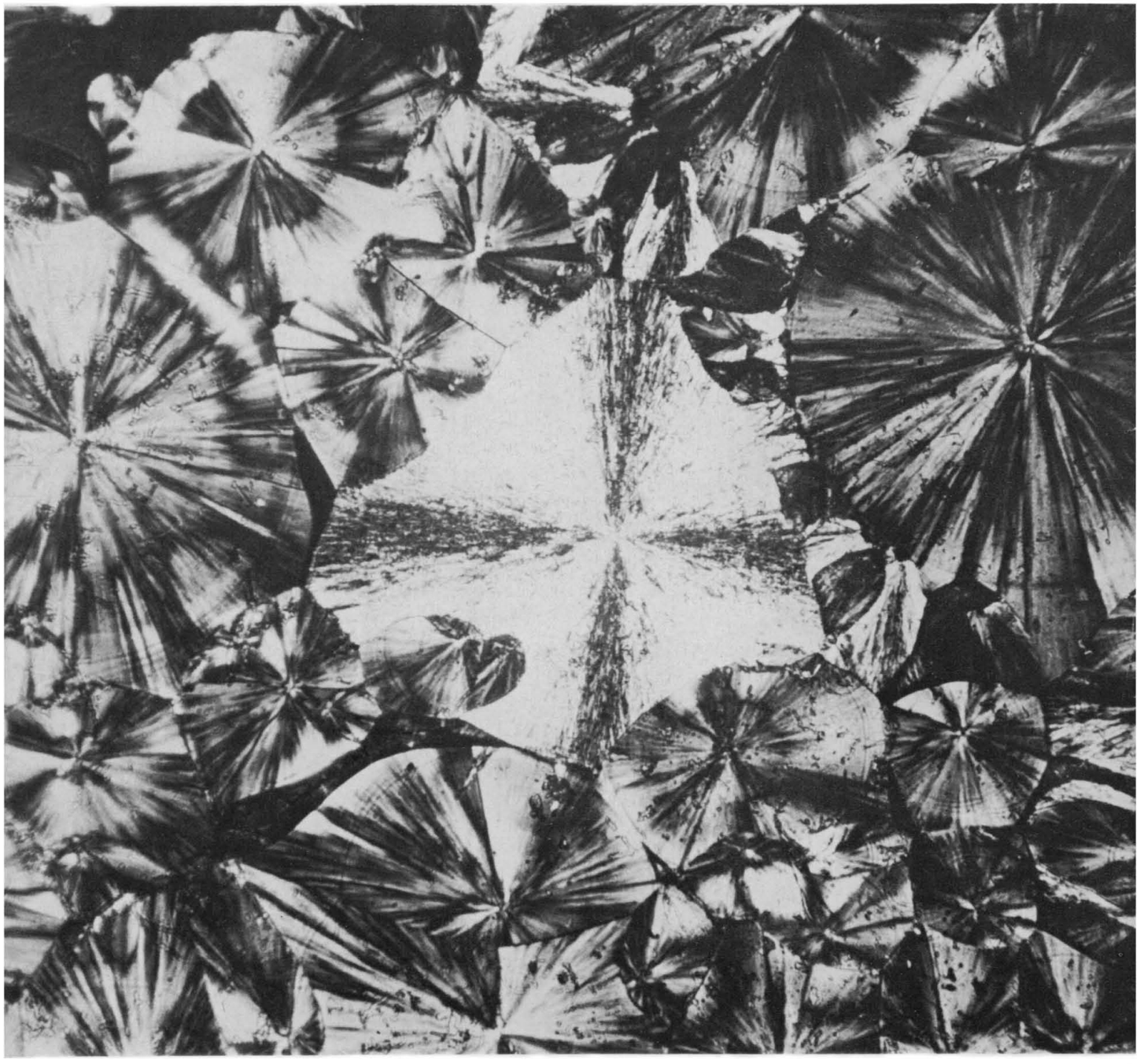
SCIENCE

6 December 1963

Vol. 142, No. 3597

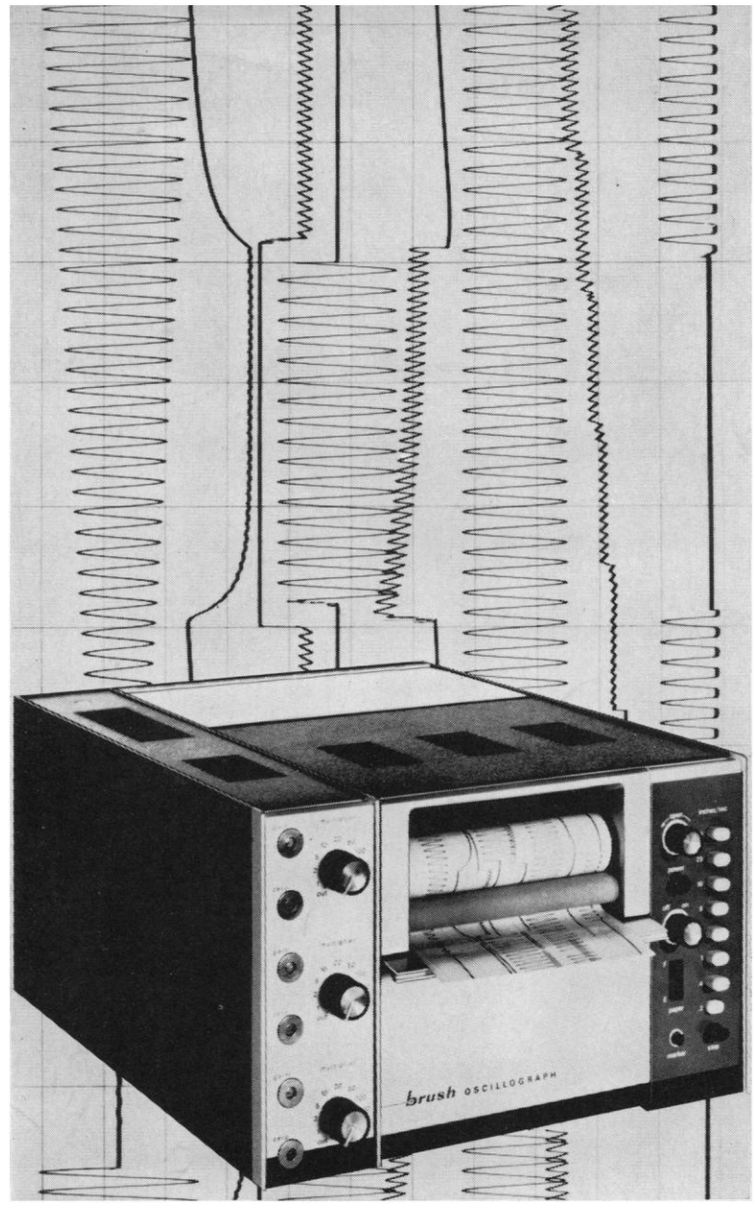
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



POLYPROPYLENE SPHERULITES

Preconvention Issue

Brush lightbeam recorder eliminates RFI with silent light!



The unique incandescent optical system of this new direct-print oscillograph completely eliminates confused data caused by generation of RF interference into associated equipment. It is the only lightbeam recorder that meets RFI specs . . . MIL-I-26600 and MIL-I-6181D. Whether your application is industrial or aero-space, check out these important facts.

Start and Re-start Recording time . . . 50 milliseconds
Writing Speed . . . Greater than 30,000 in./sec.
Companion Amplifiers . . . Especially Designed
Complete Line of Accessories
8 Pushbutton Record Speeds
Internal Chart Take-up
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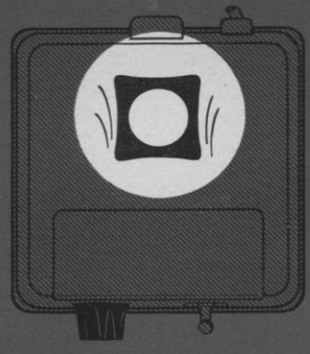
16 Channels

Now you can record over the whole range of most-used frequencies with Brush systems incorporating all the known refinements in oscillography. Write for full details.

brush INSTRUMENTS
DIVISION OF CLEVITE 37TH AND PERKINS, CLEVELAND 14, OHIO

Circle IFC on Readers' Service Card

THE MIXER WITH THE "SQUAROID" HEAD



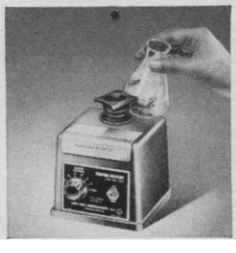
stirs, agitates, mixes . . . in seconds!

THE NEW LAB-LINE

SUPER-MIXER

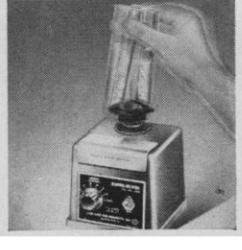
with exclusive "Touch-Plate" and variable mixing control

Positive mixing of contents in flasks, beakers, square or odd-shaped tubes . . . even micro size tubes



Single-hand control with Touch Plate Switch

Easily handles two or more tubes simultaneously



"What could be easier?" . . . is the first reaction when you see the Super-Mixer in action. The exclusive "Squaroid" mixing head—molded of durable Neoprene—provides quick, positive mixing action in test tubes, flasks, or other vehicles. Easy, convenient operation will convince you that this mixer has superior features:

- **Built-in rheostat control, gives smooth, stepless action; provides gentle, moderate or violent mixing**
- **Exclusive "Squaroid" mixing head handles micro size tubes, standard tubes, flasks and beakers**
- **"Squaroid" design of mixing head handles two or more tubes simultaneously**
- **Even square or odd-shaped tubes and flasks can be touched to the mixing head for positive stirring of contents**
- **Unique "Touch Plate" switch permits one-hand operation; mixing head stops instantly with release of pressure**
- **No springs used in the mixing mechanism**
- **Requires no stoppers, no capping of test tubes**
- **Housing of die-cast aluminum . . . 5" square base is cushioned with sponge rubber, will not creep**
- **Efficient, yet inexpensive (Order one for each lab table)**

Cat. No. 1290 LAB-LINE SUPER-MIXER. Complete with built-in rheostat control, exclusive "Squaroid" Neoprene mixing head and unique "Touch Plate". 115 Volts, 50/60 Cycles. Net wt. 6 lbs. Price **$59.50**

Cat. No. 1404 FOOT SWITCH for SUPER-MIXER. Price . . $20.00

Write for Bulletin 385

LAB-LINE INSTRUMENTS, Inc.
Manufacturers and Designers
LAB-LINE PLAZA • MELROSE PARK, ILL. 60160

6 December 1963
Vol. 142, No. 3597

SCIENCE

SCIENCE is published weekly by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D. C. 20005. Now combined with **The Scientific Monthly** ®. Second-class postage paid at Washington, D.C. Annual subscriptions $8.50; foreign postage, $1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, $7; 10 months, $7.50. Provide 4 weeks' notice for change of address, giving new and old address and zone numbers. Send a recent address label. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. Indexed in the **Reader's Guide to Periodical Literature.**

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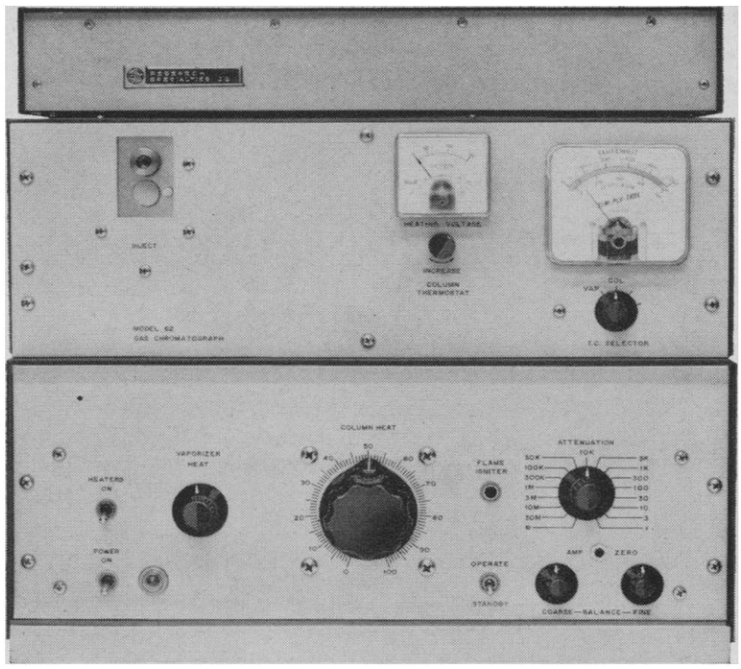
ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone 212-PE 6-1858.

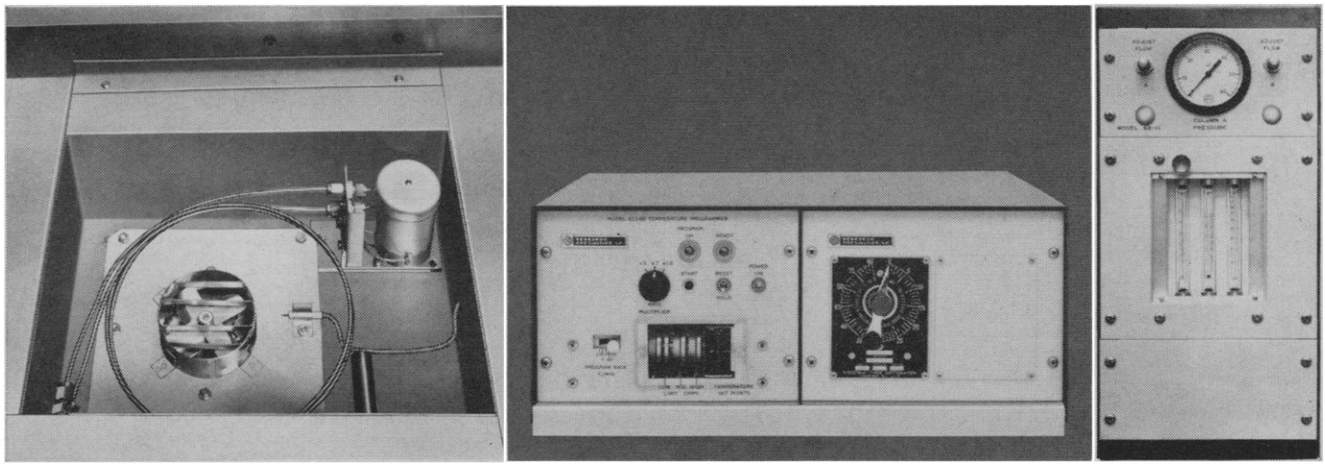
COVER

Negatively birefringent spherulites in a thin film of polypropylene. Tritiated dilauryl thiodipropionate is incorporated in the film and can be detected by autoradiography. The distribution of the labeled compound is related to the mode of crystal growth of the film. The phenomenon can be a useful tool for studies of microstructure in polymers (about × 540). See page 1316.



Here's a brand new low-priced gas chromatograph that gives you

single or dual flame operation, automatic programming, and more!



RSCo's new Model 62 is the only flame ionization gas chromatograph you can buy for $950. Add dual flame operation and automatic temperature programming and you have the most versatile, low-cost unit now available. The Model 62's wide range of accessories—separate detector ovens, sampling valves, input splitters, and flow meters—give it the versatility of a modular unit. □ Start with a basic model and add accessories as your needs expand. Good way to stretch a capital-expenditure budget? You bet. RSCo also makes the matchless 600 Series modular gas chromatography system. (It costs more, of course, but you can't buy a better one at any price.) Write us. We'd like to send you complete details.

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19 DIFFERENT READINGS AT A GLANCE

Startling scientific achievement, yet completely practical and functional. Designed for the space age by world renowned scientist, Dr. Athelstan Spilhaus, Dean of Technology, University of Minnesota. Handsome conversation piece—constantly up-to-date encyclopedia of the sky. The Spilhaus Space clock has beautiful fruitwood case and 3-sky-blue dials. Blends with decor of any home, office, club room, classroom, museum, display window, hotel, etc. Large dial shows sun position, daily sun rise and set, moon position, moon rise and set, phase of moon, low and high tide time, current stage of tide, day and month of year, current position of stars in sky, time of star rise and star set, relationships of sun, moon and stars, sidereal or star time. Left dial shows local time. Right dial shows world time including major U.S. cities and Universal (Greenwich) time. Operates on house current—requires only one simple setting for any geographic location. Measures 16" high x 11½" wide x 4¼" deep. Presentation plaques available. Complete satisfaction guaranteed or money refunded.

STOCK NO. 1201-W----------**$150.00**

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New "Weather Station" is highly sensitive to weather changes. Consistently accurate thermometer to ±2%; barometer accurate to ±.25% and hygrometer to ±5%. Foretells weather changes from 12 to 24 hours in advance. Hygrometer calibrated in percent relative humidity. Excellent for teaching weather phenomena and meteorological hobby work. Instrument mounted on handsome wood-grained wall panel 15½" x 5¾". Meter cases heavily metalized—combines beauty and protection. Dials, in etched aluminum, of high precision. Full instructions.

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70,669-W	10" x 10"	5"	9.75
50,272-W	10" x 10"	8"	5.00
70,670-W	10" x 10"	13½"	6.00
70,533-W	11⅛" sq.	19"	6.00
70,130-W	14" round	14"	6.00
19,076-W	42"	30"	700.00 Trans. Chgs. collect
30,389-W	2¼" x 2⅛"	2½"	2.49

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Here's a new adventure in optical impressions—created by the magical effect of these fascinating, rotating discs. In addition to weird shapes and fantastic "after images" this kit demonstrates "stop motion" stroboscopic principles—"off center" focus and even hypnotism. Kit includes 13 discs, approx. 5" in dia. battery holder, rheostat, small motor mounted on bracket, bulb, socket, plug and complete booklet of instructions and experimental use.

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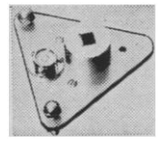

LOW-COST SOL-A-METER

Measures Solar Radiation Intensity

Now Edmund offers a low-cost SOL-A-METER pyrheliometer to schools, research labs engaged in aerospace, solar energy, meteorology, or agriculture. Also useful testing products affected by solar radiation such as paints and dyes, seed production and pesticides. Using a silicon solar cell, it generates a signal directly proportional to intensity of solar radiation falling on cell. Maximum output of 5 and 10 millivolts produced by solar radiation of 440 BTU/hr.ft.² or 2.0 Langleys. Built-in circular level vial; temperature compensated; insensitive to position or orientation. Instantaneous response (20 microseconds) to change in intensity of incoming solar radiation. Each instrument numbered and registered, individually calibrated under Arizona sun, calibration certificate included. Lifetime guarantee. Wiring and mounting diagram included.

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For Exciting Telephoto Pictures. Bring distant objects 7 times nearer with a 35mm camera. 7x50 binocular and our NEW BINOCULAR-TO-CAMERA HOLDER. Camera and binocular attach easily. Use any binocular or monocular—still or movie. Take color or black and white. Attractive gray and chrome finish. 10" long. Directions included.

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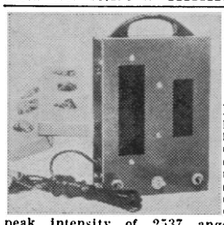

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Smart, functional, masculine cuff link and tie bar set featuring precisely calibrated, silver plated, thermometers with single degree accuracy tolerance. Fine unbreakable crystals and measuring range from 20 (degrees) F to +120 (degrees) F for the smartly groomed scientifically inclined male. In matched sets, or available separately—gift boxed and guaranteed.

