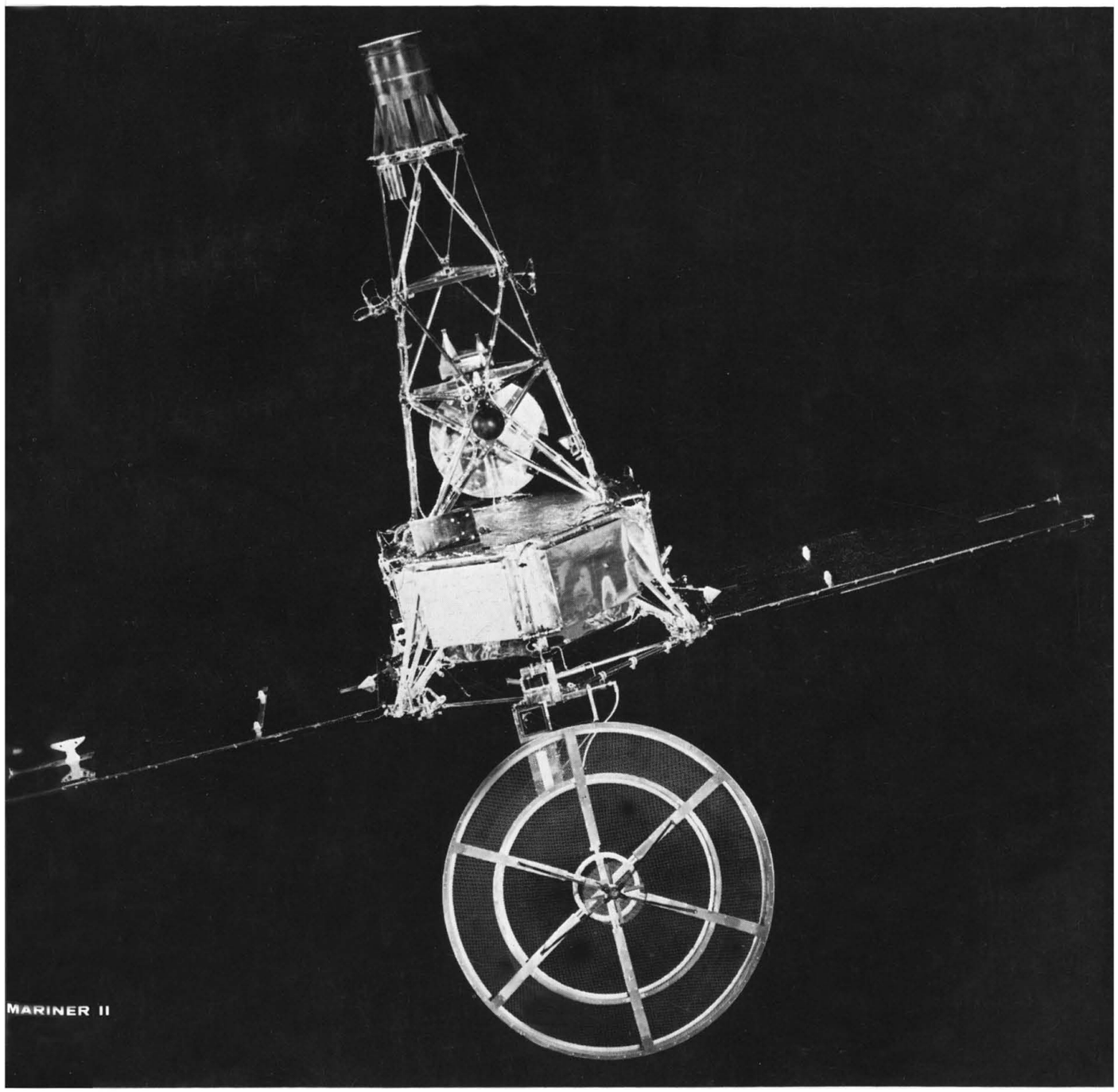
SCIENCE

7 December 1962

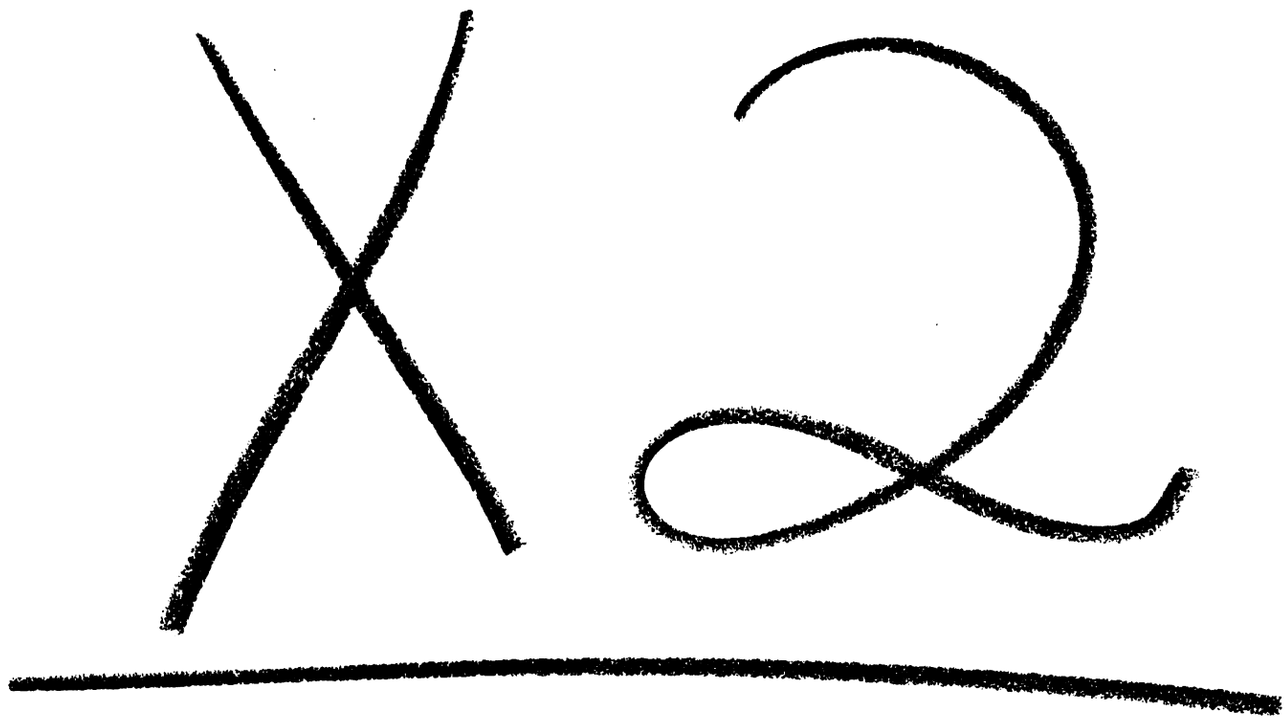
Vol. 138, No. 3545

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Preconvention Issue

Tomorrow's Farm Problem: How can we grow enough to feed twice as many people?



Within the next fifty years, the nation's farmers are going to have twice as many mouths to feed. During the same period, the land available for agriculture in this country will decrease by about fifty million acres. Modern science is already developing remarkable new techniques for food production, but tomorrow's farmers must apply them with high efficiency to grow the right foods in the right quantities to meet future demands. How will they do it?

One answer may lie in the use of a new agricultural tool—the electronic computer. IBM computers are being used by a growing number of larger farms and are serving thousands of other farmers through the extension services of several state agricultural colleges. Computers give farmers better information about crop rotation, labor and equipment costs, soil fertility, and the hundreds of other variables that affect a farm's production. They also are helping to level out areas of surplus and shortage for certain crops by providing a clearer picture of actual market demand.

Computers promise to do for the farmer what they now do for the scientist and businessman: enable him to make better decisions based on better, more complete information.

