hamilton manufactures a complete line of precision syringes from a capacity of 0.5 μl to 500 μl and other related chromatograph equipment.**

HAMILTON

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To: HAMILTON COMPANY, Inc., P.O. Box 307-K, Whittier, California

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From its convenient, elevated control panel, to the completely smooth-walled stainless steel combination rotor-chamber/evaporator, the RC-2 stands out as the foremost Refrigerated Centrifuge in the Superspeed range. Acceleration, Timing, Braking, Temperature Control, etc. are all automatic. High gravities reduce running time; acceptance of six different rotors directly onto the unequalled SERVALL-Blum Gyro-Action self-balancing drive provides functional versatility in routine and research applications. SS-34 Rotor adapts to SERVALL Continuous Flow System which collects sediment in 8, 4, or 2 standard 50 ml stainless steel tubes. We invite you to "**lift the lid**" on the RC-2 and see for yourself why it is *the* Refrigerated Centrifuge designed to researchers' requirements. 17,500 rpm — 37,000 x G (with SS-34 Rotor).
Write for Bulletin SC-2RC-2

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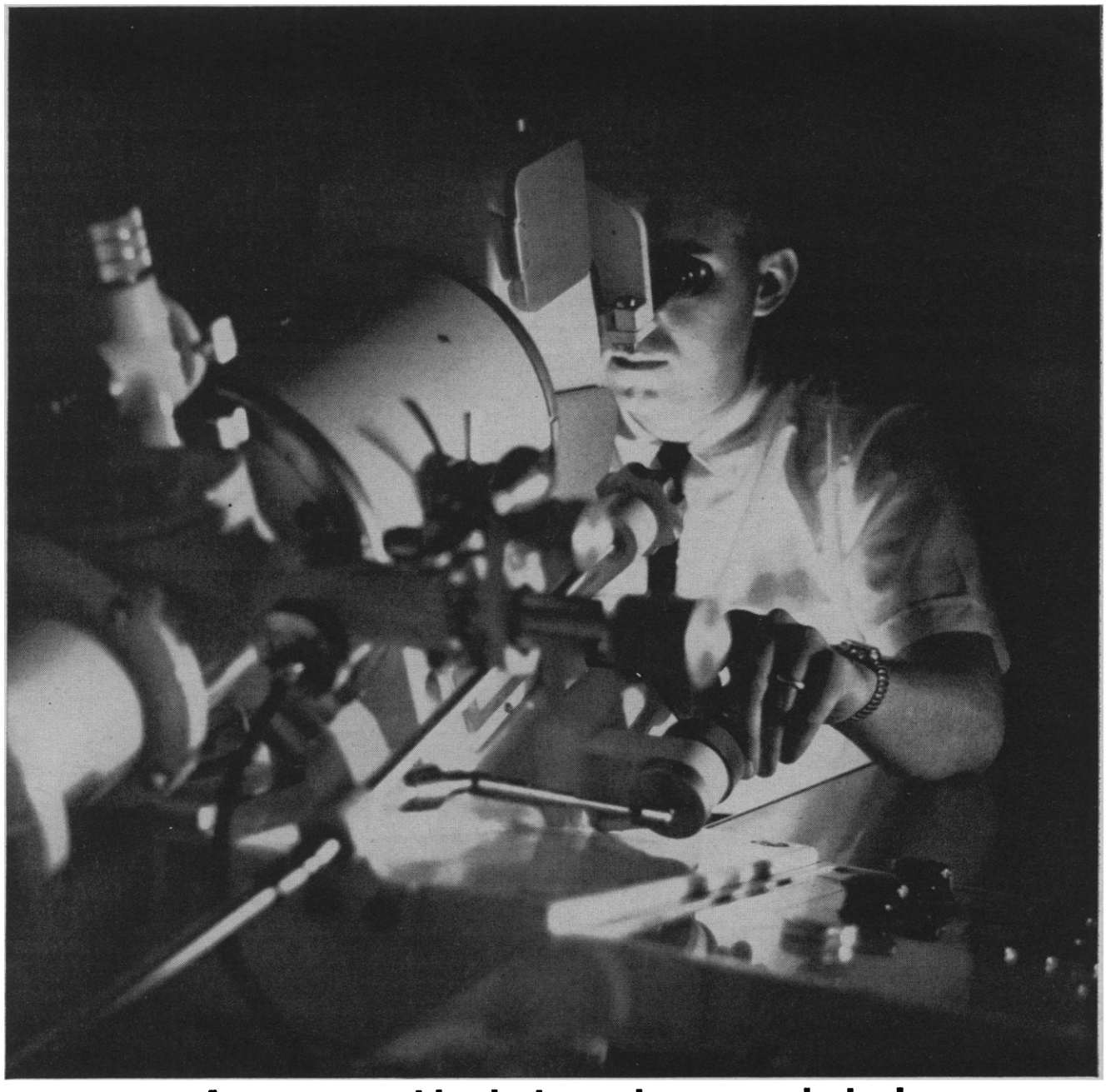


A new concept in electron microscope design!

This defines the Tronscope™ 80 electron microscope; an entirely different type of electron microscope. Bendix/Akashi engineers realized that the productivity of conventional electron microscopes could not be further improved without basic changes in concept. And improvement was necessary! Conventional microscopes had to be operated by a patient, skilled microscopist. Resolution was a function of his ability. Instrument preparation, lens alignment and other adjustments required a great deal of valuable operating time.

The Tronscope 80 has been engineered to deliver highest quality results at a level of productivity unequalled with conventional microscope design. It is unconditionally guaranteed to perform continuously at 12 Å resolution. Nineten Å readily obtainable. How? All of the electromagnetic lenses have been permanently aligned in the column, thereby eliminating the time-consuming alignment procedure. A cored-oxide cathode in combination with a telefocus electron gun requires no condenser lens.

A built-in aperture cleaning system has been devised for removing aperture contamination that affects resolution. The microscope image is interrupted less than one minute for the entire cleaning cycle. In addition, a new method of high voltage stabilization has been incorporated.

If you would like to learn more about all models of the Bendix/Akashi Tronscope, which incorporate all these new concepts, please write Dept. E-2, 3625 Hauck Rd., Cincinnati 41, Ohio.

Cincinnati Division

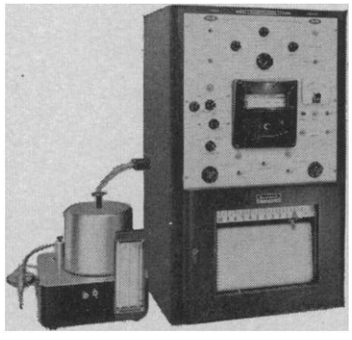
THE Bendix CORPORATION

gas chromatography in the biochemical laboratory

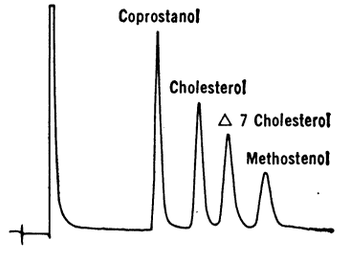
Over the past year or two, biomedical investigators have practically expropriated the F&M Model 609 Flame Ionization Programmed Temperature Gas Chromatograph for their own use. The reason: they have found in the Model 609 that rare combination of *sensitivity* to trace amounts of an almost endless variety of biological compounds and *speed* of completion that biomedical analyses require.

The Model 609 incorporates other features that increase its usefulness to the biochemical laboratory. For example, it operates isothermally or programmed; handles solid, liquid or gas samples; and has automatic flame re-ignition.

Eleven of the more important biomedical uses of the 609 are briefly noted elsewhere on this page. The current issue of the F&M technical publication "Facts & Methods for Scientific Research" contains a thorough discussion of these analytical techniques and other biomedical uses of F&M Gas Chromatographs. For your copy of this special biomedical issue, and for more information on the Model 609, write or phone F & M Scientific Corporation, Route 41 and Starr Road, Avondale, Pennsylvania, 215-COlony 8-2281. *European subsidiary: F & M Scientific Europa, N. V., Amsterdam, The Netherlands.*

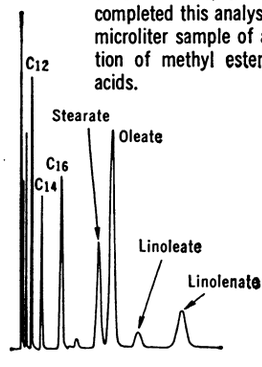


Type of analysis	*Capability of the 609*
1. Steroids	Sex Hormones, adrenal cortinal hormones, D vitamins, fecal steroids, etc.
2. Fatty Acids	Acids and glycerol esters extracted from serum, bile and tissue.
3. Krebs Cycle	All the acids in the cycle.
4. Amino Acids	More than 35 different amino acids can be analyzed after preparation of derivatives.
5. Anesthetics	Analysis of anesthetics in blood or respiratory gases, fast enough to monitor the clinical course of anesthesia.
6. Bio-Amines	Micro analysis of bio-amines in urine, blood and tissues.
7. Urinary Aromatic	Most can be extracted and analyzed with the 609.
8. Drugs	For rapid identification of poisons, narcotics and other drugs in blood and urine.
9. Atmosphere Control	For qualitative and quantitative analyses of toxic gases in air.
10. Carbohydrates	Useful for all carbohydrate chemistry in biomedical applications.
11. Surgical Chemistry	Many uses for investigative and clinical surgery, e.g. study of wound healing, collection of pure substances for characterization, etc.

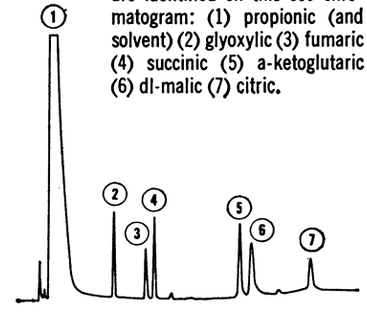


The Model 609 separated and identified these fecal steroids from a 10 microgram sample of trimethyl silyl derivatives.

In 14 minutes, the Model 609 completed this analysis of a one microliter sample of a 5% dilution of methyl esters of fatty acids.



Seven of the Krebs Cycle acids are identified on this 609 chromatogram: (1) propionic (and solvent) (2) glyoxylic (3) fumaric (4) succinic (5) a-ketoglutaric (6) dl-malic (7) citric.



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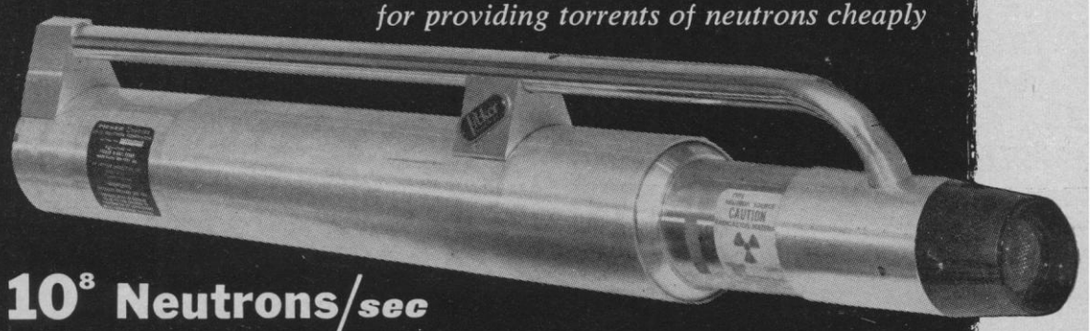


10^8 Neutrons/*sec*

for less than 3×10^3 dollars

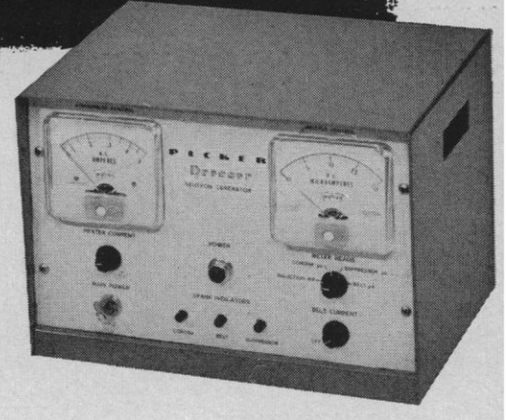
The Picker-Dresser Neutron Generator
is the *only* low cost device that allows you to:

- *demonstrate nuclear fusion*
- *do high energy activation studies to obtain isotopes like Nitrogen-16 (by bombarding Oxygen -16)*
- *perform activation analyses capable of detecting concentrations of some materials in a 10 gram sample to below 0.01% (for example, 0.003% of Aluminum)*
- *produce microcurie quantities of isotopes like Sodium-24*
- *demonstrate and test all types of neutron detectors — fast or slow (by use of a moderator)*
- *investigate neutron moderator materials*
- *determine short half lives*
- *measure detector resolving time*

The Picker-Dresser Nuclear Generator is one of the comprehensive Picker line of nuclear instrumentation and supplies: all marketed and serviced through a national network of company offices staffed by trained Picker people. (Picker alone in the nuclear field offers this caliber of local service.)

For details call your district office (see 'phone book) or write Picker X-Ray Corporation, 25 South Broadway, White Plains, New York.

Picker x-ray



The compact Neutron Generator control may be located up to 20 feet from the generator for safe operation.

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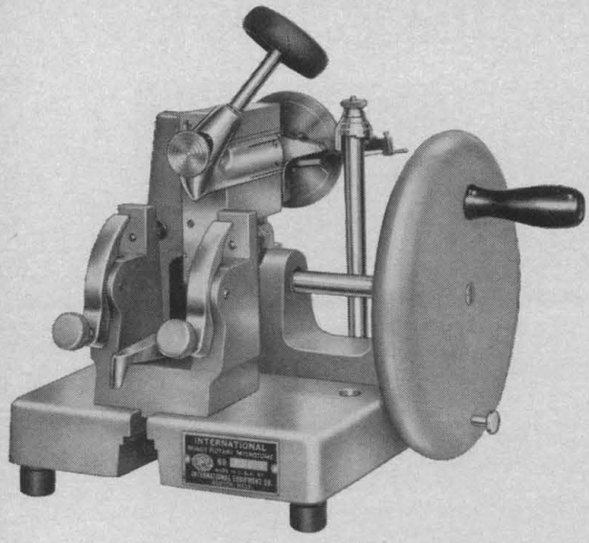

For paraffin sections

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MINOT CUSTOM MICROTOME

Perfection in precision . . . that's the only accurate way to describe IEC's Minot Custom Microtome.

Several outstanding features make the Minot Custom an ideal instrument for paraffin sectioning. It is truly **custom built** . . . painstakingly crafted with uncompromising precision which enables you to produce uniformly thin, undistorted sections hour after hour.

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You can clean this microtome with a faucet spray if you like. It is made of 100% rustproof materials in a natural metal finish that can't chip or stain. It has few moving parts and is so rugged it holds its original precision for a lifetime in the busiest laboratories.

DEMAND A DEMONSTRATION — If you do paraffin sectioning, you owe it to yourself to try this instrument — in your laboratory — before you buy **any** microtome. Write to:

INTERNATIONAL IEC EQUIPMENT CO.

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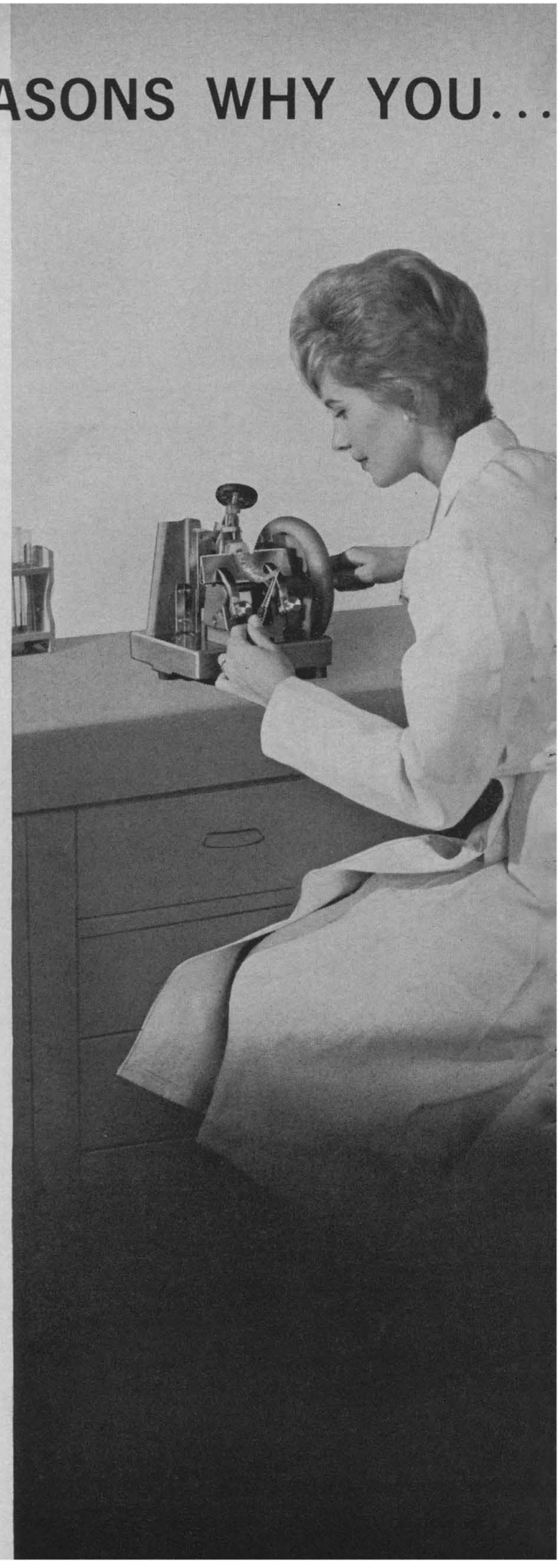
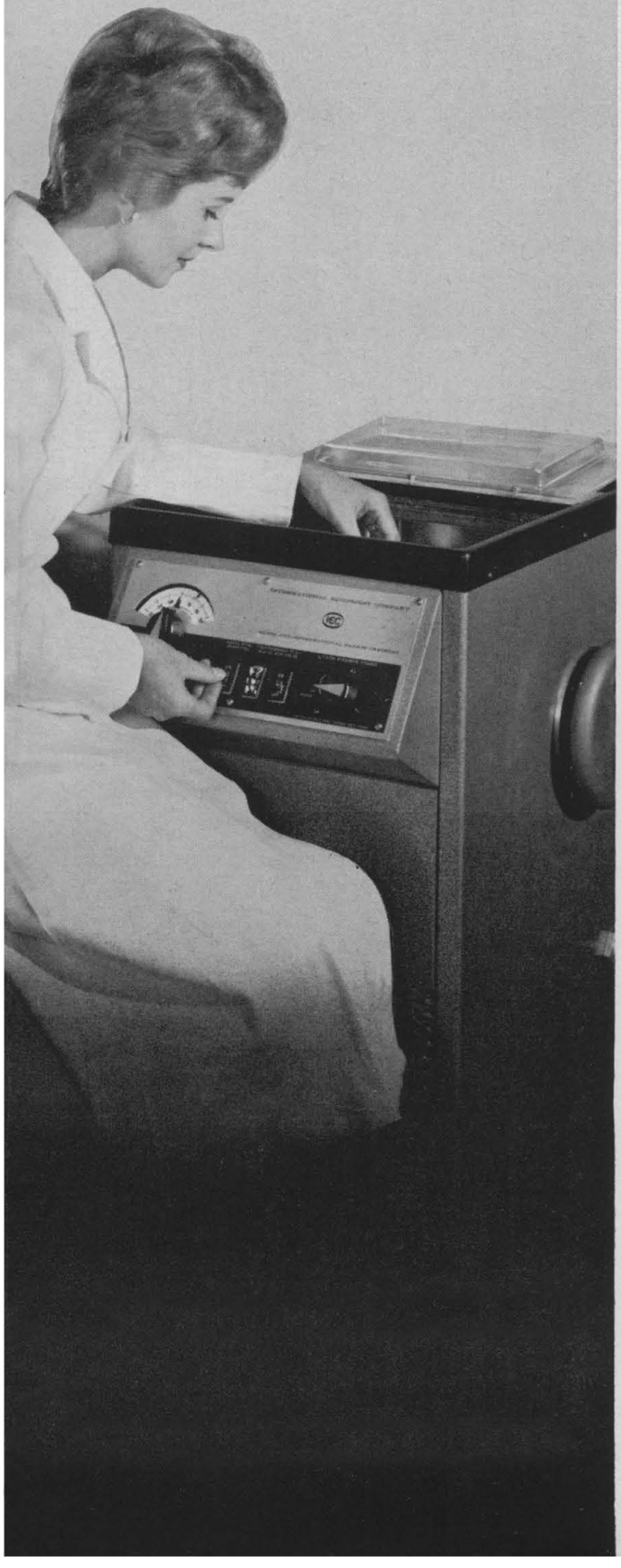


SHOULD HAVE TWO IEC MICROTOMES



For frozen sections

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Now frozen sectioning becomes even more refined with IEC's new CTD. This instrument is an improved model of the famous International-Harris CT that revolutionized frozen sectioning. The CTD features a new **polar zone cold control** that maintains precise temperatures . . . ±1° C . . . right at knife level where temperature is most critical. Just set the selector knob at any temperature between −10° C and −30° C. The CTD will hold this temperature and prove it with a readout device which indicates the actual temperature at knife level. A new thermal insulated clear plastic cover and special anti-fog control eliminates condensation problems regardless of ambient humidity. A drain is provided for ease in cleaning, defrosting, and decontamination when necessary. Everything necessary for precise frozen sectioning has been perfected in this compact, efficient instrument including the 100% rustproof Minot Custom Microtome. Fresh tissue to finished slide takes only minutes with the CTD. It will give you large or small thin, undistorted sections having exceptional cytologic detail for definitive pathologic diagnosis, and histochemistry.

DEMAND A DEMONSTRATION . . . it will show you better than any other evaluation just how the new CTD enables you to apply frozen sectioning to your laboratory needs — how you can perform your work faster and more positively even under pressures of time and heavy workloads. Write for a descriptive brochure.

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Now . . . **EXPERIMENTAL FREEZE DRYING UNDER ABSOLUTE CONTROL CONDITIONS**

AMSCO

Laboratory Freeze Dryer

Model L-3

Every design element of this all-new Laboratory Freeze Dryer contributes to its unexcelled efficiency as an experimental freeze dryer for university research and food processing laboratories. Never has a freeze dryer offered such versatility . . . precise control over the freeze drying cycle . . . and such superb quality of construction.

This significant advance in laboratory freeze drying equipment is also ideally suited to serving the diverse requirements involved in preserving labile chemical and biological materials. The L-3 permits the accumulation of process data applicable to large scale production models.

Amsco's new L-3 Laboratory Freeze Dryer provides refrigeration and controlled heating of the process shelf. Accessory items permit adjustable radiant heating and manifold drying if desired.

Amsco also offers an extensive line of freeze dry equipment for Pilot Plant operation as well as for Mass Production. If standard equipment does not suit your needs . . . Amsco will construct a freeze dryer to your specifications.

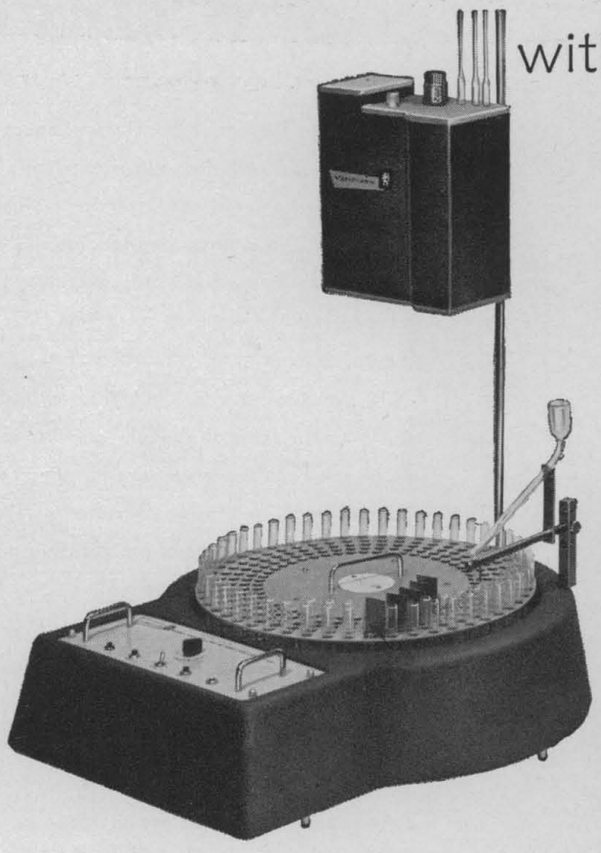
Please write for fully illustrated brochure IC-611 describing Model L-3.