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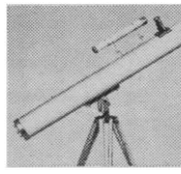
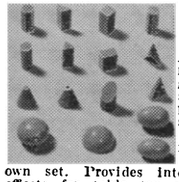


Stock No. 85-050-W----------**$29.95 Postpaid**



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70,005-W	8"	1⅜"	19.50 ppd.
70,006-W	10"	1¾"	30.75 f.o.b.
70,007-W	12½"	2⅛"	59.95 Barrington

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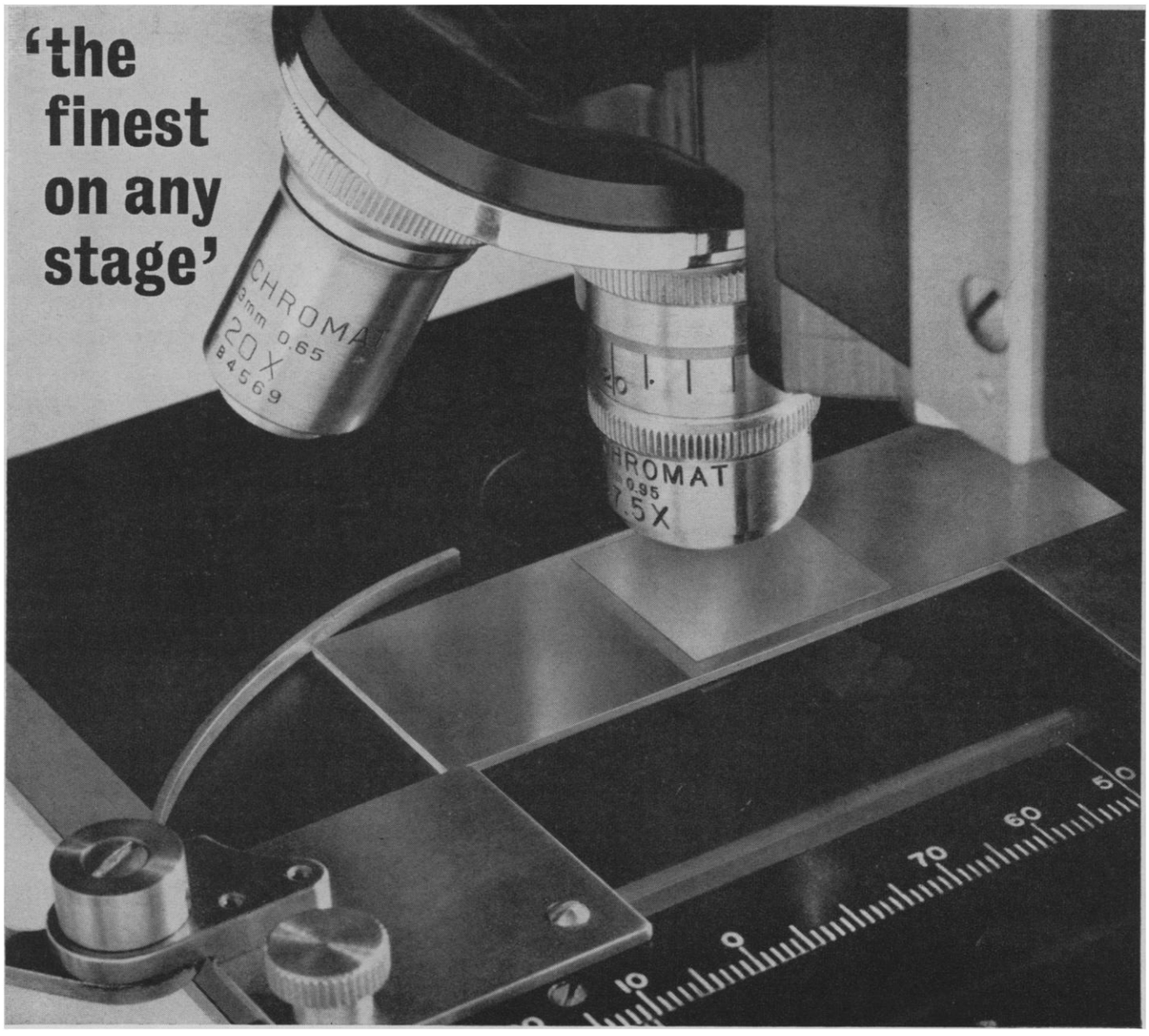

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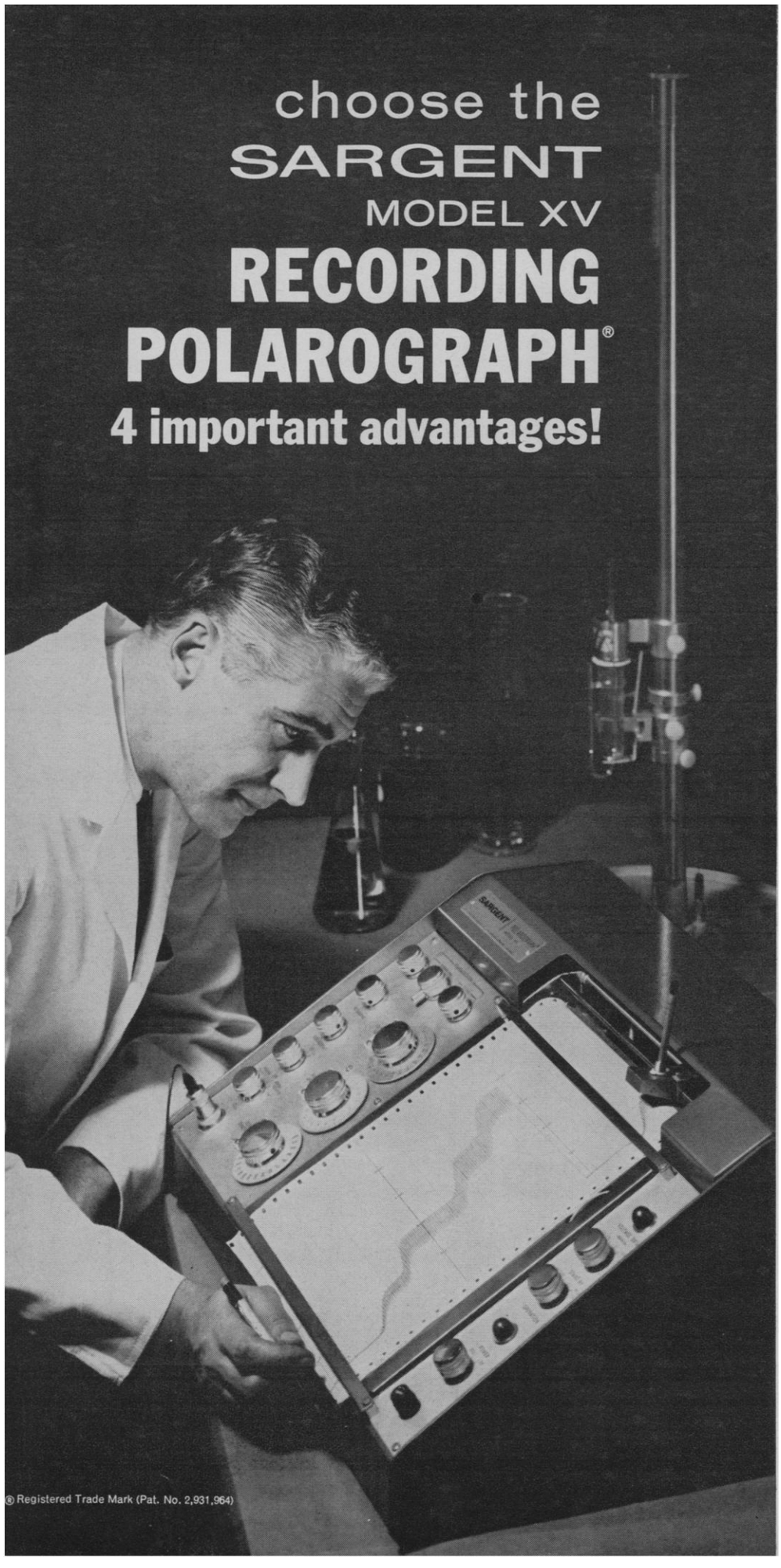

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3. 10 Standardized Polarizing Ranges

4. Low Cost

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

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

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

SPECIFICATIONS

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

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

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

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

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

Current Accuracy: 1/10%

Voltage Accuracy: ¼%

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

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

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

Damping: RC, four stage.

Pen: ball point; Leroy type optional.

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

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

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

Dimensions: 23 x 17 x 10 inches.

Net Weight: 65 pounds.

S-29310 Sargent Model XV Recording Polarograph with accessories and supplies.....**$1650.00**

For complete information write for Sargent Bulletin P-3.

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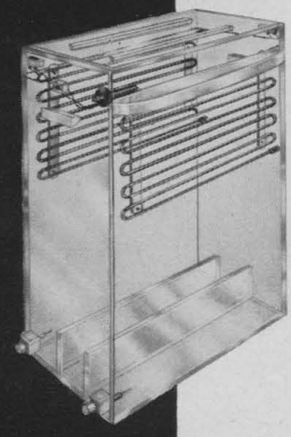

The ONLY system that allows VISUAL INSPECTION during operation

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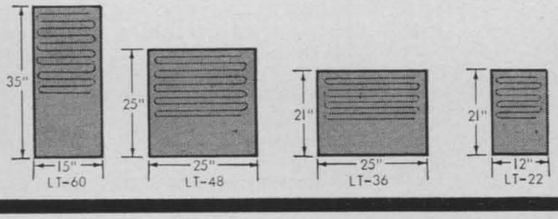

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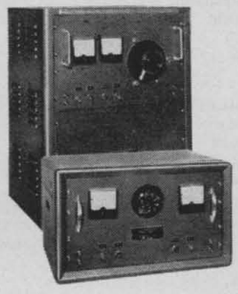

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10 KV • 5 KV • 2 KV • 400V

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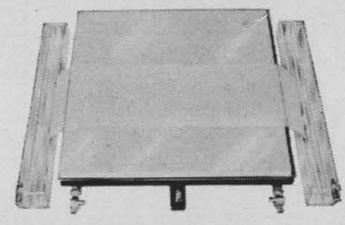

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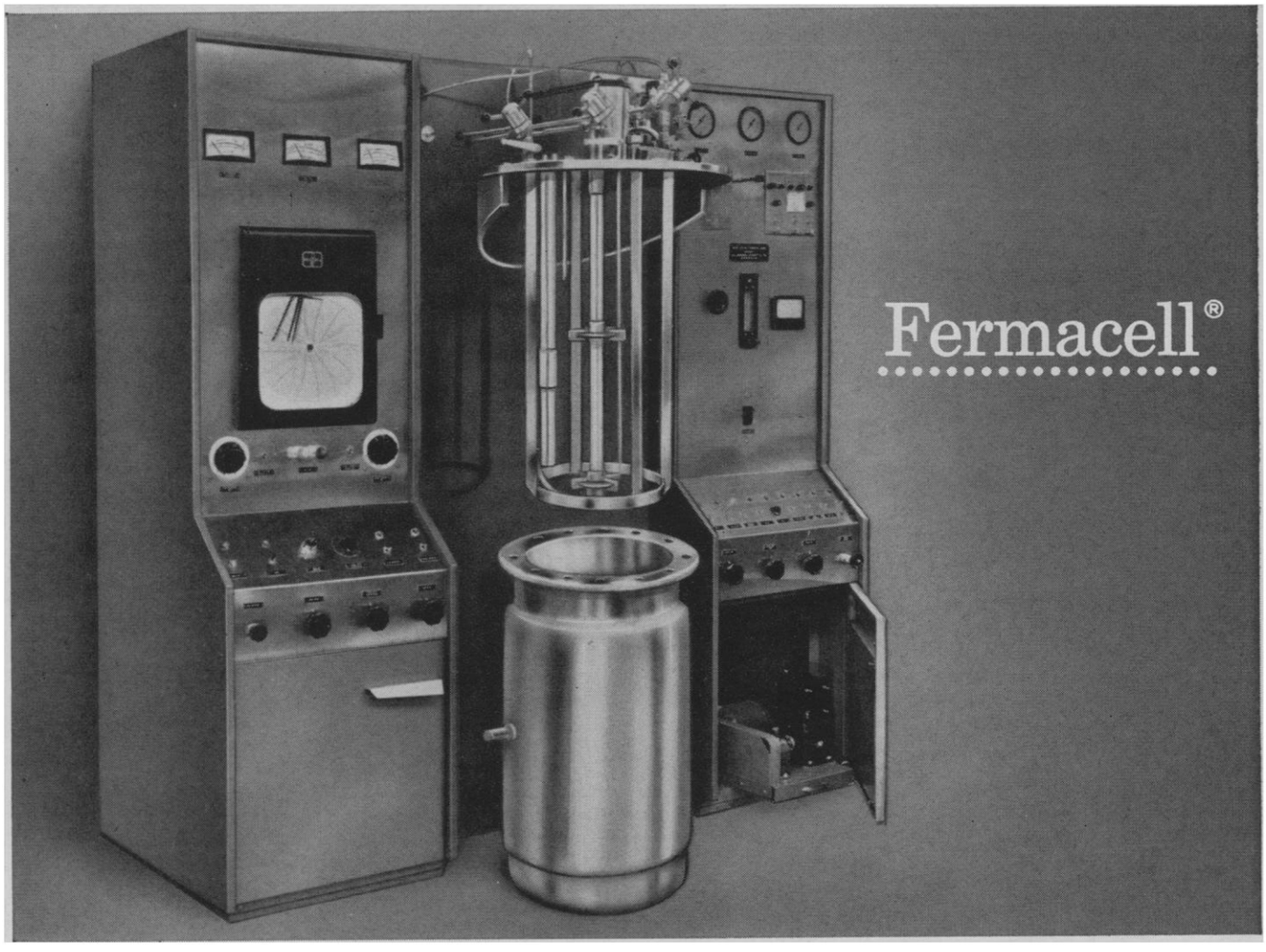

The Fermentor with the Removable Vessel

For laboratory, pilot-plant and small-scale production of microbial cells

The Fermacell is a general purpose fermentor used for basic laboratory research as well as pilot-plant and small-scale production of microbial cells. It is available in two sizes for working volumes up to 40 or 100 liters and is designed for batch production and continuous culture.

Rigid Control. This culturing apparatus is a completely steam-sterilizable system, fully integrated for rigid control of agitation, aeration, temperature, pressure, foam and pH. It is used for growing aerobic and anaerobic bacteria, streptomycetes, molds and yeasts, as well as mammalian and plant tissue cultures.

Easy to Handle and Easy to Use. The Fermacell's fermentor vessel can be removed quickly by one person in less than three minutes for cleaning as well as emptying and refilling. This design permits complete access to process lines, ports, and electrodes mounted in the stationary fermentor head plate.

Send for 12-page Illustrated Catalog No. FMS/1263

NBS New Brunswick Scientific Co., Inc.
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FERMACELL FEATURES

Removable Fermentor Vessel is easy to handle, easy to clean; provides complete access to the fermentor interior.

Replaceable Shaft Seal Assembly is designed for repeated steam sterilization and a long life of positive sealing without danger of contamination. Seals are contained in a removable cartridge to facilitate inspection and replacement.

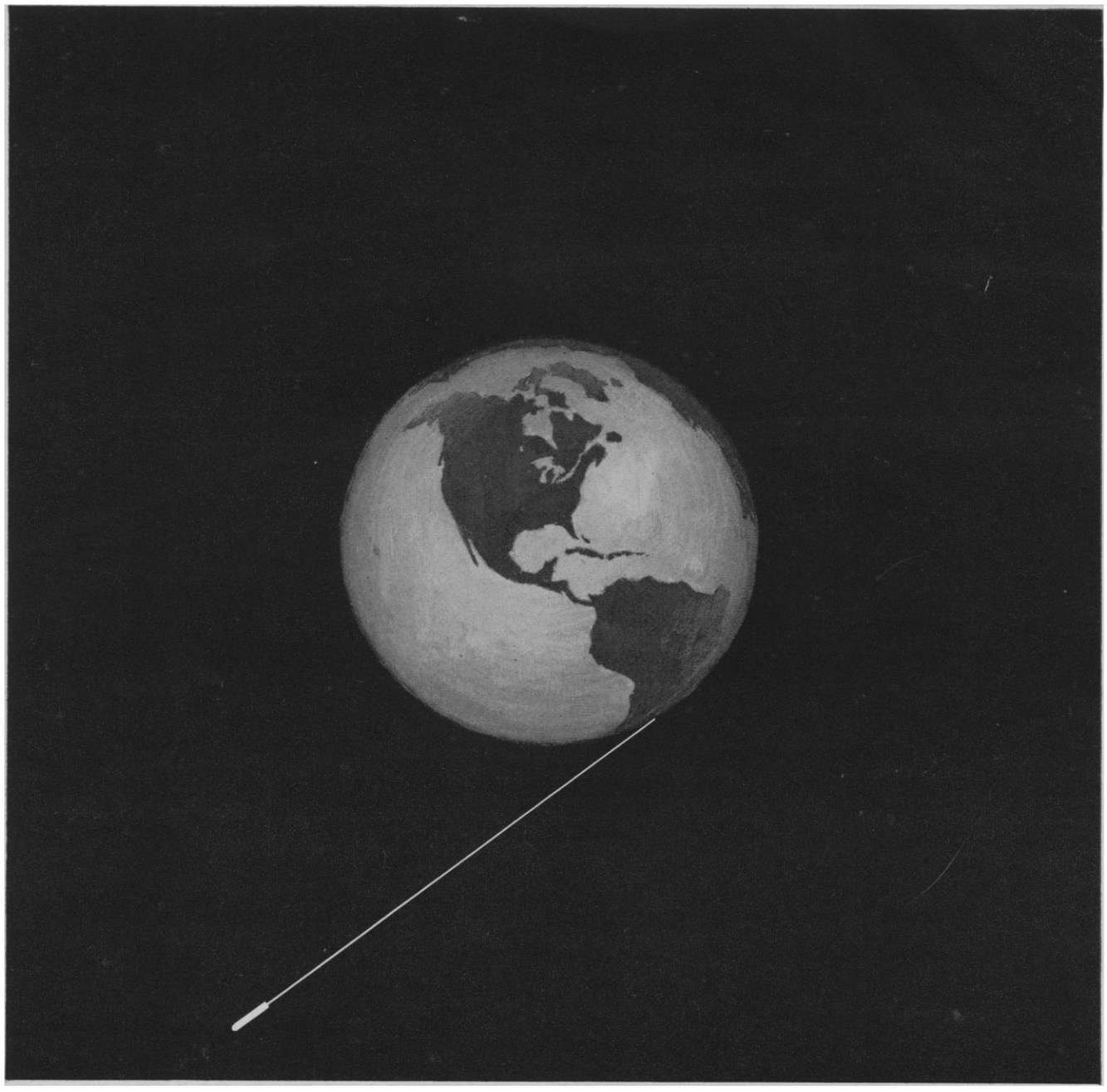
Rigid Temperature Control is maintained within ±0.5°C from 5°C above water supply temperature to 60°C.

Integral Recirculating Water Conditioning System circulates cold or heated water to fermentor jacket on control demand.

Extremely Versatile for a wide range of microbial studies. Components are designed for simple removal and cleaning as well as flexibility of operation. Choice of interchangeable spargers and impellers in four different models.

Broad Range of Accessories include Automatic pH Control, Photosynthetic and Ultraviolet Illuminators, Air Incineration System, Air Humidifier, Air Compressor and other equipment.

Easy to Operate—all controls are conveniently mounted on the front of the apparatus.



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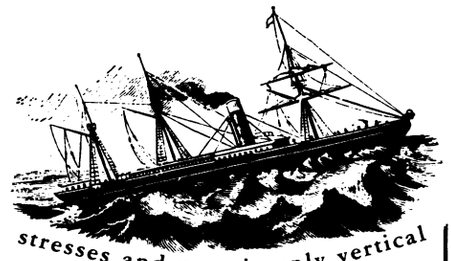
Honeywell data acquisition system records stresses on ships at sea



The extremely low recording speed capability of a Honeywell Magnetic Tape System and the versatility of a Honeywell Visicorder Oscillograph have teamed up to report a new story of the punishment ships take at sea. Lessells and Associates, Inc., Boston, used the Honeywell system to measure the vertical longitudinal stresses induced in the hull each time a ship is pounded by a wave.

