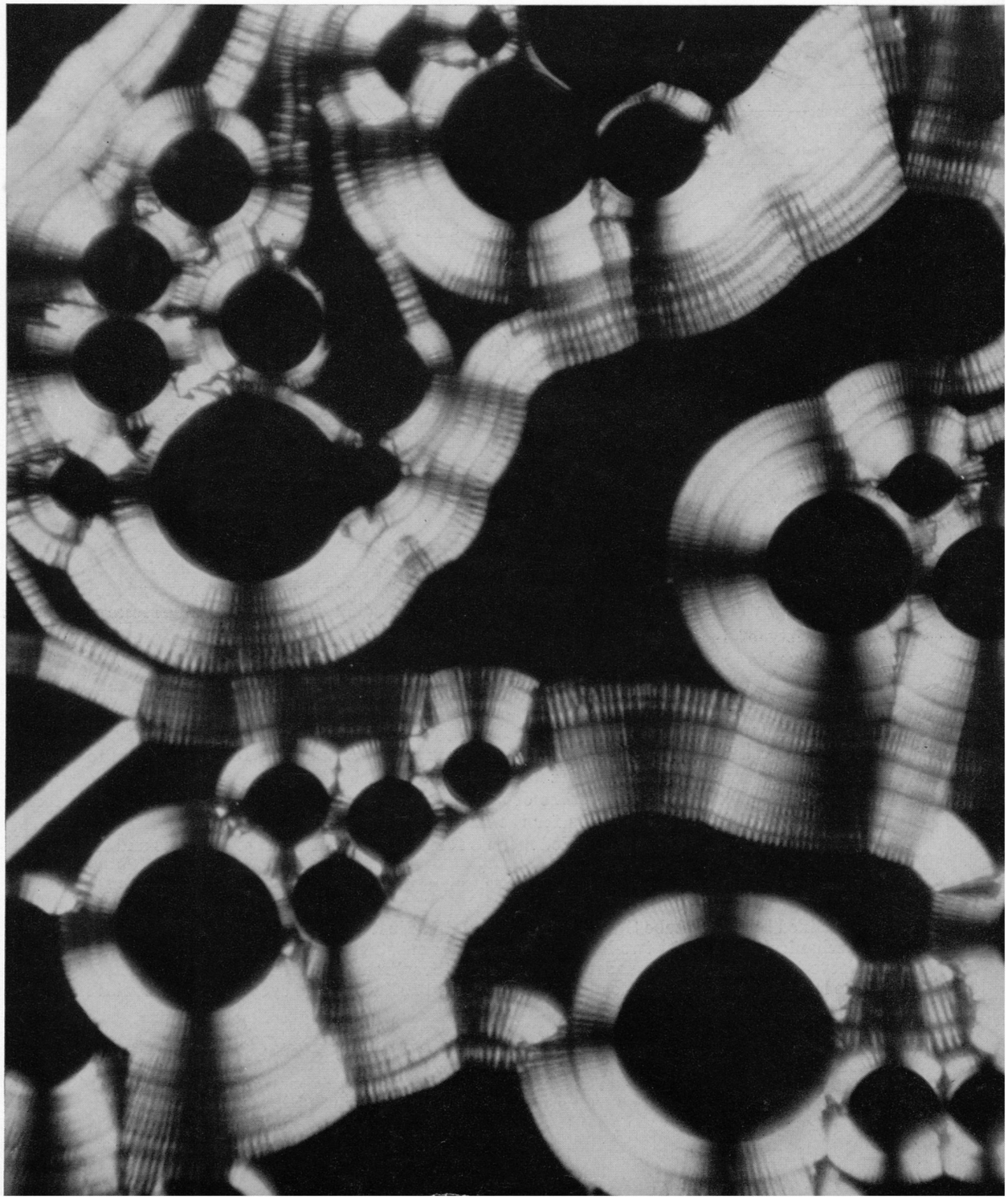
SCIENCE

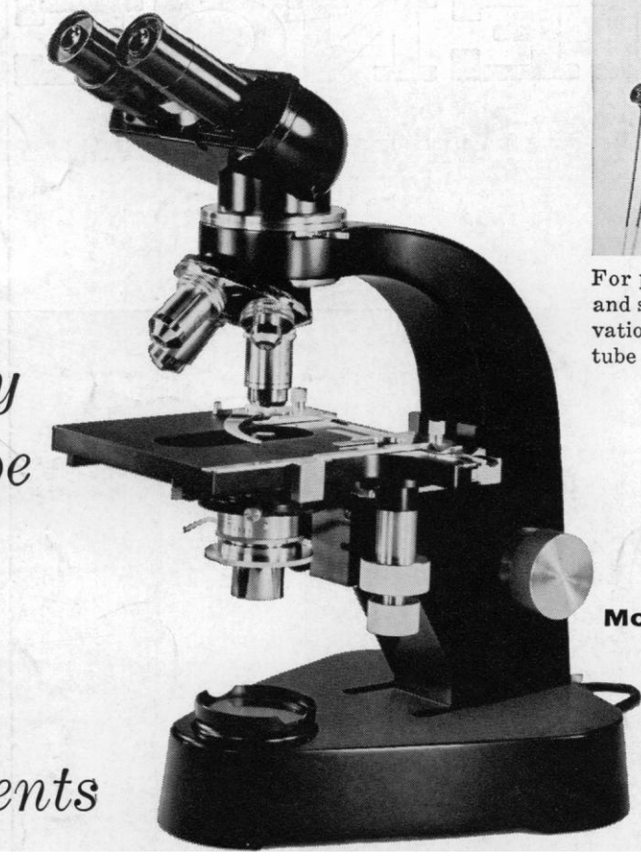
20 January 1961

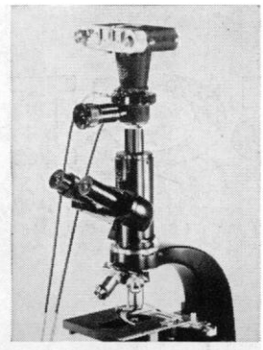
Vol. 133, No. 3447

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



the laboratory microscope which fulfills research requirements





For photomicrography and simultaneous observation, binocular photo tube "FS" is available

Model S 48/76

the new LEITZ LABOLUX IIIa

The Leitz Labolux IIIa is a new laboratory microscope with built-in illumination and the famous Labolux ball-bearing focusing control, which combines both coarse and fine focusing in a single knob. Available with a wide variety of accessories, the Labolux IIIa is recommended for all routine laboratory work and, in addition, can be equipped to fulfill the most exacting research.

A variety of interchangeable tubes is available: monocular, binocular or trinocular (binocular viewing plus photo tube for photomicrography). Tubes can be rotated 360° so that the Labolux IIIa may be faced away from the observer, for increased accessibility to all controls and to the object stage, and to make "conference-viewing" by two consultants more convenient.

Among the condensers available are the Abbe type, the Berek 2-diaphragm condenser, and condensers for phase contrast and dark field observations. The Labolux IIIa is readily adapted to fluorescence microscopy by addition of the Leitz fluorescence accessories. The large stand, in a new contemporary design, is constructed for a lifetime of use with fatigue-free operation and precision performance. All controls, including the knobs for the mechanical stage, are in a low convenient position. High-power objectives have spring-loaded mounts for prevention of damage to lenses and slides.

LABOLUX IIIa, Model S 25/95

• inclined binocular tube S with knurled knob to adjust for proper interpupillary distance • built-in mechanical stage #25 • two-lens condenser #95 • substage unit with rack and pinion focusing accepts sleeve-type condensers • quadruple nosepiece with achromats 3.5X, 10X, 45X and 100X oil immersion, the last two having spring-loaded mounts • paired 10X wide-field eyepieces • horizontal carrying case • 3-step transformer, 6 V., 2.5 Amp.

For literature and/or a personal demonstration in your laboratory, write Dept. SC-120

Leitz

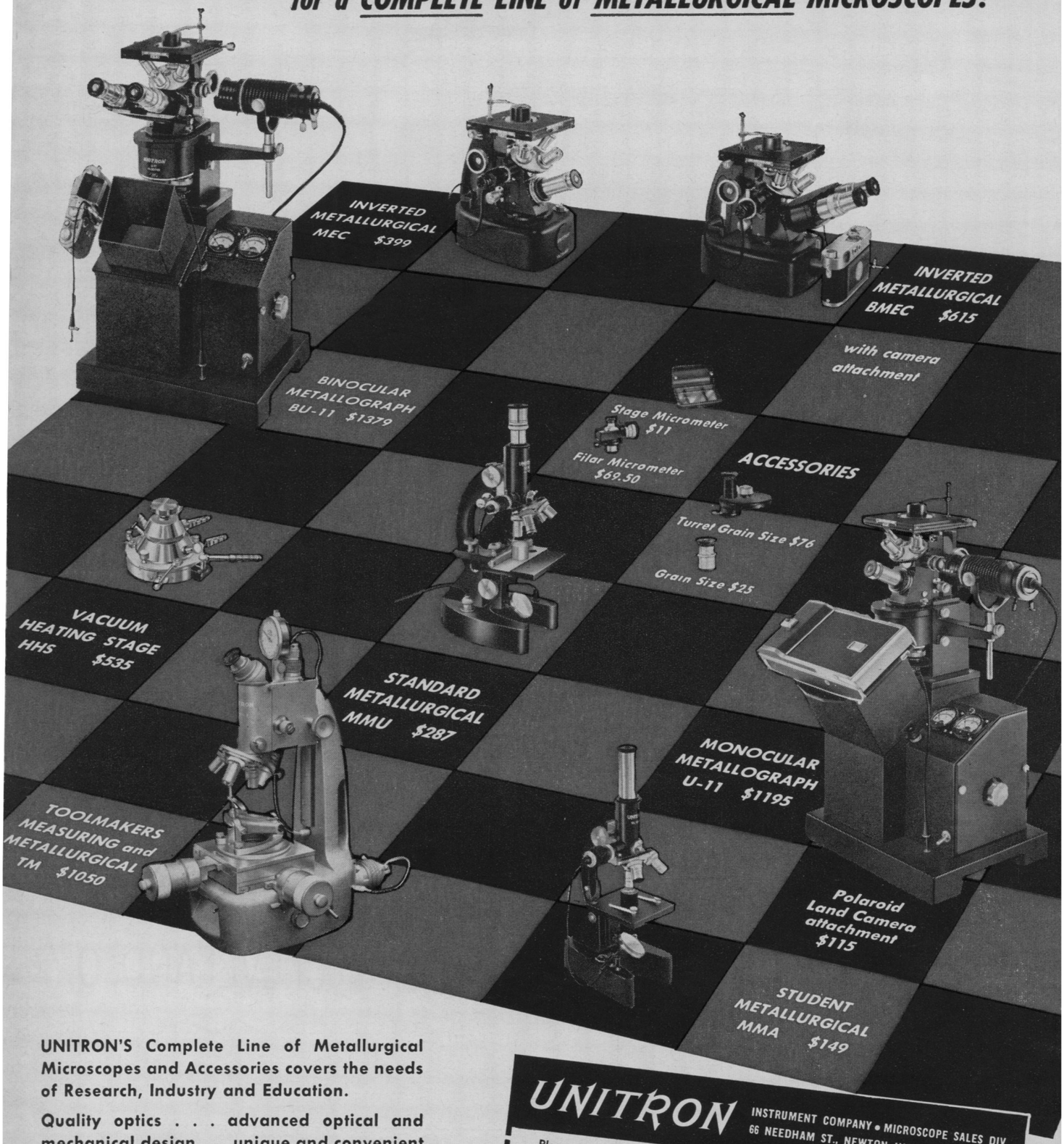
E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK 16, N. Y.
Distributors of the world-famous products of
Ernst Leitz G. m. b. H., Wetzlar, Germany—Ernst Leitz Canada Ltd.
LEICA CAMERAS · LENSES · PROJECTORS · MICROSCOPES · BINOCULARS

32959R

SCIENCE is published weekly by the AAAS, 1515 Massachusetts Ave., NW, Washington 5, D.C. Second-class postage paid at Washington, D.C., and additional mailing office. Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢.

Your best move is to UNITRON...

for a COMPLETE LINE of METALLURGICAL MICROSCOPES!



UNITRON'S Complete Line of Metallurgical Microscopes and Accessories covers the needs of Research, Industry and Education.

Quality optics . . . advanced optical and mechanical design . . . unique and convenient operational features . . . budget prices . . . free trial period — these, together with proven performance are the reasons why . . .

THE TREND IS TO UNITRON!

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

Please rush UNITRON's Microscope Catalog 4-K-3

Name _____

Company _____

Address _____

City _____ State _____

20 January 1961, Volume 133, Number 3447

SCIENCE

Cover

Soap in the "neat" phase, a mesomorphic or "liquid crystalline" condition through which most soaps and detergents pass at some stage during manufacture. In this phase the soap is neither crystalline nor liquid; it possesses some of the characteristics of both states (about × 190). [Miami Valley Laboratories, Procter and Gamble Company]

PURITY

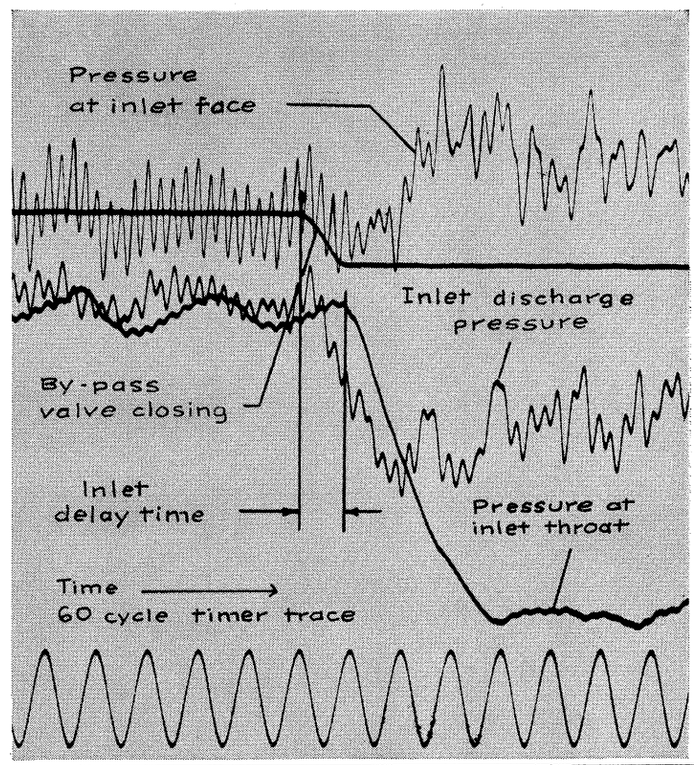
Since the inception of chemical analysis, the analyst has found the use of filter paper invaluable as his daily tool./The generic term "filter paper" embraces a great many distinct forms of paper which may be made from cellulose as well as non-cellulose fibers. A filter paper made from fibers of dubious origin may result in the complete failure of an analyst's work./Whatman Filter Papers are made from the very purest cotton fibers available./Write today for a list of technical bulletins available on Whatman products.

Sole sales agents for North America
REEVE ANGEL
9 Bridewell Place • Clifton, New Jersey

Whatman
FILTER PAPER

In research...

A Model 906 Honeywell Visicorder wrote this record of pressure fluctuations . . . "buzz" . . . for engineers at the NASA Lewis Flight-Propulsion Laboratory in Cleveland. "Buzz" is an unsteady variation in the pressure and airflow characteristics of a supersonic aircraft or missile inlet. These Visicorder studies defined the buzz-free operating limits of the inlet, and provided the designers with structural load information in case the inlet were inadvertently caused to operate on buzz during flight. This load information is vital, for inlet buzz can result in fluctuating structural loads of the order of 1000 psf . . . loads which could cause structural failure of the inlet and loss of the airplane. Visicorder records such as this have played an important role in the design of inlet control systems.

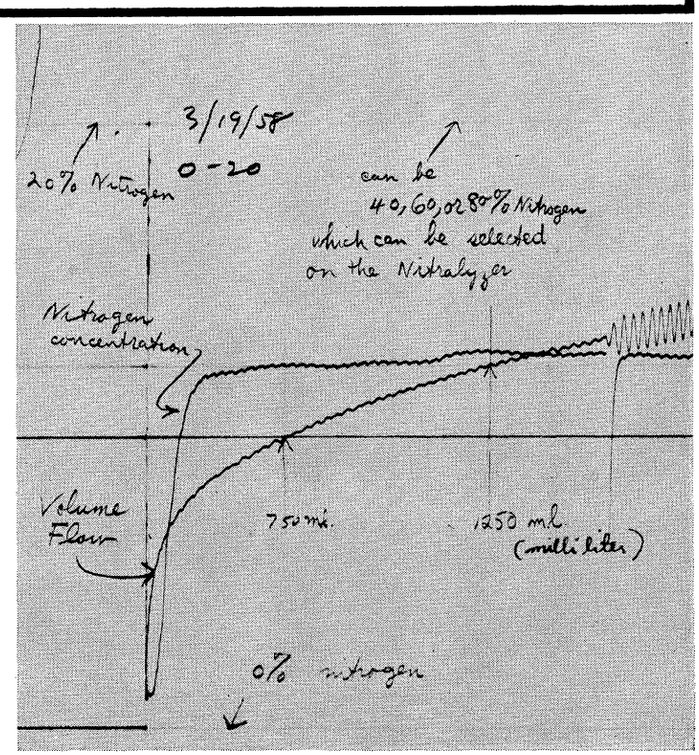


these are records of leadership

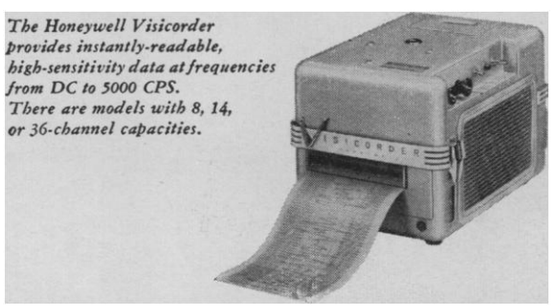
In medicine...

This directly-recorded Visicorder chart has told the scientists of the U. S. Public Health Service Occupational Health Program an important story about uneven alveolar ventilation in the human lung during a single breath of oxygen. In these lung function tests, the Visicorder measured anatomic dead space and abnormalities in the distribution of inspired gas in the alveoli of the lungs. The subject, under test, inhaled 100% oxygen to dilute nitrogen in the lungs. The Visicorder recorded the volume and the nitrogen percent of the exhalation. In these and in hundreds of other scientific and industrial applications, Visicorders are bringing about new advances in product design, computing, control, rocketry, nucleonics and production.