SCIENTIFIC AND INDUSTRIAL DEPARTMENT

AMERICAN STERILIZER
ERIE, PENNSYLVANIA

World's largest designer and manufacturer of Sterilizers, Operating Tables, Lights and related equipment for biological research

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.

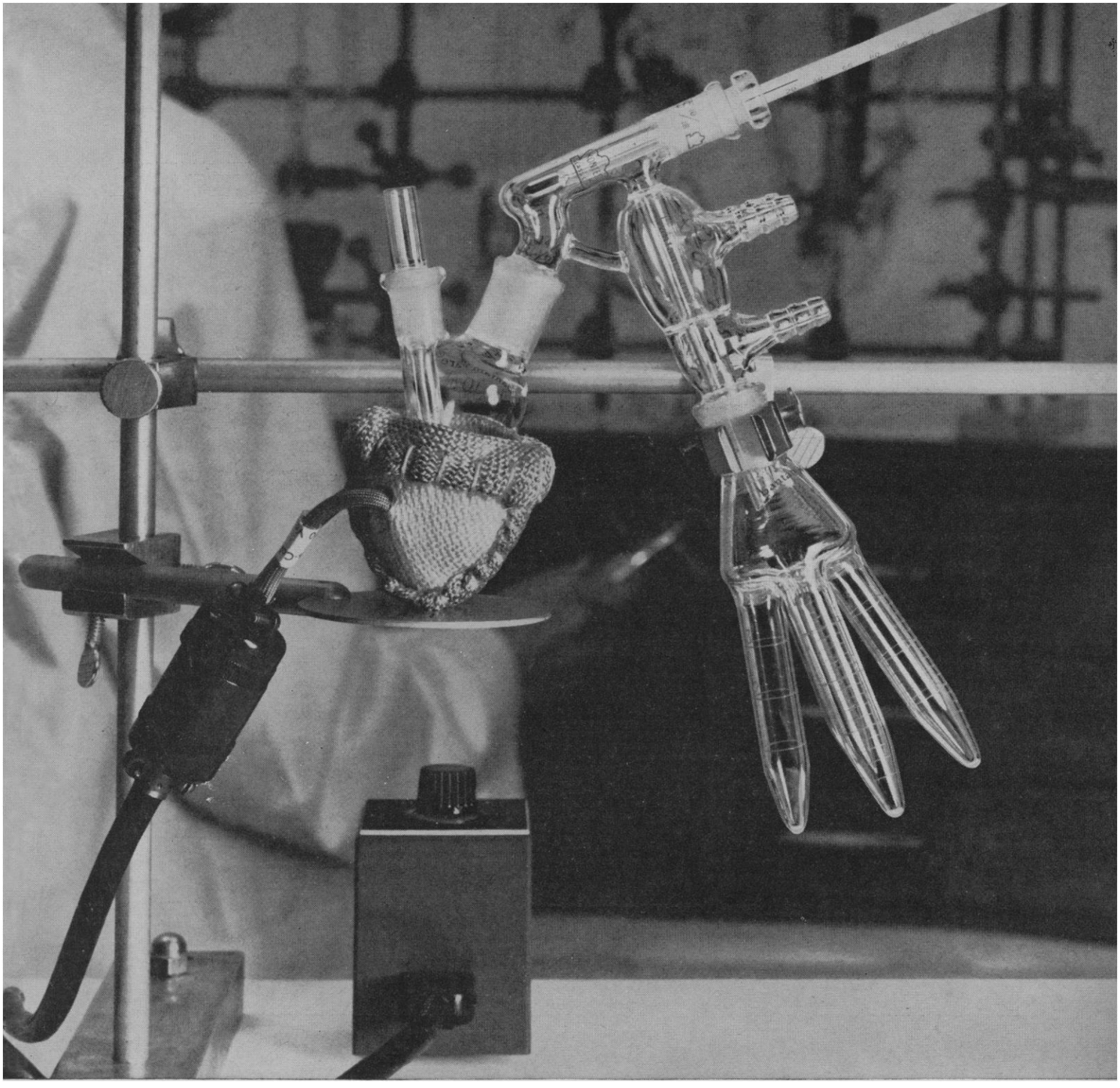
- Analyzes across the spectrum—from 200 to 400 millimicrons
- Particularly well-suited for gradient elution techniques—even when highly absorbing solvents are utilized
- Monochromator-coupled hydrogen light source permits selective dialing across UV spectrum
- Automatic chart recorder marking system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

VANGUARD
INSTRUMENT COMPANY

DESIGNERS AND MANUFACTURERS OF PRECISION INSTRUMENTATION FOR RESEARCH

P.O. Box 244 • LaGrange, Illinois • Fleetwood 4-5656

Regional Offices: New York, New York, 520 Fifth Avenue, TN 7-1998; San Francisco, California, 115 New Montgomery Street, EXbrook 2-0511



The Case of the Meandering ML's

In the vicinity of many research laboratories, small organic solutions are being mysteriously lost, daily. They are placed in small flasks, heated, and then . . . they vanish. Chemists patiently wait for their meandering ml's to show up. Sometimes a few straggle into fraction cutters, but most of them escape. The M.O. is always the same. Our job . . . find them.

Acting on a tip from Dr. Raymond Firestone at Merck & Co., Rahway, we went to work on our new K-28480 Bantam-ware Short Path Fractionator. Make the column about an inch long and let the thermometer bulb and stem serve as a packing, he said. Construct the condenser and vacuum connection in two inches, total length. Use only one joint on the fraction cutter but design it so that pipettes can be inserted to the bottom of any of the four receivers. Then, tilt the whole assembly so that drops fall from the drip tip $ 14/20 joint into one of the four receivers without unnecessary wetting. But nothing is vertically aligned, we pleaded. I know, he said. In desperation, we tried it.

We're happy to report that most of the meandering ml's now show up as product. The case is closed. Sequel: K-28480 has been added to the line because it fits in with the whole Bantam-ware concept. Very compact, low hold-up . . . functional.

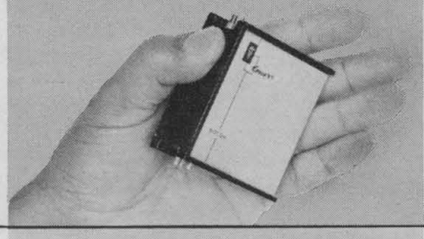
Incidentally, that little rectangular box in the photo is our new Un-A-Watt voltage controller. It occupies 1/15th the space and weighs only 1/10th as much as a conventional coil transformer. It is custom made for Bantam-ware heating mantles with 0-60 Volt range, sparkless operation, removable support rod and high sensitivity. It fits in with the Bantam-ware concept also.

Bantam-ware Kits and hundreds of individual pieces are described in Catalog BW-2. Write for it today.

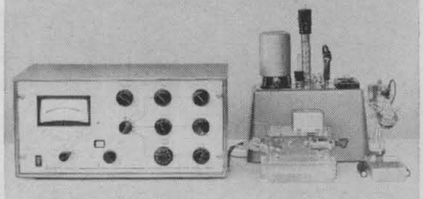
KONTES
GLASS COMPANY
Vineland, New Jersey

EPSCO Medical Instrumentation

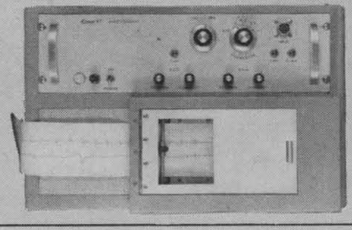
FOR CRITICAL MEDICAL ANALYSIS AND MONITORING



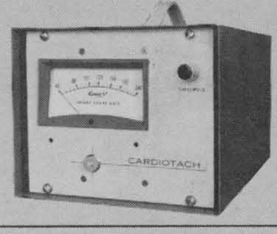
BIOCOM — A new, bio-telemetry system for physiological monitoring without restrictive cabling, consisting of a miniaturized, transistorized radio FM transmitter and a receiver. Significant modalities EKG, EEG and EMG are transmitted directly from the subject to conventional display and recording instruments.



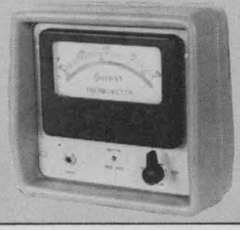
BLOOD PARAMETER ANALYZER — For direct, rapid measurement of pH, pCO_2 and pO_2 in blood and other biologic fluids. Also may be used as a gas analyzer. Complete analysis from a 2.5 cc sample in three minutes. Widely used for routine clinical determinations, cardio-vascular research, anesthesia monitoring and pulmonary function evaluations.



ANESTHOGRAPH — A complete recording system that provides continuous surveillance of patient condition and depth of anesthesia. Records EEG and EKG in the operating room under adverse conditions. Choice of recording papers and accessories available.



CARDIOTACH — This self-contained complete system displays instantaneous heart rate. Simple analog computer circuit converts time interval between successive heart beats into a rate measurement. Flashing light gives beat-by-beat indications. Fetal, infant and adult models available.



ELECTRONIC THERMOMETER — A rapid responding, portable electronic thermometer. Shock resistant. Standard esophageal, rectal and dermal probes available. Choice of temperature ranges.

LABORATORY AND HOSPITAL PHYSIOLOGICAL MEASUREMENT INSTRUMENTATION: FULL LINE OF AMPLIFIERS AND RECORDERS, SURGICAL MONITORING SYSTEMS AND INTENSIVE CARE MONITORING SYSTEMS. FOR FURTHER INFORMATION, WRITE TO MR. WILLIAM STERN, DIVISION MANAGER, EPSCO MEDICAL.

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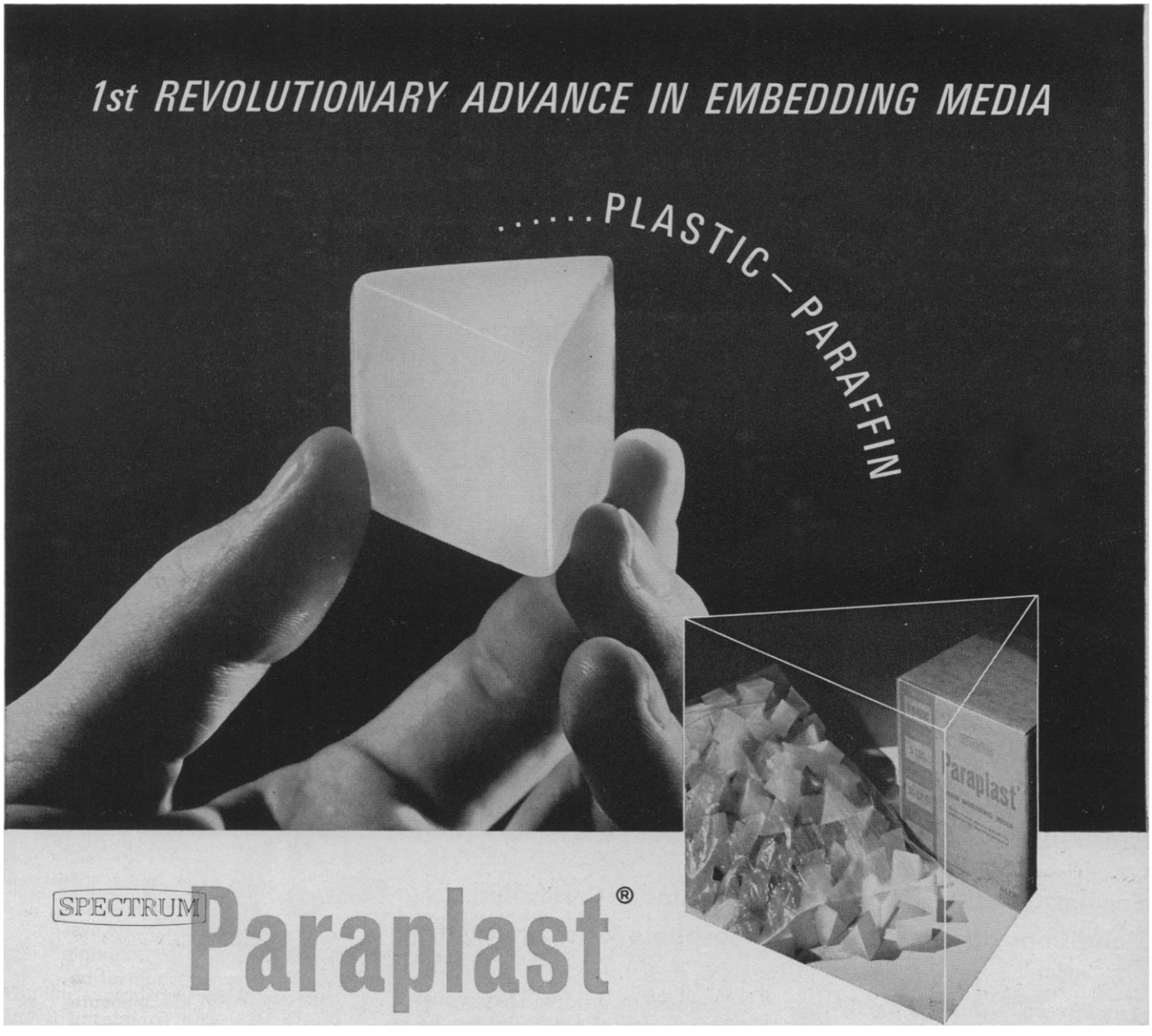

- Eliminates ice cube cooling of knife or block
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- No alterations in usual solvents or procedures
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V64650 — Paraplast Embedding Media, Spectrum.

Per 5 lb. carton	$3.60
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ALOE SCIENTIFIC

The New Brunswick Scientific Company Presents The PsycroTherm(TM)

A CONTROLLED-ENVIRONMENT INCUBATOR-SHAKER

U.S. Patent No. 3,002,895

For the Growth of Microorganisms under Controlled Conditions of Temperature, Atmosphere, and Agitation

Gassing facilities provided for circulating gas in the tightly sealed chamber.

THE PSYCROTHERM is a rigidly controlled environmental incubator with a continuous-duty shaking mechanism. Though it occupies comparatively little floor area, it has 10½ cubic feet of *usable* work space in the incubation chamber, where static and shake cultures can be incubated simultaneously or separately.

A VERSATILE UNIT

With fully integrated heating and refrigeration systems the unit is ideal for work with psycrophilic, mesophilic, and thermophilic systems. Temperatures can be accurately regulated from 0° C to 60° C with a control tolerance and temperature gradient both within ± 0.5° C. In non-refrigerated units, the temperature range is from ambient to 60° C, with the same tolerance and gradient as above.

There are many interchangeable shaker platforms. They have large capacities for flasks, tubes, and other culture and reaction vessels.

CHOICE OF SHAKER MECHANISMS

The degree of agitation can be selected and the temperature controlled for the growth of aerobic and anaerobic organisms. Models are available with either Gyrotory® or reciprocal agitation, and illumination for photosynthesis studies. The PSYCROTHERM can also be used as a BOD incubator.

CONTINUOUS DUTY SHAKING

The shaking mechanisms are precision built for continuous operation, long life, and for smooth, quiet, reproducible agitation. Speed is adjusted mechanically and will never drift nor vary when workloads or voltages change. The rotary shaker mechanism has a range of speeds between 50 rpm and 400 rpm. The reciprocating shaker mechanism has an adjustable stroke from 0 to 3½" and a speed range between 40 and 285 oscillations per minute.

OVERALL DIMENSIONS: Width 40", Depth 29", Height 65"
CHAMBER DIMENSIONS: Width 32½", Depth 21", Height 26"

UNCONDITIONAL ONE-YEAR WARRANTY

Write for Catalog G26S/2153

NEW BRUNSWICK SCIENTIFIC CO., INC.

PRECISION LABORATORY APPARATUS

P.O. BOX 606, NEW BRUNSWICK, NEW JERSEY

Hot and cold stages, and additional access ports widen the range of specimen control

Ten times the working volume is provided with this new RCA electron microscope accessory as compared with conventional chambers. Hot and cold stages provide a specimen temperature range of −140°C to 1000°C, as well as any steady-state intermediate temperature. Two extra ports give ready access for other types of specimen manipulation. Eight electrical feed-throughs provide means for accurate measurements of temperature and other parameters. Since no airlocks are involved, stages and samples can be changed easily and quickly. Though designed specifically for the new EMU-3G, the Universal Chamber can be used with all EMU-3 series electron microscopes—an excellent example of RCA's design philosophy of protecting customers against instrument obsolescence.

The new EMU-3G electron microscope incorporates many improvements in design as well as all the features which have made RCA instruments world famous—ease of operation, rapid specimen scanning by means of a new inertial-drive mechanism, step focussing in known increments (up to 200,000 X), simplicity of alignment, very fast automatic valving, and many others.

For full information, write to RCA Scientific Instruments, Dept. SC-362, Building 15-5, Camden, N. J. In Canada, write RCA VICTOR Company, Ltd., Montreal.

The Most Trusted Name in Electronics

NOW...

one chromatograph is all it ever takes

New Jarrell-Ash Universal Chromatograph employs interchangeable components to cover ALL gas chromatograph applications.

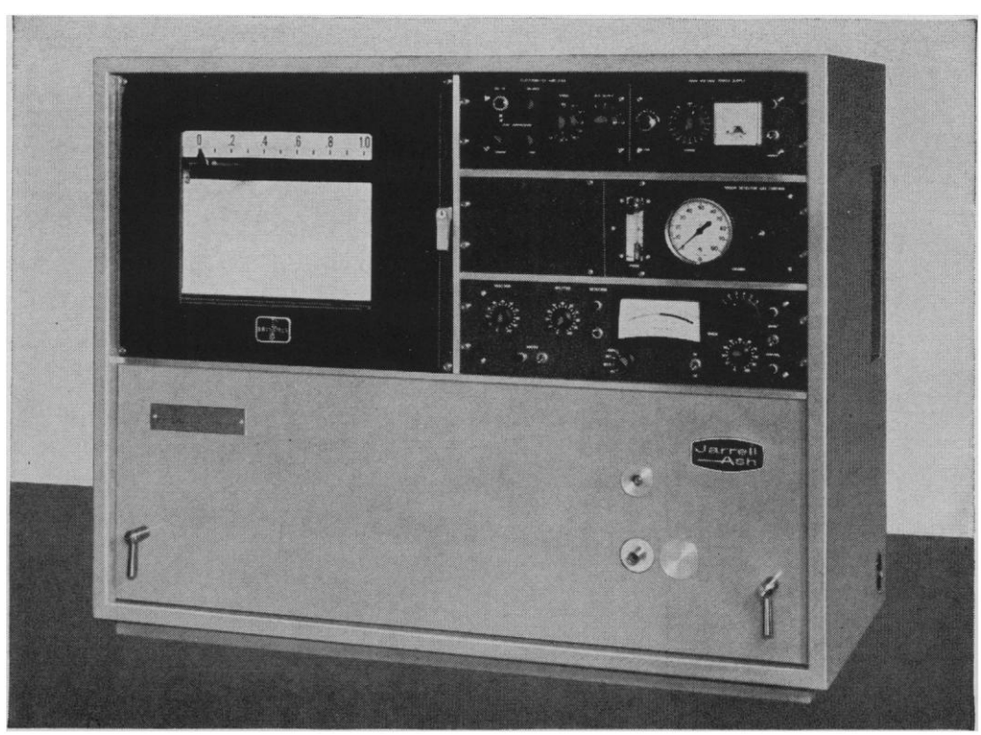
Never before such versatility in a single instrument! With a Jarrell-Ash Model 700 Universal Chromatograph, you can get parts-per-billion analyses in minutes over a range of materials previously requiring as many as four different instruments.

This unprecedented analytical range includes: amino acids, aqueous solutions, biological extracts, chemicals, flavor components, gasoline additives, high boilers, hydrocarbons, permanent gases, pharmaceuticals, steroids, and many other materials of widely different characteristics. It's unmatched for the analysis of pesticide residues in foods, feeds, milk and animal fats. And it's quantitative!

Interchangeable components . . . the key! These modular components include: *ionization detectors* . . . argon diode, hydrogen flame, cross-section and electron affinity; *preparatory and capillary columns* to meet sample size requirements; *injection systems* to fit sample form and precision needs; *temperature programming* for optimum speed of analysis.

Substantial savings result! If your work load is large and varied, a Jarrell-Ash Model 700 can save you thousands of dollars. Instead of purchasing several costly limited-range units, you invest in one Model 700—and choose—the number of inexpensive components required to meet your exact load requirements. Remember . . . off-duty components cost far less than idle chromatographs.

Bulletin 26-700 contains 28 pages of specifications, charts, and experimental data. Write for your copy today.



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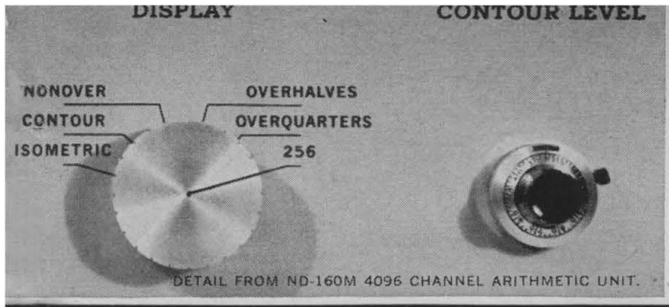
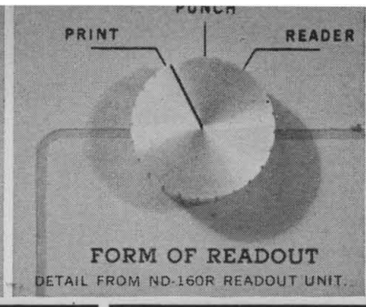
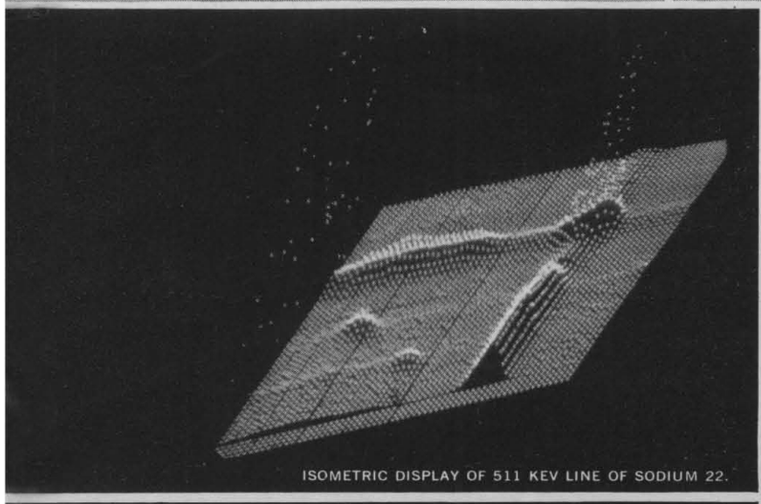


DETAIL FROM ND-160M 4096 CHANNEL ARITHMETIC UNIT.

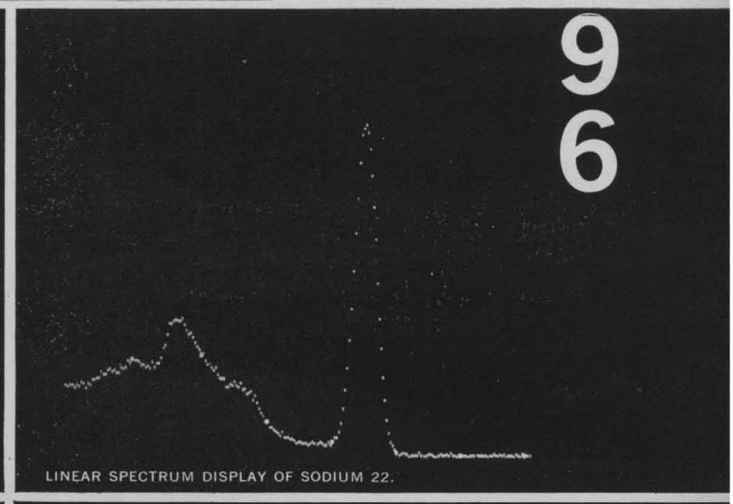


DETAIL FROM ND-160R READOUT UNIT.