A Honeywell LAR 7460 Magnetic Tape Recording system was installed aboard the S.S. Hoosier State, and later aboard a sister ship, the S.S. Wolverine State. Both are 520-foot, 15,000 ton freighters operated by States Marine Lines of New York.

Strain gages were attached to the port and starboard gunwales amidships to sense stresses produced by waves encountered over the turbulent trade routes of the North Atlantic.

The outputs of the gages were combined in a manner which would cancel the horizontal and transverse stresses and permit only vertical bending stresses to be measured.

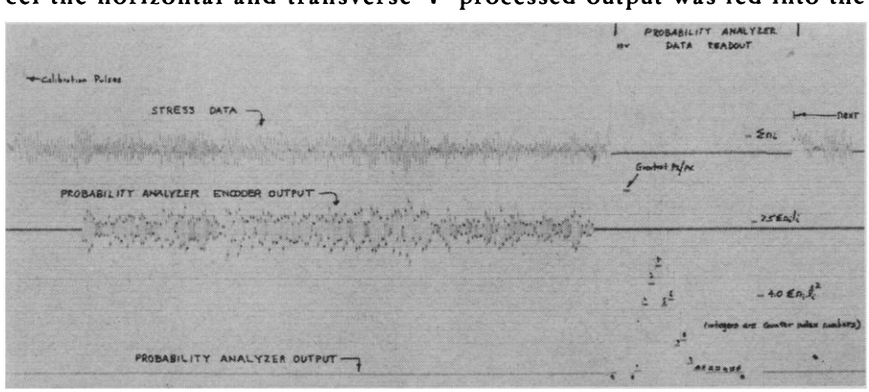
Data from the strain gages were then recorded at .3 inches per second on the 14-track LAR 7460 tape system. The extremely low speed capability of the recorder permitted 40 hours of data to be recorded on a single pass of a 10½-inch reel of tape. During the voyage, the ship's officers rewound the tape every 40 hours, permitting 160 hours of data to be recorded on a single reel of tape.

After the voyage, the tape was taken to Lessells' laboratory and played back from a Honeywell reproducing and amplifying system at 60 inches per second, or a speed ratio of 200 to 1. From the playback system, the data were recorded on a Honeywell Model 906 Visicorder oscillograph, operating at a paper speed of one inch per second.

The data were also fed through a probability distribution analyzer and this processed output was fed into the Visicorder to permit simultaneous observation of original and processed data. By being able to control both the recording speed and the playback speed, as well as the paper speed of the Visicorder, Lessells could obtain a permanent record of the data with any desired trace resolution.

Whatever your data acquisition requirements may be, Honeywell systems can meet your needs. Visicorder oscillographs are available with channel capacities from 1 to 36 and paper speeds from 1 inch per hour to 160 inches per second. Honeywell Magnetic Tape Systems range from the economical Honeywell 8100 portable recorder/reproducer to complete laboratory systems, with capabilities including FM, direct, digital, and incremental recording.

For complete information, call your local Honeywell representative. Or write or call Honeywell, Denver Division, Industrial Products Group, Denver 10, Colo. (303-794-4311)



Top trace: Stress data as recorded on ship. Middle trace: Probability distribution analyzer encoder output. Bottom trace: Probability distribution analyzer output. Work performed under NOBS Contracts: #88349, Ships Structures Committee; #88451, Office Chief of Transportation, Dept. of Army.

The Honeywell reproducing and amplifying tape system and the Model 906 Visicorder Oscillograph in Lessells' Boston laboratory.

DATA HANDLING SYSTEMS

Honeywell

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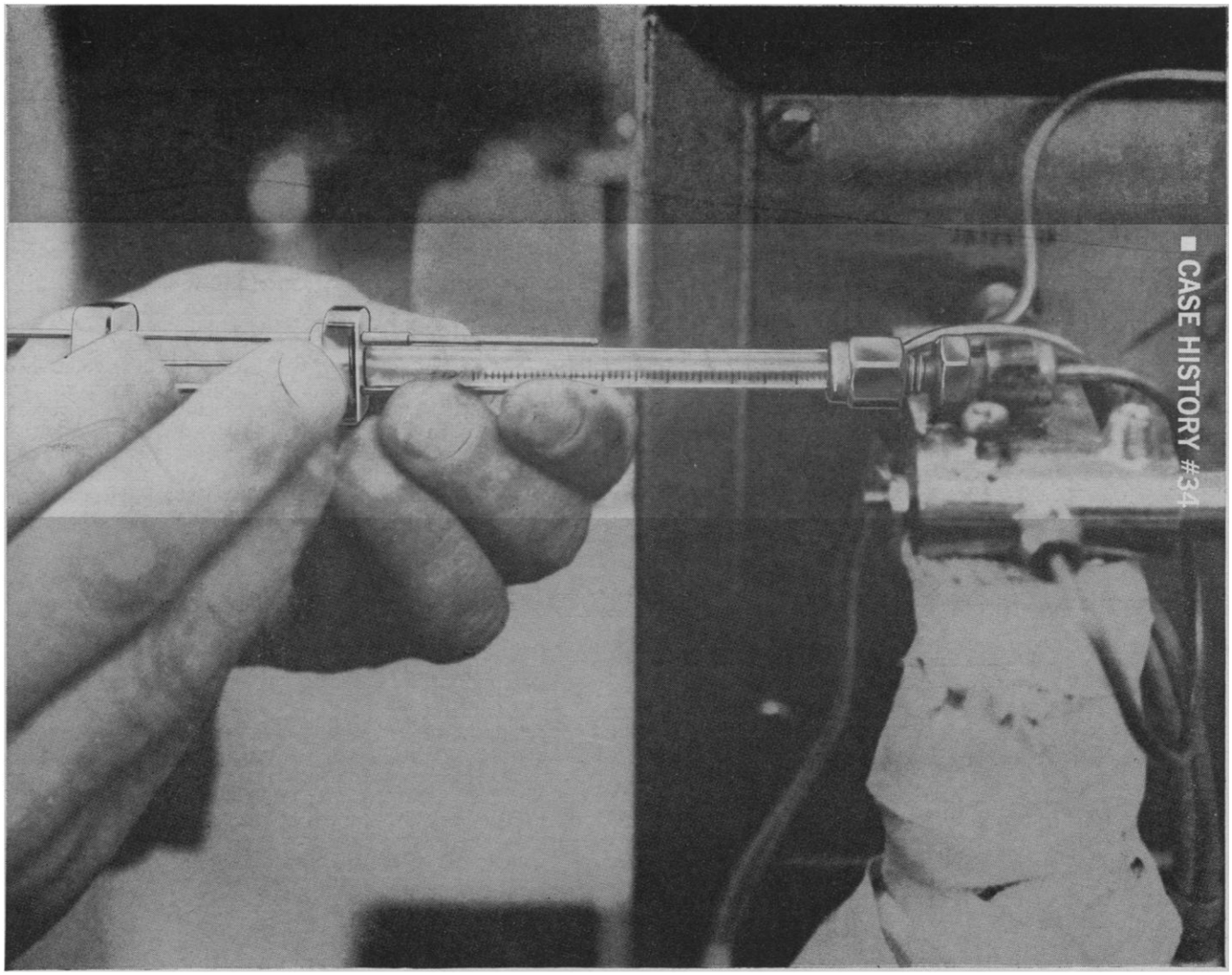

REPRODUCIBILITY AIDS FORMALDEHYDE ANALYSIS

The difficult task of analyzing the important industrial chemical, Formaldehyde, has been accomplished by Chemist Karl J. Bombaugh, of the R & D Division of the Spencer Chemical Company, Kansas City. Bombaugh reports [1] that a Hamilton Microliter syringe with a Chaney Adaptor was used because the method required reproducible injections of the actual sample and calibrating solution. First the calibrating solution which did not contain formaldehyde was used as a secondary external standard because of its stability. That solution was then calibrated using the cumbersome formaldehyde-containing solution, permitting preparation of a reference solution that could be used in a chromatograph at any time as an external standard—provided that it and the sample could be injected reproducibly. Since the errors in the "primary calibration" and in the "use calibration" are additive, extreme accuracy was required from the injection device. However, no attempt was made to determine the absolute accuracy of the syringe, "Because," Bombaugh states, "we place higher confidence in the accuracy of the syringe than in our ability to calibrate it by any simple procedure." [1] Bombaugh, K., Bull, W., **Ana. Chem., 34,** 1237, (1962). **Hamilton manufactures a complete line of precision syringes from a capacity of 0.5 μl to 500 μl and other related chromatograph equipment.**

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Special Sessions AAAS Presidential Address by Paul Gross; the AAAS Distinguished Lecture on ideology and income by J. K. Galbraith; the Joint Address of Sigma Xi and Phi Beta Kappa by Paul Sears; the George Sarton Memorial Lecture by Hudson Hoagland; and the National Geographic Society Illustrated Lecture on Mozambique by Volkmar Wentzel.

Other General Events Three-session symposium on the sciences in Japan sponsored jointly by the Science Council of Japan and the AAAS. Two symposia sponsored by the Office of Economic and Statistical Studies of the National Science Foundation: Planning and administration of scientific research programs, and the role of instruments and equipment use in research program planning.

AAAS Committees Joint symposium of the Committee on Meetings and the Committee on Science in the Promotion of Human Welfare on chemical control of heredity, arranged by Barry Commoner and David R. Goddard.

Sections and Societies The 20 AAAS Sections and some 70 participating societies are scheduling specialized symposia, and many have sessions for contributed papers.

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MEETING • 26-30 DECEMBER

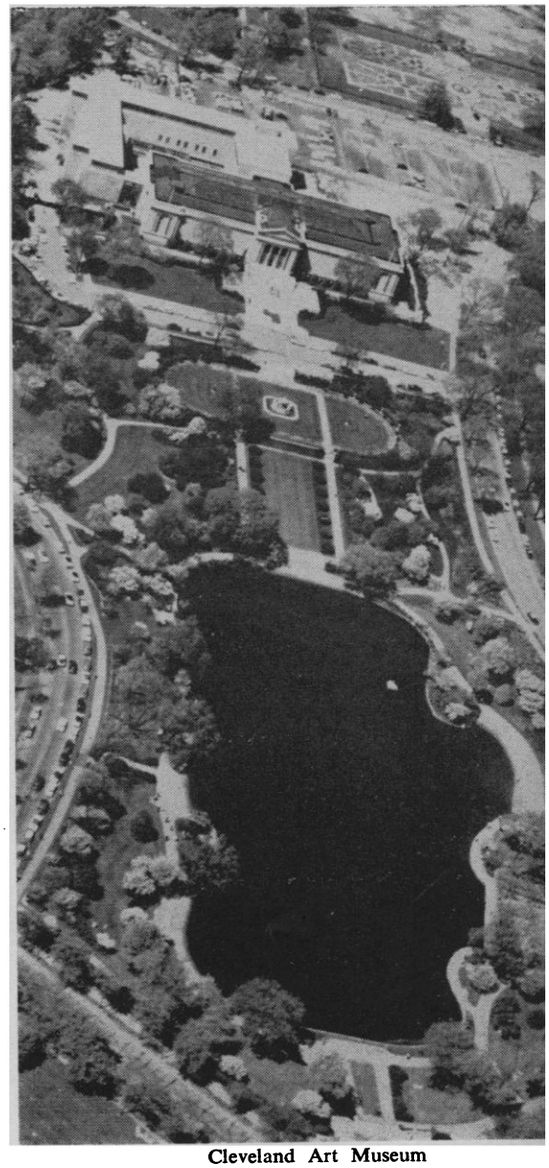
Reserve Your Hotel Room

Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 280, 19 July, SCIENCE. The AAAS headquarters is the Sheraton-Cleveland.

The hotels for the AAAS Cleveland meeting have established special, low flat rates and have reserved large blocks of rooms for the meeting.

Use the coupon below to make your hotel reservation in Cleveland. Send your application to the AAAS Housing Bureau in Cleveland, not to any hotel. Give a definite date and estimated hour of arrival, and also probable date of departure. The Housing Bureau will make the assignment and send you a confirmation in two weeks or less.

A rollaway bed can be added to any room at $3.00 per night. Mail your application now to secure your first choice of accommodations.



Cleveland Art Museum

HOTEL RATES*
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

For a list of the headquarters of each participating society and section, see page 280, *Science*, 19 July.

Hotel	Single Bed	Double Bed	Twin Beds	Suites
Sheraton-Cleveland	$8.50	$14.00	$15.50	$33.00—$60.00
Statler-Hilton	8.50	14.00	15.50	28.00— 59.00
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UNION CARBIDE

LINDE CRYOBIOLOGY NEWS

REPORT NO. 4 FROM UNION CARBIDE CORPORATION, LINDE DIVISION

More preservation progress using liquid nitrogen

Notes on preserving parasitic protozoa, tissue cultures...successful applications of new cryogenic cooling systems...latest cryobiology equipment.

Significant achievements were recently reported on the use of liquid nitrogen for freezing and storage of biological specimens. Diamond, et al.[1] successfully applied cryogenic techniques to preserve a selected group of parasitic protozoa for extended periods. Using two- or three-step freezing cycles and storing at liquid nitrogen temperature (-196°C.), this research team was able to preserve *Entamoeba histolytica, Trichomonas gallinae, T. vaginalis, T. foetus, T. hominis, Trypanosoma cruzi,* and *T. ranarum,* for unprecedented times. In evaluating the efficiency of this liquid nitrogen preservation technique, they reported:

"No difference in yields were found between samples of a given species thawed 24 hours after freezing and those thawed after the longest period of storage. This indicated absence of decay during storage . . ."

At dry ice temperature, degradative activity commonly occurs.

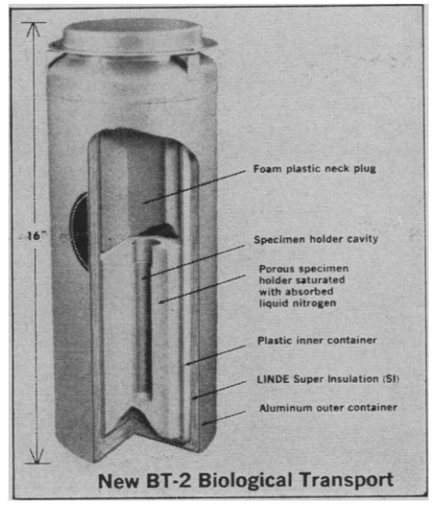
Greaves, et al.[2] designate the two major biological products requiring low temperature storage as: (1) the preservation of cells for tissue culture and (2) the preservation of erythrocytes of rare blood groups. These authors note that the key to very low temperature storage is reliability, and: "The LINDE containers require recharging only once a week as routine and in an emergency (they) will last from 28 to 90 days."

In this paper the authors also describe a modification to the plug of the LINDE LR-25B Refrigerator, which serves as a controlled-rate cooling device.

LATEST EQUIPMENT FROM LINDE

The BF-5 Biological Freezer provides a simple, economical means of freezing small quantities of biological materials with reasonable accuracy. Designed for use with the LINDE LR-35 Refrigerator, this low-cost, plug-type freezer holds nine 1.2 cc. ampules. The refrigerant is cold nitrogen gas, evolving from liquid nitrogen in the refrigerator. Cooling rate, from ½°C. to 7°C. per minute, depends upon the number and position of ampules.

The BT-2 Biological Transport (see illustration) is a practical, lightweight container that is designed to permit, for the first time, shipment of biological materials at cryogenic temperatures via postal service or common carrier.



New BT-2 Biological Transport

This new container completely eliminates loss of refrigerant by spillage during shipment. The new BT-2 features a porous specimen holder-block, which absorbs liquid nitrogen and retains it as a liquid until heat from the refrigeration load gradually evaporates this liquid as cold gas. Liquid nitrogen lasts up to five days.

The LR-120 Refrigerator combines convenience and space economy. As the first liquid nitrogen refrigerator to offer square exterior and interior geometry, it permits more convenient use of laboratory floor space and more efficient utilization of internal storage space. Completely non-mechanical, the LR-120 features LINDE's exclusive Super Insulation (SI). Storage space, providing a total bulk capacity of four cubic feet, is divided into four compartments. Storage temperature is -196°C. below and -130°C. above liquid level. Access is via a large opening covered by a two-section plastic lid. The LR-120 holds up to 9600 ampules; liquid nitrogen capacity is 120 liters. It is especially recommended for applications requiring frequent handling of stored materials.

LINDE offers a complete line of quality cryogenic equipment – biological refrigerators, freezers, and other cryogenic containers – as well as fast, nation-wide delivery of liquid nitrogen and top-flight technical service. To secure reprints and full information on latest developments in cryobiology, complete and mail the coupon below.

(1) Diamond, L. S., Meryman, H. T., and Kafig, E., CULTURE COLLECTIONS: PERSPECTIVES AND PROBLEMS (Ed. Martin, S. M.): University of Toronto Press (1963). (2) Greaves, R. I. N., Nagington, J., and Kellaway, T. D., *Fed. Proc.,* 22:90 (Jan.-Feb.) 1963.

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Please send the following:

☐ *Reprint:* Preservation of Living Cells by Freezing and by Drying by R. I. N. Greaves et al.

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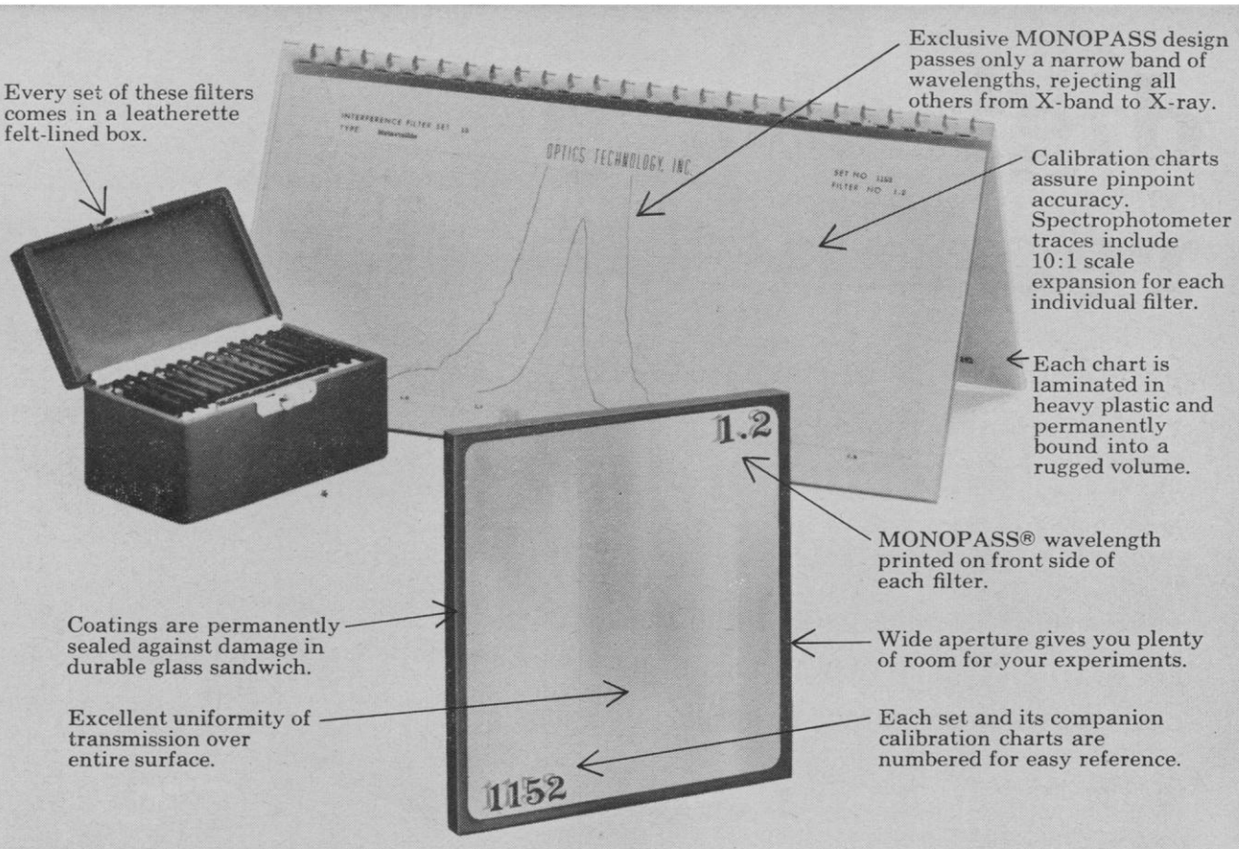

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digital-type reading

Another first from Sartorius.