For information on applying the unlimited usefulness of the Visicorder to your specific problems, phone your nearest Honeywell Industrial Sales Office.



Visicorder records 2/3 actual size.



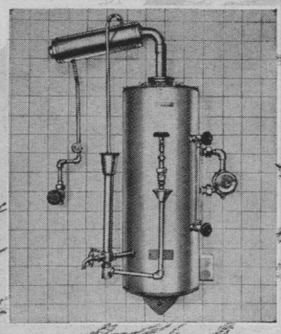
The Honeywell Visicorder provides instantly-readable, high-sensitivity data at frequencies from DC to 5000 CPS. There are models with 8, 14, or 36-channel capacities.

Honeywell

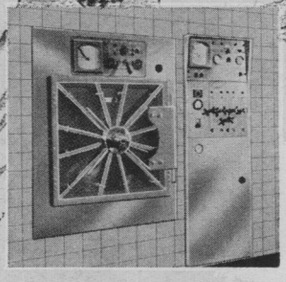
Industrial Products Group

Reference Data: Write for specifications on Visicorders 906B, 1108, 1012, and 1408.

Minneapolis-Honeywell Regulator Co., Industrial Products Group, Heiland Division, 5200 E. Evans Ave., Denver 22, Colorado

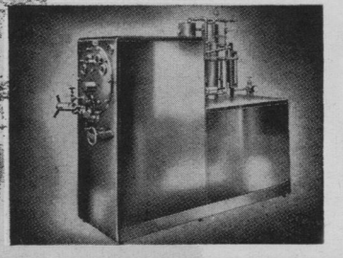


WATER STILLS
Capacities from ½ to 500 gal./hr.
Steam, Electric or Gas Heat.



STERILIZERS
Pressure Steam, Gas-Steam,
and Gas. Chambers 16″ x 16″ x 24″
to 60″ x 66″ x 120″.

TALK MICROBIOLOGICAL EQUIPMENT...

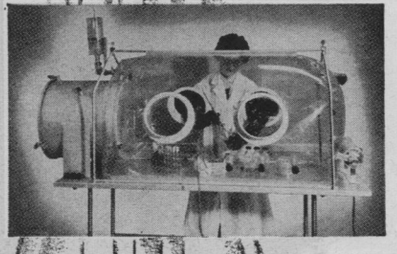


BIOGEN • *continuous culture apparatus*
For batch or continuous culture of pure microorganisms in controlled conditions.

and you have to talk to American Sterilizer!

● Here at Amsco, sterilization is still of prime concern. However, to parallel the great strides of modern biological technology, we've developed a number of highly specialized microbiological devices—all designed to do their job better with less personnel time and attention and at a cost well within practical limits.

If you've a problem in this area, a letter to our Scientific and Industrial Department may lead to its economical resolution.



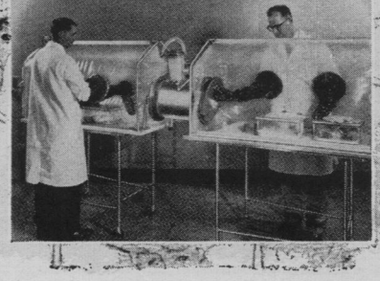
DRY BOX
Flexible film chamber.
Efficient, economical,
easy to work with.

SCIENTIFIC AND INDUSTRIAL DEPARTMENT

AMERICAN STERILIZER
ERIE • PENNSYLVANIA

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

FREEZE DRY APPARATUS
Laboratory, pilot plant and production models. Used for the preservation and concentration of labile substances.



GERM FREE LIFE APPARATUS
Complete service, including
flexible operating,
rearing and transfer chamber.

TESLA ELECTRON MICROSCOPE—Desk Model BS 243

Guaranteed Local Service

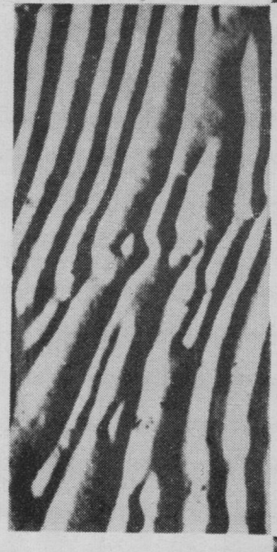
Installation and Included in Price Instruction

TESLA

The Little Giant

60 kV
30,000X
30Å

TESLA



FEATURES

- Resolving power 30Å to 50Å in routine operation, optimal resolution 25Å
- Magnification 1,000X to 30,000X, adjustable in steps
- Accelerating voltage 60 kV ±0.01%
- High-voltage stability better than 10^{-4}, ripple less than 2.5×10^{-5}
- Specimen inserted under vacuum
- Specimen motion controlled from microscope platform
- Microscope may be tilted for stereo-photography
- Viewing port usable for diffraction patterns
- Uses standard 35 mm film (36 pictures) or ten 2" x 2" plates
- Dimensions of basic instrument: 14½" wide, 18" deep, 34½" high
- Low initial cost and minimal maintenance

Made in Czechoslovakia

Worldwide Distribution by

KOVO

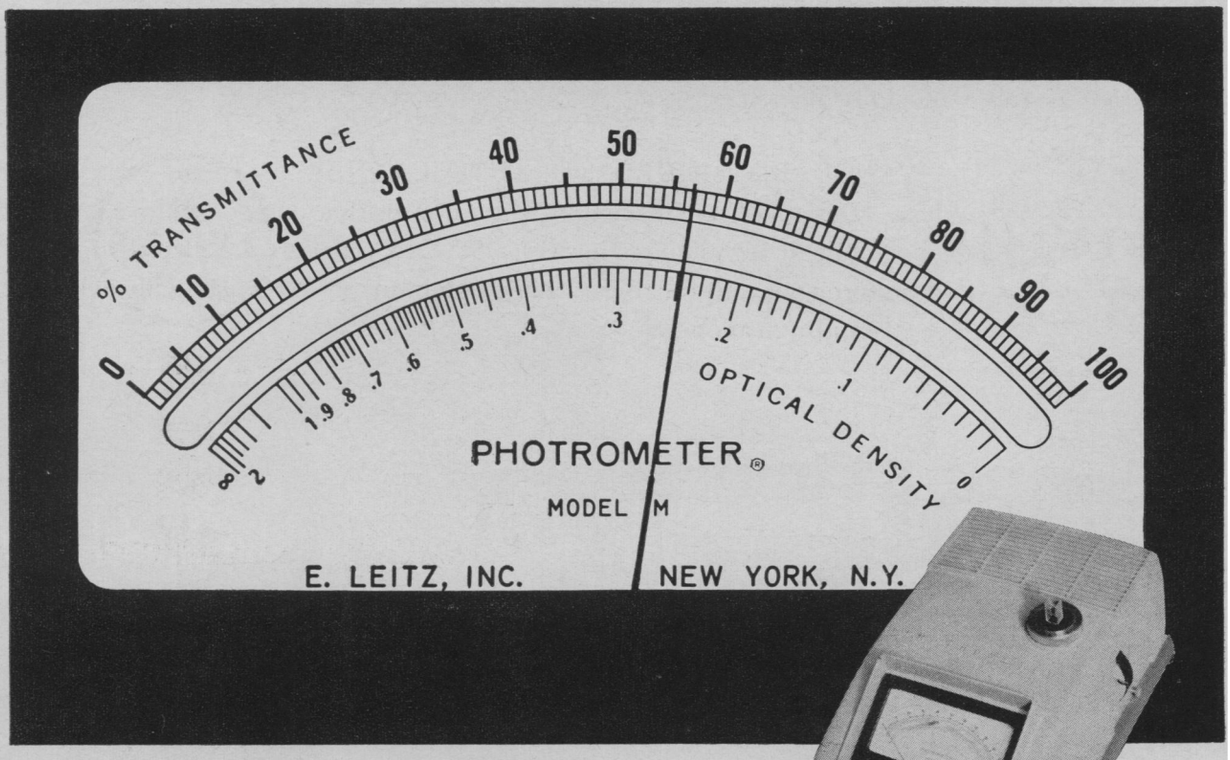
For Complete description, technical data, and ordering information, write for BULLETIN 8-2000

EXCLUSIVE SALES AND SERVICE IN U.S.A.

NATIONAL INSTRUMENT LABORATORIES, Inc.

828 Evarts St., N.E., Washington 18, D. C. **Tel.: NOrth 7-7582**

NEW LEITZ MODEL M PHOTROMETER



THE ONLY PHOTOMETER THAT COMBINES THESE IMPORTANT FEATURES

1. Larger...more easily readable meter! Accurate readings are obtained quickly and easily. New streamlined design incorporates unequalled stability.

2. Only 1.5 ml of solution needed! Precise determinations can now be made with less than half the quantities formerly required. The Leitz Model M Photrometer gives you the *accurate and dependable* readings that have set the standard for optimum requirements in clinical chemistry.

3. Precalibrated or uncalibrated! Leitz continues to offer the unique feature of calibrating each instrument individually for forty of the most commonly used determinations. Also available uncalibrated.

Leitz dependability. Since you're experienced with laboratory equipment, you know the enduring dependability of a Leitz Photrometer is the surest way to obtain reliable results *every* time—year after year.

Get all the facts . . . write for literature providing full information on all the important new features and conveniences built into the latest Model M. Fill out coupon... MAIL TODAY!

Gentlemen: Dept. Sc-120

☐ Please send me complete information on the New Leitz Model M Photrometer.

☐ Kindly have Leitz representative phone for appointment to demonstrate Photrometer at no obligation to me.

Name_____

Address_____

_____

City_____ Zone____ State_____

Telephone_____

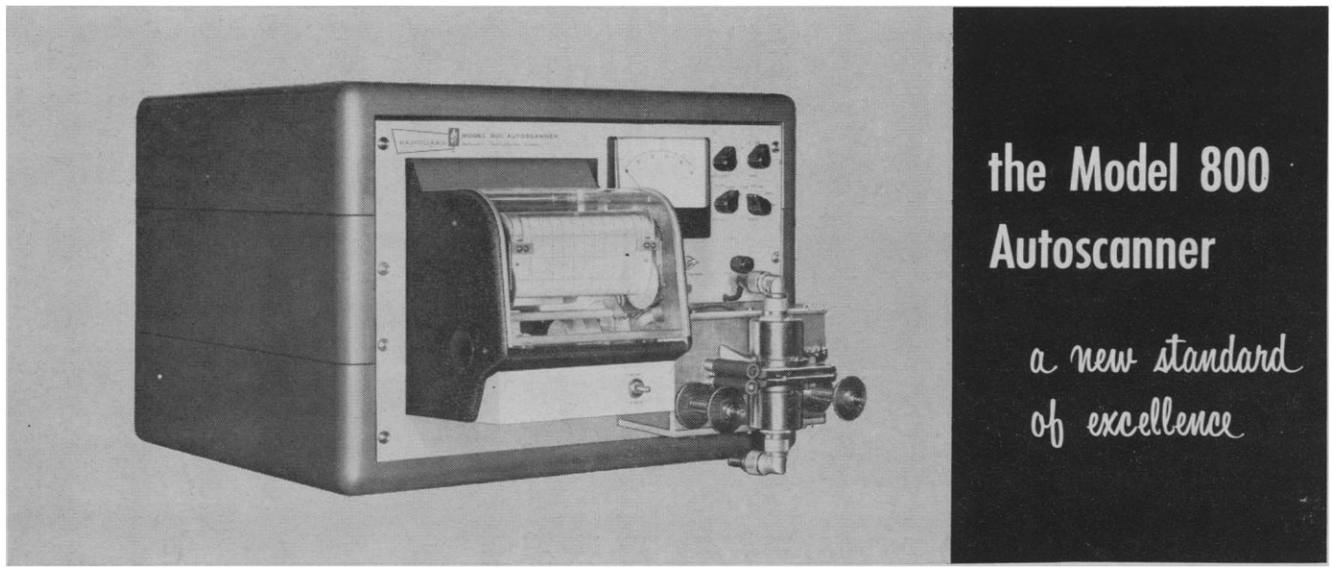
E. LEITZ, INC. 36861

468 Park Avenue South, New York 16, New York

SENSITIVITY

chromatogram scanning of tritium

The VANGUARD MODEL 800 AUTOSCANNER leads the way to better analysis. Designed for maximum tritium sensitivity and employing the most advanced circuit techniques, the AUTOSCANNER offers the investigator unparalleled performance and reliability, while exhibiting truly remarkable efficiency for all beta emitting isotopes.



Advanced features of the AUTOSCANNER include:

Completely automatic operation frees personnel for other duties. Power and gas flow are automatically shut-off after scanning period. When scanning connected multiple strips, individual strip length is monitored and permanently recorded on the chart paper.

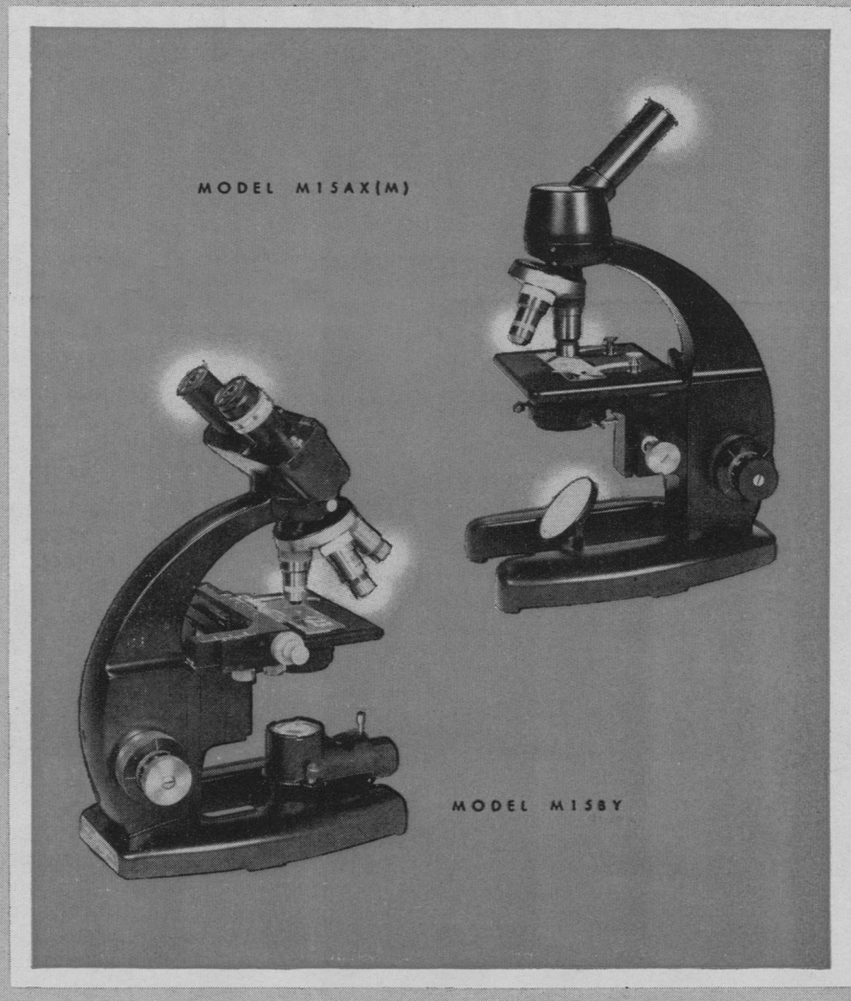
Specially designed dual scanning heads represent a major achievement in sensitivity for low energy radiation detection.

Completely transistorized circuitry incorporating plug-in modular construction eliminates all maintenance problems.

Further information and specifications may be obtained by writing to:

VANGUARD INSTRUMENT COMPANY

Vanguard Instrument Company
Department A
P.O. Box 244
LaGrange, Illinois



The Cooke M15 . . . gives you superior optical performance . . . a clean, rational design for maximum versatility, convenience and durability . . . carefully executed in the finest materials . . . at York in England.

Model M15AX(M) 60X to 400X, $220.00

Model M15BY 30X to 1000X, $454.00

Send for details on these and other M15 models.

COOKE, TROUGHTON & SIMMS, INCORPORATED

91 WAITE STREET, MALDEN 48, MASSACHUSETTS • IN CANADA: 77 GRENVILLE STREET, TORONTO

First again! Only J.T. Baker offers you

ETHER in a NEW, easy-to-use SCREW-CAP container

- **A twist of the fingers, the cap is off. Another twist makes a dependable re-seal.**
- **Exclusive leak-proof, vapor-proof, cap-liner.**
- **No ether loss on lab shelf, no contamination.**
- **Easy pouring from the large, smooth-edged opening.**
- **Safe, easy to open. No sharp-edged tool needed, no risk of injury.**

Pick up this new J. T. Baker ether can—unscrew the cap—note the ether pours evenly from the large smooth-edged opening. Screw the cap back on to secure a dependable re-seal. No more struggling to pry off a troublesome lead plug. No more time wasted in improvising a suitable re-closure or transferring the ether to another container.

EXCLUSIVE CAP-LINER. The new screw-cap contains a J. T. Baker special cap-liner made of a unique combination of resilient sealing materials. Mere finger pressure tightens the cap sufficiently to assure a leak-proof, vapor-proof seal. The container itself is made of heavy tin-plate with specially soldered seams and crimped ends to insure purity and safety.

These are the products offered in this new J. T. Baker packaging *first!* 5 ETHERS (in 1- and 5-lb. sizes)

Ether 'Baker Analyzed' Reagent
Ether 'Baker Analyzed' Reagent Anhydrous
Ether Purified Anhydrous
Ether Solvent U.S.P.
Isopropyl Ether, 'Baker Analyzed' Reagent

AND ALSO 4 IMPORTANT HYDROCARBON FRACTIONS (in 8-pt. size)

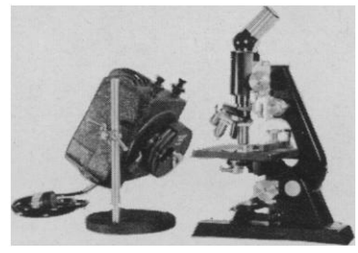
Petroleum Ether 'Baker Analyzed' Reagent	20-40°
Petroleum Ether 'Baker Analyzed' Reagent	30-60°
Petroleum Ether 'Baker Analyzed' Reagent	30-75°
Petroleum Ether 'Baker Analyzed' Reagent	60-110°

J. T. Baker Chemical Co.
Phillipsburg, New Jersey

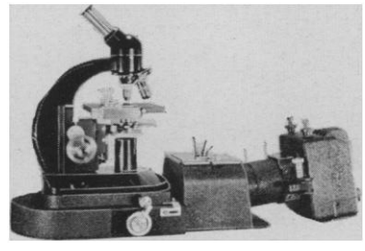
For the **Fluorescent Antibody Technique,** one of these REICHERT instruments will appeal to your budget.