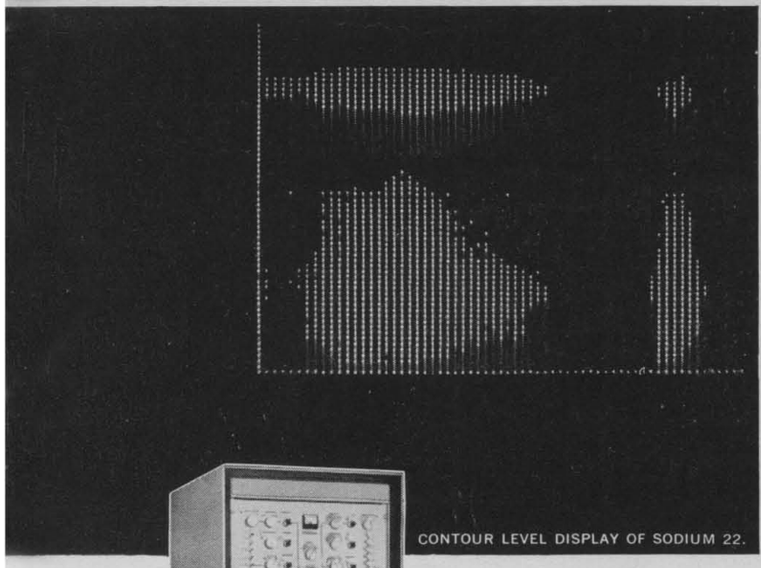
more data in more ways **4096**



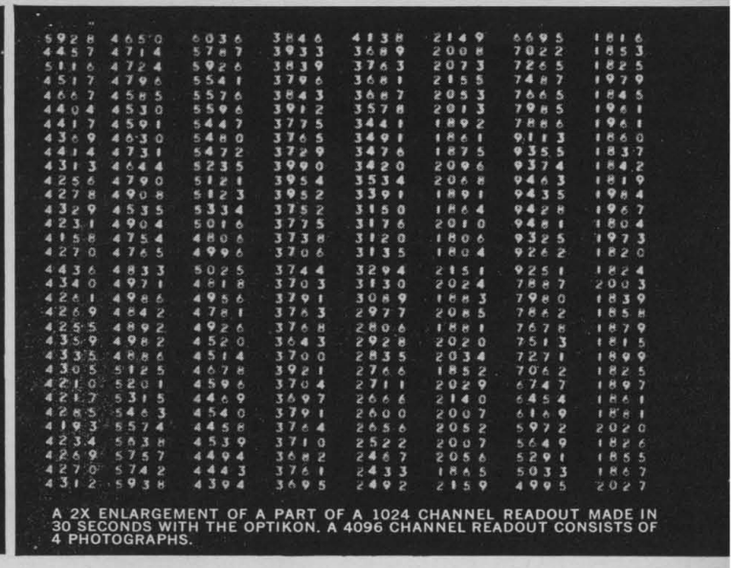
ISOMETRIC DISPLAY OF 511 KEV LINE OF SODIUM 22.



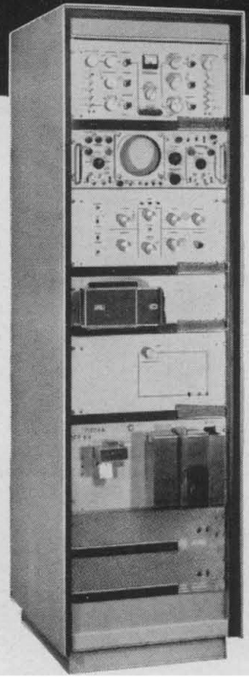
LINEAR SPECTRUM DISPLAY OF SODIUM 22.



CONTOUR LEVEL DISPLAY OF SODIUM 22.



A 2X ENLARGEMENT OF A PART OF A 1024 CHANNEL READOUT MADE IN 30 SECONDS WITH THE OPTIKON. A 4096 CHANNEL READOUT CONSISTS OF 4 PHOTOGRAPHS.



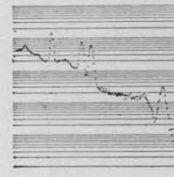
THE NUCLEAR DATA ND-160FM 4096 CHANNEL ANALYZER

A high capacity, high performance analyzer at a moderate price, the ND-160FM is the most versatile analyzer ever produced. Some of the many new features: improved Nuclear Data ADC's, individually buffered, for high resolution and multi-parameter measurements..... access to address and memory registers...parallel binary memory...quarter million count capacity per channel... conventional live display...multi-channel scaling...linear display with factor-of-two control... isometric display...calibrated contour level display...data transfer between memory halves...all important command signals available at rear deck connector...punched paper tape readout and read-in...fast decimal printout by OPTIKON at more than 20 channels per second.

NOW IN PRODUCTION

This system includes: ND-160F dual ADC's, ND-160M 4096 channel arithmetic unit, ND-160R readout control unit, ND-307 OPTIKON, ND-404 scope and ND-306 combination punch & reader. Domestic price, FOB Madison, $36,650.
(Cabinet not included)

Write or phone for further information. ALpine 7-4433



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Are you using your Most Expensive Scientific Equipment Efficiently?

If you consider the time you spent in preparing it your most expensive equipment is the personal abstract or data file you have been compiling for years. More likely than not this exists on 3 x 5 index cards which you have filed one way, and searches for special articles or correlations are very time consuming.

With the edge notched PMU cards which we sell you can convert your present file, even without retyping, and from then on record your new abstracts directly on our standard abstract cards. These edge notched PMU cards hold more information than standard tabulating cards and require no electronic equipment. The sorting rate is conservatively 11,000 columns per minute because they sort in 28 locations at once at more than 400 cards per minute.

The saving is immediately apparent. There is no monthly rental on the equipment and the job is more efficiently handled than with an 8000 dollar sorting installation because the cards are designed for the complexity and relatively small size of the usual personal abstract file.

Conversion requires no extra typing. If you want to your present cards can be attached to the standard PMU cards or the data can be transferred directly on a Xerox machine.

The next step is to establish a code for punching the data around the edge of the cards. We will supply a free coding analysis with all Master Units if you give us the information listed on the coupon below.

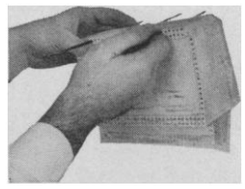
We have also provided a more detailed analysis of procedures in a Special Booklet titled: Scientific Uses of Punched Cards. Send for it with the coupon below or the magazine's inquiry card.

Low Installation Cost

A crucial part of any decision to install a data retrieval system is: How Much Will it Cost to Install and Maintain? The installation cost properly includes the expense of transcribing data into the new procedure. With our standard PMU cards (5x8 inches with 88 holes around the edges) the data can be typed on the surface, pasted on as abstracts from journals or in the case of smaller articles pasted right on the card. Larger cards are available on special order for any purpose with printing if required. We have found that most customers are satisfied with the standard cards.

Coding of the cards is extremely simple using a random overlapping code for the basic categories you choose for each item. Once you have checked off the phrases or numbers coding proceeds by notching the cards around the edge at the appropriate numbers. This work is readily delegated to non-trained clerical personnel as is the sorting procedure. You do not need specially trained operators for our equipment.

Cards once used do not have to be replaced in order. Just drop them back, after use, anywhere. The file is immediately available for reuse. This, by the way, avoids the terrible danger that a card, through misfiling, will be permanently unaccounted for in routine searches.



Cards are readily sorted by hand rods.

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Johns Hopkins University	Northwestern University
Columbia University	University of Adelaide
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Western Reserve University	Temple University

and hundreds of other institutions and organizations

FREE Coding Analysis

To help you get the most out of your PMU data file we will provide a free analysis of your data system to recommend the most efficient coding procedure. In addition to the specific items listed below we would appreciate a sample of your present card if it is printed and a full description of what you are putting in and what you expect to get out of the files.

Please be sure to list the following:

- **Total Number of Basic Categories**
- **Subheadings (total)**
- **Frequency of searches**
- **Estimated present size of file**
- **Growth Rate per year**
- **Who will make searches? Professional or secretary?**
- **Field of research**
- **Are you recording original data or just abstracts?**

Highly efficient

Information retrieval systems for personal use or small card files are usually expensive, cumbersome, and require special personnel to reprogram the sorting procedures. The Geniac Portable Memory Unit is suited particularly for files of 1000-10,000 where low installation costs and maintenance by office personnel are highly desirable features. Sorting equipment is simple but effective so that there can be no need for outside repairment or service.

Furthermore sorting rates are conservatively 400 per minute with simultaneous sorting in 25 categories at once. Procedures with other equipment of this speed require one sort per category. Our PMU therefore reduces the time you have to spend waiting for the retrieval sort to be made.

Chances are that your abstract file is just the same as it would be in the lab of an eighteenth century scientist. You put the articles into files by authors or by categories; abstracts are kept the same way. But did you know that for no extra cost you can keep articles and abstracts on file in up to ten thousand categories at once? Think of the possibilities this creates for cross correlating raw data, or bringing together papers that incidentally touch on related subjects.

Free Inspection Offer.

There is no charge for you to inspect our system. So why don't you try this inexpensive simple method for improving your own data file today. Elsewhere on this page we have a list of firms, institutions and government offices that have ordered and are using our PMU system. We are pleased, too, that every day we receive reorders for more cards to expand their files and for new basic sets so that their associates and friends can get their research done more efficiently.

To buy decide on the initial offer you want and send us an order on your institutional purchase forms; if you want just clip out the coupon below and send it in. Your order will be filled promptly from stock on the same day received.

Each basic kit contains instructions for coding the cards to achieve optimum efficiency. We are glad to provide at no extra charge advice on coding procedures for your particular research application.

Oliver Garfield Co., Inc.

Rm. 23, 17 St. Marks Place, New York 3, N. Y.

Please reserve a GENIAC Portable Memory Unit in my name for immediate delivery. I wish to order with it the following equipment:

☐ Basic PMU, with 200 punched cards, hand notching tool, 5 sorting rods, Coding Instructions @ $19.95 _____
add 80¢ post and handling _____
_____

☐ Master PMU including Basic Unit above plus 1,000 extra cards and free filing cabinet @ $49.95 _____
add $4.75 per unit balance refunded, post and handling

☐ Cabinet alone @ $8.00 plus 1.00 postage and handling
Additional cards @ $4.00 per hundred or $30.00 per thousand. _____
add 30¢ postage per hundred cards _____

☐ Send additional information and booklet Scientific Uses of Punched Cards.

I enclose my check or money order for .....$_____

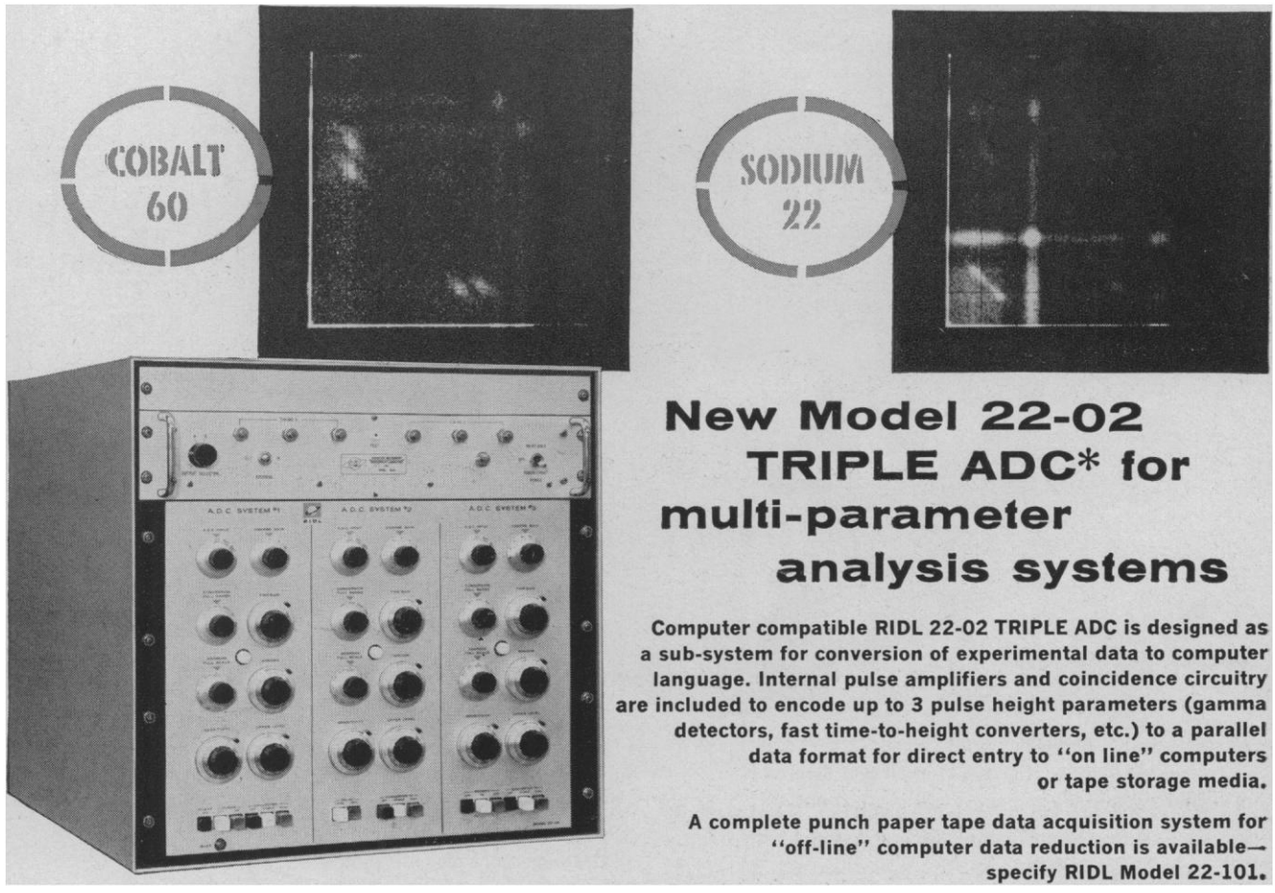
I understand that if I do not find the GENIAC Portable Memory Unit all that you have said it is I may return the entire unit and the cost of the unit will be refunded.

Name_____

Address_____

City_____ Zone____ State_____

3-PARAMETER ANALYSIS BY RIDL



New Model 22-02 TRIPLE ADC* for multi-parameter analysis systems

Computer compatible RIDL 22-02 TRIPLE ADC is designed as a sub-system for conversion of experimental data to computer language. Internal pulse amplifiers and coincidence circuitry are included to encode up to 3 pulse height parameters (gamma detectors, fast time-to-height converters, etc.) to a parallel data format for direct entry to "on line" computers or tape storage media.

A complete punch paper tape data acquisition system for "off-line" computer data reduction is available—specify RIDL Model 22-101.

GENERAL FEATURES

Three Identical Data Channels Providing—

- 3 Pulse Amplifiers.
- 3 Analog to Digital Converters, up to one part in a 1000 (or 1024) resolution.
- Triple 0.5 μsec coincidence shaping circuit.
- 36 bit register for "one event" buffer storage.
- Binary-coded-decimal or binary data format.

Operates one, two or three data channels as required by experiment.
Common prompt gate for external coincidence.
Common delayed (2 μsec) gate for external coincidence.
Full parallel data format from all systems.
Optional scanner for serial data output in 4 bit BCD or binary (part of 22-101 system).
Provision for monitoring any 2 of 3 parameters with "scope" and camera (see display photos, 800 x 800 channels, 200 KEV/division).
Provision for monitoring any of 3 parameters with RIDL Multi-channel Pulse Height Analyzers.

ADDITIONAL FEATURES WITH RIDL 22-101 SYSTEM. High speed, 60 cps, 8 level, tape punch with 10" reel and all programming for IBM and other computer codes.

*Three ADC's from the world-approved RIDL 400 Channel Pulse Height Analyzer are included and expanded to 1000 (or 1024) channel capacity.

Additional information may be obtained by contacting Dept. 713

RIDL

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15 February 1963, Volume 139, Number 3555 **SCIENCE**

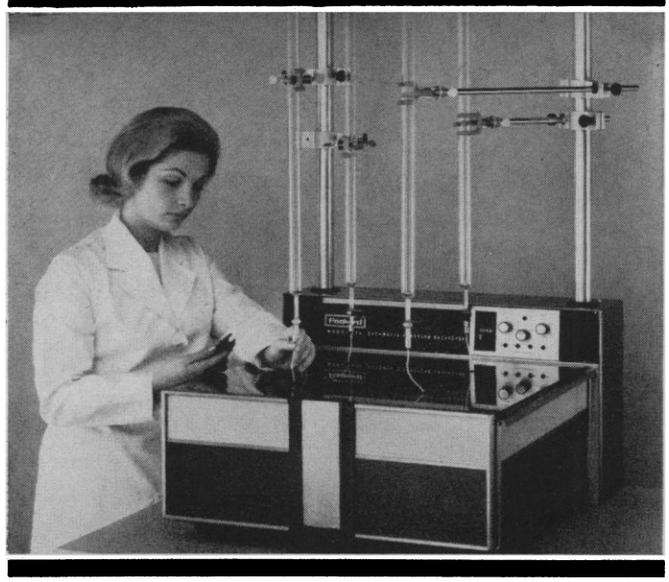
Unnecessary Research Institutes

There is one kind of independent research institution that we wish to challenge: the small, inadequately financed one that is formed to secure government grants and contracts and to live on the proceeds of such support.

But first, there are a number of independent research establishments to exclude from our strictures. One class is the institute that is established with sufficient financial resources to give it freedom and flexibility and to enable it to maintain a research staff of the size and quality that will provide the support, criticism, and stimulation that characterize any good laboratory. Germany has long made good use of such independent research institutes, and our Carnegie Institution is a sterling example of excellent management and outstanding research.

Not infrequently there is a compelling reason for the independent location and sometimes the independent management of a research institute. Oceanographic research laboratories need the seacoast. The Geological Survey's volcano observatory stands on the rim of Kilauea. Green Bank, West Virginia, was chosen for the National Radio Astronomy Observatory because that site best met such necessary criteria as freedom from electronic interference and freedom from damaging winds. Some of these installations are managed by a university, some by a combination of universities, and some in a different fashion. But none is, in the traditional sense, part of a university or university department. In each case, the nature of the research to be carried out, the availability of research material, or the interests of the sponsoring agency have determined the location and the separation from traditional academic arrangements. Moreover, since each is established to meet a special need, arrangements for continued financial support are usually part of the initial planning.

But there is another group of independent research institutions for which no such compelling reason seems to exist. These are institutions established for the pleasure, the profit, or the aggrandizement of their organizers. Their continued existence is dependent upon securing grants from government agencies or private foundations. They are financially dependent upon the agencies that support them, but since they are not really needed by those agencies, the support is likely to be on a short-term or individual-grant basis. Thus they do not have the independence that is a requisite for freedom. Lacking this strength, they can still recruit staff by paying higher salaries. But in terms of the total scientific effort, all they accomplish is to move a few men from university laboratories and contact with students to enable them to carry out pretty much the same kind of work they could have done at their universities, often with better resources of colleagues, library, and equipment. Neither in terms of economics nor of the advancement of science does it seem desirable to support such institutions.—D.W.



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symposium Plant Biology Today: Advances and Challenges. Three papers delivered in the morning and three in the afternoon brought an audience of about 150 up to date in its thinking on phytochrome and the red-far red system in plants (Bruce Bonner, Harvard), modern concepts of cell behavior (Herbert Stern, Illinois), root development in vitro (John G. Torrey, Harvard), concepts of shoot growth (Ralph O. Erickson, Pennsylvania), long distance transport in large intact plants (Martin H. Zimmermann, Harvard), and modern research in evolution in the ferns (Warren H. Wagner, Michigan). The annual luncheon for all botanists attracted over 100 persons to hear the address of the retiring chairman of the Section, John N. Couch, (Kenan professor of botany, University of North Carolina). His research on a group of organisms were presented in his talk "Are bacteria and fungi related?" All present were pleased when the director of the Cranbrook Institute of Science, Robert Hatt, awarded the Mary Soper Pope medal to Edmund Fulling, editor of *The Botanical Review;* the citation was read by Pierre Dansereau (New York Botanical Garden). The day ended with an open house in the botanical laboratories of the Academy of Natural Sciences, followed by the very successful Biologists' Smoker among the excellent exhibits of the Academy.

HARRIET B. CREIGHTON, *Secretary*

Anthropology (H)

Both Stanley Garn's talk on "Culture and the direction of human evolution" and William S. Laughlin's vice-presidential address on "Recurrent human origins and apparent extinctions" illustrated a major focus of contemporary physical anthropology, namely, the rendering of data from living populations on the problems of human evolution.

Laughlin stated that differences among fossil men are maximized because such finds are generally isolated and individual rather than parts of known populations. He stated that measurements on living populations reveal ranges of variations within groups known to be closely related that are as great as those which have been thought sufficent to identify fossil finds as different species of men. This maximization of differences has contributed to the fallacious notion of human evolution as large-scale changes in successive groups of fossil men who succeeded each other through extermination, rather than as a combination of adaptive changes of a type generally not revealed in the bony structure and absorption of earlier populations.

In the introduction to his lecture, Garn further documented this approach by pointing out that with regard to three morphological criteria considered highly significant for the grouping of fossil finds (skull thickness, tooth size, and massivity of the area of the jaw known as the mandibular symphasis), measurements of all but the earliest human fossils fall within the range of modern man.

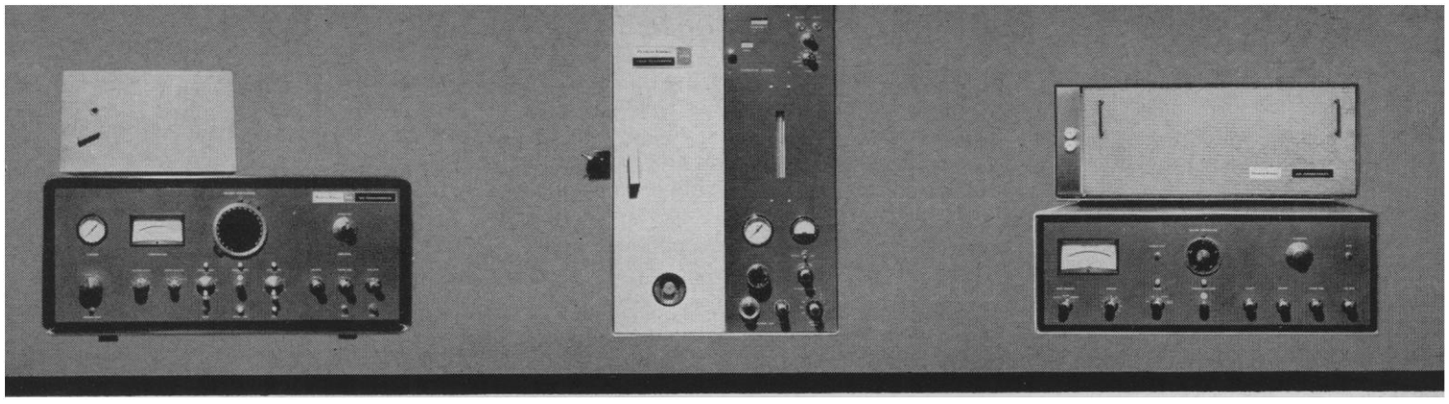
In summing up Garn's symposium, Theodosius Dobzhansky stressed the ongoing nature of human evolution, and pointed out the weight such data place against the argument recently raised by Carleton Coon in his *Origin of Races* that modern man evolved five times. Dobzhansky expressed agreement with the symposium participant, J. Crenshaw, that even without the benefit of evidence to the contrary, the hypothesis suggested a phenomenon of extraordinary improbability, and pointed out that elsewhere in his own work, Coon contradicted this theory. Dobzhansky closed by referring to the adverse use of Coon's theory by racist propagandists. He remarked that this demonstrates that scientists can no longer remain in ivory towers, unconcerned with the impact of their pronouncements, and that, indeed, it is naive and irresponsible for them to pretend they can.

ELEANOR LEACOCK, *Secretary*

Dating Man and the Pleistocene

A joint meeting of Sections E and H centered on recent advances in the dating of anthropological material and included five papers on methodology and three on applications. It is the first time such a joint meeting was held anywhere. In retrospect, three main points stand out.

1) Radioactive techniques are giving us ever greater precision and ever increasing range in our attempts to date the events of the Pleistocene and of man's history within the epoch. It now appears that the dating of the whole of the Pleistocene from its beginning to the present is within our grasp.