Sartorius pioneered in the introduction of analytical balances with a 1000 mg optical range reading direct to 0.1 mg (without interpolation). Now, while most competitive instruments still offer shorter, less practical, optical ranges, Sartorius is first to introduce a new projection scale on which each division is individually numbered. And, this scale is available on models with various sensitivities including a semi-micro version (reading direct to 0.01 mg).

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In every respect, weighings are simpler and faster. Reading errors are virtually impossible. Before you buy, compare the Sartorius Projection Scale and the Sartorius Balance to any other model available. You cannot appreciate the difference until you see it. Prices begin at just $725.

Today, Sartorius is first in balance design.

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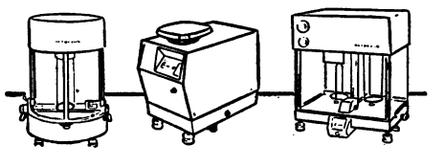

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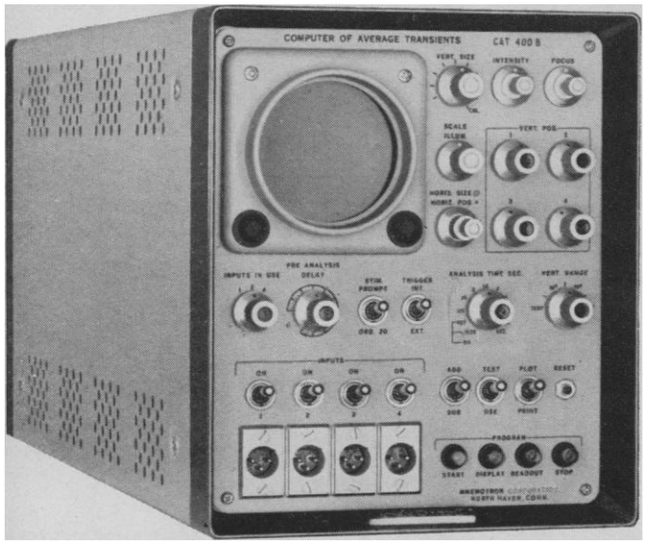

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Isolates Transient Signals from Background Noise

CAT 400B is the unique MNEMOTRON Computer of Average Transients. It is today's most invaluable instrument for processing biological data derived from investigations in Neurophysiology, Pharmacology, Ophthalmology, Psychology and Cardiology, among others.

Where "on-line" definition of repetitive transient signals is indicated by the nature of the experiment, no other instrument approaches the capabilities of the CAT. In a transistorized package of only 38 pounds, the transportable CAT occupies less than one cubic foot of bench space.

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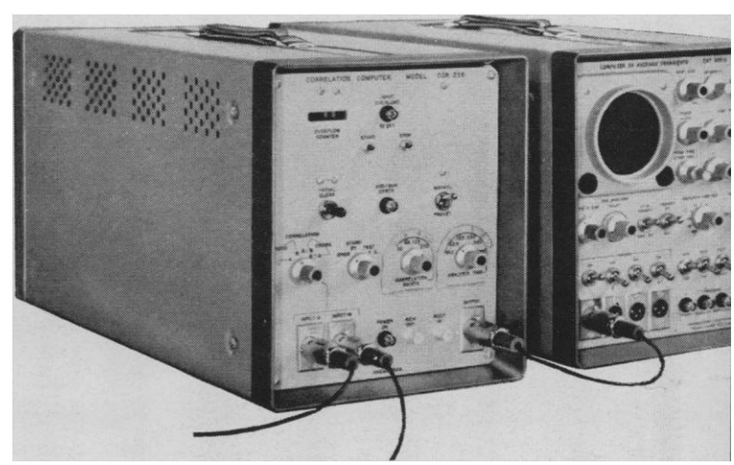

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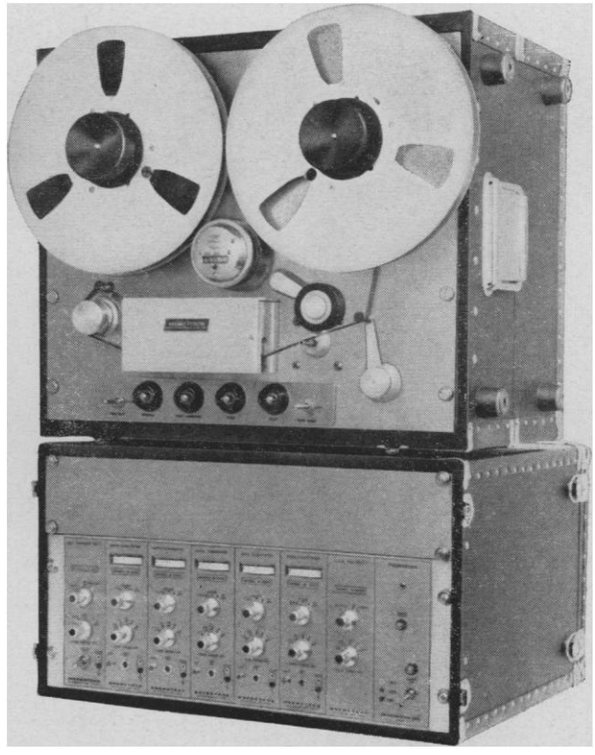

MNEMOTRON NEW MODEL 700/1400 SERIES MAGNETIC TAPE RECORDING SYSTEMS record any electrical quantity from DC up to 5000 cps. A uniquely simple pulse-frequency modulation technique insures that data signal intelligence is free from non-linearity due to tape coating or other distortions.

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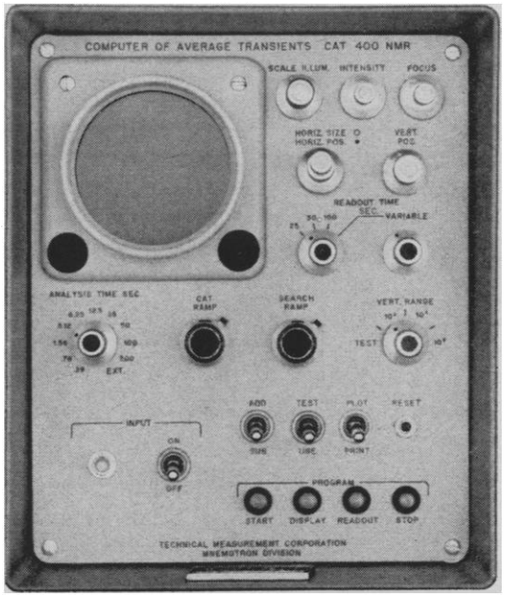

CAT 400 (NMR)

Significant New Instrumentation for NMR Spectroscopy

Up to now the investigator has been severely limited in detecting trace quantities or samples of extremely high dilution. Random noise masking the desired signal has hampered the detection of resonance peaks for adequate identification.

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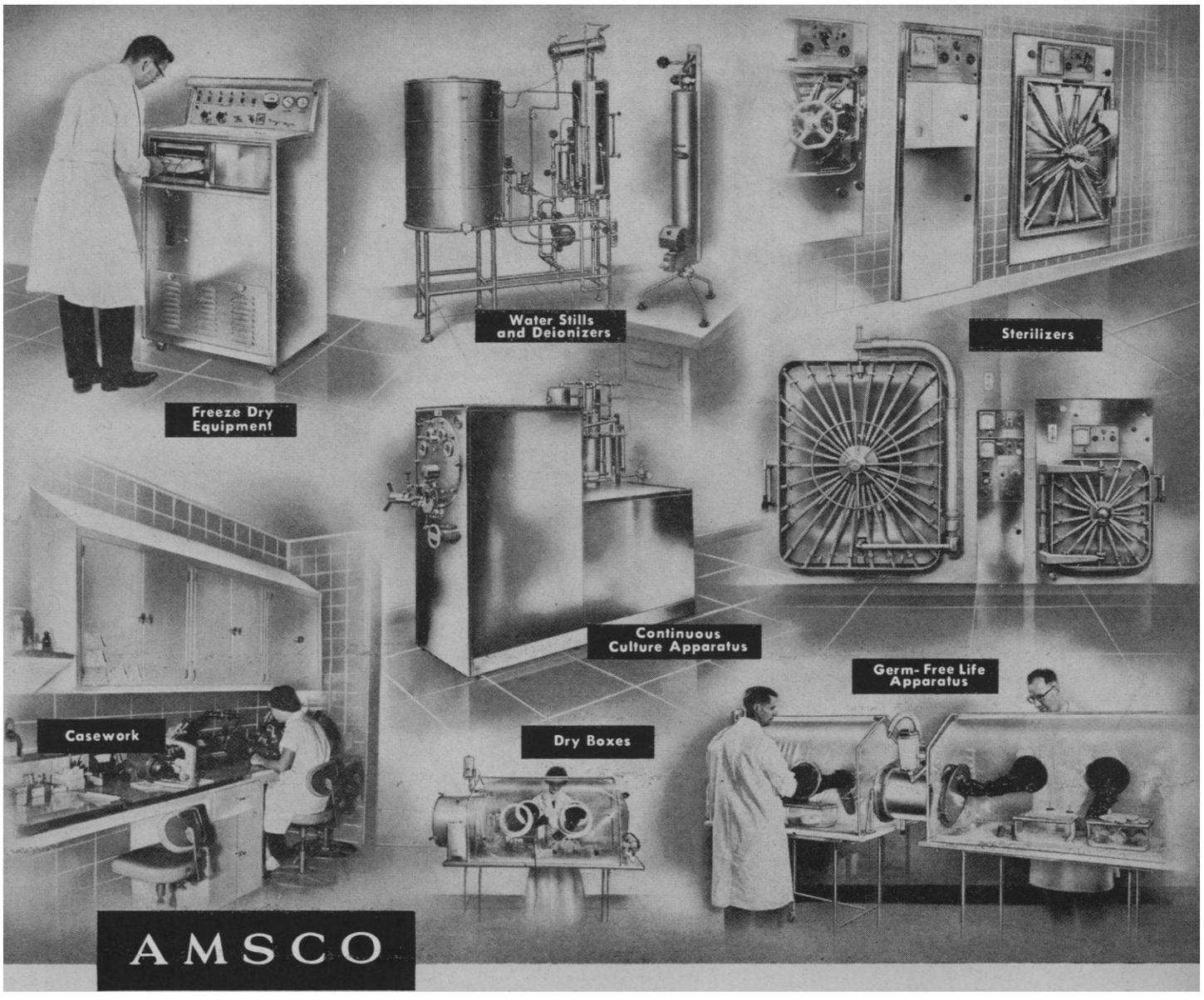

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Let us share *your* confidential equipment and process problems. We welcome the challenge, for the resolution of microbiological problems has become our way of life. Of course, Amsco's varied line of standard equipment, as illustrated, is a ready source for precision-made apparatus.

Please write for literature of interest to you. If you have special needs, a letter to our Scientific and Industrial Department may lead to their economical resolution.

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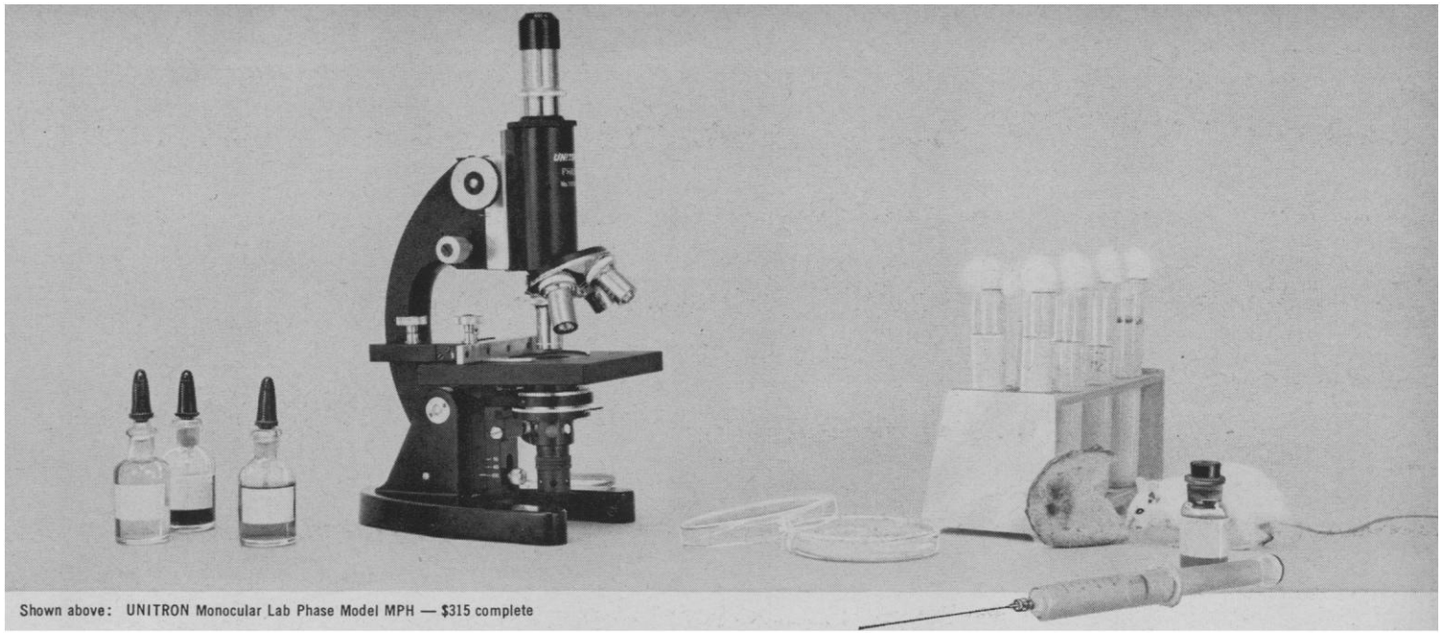

Shown above: UNITRON Monocular Lab Phase Model MPH — $315 complete

There are 3 microscopes in this picture

...at a distinctly singular UNITRON price

Most lab microscopes are used for ordinary *brightfield* studies.

So is UNITRON's MPH.

Some lab microscopes can also be used for *darkfield.*

So can UNITRON's MPH.

Still other lab microscopes offer *phase contrast* to aid in the study of *living, unstained* material.

So does UNITRON's MPH.

Until now, no lab microscope has provided all 3 for the price of 1.

UNITRON's MPH does. The 3 most important techniques of microscopy are built-in, yet the MPH costs less than many single-purpose microscopes.

That's not all. UNITRON's MPH gives you more than just the advantages of 3 specialized microscopes. It unites them in "Continuous-Transition Microscopy." With a turn of the condenser knob, you change from *brightfield* to *darkfield* to *phase contrast,* all in rapid succession. Operation is so easy, it's almost automatic. There are no accessories to attach and no time-consuming adjustments to make. Everything has been factory-centered for you. Even the light source is built-in and permanently aligned

Have cost and complexity kept you in the dark about phase? If so, you're in for a treat UNITRON phase contrast will impress you all the more if you've tried to study *unstained, living* material with ordinary brightfield microscopes. There's no need to close the iris to pinhole size, reducing resolution and detail. Gone are those ghostly artificial images.

UNITRON Phase Contrast provides optical staining. You get the benefits of chemical staining, without the time-consuming preparation. And what's more, you see material *alive* with vivid contrast and pin-point detail. With phase, even your stained slides show unsuspected details. All this, without any special effort.

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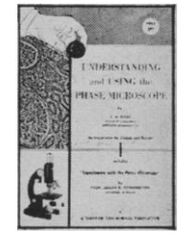
And now, the moment of truth. The price. Only $315 for UNITRON's Monocular Laboratory Phase Model MPH . . . less than you pay for many ordinary brightfield lab microscopes. The Binocular Model BPH, with several additional features of its own, costs only $527.

UNITRON prices include everything but the specimens. In addition to all the special features of our phase models, you'll find everything else you expect in a good lab microscope. Four achromatic objectives (including high-power oil-immersion), mechanical stage, focusable substage condenser with iris diaphragm and filter system, fitted cabinet, etc. These, and all the other features we've described, are standard equipment with UNITRON. *There are no hidden extras to buy*

Too good to be true? You needn't take our word for it. Borrow a UNITRON Monocular MPH or Binocular BPH for 10 days. No cost or obligation. (We'll even pay shipping charges for a chance to let you put our microscope through its paces.) Give this UNITRON an opportunity to prove its value in your lab. We think it will sell itself.

Teachers will be interested to learn that UNITRON even offers *student phase models* for as little as $99. To introduce phase to the student lab, and to other areas where it has been a stranger, UNITRON has published a fully illustrated 64-page booklet, *Understanding and Using the Phase Microscope.* The text includes a special chapter of experiments written by Professor Julian D. Corrington of the University of Miami. Other subjects are covered, including the optical theory of microscopes in general. The booklet normally sells for $1.00 but we will be glad to send a free copy to any interested teacher or researcher



Ask for a free 10-day trial. Please specify whether you want to try Model MPH or BPH. A phase booklet is shipped with each microscope . . . **or,** you may request the booklet separately.