Whether you select the inexpensive "Lux UV", the convenient "FLUOREX" or the versatile "ZETOPAN", you will enjoy the advantages of working with this most qualified and efficient apparatus for fluorescence microscopy, based on nearly a Century of Experience by REICHERT in this field.
Featuring the OSRAM HBO 200 Mercury Arc Lamp, all units are equipped with fingertip controlled illumination including centering device, quartz collector and field iris diaphragm. Lamp housings are reinforced aluminum cast and air-ventilated. Built-in slides or turrets accommodate ALL filters for general fluorescence microscopy and the Antigen-Antibody Technique.
You can depend on our time-tested Power Supply for operation of the Mercury Lamp. We guarantee trouble-free performance and uninterrupted service facilities.
New AC Input/DC Output power supply completely eliminates current fluctuations, increases light intensity and prolongs lifetime of burner.

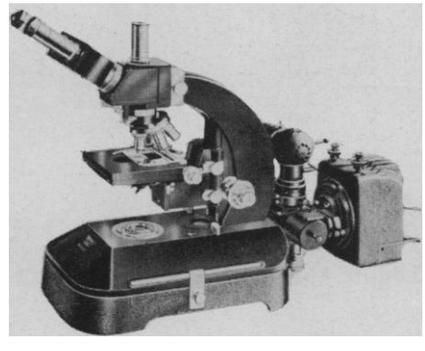
Demonstrations can be arranged anywhere in the U.S.A.



"Lux UV" Illuminator
Most economical fluorescence light source Can be used with almost any microscope



"Fluorex" unit
Most convenient for prolonged effortless operation. Enclosed light path. Fluorex and microscope form an integral unit. Can be used with most microscopes



"Zetopan"
REICHERT Research Microscope equipped with Double Lamp Unit for instantaneous transition from illumination for routine investigation to fluorescence microscopy

Please request our literature for complete particulars on the REICHERT apparatus for Fluorescence Microscopy.

WILLIAM J. HACKER & CO., INC.

P. O. Box 646 **CApital 6-8450** **West Caldwell, N.J.**

SPERMATOZOA FROM MACROGLOSSUM STELLATARUM (INSECTA, LEPIDOPTERA)

Transversal section through the middle pieces. The dense core is the mitochondrial derivative flanked on one side by the flagellum and on the other by a series of laciniate appendages of the head. 60,000 X. Reproduced by courtesy of Dr. Jean André, Institut de Recherches sur le Cancer, Villejuif (S.), France.

* SUPERIOR RESULTS IN ELECTRON MICROSCOPY

The quality of the section, whether it is biological material, synthetic fibre or metal, is as important to picture quality as the performance of the electron microscope itself.

Cutting high-quality sections requires a high-quality ultramicrotome.

The LKB Ultrotome produces unlimited quantities of superior sections. It matches the work capacity and resolving power of the best electron microscopes available.

THE ULTROTOME®

A complete ultra-microtomy lab which

- Speeds research by eliminating the element of chance from ultra-thin sectioning
- Provides ultra-thin serial sections of uniform thickness with no extra trouble to the operator
- Cuts thick sections in sequence with the ultra-thin whenever desired
- Produces large-area sections without wrinkles

Send for the *new* 20-page brochure 4800-E04 "the ULTROTOME for modern Ultra-microtomy" and a 4-page reference list.

LKB

LKB Instruments Inc., 4840 Rugby Ave., Washington 14, D.C.

International Sales Headquarters: LKB-Produkter AB, P.O.B. 12220, Stockholm 12, Sweden.

NEW TORSION DIAL BALANCES with WEIGHT LOADERS

Torsion's new line of weight-loading dial balances retains all the proved advantages of the unique Torsion principle which eliminates knife edges and guarantees long-lasting accuracy.

Since Torsion introduced the "fine weighing" dial over a year ago, users have reported substantial savings in weighing time. Now Torsion has added a "weight-loading" dial which enables the user to "dial in" additional weights as described in the specifications for each new balance.

Both dials can be used without arresting the balance.

By using two dials, one for weight loading and one for fine weighing, Torsion has cut weighing time even more.

With Torsion's new two-dial feature, the time-consuming handling of small, loose weights has been eliminated. In addition to faster weighing, Torsion's new dial balances with weight loaders minimize the possibility of weights becoming inaccurate from rough handling.

Ask your laboratory supply salesman for a demonstration or write for complete specifications.

The **Torsion Balance** *Company*

Main Office and Factory: Clifton, New Jersey
Sales Offices: Chicago, San Francisco

A TORSION MODEL DWL-3
Capacity: 200 grams
Weight-loading Dial: up to 9 grams by 1 gram increments
Fine Weighing Dial: 1 gram by .02 gram graduations
(Readability: .005 g)

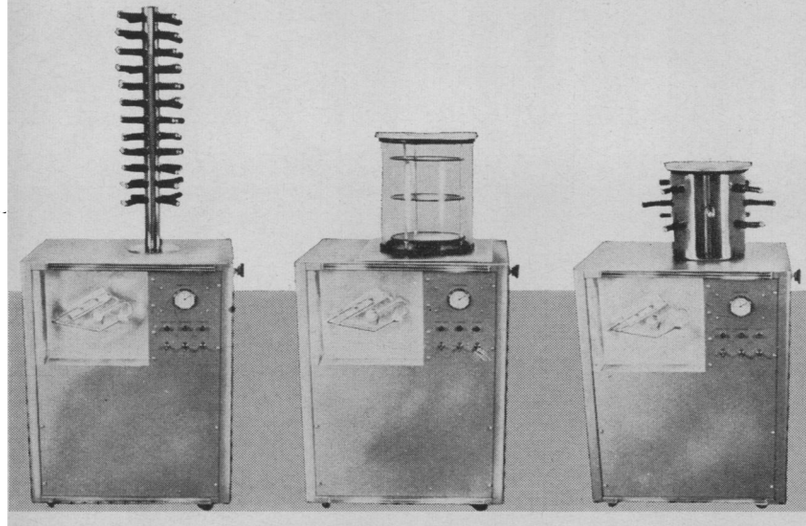
B TORSION DWL-5
Capacity: 500 grams
Weight-loading Dial: up to 90 grams by 10 gram increments
Fine Weighing Dial: 10 grams by .1 gram graduations
(Readability: .02 g)

C TORSION DWL-2
Capacity: 120 grams
Weight-loading Dial: up to 9 grams by 1 gram increments
Fine Weighing Dial: 1 gram by .01 gram graduations
(Readability: .002 g)

TORSION DWL2-1
Specifications are same as the DWL-2 except that this model has scoop for seeds or other bulky material.

FREEZE DRY

with the VirTis UniTrap



One automatically refrigerated cold trap for all freeze-drying procedures.

Freeze-dry on manifolds or electrically heated trays.

Eight different vacuum drums available.

Three liter effluent capacity per dehydration.

The VIRTIS AUTOMATICALLY REFRIGERATED UNITRAP offers a new convenience. To freeze-dry heat labile materials use this automatic cold trap with any required type of freeze-dryer and suitable vacuum pump. Sublimating water molecules are frozen out on cooling coils inside the stainless steel condenser . . . Coil temperature has a maximum low of −65° . . . The high vacuum essential for freeze-drying is maintained and moisture prevented from contaminating vacuum pump oil.

The eight different vacuum drums available for use with UNITRAP represent three different types . . . For bulk processing only; for drying samples connected to a manifold; and combination bulk and manifold drying chambers. An electrically heated three tray rack is supplied for bulk drying procedures. These trays yield an even heat input to each sample, assuring uniform drying rates.

The VIRTIS UNITRAP provides maximum safety for high vacuum studies . . . (no glass used except in the fabrication of the vacuum gauge.) Because a high degree of drying efficiency is routinely obtained, the UNITRAP is suitable for precise freeze-drying studies to relate to production schedules, as well as for routine laboratory operations.

For full details on the UNITRAP write . . .

VIRTIS

THE VirTis COMPANY INC.

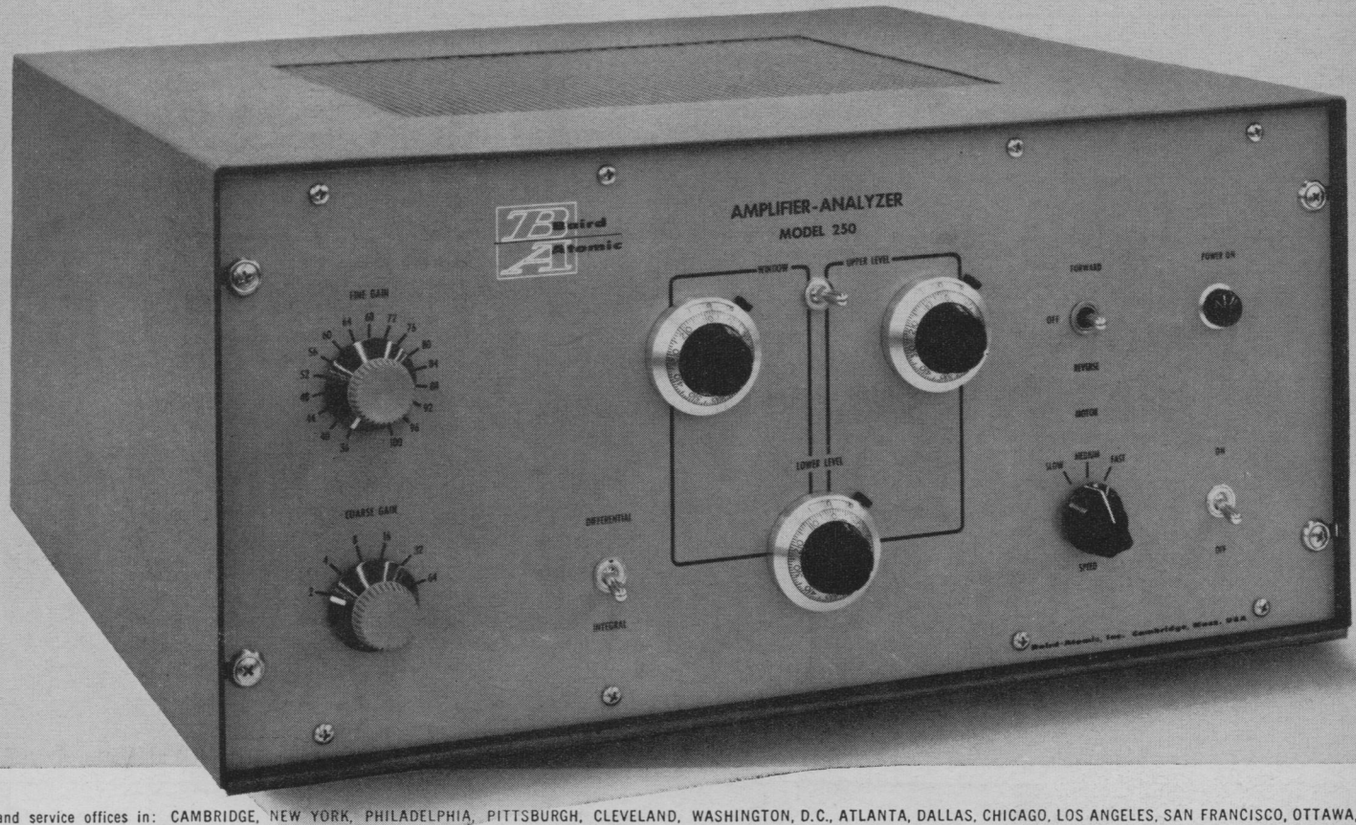
GARDINER, N.Y.

VERSATILITY

New from B/A — **The MODEL 250 Amplifier-Analyzer**

. . . so convenient and versatile it is applicable to any scintillation counting technique. Here are a few of the many unique features of this totally new instrument: in addition to standard window operation, upper and lower base line levels are independently variable over a 100-volt range — allows selection of a wide range of pulse amplitudes and cuts out very high and very low level noise; standard instrument has all controls necessary for any scintillation counting technique including provision for addition of base line scan drive (drive available in kit form); circuitry is based on a combination of well proven techniques for maximum reliability and ease of service.

Full details on the pace-setting Model 250 are now available from your Baird-Atomic sales and service representative. Offices in principal cities — write, wire or phone today.



Sales and service offices in: CAMBRIDGE, NEW YORK, PHILADELPHIA, PITTSBURGH, CLEVELAND, WASHINGTON, D.C., ATLANTA, DALLAS, CHICAGO, LOS ANGELES, SAN FRANCISCO, OTTAWA, CANA

BAIRD-ATOMIC, INC.

33 university road · cambridge 38, mass.

IN THE FOREFRONT OF RESEARCH

RC-2

SERVALL® **Automatic Superspeed Refrigerated Centrifuge**

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-1RC-2

Ivan Sorvall, Inc. **Norwalk, Connecticut**

SERVALL CENTRIFUGES SERVE YOU BEST

#5 OF A SERIES

LINEAR PROGRAMMED TEMPERATURE GAS CHROMATOGRAPHY

5. ANALYSIS OF COFFEE VOLATILES

Gas chromatography has made possible the identification and control of flavor components[2,3]. For example, natural or synthetic flavor agents can be distinguished in aroma by sampling the air above a given food and chromatographing it[3]. Gas chromatography is responsible for much of the existing data on aroma and flavor constituents in coffee[6,7] as well as in meat, fish, vegetables, fruits, and desserts[5].

The gas chromatographic method is hampered, however, by many difficulties, among them the lack of a high sensitivity detector which permits the interference of water and air, and the length of time required to make a run[1]. When thermal conductivity detectors are used, water and air block the identification and measurement of components which elute simultaneously with them. Constant temperature operation holds high boiling components on the column longer than necessary. A flame ionization detector combined with linear programmed temperature eliminates these difficulties. As shown in the chromatogram at the left, more than twenty components present in coffee aroma are separated[4].

This separation of coffee volatiles was made on F & M's Model 609 Flame Ionization Linear Programmed Temperature Gas Chromatograph using a 4 ft. Carbowax 20 M column. After holding a constant temperature of 35°C for 15 minutes, the column was programmed at a rate of 4.6°C/min. to 200°C. This unit offers a choice of 18 linear heating rates. These rates are: 0.23, 0.33, 0.46, 0.64, 0.9, 1.3, 1.8, 2.3, 2.5, 3.3, 3.5, 4.6, 6.4, 9, 13, 18, 25 and 35°C/min.

LITERATURE CITED

(1.) Fearns, E. C., *Food Eng.*, 31, 78-80 (1959).

(2.) Lockhart, E. E., *Food Eng.*, 31, 82 (1959).

(3.) MacKay, D. A. M., and Connor, J., "The Use of Gas Chromatography in Food Additive Analysis," presented at Symposium for Analysis of Food Additives, Michigan State University, March 1960.

(4.) *Martin, A. J., Euston, C. B., and Martinez, F. W., Jr., "The Design and Evaluation of a Linear Programmed Temperature Gas Chromatograph Featuring a Hydrogen Flame Ionization Detector," presented at the Detroit Anachem Conference, October 1960.

(5.) Merritt, C., Jr., Bresnick, S. R., Bazinet, M. L., Walsh, J. T., and Angelini, P., *J. Agr. Food Chem.*, 7, 784-787 (1959).

(6.) Rhoades, J. W., *J. Agr. Food Chem.*, 8, 136-141 (1960).

(7.) Zlatkis, A., and Sivetz, M., *Food Res.*, 25, 395-398 (1960).

*Write **F & M** for free copies.

Modern . . . Versatile . . .
. . . Economical!

INTERNATIONAL'S ALL-NEW MODEL UV UNIVERSAL CENTRIFUGE

This latest contribution to centrifuging progress combines in one moderately priced unit all the features most wanted by medical and industrial laboratories.

STREAMLINED DESIGN! Cabinetized construction adds new eye appeal to traditional International "work horse" ruggedness. Unitized control panel simplifies operation. Convenient storage space keeps accessories handy.

WIDE-RANGE VERSATILITY! Swings more than **80** different accessory combinations . . . at speeds up to **5400** RPM. For example: 4 one-liter bottles, 150 serum tubes, 6-250 ml bottles, 16-50 ml tubes.

MOST-WANTED FEATURES! Stainless steel guard bowl makes cleaning easy. Electric tachometer, timer and brake assure accuracy . . . improve performance. Powerful series-wound motor is International-made for extra reliability.

GET ALL THE FACTS about this modern, versatile, economical centrifuge . . . the one model you can standardize on for general-purpose laboratory work.

INTERNATIONAL IEC EQUIPMENT CO.

1219 SOLDIERS FIELD ROAD • BOSTON 35, MASSACHUSETTS

Please rush complete data on International's all-new MODEL UV Universal Centrifuge and accessories. Sold and serviced the world over by authorized International dealers.

Name..... Title.....

Institution.....

Street & No.....

City..... Zone..... State.....

TITRIGRAPH

For recording Titration Curves
For Use as a Recording pH Stat

SBR2
RECORDER

TTT-1
AUTOMATIC TITRATOR

SBU1
SYRINGE BURETTE
UNIT

The new Radiometer Titrigraph has a wide field of application in pH and buffering studies, and in enzymatic and protein investigations or any other studies requiring maintenance of constant pH in reaction solutions.

The TTT-1 Automatic Titrator is noted for its stability and flexibility in the performance of automatic titrations, and as a precise pH meter. Combined with the new SBR2 Recorder and the SBU1 Syringe Burette units, it can automatically draw and record titration curves, or act as a pH stat to record titrant consumption as a function of time under conditions of constant pH.

As a Titrigraph, the Recorder is unique in adapting itself to the slope of the titration curve and closely controlling titrant flow where the curve becomes steep. As a pH stat, remarkable stability permits studies of up to several days' duration with a wide choice of chart speeds and burette delivery rates.

A precise and versatile instrument designed and produced in the Radiometer tradition.

Write for descriptive literature and complete specifications — you will find prices most attractive.

SOLD AND SERVICED IN U.S.A. BY

WELWYN INTERNATIONAL INC.
3355 Edgecliff Terrace CLEVELAND 11, OHIO

RADIOMETER
72 Emdrupvej COPENHAGEN, DENMARK

In Canada: Contact any Branch of Canadian Laboratory Supplies Limited

WHY JULIUS SUMNER MILLER CAME TO CENCO WITH HIS NEW IDEA...