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A review of latest progress in

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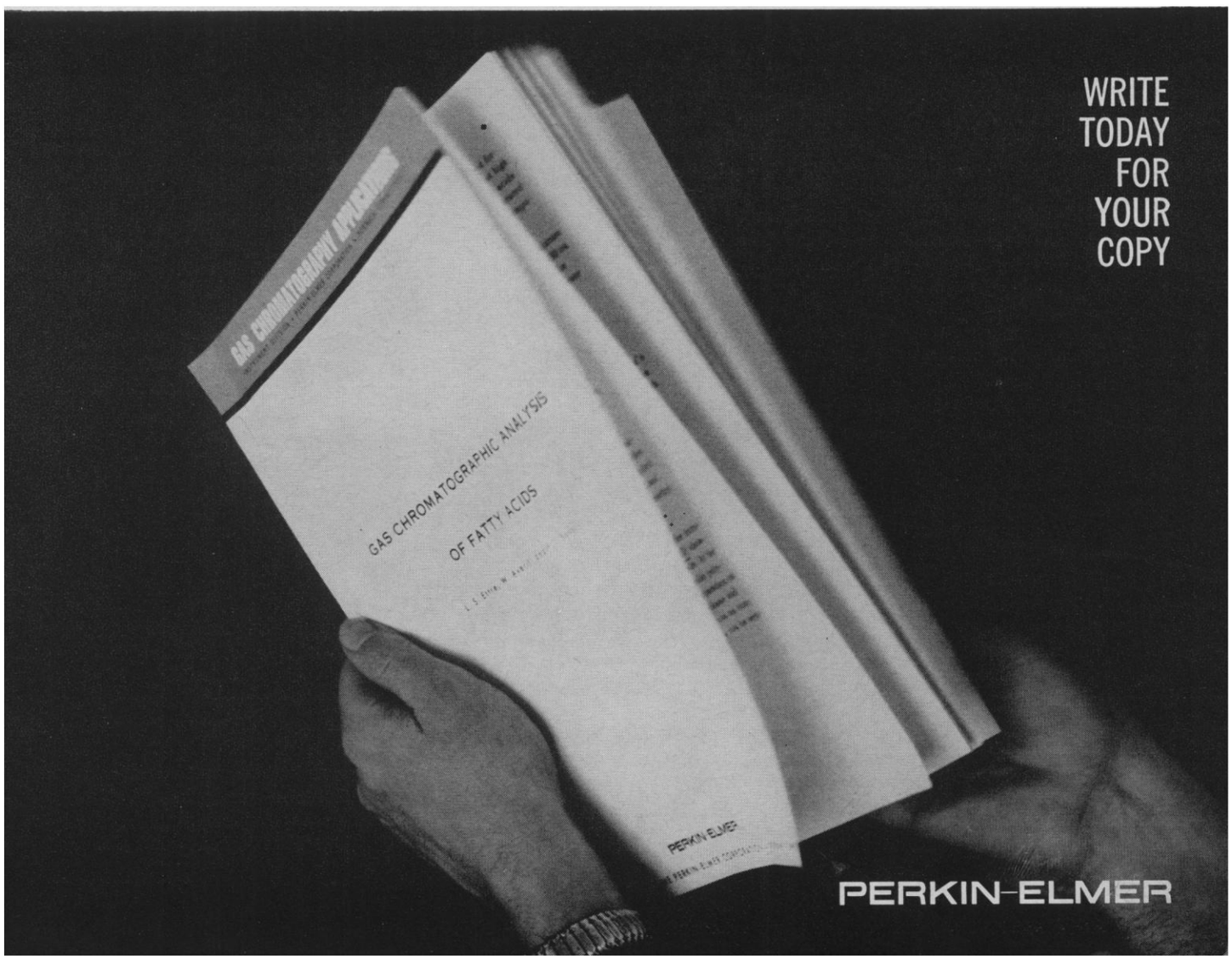


J. F. Evernden and G. H. Curtis (University of California) presented latest dates on the Late Tertiary and Pleistocene, based on potassium-argon measurements, and produced dates by their methods indicating that they have refined their techniques to bring potassium-argon dating well within C^{14} dating limits.

Aaron Kaufman (Columbia University) presented a progress report on the use of the thorium-230 and uranium-234 ratio to date fresh-water carbonates.

Cesare Emiliani (University of Miami) is extending the "absolute" dates of his deep-sea-core temperature curves on the presence of protactinium and thorium adsorbed on sediments.

2) Many factors and variables in radioactive dating are receiving increasing attention as techniques are refined.

Terah L. Smiley (University of Arizona) is of the opinion that geochronology will ultimately become "a study of ecology through time" as field observations, recording of data, and so forth are improved.

Elizabeth K. Ralph (University of Pennsylvania) reported on refinements in the C^{14} method. Certain discrepancies have been found in dating Egyptian dynastic age wood materials. Measurements of samples of known positive age, as determined by dendrochronology, are providing a means of elucidating these uncertainties.

3) It was heartening to see workers in several different disciplines approach a common problem. The session demonstrated once and for all that paleontologist, zoologist, physicist, anthropologist, chemist, geologist, and archeologist can live happily together and all can benefit from valuable data in the disciplines of the others.

Dating of man in the Pleistocene in connection with his environment in the Old World was demonstrated in the papers of G. H. R. von Koenigswald (Rijks-Universiteit te Utrecht) and D.A. Hooijer (Rijksmuseum van Natuurlijke Historie, Leiden). Frederick Johnson (R. S. Peabody Foundation) showed how in recent years radioactive dating methods have compelled revisions in respect to the age of the peopling of the New World to double the once accepted time (about 12,000 to 15,000 years ago).

RALPH SOLECKI,
Program Chairman

Psychology (I)

Diversity of approach to the two major topics was the feature of the 1962 Section I program. The concept of maturity was discussed from the vantage points of biology, physiology, psychiatry, psychology, and philosophy. Memory was considered in terms of neurological mechanism, computer simulation, and various psychological formulations, with Arthur Melton's vice-presidential address an overview of the current empirical and theoretical state of affairs. A third symposium presented certain psychological implications of the problem of increasing population, and programs were cosponsored on developments in mathematical psychology, linguistic analysis and cultural problems, the structure of meaning systems, and the evolution of behavior.

For 1963 the vice president for Section I is Lloyd Humphreys (University of Illinois), and Richard L. Solomon (University of Pennsylvania) begins a 4-year term as member-at-large of the Section Committee. The Committee expects to concern itself during the year with the place of psychology in the primary and secondary school curriculum.

FRANK W. FINGER, *Secretary*

Social and Economic Sciences (K)

Some theories and concepts of economic growth were discussed at the vice-presidential address session of Section K. Simon S. Kuznets (Harvard University) was concerned with problems of measuring economic growth and discussed the several structural forms which social and economic development included; he cautioned against emphasizing growth-rate statistics which were not in a proper historical perspective and which omitted the major needs to which growth should apply. The major problems of measurement center around the meaning of: commodities and services produced, the adjective "net" in net output, the weights used to combine diverse goods and services into a total with comparably measured parts, and the long-term aspect of the increase in growth rates. The session, in an interdisciplinary context, also dealt with the relationship of economic growth to changing social institutions and values. Factors of sociocultural adaptability, for example, influence rates of growth beyond mere savings-investment functions, and these problems relate importantly to balanced economic development.

The American Economic Association held a session on the economic impacts of disarmament. The shift of productive resources at a time when less of these resources are needed for armaments requires programs for investment in peacetime goods and services. Some reinvestment into expanded peaceful space activities can be anticipated as well as into new products and services whose fuller potential has been deferred from weapons expenditures. The session treated in detail the strategy of such adjustments to disarmament in a qualitative and quantitative approach, and also related the subject to its impact on trends in research and development.

The American Political Science Association discussed the general subject of scientists in politics by reviewing the establishment of NASA, the national policy, and the President's science advisors. These papers pointed in general to the frequent confusions which nonetheless have led to the successful creation through legislation of scientific establishments within the Federal government. While conflicts in this area remain, it was inferred that the gulf between scientist and legislator and scientist and administrator is diminishing in favor of greater mutual understand-

ing of the problems and responsibilities of each.

The American Sociological Association discussed in one session matters relating science and education to the national interest. The subject matter included the conflict between science and humanism, the problems of choosing science as a career in American colleges, federal support of research, and projections to 1970 of the role of science in higher education. In a second session, cosponsored by the Population Association of America, problems of population research were reviewed to include demographic trends in Hong Kong and Africa, statistical treatment of annual birthrates in the United States back to 1855, and questions concerning the training of demographers. On the latter subject, recommendations were offered for the establishment of separate departments of demography at a few leading universities where faculty resources might be able to handle such studies.

The contributed papers session of Section K reviewed selected subjects in social science research. Political literacy in less-developed countries was noted as being commensurate with economic and social development, but maturing at a slow rate. The most politically literate paradoxically tend to display a low-level correlation with the requirements of stable personality orientation. Considerable research in this area is needed and implementation should stress "the political development of less-developed countries."

A review of problems attached to private developmental capital indicated a conflict between the equity capital principle in less-developed areas and the essential demand for new capital from external sources. In several countries a relaxation of the equity requirement is being instituted to provide for growth. A discussion of corporate decision making pointed toward urging sociologists to research corporate structures instead of concentrating on labor orientated research, and to develop the study of managerial sociology. In a treatment of the subject of the urban adjustment of immigrant workers, largely Mexican and negro, the sample study for a northern community indicated employment opportunity as the principal reason for immigration, and that the majority of the sample demonstrated satisfaction with new surroundings. A final contribution offered suggestions for a theory of social dynamics and in part was concerned with the elements of a theory of success or failure.

The Metric Association held two sessions dealing with business matters and with papers on the promotion of the metric system. Section K cosponsored the very useful symposium of Section E on coal in the United States, the session of Section H on analytic sociological methods, the program of Section U on statistics in social and economic research, and the interdisciplinary symposium on technical knowledge diffusion and economic development. A reception in honor of the vice president and chairman of the Section was thoughtfully tendered by the Wharton School of Finance and Commerce of the University of Pennsylvania and cosponsored by Sections U and K.

Kingsley Davis (University of California), a sociologist and demographer, is vice president and chairman of Section K for 1963. Henry W. Riecken (National Science Foundation), whose fields are sociology and social psychology, was elected to the new term as a member of the Section committee. Section K is fortunate to have the able services of political scientist Ithiel de Sola Pool (M.I.T.), its new secretary. The retiring secretary thanks all those who have generously assisted in the development of Section activities during the past 8 years.

DONALD P. RAY, *Retiring Secretary*

American Political Science Association (K2)

The three papers at this session all described the experiences of scientists and politicians in dealing with each other. Harry S. Hall (Temple University), in his paper on scientists and conservative legislators, reported on a study of the way in which right-wing members of Congress reacted to atomic scientists in the period before Sputnik. The data were hearings and personal interviews. There was some discussion as to whether the distrust of their patriotism and security-mindedness continues into the present period. Robert Gilpin (Princeton University) spoke about the successes of PSAC, particularly in its formative years and particularly in reference to modifying administrative and decision-making processes in the executive branch so as to allow fuller account to be taken of scientific considerations. Enid Curtis Bok and Robert C. Wood (Massachusetts Institute of Technology) discussed the establishment of NASA and the political role of advisory scientists. They noted that scientists won from Congress a number of points about which they felt strongly. But the paper showed that this was in each case the result of a coincidence of interest between the scientists and certain other groups strongly represented in Congress. The civil character of NASA and other points incorporated in the bill reflect not the political power of scientists or their reasons for advocating these measures but rather these coincidences of interest.

American Society of Criminology (K3)

Criminology includes the study of offenders, the reasons for crime, penal treatment, and the prevention of crime. All these topics were covered in the four symposia presented by the American Society of Criminology.

The first session dealt with psychiatry, psychology, and criminology. During the past decade a shift in the modal personality of offenders has occurred and has resulted in the evolution of the "new criminal." The typical prototype has changed from the "ethical professional," highly skilled offender to the reckless, unskilled, selfish, reputation-acquiring offender of today (Lewis Yablonsky, University of California, Los Angeles). An origin of delinquency was outlined by Sanford J. Fox (Boston College Law School) in his talk on delinquency and biology. Developing the science of criminology involves the utilization of the many facts of human biological individuality. Glueck's study of delinquency is evidence of the association between body type and proneness to delinquency. One important responsibility of the criminologist, who is trained in the social sciences, is to recognize the possibility that physical characteristics may relate to criminality. In a discussion on why some crimes occur, Michael Fooner (Association for Applied Psychoanalysis) cited "The Careless American." The loss of cash by theft may be induced by the victim's offering excessive temptation to the thief. Such a complementarity of roles requires assessment of the victim's responsibility. One should be alerted to and aware of the risky position into which he places himself as a potential victim of theft. One aspect in the prevention of crime was discussed by Hector Ritey (psychiatrist, New York City). We learn about the psychodynamics of criminality not so much by observing

the criminal but by concentrating our attention on the repressed criminal tendencies of those who never broke the law. A criminal act is the climax of millions of never acted-out criminal fantasies. In response to the question of what should be done with the mentally ill individual who has committed a criminal act, it is suggested by Henry Weihofen (National Law Institute), that treatment voluntarily requested under a "Psychiatric Offender Proceeding" has merit. Such a procedure involves the voluntary waiving of rights to trial by jury and to any defense of the act.

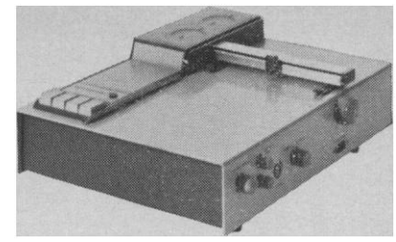
BARBARA A. KAY, *Rapporteur*

The second symposium considered the sociological approaches to problems in criminology. Marvin Wolfgang (University of Pennsylvania) emphasized the contributions of sociology to the study of crime. Peter Lejins (University of Maryland; president of the American Correctional Association) traced the development of criminological studies, and found that in the United States, in contrast to Europe, criminology is still largely treated as a branch of sociology. However, he predicted its future establishment as an independent science. In the ensuing discussion, a somewhat different opinion was expressed by Thorsten Sellin (University of Pennsylvania) who indicated that while the study of criminology might be isolated, it was still inextricably dependent on many other disciplines, and the criminologist would have to depend on other scientific experts for many of his conclusions. In a paper entitled "Criminal statistics a century ago," Sellin traced the development of statistical approaches and problems in the study of crime in the last century, and suggested that the statisticians a century ago were not only struggling with the same problems that face us today, but also managed to express the same criticisms but in a clearer and more forceful manner. Thomas G. Eynon and Walter C. Reckless (Ohio State University), in a paper read by Eynon, developed the results of research since 1948 on the delinquent population of a large state detention facility. They concluded that such institutions were not training schools for crime; the inmates themselves feel significant changes in their own points of view. The most effective contacts developed by the boys are with staff members such as the cottage parent or counselor, rather than with the social

worker, psychologist, doctor, or the teacher. Charles Newman (Kent School of Social Work, University of Louisville) appraised the corrective value of the treatment of delinquents in foster homes, rather than in punitive institutions, and considered some of the difficulties of placement and adaptation, particularly of adolescents and delinquent girls. He contended that as a form of treatment foster home care deserved much greater attention than it was presently receiving. Finally, Theodore N. Ferdinand (Northeastern University) presented statistics concerning the offense patterns and family structures of delinquents from urban and rural communities. He analyzed the records of male and female juvenile offenders in rural, village, and urban communities in relation to the marital status of parents, whether mother or father was dead, and type of offenses.

CANIO L. ZARRILLI, *Rapporteur*

Problems in the administration of criminal justice were the subject of the third symposium. Bail problems of indigent defendants were discussed by Herbert Sturz (Vera Foundation). The Manhattan Bail Project is an experimental philanthropic project designed to assist indigent defendants who are unable to post even nominal bail and who are deemed unacceptable risks by the professional bail bondsmen. Certain high-risk categories of offenders are not aided (narcotic addicts and distributors, sex offenders, assaulters of police officers, and those charged with homicide). The experimental hypothesis is that selected offenders may be released without risk to the community even though they are unable to post bail. Long-term incarceration prior to trial is contraindicated by the high percentage of arrested persons found "not guilty." In some cases, individuals have spent more than a year in jail prior to trial because of their inability to post bail. In his talk on the chronic petty offender, T. Grygier (University of Toronto) described this type of offender as dependent and passive, as compared to the indictable felon. They are often immature, irresponsible, and afraid of life. Unable to compete in society, they frequently welcome confinement, which is often to them emotionally satisfying, and solves their basic needs for security, response, and recognition. One of the problems in the study of criminology, the absence of a criminal research and information center, was pointed up by John Scanlon (National Council on



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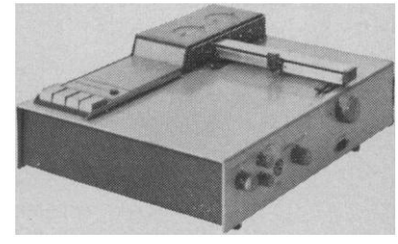

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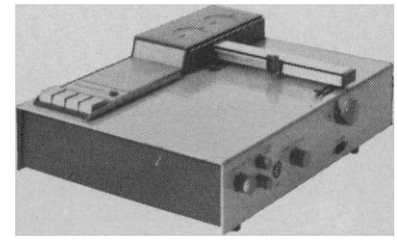

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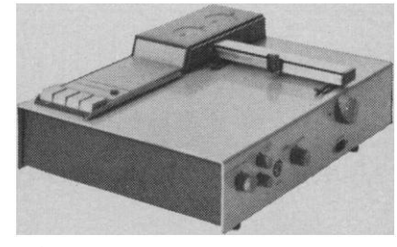
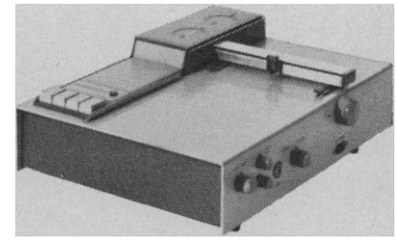


a log recorder



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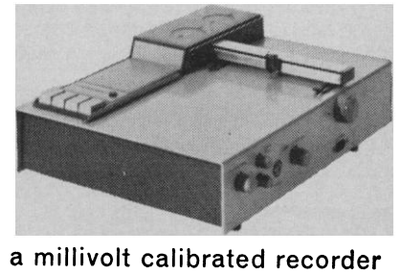

a millivolt calibrated recorder

(more–)

Crime and Delinquency). While the necessity for intensified research into all phases of crime and delinquency is widely acknowledged, the absence of such a center has in the past frustrated scholars and inhibited the most economical and efficient utilization of available data, personnel, and funds. The National Council on Crime and Delinquency, working with the United Nations, U.S. government agencies, 35 foreign countries, and several state and private units has compiled (and will maintain as a current inventory) a tremendous bibliography of crime-delinquency research in progress or projected and is in the process of building a central criminal research and information center which will service the profession. Some observations on the penal system of Israel were noted by Joseph Eaton (University of Pittsburgh). The Israeli system, although much modified in the 14 years of freedom, was inherited from the English mandate authorities and bears the English stamp. Although more than 50,000 offenses are recorded annually, there are fewer than 2000 inmates in the six institutions. Probation, fines, and short sentences are stressed; the "Irish" reformatory system is preferred although it is adjusted to local conditions. Flogging has been abandoned and capital punishment has been abolished.

CLYDE VEDDER, *Rapporteur*

Problem areas in contemporary law enforcement was the theme of the fourth symposium. How industrial security programs are effective in the prevention of crime was discussed by Timothy J. Walsh (American Society for Industrial Security). Measures employed by such programs include a combination of physical security devices, loss control systems, and personnel screening. Industry does not close the gates to ex-convicts, but rather attempts to place them in positions which will neither constitute an unnecessary hazard to corporate property nor contribute to the possible recidivism of the employee. Donal E. J. MacNamara (New York Institute of Criminology) spoke about the problem of police brutality throughout the United States. One solution proposed is review boards composed of distinguished private citizens to hear complaints against police officers and units. While such boards may prove helpful, the basic answer to police brutality is a police administrator who will not tolerate it, and a systematized, objective

complaint system within the law enforcement agency dedicated to the eradication of objectionable police practices. Jacob Chwast (New York University) feels that a redefinition and reevaluation of the proper role of the police in a twentieth century democracy are vitally needed. No small part of this need is a new self-concept (or self-image), individual and group, to be developed and accepted by the police themselves. A solution to one of the major problems in law enforcement was suggested by Alvin J. T. Zumbrun (Maryland Crime Commission). The legalization of the most popular forms of gambling would reduce the multi-million dollar annual tribute to the organized crime syndicates; would eliminate much corruption of public officials; and would provide needed revenues for expanding public services. John P. Kenney (University of Southern California) expounded on the role of August Vollmer as the father of modern professional policing, specifically in California, but indirectly throughout the United States. An emphasis on research and evaluation studies of police procedures have combined to win California leadership in the march toward police professionalism.

JACOB CHWAST, *Rapporteur*

The awards and memorial session of this program was concerned with the roles played by workers in the field of criminology. Rev. Andrew Marinak (Federal Correctional Institute, Lewisburg, Penna.) noted that the role of the prison chaplain as an integral member of the rehabilitation team has neither been clearly defined nor scientifically evaluated. The problems of the practical penologist were discussed by James V. Bennett (U.S. Bureau of Prisons); in developing practical rehabilitative facilities and techniques, the penologist frequently incurs both the wrath of theoretical criminologists and the opposition of legislators.

Negley K. Teeters (Temple University) noted in his paper that the academic criminologist has all too often shirked his responsibility to inform and lead social action in correcting abuses in criminal justice administration and in righting miscarriages of justice. Also cited for being lax in its responsibility was the legal profession (Justice Haim Cohn, Supreme Court of Israel). Too frequently lawyers and jurists have neither recognized the necessity of nor taken leadership in the

campaign for the reform of the criminal law.

The following officers were chosen for 1963: president and AAAS representative, Donal E. J. MacNamara; vice presidents, Marvin Wolfgang, Lewis Yablonsky, Clyde Vedder and Jacob Chwast; secretary-treasurer, Charles Newman; executive council members, John P. Kenney and Marcel Frym.

CHARLES NEWMAN, *Rapporteur*

History and Philosophy of Science (L)

Historical testimony by actual participants in recent technological developments was the highlight of the fifth annual meeting of the Society for the History of Technology. In a symposium on the history of rocket technology, chaired by Eugene M. Emme, G. Edward Pendray spoke on Robert H. Goddard and early A.R.S. rockets; Walter E. Dornberger on the V-2 rocket; John P. Hagen on Viking and Vanguard; and Simon Ramo on Atlas, Titan, and Thor. Speaking for the historical record, these men provided valuable material on some of the most significant episodes in the recent history of rocketry.

The session on the history of the technology of atomic energy was chaired by Ralph Sanders (Industrial College of the Armed Forces). Gerald W. Johnson (Assistant to the Secretary of Defense, Atomic Energy), Richard G. Hewlett (U.S. Atomic Energy Commission), and Rear Admiral Lewis L. Strauss (USNR, Ret.; former chairman, U.S. Atomic Energy Commission) served as panelists.

Johnston talked on the historical role of military research and development in atomic energy and emphasized the development of atomic weaponry and nuclear propulsion. He expounded upon the military's role in managing the fantastic engineering feat of fashioning the first atomic bomb. He paid special attention to the fear among U.S. scientists and military personnel that Germany had been making considerable headway in building an atomic bomb of its own, a fear which later proved unfounded. Johnson then recounted the Navy's development of the atomic submarine as the pioneer vehicle in nuclear propulsion.

Hewlett's paper, "Pioneering on nuclear frontiers: two early landmarks in reactor technology," provided some historical insights. He analyzed the historical significance of the first self-sustained chain reaction produced by Enrico Fermi on 2 December 1942 in Chicago and the first generation of electric power from atomic energy by Walter H. Zinn on 20 December 1951 from the experimental breeder reactor No. 1 at Idaho Falls, Idaho. Although these events are often called landmarks, Hewlett contended that they more appropriately could be called convenient reference points. He also pointed out that subsequent history of atomic energy suggests that a depersonalizing process inevitably accompanies the rise of big science.

Strauss presented a chronology of events which led to President Eisenhower's announcement of the Atoms for Peace Program before the United Nations on 8 December 1953. He credits President Eisenhower with originating the idea during a plane flight from Denver to Washington to attend the funeral of Chief Justice Vinson.

The history of the industrial laboratory was the subject of a session chaired by Cyril S. Smith. John Beer told of European precedents of the industrial laboratory; Kendall Birr related the history of the General Electric Laboratories; and Matthew Josephson spoke on Edison and industrial research. Simon Marcson and Nathan Reingold commented on their papers.