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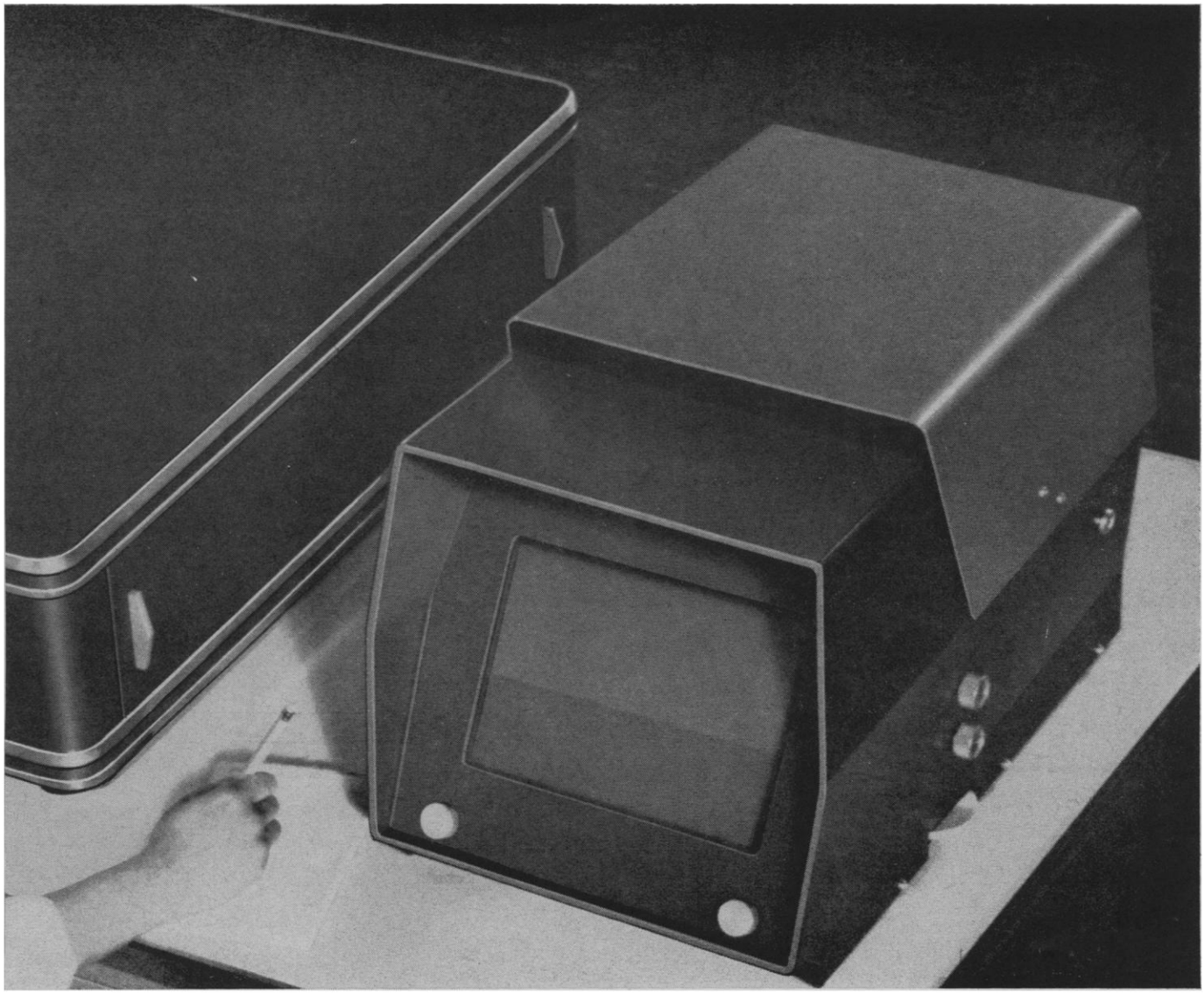

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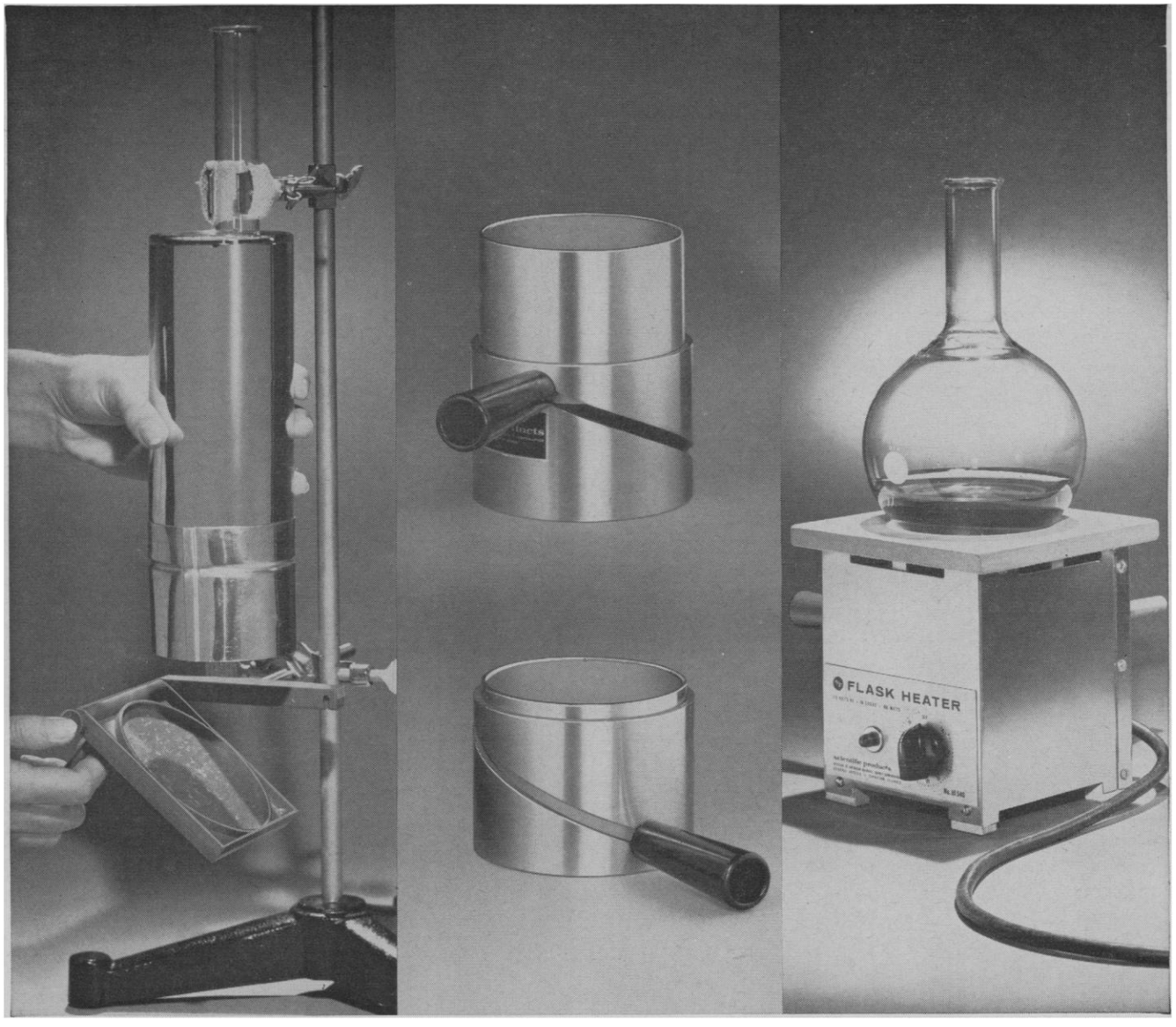

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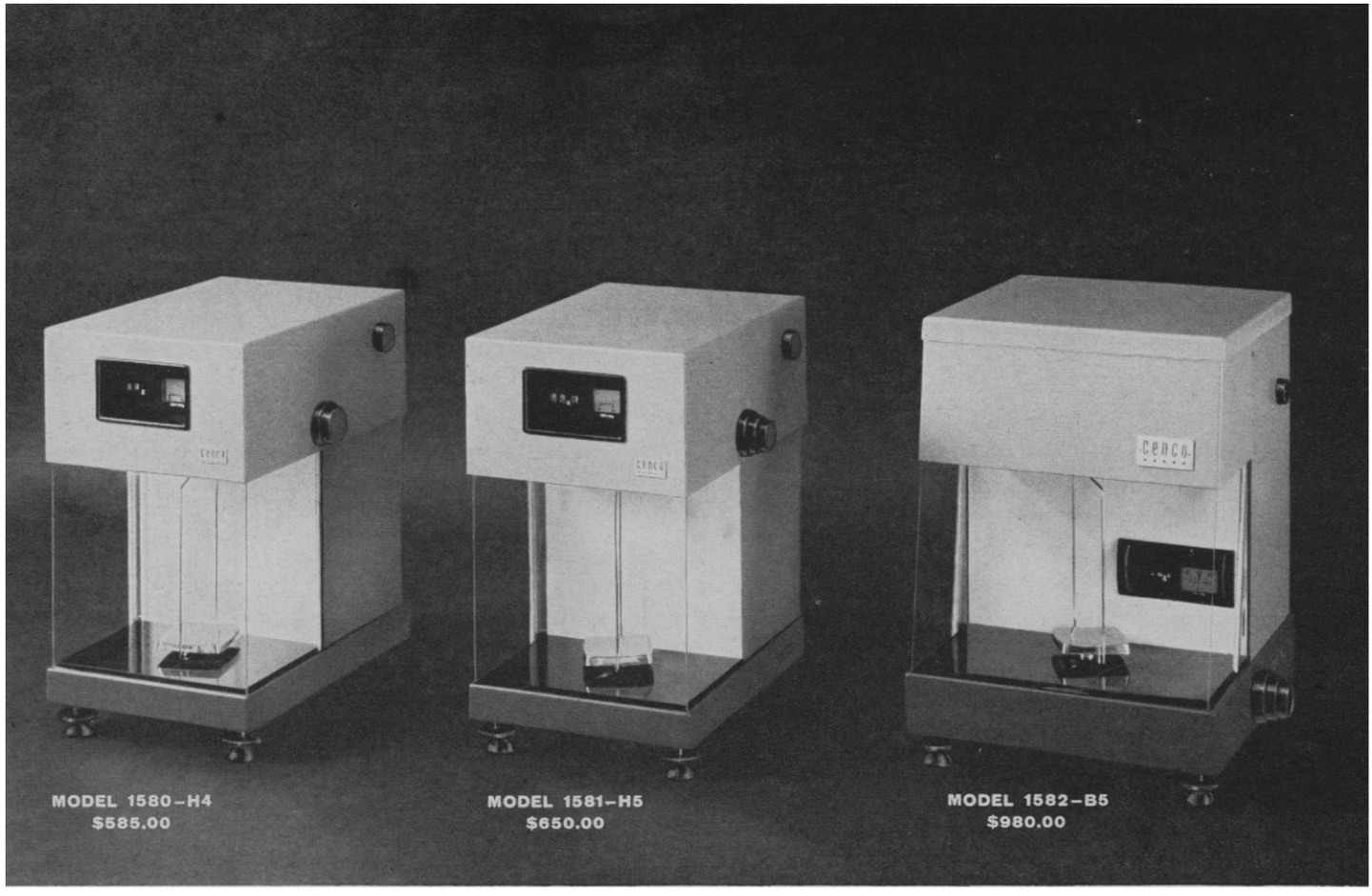

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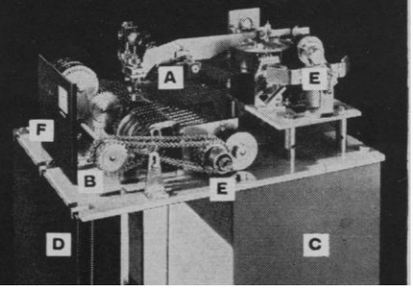

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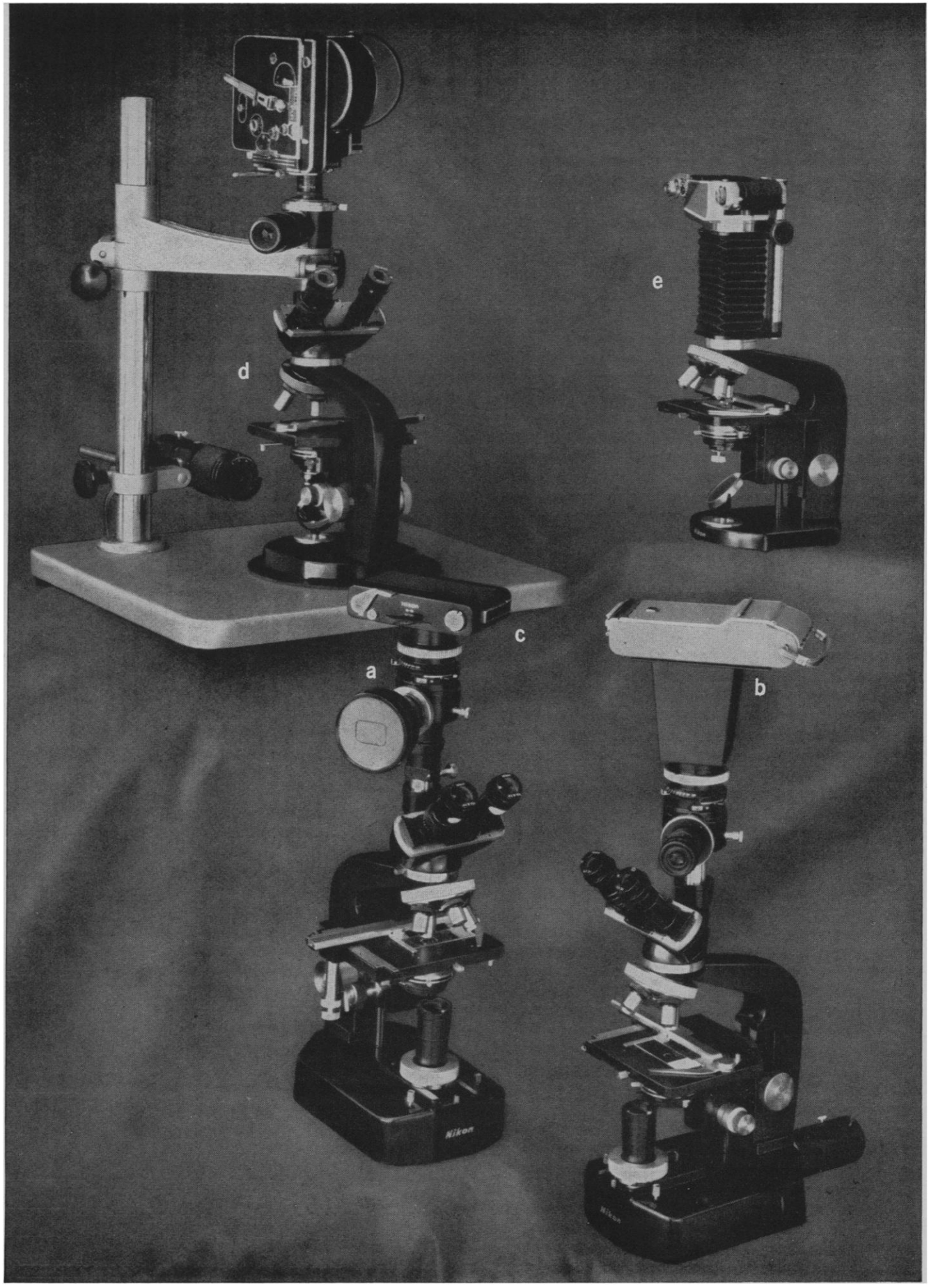
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nikon photomicrography

Modern microscopy is not limited to visual observation alone. The photographic record is no less essential. And the facility with which a microscope can produce fine specimen photographs becomes a major factor in its choice. ☐ Nikon laboratory and research microscopes offer unique advantages in this respect. For, apart from their inherent qualities as observational instruments, they benefit appreciably from the skill, experience and reputation of the maker in the realm of photographic optics and equipment. ☐ The variety of Nikon attachments and accessories available for photomicrography only hint at the versatility at your command. The quality of their performance must be determined through use, either from your own experience with this or other Nikon optical equipment, or from the experience of friends or colleagues. If neither prevail, we shall be happy to arrange for a personal demonstration.

A. Microflex A prism-reflex attachment for producing high quality, full-frame, 35mm photomicrographs in natural color or black-and-white with Nikon and other standard-tube microscopes. Accepts Nikon M35, Nikon F, Nikkorex F, and Nikon S series 35mm camera bodies. Can also be adapted for use with other camera bodies.

It has its own built-in photo-image lens, its own shutter and finder-observation system. It is supplied with a focusing telescope for use in high-power, phase-contrast, interference-phase and dark-field photomicrography. It is also supplied with an interchangeable ground-glass screen, indispensable for precise focusing in the low-power range. The Microflex reduces the overall magnification by one half, so that only the central rays are used for the photographic image. This assures optimum sharpness even with ordinary objectives.

A full-reflecting prism diverts the microscope image into the telescope or onto the screen for focusing and framing the image in the picture area. A single, conventional cable release swings the prism out of the camera path and fires the shutter. *All* the light of the specimen image reaches the film for exposure. There is virtually no vibration in the shutter action to deteriorate the sharpness and definition of the image.

B. Polaroid® Land Camera Body
Attaches directly to Microflex. Equipped with photo-image lens and extension cone. Designed for "instant" photomicrography with 2¼ x 3¼ Polaroid-Land color and black-and-white film.

C. M35 Camera Body A low-cost, precision-built die-cast camera body with film transport mechanism, exposure counter and dark slide, but without lens or shutter. Designed especially for use with Microflex and other similar devices. Accepts standard 35mm film cassettes.

D. Cine-Microflex Designed for use with 8mm and 16mm movie cameras. Outfit includes base and sturdy upright with sliding arms for supporting camera equipment and external illuminator, where used. There is no physical contact between camera and microscope, and no vibration transmitted to the microscope while camera is running. The Cine-Microflex can also be adapted for use with 35mm camera bodies, and for use with closed-circuit TV cameras.

Adapter (photo-image) lenses are supplied with the Cine-Microflex which provide the same coverage on 8mm and 16mm film, and the same relative coverage on 35mm. These lenses may also be combined to reduce overall magnification and thus increase coverage on 16mm and 35mm films.

E. Macro-Bellows Attachment Designed specifically for low power applications (4X to 18X) utilizing the microscope objective or a micro-anastigmat as the 'picture' lens. Accepts either Nikon F, or Nikkorex F or Nikon S series cameras. Image covers entire 35mm format. The attachment may also be used off the microscope with conventional photographic lenses for extreme close-up (gross) photography.

For further information, write to Dept. S12.

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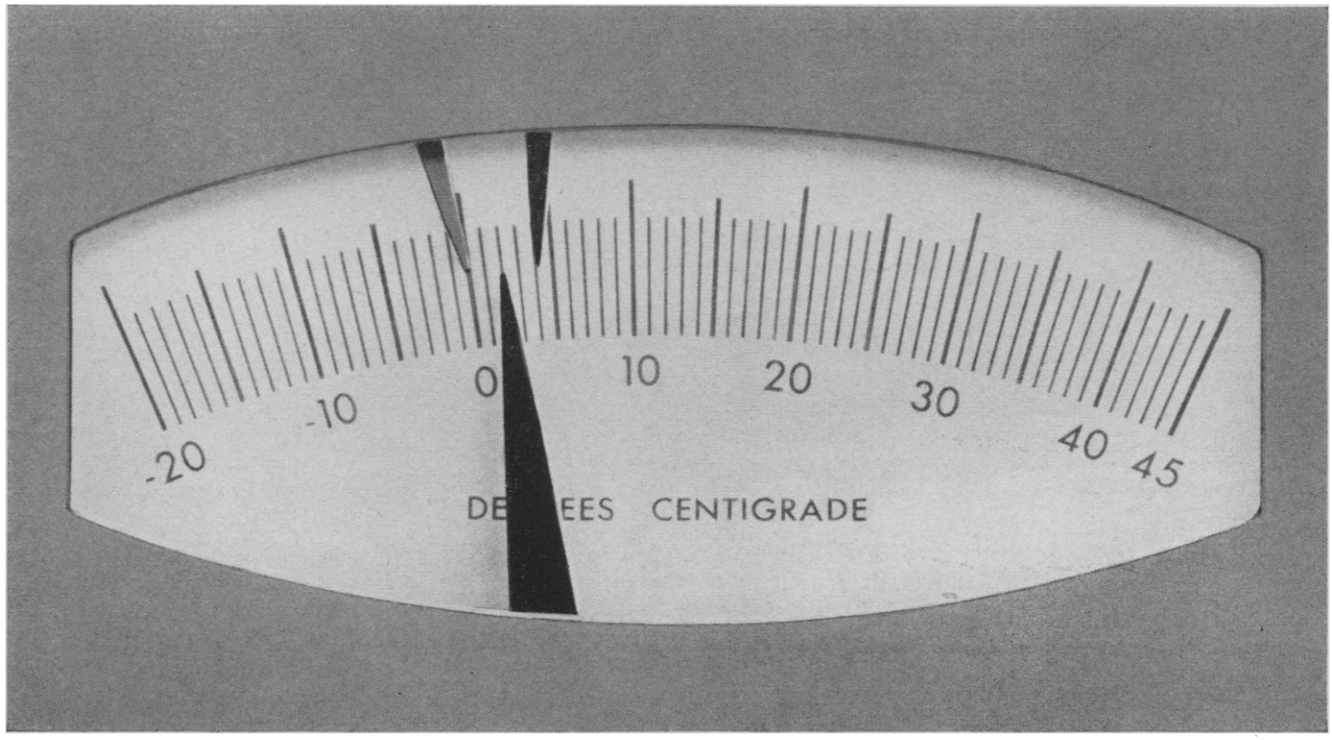
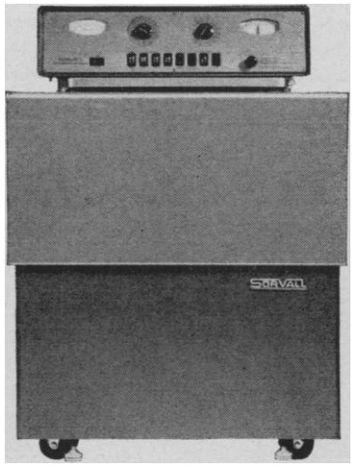


WHY SORVALL DUAL TEMPERATURE CONTROL?