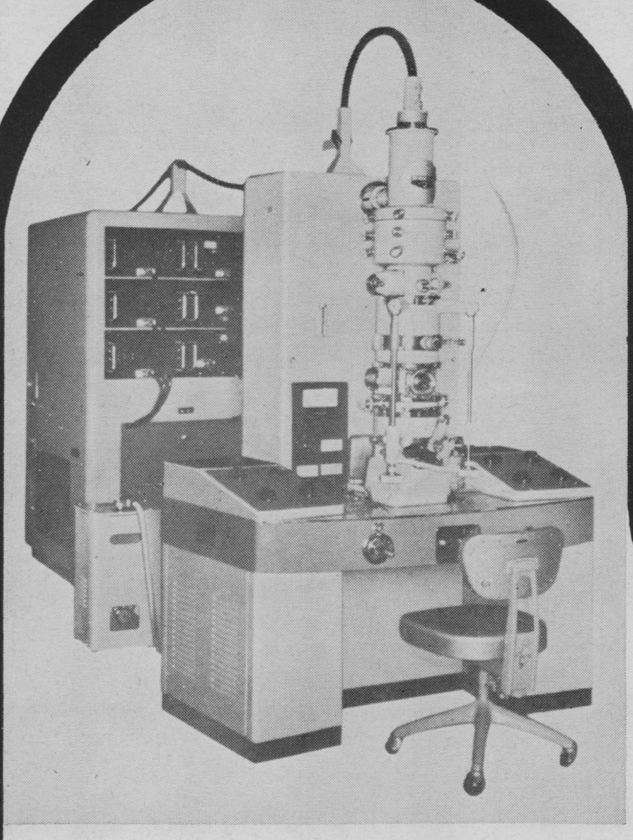
Julius Sumner Miller, Professor of Physics at El Camino College, California, came to Cenco with ideas for four proved teaching devices which would stimulate student interest and demonstrate important laws in physics. Cenco engineers, in collaboration with Professor Miller, have designed and developed these new devices . . . a thermal expansion apparatus . . . a temperature coefficient of resistance apparatus . . . a rocket propulsion demonstrator . . . and a triple track inclined plane. These teaching aids fit into any physics course. They are sturdily built for student use and of large dimensions for lecture demonstration. Professor Miller is typical of scientists in both the teaching profession and in industry who come to Cenco and find a cooperative atmosphere for the development of new ideas. This is another example of new laboratory instruments from Cenco to aid in teaching the fundamentals of science.

New Miller devices: Thermal expansion apparatus No. 77430, $49.50 (top left); temperature coefficient of resistance apparatus No. 83064, $37.50 (bottom left); propulsion demonstrator No. 76176, $29.50 (top right); triple track inclined plane No. 74870, $69.50 (bottom right).

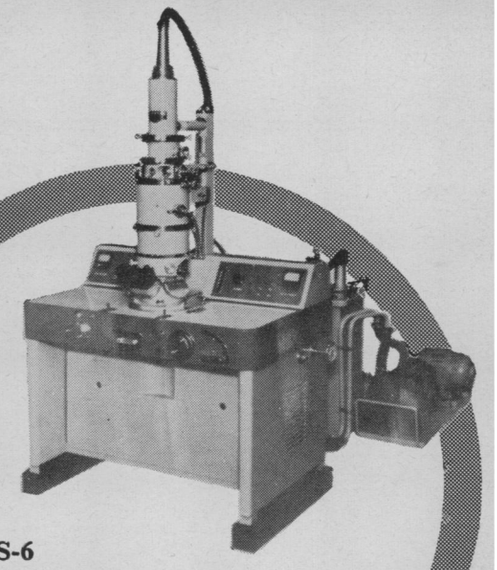
CENTRAL SCIENTIFIC COMPANY
A Subsidiary of Cenco Instruments Corporation
1718-M Irving Pk. Rd. Chicago 13, Illinois
Branches and Warehouses — Mountainside, N. J.
Somerville, Mass. • Birmingham • Santa Clara • Los Angeles
Tulsa • Houston • Toronto • Montreal • Vancouver • Ottawa

cenco

HITACHI



HU-11



HS-6

Permanent magnet-lens system
20 AU resolution.
Suitable for medical purposes
Easy operation

Complete **HITACHI** Electron Microscope For All Scientific Institutes And Laboratories

Direct Magnification : 250,000 Times
Resolving Power : 8 ~ 10 AU

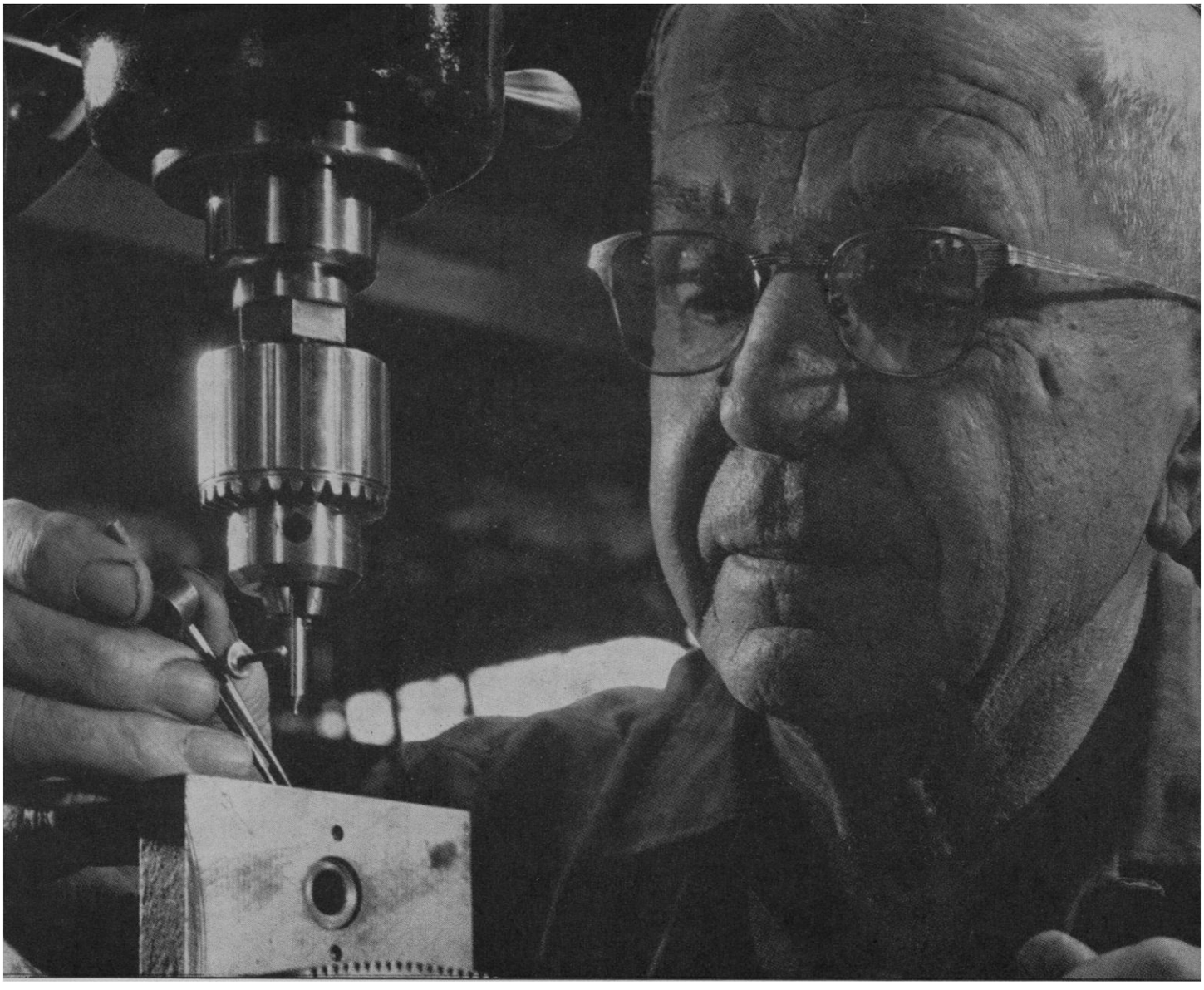
- **Accelerating Voltage: 100,75 and 50KV**
- **Optical System: 3-stage magnetic lens system, 4 turret projection lenses, interchangeable during operation.**
- **Magnification: (Electronic) 400~250,000X**
- **Resolving Power: 8~10AU**
- **Minimum Area of Selected Field: 1 μ^2**
- **Accessories: Specimen heating and cooling devices, X-ray microscope unit, holder for diffraction, etc.**

"HITACHI, Ltd. has now developed the new model HU-II, a unit featuring extremely high resolving power and being able to attach many kinds of accessories".

Erb & Gray Scientific, Inc.
854, S. Figueroa St., Los Angeles, California

Hitachi, Ltd.
Tokyo Japan

Cable Address : "HITACHY" TOKYO



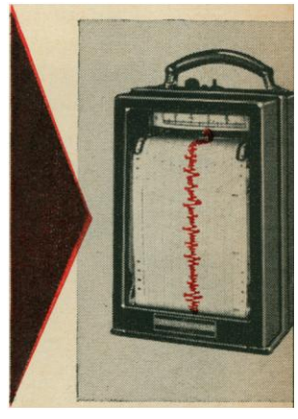
At Esterline-Angus, the past becomes the future

● Our experience of over 50 years . . . the skill of our master craftsmen . . . complement perfectly the new forward-looking, creative work of our engineering staff. The result? Modern graphic recording instruments unequaled in design as well as workmanship and material.

We're continuously developing new instrument designs and applications. All are carefully built and tested to assure trouble-free performance under even the most severe operating conditions. That's why Esterline-Angus recording instruments offer you the highest reliability rating in the industry. Many of our very first instruments are *still* functioning accurately. Ten, twenty, thirty years of dependable operation are not unusual.

Insist on modern recording instruments by Esterline-Angus . . . where master craftsmen's skill is successfully teamed with space-age technology.

Write for case histories, "How to cut production costs, increase maintenance efficiency and aid research with Esterline-Angus Graphic Instruments." Address: THE ESTERLINE-ANGUS INSTRUMENT COMPANY, Box 596L, Indianapolis 6, Indiana.

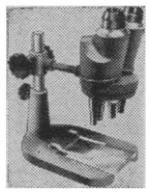


Finer graphic instruments for over 50 years—ESTERLINE-ANGUS

GET READY FOR THE SPACE and SCIENCE ERA! SEE SATELLITES, MOON ROCKETS CLOSE-UP

AMAZING SCIENCE BUYS for FUN, STUDY or PROFIT

American Made — Terrific Buy!



Over 50% Saving
STEREO MICROSCOPE

Years in development. Precision American made. Used for checking, inspecting, small assembly work. Up to 3" working distance. Clear, sharp, erect image. Wide, 3 dimensional field. 2 sets of objectives on rotating turret. 23X and 46X. 10 Days Free Trial.

Stock No. 85,056-W ..... $99.50 f.o.b. Barrington, N.J.

Low Power Supplementary Lens Attachment for above Stereo—provides 15X down to 6X with clear, extra large 1½" field at 6X.

Stock No. 30,276-W $7.50

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

See the Stars, Moon, Planets Close Up!
3" ASTRONOMICAL REFLECTING TELESCOPE
60 to 180 Power. An unusual Buy! Famous Mt. Palomar Type

You'll see the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail. Galaxies! Equatorial mount with lock on both axes. Aluminized and over-coated 3" diameter high-speed f/10 mirror. Telescope comes equipped with a 60X eyepiece and a mounted Barlow Lens, giving you 60 to 180 power. An Optical Finder Telescope, always so essential, is also included. Sturdy, hardwood, portable tripod—**FREE with Scope:—Valuable STAR CHART plus 272 page "HANDBOOK OF HEAVENS" plus "HOW TO USE YOUR TELESCOPE" BOOK.**

Stock No. 85,050-W ..... $29.95 Postpaid

4¼" Reflecting Telescope—up to 255 Power, all-metal pedestal mount. Stock No. 85,105-W ..... $79.50 F.O.B. Barrington, N.J.

NEW! GRAPH RUBBER STAMP

Real time and labor saver for math teachers. If your tests require graph backgrounds—no need to attach separate sheets of graph paper and worry about keeping them straight. Simply stamp a graph pattern, 3" square as needed on each paper. Grading graph problems then become 100% easier. Stamps are 3" square overall—2 different patterns.

Stock No. 50,255-W (100 blocks) ..... $3.00 Postpaid
Stock No. 50,351-W (16 blocks) ..... $3.00 Postpaid
Polar Coordinate Graph Stamp—3" Diam.
Stock No. 50,359-W ..... $3.00 Postpaid

OFFSPRING OF SCIENCE . . . REALLY BEAUTIFUL! CIRCULAR DIFFRACTION-GRATING JEWELRY
1" diameter

Shimmering rainbows of gemlike color in jewelry of exquisite beauty—made with CIRCULAR DIFFRACTION-GRATING REPLICA. Just as a prism breaks up light into its full range of individual colors, so does the diffraction grating. Promises to become a rage in current fashion.

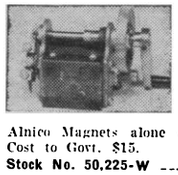
Stock No. 30,349-W Earrings ..... $2.75 Pstpd.
Stock No. 30,350-W Cuff Links ..... $2.75 Pstpd.
Stock No. 30,372-W Pendant ..... $2.75 Pstpd.
Stock No. 30,390-W Tie-Clasp ..... $2.75 Pstpd.

15½" VISIBLE WOMAN KIT

Astonishing counterpart of the famous VISIBLE MAN. Authentic, exact-scale, laboratory model of female figure lets you look right through transparent "skin"—examine vital organs, glands, nerves, veins, arteries. All parts removable, replaceable. Articulated skeleton permits inspection of 206 bones. Separate group of internal parts shows 7-months pregnancy. Ideal for students, doctors, nurses, hobbyists. Compares favorably with expensive medical school models. Complete with base. Authoritative 12-page Book, INTRODUCTION TO ANATOMY, included.

Stock No. 70,283-W ..... $4.98 Postpaid
Stock No. 70,228-W ... Visible Man Kit ... $4.98 Postpaid

WAR SURPLUS ELECTRIC GENERATOR



Brand new Signal Corps Electric Generator for scientific experiments, electrical uses, demonstrations. Generates up to 90 volts by turning crank. Use in high impedance relays. Charge ground and bring up night crawlers for bait or study. 2 Alnico Magnets alone worth original price. Wt. 2 lbs. Cost to Govt. $15.

Stock No. 50,225-W ..... $4.95 Postpaid

SCIENTIFIC ENCYCLOPEDIA

Over 1800 pages! 1100 illustrations—over 2,000,000 words—100,000 definitions—14,000 separate articles. If you're science-minded you'll drool over it! Wealth of useful information on Science, Math, Engineering, Chemistry, Physics etc. 8½ lbs—size 9" x 11".

Stock No. 9287-W ..... $29.75 Postpaid

Terrific Buy! American Made!
OPAQUE PROJECTOR

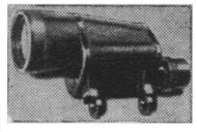
Projects illustrations up to 3" x 3½" and enlarges them. No film or negatives needed. Projects charts, diagrams, pictures, photos, lettering in full color or black-and-white. Operates on 115 volt, A.C. current, 6-ft. extension cord and plug included. Operates on 60 watt bulb, not included. Size 12" x 8" x 4½" wide. Weight 1 lb., 2 oz. Plastic case with built-in handle.

Stock No. 70,199-W ..... $7.95 Postpaid

ANALOG COMPUTER KIT

Ideal introduction to the increasingly important electronic computer field. For bright students, or anyone interested in this new science. Demonstrates basic analog computing principles—can be used for multiplication, division, powers, roots, log operations, trig problems, physic formulae, electricity and magnetism problems. Easily assembled with screwdriver and pliers. Operates on 2 flashlight batteries. Electric meter and 3 potentiometers are mounted on die-cut box. Answer is indicated on dial. Computer is 20" long, 9" wide, 2" deep.

Stock No. 70,341-W ..... $14.95 Postpaid



Take Telephoto Shots Thru
7 x 50
MONOCULAR

This is fine quality, American made instrument—war surplus! Actually ½ of U.S. Govt. 7 x 50 Binocular. Used for general observation both day and night and to take fascinating telephoto shots with your camera. Brand new, $95 value. Due to Japanese competition we close these out at a bargain price. Directions and mounting hints included.

Stock No. 50,003-W ..... $15.00 Postpaid

SCIENCE TREASURE CHESTS

For Boys—Girls—Adults!
Excellent "Science Fair" Material!

Science Treasure Chest — Extra-powerful magnets, polarizing filters, compass, one-way-mirror film, prism, diffraction grating, and lots of other items for hundreds of thrilling experiments, plus a Ten-Lens Kit for making telescopes, microscopes, etc. Full instructions included.

Stock No. 70,342-W ..... $5.00 Postpaid

Science Treasure Chest DeLuxe—Everything in Chest above plus exciting additional items for more advanced experiments including cyrstal-growing kit, electric motor, molecular model set, first-surface mirrors, and lots more.

Stock No. 70,343-W ..... $10.00 Postpaid

LIFE SIZE HUMAN SKULL

Invaluable educational aid! Fascinating conversation piece! Skull is anatomically correct—made of natural bone color, bone hard, lifetime plastic. Parts snap together—take apart. Spring-action lower jaw. Removable skull cap for examination of skull cavity, nasal passages, etc. Ideal for scientists, doctors, dentists, teachers, students, artists. Stand and Instruction and Anatomy Chart included.

Stock No. 70,294-W ..... $4.95 Postpaid

NEW! SCIENCE FAIR PROJECT KITS

Carefully planned to give any boy or girl the fun and excitement of discovering science facts. Can lead to awards or scholarships!

For Junior High School and beyond:
MOLECULE AND CRYSTAL MODELS KIT—Rods and balls to make atomic models, plus directions.

Stock No. 30,413-W .. $2.50 Postpaid

NUMBER SYSTEMS ABACUS—Makes a dramatic exhibit demonstrating number systems other than the decimal system.

Stock No. 70,334-W ..... $4.25 Postpaid

SOIL TESTING KIT—Basis for many fascinating experiments regarding growth of plants, etc.

Stock No. 60,118-W ..... $2.00 Postpaid

TOPOLOGY—All the ingredients for a project on 4-color map problems, Moebius strips, etc.

Stock No. 70,353-W ..... $6.00 Postpaid

CRYSTAL GROWING KIT—Grow breathtaking display of large crystals with this set.