Among the participants in a work-in-progress session was Peter F. Drucker, who spoke on the need for engineers to consider the work habits of people in the underdeveloped nations and to design for their actual needs instead of for a too-advanced technology. Carl W. Condit told of the construction features revealed by the demolition of the Garrick Theater in Chicago which illustrated advances in construction engineering pioneered by Dankmar Adler. Eugene S. Ferguson reviewed the writings and the scholarly problems involved in the study of American technology from 1788 to 1853. Other papers of this session, chaired by Thomas P. Hughes, were by W. David Lewis, Frank D. Prager, Robert M. Vogel, and Lynn White, Jr.

The annual meeting of the society was marked by the presentation for the first time of the Leonardo da Vinci medal. This was awarded to R. J. Forbes of the Netherlands "for his distinguished contributions, both monographic and bibliographical, to the history of technology." The Abbot Payson Usher prize was awarded to Silvio

A. Bedini for his article, "The compartmented cylindrical clepsydra," which appeared in the spring 1962 issue of *Technology and Culture.*

As its officers for the coming year, the society elected Cyril S. Smith as president, Peter F. Drucker as first vice president, Elmer Belt as second vice president, and Melvin Kranzberg as secretary. New members of the executive council include J. G. Brainerd, W. E. Hanford, and Thomas P. Hughes.

MELVIN KRANZBERG, *Secretary*
RALPH SANDERS, *Program Chairman*

Engineering (M)

Four speakers representing universities, industry, and government presented points of view on the very important problem of continuing education for technological personnel. Although it was agreed that the individual engineer is ultimately responsible for the furtherance of his own education, nevertheless many institutions of our society should recognize an obligation to encourage further development of each individual and to employ him at his highest skill and capability in view of the pressing demands for qualified technical personnel. Engineering societies, according to H. K. Work and C. E. Davies, can provide educational opportunities by national, state, and local technical meetings; providing teachers and arranging for courses on an in-plant or inter-industry basis; workshops; seminars; and similar activities. A plea was made for professional recognition of continuing education efforts. M. W. Kriegel outlined present company policies to encourage employees and listed programs, such as tuition refund plans, time off for course attendance, industrial leaves, professors visiting the company to teach, time and expense to attend university short courses, graduate and post-doctoral study industrial fellowships on full- or part-time, teaching machines, and others. J. W. Macy pointed out that the Bell report stressed the need for continuing education of government personnel and the government's plans for allowing attendance at courses, graduate study, visiting professors, and in-laboratory training programs. He mentioned that government employees may devote one year out of every ten years of work to further education. Discretionary funds are available in many areas for advanced study. T. P. Torda stressed the need for

educational institutions to orient their graduates to the need for continual study; he advocated a clearinghouse for information on research in education and the establishment of an institute for re-education of senior scientific and engineering personnel.

A thorough study of the needs of each company, governmental establishment, and university should be conducted and some means of informing educational institutions and engineering societies of these needs should be worked out. A plea was made for a realistic appraisal of degrees as a measure of gauging needs and abilities. Continual study of the problem is mandatory and there is an urgent need for innovation.

MERRITT A. WILLIAMSON,
Program Chairman

Medical Sciences (N)

Section N's annual symposium was organized along interdisciplinary lines, and was entitled New Concepts Regarding Biological Control Mechanisms. Cosponsored by Section F (Zoological Sciences) and the American Society of Zoologists, the symposium was arranged by DeWitt Stetten, Jr. (National Institutes of Health), and Oscar Touster (Vanderbilt University) in collaboration with the chairmen of each of the four half-day sessions. A generous grant from the National Institutes of Health permitted the inclusion of three European scientists among the speakers. Each session was followed by a roundtable discussion among the participants.

The symposium covered biological phenomena in species ranging from bacteria to mammals. Part I, on repression mechanisms, was chaired by B. Magasanik (Massachusetts Institute of Technology) and included L. Gorini (Harvard), B. Ames (National Institutes of Health), and H. L. Kornberg (University of Leicester, England) as speakers. Part II, on the feedback control of enzyme action, was chaired by H. E. Umbarger (Long Island Biological Association) and had as speakers G. N. Cohen (Centre National de la Recherche Scientifique, Gif-sur-Yvette, France), A. B. Pardee (Princeton), and H. S. Moyed (Harvard). The remaining sessions emphasized animal studies. Part III, on hormonal phenomena, was chaired by E. W. Sutherland (Western Reserve), and offered talks

by T. W. Rall (Western Reserve), O. H. Lowry (Washington University), and G. M. Tomkins (National Institute of Health). The final session, on transport across cell membranes and chaired by C. R. Park (Vanderbilt), offered talks by D. O. Rudin (Eastern Pennsylvania Psychiatric Institute), J. Skou (University of Aarhus, Denmark), and A. Leaf (Harvard).

Many thought-provoking remarks on medical education were made by DeWitt Stetten, Jr. in his vice-presidential address to the members of the section. Problems related to the supply and financial support of medical students were discussed from the standpoint of long-range needs for physicians.

Section N cosponsored several other programs, including the interdisciplinary general session on the transfer of genetic information. Francis D. Moore (Harvard) is the new vice president and chairman of Section N for 1963, and DeWitt Stetten was elected a committeman-at-large to succeed J. Murray Steele, who has completed his 4-year term of office.

With the greatly increasing number of physicians who are joining the AAAS, it is likely that the activities of Section N can be expanded in future years.

OSCAR TOUSTER, *Secretary*

Pharmaceutical Sciences (Np)

The Pharmaceutical Sciences Section held nine sessions 26 December through 29 December. A total of 33 contributed papers on various scientific studies was reported, and two symposia were held. Over 360 persons registered as having attended one or more of the meetings.

Of major interest to the group in attendance was a most interesting and stimulating vice-presidential address entitled "Pharmacy and space," presented by John A. Autian. Two symposia—one entitled Some Aspects in the Developing, Handling, and Control of Investigational Drugs, and the other entitled Rational Use of Computers in Pharmacy and Medicine—also attracted considerable interest, not only from the pharmaceutical scientists in attendance, but also from many individuals from other scientific disciplines. Over 150 persons attended each of the two sessions.

Don Francke gave introductory remarks and served as presiding officer over the symposium on investigational drugs. Ralph G. Smith (U. S. Department of Health, Education and Welfare), George Schneller (Wyeth Laboratories), Robert I. Wise (Jefferson Medical College), and Milton W. Skolant (American Society of Hospital Pharmacists) discussed the problem from the viewpoint of government, industry, clinical investigation, and the pharmacist, respectively.

John A. Autian presented introductory information on the rational use of computers and presided over the computer symposium session. Eric W. Weiss (Sun Oil Company) discussed the advantages and limitations of computers and defined many of the terms used in computer work as a basis for a clearer understanding of the subsequent papers presented. The application of computers to the storage and retrieval of information was presented by Eric W. Martin (Lederle Laboratories). John F. Pauls (Smith, Kline, and French Laboratories) presented some experiences with a small computer in pharmaceutical research and development. The applications of analog computers to problems of pharmacokinetics and drug dosage were set forth by Edward R. Garrett (University of Florida). The final paper presented before the symposium was on computer applications to neural and behavioral problems by William Ross Adey (University of California).

In addition to the above-mentioned program, the hospital pharmacy group had a most informative, well attended, full-day session of discussion and contributed papers on the scientific aspects of hospital pharmacy under the guidance of Archambault, Francke and Joseph A. Oddis. The following groups were represented: American Society of Hospital Pharmacists, American Pharmaceutical Association, American Hospital Association, and the Delaware Valley Hospital Pharmacists Association. Luncheon, entertainment, and dinner were sponsored by E. R. Squibb and Sons, Wyeth Laboratories, and McKesson and Robbins, Inc., respectively.

Wayne V. Kessler (Purdue University) and Lee H. MacDonald (Upjohn Co.), presided over the two contributed paper sessions which consisted of the presentation of the results of original investigations. The papers presented were of unusual merit. John Autian and co-workers at the University of Texas and the National Institutes of Health presented two papers describing work recently completed on

the interaction of drugs with plastics and the tissue responses noted in rabbits with plastic tubings. A series of three papers on in vivo tracer techniques in drug screening studies, the determination of the body fat of human obese subjects by whole body measurements of potassium-40 radioactivity, and the determination of potassium in solids and liquids by measurement of potassium-40 were presented by W. F. Bousquet, John E. Christian and W. V. Kessler, respectively (Purdue University). Bousquet also presented a paper on studies of the excretion and metabolism of carbon-14 labeled 2-acetamide-5-nitro thiozole in turkeys. The effect of certain drugs on perfused human placentas was discussed by H. P. Cinchta and R. F. Gautieri (Temple University). R. G. Miller and H. C. Shirkey (University of Cincinnati) presented the effects of pooled rabbit serum in alkaloidal poisoning. The synthesis and pharmacology of some basic esters of trimethoxy-benzoic acid were discussed by A. J. Vazkas and J. T. Doluisio (Temple University). Work on the identification of complex salt species of triamterene and the dynamic measurement of stress carried out at the Smith, Kline and French Laboratories, were presented by L. W. Dittert and C. Chong, respectively. A. C. Huitric (University of Washington) discussed proton magnetic resonance and the steriochemistry of cyclohexanols. Computer simulation of problems in pharmaceutical stability was presented by N. G. Lordi (Rutgers University).

The AAAS Council, the governing body of the Association, elected Don E. Francke (American Society of Hospital Pharmacists) as a vice president of the Association and elected Curtis H. Waldon (University of Colorado) to serve for a 4-year term on the committee-at-large of the Section. Francke will serve as chairman of the Section for the coming year and will preside at the Cleveland meeting in December, 1963.

The meeting was exceedingly well attended and proved to be one of the most successful in recent years.

JOHN E. CHRISTIAN, *Secretary*

Agriculture (O)

The entire program of Section O was a symposium devoted to the topic Food Quality As Affected By Production Practices and Processing. This program was arranged by George W. Irving, Jr. (U.S. Dept. of Agriculture) and covered fruits and vegetables, cereals, dairy products, poultry and eggs, and meats. Attendance was about 200.

Symposium speakers organized, analyzed, and illustrated the profound effects of production, protection, processing, and distribution practices on the quality of our major foods and predicted some predominant trends.

Among the significant conclusions reached were the following:

1) Research is steadily substituting objective for subjective measures of quality factors and is using them to refine knowledge concerning effects of genetic, environmental, management, and processing changes on product quality.

2) Better means for disease and spoilage control are emerging and further improvements are being vigorously sought.

3) Conversion of agricultural products to forms desired by consumers involves many steps. All are being examined to ascertain deleterious influences on quality and to minimize them.

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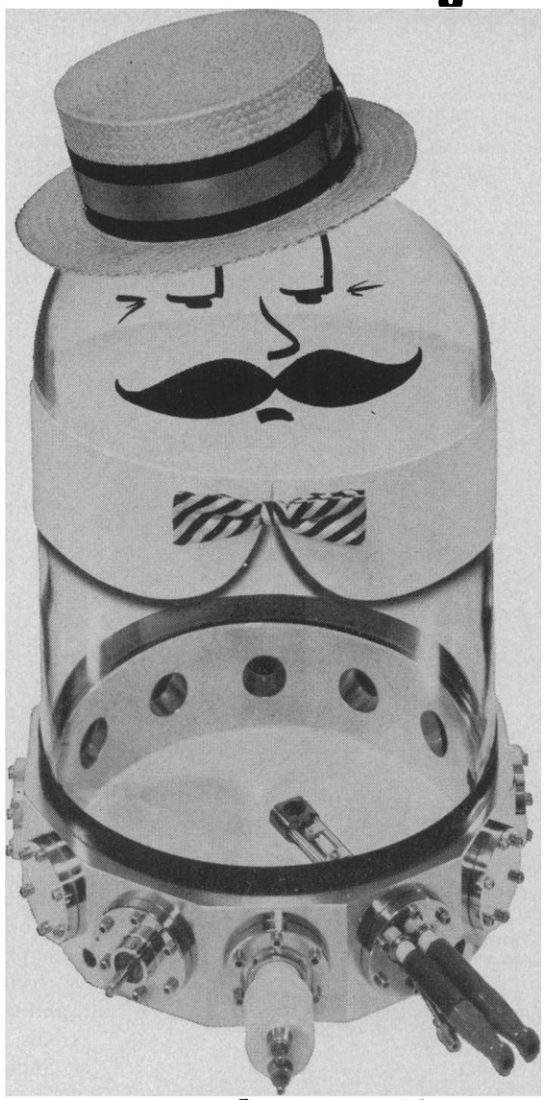

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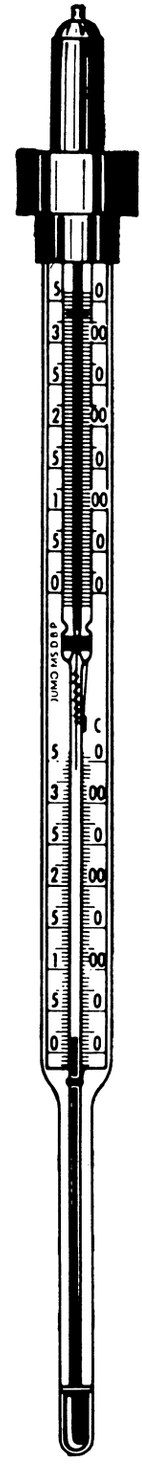

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4) Fruits, vegetables, and cereals, and among the animal products, poultry, are on the whole rapidly responsive to genetic modification. The genetic improvement of cattle and hogs, on the other hand, is progressing more slowly. Nevertheless, all are continually being adapted to possess the differing quality properties desired in fresh and in processed products. Basic research on flavor, color, texture, and microbiology, with more precise and sensitive tools, is providing information upon which to base practical improvements in each of the steps involved in making quality foods available to the consumer—better germ plasm, farm management practices, harvesting methods, protection during production and post harvest, processing innovations and control, and storage and distribution techniques.

In conjunction with the session on 27 December, the 1962 AAAS Campbell award was made to Robert N. Campbell and Raymond G. Grogan (University of California, Davis). These scientists were honored for their published research entitled "The big-vein virus of lettuce and its transmission by *Olpidium brassicae*."

The retiring vice president, chairman of Section O, George W. Irving, was appointed to a 4-year term as committeeman-at-large, beginning 1 January 1963. The newly designated vice president and chairman of Section O for 1963 is A. H. Moseman (director, Agricultural Sciences, Rockefeller Foundation). Moseman will develop a symposium program on agricultural sciences for new developing nations for presentation at the 1963 AAAS meetings.

GEORGE W. IRVING, JR., *Chairman*
HOWARD B. SPRAGUE, *Secretary*

Industrial Science (P)

The session on research and development management was held on 26 December 1962. All speakers were present, and the program was conducted as shown in the official program. There were about 65 persons in the audience, and a discussion period was held at the end of each paper. It was interesting to note that there were only five members of the Institute of Management Sciences in the audience, so that there was a broad appeal in the subject among AAAS attendees. The discussion centered on various main points made by the speakers: the changing nature of research and development with its large projects, the importance of doing re-

search on research and development management, the need to evaluate the gains and costs of research and development, the need to make more precise and quantitative decision-making on research and development, and the experience with analyzing actual data derived from research and development projects. There were also some sober thoughts expressed by members of the audience on the need to minimize the stress on special or unique characteristics of scientists and engineers as against other human beings, since this emphasis creates more problems than it solves.

M. A. GEISLER, *Program Chairman*

Education (Q)

One of the featured Section Q programs was the symposium on the preparation of elementary and secondary school teachers, which was cosponsored by the AAAS Cooperative Committee and Section Q. The basis of the program was a report on teacher preparation prepared by a joint study group of the AAAS and the National Association of State Directors of Teacher Education and Certification.

Cosponsored programs were scheduled with the Council for Exceptional Children and with the American Educational Research Association. The program arranged by CEC involved aspects of educational problems associated with both retarded and accelerated children. The AERA programs included one session on the scientific study of classroom behavior and another on research in the problems of education in large cities.

The teaching societies scheduled their programs independently, but had their usual diversified schedule of offerings. Section Q scheduled its vice-presidential address and four sessions for contributed papers. The papers covered a variety of subjects ranging from philosophy to research on the selection and training of graduate students.

The business session was well attended. Problems related to this section's programs were considered. A meeting of the Section committee was scheduled and preliminary program plans for the Cleveland meeting were made.

In summary, the meetings at Philadelphia were disappointing in terms of attendance. Many excellent papers were presented and deserved a better attendance. There was some indication that the programs were not sufficiently advertised in the immediate area.

HERBERT A. SMITH, *Secretary*

Council for Exceptional Children (Q3)

In a full day of meetings on 26 December, three significant topics were considered. An advance in the education of the deaf was reported by E. Ross Stuckless (University of Pittsburgh). He described a well-designed and carefully controlled study which concluded that programmed self-instruction in written language for deaf children could produce impressive gains over the typical classroom approach. Under the supervision of teachers of the deaf, programmed instruction resulted in the acquisition of certain elements of written language in half the time taken by typical classroom teaching. Stuckless described further research on the correction of language errors in adolescent deaf children through similar kinds of programmed self-instruction. That research is still in process.

John H. Hollis (Parsons Research Project, Kansas) reported on his work in eliciting differential responses from mentally retarded children in social and non-social stimulation situations. His findings may have considerable meaning for the education of retarded children. In particular, his carefully devised methods for isolating specific kinds of behavior, and measuring changes in them in response to stimulation, could have tremendous implications for the systematizing of teaching for severely retarded children.

William David Barney (University of Auckland, New Zealand) summarized work that he has done this year as visiting research professor at the University of Pittsburgh's School of Education, on formal education for mentally advanced children. Reporting on a project being conducted in the Warren, Penna., public schools, Barney indicated that the identification of highly able children at pre-kindergarten age appears to be quite feasible. An analysis of the progress of children admitted a year early to kindergarten is now underway.

National Science Teachers Association (Q5)

Experimentation and measurement was the theme for the NSTA session on 28 December at the 1962 AAAS meetings in Philadelphia. The program, whose audience consisted mainly of science teachers, was chaired by John H.

Marean (president, National Science Teachers Association, and a high school teacher in Reno, Nev.). The speaker for the session was W. J. Youden (National Bureau of Standards). Youden's address, "The parable of the fisherman," used experimental programs such as the testing of the Salk vaccine, the testing of new highway materials, and an "elegant" fish story to make his points on the characteristics of carefully designed experiments.

Following Youden's presentation, three panelists, Herbert A. Smith (Pennsylvania State University), Helen Hale (science supervisor, Baltimore County Schools, Towson, Md.), and James V. DeRose (head of the Science Department and chemistry teacher at the Marple-Newtown Senior High School, Newtown Square, Pa.) each responded to Youden's presentation with their own suggestions for improving experimentation and measurement in the science courses offered in the public school. Albert Piltz (U.S. Office of Education) initiated questions from the audience and the subsequent discussion that completed the program.

The National Science Teachers Association also participated in the joint meetings of the teaching societies.

MARJORIE GARDNER,
Program Chairman

Information and Communication (T)

At the annual business meeting members proposed and elected Chauncey D. Leake (past president of AAAS) and Joseph Kaplan (University of California) honorary members of the National Association of Science Writers. Also, recognition was noted in the minutes that as of the Christmas week of 1962, Sidney Negus (director of the public information committee for AAAS meetings) "has served the AAAS faithfully and well during the past quarter century and has extended kind and skillful help to an entire generation of science writers."

HERBERT B. NICHOLS,
Representative on AAAS Council

Statistics (U)

The first participation of Section U (Statistics) in the AAAS annual meetings covered a variety of topics and drew considerable attendance from the

statistics profession, as well as from other groups.

A highlight of the meeting was the dinner at which Jerzy Neyman, AAAS vice president and first chairman of Section U, spoke on statistics as a servant of all sciences and as an independent discipline. The essential points of this talk, and of the contributions of the discussants, involved the future pattern of the Section activity. Briefly, a consensus developed that Section U should concentrate on interdisciplinary meetings of two types. One type of session should be planned for the mutual exchange of information with scientists in other disciplines. A second type would have as its purpose the summarizing and clarifying of the results of research, particularly research involving the application of statistical techniques to various subject matter areas. A third type of meeting, designed primarily for statisticians, is also needed for those interested primarily in theory.

The sessions at this meeting, arranged largely by Neyman, indicated in practical form the ideas outlined above. Joint and cosponsored sessions covered statistical problems in probability, genetics, astronomy, psychology, social and economic research, and ecology. Attendance at these meetings varied from 25 to 150. The quality of the papers was high and the reactions of the listeners indicated intense interest.

A special session was held in appreciation of the work of the late Sir Ronald A. Fisher, the eminent British statistician who died last June in Australia. The chairman, Chester I. Bliss, gave the general background on Fisher's life. Fisher's contributions to the theory of statistics, to experimentation, and to mathematical and statistical genetics were discussed by Harold Hotelling, W. J. Youden, and Oscar Kempthorne, respectively.

The final session, Statistical Problems in Novel Domains of Science, drew a large group on the last afternoon of the meetings. In addition to the three papers listed in the program, a fourth paper entitled "Molecular-size channels and flows against the gradient," was given by George B. Dantzig (University of California, at Richmond). The application of statistics to novel problems was quite exciting in that they opened up possible new areas of development; it is likely that a similar session may be a regular feature in the future.

The quality of the first participation of Section U was due to the cooperation of the 48 persons who participated in

the sessions. In addition, Section U cosponsored a number of other sessions.

Harold Hotelling (University of North Carolina) is chairman of Section U for 1963.

MORRIS B. ULLMAN, *Secretary*

Biometric Society (U2)

At the AAAS meetings in Philadelphia, 26–30 December, the Biometric Society (ENAR) arranged five significant sessions, two jointly with the new Statistics Section (U) which met for the first time. The other three sessions were cosponsored by Section U and by the Zoology and Botany sections (F and G).

The important general contribution of statistics to science and industry is to provide an efficient methodology for acquiring new knowledge in other disciplines. It is a part of scientific methodology. However, there is another face of statistics; it is a discipline in its own right.

The first session, considered some uses of high speed computers in statistics. H. O. Hartley (Iowa State University) spoke on solutions of statistical distribution problems by Monte Carlo methods. His paper was concerned with the use of computers in Monte Carlo computations and simulations. In these procedures statistical chance variables are generated inside the computer and the physical and biological laws into which they enter are then also compounded and summarized by the computer to give the solution to the various problems. Max A. Woodbury (New York University) and Martin Lipkin (Cornell) discussed the possibility of using the computer for a high-speed evaluation of a large number of clinical symptoms of a patient to obtain a suggested diagnosis.

A second session was concerned with problems of mathematical biology, and a third considered statistical problems of genetics.

The fourth session was devoted to sampling for zoologists, and a fifth honored Sir Ronald Fisher, who has been described as the greatest statistician who ever lived. Sir Ronald died in Adelaide, Australia, on 29 July 1962. Harold Hotelling of the University of North Carolina spoke on Fisher's contributions to mathematical statistics, a subject in which investigations had barely begun when Fisher started his work. There are now many recognized national and international journals in this area, and a considerable portion of their papers still deal with the development of Fisher's ideas. W. J. Youden (National Bureau of Standards) discussed Fisher's contributions to scientific method, particularly efficient plans for obtaining and methods of interpreting data for purposes of inference. The area of knowledge and research known as the design of experiments was founded almost single-handedly by Fisher. Oscar Kempthorne (Iowa University) described Fisher's contributions to mathematical genetics.

T. A. BANCROFT, *Program Chairman*

Science in General (X)

The theme of the 1962 American Nature Study Society meetings was "Nature Study—the grassroots of Science." Papers were given on the history of the nature study movement, nature study in various parts of the world, and means by which a feeling of kinship with nature may be established in the minds of persons today. Various projects for the acquiring and use of natural

areas for schools and nature centers were described in an important session chaired by John W. Brainerd. Howard Zahniser of the Wilderness Society spoke at the annual banquet of the society on the wilderness bill pending in Congress. The joint field trip with the National Association of Biology Teachers was held on 30 December; the visit to the Brigantine National Wildlife Refuge was honored by the presence of the noted ornithologist, Roger Tory Peterson.

John W. Brainerd is the new president-elect, and thus program chairman for the 1963 meeting. S. Glidden Baldwin, retiring president, presided at all business meetings. The Society voted to affiliate with the International Union for the Conservation of Nature.