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For several good and functional reasons. A rotor running at speed requires a greater rate of heat extraction than when it is at rest. A single temperature control cannot differentiate. Set to cool the rotor during the running portion of the operating cycle, it would overcool a rotor slowing down, and even freeze the contents of a rotor at rest. SORVALL'S dual control on the other hand can be preset to provide a constant temperature level throughout the entire cycle of running, deceleration, and rest. Because SORVALL'S sensitizing element surrounds the base of the exclusive Gyro-Action Direct Drive, immediately adjacent to the rotor, it provides far more accuracy and reliability in the area important to you — rotor contents — than any similar control available. With SORVALL, the "holding" control takes over automatically from the "running" control at just the right moment during deceleration, and then "holds" your desired temperature indefinitely after the rotor has stopped. SORVALL, and only SORVALL, has had years of experience with dual temperature controls, and has proved them in use with thousands of refrigerated centrifuges in leading laboratories all over the world. This is one more reason why the RC-2 (illustrated) is a truly "set it and forget it" instrument. RC-2 Automatic Superspeed Refrigerated Centrifuge — 17,500 rpm — 37,000 x G — 6 Angle and Horizontal Rotors.

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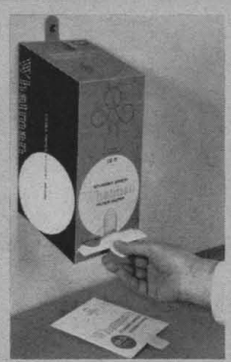

We do not guarantee that all students will *pass* chemistry merely by using Whatman Student Grade filter paper, but we will wager they will have fewer filtering problems and get more reproducible results. (Plus fewer decisions.) Whatman Student Grade has great advantages in the stockroom too. It comes in an ingenious dispenser package of 50 envelopes (11 or 12.5 cm size) with each envelope containing 25 filtering circles. The dispenser can be thumbtacked to any convenient wall that will accept thumbtacks and you have 50 envelopes *waiting* for 50 students.

We have pointed out in previous communications that no one has yet developed a completely logical and foolproof method for numbering filter paper grades. In this case we dodged the issue by *not* assigning a number and merely using the designation—WHATMAN STUDENT GRADE. This grade, and all those with numbers, are described more completely in our new catalog. We will be happy to send you a copy and samples of the Student Grade as well if you will drop us a line.

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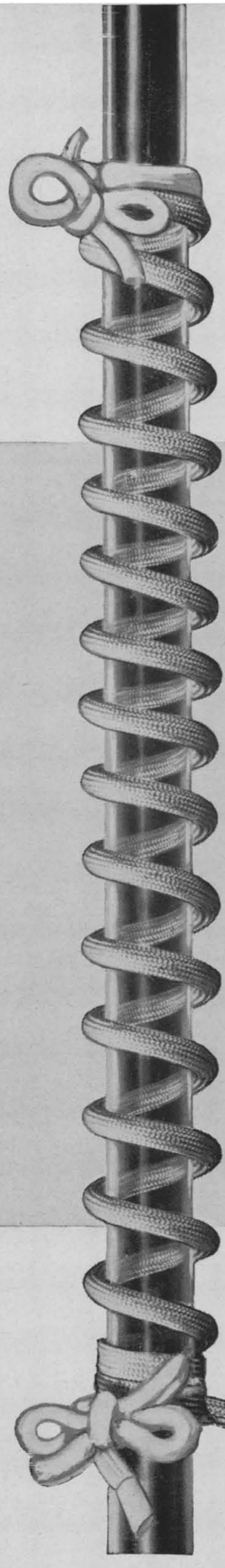

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	C-C 6	6 ft.	240W, 115V	15.00
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	C-C 10	10 ft.	400W, 120V	23.00
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	C-C 14	14 ft.	560W, 220V	31.00
	C-C 16	16 ft.	640W, 220V	35.00
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	SC-C 3	3 ft.	300W, 115V	13.75
	SC-C 4	4 ft.	400W, 115V	16.75
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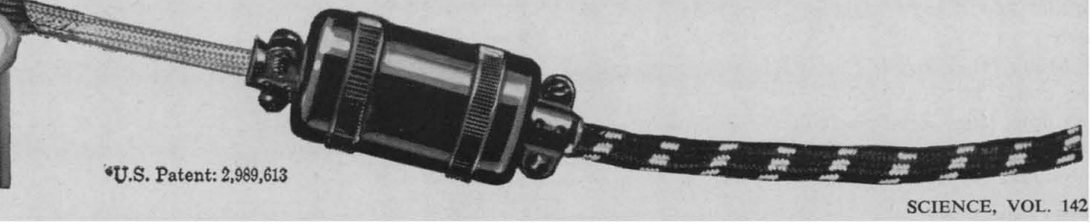
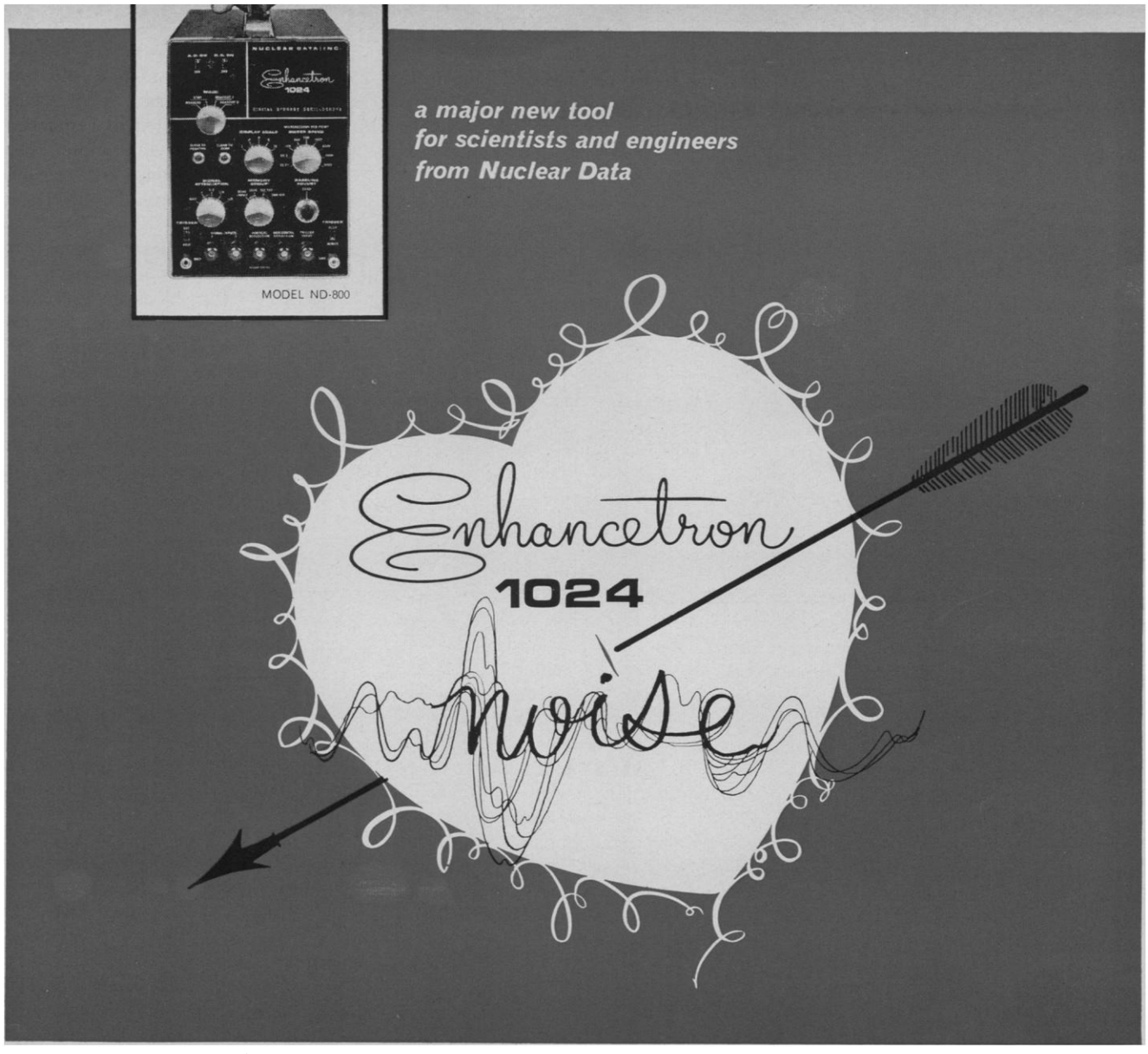


*U.S. Patent: 2,989,613



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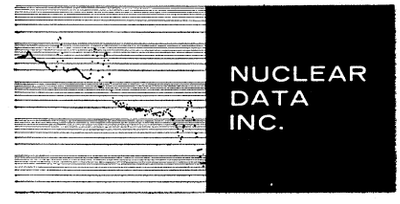

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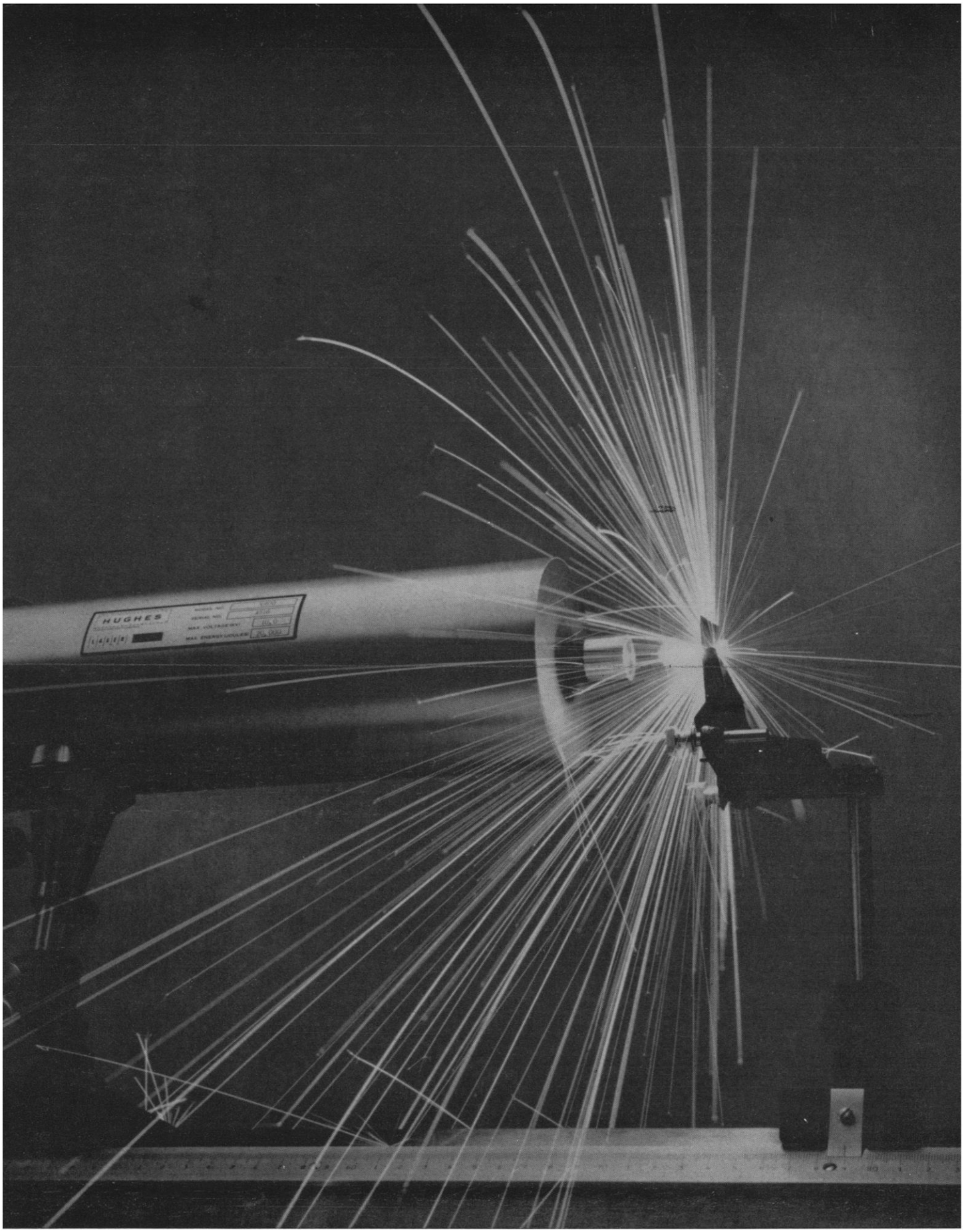

Larry Foster of Hughes Aircraft Company had a fully developed negative and positive just 20 seconds after he took this picture of a laser beam piercing a sheet of tantalum. He used a Graphic view camera and **Polaroid Land 55 P/N 4x5 Film.**

et al. (*1*), using an electrophysiological technique.

4) We agree with Wharton *et al.* that our assignment of a band at 12.5 μ to an isopropylidene group was an unfortunate one. The assignment was based on the absence of this band from the infrared spectrum of the hydrogenated attractant. Gas chromatography of the hydrogenated attractant and the synthetic saturated product on packings different from those described has indeed shown the presence of several peaks, identical in the two preparations.

In spite of the marked instability of our cockroach sex attractant, we are attempting to synthesize this material. In the final analysis, only synthesis can serve as the decisive factor.

MARTIN JACOBSON
MORTON BEROZA

Entomology Research Division,
U.S. Department of Agriculture,
Beltsville, Maryland

References

1. J. Boeckh, E. Priesner, D. Schneider, M. Jacobson, *Science* **141**, 716 (1963).

Biological Mechanisms of Aging

In a recent very stimulating paper [*Science* **141**, 686 (1963)] Curtis has discussed biological aging processes and concluded, quite justly, that somatic mutations appear to have a primary importance in reducing longevity of living creatures. I think, however, that he has been unjust in holding up the "wear and tear" hypothesis of Selyle, Comfort, and others as antithetical to the "somatic mutation" hypothesis which he espouses so effectively.

While Curtis has shown conclusively that certain stresses, even when applied systematically and repeatedly, do not accelerate aging, he has *not* shown that a wide variety of such stresses (such as are the burden of every living thing) will not do so. As he points out, certain stresses cause irremediable damage to some organ or tissue and thus make eventual failure at that point relatively likely. The beauty of radiation as an experimental stress is that it is general, striking all sensitive tissues at once. But from the experiments reported by Curtis we cannot say that application of a number of specific chemical and disease stresses will not bring about a general loss of viability similar to that caused by radiation. The advance Curtis has made is to suggest (implicitly) that the wear-and-tear hypothesis *is commuted to* the somatic-mutation hypothesis by the recognition that viability-reducing stresses are those which are mutagenic in certain susceptible tissues: those in which mitosis is slow. The two hypotheses are more alike than they first seemed.

Experiments like those of Curtis's group are suggested, in which mice during their laboratory lifetimes are subjected to a carefully selected *range* of stresses. Like Selye, I would include various types of psychological stress, in addition to numerous chemicals and diseases, because such stresses are notorious as "imbalancers" of function in many of the organs now shown to be most susceptible to weakening by somatic mutation.

RICHARD O. WHIPPLE

Department of Chemistry,
University of Singapore,
Singapore, Malaysia

I think Whipple's suggestion is excellent and am inclined to agree that if just the right combination of stresses were found it would shorten the life span. But the question would then be: What does this have to do with natural aging? It is apparent there is abundant room for future research.

HOWARD J. CURTIS

Department of Biology,
Brookhaven National Laboratory,
Upton, New York

Blood of Anthropoid Apes

Readers using the report by Wiener and Moor-Jankowski on blood groups in apes and baboons [*Science* **142**, 3588 (4 Oct. 1963)] will probably also be interested in a neglected paper by Yvan Bereznay [*Bull. Soc. Roy. Zool. Anvers No. 10* (1959)]. Bereznay gives detailed data on blood groups, chemistry, counts, various measurements, and immunoelectrophoretic patterns for nine chimpanzees, six gorillas, and two orang-utans. A finding in some contrast to that of Wiener and Moor-Jankowski concerns the blood groups of gorillas: Bereznay reports type O in four *Gorilla gorilla beringei* and one *G. g. gorilla*, type A in one *G. g. beringei*.

GEORGE B. RABB

Chicago Zoological Park,
Brookfield, Illinois

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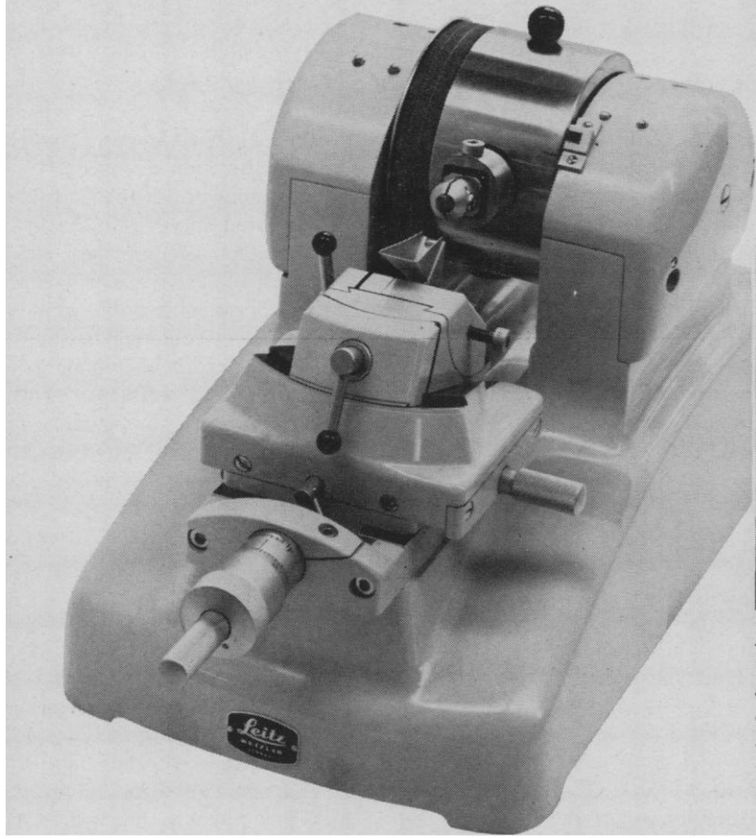

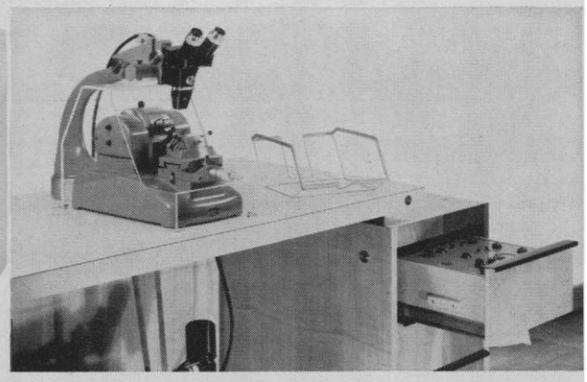

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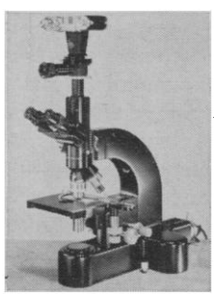

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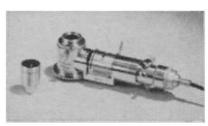

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6 December 1963, Volume 142, Number 3597 **SCIENCE**

Course Content Improvement, British Style

Publication of the first general report of the British Nuffield Foundation Science Teaching Project provides an opportunity to compare British and American approaches to the problem of improving science teaching. There is much in common between the two. The Nuffield statements that "the central objective is 'science for all'—not merely for future specialists," and that "present-day science teaching should place much more emphasis on imaginative enquiry and the judgment of evidence, and much less emphasis on dogmatic assertion and the memorising of facts" might just as well have been written in this country. So might the description of working arrangements. Organized groups of scientists and teachers are producing new texts, guides, demonstrations, experiments, and teaching aids. Experimental use of the new materials in selected schools will determine the changes to be made before they are released for general use.