Stock No. 70,336-W ..... $9.50 Postpaid

For Ages 8 thru Jr. High School:

MAGNETISM KIT—Based on magnetism demonstrations developed by UNESCO.

Stock No. 70,325-W ..... $3.75 Postpaid

COLORS THROUGH POLARIZATION—Show the beautiful color effects produced by passing polarized light through transparent objects.

Stock No. 70,350-W ..... $2.00 Postpaid

OPTICAL ILLUSION KIT—Diagrams, lenses, mirrors, etc., for producing many amazing optical illusions.

Stock No. 70,352-W ..... $3.00 Postpaid

War Surplus American-Made 7x50 Binoculars

Big savings! Brand new! Crystal clear viewing—7 power. Every optical element is coated. An excellent night glass—the size recommended for satellite viewing. Individual eye focus. Exit pupil 7mm. Approx. field at 1,000 yds. is 376 ft. Carrying case included. American 7 x 50's normally cost $195. Our war surplus price saves you real money.

Stock No. 1533-W ..... Only $55.00 Postpd. (Tax included)

NOW! EXPLORE THE NEW LAND THEORY OF COLOR!

This entirely new method of color projection, demonstrated by Dr. Edwin Land of Polaroid, challenges all classic theories of color perception! Explore this new process—taking 2 black-and-white transparencies through differently colored filters, and projecting them with just 2 colors (usually red and white) for a full-color effect. Kit contains necessary filters for duplicating original experiments, plus many more for your own variations—also beam-splitter mirrors, parts for assembling a variable density filter, full directions and bibliography. Process works most easily with Polaroid Camera, but can be used with others.

Stock No. 50,366-W ..... $9.50 Postpaid

WRITE FOR FREE CATALOG "W"!

Optics for the Science Class! Optics for the Space Era!
144 PAGES! OVER 1000 OPTICAL BUYS!

Huge selection of lenses, prisms, war surplus optical instruments, parts and accessories. Telescopes, microscopes, binoculars, infrared sniperscope, etc. Lowest Science and Math Learning and Teaching aids.

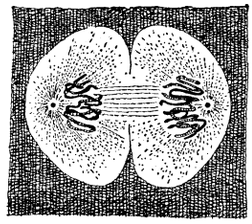
Request Catalog W.

ORDER BY STOCK NUMBER . . . SEND CHECK OR MONEY ORDER . . . SATISFACTION GUARANTEED!

EDMUND SCIENTIFIC CO. BARRINGTON, NEW JERSEY

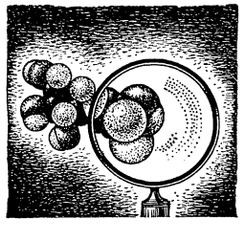
IT HAPPENED THIS MONTH...

a glance at yesterday in relation to today



IN JANUARY—(1950)—a report[1] from the Karolinska Instutet in Stockholm discusses the effect of cold storage on mouse ascites tumor. There was a considerable loss of RNA but not DNA after 9 days at 4° C. Depletion of RNA is correlated with loss of virulence. Maintenance of a high nuclear DNA content indicates the cells survive the storage period and may possibly be interpreted as evidence of polyploidy.

As cancer researchers become more and more interested in nucleic acid chemistry, they make increasing use of the full line of nucleic acid compounds available from Schwarz BioResearch. We supply DNA, RNA, nucleotides, nucleosides (including iodo- and bromo-deoxyuridine), purines and pyrimidines, sugars and sugar phosphates, plain and radiolabeled. Have you written for our latest catalog and price list?



IN JANUARY—(1907)—*Chemical Abstracts* appears for the first time and summarizes[2] a paper by Emil Fischer on synthesis of polypeptides. This paper is of special interest because it describes the synthesis of the most complicated polypeptide ever prepared, consisting of a leucine and 11 aminoacetic acid residues. Fischer's new polypeptides closely resemble natural peptones in their water solubility and in failure to crystallize.

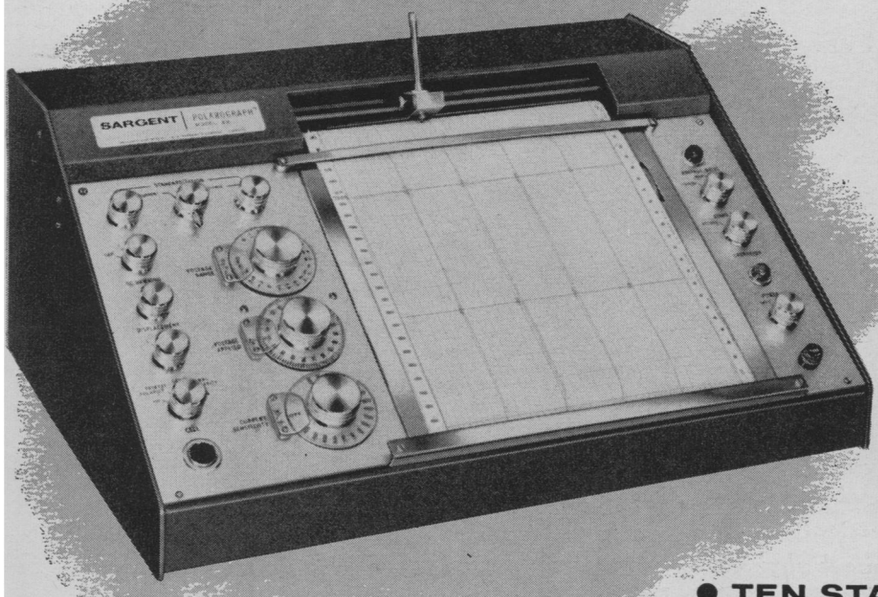
The techniques and basic knowledge discovered by Fischer have enabled modern organic chemists to synthesize peptides of far greater complexity. The Yeda Research and Development Company produces a wide variety of peptides, polyamino acids, and carbobenzoxy amino acid compounds, which are distributed by Schwarz BioResearch. Inquiries are invited for quotations on your special requirement. Yeda is equipped to make to your order a host of specialized compounds.

IN JANUARY—(1800)—J. J. Virey, of the Val de Grace, reports on the effects of animal aliments upon the human body. He states, "It is erroneous to maintain, that the nutritive quality is principally in the gelatinous substance of animals, since this is much less nourishing than the albuminous substance. The latter, when entirely animalized, requires only a light exercise, and a greater degree of oxygenation, to be converted into fibrous substance; but the gelatinous matter, being analagous to the mucilaginous substance of vegetables, requires a greater effort of nature for assimilation, and a more considerable separation of carbon and hydrogen."[3]

If you are doing nutritional research involving essential or nonessential amino acids, from albuminous or gelatinous sources, Schwarz BioResearch can supply you with bulk quantities at low cost. We produce a long list of amino acids and derivatives labeled with C^{14}, N^{15}, and S^{35}. In addition, we are the distributor of O^{18}-labeled amino acid compounds produced to order by Yeda Research and Development Company, Ltd. at the Weizmann Institute of Science in Israel.

1. Klein, E.; Kurnick, N. B., and Klein, G.: The effect of storage on the nucleic acid content and virulence of mouse ascites tumor. Exper. Cell Research *1*:127 (Jan.) 1950. 2. Fischer, E.: Synthesis of polypeptides, XV. Chem. Abstracts *1*:51 (Jan.) 1907. 3. Virey, J. J.: General remarks on aliments produced by the different classes of the animal kingdom, and their influence on the human body. Med. & Phys. J. *3*:65 (Jan.) 1800.

The SARGENT Model XV
RECORDING POLAROGRAPH®



offers you—

- **FULL 10 INCH CHART**
- **1/10% ACCURACY OF MEASUREMENT**
- **TEN STANDARDIZED POLARIZING RANGES**

This new Sargent Polarograph gives you a large 250 mm (10 inches) chart and the highest accuracy and current sensitivity at the lowest price of any pen writing polarographic instrument on the market.

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

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

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

®Registered Trade Mark (Pat. No. 2,931,964)

Current Ranges:	19, from .003 to 1.0 μA/mm.
Current Sensitivity:	standard specifications, 10^{-4}μA/mm.
Polarizing Ranges, volts:	0 to −1; −1 to −2; −2 to −3; −3 to −4; +.5 to −5; 0 to −2; −2 to −4; +1 to −1; 0 to −3; +1.5 to −1.5.
Balancing Speed:	standard, 10 seconds; 1 second or 4 seconds optional.
Bridge Drive:	synchronous, continuous repeating, reversible; rotation time, 10 minutes.
Chart Scale:	current axis, 250 mm; voltage axis, 10 inches equals one bridge revolution.
Current Accuracy:	1/10%
Voltage Accuracy:	¼%
Chart Drive:	synchronous, 1 inch per minute standard; other speeds optional.
Writing Plate:	10½ x 12½ inches; angle of slope, 30°.
Standardization:	manual against internal cadmium sulfate standard cell for both current and voltage.
Damping:	RC, four stage.
Pen:	ball point; Leroy type optional.
Suppression:	zero displacement control, mercury cell powered, 6 times chart width, upscale or downscale.
Potentiometric Range:	2.5 millivolts, usable as general potentiometric recorder.
Finish:	case, enameled steel; panels, anodized aluminum; writing plate, polished stainless steel; knobs and dials, chromium plated and buffed.
Dimensions:	23 x 17 x 10.
Net Weight:	65 pounds.

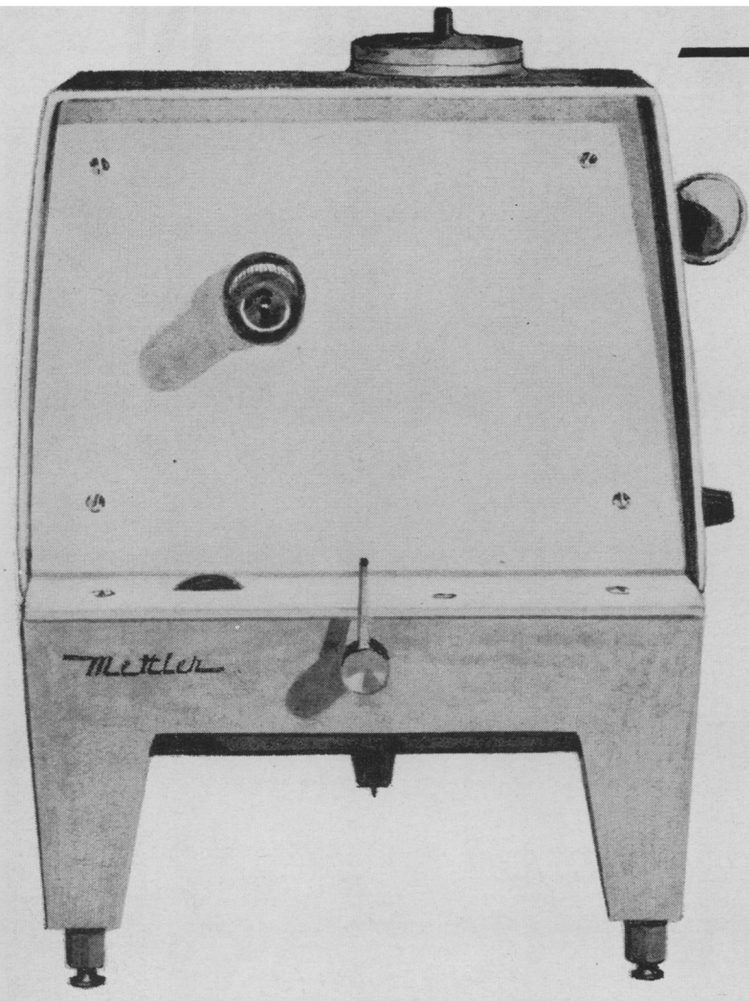
Catalog number **S-29310** with accessories and supplies. . . . **$1585.00**

For complete information write for Sargent Bulletin P

SARGENT *SCIENTIFIC LABORATORY INSTRUMENTS • APPARATUS • SUPPLIES • CHEMICALS*

E. H. SARGENT & CO., 4647 W. FOSTER, CHICAGO 30, ILLINOIS

DETROIT 4, MICH. • DALLAS 35, TEXAS • BIRMINGHAM 4, ALA. • SPRINGFIELD, N.J.



Mettler

PROUDLY PRESENTS THE NEW

UM 7

ULTRA MICRO BALANCE

BASIC FEATURES

Capacity 2 mg

Optical range 2 mg

Tare (platinum boat) 100 mg

PRECISION

±0.1

MICROGRAMS

Single pan

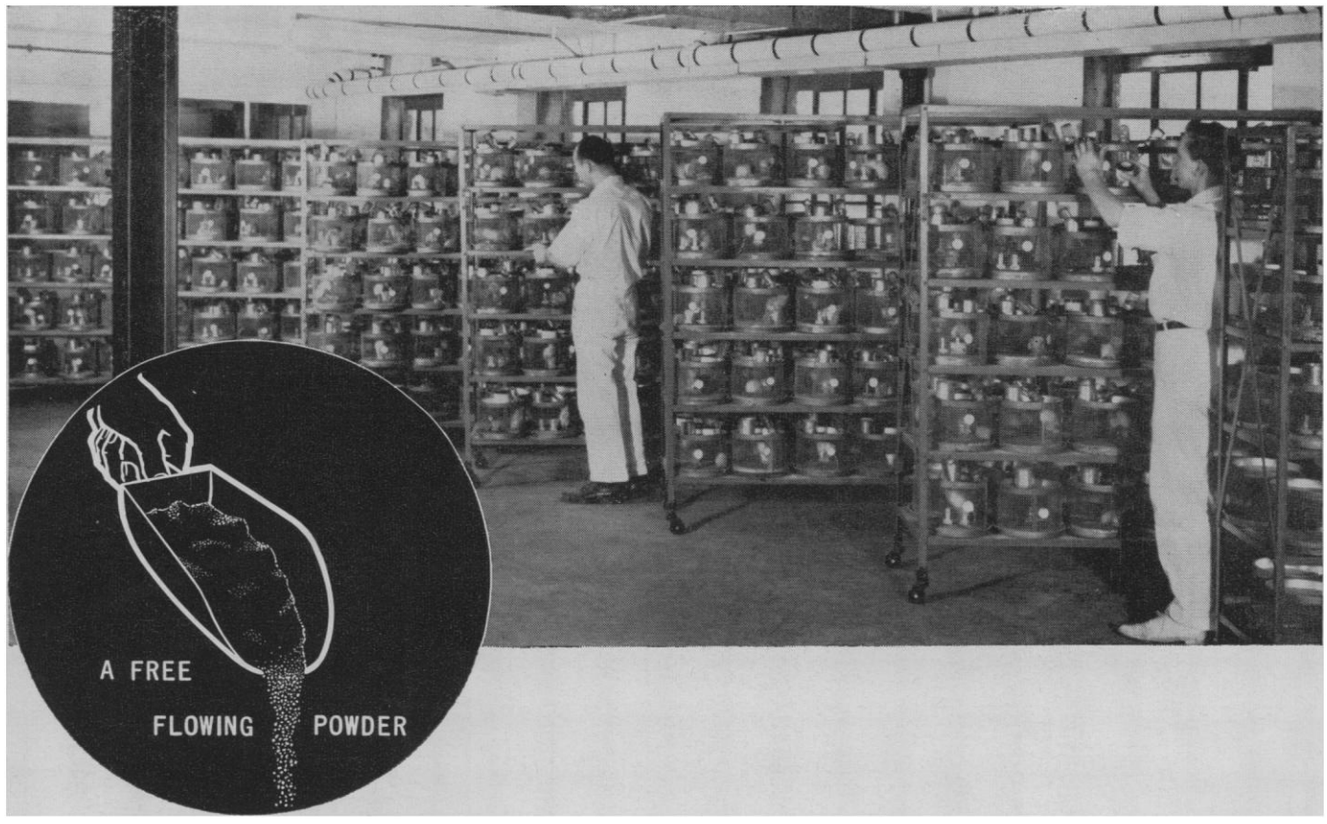
Two sapphire knife edges

Triple housing

Request our new leaflet for complete specifications

METTLER INSTRUMENT CORPORATION

P. O. BOX 100, PRINCETON, NEW JERSEY



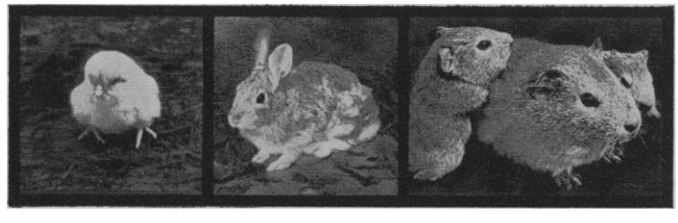
PIONEERS IN THE BASIC PRODUCTION

OF "VITAMIN-FREE" TEST CASEIN

. . . FOR OVER 20 YEARS

In animal nutritional experimentation the type of protein used may well be the most important dietary factor. When "Vitamin-Free" Test Casein GBI is the protein of choice in the deficiency diet, uniform and consistent depletion of test animals occurs well within the required time interval specified by the U.S.P. or other methods.

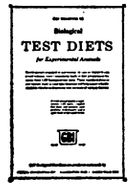
"Vitamin-Free" Test Casein GBI is prepared by several hot-alcohol extractions designed to remove both fat and water soluble vitamins. It is therefore biologically free of vitamins A and D as well as the B complex vitamins including vitamin B_{12} and vitamin K. Biological tests are run at significant intervals to assure consistent and satisfactory results. Each lot bears a control number for identification purposes.



"Vitamin-Free" Test Casein GBI is available for immediate shipment in 5 lb., 25 lb., 100 lb. and 250 lb. fibre drums.

For Animal Experimentation Select "Vitamin-Free" Test Casein GBI.

Write for GBI Bulletin 15 entitled, "Biological Test Diets for Experimental Animals".



PRODUCTS FOR RESEARCH

GENERAL BIOCHEMICALS

A Division of The North American Mogul Products Co.

YP Laboratory Park • Chagrin Falls, Ohio

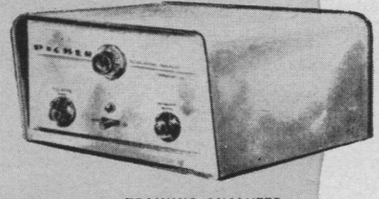
PICKER NUCLEAR

announces a new line of

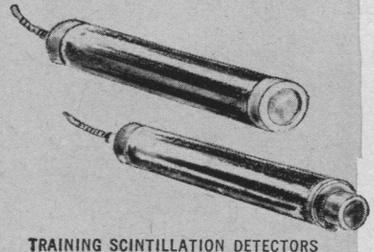
transistorized NUCLEAR TRAINING INSTRUMENTS

TRAINING SCALER

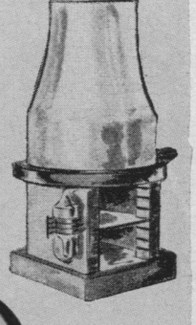
TRAINING RATEMETER



TRAINING ANALYZER



TRAINING SCINTILLATION DETECTORS



TRAINING FLOW COUNTER

PICKER QUALITY AT "BUDGET" OUTLAY

Picker Nuclear announces a comprehensive line of basic instrumentation for training students in radioisotope technics. Uniquely versatile, these instruments permit the scheduling of full laboratory courses in radioisotope technics (including such important fields as pulse height analysis and rate function studies).