JOHN A. GUSTAFSON,
Program Chairman

Conference on Scientific Manpower (X4)

The theme of the 1962 Scientific Manpower Conference, which met in morning and afternoon sessions on 28 December, was "Community Programs for Motivation to Science and Engineering Training." The morning program was chaired by James Creese (Drexel Institute). Glenn W. Giddings (General Electric Company) discussed local industry-school cooperation in science instruction and noted that the concern of industry with education below the collegiate level is a relatively new development. However, cooperation is fast growing, and the establishment of a national clearinghouse to gather and disseminate information on such programs may now be appropriate. James G. Harlow described the statewide program sponsored by the Frontiers of Science Foundation of Oklahoma. Robert W. Neathery (The Franklin Institute) reported on the Museum's activities as examples of local motivational programs. Kenneth E. Karmel discussed the program of the Engineering and Technical Societies Council of the Delaware Valley, which includes newsletters, a speakers' bureau, student engineering clubs, and career guidance talks as exemplary of professional society activities.

The afternoon session, under the chairmanship of Samuel Schenberg, director of science of the New York City public schools, featured a panel discussion on counseling and guidance activities. Ralph Bedell (U.S. Office of Education) discussed the National Defense Education Act support for training of school counselors. Richard B. Scheetz (New Jersey Department of Education) provided specific examples of industry-local school cooperation in such areas as career conferences, laboratory visits, laboratory work experience, and summer science programs. W. Donald Vaughan, a counseling supervisor, discussed public school counseling from the standpoint of the counselor's problems and frustrations. Stewart Wood, a high school senior from Bladensburg, Md., described activities of the Washington Junior Academy of Sciences, which he felt were important in attracting and maintaining youth's interest in science. A related paper delivered by John D. Hopperton (New Mexico Institute of Mining and Technology) reported on the activities of the 37 state junior academies of science.

Papers delivered at the conference will be published by the National Science Foundation and will be available sometime after February.

THOMAS J. MILLS, *Program Chairman*

White Sulphur Springs, W. Va. (C. G. Stetson, ARS, Dept. of Radiology, Englewood Hospital, Englewood, N.J.)

1–5. American College of **Physicians**, Denver, Colo. (E. C. Rosenow, Jr., 4200 Pine St., Philadelphia 4, Pa.)

1–27. World **Meteorological** Organization, 4th congr., Geneva, Switzerland. (Secretariat, WMO, 41 Avenue Guiseppe Motta, Geneva)

2–6. **Psychology**, 8th Inter-American congr., Mar La Plata, Argentina. (G. M. Gilbert, Psychology Dept., Long Island Univ., Brooklyn 1, N.Y.)

3–5. American Soc. of **Internal Medicine**, annual, Atlantic City, N.J. (ASIM, 3410 Geary Blvd., San Francisco 18, Calif.)

3–5. **Streamflow Regulation** for Quality Control, symp., Cincinnati, Ohio. (J. E. McLean, Field Operations Section, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Pkwy., Cincinnati 26)

3–6. National Council of Teachers of **Mathematics**, Pittsburgh, Pa. (M. H. Ahrendt, 1201 16th St., NW, Washington 6)

4–5. Agricultural **Meteorology**, 5th natl. conf., Lakeland, Fla. (American Meteorological Soc., 45 Beacon St., Boston 8, Mass.)

4–5. **Systems**, 2nd symp., Cleveland, Ohio. (M. Mesarovic, Case Inst. of Technology, University Circle, Cleveland 6)

4–6. International Assoc. for **Dental Research**, British section, 11th annual, London, England. (C. Tonge, Dept. of Anatomy, King's College Medical School, Newcastle upon Tyne 1, England)

4–6. Latin **Medical** Conf., Rome, Italy. (Prof. Urso, Policlinico Umberto 1, Viale Policlinico, Rome)

5–6. Alabama **Acad. of Science**, Tuscaloosa. (W. B. DeVall, Forestry Dept., Auburn Univ., Auburn, Ala.)

6. **Paleontological Research** Inst., Ithaca, N.Y. (R. Harris, PRI, 109 Dearborn Pl., Ithaca)

7–13. Panamerican **Diabetic** Congr., 2nd, Chicago, Ill. (Diabetic Inst. of America, Inc., Suite 1646, Chicago 2, Ill.)

8–10. American Assoc. for **Thoracic Surgery**, 43rd, Houston, Tex. (AATS, 7730 Carondelet Ave., St. Louis, Mo.)

8–10. **Feedback Mechanisms in the Nervous System**, Villahermosa, Mexico. (E. Eidelberg, Div. of Neurobiology, St. Joseph's Hospital, 350 W. Thomas Rd., Phoenix, Ariz.)

8–10. **Seismological** Soc. of America, Berkeley, Calif. (K. V. Steinbrugge, 465 California St., San Francisco 4, Calif.)

8–11. American **College Personnel** Assoc., Boston, Mass. (B. A. Kirk, Counseling Center, Univ. of California, Berkeley 4)

9–11, American Assoc. of **Anatomists**, Washington, D.C. (L. B. Flexner, Dept. of Anatomy, School of Medicine, Univ. of Pennsylvania, Philadelphia)

10–11. Engineering Aspects of **Magnetohydrodynamics**, 4th symp., Berkeley, Calif. (G. S. Janes, Avco-Everett Research Laboratory, Everett 49, Mass.)

11–13. Natural **Radiation** Environment, intern. symp., Houston, Tex. (J. A. S. Adams, Dept. of Geology, Rice Univ., P.O. Box 1892, Houston 1)

11–13. Eastern **Psychological** Assoc., 34th annual, New York, N.Y. (M. A. Iverson, Dept. of Psychology, Queens College of the City University of New York, Flushing 67)

11–13. **Pulsatile Blood Flow**, intern. symp., Philadelphia, Pa. (E. O. Attinger, Presbyterian Hospital in Philadelphia, 51 N. 39 St., Philadelphia 4)

11–13. Southern Soc. for **Philosophy and Psychology**, Miami Beach, Fla. (E. A. Alluisi, Human Factors Research Lab., Lockheed Georgia Co., Marietta, Ga.)

12–13. Pennsylvania **Acad. of Science**, East Stroudsburg, (K. B. Hoover, Messiah College, Grantham, Pa.)

14–18. **Electrochemical** Soc., Pittsburgh, Pa. (ES, 30 E. 42 St., New York 17)

15–16. American Soc. for **Artificial Internal Organs**, annual, Atlantic City, N.J. (B. K. Kusserow, Medical College of Vermont, Burlington)

15–20. Association for Research into **Periodontal Diseases**, 17th intern., Athens, Greece. (O. Louridis, ARPA, 8 rue Hippocratous, Athens)

16–18. **Optical Masers**, intern. symp., New York, N.Y. (L. Bergstein. Symp. Committee, Polytechnic Inst. of Brooklyn, 55 Johnson St., Brooklyn 1, N.Y.)

16–19. USAF **Aerospace Fluids and Lubricants** Conf. (unclassified), San Antonio, Tex. (J. Harmon, Southwest Research Inst., 8500 Culebra Rd., San Antonio)

16–20. American **Physiological** Soc., Atlantic City, N.J. (H. Rahn, Dept. of Physiology, Univ. of Buffalo, Buffalo 14, N.Y.)

16–20. British Inst. of **Radio Engineers**, Southampton, England. (BIRE, 9 Bedford Sq., London, W.C.1, England)

16–20. Federation of American Societies for **Experimental Biology**, annual, Atlantic City, N.J. (M. O. Lee, 9650 Wisconsin Ave., NW, Washington 14)

16–21. American Soc. for **Experimental Pathology**, Atlantic City, N.J. (K. M. Brinkhous, Dept. of Pathology, Univ. of North Carolina, Chapel Hill)

16–21. American Inst. of **Nutrition**, Atlantic City, N.J. (A. E. Schaefer, Bldg. 16, Rm. 207, NIH, Bethesda 14, Md.)

16–24. **Forensic Immunology, Medicine, Pathology, and Toxicology**, 3rd intern. meeting, London, England. (I. Sunshine, 2121 Adelbert Rd., Cleveland, Ohio)

17–19. Institute of **Environmental Sciences**, technical meeting and equipment exposition, Los Angeles, Calif. (Natl. Office, P.O. Box 191, Mt. Prospect, Ill.)

17–19. **Nonlinear Magnetics**, intern. conf., Washington, D.C. (Inst. of Radio Engineers, 1 E. 79 St., New York 21)

17–19. **Plastics**, joint congr. of West Germany, Switzerland, and Austria, Vienna. (Wirtschaftsförderungsinstitut der Bundeskammer der gewerblichen Wirtschaft, 3 Hoher Markt, Vienna 1, Austria)

17–20. American **Astronomical** Soc., meeting, Tucson, Ariz. (P. M. Routly, 265 Fitz Randolph Rd., Princeton, N.J.)

17–20. American **Geophysical** Union, annual, Washington, D.C. (AGU, 1515 Massachusetts Ave., NW, Washington 5)

17–20. German Soc. of **Surgery**, 80th meeting, Munich. (E. Derra, Chirurgische Klinik der Medizinischen Akademie, Moorenstr. 5, Düsseldorf, Germany)

17–21. Man, **Technology, and Medicine in Nuclear and Space Age**, 3rd in-

tern. congr., Rome, Italy. (A. J. Shneiderov, 1945 Calvert St., NW, No. 44, Washington 9)

18. Society of **Plastics Engineers**, regional technical conf., Syracuse, N.Y. (R. R. Collis, c/o Joseph Cashier & Co., Inc., 810 E. Water St., Syracuse)

18–20. **Neurosurgery**, 2nd European congr., Rome, Italy. (B. Guidetti, Viale Universita 30, Rome)

18–20. **Stereology**, 1st intern. congr., Vienna, Austria. (Vienna Medical Acad., Alserstrasse 4, Vienna 9)

18–21. Radiology in **Otolaryngology**, intern. symp., Bordeaux, France. (G. Guillen, 45, cours du Marechal Foch, Bordeaux)

20. New Jersey **Acad. of Science**, annual, Glassboro, N.J. (H. L. Silverman, 361 Highland Ave., Newark 4, N.J.)

21–24. **Rare Earth**, conf., Grand Bahama Island. (K. S. Vorres, Dept. of Chemistry, Purdue Univ., Lafayette, Ind.)

21–25. International College of **Surgeons**, North American Federation, annual, Los Angeles, Calif. (W. F. James, 1516 Lake Shore Dr., Chicago 10, Ill.)

22–24. Institute of the **Aerospace** Sciences, Dallas, Tex. (R. R. Dexter, 2 E. 64 St., New York 21)

22–24. American **Oil Chemist** Soc., Toronto, Ont., Canada. (K. F. Mattil, Swift & Co., Packers and Exchange Ave., Chicago 9, Ill.)

22–24. **Biomedical Engineering**, 3rd symp., San Diego, Calif. (J. H. McLeod, Program Committee, 8484 La Jolla Shores Dr., La Jolla, Calif.)

22–25. American **Physical Soc.**, Washington, D. C. (K. K. Darrow, APS, Columbia Univ., New York 27)

22–26. **Radioisotopes and Radiation** in Plant and Animal Insect Control, intern. symp., Athens, Greece. (J. H. Kane, Intern. Conferences Branch, Div. of Special Projects, U.S. Atomic Energy Commission, Washington 25)

22–27. American Acad. of **Neurology**, Minneapolis, Minn. (C. A. Kane, 80 E. Concord St., Boston, Mass.)

23–25. Electronic Processes in **Dielectric Liquids**, Durham, England. (Administration Assistant, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

24–26. German Soc. of **Hygiene and Microbiology**, Würzburg. (W. Herrmann, Städtischen Krankenanstalten, Robert Koch-Haus, Essen, Germany)

24–26. Institute of **Radio Engineers**, regional conf., San Diego, Calif. (E. Herz, 4444 Mt. Castle Ave., San Diego 17)

24–28. German **Roentgen** Congr., 44th, Baden-Baden, Germany. (H. Lossen, GRC, Universitäts-Strahleninstitut, Langenbeckstr. 1, Mainz, Germany)

25–27. Mississippi **Acad. of Sciences**, University. (C. Q. Sheely, Dept. of Chemistry, Mississippi State College, State College)

25–27. Ohio **Acad. of Science**, Wilberforce. (G. W. Burns, 505 King Ave., Columbus 1, Ohio)

25–27. **Population** Assoc. of America, Philadelphia, Pa. (P. C. Glick, Bureau of the Census, Washington 25)

25–27. West Virginia **Acad. of Science**, Buckhannon. (J. A. Duke, S.J., Dept. of Chemistry, Wheeling College, Wheeling, W. Va.)

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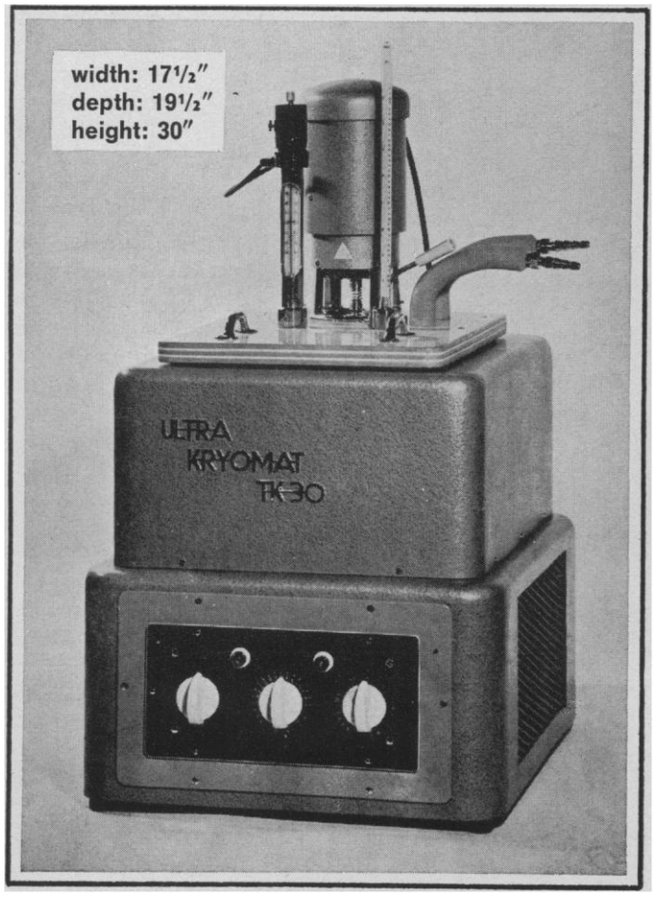

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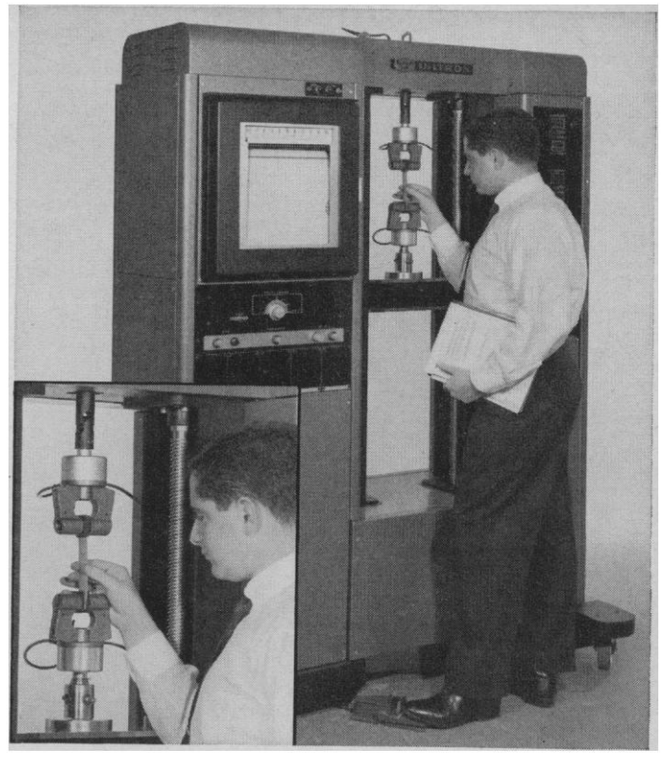

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aged, its radiations became poisonous and produced debility and death. Most of the Lemurians abandoned Earth. Some remained, one branch becoming our own ancestors. The other branch degenerated completely, withdrew to a vast system of caverns, and became a misshapen, evil race of "deros." Coming upon some devices left behind by the Lemurians which project mind-controlling rays, the deros have amused themselves ever since by causing all types of aberrant thought and behavior in mankind.

Obviously Shaver has predicted (i) solar particle emission, (ii) the aging and mutagenic effects of ionizing radiation, and (iii) recent findings as to the effect of direct electrical stimulation of various brain centers. In view of these prognostications, his other conclusions must be objectively re-examined—unless, that is, one simply feels, as I do, that while one bad apple spoils the rest, the accidental presence of one or two good apples does not redeem a spoiled barrelful.

POUL ANDERSON
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The Possibility of Compound Formation by Helium

The recent letter "On the chemistry of inert gases" by George Wald (*1*) contains many points which deserve discussion. We wish to comment only on Wald's proposition that "it should be exceedingly difficult to prepare compounds of helium, in which the . . . 1*s* orbital is filled and no others are available. . . ." The statement is undoubtedly correct if one considers only ionic bonding, as in the first reported xenon compound, $Xe^{+}PtF_6^{-}$ (*2*), or covalent bonding with heavy atoms, such as appears to be present in XeF_4 (*3*).

However, helium has long been known to form covalent bonds in the species HeH^{+} and He_2^{+}, first observed in mass spectrometric studies of ionized gases. Recent mass spectrometric studies of the beta-decay of HT and T_2 gases have shown that the predominant products are $^3HeH^{+}$ and $^3HeT^{+}$, respectively (*4*). About 90 percent of the helium-3 product of the decay reactions is found as helium hydride molecule ions which survive the 10^{-4} sec transit time of the mass spectrometer (*5*).

A qualitative explanation can be given for the stability of these diatomic

ions. Bonding in HeH^+ results from overlap of the 1*s* atomic orbitals of the two atoms. Only two electrons are present, and both lie in a bonding molecular orbital (the σs *orbital*). No inner electron shells are present to shield the nuclei, and the nuclei can therefore approach each other closely; this results in large overlap of the 1*s* wave functions and so in large covalent exchange energy. The same factors lead to strong bonding in the isoelectronic hydrogen molecule (heat of dissociation = 103 kcal/mole).

The same considerations apply to He_2^+, with the exception that an antibonding electron is also present, reducing the effect of the two bonding electrons. However, the equivalence of the nuclei is favorable, and the most recent quantum mechanical calculations suggest that dissociation energies for both species are in the range 40 to 50 kcal/mole (*6*). These estimates offer some hope that compounds of HeH^+ or He_2^+ with anions may be isolable, although they will probably be endothermic. The availability of $^3HeT^+$ from tritium gas may make it possible to detect very small quantities of helium hydride compounds radiochemically.

ROBERT WEST
LARRY HASKIN

Department of Chemistry, University of Wisconsin, Madison

References and Notes

1. G. Wald, *Science* **138**, 1350 (1962).
2. N. Bartlett, *Proc. Chem. Soc.* **1962**, 218 (1962).
3. H. H. Claassen, H. Selig, J. G. Malm, *J. Am. Chem. Soc.* **84**, 3593 (1962); C. L. Chernick *et al.*, *Science* **138**, 136 (1962).
4. A. H. Snell, F. Pleasonton, H. E. Leming, *J. Inorg. Nucl. Chem.* **5**, 112 (1957); S. Wexler, *ibid.* **10**, 8 (1959).
5. It is possible that ~ 90 percent represents an upper limit on the proportion of HeH^+ species generated, but in any event the proportion must be high. For a discussion see S. Wexler, *J. Inorg. Nucl. Chem.* **10**, 8 (1959).
6. A. Evett, *J. Chem. Phys.* **24**, 150 (1956); P. N. Reagan, J. C. Browne, F. A. Matsen, *J. Am. Chem. Soc.* **84**, 2650 (1962).

Physical Contact between Mother and Young

In the article "Critical periods in behavioral development" [*Science* **138**, 949 (1962)] J. P. Scott suggests that there must be negative mechanisms, including perhaps fear responses and rejection of strange young, which prevent or bring to an end the social relationship between mother and young.

To these components I would add a third possible factor—lack of physical

contact between mother and young. Experiments with maternal (broody) hens (R. A. Majer, *J. Comp. Physiol. Psychol.*, in press) indicate that, if a broody hen is prevented from having physical contact with chicks while other cues are left intact, the hen's broody response quickly dissipates.

It is possible that the fear response hypothesized by Scott and the physical-contact variable interact to bring about a normal termination of the mother-young relationship in chickens. For example, as the chicks become relatively large the hen may show a fear response and avoid them as she does other large (adult) birds, thus terminating the period of physical contact. Lack of contact could reduce the maternal hormone level, bringing about a break-up of the maternal response.

The biological significance of such negative mechanisms is clear: without termination of one maternal relationship, other relationships, notably sexual relationships, may not commence.

RICHARD A. MAIER
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Civil Defense

A potential enemy will surely perceive civil defense moves of the type advocated by A. W. Bellamy [*Science* **138**, 958 (1962)] in their strategic context. Regardless of our intent, the principal strategic effect of civil defense will be not to increase the chance of preventing all-out war but to perpetuate the "policy-backing" role of our offensive forces as a mechanism for threatening the enemy. For without civil defense our threats of massive retaliation, or of similar reaction incommensurate with provocation, acquire the nature of an embarrassingly transparent bluff.

The latest form of threat, known as the "no-cities" policy, makes obsolete Bellamy's statement that "there is general agreement that such an attack would result in heavy damage to the nation's industrial plants. . . ." According to the no-cities mythology, we can safely threaten to strike first ("pre-emptively") by planning an antiseptic attack on the enemy's offensive military forces alone, leaving his cities untouched. Being rational and a good loser, our opponent will retaliate in an equally antiseptic manner. Our superior force will then "prevail," thus justifying our preemptive action and the posture and policy of threats that lay behind it. This fairy tale would be amusing were it not the crucial substance of Defense Secretary McNamara's Michigan speech and the unspoken rationale behind the United States' current strategic stance and the composition of its armed forces for all-out war. On 22 October President Kennedy's Cuban-crisis threat of "full retaliatory response" to lesser provocation made explicit the preemptive-threat basis of U.S. strategy, in keeping with his advocacy the previous year of U.S. civil defense as the answer to the Berlin problem.

What advocates of the "defended posture" habitually forget is the technological versatility of the offense in reshaping its policy. Preparedness is met by counterpreparedness. If the U.S. seriously prepares itself for the Office of Civil Defense Mobilization's 2 weeks of shelter occupancy, apparently endorsed by Bellamy, the obvious enemy response is to prepare for a long war (for example, by insuring relative invulnerability of his striking forces through designing them for mobility and concealment). If food and petroleum are to be stockpiled above ground, they become targets for high-yield thermal weapons. If crops are, as Bellamy believes, not seriously threatened by fallout, they can be attacked by specific anticrop agents. If neutral nations are to be called on for assistance in post-attack recovery, they can be subjected to nuclear blackmail. And so on; offense readjusts to meet defense. It remains true that there is no place to hide.

In view of the possible penalties to a policy of deterrence—the forcing of the arms race that would result from our opponent's inevitable search for measures with which to counter our disaster "insurance"—it seems unprofitable to make even the first moves in this game, unless possibly it can be demonstrated that those moves would exert strong economic leverage such that a small investment in defense on our part would necessitate a large compensatory outlay on the part of the opponent. Bellamy has attempted no such demonstration. Nor has he attempted an analysis of the relative time scales for developing defensive measures and offensive countermeasures. He has failed to recognize the strategic implications of his recommendations, which are based, apparently, on behavioral considerations.

Both the aggressively threatening humanitarianism of the no-cities policy and the curatively threatening humani-

tarianism of the "defended posture" should receive short shrift from scientists or laymen oriented toward genuine humanitarianism. To love people and to respect their values is to think in terms of prevention, not of cure. As Bellamy's article and the rest that has been written on civil defense confirm, the belief that one can think both ways is subtly delusive.

T. E. PHIPPS, JR.
Research Department,
U.S. Naval Ordnance Test Station,
China Lake, California

Phipps illustrates well the controversial muddles that have beset nonmilitary defense policy-making and planning from the beginning. In making assumptions about enemy intentions and an enemy's reactions to our several security measures, he seems to miss the main point and purpose of my article.

In accepting the federal intent to create a civil defense system I attempted to *outline* a neglected and necessary part of that system and noted that "systematic study, by experts, is required to advance these proposals to the implementation stages." A main point of the article is that as long as there is federal determination to create a civilian defense system with survival potential, the system should be complete in both its short- and long-term aspects. I did not attempt to instruct the State or Defense Department on how it should respond to possible Russian reactions.