There are also significant differences between British and American approaches. Curriculum organization in this country called for 1-year courses in biology, chemistry, and physics. The British system has permitted the Nuffield group to start with 5-year sequences in each of these fields, for children aged 11 to 16 in selective secondary schools. Thus they have been able to adopt a much more longitudinal or developmental approach than we have.

Work on science for children from 8 to 13 in primary schools and nonselective secondary schools will get started early in 1964, and the group hopes to start a parallel program in mathematics within the year. Later on they may proceed to the development of other courses: one for 16- to 18-year-old students who wish to specialize in science; one for students of like age with other interests; one for 13- to 16-year-olds of less than average ability; and a combined physical and biological science course for the 11 to 16 range.

As a matter of general policy for all courses, pupils' guides, teachers' handbooks, films, apparatus, experimental guides, and collections of problems and questions are intended to be sufficiently flexible to permit a considerable amount of adaptation to different levels of ability and to differences in the plans and wishes of individual teachers. Commendably, the development of new examinations that will better fit the major objectives instead of rewarding the parroting of a mass of detail is getting earlier attention than it has in most of the American programs. While this emphasis is made necessary by the British examination system, it is in any event desirable as a basis for evaluating the whole venture.

The Nuffield group has had the opportunity to profit from both successes and mistakes of the American programs that started a few years earlier. Included on the steering committees, central staff, and writing groups are a number of recent participants in American summer institutes, writing groups, and visiting programs. There is a reciprocal opportunity for us to profit. Work here began at the senior high school level and is now being extended to higher and lower ages. But work at elementary and junior high school levels is not yet far along, and not yet have we really tackled the problem of articulating the whole program from elementary beginnings into the early collegiate years. The British system of sequential courses forced the Nuffield group to look at some problems we have so far neglected. The results of their experience—which might best be imported through participation by a few American scientists—can enable us to move more rapidly toward the kind of articulated program that should soon become our objective.—D.W.

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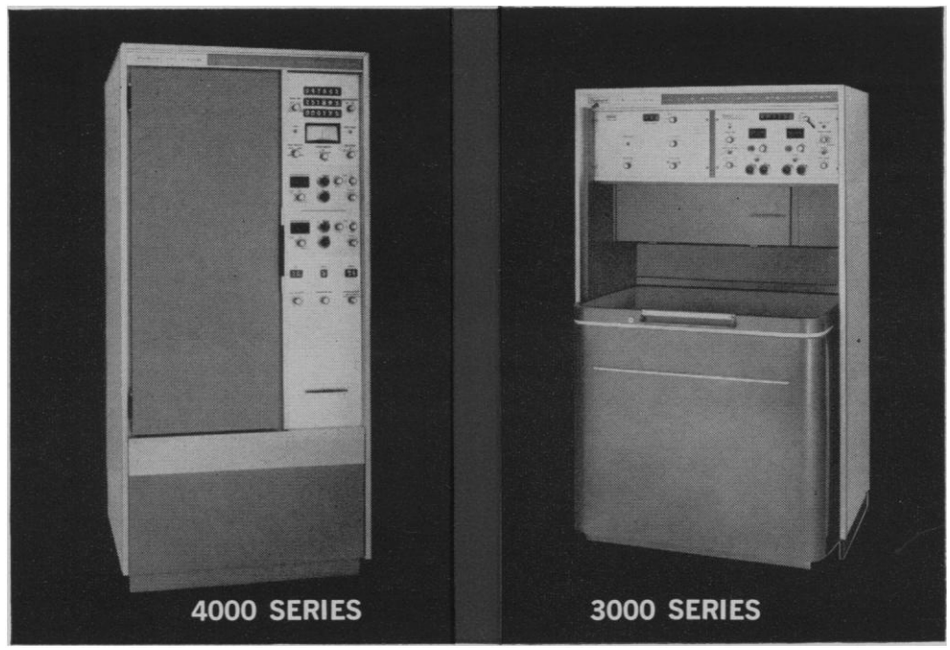

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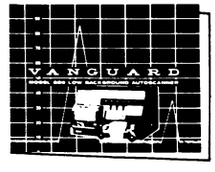

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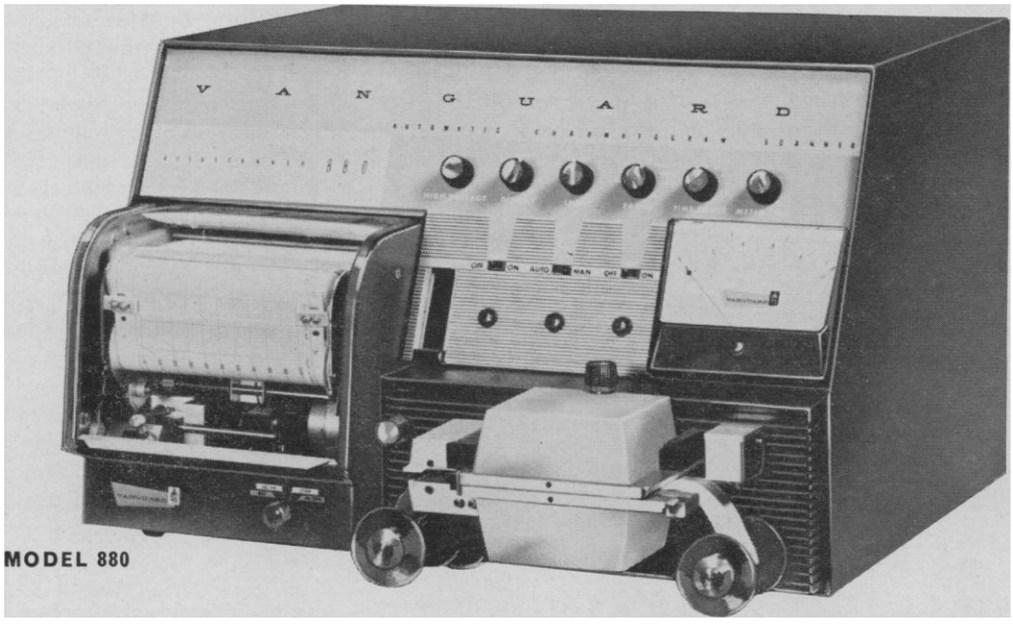

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Hill, Ford Foundation. New patterns of agricultural research and education in India, A. H. Moseman. An efficient approach in modernizing agriculture, T. W. Schultz, University of Chicago.

Industrial Science

Monday 30 December

Retiring Vice Presidential Address and Luncheon. Alfred T. Waidelich, The Austin Company, will preside. Instruments and industrial research—some educational implications, Henry F. Dever, Minneapolis-Honeywell Regulator Co. and retiring vice president for section on Industrial Science (P).

The Industrial Science Section together with the Office of Economic and Statistical Studies, National Science Foundation, is sponsoring two additional symposia: "The Role of Instruments and Equipment Use in Science Research Program Planning" and "The Planning and Management of Science Research Programs."

Education

Friday 27 December

Address. Joint session of the section on Education (Q) and the Council for Exceptional Children. Arranged by Dorothy Norris, Cleveland Board of Education, who will also preside. A study of gifted children in Cleveland's major work program, Edward C. Frierson, Kent State University.

Sunday 29 December

Contributed Papers, Session I, and Vice-Presidential Address. Arranged by Herbert A. Smith, Pennsylvania State University. Joseph Novak, Purdue, will preside. Remedial research: approach and models available to education research, David Mostofsky, Boston University. Studies of televiewing, 1949-63, Paul A. Witty, Northwestern. Herbert A. Smith will preside at the vice-presidential address, Science and civic responsibility by Harold E. Wise, University of Nebraska.

Contributed Papers, Session II. Arranged by Herbert A. Smith. Harold E. Wise will preside. The coming crisis in secondary education, Ivor Kraft, U.S. Department of Health, Education, and Welfare. "Needed: a redefinition of status and roles in American society," Annette Rosenstiel, Mills College of Education. Science, education, and students from the undeveloped nations, Wilbur N. Moulton, Southern Illinois University. Science training program for high ability secondary school students: the development of man, an enrichment program, Dolores Elaine Keller, Fairleigh Dickinson University.

Monday 30 December

Career Developments of Scientists: Grade School to Graduate School. Symposium, joint session of section on Education and the American Educational Research Association. Arranged by William W. Cooley, Harvard, who will also be the principal speaker. Herbert A. Smith will preside. Discussants include Lindsay R. Harmon, National Academy of Sciences, and Howard J. Hausman, National Science Foundation.

Contributed Papers, Session III. Arranged by Herbert A. Smith. William E. Martin, U.S. Office of Education, will preside. Comparison of manifest needs of open and closed minds, C. Gratton Kemp, Ohio State University. Learning, human behavior, and clinical brain anatomy, Ralph H. Pino. The classroom computer in the social and natural sciences, John S. Jackson, University of Kentucky.

Contributed Papers, Session IV. Arranged by Herbert A. Smith. William McCollum, Iowa State University, will preside. Free verus guided experimentation, Brenda Lansdown and Thomas Dietz, Brooklyn College. The role of

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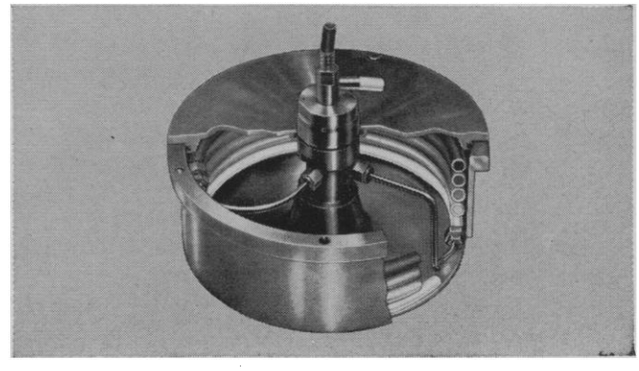

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the science specialist in the elementary school system, Donald E. Hicks. Term papers versus term projects, Manny Sternlicht, Willowbrook State School, Staten Island, N.Y. Carnegie units required for college admission: an historical study, P. W. Hutson, University of Pittsburgh.

AAAS Cooperative Committee on the Teaching of Science, Mathematics

Sunday 29 December

Panel. Report of the Commissions on College Science. Program of AAAS Arranged by John R. Mayor, AAAS. J. W. Buchta, American Association of Physics Teachers, will preside. Panel: Advisory Council on College Chemistry, Charles C. Price, University of Pennsylvania; Commission on College Physics, E. Leonard Jossem, Ohio State University; Commission on Undergraduate Education in the Biological Sciences, Thomas S. Hall, Washington University; Geological Education Orientation Study, William W. Hambleton, University of Kansas; and Commission on Engineering Education, Newman A. Hall.

Science Service

Monday 30 December

Interrelation of Science Youth Activities. Arranged by Leslie V. Watkins, Science Service. Watson Davis, Science Service, will preside. Science youth activities and the school program, Franklin D. Kizer, State Board of Education, Richmond, Va. Intrastate science youth activities, Thomas Hutto, School of the Ozarks. National organizations can interrelate their science youth activities, John H. Marean, retiring president of the National Science Teachers Association.

Science Teaching Societies

Friday 27 December

Films. Session I. Joint program of the American Nature Study Society, Central Association of Science and Mathematics Teachers, National Association for Research in Science Teaching, National Association of Biology Teachers, and National Science Teachers Association. Arranged by David J. Lockard, University of Maryland.

Address. Joint program of all science teaching societies. Phillip Fordyce,

Florida State University, will preside. The history of science in science education teaching, Genevieve Miller, Howard Dittrick Museum of Historical Medicine of the Cleveland Medical Library.

Address. Joint program of all science teaching societies. John Brainerd, Springfield College, will preside. Some early naturalists of the Cleveland area, Ralph W. Dexter, Kent State University.

Elementary School Science Symposium. Arranged by Mildred Ballou, Ball State Teachers College, who will also preside. Science and children: partners in discovery, Joseph Zafforoni, Pennsylvania State University.

Saturday 28 December

Films. Session II. Joint program of all science teaching societies. Arranged by David J. Lockard.

Sunday 29 December

Films. Session III. Same sponsors and arranger as for Parts I and II.

American Nature Study Society

Friday 27 December

Observing Nature: Basic Technique of Arts and Sciences. Symposium, program of the American Nature Study Society, cosponsored by the Association of Interpretive Naturalists. Harold E. Wallin, Cleveland Metropolitan Park District, will preside. Speakers include: Dura Dean, Lakewood (Ohio) Board of Education; William Hopkins, Huron-Clinton Metropolitan Authority; Kenneth Hunt, Antioch; Stanley Mulaik, University of Utah; Charles Roth, Massachusetts Audubon Society; and Howard Weaver, University of Illinois.

Saturday 28 December

Recording Nature I. Sketching. Symposium, program of the American Nature Study Society, cosponsored by the Association of Interpretive Naturalists. William E. Scheele, Cleveland Natural Science Museum, will preside. Panelists will be announced at a later date.

Presidential Address and Luncheon. Picture framing by John A. Gustafson.

Recording Nature II. Photography. Grant W. Sharpe, University of Michigan, will preside. Panelists include Donald T. Ries, Illinois State Normal University, and Morton Strauss, Photographic Society of America.

Nature on Record. Tours to Cleveland Art Museum, Cleveland Natural

Science Museum, Cleveland Metropolitan Parks, and the Cleveland Zoo.

Sunday 29 December

Ohio-Michigan Landscapes. Pre-field trip Orientation. Part I. Symposium, joint program of American Nature Study Society and the National Association of Biology Teachers. George F. Linn, Huron County (Ohio) Department of Education, will preside. Biology of man-altered landscapes, Marston Bates, University of Michigan. Geology's contribution to Ohio's landscapes, Jane Forsyth, Ohio Geological Survey Integrating a conservation program, grades K-12, William Stapp, Ann Arbor Public Schools. Swamp Stompers field trips, Earl Cranston, New London (Ohio) Local Schools.

Part II. George F. Linn will preside. Geological setting in north-central Ohio, Jane Forsyth. The role of ecology in high school biology, Marston Bates. The use of school sites as outdoor laboratories, William Stapp. Pre-field-trip orientation, Earl Cranston and George Linn.

National Association of Biology Teachers

Friday 27 December

Recent Developments in Cellular Biology. Session I. Joseph D. Novak, Purdue, will preside. Molecules, membranes, and molds—studies on cellular function, John W. Greenawalt, Johns Hopkins. Differential lytic reactions of some bacterial species, Ted S. Surdy, Kansas State Teachers College. Plant pectins and their function in food texture, Frank J. McArdle, Pennsylvania State University.

Saturday 28 December

Recent Developments in Organismal Biology. Session II. Ann Reynolds, Ball State Teachers College, will preside. Recent advances in the study of social behavior in mammals, J. P. Scott, Jackson Memorial Laboratory. Behavioral studies on reptiles—bobs, nods, and pushups, Charles C. Carpenter, University of Oklahoma. Host-selection behavior in parasitic mites and ticks, Joseph H. Camin, University of Kansas.

Recent Developments in Ecosystem Biology. Session III. John Breukelman, Kansas State Teachers College, will preside. Daily energy budgets in environmental fluids, Jacob Verduin, Bowling Green State University. Microcosm approach to ecosystem biology, Robert J.

Beyers, University of Texas. Changes in the structure and function of terrestrial ecosystems exposed to ionizing radiation, G. M. Woodwell, Brookhaven National Laboratory.

Sunday 29 December

Innovations in Teaching Biology. Session IV. Jerry J. Nisbet, Ball State Teachers College, will preside. Single concept films for college botany, James Wickliff, Iowa State University. Single concept films for high school biology, James Koevenig, University of Colorado. Laboratory blocks for high school biology, Addison Lee, University of Texas. Impact of testing on new curricula, William Mayer, Wayne State University. Impact of new curricula on facilities for biology, James Dawson, Macalaster Scientific Corporation.

Research Activities in High Schools. Session V (concurrent with IV). G. E. Caraker, Eastridge High School, Rochester, N.Y., will preside. A multiple integrated response device for use in teaching science, Charles Ostrander, Atwater High School, Atwater, Calif. The apparent relationship between smoking and academic performance among high school students, G. E. Caraker.

Collegiate Curricula for Biology Teachers. Session VI. Jack L. Carter, Kansas State Teachers College, will preside. The commission on the undergraduate education in biological sciences, Thomas Hall, Washington University. The commission on the education of teachers of science, Fletcher Watson, Harvard.

Presidential Address and Silver Jubilee Banquet. Ted F. Andrews, Kansas State Teachers College, will preside. Missions, money, and men, Phillip Fordyce, president of the National Association of Biology Teachers.

Monday 30 December

Field Trip. Visit to north-central Ohio with Swamp Stompers. Joint trip of American Nature Study Society and the National Association of Biology Teachers.

National Association for Research in Science Teaching

Saturday 28 December

The Improvement of Science Teaching. Research symposium. Arranged by Lloyd K. Johnson, U.S. Office of Education. Cyrus W. Barnes president of the National Association for Research in Science Teaching, will preside. Cur-

rent research and its meaning for the elementary school, J. Darrell Barnard, New York University. Current research and its meaning for the secondary school, T. Wayne Taylor, Michigan State University. Current research and its meaning for the college, Joseph D. Novak, Purdue.

National Science Teachers Association

Friday 27 December

Youth Looks at Science Education. Arranged by Victor M. Showalter, Ohio State University, who will also act as moderator of this session. Discussants will be high school students.

Saturday 28 December

Newer Efforts to Improve Science Courses and Curricula. Robert H. Carleton, executive secretary, National Science Teachers Association, will preside. A general physical science program for senior high school students, Charles W. Woodfield, Dundalk Senior High School, Baltimore County, Md. The junior high school science project, Mrs. Charles Tanaka, Princeton. The earth science curriculum project—its organization, objectives, and philosophy, Robert C. Stephenson, Ohio State University Research Foundation.

Information and Communication

Friday 27 December

Communication of Research and Development Information and the Role of the Working Scientist and Engineer. Panel, joint program of the section on Information and Communication (T) and the Society of Technical Writers and Publishers, cosponsored by the Engineering Section. Arranged by Stello Jordan, Sperry Rand Corporation, who will also preside. Discussion will be based upon the report of the President's Science Advisory Committee, "Science, Government, and Information," prepared by the Panel of Science Information and issued 10 January 1963. Panel members include: Alvin Weinberg, Oak Ridge National Laboratory; Milton O. Lee, American Societies for Experimental Biology; Klaus Liebhold, General Electric Company; Vernon Root, Applied Physics Laboratory; and Robert Speers, E. I. du Pont de Nemours and Company.

Sunday 29 December

Vice-Presidential Address. Phyllis V. Parkins, *Biological Abstracts,* will preside. Dynamics of documentation: a synthetic science, Foster E. Mohrhardt, National Agricultural Library and vice president for Information and Communication Section.

Control of Metallurgical Information. Symposium, joint program of section on Information and Communication and the American Society for Metals, cosponsored by Engineering Section. Arranged by Marjorie R. Hyslop, American Society for Metals. Harry B. Goodwin, Battelle Memorial Institute, will preside. Information problems in metallurgical research, John A. Fellows, Mallinckrodt Chemical Works. Metallurgical information handling by government agencies, Donald A. Shinn, Wright-Patterson Air Force Base. Responsibilities of academic institutions in guiding students in the use of information, Robert S. Taylor, Lehigh University. Inter-society and inter-agency cooperation in metallurgical information: panel discussion by representatives of the American Society for Testing and Materials, Society for Non-destructive Testing, American Institute of Mining (Metallurgical and Petroleum Engineers), Engineers Joint Council, and the American Society for Metals.

Address. A new problem in communication: trying to make contact with intelligent life beyond the solar system, Walter Sullivan, New York *Times*. P. C. Fraley, Council for the Advancement of Science Writing, will preside.