The cost of this new equipment falls well within the reach of modest equipment budgets. Instruments can be delivered before the start of the 1960-61 academic year. For details, please call any local Picker office (see 'phone book) or write Picker X-Ray Corporation, 25 South Broadway, White Plains, New York.

Hallmark of quality nuclear instrumentation

Picker nuclear

Standing behind every Picker instrument is a local member of the Picker X-Ray national sales and service network.

He's there to protect your investment.

Because of him the user of a Picker instrument is never left stranded.

In PRECISION... SIMPLICITY... PRICE... *here's an entirely NEW* BLOOD CELL COUNTER *ideal for both the large and small hospital*

MODEL 75 SANBORN-FROMMER CELL COUNTER
GIVES ACCURATE, DIRECT-READING COUNTS IN 25 SECONDS
... MAKES CELL COUNTING EXTREMELY SIMPLE
... PRICE $1800 DELIVERED, CONTINENTAL U.S.A.

POUR THE SAMPLE — press the lever — within seconds read the cell count *directly* on the panel meter. This fast, simple procedure for accurate counting of red and white cells is now made possible by the new, economically priced Sanborn instrument of unique optical-electronic design.

Cell count is determined by the percent of time individual cells are present in a photoelectrically-observed portion of a "dark field" illuminated chamber. The large number of cells sampled reduces chance of statistical error. Direct read-out of cell count on the panel meter, without correction or conversion — and simple, positive instrument calibration — assure continuing efficiency and economy of operation.

For red or white cells, normal or abnormal blood specimens, the Model 75 is ideally suited for hospital admittance, clinical, research and similar laboratories where speed, accuracy and economy are essential. And this new Sanborn instrument has the same nationwide service facilities of 46 Branch Offices and Service Agencies offered all Sanborn owners. For complete details, contact your nearby Sanborn man or write the Inquiry Director in Waltham.

U.S. Pat. 2,775,159 Canadian Pat. 547,435
Other Patents Pending in U.S. and Foreign Countries

SANBORN COMPANY
175 Wyman Street Waltham 54, Massachusetts

IS CENTRIFUGING A BOTTLENECK?

The Adams Analytical Centrifuge, with its "2 to 4 Student" capacity, eliminates student "waiting time," solves your space problem

SAVES VALUABLE TIME... With 1 machine for every 2 to 4 students, there is little lost "waiting time."

Relatively high fixed speed (3400 RPM) and angle-head efficiency reduce time required for individual procedures.

Fast stopping, with light pressure of hand.

SAVES VALUABLE SPACE... Compact (10" in diameter) machine requires minimum of table space.

Light and portable—weighs only 11 ¾ lbs.

This six-place centrifuge (for 5 ml. or smaller tubes) is ideally suited for teaching elementary and analytical chemistry, including qualitative analysis. In the industrial laboratory, its speed and variable capacities recommend its use for micro & semi-micro work.

Economically priced, strongly constructed with a chemical-resistant finish, the Adams Analytical Centrifuge is maintenance-free... oilite bearings need no lubrication for 2 years. Brushless, sparkless motor eliminates fire hazard. 110-115 volt, 60 cycle, AC motor (transformer for 220 volt available).

Complete with angle-head, six shields and cushions, and six 5 ml. ungraduated taper bottom glass tubes $69.00

ATTRACTIVE QUANTITY DISCOUNTS... Order from your supplier, or write Clay-Adams, Inc., 141 East 25 St., New York 10, N.Y.

Clay-Adams
NEW YORK 10

20 January 1961, Volume 133, Number 3447

SCIENCE

SCIENCE, now combined with THE SCIENTIFIC MONTHLY, is published each Friday by the American Association for the Advancement of Science at National Publishing Company, Washington, D.C. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

Editorial correspondence should be addressed to SCIENCE, 1515 Massachusetts Ave., NW, Washington 5, D.C. Manuscripts should be typed with double spacing and submitted in duplicate. The AAAS assumes no responsibility for the safety of manuscripts or for the opinions expressed by contributors. For detailed suggestions on the preparation of manuscripts, see *Science* **125**, 16 (4 Jan. 1957).

Advertising correspondence should be addressed to SCIENCE, Room 740, 11 West 42 St., New York 36, N.Y.

Change of address notification should be sent to 1515 Massachusetts Ave., NW, Washington 5, D.C., 4 weeks in advance. If possible, furnish an address label from a recent issue. Give both old and new addresses, including zone numbers, if any.

Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢. Single copies, 35¢. Cable address: Advancesci, Washington.

The Human Study of Human Beings

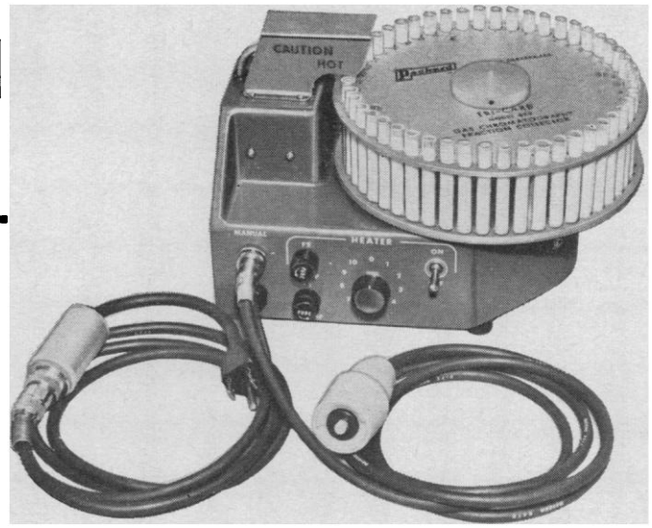
The growth of importance of the study of human behavior raises a host of new ethical problems, at the head of which I would place the need for consent to the research by both observer and subject. Studies of the behavior of animals other than man introduced a double set of problems: how to control the tendency of the human observer to anthropomorphize, and so distort his observations, and how to protect both the animal and the experimenter from the effects of cruelty. In debates on the issue of cruelty it is usually recognized that callousness toward a living thing may produce suffering in the experimental subject, but it is less often recognized that it may produce moral deterioration in the experimenter.

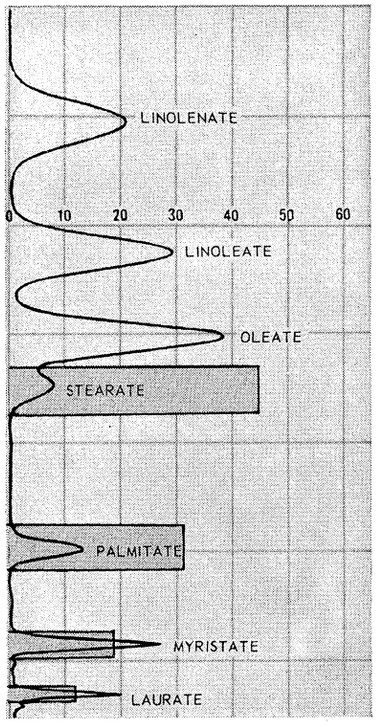
Further problems arise when living human beings are studied in their natural habitats, in laboratories, or in partially simulated situations. The observer or experimenter must control his individual and cultural bias at the same time that he uses his membership in the species and in a culture as tools of research. He must systematically allow for the effect of his research methods on the behavior he is observing. He must protect his subjects from damage during and subsequent to his investigations. He must protect his particular scientific discipline and science in general from any loss of confidence that might make future scientific work more difficult. *And* he must protect from ill effects other human beings who are not involved in his particular set of observations.

The first two of these ethical and scientific imperatives are reasonably well understood, although many natural scientists may not be fully conversant with the various disciplined ways in which individual and cultural bias are allowed for—through, for example, allowance for countertransference in psychiatry or the employment of different observational methods with comparison groups. One possibility for dealing with the third imperative was discussed in *Science* [**132**, 989 (1960)], but much more specific safeguards are needed to protect the subjects of research, sometimes in terms of their own identity, sometimes in terms of their capacity to trust themselves or to trust other individuals of higher status. In regard to loss of confidence, there is a general recognition that a social investigator should not infuriate the local citizenry or outrage the board of trustees of a university by his research methods or the way in which he presents his results.

But the last requirement is one on which scientists have not yet adequately come to terms. The question can be stated simply: Is it scientifically and ethically permissible to deceive the subjects of research by disguising oneself as a "participant observer," or by introducing stooges into an experiment, or by making use of long-distance television or hidden microphones or other devices for concealed observation? When a human being is introduced who is consciously distorting his position, the material of the research is inevitably jeopardized, and the results always are put in question as the "participant"—introduced as a "psychotic" into a mental ward or as a "fanatic" into a flying-saucer cult group—gives his subjects false clues of a nonverbal nature and produces distortions which cannot be traced in his results. Concealed instruments of observation may not distort the subjects' course of action, but the subsequent revelation of their presence—as in the jury room that was tapped for sociological purposes—damages the trust both of the original participants and of all others who come to know about it. The deception violates the conventions of privacy and human dignity and casts scientists in the role of spies, intelligence agents, Peeping Toms, and versions of Big Brother. Furthermore, it damages science by cutting short attempts to construct methods of research that would responsibly enhance, rather than destroy, human trust.—MARGARET MEAD, *American Museum of Natural History, New York.*

A NEW APPROACH TO PRECISE MEASUREMENT OF RADIOACTIVITY IN GAS CHROMATOGRAPHY





Typical gas chromatogram trace showing mass peaks of fatty acid methyl esters. Superimposed on the mass trace, the bar graph indicates no radioactivity in any of the unsaturates.

The Packard Model 830 Tri-Carb® Gas Fraction Collector enables quantitative collection of individual organic components in a gas chromatographic effluent stream. Precise measurement of radioactivity in component peaks can be made after collection.

An 8″ diameter turntable holds up to 50 Tri-Carb Cartridges, each packed with silicone-coated scintillation crystals. Vapors leaving the gas chromatography mass detector pass through the heated gas injection nozzle of the collector and condense on the coated surfaces of the scintillation crystals. As the operator observes the beginning and completion of each peak on the mass detector trace, he actuates a control switch to change cartridges. Changing takes only a fraction of a second.

After sample collection, the cartridges are placed in positioning adapters in an Automatic Tri-Carb Liquid Scintillation Spectrometer for completely automatic counting. No sample preparation is necessary and up to 100 samples can be handled at one time.

Counting efficiency for carbon-14 in Tri-Carb Cartridges is over 50%. Backgrounds for these cartridges in the Tri-Carb Spectrometer are extremely low—less than 5 cpm. Consequently, even peaks with very low activity can be accurately measured in short counting periods.

The Packard Model 830 Tri-Carb Collector is suitable for use with any gas chromatograph using a nondestructive mass detection system.

For literature, prices, and further information write:

Packard Instrument Company, Inc.

P. O. BOX 428-A, LA GRANGE, ILLINOIS

ATLANTA • BOSTON • LOS ANGELES • NEW YORK • PHILADELPHIA
SAN FRANCISCO • WASHINGTON, D. C. • ZURICH, SWITZERLAND
PARIS, FRANCE

Letters

Cost of Scholarly Books

Steven Ross's letter in *Science* [**132**, 835 (23 Sept. 1960)] rightly points out the high cost of scientific books. Yet many who cannot afford to buy would borrow, if they knew where. College students with access to good libraries are largely but not entirely free of this problem, but others find it pernicious.

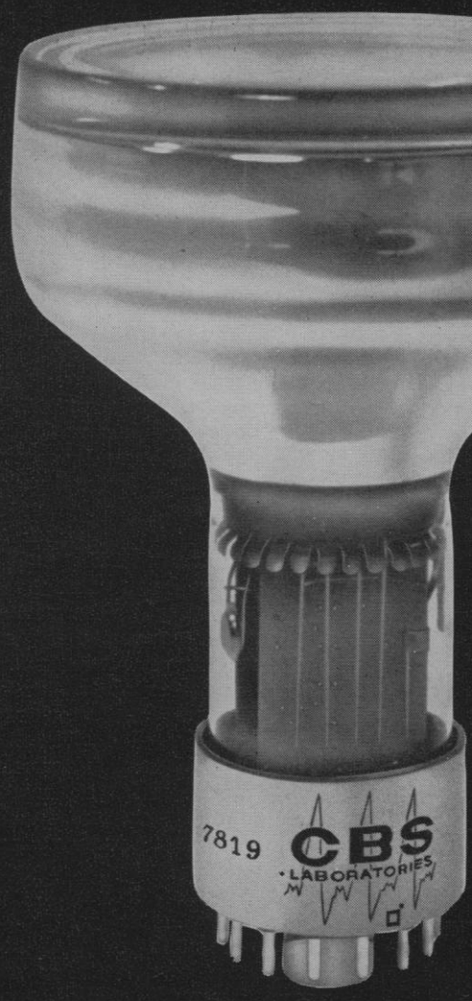
The obvious answer is the public libraries, but even the best of these will have a skimpy representation in many fields. Probably this is inevitable in a local system, but why can't a large, national collection be built and maintained? This would not be an archive but a supplement to local libraries unable to meet specific requests. As Ross says, "to read is to learn"; such a project would certainly help spread scientific knowledge.

WOLFGANG WIEMER
B. S. Coler Hospital,
Welfare Island, New York, New York

Your recently published plea by S. E. Ross regarding the need for cheaper books prompts me to voice a related pet peave. As a practicing clinician my mail is clogged with innumerable pieces of junk mail from drug concerns. Most of this is no doubt conceived, printed, and distributed at great cost. Yet a brief, admittedly statistically invalid, survey of my colleagues reveals that almost none of this material is ever opened, much less read. If it is opened it is only to identify it for what it is—an ad proposing that some company's new muscle relaxant, tranquilizer, or antibiotic is superior to its competitors' chemically identical product.

The distressing part of this is the fate of all that costly writing and printing—to wind up unseen in a trash can. Yet other printed matter, directed at the same scholar, is out of reach because of the cost of printing technical books. How much more practical, then, to direct the trash-can advertising money into subsidizing scholarly books. Perhaps only the dust cover could be bought for advertising at the start. Less costly printing and paper would help too.

There is, no doubt, a hard conservative core in the publishing industry which holds a book to be sacred and not to be contaminated by advertising. Somehow there is no objection to advertising in periodicals, and indeed *Science* itself would quite probably not be published if it were not for advertising. Small, highly specialized periodicals could certainly not be produced without advertising. Why, then, the difference between the periodical and the textbook?



SPECIFICATIONS:

Variation in cathode luminous sensitivity over entire cathode.....± 20%

Cathode luminous sensitivity.....70 ua/lumen

Shock.....40 g, 11 ms. duration

Vibration.....10 g, 25-2,000 cycles

NEW 5" PHOTOMULTIPLIER FROM CBS LABORATORIES

This new 5" diameter, 10-stage photomultiplier tube, Type 7819 (formerly CL-1015), is guaranteed to withstand shock and vibration in each of three planes, as specified above. Interchangeable with existing 5-inch, 10-stage photomultipliers, the 7819 is ideal for scintillation counting, spectroscopy, photometry and flying spot scanner applications.

High photoelectron collection efficiency provides excellent uniformity of response across the face of the tube. This is achieved by the special design of the plano-concave faceplate with S-11 photocathode (visible response) deposited upon the curved surface.

The high cathode sensitivity, together with uniform cathode response, result in superior pulse-height resolution on large scintillators and also make this tube ideal for alpha monitoring.

The 7819 can be shipped from stock to your order. For complete information on this and other tubes in the new photomultiplier line, write to CBS Laboratories, Electron Tube Department.

CBS LABORATORIES HIGH RIDGE ROAD, STAMFORD, CONNECTICUT
A DIVISION OF COLUMBIA BROADCASTING SYSTEM, INC.

If the pristine purity of the publishers is at the heart of the matter, then that species of books we call scholarly may soon be extinct—a victim of inability to adapt to an unfavorable environment.

W. H. OLDENDORF
Veterans Administration Center, Los Angeles, California

Food and Flavor

Concerning the report on radiation flavor by M. P. Drake, B. J. Kroll, and F. J. Pilgrim [*Science* **132**, 1394 (11 Nov. 1960)], may I suggest that the "representative tasting panel" whose responses might enable us to foretell something about "consumer acceptance" be augmented by such invaluable members as a cat and a rook (or any other member of the raven family). In my experience these animals, if copiously supplied with food and given an *embarras de choix*, turn into finical connoisseurs. And, whatever their prejudices may be, there can be no question of partiality against radiation.

Advanced efforts in food technology remind one that ours is a period of transition from mass-produced, mass-distributed, and prefabricated foods toward worse to come. Would it perhaps be desirable, for the benefit of later generations of scientists bound to take an interest in the nature of foods so often referred to in documents of all times up to the present, to stow away a representative selection from all over the world in some remote corner of the Antarctic?

H. GLOOR
Department of Genetics, University of Leiden, Leiden, Netherlands

The Future of "American Men of Science"

American Men of Science has been published as a biographical directory since 1906. As editor, I have carried on its publication for the last 35 years.

During this period the directory has never had financial help in the form of a grant, though it is a marginal publication insofar as profits are concerned. In 1948, after World War II, prices spiraled, making it necessary to ask those included to help make ends meet. The results were gratifying, and through such contributions publication of *American Men of Science* was continued.

I find it desirable to again approach those included for additional funds. The price of the four volumes that cover the physical and biological sciences is high for an individual; after test mailings of the A–E volume, the number of

orders did not come up to the expected percentage. As a result, the size of the complete edition will be smaller than had been planned, and the cost per volume will be correspondingly higher. Thus, the membership subscription established for this edition appears to have been too low.

A request for contributions to make up this deficit has been mailed to those included, or scheduled for inclusion, in the 10th edition (the editors hope that no supplementary contributions will be needed for future editions). It is well known that subscriptions and contributions have never been factors in the selection of scientists to be included in *American Men of Science.*

It has been proposed by a large proportion of those who have returned their proofs that specialized volumes be published. This may be the solution.