Phipps notes that "regardless of our intent, the principal strategic effect of civil defense will be not to increase the chance of preventing all-out war but to perpetuate the 'policy-backing' role of our offensive forces as a mechanism for threatening the enemy." Historians may one day record the extent to which an adequate civilian defense or the lack of it does or does not act as a deterrent or as a "mechanism for threatening the enemy." In my opinion the time is past when hypothetical enemy reactions to our postures and actions should be permitted seriously to affect our national interests, security measures, and countermeasures. I have no doubt that an "enemy will surely perceive civil defense moves of the type advocated. . . ." So what?

I am gratified that Phipps has taken time to read the article but disappointed that he neglected the main point and made no constructive criticism.

ALBERT W. BELLAMY
University of California, Los Angeles

"Fire Department" of Science

The editorial "A proper accounting" [*Science* **139**, 7 (1963)] caused me to recall that an earlier issue of *Science* [**125**, 949 (1957)] contained a letter on the same subject.

Is not the fact that, in the past 6 years, nothing has been done to correct this important deficiency in the communication system of U.S. science proof that something far deeper than this symptom is wrong with the organization of the "system"? Could it be that U.S. science really has no organization? Certainly neither the National Academy of Sciences, the National Science Foundation, nor any other agency has the authority to study, much less make decisions about, such matters. Isn't this proof that we lack the needed organizational machinery with which to solve important problems related to science?

In the absence of such machinery, many of the most fundamental decisions affecting the future development of U.S. science and the lives and work of individual scientists are being made by a process which might be called "studied neglect." The status of U.S. scientists in many vital matters can be compared to that of the owner of a new home in an isolated, somewhat unknown neighborhood, who discovers that his house is burning and that the fire is too big for him to handle alone. Not yet having a telephone he has no direct way to call the fire department. And anyway, he can't be sure there *is* a fire department. And if there is one, he doesn't know for sure if it is responsible for fires in "his" neighborhood. In his alarm he's likely to raise a window and scream "fire." But under those circumstances his scream will, I fear, probably be no more effectual than your editorial, or the 1957 letter, will be.

If this is an apt analogy it points to the need for establishing an official "fire department" of science—and for letting the public know what its functions are, how to communicate with it, how it can be used to solve problems such as the editorial points to, and so on. But that thought leads to the question: How would we do it?

Because of the fundamental issues of public and national policy involved, it seems clear that to answer the question in a way that would be influential would require a national debate. Probably the appropriate body to initiate such a debate is Congress. It could

easily be initiated by offering prizes for answers to some such question as this: What is the best way to reform our government machinery in order to improve the relationship of science to the federal government, and, by improving that relationship, to improve the total relationship of science to our whole society?

JOSEPH W. STILL
419 Cambridge Avenue,
Claremont, California

Messier 1

"The story of the Crab Nebula" [N. U. Mayall, *Science* **137**, 91 (1962)] caused me to examine my old radio maps [G. Reber, *Proc. I.R.E. (Inst. Radio Engrs.)* **1948**, 1215 (1948)]. At 480 megacycles per second the most prominent feature of the winter Milky Way corresponds with the position of Ml. Apparently I encountered this object without being aware of its nature. The observations were made during 1946–47.

GROTE REBER
"Dennistoun,"
Bothwell, Tasmania, Australia

Science for the Humanist

The editorial "Science and the humanities" [*Science* **138**, 1367 (1962)], commenting on James H. Mathewson's excellent article on educating the nonscientist in the nature of science [*ibid.* **138**, 1375 (1962)], exhibited a parochialism and arrogance unworthy of the pages of *Science*. The editorial says that science is difficult; therefore our educational process should be geared to the teaching of science. After that, the graduate can pick up the humanities at his leisure because "after the rigors of training in science, the subject content of the humanities seems hardly more difficult than a good novel."

Are the myriad individual and social problems of a typical blighted area of a big American city (poverty, dependence, mental health, delinquency and crime) really so easy of solution? How about the economic, social, and cultural problems of developing areas? Racial conflict? War? Ethics? Can rigorously trained scientists, after a bout of easy novel-like reading, undertake to tell us how to meet these problems?

To paraphrase the comment by Ken-

neth E. Boulding in a review of two works on sociology in the *Scientific American* (issue of January 1963), it is very tempting for the physical scientist to conclude that, because all of us live in a society and inevitably pick up a considerable amount of folklore about it, amateur standing is all that is necessary in that area and that, if we need to solve social problems, a few Pugwash conferences of distinguished physicists will do the trick.

What the rigorously trained scientist needs to realize—especially if he is going to speak publicly as a representative of the scientific community—is that science is not the only body of learning and technique that, in the phrase of the editorial, is standing between our civilization and "chaos and starvation." A not insignificant problem of education today is how to give the scientist an appreciation of the nature of man and society.

ELEANOR GREENWALD
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Mathewson's article on science for the citizen does indeed point up many of the difficulties that beset those of us who are involved in general-education science courses.

What Mathewson does not mention is our most annoying problem: time. In the typical general-education sequence, a nonscience major is required, or urged, to take a 1-year course in the physical sciences and a 1-year course in the biological sciences. In some colleges the requirement is reduced to a semester course in each of these areas. How solid a grasp of the methodologies of science can a student acquire in this amount of academic time?

In the case of the physical sciences (the area in which I teach), what effect does this time limitation have on the criteria for selecting subject matter? Should the academic year be devoted to the study of case histories in physics alone? or in chemistry? or in geology? There is certainly enough material in each of these areas for a full-year cultural course. What effect does the background and bias of the individual teacher have on decisions about what material is "relevant" and what is not? How much mathematics ought to be (or *must* be) involved in a physical science course in order for the student to understand the part played by mathematical thinking in the development of physical ideas? Can the student understand the

significance of Newtonian mechanics without working problems which involve $F = ma$? What is of more worth to the nonscience major—to know that $s = \frac{1}{2}gt^2$ or to understand the second law of thermodynamics? Or is *any* emphasis on mathematical discipline a waste of time in such courses? Would the student be better off if he read C. P. Snow and discussed the impact of science on society? At any conference on general education that I have attended, these questions have always been bounced around in random Brownian motion, but the answers are usually not satisfactory.

A secondary nuisance in a physical science course is the fact that the average student in such a course has managed to forget most of the algebra and geometry of his high school years (there must be a Freudian explanation for this). Therefore, if one attempts to use the most simple mathematical logic as a necessary part of the course, part of the course time usually has to be spent on remedial work in mathematics. In other words, the teacher finds himself spending some weeks of discussion time doing over the work of the high school mathematics teacher, while more pertinent course material has to be bypassed or rushed over. It has also been my experience that a considerable number of students in such a course enter the university ill equipped to read and understand most of the books written for the layman about science.

In my opinion, the answer to many of the questions raised by Mathewson does not lie only in the re-evaluation of general-education courses. I am in agreement with the author of the editorial when he states that much of the fault lies in the structure (or lack of it) of science teaching all the way down the educational line to kindergarten. There is now some excellent work going on in the restructuring of science teaching in the elementary and secondary schools. If these new approaches to science teaching seem to provide the kind of exposure to science we think proper for our children, then the next step involves the preparation of teachers to teach such courses. It seems to me that with the admission to the university of students better prepared to understand scientific thinking, solutions to many of the problems in the teaching of general-education science courses will become obvious.

SIDNEY ROSEN

1417 Mayfair Road,
Champaign, Illinois

I take exception to, but do not completely oppose, some remarks in Mathewson's valuable article.

First, Mathewson writes, "The purpose of our schools is the development of free, capable, and responsible individuals aware of something beyond their desks. . . ." Although I do not claim to know, with certainty, the purpose of our schools, it seems to me that an ideal purpose, which subsumes that stated by Mathewson, is the providing of a forum for independent and original *inquiry* upon any matter still open to investigation that presents itself to the intellect. Such inquiry would be the basis of the awareness about which Mathewson writes.

Second, I, for one, do not believe that we have at present the capacity to outdo the Soviets in matters of technological improvisation; certainly our engineering schools are not training people along such lines. Unless I am mistaken, our superiority rests in the realm of creative pure science, which does not have immediate technological import. Since the technology of tomorrow is determined in no small part by the science of today, our technological marathon with the Russians may well be decided on the basis of the creative scientific endeavors of this decade and past ones.

Third, Mathewson writes, "The scientist can no longer feel that the essential amorality of science absolves him from responsibility for the uses of technological power." But what could be more moral than science (truth), which assumes a commitment of mental behavior (by an agent) to a self-correcting method—namely, the scientific method? In order to engage in scientific inquiry one must be involved in a form of deliberate mental conduct for which the agent is responsible. The logical methodology of science presupposes an ethical norm, and one cannot be scientific except upon an ethical and esthetical basis. In the context of science, amorality appears in the form of amoral activity passing for science.

Finally, it seems to me that if one has been trained thoroughly as a specialist, then, out of habit, one would not endeavor to broaden oneself when one's formal training ends.

ALBERT A. MULLIN
University of Illinois, Urbana

I don't know when I have agreed more heartily with another man's point of view than I did while reading Mathewson's "Science for the citizen: an educational problem."

There was, however, an assumption stated as a truism, with all its implications for educational and political systems, that must not go unchallenged. This is the notion—and that's all it is—that the Russian people "are coerced and apathetic citizens."

Where do we see this coercion and apathy? Do Russian films, ballet, opera, poetry, and art reflect this? Have returning tourists and scholars conveyed this impression? Are such mannerisms exhibited by Russian teachers and politicians? What of Russian athletes—can they be labeled apathetic?

The "facts," as I interpret them, incline me toward the opposite view—one that is not lulling in its simplicity. As we seek to strengthen our own society, let us not measure another's with imperfect yardsticks. To paraphrase one of the Soviet saints, self-deception can be the opiate of the people.

M. A. BENARDE
Rutgers University, New Brunswick, New Jersey

The problem expounded by Mathewson is one that the journalist has recognized for a longer time, perhaps, than the scientist or even Admiral Rickover. Most of us would agree that "the scientist and the nonscientist must learn to understand each other and to act on . . . common goals and values."

I would like to share an experience that raises doubts that Mathewson's proposed science survey courses or the editorial proposal of "almost continuous exposure to science, beginning in the primary grades," lead to viable solutions. It may be that neither goes far enough; the trouble may be too deep-seated to be correctable through tinkering with the curriculum.

I inquired of a class of senior journalism students why they so strenuously resisted the idea of taking courses in natural science, particularly physics and chemistry. Several years of academic counseling had given evidence of such resistance on the part of students in the social sciences and the humanities. Didn't they realize that, living in the atomic and space age, and being journalists, they had better expose themselves to its key sciences? The replies, from students from half a dozen different secondary-school backgrounds, were all the same, and disconcerting. Remember, these seniors of the class of 1963 were high school sophomores when the first sputnik was launched, and they had encountered the scholastic belt-tightening that followed. Sure,

they'd like to take physics and chemistry, rather than the easier zoology-botany or astronomy-geology sequences they chose to fulfill distribution requirements. But they couldn't. Why not? Because in high school they had had to make the decision to go the science-mathematics route or the humanities-social sciences route. And quite definitely, they testified, they couldn't sample or straddle—not if they expected to make the grades and get the credits needed for admission to college.

Is this division of the flock at the secondary-school level general, and is it contributing to Sir Charles Percy Snow's frightening dichotomy of "the two cultures"?

KARL F. ZEISLER
Department of Journalism, University of Michigan, Ann Arbor

I find it distressing that the recent editorial "Science and the humanities" should perpetuate C. P. Snow's gap between the two cultures in a manner so blatant and, indeed, Victorian. With the phrase "After the rigors of training in science, the subject content of the humanities seems hardly more difficult than a good novel," one wipes away as trivial all the nonscientific scholarship of our civilization in general and our universities in particular.

Any reasonable acquaintance with the recommended study of scientists (rather than of science itself) as a subject for humanists shows that it is not a necessary condition that there exist a type specimen or standard sample from which to proceed. One can proceed to study science from the outside (historically or philosophically), just as one can study political history without being trained as a politician, or economics without becoming a successful businessman. Indeed, one may criticize Mathewson's proposal from the other direction; he seems to be ignorant of the fact that much of what he proposes (and more) is already in being, and in process of rapid and effective extension.

There are at least nine graduate schools now offering doctorates in the history and philosophy of science (including the sociology, economics, and politics of science) and more than 30 colleges offering undergraduate instruction in this field. At Yale, courses in the history of science have become valuable supplementary fare for scientists and humanists, and history of science has a sizable research program in its own right. At Oak Ridge during June and July 1963 there will be a summer institute designed to give nonscience college teachers an opportunity to discuss these aspects of science, in the expectation that they will introduce such discussion into their own teaching programs. In these ways, it is hoped, we may at one and the same time solve the problem stated by Mathewson and help prevent the rise of another generation of scientists that can hold such an absurdly derogatory view of humanistic scholarship as that expressed in the editorial.

DEREK J. DE SOLLA PRICE
Department of History of Science and Medicine, Yale University, New Haven, Connecticut

Effects of Penicillin on Bacteria

The interesting and constructive paper by J. Ciak and F. E. Hahn dealing with the antimicrobial action of penicillin [*Science* **137**, 982 (1962)] states, "Lysis of *S. aureus* under the influence of penicillin has rarely been mentioned," presumably as a mode of action of penicillin or as a consequence thereof. A reference from 1957 and another from 1959 are cited.

Actually, such effects were reported, and considered a mode of action, early in the penicillin story. Bonét-Maury and Pérault [*Nature* **155**, 701 (1945)] reported that when cultures of *S. aureus* are exposed to appropriate concentrations of penicillin, "proliferation stops almost immediately, followed by slow lysis of the bacteria," and that penicillin exerts a "very powerful lytic action." A year earlier, Nitti *et al.* [*Ann. Inst. Pasteur* **70**, 80 (1944)] made a similar observation. In 1947 Dufrenoy and Pratt referred to "bacteriostatic, bacteriocidal [*sic*], and bacteriolytic concentrations" of penicillin [*J. Bacteriol.* **53**, 657 (1947)], and Pratt and Dufrenoy offered an explanation for the "extensive bacteriolysis" of *S. aureus* exposed to the antibiotic [*ibid.* **54**, 127 (1947)].

In 1949 it was suggested that one fundamental effect of penicillin is qualitatively similar in Gram-positive and Gram-negative bacteria, but quantitatively different. "The evidence indicates that penicillin affects aerobic Gram-positive and Gram-negative organisms by blocking the catabolism of nucleotides. The threshold concentra-

tion at which its effects become manifest [in the two classes of organisms] is, however, many times greater . . . with Gram-negative organisms than . . . with Gram-positive organisms" [Pratt and Dufrenoy, *Antibiotics* (Lippincott, Philadelphia, 1949), p. 214]. This view is not incompatible with the "unified hypothesis of penicillin action" cited by Ciak and Hahn as proposed by Park and Stromiger [*Science* **125**, 99 (1957)] nearly a decade later. The latter authors did, however, present precise quantitative data to support their view, whereas the earlier proposal was based on less refined data and did not pinpoint the effects on cell-wall formation.

ROBERTSON PRATT
University of California
Medical Center, San Francisco

Therapeutic Dosage in Small and Large Mammals

The research report "Lysergic acid diethylamide: Its effects on a male Asiatic elephant" [*Science* **138**, 1100 (1962)] on the therapy of the Proboscidea contains an elephantine fallacy. In these days when certain highly organized groups are striving earnestly to legislate against animal experimentation, it is unfortunate that quite so gross an error should appear in print. The basic problem seems to be extrapolation from limited data acquired in therapy of small mammals in determining the first therapeutic dose to be used on a larger form. To my knowledge no very precise set of rules exist, but some general principles are of value.

Rule 1. If we wish to determine, from toxicity data based upon findings in the cat, a therapeutic dose safe for an elephant, our first rule is to consult a veterinarian or, if possible, an animal husbandman with experience in handling elephants. Probably the best individual is a veterinarian with experience in dosing animals in a zoological garden. Individuals experienced in human therapeutics are too much limited by their training. Their thinking is confined essentially to one species of animal, and they have no proper experience upon which to draw in trying to transfer data obtained from one species to a second species.

Rule 2. The metabolic rates, including the rates of metabolism of drugs, of two animals are related not as the weights of the animals but as their sur-

face areas. If the two animals are very similar in body proportions, and if their weights are not very different (a ratio of not more than 1 : 10) one may arrive at a fairly reasonable therapeutic deduction by extracting the cube root of the weights of the two animals, then squaring the two figures and obtaining a therapeutic ratio from the square. This calculation may be simplified by obtaining the ratio of the two weights, extracting the cube of the ratio, and squaring the root. For example, the ratio of the weight of a cat to the weight of a man is approximately 1 : 30; that of the weight of a man to the weight of an elephant, approximately 1 : 50. The cube root of 50 is approximately 3.7, and the square of 3.7 is 13.7. Accordingly, the dose of lysergic acid for an elephant, as extrapolated from the oral dose for man, should have been 2½ to 3 milligrams rather than 297 milligrams.

Rule 3. Extrapolation on the basis of a simple comparison of weights is not valid in the case of man and elephant because the two weights are not similar (the ratio is greater than 1 : 10). It is a useful rule in extrapolating from a relatively small species of mammal to a large species, especially if it is important to be on the safe side because the animal is of great value, to point off one additional decimal place in making the calculation and to use this low dose as a start. A dose of 300 micrograms is all that could be recommended as the initial dosage in experimental administration of lysergic acid to an elephant. Admittedly this dosage is not much above that found necessary in the oral treatment of humans. However, we are by-passing the liver when we administer the drug by injection, and we may expect a somewhat sharper reaction when the method of administration is that employed in the experiment described. I might point out that the effective dose for a cat bears much the same relationship to the effective dose for a man that the effective dose for a man bears to the suggested dose for an elephant.

Rule 4. In extrapolating from one species of animal to a very different species one should be extremely conservative in deciding upon the first dose to be administered because unexpected reactions are likely to occur. Generally, closely related species show similar responses to therapy, but many exceptions to the phylogenic rule are known. Caution is required.

PAUL D. HARWOOD
Hess and Clark, Ashland, Ohio

New Products

Neutron generator (model 110) is designed to produce 14 Mev neutrons from the D-T reaction. Neutron yield is said to be greater than 10^{10} neutrons per second continuously. The ion source and the accelerating tube assembly are oil immersed to eliminate danger to personnel from exposed high voltages. Vacuum function, beam energy, and beam current are remotely controlled and metered. Operating vacuum is approximately 10^{-4} mm-Hg and ultimate vacuum is 10^{-6} mm-Hg. The target is titanium tritide. The equipment is housed in a steel cabinet mounted on heavy-duty casters.—J.S. (Technical Measurements Corp., 441 Washington Ave., North Haven, Conn.)

Circle 1 on Readers' Service card

Electron mirror microscope permits visual observation of electron-deflecting irregularities on a specimen. The specimen serves as an electron-optical mirror element and simultaneously constitutes the specimen. In general the mirror specimen remains untouched by the image-forming electrons because the specimen is biased slightly negative with respect to the electron beam source. Electrons approaching the specimen are slowed to zero axial velocity shortly before reaching it, and then reverse their direction of motion. Irregularities in the potential or magnetic gradients in front of the specimen capable of deflecting the approaching and receding electrons will modify the spacial density distribution of the returning electron beam. The returning beam carries back information about the distribution of irregularities on the mirror specimen and this is presented on a phosphorescent screen as a magnified, visually observable image. Magnification range is approximately 20 to 1500. Resolving power is 0.2 μ.—J.S. (General Mills, 1620 Central Ave., Minneapolis, Minn.)

Circle 2 on Readers' Service card

Flow-through hemophotometer is a companion to the Fisher hemophotometer model 55 direct-reading colorimeter for hemoglobin. After the sample is read, a toggle switch is flipped to the "empty" position and a peristaltic suction pump evacuates the cuvet. The cuvet is emptied in about 2 seconds and it is claimed that crossover contamination is insignificant. This model requires a sample of 0.02 ml of whole blood per determination, and has the same accuracy as the Fisher model 55.—R.L.B. (Fisher Scientific, 415 Fisher Bldg., Pittsburgh 19, Pa.)

Circle 3 on Readers' Service card

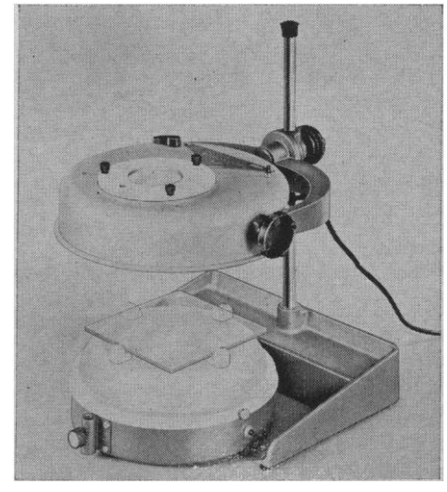
Acoustic-marker receiver (model 502) is designed for submersible use at pressures up to 150 lb/in^2 and temperatures from 0 to 50°C. Incoming signals are amplified by a low-noise preamplifier and heterodyned with a variable oscillator in a balanced diode mixer. The difference frequency passes to a 1 kcy/sec variable-gain amplifier feeding a power amplifier that drives an earphone. Tuning range is 34 to 41 kcy/sec to accommodate conventional acoustic markers. Ranges up to 1 mile are said to have been achieved with the Clevite acoustic marker. The unit is portable and completely transistorized. Power is supplied by four size-D flashlight cells with 400 hours nominal life. Audio power output is 125 mw and output impedance is 600 ohms.—J.S. (Straxa Industries, 790 Greenfield Dr., El Cajon, Calif.)

Circle 4 on Readers' Service card

High-resolution television camera system provides resolution of 1000 lines horizontal and 700 lines vertical, with distortion said to be less than 3 percent. The system includes camera, camera control synchronization generator, and necessary power supplies. The camera uses a 1.5-inch vidicon tube and contains a low-noise video amplifier. The camera is said to deliver the specified resolution with the vidicon tube face plate illuminated by as little as 6 ft-ca. Also included are a video preamplifier, deflection amplifiers, electron sweep failure protection, and an overscan feature for setup and alignment. The camera control includes all vidicon adjustments. The synchronizing generator that furnishes driving and blanking signals incorporates a binary divider countdown for stability and ease of maintenance. Video response is flat ± 1 db at 25 Mcy/sec. Scanning is interlaced 2 : 1 with 30 cy/sec frame rate. Horizontal scanning frequency is 30.87 kcy/sec. Video output is 1.5 volts composite p-p, black negative. Standard 35-mm optics are furnished. The system includes separate high peaking, phase correction, and delay line aperture correction.—J.S. (Thompson Ramo Wooldridge Inc., 455 Sheridan Ave., Michigan City, Ind.)

Circle 5 on Readers' Service card

Macroscope has magnifications of 2.5 and 3.5 supplied by achromatic, aplantic optical system. These magnifications can be doubled by addition of a swing in multiplier. Illumination is supplied by a circular, 22-watt fluorescent light above the object. An accessory light table is available supplying underneath lighting for examining transparent and translucent objects, dissection, or specimen preparation. A special



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 689. Circle the department number of the items in which you are interested on this card.

mount adapts the unit to accommodate any 35-mm camera. The lens system is yoke-assembled and rod-supported on a cast-iron base, and has height and tilt adjustments for proper focusing. The unit is 16 inches high with a base measuring 15 by 10⅜ inches.—R.L.B. (Scientific Products, 1210 Leon Pl., Evanston, Ill.)

Circle 6 on Readers' Service card

Sweep generator (model PD-8) is capable of delivering up to 4 watts of swept or modulated swept radiofrequency power over the frequency range 330 to 1010 Mcy/sec. It is also capable of operating in continuous-wave or modulated-continuous-wave modes. In continuous-wave modes, the instrument furnishes up to 2 watts with 100 percent duty cycle. Outputs may be set at any value up to their maximum by means of a turret attenuator graduated from 0 to 59 db in 1-db increments. Additional attenuation can be provided by accessory equipment. Constant output amplitude is maintained automatically. Center frequency range is 375 to 1000 Mcy/sec and sweep width is continuously adjustable from 0.0r to 15 percent. During retrace, the sweep oscillator is blanked to provide a zero line on the display oscilloscope. A marking system incorporated in the instrument will accept up to five crystal-controlled frequency markers.—J.S. (Telonic Industries, Inc., 60 N. First Ave., Beech Grove, Ind.)