Information Retrieval in the World of Metals—Its Promise and Limitations. Panel, joint program of section on Information and Communication and the American Society for Metals, cosponsored by Engineering Section. Arranged by Marjorie R. Hyslop, who will also preside. Introduction, Norman E. Cottrell, American Society for Metals. Panel presentation by the documentation service staff of the American Society for Metals: Richard Z. Bedy, Betty A. Bryan, Brice Carter, Thomas J. Fitzgerald, and Barbara Shaffer.

National Association of Science Writers

Friday 27 December

Annual Dinner and Announcement of AAAS-Westinghouse Science Writing Awards. Donald J. Dunham, *Cleveland Press, will preside.*

Statistics

The American Statistical Association and the Institute of Mathematical Statistics are general cosponsors of all sessions arranged by the section on Statistics (U).

Friday 27 December

Sessions for Teachers of Statistics. Arranged by Horace W. Norton, University of Illinois, who will also preside. Statistics today, Fred C. Leone, Case Institute of Technology. A look at statistics on the AAAS program, N. L. Johnson, North Carolina State University.

Financing Graduate Studies. Program of the section on Statistics, cosponsored by sections on Social and Economic Sciences and Education. Arranged by Thomas J. Mills, National Science Foundation. Elmer D. West, American Council on Education, will preside. Financial support of graduate students, Thomas J. Mills. The federal government interest in graduate education, Peter P. Muirhead, U.S. Office of Education. University financing of graduate education, John W. Hicks, Purdue.

Vice-Presidential Address. S. S. Wilks,

Princeton, will preside. Statistical teaching in 1974, Harold Hotelling, University of North Carolina and vice president for the Statistics Section.

Monday 30 December

Organization, Search, and Retrieval of Technical and Scientific Information. Symposium, joint program of sections on Statistics and Information and Communication, cosponsored by the Institute of Management Sciences. Arranged by Ezra Glaser, U.S. Patent Office, who will also preside. The role of search in the Patent Office, Richard Spencer, U.S. Patent Office. On some statistical models of search operations, Edward C. Bryant, Westat Research Analysts, Inc. On some recursive models of large-scale information systems, David Rosenblatt, National Bureau of Standards.

Reliability of Complex Systems. Arranged by S. S. Wilks. Landis Gephart, Lockheed Corporation, will preside. Systems reliability and engineering statistical aspects, George Levenbach, Bell Telephone Laboratories. Functional analysis for evaluating systems reliability, William S. Connor, Research Triangle Institute. The concept of monotone hazard rate in systems reliability, Frank Proschan, The Boeing Company.

Science in General

The following are the programs of organizations not affiliated with any one section.

Academy Conference

Thursday 26 December

National Junior Academy of Science Program. Charles L. Bickle, Milton Hershey (Pa.) High School, will preside. Titles of papers and lists of participants will be available at the meeting.

Friday 27 December

Meeting of Directors of Junior Academies of Science. Charles L. Bickle will preside. Summary of final report on the AAAS Academy Conference survey of junior and collegiate academies supported by the National Science Foundation, John D. Hopperton, Oklahoma Academy of Science. Report on national science seminars, J. Teague Self, Oklahoma Academy of Science.

The Activities of the Academies of Science and the Role of the National Science Foundation. Symposium. Ger-

ald Acker, president of the Academy Conference, will preside. Participants include: John Breukelman, Kansas State Teachers College; J. Teague Self; and John A. Yarbrough, Meredith College. Participants who will discuss the report on national science seminars include: J. Teague Self; Harry J. Bennett, Louisiana State University; Charles L. Bickle; Irving Auerbach, Sandia Corporation; and John D. Hopperton.

Presidential Address and Dinner. E. Ruffin Jones, past president of the Academy Conference, will preside. The day of reckoning, Gerald Acker.

Annual Junior Scientists Assembly

Friday 27 December

Tours. Places that will be visited include Case Institute of Technology, Natural Science Museum, and Western Reserve University.

Student Papers. Sanford Eisler, Cleveland Public Schools, will be master of ceremonies. The keystone address, Antarctica—frontier of international science, will be presented by Laurence M. Gould, president-elect of AAAS. The advanced placement program in science, Ward Ebert, junior at Princeton. Effect of hormones on secondary sexual characteristics of canaries, Larry Spitz, student at Hawken School, South Euclid, Ohio. Journey to a smaller world, Larry Nelson, sophomore at the University of Michigan. An investigation of optimum free convection heat transfer from a finned horizontal cylinder, Richard Karash, a senior at Euclid Senior High School. Opportunities unlimited, Carol Smalheer, a senior at John Marshall High School, Cleveland, Ohio.

National Science Foundation

Monday 30 December

The Role of Instruments and Equipment Use in Science Research Program Planning. Symposium, joint program of the office of Economic and Statistical Studies, National Science Foundation, and the section on Industrial Science. Arranged by Zola Bronson, National Science Foundation. J. Francis Reintjes, M.I.T., will preside. The issues of instrument and equipment expenditures and use in science research organization planning management, Zola Bronson. The role of instruments and equipment in the planning, management, and design of research experiments, John E. Jacobs, Northwestern. The effect of

instrumentation on research, Winston E. Kock, Bendix Corporation. New instrumentation and research management, John J. Grebe, Dow Chemical Company. Policies in the development, acquisition, and utilization of instrumentation in science research, Otto H. Schmitt, University of Minnesota.

The Planning and Management of Science Research Programs. Symposium, joint program of the Office of Economic and Statistical Studies, National Science Foundation, and section on Industrial Science. Arranged by Zola Bronson. Jacob Perlman, National Science Foundation, will preside. Productivity in the ivory tower, John R. Dunning, Columbia. The administration of scientific research in universities, Ralph A. Sawyer, University of Michigan. Planning and management of consumer product-oriented industrial research, William B. Reynolds, General Mills, Inc. Research planning and management in an unchanging world, Erwin G. Somogyi, Somogyi Associates. Research planning and management in the federal government, Nicholas E. Golovin, Office of Science and Technology, Executive Office of the President. Quality, relevance, and rate of research productivity with regard to management, Theodore C. Byerly, U.S. Department of Agriculture.

Scientific Research Society of America

Monday 30 December

Annual Address for the Scientific Research Society of America and Award of the William Procter Prize. William E. Hanford will preside. Speaker will be announced later.

Sigma Delta Epsilon

Friday 27 December

Luncheon for All Women in Science and Address. Ernestine Thurman, National Institutes of Health, will preside. A study of the atmospheric pollen of the Minneapolis Area, Agnes Hansen, University of Minnesota.

Society of Sigma Xi

Friday 27 December

Joint Annual Address of the Society of the Sigma Xi and the United Chapters of the Phi Beta Kappa. Wallace R. Brode, past president of AAAS, will preside. Telltale dust, Paul B. Sears, Yale University and past president of AAAS.

Sciences (Berlin), Mohrenstrasse 39, Berlin W.8, East Germany]

May 1964

6–10. **East German Geographic** Soc., 7th meeting, Leipzig. (The Society, Georgi Dimitroff Platz 1, Leipzig Cl)

May 1964 (no dates)

Mechanism of **Antibody Formation**, intern. symp., Prague, Czechoslovakia. (Inst. of Microbiology, Czechoslovak Acad. of Science, Na cvićišti 2, Prague 6)

Earth Slides, all-union conf., Kiev, U.S.S.R. (A. M. Drannikov, bul'var Shevchenko, 78, Kiyevskiy inzhenernostroitel 'nyy institut., Kiev)

Czechoslovak National **Geodetic** Conf., Czechoslovakia. (B. Volfik, Research Inst. of Geodesy, Topography, and Cartography, Prague 1)

Heat and Mass Transfer conf., Minsk, U.S.S.R. (Minsk Inst. for Heat and Mass Transfer, Minsk)

Czechoslovak Medical Soc., **Internal Medicine**, Experiment and Diagnosis. (J. Berman, First Internal Medicine Clinic, U Nemocnice 2, Prague, Czechoslovakia)

May–June 1964

Telecommunications Union, 3rd assembly of the consultative committee, Moscow, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

June 1964

3–5. **Ultrasonic Diagnosis in Ophthalmology**, 1st intern. symp., Berlin, East Germany. (W. Buschmann, Augenklinik der Humboldt Universität, Berlin, Ziegelstrasse 5, Berlin N4, East Germany)

15–19. Czechoslovak Microbiological Soc., intern. congr. on **antibiotics**, Prague, Czechoslovakia. (V. Vlćek, Antibiotics Research Inst., Roztoky, Czechoslovakia)

22–26. **Material Handling** Conf., Scientific Soc. for Mechanical Engineering, Hungary. (L. Prockl, Scientific Soc. for Mechanical Engineering, Szabadsag ter 17, Budapest 5, Hungary)

25–27. **Hungarian Radiological** Congr., Budapest. (Magyar Radiologus, Szakcsoport, Kongressbüro, Szabolcss ut., 35, Budapest 13)

June 1964 (no date)

Biological Action of **Ionizing Radiations**, all-union conf., Vil'nyus, U.S.S.R. (Inst. of Biophysics, Acad. of Sciences of the U.S.S.R., Moscow, B-133 ul Profsoyuznaya 7)

Balkan Medical Union, 7th **Balkan Medical Week**, Sofia, Bulgaria. (M. Popescu-Buzeu, 10 rue Progresului, Bucharest, Rumania)

July 1964

15–19. International Union of **Biological Sciences**, 15th general assembly, Prague, Czechoslovakia. (G. L. Stebbins, Dept. of Genetics, University of California, Davis)

July 1964 (no date)

Testing and Research Laboratories of the International Union of Materials and Structures, 18th annual meeting of the permanent commission, Moscow, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

August 1964

2–8. International Assoc. of **Applied Psychology**, 15th congr., Ljubljana, Yugoslavia. (Inst. of Psychology, Faculty of Philsosophy, Askerceva 12, Ljubljana)

3–10. International Union of **Anthropological and Ethnological Sciences**, 7th intern. conf., Moscow, U.S.S.R. (Inst. of Ethnography, Acad. of Sciences, Lenin Prospekt 7, Moscow)

9–16. Sodic **Soils**, 9th symp., Budapest, Hungary. (I. Szabolcs, Research Inst. of Soil Sciences and Agricultural Chemistry, Hungarian Acad. of Sciences, Herman-Otto-ut., 15, Budapest)

14–29. **Soil Scientists**, all-union soc., tour of the Soviet Union. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

17–22. **Cardiology**, 4th European congr., Prague, Czechoslovakia. (D. H. Kafka, Karlovy Namesti 32, Prague 2)

26–3. **Electron Microscopy**, 3rd European regional conf., Prague, Czechoslovakia. (Organizing Committee, Intern. Federation of Electron Microscopy Societies, Albertov 4, Prague 2)

31–9. **Soil Scientists**, 8th intern. congr., Bucharest, Rumania. (C. N. Cernescu, Geological Inst., Sosceaua Kiseleff 55, Bucharest)

August 1964 (no date)

Spectroscopy Conf., Scientific Soc. for Mechanical Engineering, Hungary, (L. Prockl, Scientific Soc. for Mechanical Engineering, Szabadsag ter 17, Budapest 5, Hungary)

September 1964

1–5. **Material Testing**, Scientific Soc. for Mechanical Engineering, Hungary. (L. Prockl, Scientific Soc. for Mechanical Engineering, Szabadsag ter 17, Budapest 5, Hungary)

15–20. Yugoslav **Pharmacists**, 4th congr., Opartija. (Yugoslav Acad. of Sciences and Arts, Zrinski trg. 11, Zagreb 1)

18. **Coordination Chemistry**, Hungarian Chemical Soc., Tihany. (M. T. Beck, Szabadsag ter 17, Budapest 5, Hungary)

30–4. **Spectroscopy**, 11th intern. conf., Belgrade, Yugoslavia. (Sekretarijat, Prirodno-matematicki fakultet, Fizickohemijsky zavod Beograd, Studentski trg., 16, Blok "C," Yugoslavia)

September 1964 (no date)

World Health Organization, European regional committee, 14th session, Prague, Czechoslovakia. (WHO, 8 Scherfigsveg Ø, Denmark)

Rheumatology, 11th Czechoslovak congr., Piestamy. (I. J. Charvat, Czechoslovak Medical Soc., Albertov 7, Prague 2)

Czechoslovak **Ophthalmological** Soc., 28th annual congr., Kosice. (Ophthalmological Diseases Clinic, Medical Faculty, P. J. Safarik University, Bratislavova 41, Kosice)

Prehistoric and Protohistoric Sciences, 7th intern. congr., Moscow, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Polarography in Chemotherapy, Biochemistry, and Biology, 2nd Jena symp., Jena, East Germany. (Inst. for Microbiology and Experimental Therapy. Reuthenbergstrasse 11, Jena)

September-October 1964

Pathophysiologists, 1st all-union congr., Tbilisi, U.S.S.R. (I. R. Petrov, All-Union Soc. of Pathophysiologists, Moscow, U.S.S.R.)

October 1964

7–9. Czechoslovak **Dermatological** Soc., symp. on structure and function of epidermal barriers, Brno. (Zd. Vlasin, Dermatological Clinic, Pekarska 53, Brno, Czechoslovakia)

October 1964 (no dates)

Iatrogenic Diseases, meeting, Internal Medicine Section of the Czechoslovak Medical Soc. (J. Berman, First Internal Medicine Clinic, U Nemocnice 2, Prague 2, Czechoslovakia)

Moorland Research, 9th intern. congr., Budapest and Keszthely, Hungary. (Hungarian Acad. of Sciences, Akademia-utca 2, Budapest)

November 1964 (no dates)

Progress in **Treatment in Internal Medicine**, meeting, Internal Medicine Section of the Czechoslovak Medical Soc. (J. Berman, First Internal Medicine Clinic, U Nemocnice 2, Prague 2, Czechoslovakia)

1964 (no dates)

International Congr. of **Aeronautical Sciences**, Warsaw, Poland. (Polish Acad. of Sciences, Palace of Culture and Sciences, Dworkowa 3, Warsaw)

Animal Blood Group, 9th conf., Czechoslovakia. (Czechoslovak Acad. of Sciences, Narodní tr. 3, Prague 1)

East German **Chemical** Soc., Processes Div., Freiberg, East Germany. (East German Acad. of Sciences, Mohrenstrasse 39, Berlin W.8)

Economic and Administrative Applications of **Digital Computers**, colloquium, Hungary. (A. Prekopa, "Bolyai Janos" Mathematical Soc., Szabadsag ter 17, Budapest 5, Hungary)

Electrochemistry of Organic Compounds, 5th conf., Moscow, U.S.S.R. (Institute of Chemistry, Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Electronics, 3rd biennial natl. conf., Prague, Czechoslovakia. (Czechoslovak Acad. of Sciences, Narodní tr. 3, Prague 1)

Technical and Scientific **Films**, 3rd intern. festival, Budapest, Hungary. (Scien-

tific Soc. of Mechanical Engineering, Szabadsag ter 17, Budapest 5)

Fracture Reservoirs, 3rd all-union conf., L'vov, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

French-Yugoslav Medical Meetings, Yugoslavia. (Faculte de Medecine de Paris, 12, rue de l'Ecole de Medecine, Paris 6, France)

Legal **Metrology**, intern. committee, meeting, Bucharest, Rumania (closed). (Acad. of the Rumanian People's Republic, Calea Victoriei, 125, Bucharest)

Microelements and Natural **Radioactivity** in Soils, 4th conf., U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Neurocybernetics, 2nd all-union conf., Kiev, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Neurosurgery Conf., Prague, Czechoslovakia. (Czechoslovak Acad. of Sciences, Narodní tr. 3, Prague 1)

High Speed **Photography,** 7th intern. congr., Moscow, U.S.S.R. (Soc. of Motion Picture and Television Engineers, 55 W. 42 St., New York, N.Y. 10036)

High Energy **Nuclear Physics,** 12th intern. conf., Moscow, U.S.S.R. (E. Tamm, Acad. of Sciences of the U.S.S.R., B. Kaluzhskaya 14, Moscow)

Ophthalmologists, 29th Polish congr, Krakow. (M. Wilczek, ul. Slawkowska m. 3, Krakow)

Czechoslovak Soc. of **Orthopedics and Traumatology**, congr., Bratislava. (Czechoslovak Acad. of Sciences, Narodní tr. 3, Prague 1)

European **Seismological** Commission, general assembly, Budapest, Hungary. (H. W. Sponheuer, Stellvetr., Inst. fuer Bodendynamik und Erdebebenforschung, Burgweg, 11, Jena, East Germany)

Zoologists, 2nd conf., Krasnodarsk, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

May 1965 (no date)

Czechoslovak Medical Soc., **Ophthalmological** Congr., Brno. (J. Kirzenecky, Mendel Museum, Brno)

June 1965 (no date)

Microwave Communications, 3rd colloquium, Hungary. (Microwave Research Inst., Hungarian Acad. of Sciences, Technica Haza, Szabadsag ter 17, Budapest 5)

September 1965

3–19. **Speleology,** 4th intern. congr., Ljubljana, Postajna, and Opatija, Yugoslavia. (Yugoslav Acad. of Sciences and Arts, Zrinski trg. 11, Zagreb 1)

September 1965 (no date)

History and Philosophy of Science, 11th intern. congr., Poland. (Polish Acad. of Sciences, Palace of Culture and Sciences, Dworkowa 3, Warsaw)

Nematology, 8th intern. symp., Aschersleben, East Germany. (J. van Brande, Soc. of European Nematologists, Rijslandbonwhageschool, Coupure links 235, Ghent, Belgium)

1965 (no dates)

Invariance in **Automatic Control,** 3rd all-union conf., U.S.S.R. (Inst. of Automatics and Telemechanics, Dept. of Technical Sciences, Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

International Union of **Biological Sciences,** theoretical and applied limnology, 16th congr., Poland. (Polish Acad. of Sciences, Palace of Culture and Sciences, Dworkowa 3, Warsaw)

Diseases and Parasitology, 6th conf., Dushanbe, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Fatigue and Restoration Problems, congr., U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Geographic Soc. of the U.S.S.R., 4th congr., U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Information Theory, Statistical Decisions, Functions, and Random Processes, 4th conf, Czechoslovakia. (Czechoslovak Acad. of Sciences, Nardoni tr. 3, Prague 1)

Ionization Phenomena in Gases, 7th intern. symp., Belgrade, Yugoslavia. (Yugoslav Acad. of Sciences and Arts, Zrinski trg. 11, Zagreb 1)

Physico-Chemical Analysis, 5th all-union conf., Moscow, U.S.S.R. (Acad. of Sciences of the U.S.S.R., Lenin Prospekt 7, Moscow)

Forthcoming Events

December

11. **Radioisotopes** in the Life Sciences, Buffalo, N.Y. (R. F. Lumb, Western New York Nuclear Research Center, Inc., Power Dr., Buffalo 14)

11–13. **Heterogeneous Combustion** Conf., Palm Beach, Fla. (American Inst. of Aeronautics and Astronautics, 500 Fifth Ave., New York, N.Y. 10036)

13–14. **Anatomists,** Southern Society, 3rd annual meeting, Birmingham, Ala. (E. G. Hamel, Jr., Dept. of Anatomy, University of Alabama Medical Center, Birmingham 3)

16–17. **Non-Linear Processes** in the Ionosphere, conf., Boulder, Colo. (R. T. Frost, Natl. Bureau of Standards Boulder Laboratories, Boulder)

16–18. **Thin Films,** Electrical and Magnetic Properties in Relation to Their Structures, London, England. (Administration Assistant, Institute of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1)

19–20. **Radiation Emergencies** in Medicine, Research and Industry, Chicago, Ill. (R. V. Wheeler, Argonne Natl. Laboratory, 9700 S. Cass Ave., Chicago)

19–21. American **Physical** Soc., Pasadena, Calif. (APS, Columbia Univ., New York 27)

26–28. National Council of **Teachers of Mathematics,** San Angelo, Tex. (H. T. Karnes, Dept. of Mathematics, Louisiana State Univ., Baton Rouge 3)

26–28. American **Geophysical** Union, western natl., Boulder, Colo. (W. W. Kellogg. Rand Corp., 1700 Main St., Santa Monica, Calif.)

26–30. American Assoc. for the **Ad-**