I would be glad to receive suggestions from readers of *Science* as to the best method to be followed in future publication of this important tool of the scientists of America.

JAQUES CATTELL*
"American Men of Science,"
Arizona State University, Tempe
* Deceased

Science Teaching

The recent letter on science teaching [*Science* **132**, 836 (23 Sept. 1960)] by Harry Milgrom made reference to an earlier report by Howard E. Gruber [*ibid.* **132**, 467 (19 Aug. 1960)]. Both were stimulating and informative. Each points up a real problem in the area of higher education in the United States (particularly in science education) and the need to re-examine not alone what we are teaching but the pre-service and graduate training we are giving those who have chosen teaching as a career.

We think it ridiculous to teach scientific facts as isolated units of knowledge, but a cursory study of most college examinations indicates that the measurement of factual knowledge is the primary objective. There is much talk in academic meetings about the development and use of the scientific method and the scientific attitude, but there seems to be little attempt to attain these objectives through our present traditional methods of teaching and evaluating.

Jerome Bruner, in a little book called *The Process of Education*, has spoken well of this dilemma in present-day teaching and refers to the teaching of "unconnected facts having a pitiably short half-life in memory."

The preparation of good secondary school and college teachers involves

more than a series of unrelated courses capped with a research paper or a thesis. It should include a well-articulated program of scope and depth in general and professional education. College teachers who prepare secondary school science teachers need to know something about the problems of secondary school science teaching, and the graduate schools that prepare college teachers of science need to have some idea of science teaching in small colleges.

My thinking has been similar to Gruber's in that I think the history leading up to a scientific discovery and the consequences of such a discovery are important in science teaching. How and where would a student get the background in the history of science for this kind of teaching? Possibly through leisure reading, for there is limited chance for him to receive such training as a required part of his preparation for teaching.

In 1957 I made a random sample of 135 colleges and universities to find to what extent the history and philosophy of science were being offered as a requirement or an elective for those going into teaching. A summary of the compiled data looks as follows: Of the 107 colleges and universities that answered the questionnaire, 58, representing 54.1 percent, answered that they did not include in their curriculum in any form whatever a course directly or indirectly connected with the teaching of the history of science. Ten of the schools included the course in both the department of history and the department of philosophy. In all except four of the institutions the course was at the undergraduate level, and in every instance except two the subject was listed as an elective.

My contention is not that a specific course will be just the answer to problems dealing with the broad background and development of ideas in the sciences, but few will argue that one's scientific education and potentials as a teacher would not be enriched if this and similar disciplines were a part of his required preparation.

In the light of my findings (*1*) I think there is need for more inquiry into what teachers are being trained to teach. This is of real concern to both colleges and secondary schools. We will then be moving in the direction of improving the quality of science instruction.

R. H. SIMMONS
Albany State College, Albany, Georgia

Reference

1. R. H. Simmons, *Sci. Educ.* **41**, No. 1 (1957).

Racial Differences

I have often wondered why some scientists (like other people) are prone to take extreme positions on a subject when there is a logical mid-ground which comes closer to the essential truth. A case in point is the letter by H. E. Garrett [*Science* **132**, 685 (1960)] taking *Science* to task for the news article entitled "Un-American science" [*Science* **132**, 24 (1960)]. It is probably true, as suggested by Garrett, that "equalitarian dogma" regarding racial differences has been too widely accepted as a basic premise. It is also probably true that this has hindered research in this field. To suggest that research in racial differences is "Un-American science" is certainly unscientific. On the other hand, to infer that any proven differences should have any effect on social treatment of the Negro (or any other race) is immoral, ridiculous, and utterly opposed to Jeffersonian equality.

The truth of the matter is that races of men do differ; else they would not be races. These differences almost certainly extend to mental as well as physical traits, just as in the case of individual people. The normal distribution curves for a particular inherent mental characteristic for different races of men would surely be different, just as the curves would differ between

populations of laborers and college teachers. However, these distribution curves would overlap and, furthermore, would differ for different traits. For example, there may be a higher percentage of Negroes than Scots with an inherent acute sense of rhythm. In a statistical sense U.S. Negroes apparently have greater ability than whites in short-distance running and some other athletic events. In some other traits the shape of the normal distribution curve for the two populations would favor whites. In some there would be little or no difference.

Is this view unscientific, un-American, or undemocratic? Conversely, recognition of racial *differences* is no excuse for branding any race as generally *inferior* to any other. Above all, it is no excuse for intolerance or discrimination. It is just as silly to use racial differences as a basis for discrimination as it is to label studies of racial mental differences "un-American science."

LEON S. MINCKLER
Box 760, Carbondale, Illinois

Wave-Riding Dolphins

The very interesting discussion which has recently taken place between Scholander and Hayes concerning the possible ways in which dolphins or porpoises might obtain free rides in the bow waves of ships (*1*) has stimulated me to keep a very close watch for such activities while at sea. This watch has resulted in the accompanying photograph (Fig. 1), which shows a dolphin (probably *Tursiops* sp.) riding motionless with its tail some 15 to 20 centimeters in front of the bow of a small ship moving at a speed of 10 knots.

This photograph was taken from the bow of the 62-foot motor vessel *Capre* at about 2 P.M. on 9 August 1960, in an absolutely flat calm about 20 miles offshore, en route from the town of Gladstone, Queensland, Australia, to Heron Island, in the Capricorn Group of islands at the southern end of the Australian Great Barrier Reef (*2*). A Zeiss Contaflex II camera was used, with Kodachrome film and a shutter speed of 1/125 second.

Shortly before the picture was taken three dolphins of the same species were observed doing the same thing over a period of about 5 minutes. All three would ride at once, the two outboard ones being tipped over on their sides at angles of about 30°.

My observations of these dolphins have led to further consideration of one of the major problems debated by Scholander and Hayes—namely, why, in Scholander's model, the dolphin does

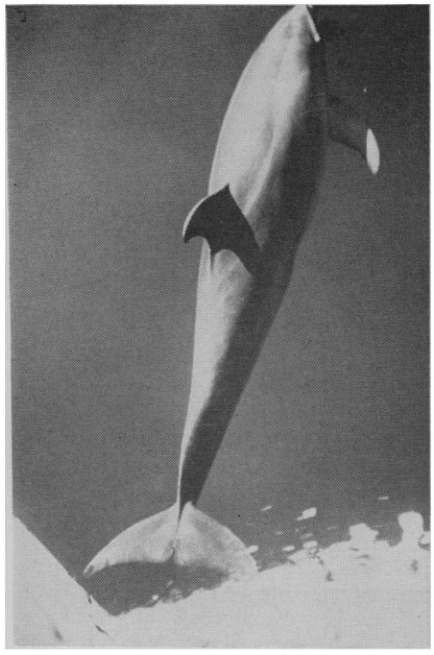


Fig. 1. A dolphin riding the bow wave of a small ship.

not topple over and out of position due to the apparent unbalanced upward force on its tail flukes. In this regard both gentlemen seem to have ignored the fact that dolphins and porpoises also have well-developed pectoral flippers. Might they not adjust the angle of attack of these pectoral flippers so as to produce an upward moment forward of their center of gravity which balances the upward moment from the tail flippers astern? Negative buoyancy, or an orientation of the total-body hydrofoil such as to produce a counteracting downward force, would, of course, be necessary in this situation to prevent the animal's being pushed to the surface.

MALCOLM S. GORDON
Department of Zoology,
University of California, Los Angeles

References and Notes

1. P. F. Scholander, *Science* **129**, 1085 (1959); W. D. Hayes, *ibid.* **130**, 1657 (1959); P. F. Scholander, *ibid.* **130**, 1658 (1959).
2. These observations were made during an expedition supported by U.S. Public Health Service grant No. RG-7114.

Chestnuts

Will you please ask the writers of letters on "The Chinese chestnut" [*Science* **132**, 366 (5 Aug. 1960)] what they really mean by this phrase and the phrase "the American chestnut"? I suspect that the writers are referring to *Castanea dentata* Borph. versus *C. mollissima* Blume, but they do not say so. They leave the reader to finish their work for them.

There are at least ten species of

Castanea Mill., the genus of chestnuts, in the temperate regions of the Northern Hemisphere. Three species occur in China, Japan, and Korea, and there are possibly half a dozen more in the eastern United States. To attempt to distinguish chestnuts as shrubs or trees is scarcely scientifically accurate, as one of the writers shows. In the United States there are several native shrubby chestnuts. One of the writers, incidentally, implies that "the spreading chestnut tree" of Longfellow's poem belonged to the genus *Aesculus* L., possibly *A. hippocastanum* L., instead of *C. dentata*. I agree, but it would be interesting to know whether this is an ascertainable fact.

G. NEVILLE JONES
Department of Botany,
University of Illinois, Urbana

G. Neville Jones is obviously justified in criticizing us for not using Latin names. However, each of us knew what we were referring to when we said "American chestnut" or "Chinese Chestnut." I felt that if I used the Latin names I would be trying to make people think I am a scientist, which I am not. I am just a plain old nut grower who subscribes to a magazine called *Science*.

Regarding Longfellow's chestnut tree, it is not hard to pin it down as a horse chestnut. It was located in Cambridge, Mass., within view of Longfellow's house, and did indeed shelter a blacksmith's shop. The village authorities chopped the tree down in 1876, over the vigorous protests of Longfellow and others. They said it was a menace to those driving under it with heavy loads. My source for that information is *The Horse and Buggy Age in New England* by Edwin Valentine Mitchell.

ROBERT RODALE
"Organic Gardening," Organic Park,
Emmaus, Pennsylvania

Hybrids and Growing Practices

In his recent article, "Hybrid corn and the economics of innovation" [*Science*, **132**, 275 (1960)] Griliches treats the use of hybrid seed as if it were an isolated practice. Actually, many practices in proper combination are needed to produce a good corn harvest. True, adapted hybrids have the genetic potential to respond to high levels of plant nutrients and to adequate supplies of soil moisture; yet where these are not present the hybrid has little if any superiority over good old varieties.

On the dark-colored soils of the corn belt the hybrids gave an immediate response on many farms because of the excellent soils. But elsewhere it was much more difficult to get the same effects because the other soil management practices had to be devel-

oped before there was significant advantage from hybrid seed.

The recognition of interactions between plant varieties and other growing conditions is exceedingly important for any understanding of modern farming. Our greatly increased efficiency during the last 20 years is clear evidence that successful American farmers have learned this principle. What they have learned is to develop proper *combinations* of practices to suit their soils.

I am fully mindful and appreciative of the great contributions of plant breeders, but the apparent increases in yield due to hybrid seed would be only a fraction of what they are without improved fertilization, water management, and the other essential practices for producing a corn crop. Then, too, the fivefold increase in the use of fertilizers since 1935 would not have given nearly the increases some attribute to it with the old crop varieties.

CHARLES E. KELLOGG
United States Department of Agriculture, Washington, D.C.

It is impossible in a brief paper to cover *all* the relevant aspects of a problem. The figures and data I used were based on experiments that attempted to hold other cultural practices constant. The interaction aspects brought out in Kellogg's letter are undoubtedly very important, and there was no intention to minimize them. The importance of the increases in the use of fertilizer is recognized and analyzed in my paper on "The demand for fertilizer: An economic interpretation of a technical change" (*J. Farm Economics*, August 1958).

ZVI GRILICHES
National Bureau of Economic Research, New York, New York

Records for Future Historians

The report by Chauncey D. Leake on "Preserving our science archives" [*Science* **132**, 158 (15 July 1960)] concerns a matter deserving greater attention than has been given it by most scientists in the past. When Samuel Henshaw succeeded Alexander Agassiz as director of the Museum of Comparative Zoology at Harvard University, he wrote to E. S. Morse, director of the Peabody Museum of Salem, as follows (*1*): "It is strange that Mr. Agassiz kept so few mementos of the M.C.Z. I have been getting together such data as I can find as to early workers in the museum—I want to leave a good lot of M.C.Z. data for someone if I do not get a chance to use it myself."

Many scientists do not realize the historical importance of their records. The editorial by Gerald Gruman [*Science* **127**, 1471 (1958)] and the recent conference on science manuscripts reported by Leake pointed up the need for more attention to the historical aspects of science. Over 40 years ago T. D. A. Cockerell at the University of Colorado wrote to Morse as follows (*1*): "I wish we had some systematic way of preserving data on American Science. At the New York Botanical Garden they have a good plan. For each American Botanist they have a large, open envelope or folder into which can be stuffed any letter, Ms., portrait or whatnot. Thus all sorts of data accumulate and will some day be very handy for the historian of American Botany—what a blessing it would be if naturalists habitually filed somewhere, brief accounts of all their collecting expeditions."

A few years ago a national committee of the International Union of the History and Philosophy of Science was formed [*Science* **127**, 1166 (1958)]. The Academy Conference has a Committee on History of Science, and many state academies have academy historians. What is urgently needed is a more general awareness on the part of scientific workers of the need to preserve personal and professional records for our future historians of science.

RALPH W. DEXTER
Department of Biology, Kent State University, Kent, Ohio

Note

1. The letters quoted in this communication are on file at the Peabody Museum of Salem, Mass., and are quoted with the permission of Ernest S. Dodge, director of the museum.

Meetings

Science News Writing

"Learning without thinking is useless. Thinking without learning is dangerous." So wrote Confucious about 500 B.C. Concern regarding this precept prompted the National Science Foundation to underwrite costs covering six science-news-writing seminars and conferences during 1960. These conferences were held in the following localities: Chapel Hill, North Carolina; Louisville, Kentucky; New York City; Fort Collins, Colorado; Manhattan, Kansas; and northern Minnesota.

The Science News Writing Seminar held at Colorado State University in Fort Collins from 12 to 18 September was sponsored by the Denver *Post*, the Boulder Laboratories of the National Bureau of Standards, and Colorado State University. Herman Weisman of Colorado State University was seminar director; Mortimer Stern of the Denver *Post* and David M. Gates of the National Bureau of Standards were associate directors. Participation was limited to 25 science reporters, primarily from a 15-state region centered on Colorado, although several came from other parts of the United States. In addition to the science news writers in attendance, another dozen individuals in the field of communications attended sporadically, and some 20 scientists participated in one or more of the sessions.

The seminar program was arranged so that the scientists expressed their views on science, education, and science news writing early in the week. The science news writers presented their problems, attitudes, and objectives later in the week, and the final session consisted of replies and a summing up by both groups. Three basic questions represented the framework for the seminar: What is going on in the exploding world of science? How best can reporters tap the sources of scientific information? How can science news stories best be told to newspaper readers?

Keynote addresses were given by Palmer Hoyt, editor and publisher of the Denver *Post*, and Frederick W. Brown, director of the Boulder Laboratories of the National Bureau of Standards. Other addresses given during the seminar were by Theodore Puck, professor of biophysics, University of Colorado; John M. Parker, Rocky Mountain district manager of the Kirby Petroleum Co.; Henry Eyring, dean of the Graduate School, University of Utah; and Graham DuShane, editor of *Science*. Panel discussions were held on the following subjects: "Philosophy of Scientific Research," "Biology Research," "Soil and Water Research," "Science Writing," "Science News Writing," and "The Scientists Talk Back."

Speakers on the panels were as follows: William E. Morgan (president, Colorado State University); M. L. Albertson (director, Colorado State University Research Foundation); Robert V. Bartz (executive director, Associated Rocky Mountain Universities); S. I. Johnson (director, Denver Research Institute); William Purdy (director of engineering, the Martin Company, Denver); Willard C. Haselbush (Denver *Post*); Gene Lindberg (Denver *Post*); Richard E. Slawsky (New York *World-Telegram and Sun*); Arthur J. Snider (Chicago *Daily News*); Lawrence Durrell (dean emeritus, Colorado State University, College of Arts and Sciences); Rue Jensen (dean, Colorado State University, College of Veterinary Medicine); John R. Olive (American Institute of Biological Sciences); Frank Salisbury (Colorado State University); Verne L. Van Breeman (Mercy Hospital, Denver); Watson Davis (director, Science Service); H. J. Geiger (Harvard Medical School); Harold F. Osborne (American Institute of Biological Sciences); Daniel Q. Posin (DePaul University); A. R. Chamberlain (vice president, Colorado State University); Robert Dils (Colorado State University, College of Forestry); Omar J. Kelley (U.S. Department of Agriculture); Herbert Riehl (Colorado State University); and Robert Whitney (Colorado State University).

The participants spent one day at the Boulder Laboratories of the National Bureau of Standards. They also visited the High Altitude Observatory of the University of Colorado, with

Robert J. Low, executive officer, leading the tour. There was a half-day excursion into the Rocky Mountains, which included a visit to the National Bureau of Standards' Fritz Peak Observatory, directed by Franklin E. Roach. Each evening the sessions were continued informally, and discussion ran into the night. At week's end the participants were weary, enlightened, and still friends, despite the fact that the gap between the two professional groups had been large indeed at the beginning of the seminar. Much of the success of the seminar was due to the pleasant and efficient handling of the rigorous 14-hour day, six-day schedule.

Specific answers formulated at the Fort Collins meeting to the question, How can science news stories best be told to newspaper readers? and comments relating to the whole subject of science news writing were as follows:

1) An outstanding science reporter must first be an excellent reporter. The best possible science reporter is a true hybrid, a real journalist and a real scientist.

2) There is a lack of aggressiveness in science writing; reporters are not skeptical enough about handouts, are timid in their presentation, and seldom do interpretive writing based on a careful background study of the subject matter.

3) A science reporter should know and use a "stable of experts"—that is, he should have a friend in each of the major scientific disciplines on whom he can call for advice.

4) There is little coverage of basic research and almost no coverage of negative experiments and research projects. The public should be educated in the philosophy of science and should understand that some experiments and projects, both basic and applied, are failures. Since a large part of what the public learns is from our daily newspapers and since the public is paying very directly for most of the research going on today, it is obvious that taxpayers, legislators, and all people concerned with formulating and administering educational and research programs must have a deeper understanding of science.

5) Newspapers have too many "sacred cows" of both the inclusive and the exclusive variety. For example, there is prodigious coverage of sports despite the fact that reader surveys show that science news stories are read by approximately twice as many people as stories on sports; newspapers exclude critical and analytical reporting of technological or applied science if such stories cover one of the local sacred minorities, such as the lead-zinc lobby group or the western reclamation lobby group.

6) Too many stories promise a

"breakthrough." This leads people to think that science evolves primarily around breakthroughs, and breakthroughs for a specific purpose, such as the control of cancer and heart disease. Further, in regard to medical stories, statistical results are sometimes accepted willy-nilly from scientists and medical men who may not qualify or properly limit the conclusions based on statistical data.

7) There is little coverage of the social sciences.