Circle 7 on Readers' Service card

Semiautomatic **a-c instrument calibration standard** (model 1967) provides for calibrating a-c voltages, current, and power-measuring instruments over the frequency range 50 to 3200 cy/sec. The console for calibration of voltmeters and ammeters contains a variable-frequency power supply, multitapped potential and current ratio transformers, necessary controls, and an accurate reference source for monitoring the voltage or current circuits. For calibration of wattmeters, two power supplies are provided. Phase of the two supplies is locked at unity phase angle for calibration at 50, 60, and 400 cy/sec. Short-term stability of the supplies is said to be better than 0.02 percent and harmonic distortion less than 1.5 percent at 60 and 400 cy/sec. All current and voltage outputs are referred to a standard cell of ± 0.01 percent accuracy rating by means of a thermoelement, galvanometer, and servo-amplifier circuit. The frequency range is

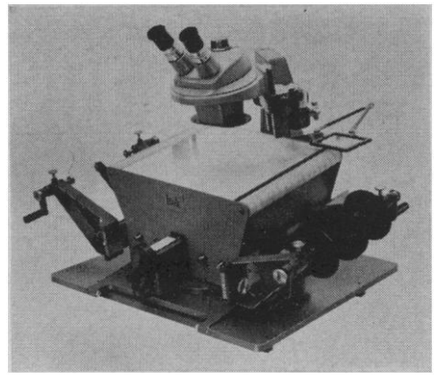
covered in seven fixed settings as well as in two adjustable ranges from 150 to 3200 cy/sec. The 50- to 150-cy/sec range can be made adjustable by addition of external capacitors. The maximum limit of current error traceable to primary standards is said to vary from ± 0.03 percent to ± 0.13 percent of dial reading from no load to full load at 50 to 400 cy/sec, depending on range of downscale value selected. The maximum limit of error for voltage measurements is said to vary from ± 0.03 to ± 0.18 percent under the same conditions. Calibration data are supplied for any three frequencies. The limit of error for wattmeter calibration is said to be ± 0.2 percent, including errors due to phase shift. By using external accessories for measuring phase angle, wattmeters having up to 0.5 power factor can be calibrated.—J.S. (Radio Frequency Laboratories, Inc., Boonton, N.J.)

Circle 8 on Readers' Service card

System for automatic readout of spectrometric data (model MSD2) provides a printed and punched-tape record of the voltage peaks and corresponding acceleration voltages measured by mass spectrometers. The instrument utilizes digital decision-making and computing elements for peak detection. Voltage range of the instrument is 0.000 to 9.999 volts d-c. Voltage digitizing accuracy is said to be ±(0.01 percent of full scale + 1 digit). Resolution is + 0.01 of full scale. Mass number range is 0 to beyond 250 and mass number accuracy is said to be ± 0.2 percent under the worst conditions. Overall speed is 3 peaks per second, limited by the printer and tape punch used. Voltage digitizing time is 170 μsec. All elements of the completely transistorized instrument are designed to fit into standard rack mounts. Provision is made for inserting external data and for calibrating the mass spectrometer.—J.S. (Non-Linear Systems, Inc., 1 Quality Lane, Del Mar, Calif.)

Circle 9 on Readers' Service card

Dual-path stereo viewer (model 45) is designed for quick-look and detailed examination of aerial, missile, instrumentation, and research photography. The viewer will accommodate two rolls of 70-mm or 5-inch film, single rolls of 9-inch film, or a combination of 70-mm and 5-inch rolls concurrently. Features of the instrument include a



cross-slide adjustment for stereomicroscopic viewing; rotation of viewing plane through ± 90°; tilting of viewing plane up to 20° forward, independent of rotation; and built-in film tension A mount is provided for installation of the purchaser's microscope.—J.S. (Itek Corp., 10 Maguire Rd., Lexington, Mass.)

Circle 10 on Readers' Service card

Critical **alignment and standardization of TV cameras** is provided by equipment that attaches to the lens mount of studio or closed-circuit TV cameras to check optical-mechanical alignment, sensitivity, and calibration. Internal test patterns are used instead of external patterns. Light level and color temperatures are adjustable, and even illumination, free of hot spots, is provided by an integrating sphere. A specially developed photocell measures light intensity on the face of the camera pick-up tube for sensitivity testing. All standard SMPTE and EIA test patterns are available in black-and-white and color. Special patterns can be provided.—J.S. (Photo Research Corp., 837 N. Cahuenga Blvd., Hollywood 38, Calif.

Circle 11 on Readers' Service card

pH-mv electrometer (model 135) features an expandable *p*H scale which allows any one *p*H unit to be expanded to full scale. This permits readability of 0.001 *p*H with repeatability within ± 0.003 *p*H and a cumulative accuracy of plus or minus 0.01 *p*H full scale. The Electrometer has four ranges: 0 to 14 *p*H, any 1 *p*H unit full scale, 0 to 1400 mv, and 0 to −1400 mv. The temperature compensation control is calibrated in 1° units from 0 to 50°C. A *p*H balance control knob allows *p*H calibration. The input impedance is greater than 10^{13} ohms, great enough to handle all types of glass electrodes. The meter has a chopper-stabilized amplifier, and it is claimed that there is no discernible zero drift or noise. It has an offset current of 10^{-13} amp and a recorder output of 1.0 ma.—R.L.B. (Instrumentation Laboratories, Inc., 108 Cummington St., Boston, Mass.)

Circle 12 on Readers' Service card

Solid sampler (model SS60) for chromatography makes sampling possible by either dissolving the sample or by melting it. With the solid in an interfering solvent, a 1-μl or 10-μl syringe is used to sample the solvent mixture. This quantity is evaporated onto the sample tongue of the plunger and the plunger is withdrawn into the septum-penetrating needle. When the needle is inserted into the septum and the plunger depressed, the helium stream has sufficient heat capacity to give proper flashing of the sample into the carrier gas. If the sample is available only as a solid and any solvent residue will interfere, the described technique is used to establish chromatograph response per microgram of peak height. Then a melt is made or the warmed plunger tongue touched to the powder and this injected into the chromatograph as above. Simple calculation from peak height gives the quantity injected. Cleaning is accomplished by washing with normal solvents, drying, and putting the needle into the chromatograph and extending the plunger for a few minutes.—R.L.B. (Hamilton Co., Inc., P.O. Box 307, Whittier, Calif.)

Circle 13 on Readers' Service card

Digital telemetering system, consisting of the model 190 transmitter and the model 210 receiver, transmits over a four-wire line. When used with digital voltmeters, these instruments permit reading of voltages at locations remote from the data source without introducing errors or malfunctions caused by line drops, noise, or capacitance. Line noise errors are virtually eliminated, since only pulses received in synchronism with a transmitted clock pulse are accepted by the receiver, and then only when accompanied by the complement of each data pulse. Pulse-shaping circuits in the receiver permit use of lines with relatively large capacitance and inductance. Speed of the system is 36 msec per 5-digit number. Capacity is 19999 in the decimal number system. Special versions are available with a capacity of 99999 and additional data bits for decimal points, polarity signs, and functional data. Standard models accept input data in the decimal number system in time-parallel form. An

auxiliary digital output of the data receiver furnishes 8-4-2-1 binary-coded-decimal output for computer use.—J.S. (Non-Linear Systems, Inc., Del Mar, Calif.)

Circle 14 on Readers' Service card

Dynamic displacement calibration system uses interferometer methods to provide absolute calibration of accelerometers at frequencies up to 20 kcy/sec. The system is composed of an interferometer, a piezoelectric vibrator and driver. Useful frequency range of the interferometer is 500 cy to 20 kcy/sec. Absolute displacements can be measured over the range 4×10^{-6} to 4.5×10^{-5}. The vibrator is constructed of stacked piezoelectric wafers bonded together. It contains a monitoring standard accelerometer and provides for mounting either a mirror or the accelerometer to be calibrated. Wave form distortion is said to be less than 2 percent to 20 kcy/sec.—J.S. (Gulton Industries Inc., 212 Durham Ave., Metuchen, N.J.)

Circle 15 on Readers' Service card

Vacuum viscometer measures absolute viscosity over a range of 0.01 to 60,000 poises. The instrument is of the glass capillary type and uses the driving force of an applied vacuum instead of the liquid head to move the fluid through the capillary; hence the measured viscosity is independent of the fluid density and is computed directly in absolute units. In use, a vacuum of 5 to 50 cm-Hg is applied to the small arm of the instrument containing the timing bulbs; two timing bulbs are used to extend the convenient operating range of each instrument. Eleven standard tubes with overlapping scales cover the range. Absolute viscosity in poises (or centipoises) is obtained by multiplying the fill time in seconds by the viscometer constant which is supplied with each viscometer. Shear rate is calculated by dividing a second viscometer constant by the fill time in seconds. The instrument requires a constant temperature bath depth of 7 inches and a sample size of about 6 ml.—R.L.B. (Cannon Instrument Co., State College, Pa.)

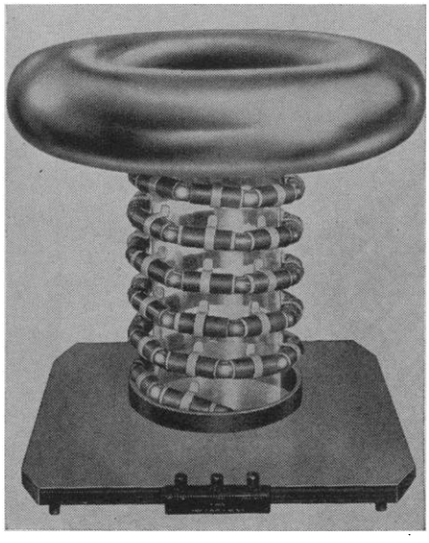
Circle 16 on Readers' Service card

Magnetic data storage device, available in several storage capacities, uses the Bernoulli principle to stabilize the flexible recording medium used in the form of disks. The rotating disk pumps air between itself and the headplate. This flow is controlled so that the hy-

drodynamic forces of air and the dynamic and elastic forces on the disk result in a stable equilibrium. The flow of air is said to assure close and controlled separation between the disk and headplate and to prevent contact between them. Four series, the BD-10, BD-100, BD-200, and DB-500, have storage capacities up to 82,500, 320,000, 320,000, and 777,200 bits respectively. Standard interchangeable assemblies provide numerous speed, track, and packaging configurations. Complete data storage systems including these disk memories are available.—J.S. (Laboratory for Electronics, Inc., Boston, Mass.)

Circle 17 on Readers' Service card

High-voltage divider is said to provide ±0.05 percent accuracy. Each 100-kv unit consists of 100 individually shielded 1-megohm resistors, matched to each other to achieve an approximate temperature coefficient of less than 1 ppm per degree centigrade and connected in series to form a vertical helix between ground plate and a high-voltage electrode. Corona, heating, and leakage error are said to be less than 10 ppm at 50 kv and 50 ppm at 100 kv.



The high-voltage electrode of the divider is designed to give uniform gradients to ground and to allow stacking of additional units for measurement of higher voltages. Each unit is 22.25 inches high. The divider can be used for 60 cy/sec a-c measurements with overall accuracy said to be ±1 percent based on the use of the manufacturer's model ESD electrostatic voltmeter for readout.—J.S. (Sensitive Research Instrument Corp., 310 Main St., New Rochelle, N.Y.)

Circle 18 on Readers' Service card

Electron focusing feature for projection x-ray microscope provides a means for observing the focus of the electron beam on the target. The quality of the image produced by a projection x-ray microscope is dependent upon the size of the x-ray source which is in turn determined by the focus of the electron beam on the target. The new feature of the Norelco-Projection x-ray microscope provides a means for observing those electrons that are scattered at the focal point and go back through the magnetic lens system. These electrons form an image of the target spot on a fluorescent screen that is viewed through a special viewing port to permit visual monitoring of the target electron image. Without this feature it is necessary to focus the spot by observing the quality of the projected x-ray image on a fluorescent screen. Now, it is unnecessary to view the actual x-ray image when adjusting for sharpness. The operator observes minimal electron spot size on the x-ray target in a room having normal illumination. Backscatter beams are made to deviate slightly from the primary beam by slightly tilting the magnetic lens. The backscatter image is intercepted by the fluorescent screen and its primary beam is passed through an aperture. With this device, electron focus can be observed with excellent intensity (brightness approximately 1000 times higher than fluorescent image) and large magnification. Small changes in focusing conditions and lens errors are easily detected, column alignment is simplified, and consistent image quality is attained.—R.L.B. (Philips Electronic Instruments, 750 S. Fulton Ave., Mt. Vernon, N.Y.)

Circle 19 on Readers' Service card

Burrell-Severs **thermal incline** is designed to disclose differences in flow properties and setting time of heat-sensitive materials, such as epoxy and polyester resins, over a wide temperature range. In operation, a sample is poured into a tilting trough through which it spills onto a large pivoted aluminum plate on which a stable temperature gradient has been established. The angle of tilt of the plate is adjusted according to the nature of the sample. A time-temperature curve can be determined from the contour of the gelled edge.—J.S. (Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.)

Circle 20 on Readers' Service card

Very-low-frequency receivers are designed primarily for reception of standard frequency and time reference broadcasts. The receivers are fixed-tuned units of transistor design. Special effort has been made to stabilize phase delay in the design of the instruments to preserve reference phase of the received signals. A beat-frequency oscillator provides for audio monitoring through the self-contained speaker. Sensitivity is said to be 0.1 μv at 10 ohms source impedance for a 4-db signal-to-noise ratio at the output. The unit weighing 5.25 lb is mounted in a 3.5-inch relay rack section. Auxiliary equipment is available to permit use of the receiver as a frequency comparator.—J.S. (Aerospace Research Inc., 130 Lincoln St., Boston 35, Mass.)

Circle 21 on Readers' Service card

Cryogenic quality meter is designed to determine the vapor content at a given point in a multiphase cryogenic flow system. The meter is composed of a pipe section, designed to be inserted into the cryogenic system, and an electronic rack. The pipe section contains capacitance and temperature transducers. Functioning of the instrument is

based upon determination of the dielectric constants of the liquid, the vapor, and the two-phase fluid. Temperature, upon which dielectric constant of the fluid is dependent, is sensed with a standard transducer with accuracy said to be ±0.1°K. Dynamic range of the instrument is 0 to 100 percent vapor, and accuracy is said to be ±1 percent of full scale. Response time is less than 2 msec. Continuous indication is provided by a built-in meter and provision is incorporated for operation of recorders or for oscilloscopic display. The basic instrument can be modified and augmented to make measurements of temperature, liquid density, vapor density, volumetric flow, and mass flow.—J.S. (Space Science Inc., 2 Mercer Rd., Natick, Mass.)

Circle 22 on Readers' Service card

Random-noise generator (model 1402) is designed for use as part of an integrated measuring system for calibration, frequency-response measurements, environmental testing, and reverberation and acoustic transmission measurements. The noise generator furnishes a uniform spectrum density, ±0.5 db, from 20 cy to 20 kcy/sec with a symmetrical Gaussian amplitude distribution to 4 sigma. The output circuit provides for matching impedance of 6, 60, 600, and 6000, and supplies peak voltages up to 170 volts. The random signal output voltage level is indicated by a built-in r.m.s. voltmeter. Provision is made for the connection of external filters between input and output amplifiers of the generator to select bands of random noise. A Miller integrator circuit provides meter time constants of 0.5, 1.5, 5, and 15 sec to insure stable output-meter indications for different bandwidths of noise. The noise generator circuit uses two Zener diodes as the primary noise source. The a-c components of the noise voltages are fed to two amplifiers and then added so that a signal with a symmetrical amplitude distribution is obtained.—J.S. (B & K Instruments, Inc., 3044 W. 106 St., Cleveland 11, Ohio)

Circle 23 on Readers' Service card

Dynamic capacitor electrometer (model 6010) is said to be capable of measuring currents as small as 5×10^{-17} amp and charge in the region of 5×10^{-16} coul. Precision is said to be ±1 percent for currents of 10^{-15} amp. Response time of the instrument is 0.025 sec. Measurements can be made by the equilibrium-voltage or the rate-of-charge

method. Provision is also incorporated for operating the instrument as a null indicator. Outputs are furnished for 10-mv potentiometer recorders and for galvanometer-type graphic recorders.—J.S. (Nuclear-Chicago Corp., 359 E. Howard Ave., Des Plaines, Ill.)

Circle 24 on Readers' Service card

Voltage reference (model 150) permits calibration of a-c measurements to 1000 volts and 20 kcy/sec. Absolute accuracy of the completely transistorized instrument is said to be ±0.035 percent including all calibration uncertainties. Stability is given as 0.005 percent in 48 hours. The total range of the instrument is covered by three scales: 1011.110; 101.1110; and 10.11110; with six-decade resolution on each scale. Total harmonic distortion is less than 0.015 percent. The unit is convection cooled.—J.S. (Rotek Instrument Corp., 733 Concord Ave., Cambridge, Mass.

Circle 25 on Readers' Service card

Vibration isolation table consists of a metal loading platform attached to a base plate that is suspended by springs within a housing. Two models are available, one with 0 to 30-lb capacity and the other with a capacity of 30 to 60 lb. Each of the two is supplied with preloading plates to bring the load up to full capacity of the table. Vibration absorbing range of the table is said to extend from 5 cy/sec to infinity. Normal resonance when fully loaded is approximately 2 cy/sec. Platform size is 21 by 11 inches. A low center of gravity provides added stability.—J.S. (Central Scientific Co., Chicago 13, Ill.)

Circle 26 on Readers' Service card

Infrared source uses a hermetically sealed, low-mass, cylindrically coiled tungsten filament to produce radiation over the range 1 to 15 μ. The radiation is available through a 0.7-inch diameter window. As supplied with a heat sink required for normal operation, the source can be operated at temperatures ranging from ambient to 2500°C, with forced air cooling at the higher temperatures to keep the window below 200°C. The small thermal inertia of the filament results in a short thermal time constant. The filament is brought out to a standard four-pin plug. Provision is made for mounting the lamp on a standard optical bench or laboratory stand.—J.S (Telewave Laboratories, Inc., 43–20 34 St., Long Island City 1, N.Y.)

Circle 27 on Readers' Service card

(Continued from page 578)

provides an advantageous jumping-off place for Antarctica.

All active American bases can be supplied by air, and the introduction of the big C–130 "Hercules" cargo plane fitted with skis for landing on snow means that heavier cargoes can be moved to more remote areas during a longer period in the open summer months.

The United States, for example, can fly in supplies to its Pole station, located at an elevation of over 9000 feet near the center of the continent. On the other hand, the Russian Vostok station, hundreds of miles from the coast and at an altitude of 14,000 feet on the great ice plateau which covers most of the eastern part of the continent, is supplied only by tractor train. Since the tractors must start for Vostok at the beginning of the summer season, supplies must be moved into the Russian coastal station nearly a year in advance.

In speed and convenience, therefore, the United States enjoys a logistical edge over other nations in Antarctica. The antarctic airlift is an impressive achievement, though it has been suggested that the service is sometimes put to nonessential use to transport VIP tourists and equipment which could be moved less expensively by other means.

The antarctic summer extends from October to March; quite soon the 1962–63 summer season will end, and the human population in Antarctica will take its seasonal drop. The number of American scientists there will fall from about 170 to fewer than 50, and the number of servicemen, which during the summer may hit 2000, when crews of ships and planes and construction details are on hand, will fall to perhaps a fifth of that number.

The exodus at the end of the summer is in part a result of the change in the character of the antarctic scientific program. Albert P. Crary, chief scientist for the NSF antarctic program, says that post-IGY operations reflect two major influences: (i) broadening of the scientific program beyond the synoptic sciences which were emphasized in the IGY (the synoptic sciences are those which require observation over a large area of the world simultaneously, such as meteorology and upper-atmosphere physics); (ii) the descent on Antarctica of the individual investigator with uni-

versity or other nongovernmental connections.

The roster of summer and wintering parties shows that a majority of the summer sojourners are scientists in disciplines such as biology, geology, and glaciology which require field work and cannot be profitably pursued during the months of winter darkness.

The wintering party runs heavily to those who can carry on observations during the winter in such disciplines as meteorology and upper atmosphere physics. Scientists from government agencies such as the Weather Bureau and Bureau of Standards dominate the winter roster, as they did during the IGY, but well over half the summer scientists now are affiliated with universities and other nongovernmental bodies.

Antarctica, surface and subsurface, remains the least known of continents, and Crary says that descriptive programs in the earth sciences and biology, particularly in geology and ecology, must be continued for some time to provide the framework for the basic research which is now beginning in earnest in Antarctica.

Little mapping was done during the IGY, but since then the United States and other nations have done a great deal to fill in the blanks on the map of Antarctica. In Western Antarctica, extensive mapping of mountains and coastal areas is being done, and new techniques of establishing ground controls to set distances accurately between known points are being used.

Seismologists not only find Antarctica a fine listening post for studying earthquake activity in the Southern Hemisphere but also are equipped to provide answers to questions on the thickness of the antarctic ice cap and what it conceals.

A breakdown of the $7 million scientific budget for Antarctica shows that the atmospheric sciences continue to claim the largest single portion, some $2.3 million, with $965,000 of this earmarked for meteorology, $700,000 for ionospheric studies, and lesser amounts for studies of the aurora, cosmic rays, and geomagnetism.

The earth sciences—geology, oceanography, glaciology—get the next-largest cut of the pie, about $1.3 million; the life sciences, whose share is growing, get $740,000 this year and cartography gets $420,000.

About $1 million is used for operation and upkeep of the *Eltanin*, and a $200,000 item this year goes to set

up the new Eights station, named after James Eights, the first American scientist to visit the Antarctic (in 1830). The Eights station will be used largely for the study of upper-atmosphere physics and will be ready for operation during the International Quiet Sun Year, 1964–65.

Meteorology and upper-atmosphere physics have the longest history of concentrated work in Antarctica, and there is a feeling that efforts in these fields can slacken after the IQSY. The IGY and space programs have produced such a great quantity of data that all of them have by no means been analyzed, and in the Antarctic, too, data gathering has to some extent outrun analysis.

Comparatively little work has been done in Antarctica in the social and behavioral sciences. The effort of the environment on humans, particularly during the winter months, appears to offer broad scope to psychologists and sociologists, and program officials say they would welcome proposals for promising projects from first-class investigators.

The scientific climate in Antarctica appears favorable, in part because of the emphasis put on science in the Antarctic Treaty.

The Antarctic Treaty itself, in its limited, live-and-let-live way, has been working so smoothly that nobody talks about it much. This agreement, signed by the 12 nations which cooperated in the Antarctic IGY program, which include the United States and the Soviet Union, is essentially an extension of IGY agreements.

By signing the treaty the twelve nations indicated it was in their mutual interest that Antarctica should "be used exclusively for peaceful purposes" and that international cooperation in scientific investigation in Antarctica should continue.

Specifically prohibited in Antarctica are military operations and maneuvers of all kinds, establishment of military bases, and weapons testing. The treaty does not, however, bar the use of military personnel and equipment for scientific purposes.

Guarantees for the freedom of scientific investigation established during the IGY and provision for exchanges of information and persons are also written into the treaty.

The treaty also includes some interesting precedents in the field of arms control and disarmament. Article 5 prohibits any nuclear explosions or

disposal of radioactive wastes in Antarctica, and article 7 provides that all areas of Antarctica, including all stations and ships, shall be open to inspection at all times. Each signatory power may appoint its nationals as observers to carry out on-site inspections, and aerial observation is permitted as well.

The treaty is the first example of a limited nuclear arms and test ban and inspection agreement with both the United States and the Soviet Union as signatories. There have so far been no similar agreements for warmer latitudes, but the treaty itself and the history of international good fellowship in Antarctica are regarded as useful, if minor, political precedents.

The treaty tends to be vague on more mundane points of international law. For example, what happens when a national of one country commits a crime against a national of another; or, if someone strikes gold, who can claim it? The treaty says only that nationals remain under the jurisdiction of their own countries while on the continent of Antarctica. On territorial claims in the South Atlantic and Antarctica—where Argentina, Britain, and Chile particularly have been at odds—the treaty, in effect, puts such disputes in cold storage for 30 years by providing that while the treaty is in force no action shall diminish or enhance any claim of sovereignty in Antarctica.

Certainly the matter of territorial claims as well as the possibilities of exploiting the continent's ice-bound natural resources and the open question of the future military value of Antarctica figure in the mixed motives which keep the United States and other treaty powers there.

Were it not for these contingencies it is doubtful that Congress, mindful of vast expenditures for science on land, on sea, and in aerospace, would so willingly provide funds for antarctic operations which seem to be leveling off at about $7 million for the science program and $20 million for support costs annually.

With Antarctica colonized and somewhat civilized, the pattern of operation there seems set at least for the next decade. As if to mark the passing of an era, one of those Britishers who seem compelled to seek the more inaccessible and perilous parts of the world recently passed through NSF and remarked that the Antarctic no longer interested him and he thought he might have a try at the Blue Nile.

—JOHN WALSH