8) Being a good reporter and a good writer is not enough. A reporter must continue to educate himself in order to advance his knowledge of science. A science reporter should seek the opportunity to work in a laboratory or in the geological department of an oil company or to attend a field camp in session in order to get the "feel" of scientific investigation. This period should be at least a week and preferably a month or more, and it should be repeated. A medical reporter should make the round of the wards with an intern once every six months.

9) The "lead concept" is not necessarily the best way to tell a science news story.

10) The wire services and some newspapers at times arbitrarily limit science news stories to 150 words.

11) Managing editors wrongly think everyone can cover everything.

12) Poor techniques are frequently used in telling a science story of the expository type. The correct techniques are as follows: (i) Use graphic aids (pictures, diagrams, sketches, cartoons, and good pictures); (ii) keep the development slow, do not amaze; explain, teach, have a logical re-enactment, build up to a climax; (iii) don't use technical jargon unduly, but be willing to introduce new words to the public when necessary; (iv) write to one person—*yourself*.

The reporters had some specific and appropriate things to say to scientists.

1) The scientist should be willing to cooperate with the press and society.

2) The scientist should have a better concept of the public that is to be informed. Scientists work with things. Reporters know about and write for people. The reporter's reader cannot be told what to read. If a science writer can convey the excitement of science he will get and hold the attention of the reader. The excitement factor is most important since newspapers, to be successful, must be read, and therefore a newspaper must appeal to both intellect and emotion.

3) The scientist should be willing to interpret his subject for the layman.

4) The scientist should realize that a reporter works with a deadline, not only on straight news stories but also on feature stories.

5) Newspapers contribute to civic projects, and they need more help from scientists than they are getting at the present time. In the opinion of the science news writers this is particularly true with regard to crusades to raise teaching standards and teachers' salaries, wherein scientists, both as individuals and as groups, could work with the press better than they now do. Scientists appear not to accept enough public responsibility.

6) Scientists should realize that newspapers must crusade for 200 different things, of which science is only one.

7) Universities give very few honorary degrees to scientists in basic research; this shows poor judgment on the part of the university and is bad public policy.

8) There is a common tie between scientists and reporters; both are curious and both are skeptical.

The 20 points listed above are representative of the general consensus of the Fort Collins meeting. Individual reactions and interpretations on these points varied widely among the reporters and the scientists present, but the general feeling was clear.

It was evident from the Fort Collins meeting that editors and publishers must be convinced of the need for improving the quality and quantity of science news reporting. We urge *Editor and Publisher*, the National Science Foundation, and any other interested group to sponsor science reporting seminars limited to editors, publishers, and scientists.

We believe that some specific steps are in order. Presidents of scientific societies should stress the fact, in letters and in conversation with newspaper publishers, that our country needs better coverage of basic science news and research. Local scientific societies should assist with public-school reforms and projects of similar nonpartisan nature. Local or national scientific groups should not become involved in group endorsement of partisan political activities, but it is important that the consensus of professional opinion, within a scientific organization, concerning a specific issue be made known to the public through the press. Concerning nonpartisan issues, very few scientific societies avail themselves of the "poll" type of survey. If a legitimate poll is made (by a nonmember) of the membership of a scientific organization, such a poll is news for the local press and is also an effective means of influencing public opinion.

On a national level, related scientific disciplines need umbrella-type organizations in order to maintain effective professional responsibility, ethics committees, public information offices, school curricula committees, and the like. Several organizations of this type exist and are doing a good job. We believe that these organizations should be supported and strengthened.

Science, the organ of the oldest and largest of the umbrella-type associations in this country, published the following pertinent items in 1960 on the subject of science news writing and related topics: "Science reporting—today and tomorrow," by Joan Troan [**131**, 1193 (1960)]; "Dons or crooners?" by Eric Ashby [**131**, 1165 (1960)]; "Popularization of science," by Jean Rostand [**131**, 1491 (1960)]; "Science and human welfare" [**132**, 68 (1960)] and "Science teachers and the scientific attitude: An appraisal of an academic year institute," by Howard E. Gruber [**132**, 467 (1960)].

Nothing new regarding science news writing and scientists was said at Fort Collins, but the inspiration, the impact, and the results are new. Reporters and scientists agreed unanimously as to the tremendous value to be gained from conferences of this type and urged that other such conferences be convened in the future to further understanding between the two professions.

DAVID M. GATES
Boulder Laboratories, National Bureau of Standards, Boulder, Colorado
JOHN M. PARKER
Rocky Mountain District, Kirby Petroleum Company, Denver, Colorado

Physiological and Behavioral Aspects of Taste

Obesity and selection of a nutritionally adequate diet are human problems in many societies today. Restricted intake of feed has been established as advantageous to animal production and health. Various animals show deficiency-related specific appetites. In addition, gustatory stimuli can be powerful motivators for learning. The complex nature of the problems which the field of "taste" encompasses suggests that an interdisciplinary approach would provide wider perspective. On 27 and 28 June 1960, a Conference on Physiological and Behavioral Aspects of Taste, organized with the support of the National Science Foundation, was held at Cornell University.

The concept of senses was traced from its origin in Aristotelian philosophy by R. B. MacLeod. He argued: "There is no such thing as a sense." Rather, "We have dimensions and qualities of sensations, and these can be measured. . . . We [should] stop talking about taste and smell, audition and hearing as sensory systems, . . . look first at the dimensions of human sensory experience and then try to identify their neurological, their physiological, their anatomical, and their physical correlates." This questioning of a rigid categorization of sensory input into the usual modalities or senses was partially supported by neurophysiological data.

Human judgments of pair-mixtures of sodium chloride, citric acid, sucrose, and caffeine were reported by F. J. Pilgrim. Interactions were complex, with chemical composition and concentration of each component significant. The words *sour* and *bitter* were sometimes used interchangeably in describing these stimuli. Similar "quality confusion" was reported by R. M. Pangborn. In the light of these observations and other data, T. Engen questioned the validity of the classical four taste qualities.

In studying species differences in taste preference behavior, it is necessary to be free of preconceived ideas as to what chemical entities will be selected or rejected by each species. On the bases of several thousand trials with calves, pigs, chickens, and other animals it was obvious that man cannot use his taste reactions to predict the taste reaction of an animal. The unique individual taste behaviors described by M. R. Kare could not be related to any of a large group of physical or chemical variables incorporated into a systematic study. Further, the dozen taste buds in the fowl or the 25,000 in the ruminant could not be correlated with the distinctive taste behaviors of these two species. These data generally served to complement

the comparative studies of A. J. Carpenter.

Related electrophysiological data on chorda tympani and glossopharyngeal responses in chickens, goats, sheep, cats, monkeys, and human beings were reported by R. L. Kitchell. No two of these animals showed the same overall neural response pattern for the stimuli used.

Calves, rats, rabbits, and hamsters on adequate *ad libitum* diets will select a range of sucrose (glucose) solutions when offered a sucrose (glucose)-water choice. The relation between intake and sucrose (glucose) concentration is a function of the length of exposure to the choice situation: When both fluids are constantly available for approximately 24 hours, the preference function is roughly bell-shaped, with the maximum at about 10 percent (0.3*M*) sucrose. A choice period of 20 minutes or less results in a roughly linear and positive function. Postingestional factors, including all effects of the ingested material except the direct stimulation of taste receptors, are thought to underlie the differences. The osmotic dehydration effects of the ingesta have been emphasized in current research.

Experiments involving stomach loads, designed to test the osmotic dehydration hypothesis, were reported by H. L. Jacobs. In a 6-hour, two-choice situation, hypertonic glucose loads in non-water-deprived rats did not affect water intake, while water deprivation (16 hours), with or without glucose loads, significantly increased water intake. Glucose intake was reduced only by hypertonic glucose loads.

The location and functional characteristics of the thalamic gustatory relay in the rat were described by G. P. Frommer. Multiunit recording and adequate stimulation, combined with histological verification of electrode tracks, localized thalamic gustatory input in the medial portion of the tongue-like medial extension of the nucleus ventralis [according to DeGroot's terminology, *Trans. Roy. Netherlands Acad. Sci.* **52** (1959)]. Tactile and temperature inputs were localized laterally in the subnucleus. Thalamic response patterns were similar to those described in the chorda tympani (C. Pfaffmann) and in the medulla (B. P. Halpern).

This localization of the thalamic gustatory relay and the limited overlap of taste and somesthetic regions were verified by a series of lesion and recording studies described by R. M. Benjamin.

The procedures used in electrophysiological studies of neural responses to taste stimuli were discussed by R. L. Kitchell. Pre-stimulus treatment, solvent, temperature, method of applying fluids to the tongue, procedures for gaining access to the recording site, and electronic apparatus were all significant factors.

The development of brief-exposure preference testing methods (by P. T. Young) and data collected with an electronic preference tester were presented by K. Christensen. Sodium chloride-sucrose mixtures as acceptable as one of a series of pure sucrose solutions were determined for the rat on an *ad libitum* food and water regimen; for example, a 1-percent (0.03*M*) sucrose solution was matched by a 0.5-percent (0.1*M*) sodium chloride, 0.5-percent (0.015*M*) sucrose mixture.

Interactions between taste-determined behavior, nutritional state, and metabolic activity were discussed by J. Tepperman. Changes in any one of these may lead to alterations in the other two. The experiments of C. P. Richter were quoted as classic examples of these interactions. Recent experiments have demonstrated that modification of rate of lipogenesis, of catabolism of fatty acids, and of enzyme production can be a function of the metabolic mixture. Taste can determine the nature of the metabolic mixture.

A detailed example of interaction

between quality and quantity of ingested food and metabolism was presented by F. W. Heggeness. Weanling rats fed high carbohydrate diets ingested calories in excess of requirements and developed a transient, self-limiting elevation in metabolism. This could be prevented by initially presenting the diets in amounts just sufficient to maintain body weight. Modification of capacity for lipogenesis appeared to be the critical factor.

The 1960 Conference on Physiological and Behavioral Aspects of Taste brought together researchers from many disciplines: L. M. Bartlett (zoology), University of Massachusetts; R. M. Benjamin (physiology), University of Wisconsin; J. A. Carpenter (applied biodynamics), Yale; K. Christensen (psychology), University of Illinois; W. C. Dilger (ornithology), Cornell; T. Engen (psychology), Brown; I. Y. Fishman (biology), Grinnell; G. P. Frommer (psychology), Brown; A. Goldstein (psychology), Cornell; E. B. Hale (poultry husbandry and psychology), Pennsylvania State; A. E. Harriman (psychology), Franklin and Marshall; F. W. Heggeness (physiology), University of Rochester; H. L. Jacobs (physiology and psychology), University of Rochester; R. L. Kitchell (anatomy), University of Minnesota; R. B. MacLeod (psychology), Cornell; G. R. Morrison (psychology), McMaster; R. M. Pangborn (food technology), University of California; F. J. Pilgrim (food acceptance), Quartermaster Institute; M. W. Schein (poultry husbandry), Pennsylvania State; J. Tepperman (pharmacology), State University of New York, Upstate Medical Center; and L. F. Titlebaum (nutrition), Harvard.

The conference proceedings were recorded. An edited version is being prepared for publication.

BRUCE P. HALPERN
MORLEY R. KARE
College of Arts and Sciences and
New York State Veterinary College,
Cornell University, Ithaca, New York

Forthcoming Events

February

1–3. Solid Propellant Rocket Conf., American Rocket Soc., Salt Lake City, Utah. (R. D. Geckler, Aerojet-General Corp., P.O. Box 1947, Sacramento, Calif.)

1–3. Winter Military Electronics Conv., 2nd, Inst. of Radio Engineers, Los Angeles, Calif. (A. N. Curtiss, IRE Business Office, 1435 S. La Cienega Blvd., Los Angeles 35)

1–4. American Physical Soc., annual, New York, N.Y. (K. K. Darrow, APS, 538 W. 120 St., New York 27)

2–4. Congress on Administration, 4th annual, Chicago, Ill. (R. E. Brown, Amer-

ican College of Hospital Administrators, 840 N. Lake Shore Dr., Chicago 11)

6–8. American Acad. of Allergy, 17th annual, Washington, D.C. (J. O. Kelly, 756 N. Milwaukee St., Milwaukee 2, Wis.)

6–8. Geodesy in the Space Age, symp., Ohio State Univ., Columbus. (W. A. Heiskanen, Ohio State Univ., 1314 Kinnear Road, Columbus 12)

6–10. British Medical Assoc., annual, Auckland, New Zealand (E. Grey-Turner, B.M.A., Tavistock Sq., London, W.C.1)

9–15. Second Allergy Conf., Nassau, Bahamas. (I. M. Wechsler, P.O. Box 1454, Nassau)

13–16. American Soc. of Heating, Refrigerating and Air-Conditioning Engineers, Chicago, Ill. (R. C. Cross, 234 Fifth Ave., New York 1)

14–15. Conference on Microdosimetry, 2nd, Rochester, N.Y. (N. Kreidl, Bausch & Lomb Optical Co., Inc., Rochester 2)

15–17. International Solid-State Circuits Conf., Philadelphia, Pa. (J. J. Suran, Bldg. 3, Room 115, General Electric Co., Electronics Park, Syracuse, N.Y.)

16–18. Biophysical Soc., annual, St. Louis, Mo. (W. Sleator, Dept. of Physiology, Washington Univ., St. Louis 10)

22–25. American Educational Research Assoc., annual, Chicago, Ill. (G. T. Buswell, 1201 16th St., NW, Washington 6)

23–25. Fifteenth Annual Symp. on Fundamental Cancer Research, Houston, Tex. (Publications Dept., Univ. of Texas M.D. Anderson Hospital and Tumor Inst., Texas Medical Center, Houston 25)

23–25. Symposium on Molecular Basis of Neoplasia, Houston, Tex. (Publications Dept., Texas Medical Center, Houston 25)

26–1. American Inst. of Chemical Engineers, natl., New Orleans, La. (F. J. Van Antwerpen, AICHE, 25 W. 45 St., New York 36)

26–2. American Inst. of Mining, Metallurgical, and Petroleum Engineers, annual, St. Louis, Mo. (AIME, 29 W. 39 St., New York 18)

27–3. Conference on Analytical Chemistry and Applied Spectroscopy, 12th, Pittsburgh, Pa. (L. P. Melnich, U.S. Steel Corp., Monroeville, Pa.)

March

2–4. Optical Soc. of America, spring meeting, Pittsburgh, Pa. (Miss M. Warga, 1155 16th St., NW, Washington 6, D.C.)

5–9. Gas Turbine Conf. and Products Show, 6th annual, Washington, D.C. (Meetings Dept., American Soc. of Mechanical Engineers, 29 W. 39 St., New York 18)

6–8. North American Wildlife and Natural Resources Conf., 26th, Washington, D.C. (C. R. Gutermuth, Wildlife Management Inst., 709 Wire Bldg., Washington 5)

7–9. American Railway Engineering Assoc., annual, Chicago, Ill. (N. D. Howard, 59 E. Van Buren St., Chicago 5)

8–10. Instrument Soc. of America Conf., 11th annual, Pittsburgh, Pa. (R. R. Webster, 900 Agnew Ave., Pittsburgh 30)

8–11. Neurosurgical Soc. of America, Boca Raton, Fla. (R. K. Thompson, 803 Cathedral St., Baltimore 1, Md.)

9–10. Magnetohydrodynamics, symp. on engineering aspects of, Philadelphia, Pa.

(N. W. Mather, Project Matterhorn, P.O. Box 451, Princeton, N.J.)

12–17. American College of Allergists, annual, Dallas, Tex. (P. Gottlieb, 818 Medical Arts Bldg., Philadelphia, Pa.)

13–17. National Assoc. of Corrosion Engineers, annual, Buffalo, N.Y. (W. A. Mapler, 18263 W. McNichols Rd., Detroit 19, Mich.)

13–24. Radiological Health, course in, Cincinnati, Ohio. (Chief, Training Programme, Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26)

14–16. Clinico-Pathological Significance of Renal Biopsy, Ciba Foundation symp. (by invitation only), London, England. (Ciba Foundation, 41 Portland Place, London, W.1)

14–16. Inter-Station Supersonic Track Conf., 6th symp., China Lake, Calif. (U.S. Naval Ordnance Test Station, Code 307, China Lake, Calif.)

15–17. Medical Photography and Cinematography, intern. cong., Cologne, Germany. (Deutsche Ges. für Photographie, Neumarkt 49, Cologne)

16–17. Textile Engineering Conf., American Soc. of Mechanical Engineers, Clemson, S.C. (ASME Meetings Dept., 29 W. 39 St, New York 18)

16–18. Aviation/Space Education, 5th natl. conf., Washington, D.C. (Natl. Aviation Education Council, 1025 Connecticut Ave., NW, Washington 6)

17–19. International Medical Conf., Liège, Belgium. (Medical Commission of the FIR, Castellezgasse 35, Vienna II, Austria)

19–25. American Soc. of Photogrammetry, American Cong. on Surveying and Mapping, Washington, D.C. (C. E. Palmer, ASP, 1515 Massachusetts Ave., NW, Washington 5)

20–22. American Physical Soc., Monterey, Calif. (W. A. Nierenberg, Univ. of California, Berkeley 4)

20–23. Institute of Radio Engineers, 1961 intern. convention, New York, N.Y. (E. K. Gannett, IRE, 1 E. 79 St., New York 21)

20–24. American Surgical Assoc., Boca Raton, Fla. (W. A. Altemeier, Cincinnati General Hospital, Cincinnati 29, Ohio)

20–24. National Health Council, forum and annual meeting, New York, N.Y. (NHC, 1790 Broadway, New York 19)

20–24. Western Metal Cong. and Exposition, 12th, Los Angeles, Calif. (A. R. Putnam, American Soc. for Metals, Metals Park, Ohio)

21–23. American Meteorological Soc., general meeting, Chicago, Ill. (E. P. McClain, Dept. of Meteorology, Univ. of Chicago, Chicago 37)

21–23. American Physical Soc., Division of High-Polymer Physics, 21st, Monterey, Calif. (D. W. McCall, Bell Telephone Laboratories, Murray Hill, N.J.)

21–23. American Power Conf., 23rd annual, Chicago, Ill. (W. C. Astley, Philadelphia Electric Co., 900 Sansom St., Philadelphia 5, Pa.)

21–24. American Assoc. of Anatomists, 74th annual, Chicago, Ill. (O. P. Jones, Dept. of Anatomy, Univ. of Buffalo, Buffalo 14, N.Y.)

21–30. American Chemical Soc., 139th, St. Louis, Mo. (A. T. Winstead, ACS, 1155 16th St., NW, Washington 6)