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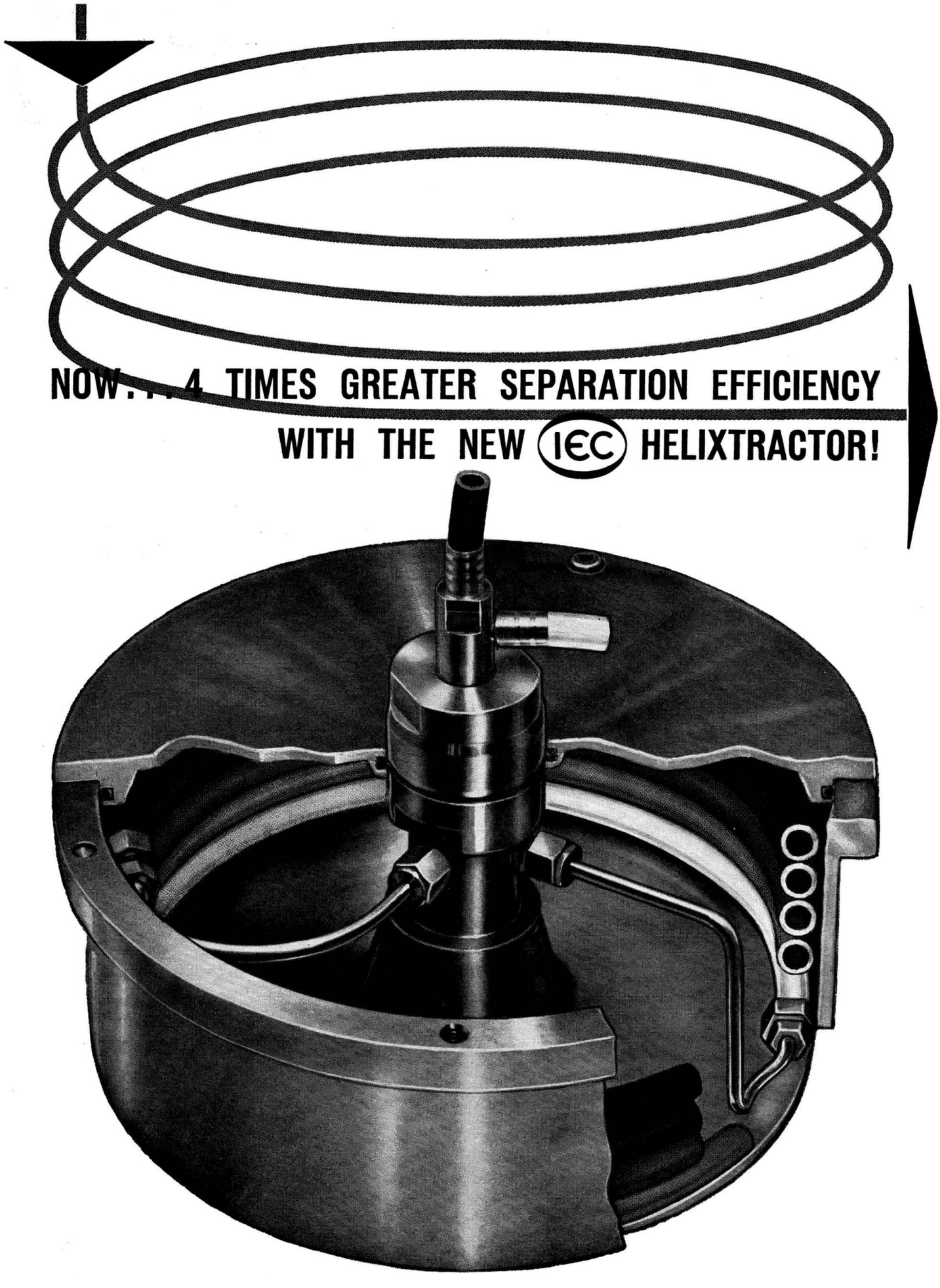
7 December 1962, Volume 138, Number 3545

SCIENCE

Cover

Mariner II, the spacecraft used in the Venus mission, will pass Venus on 14 December. Reports on the experiments conducted during the flight appear on page 1095. [Jet Propulsion Laboratory, California Institute of Technology]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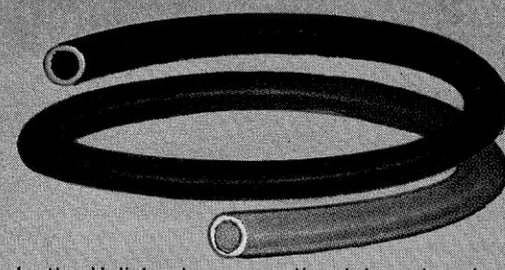
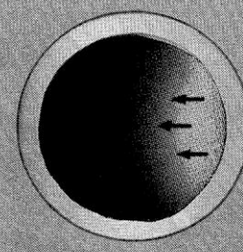
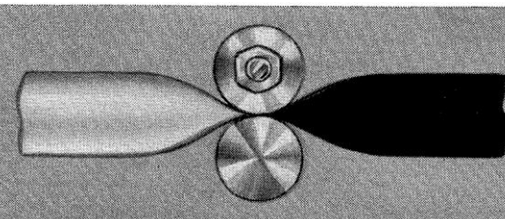


In the Helixtractor, separation takes place in a vertical coil (helix) of polyethylene or Tygon plastic tubing. Material to be centrifuged is introduced into the spinning helix through a central, stationary hub. Solids are collected along the wall of the tubing in the form of a paste. Because the tubing is transparent, different phases of the precipitate may be identified and isolated by simply cutting out a particular section of the tubing.



All material passing through the tubing is subjected to the same G force for the same length of time. The flowing liquid is only a fraction of an inch in thickness; therefore the solid phase separates three to four times more rapidly than by any other method.



Precipitate is easily removed with the roller-type extractor supplied with each IEC Helixtractor unit or flushed with a syringe. Precipitates also can be preserved for future use simply by sealing the ends of the tubing. This forms an air-tight package which lasts indefinitely.

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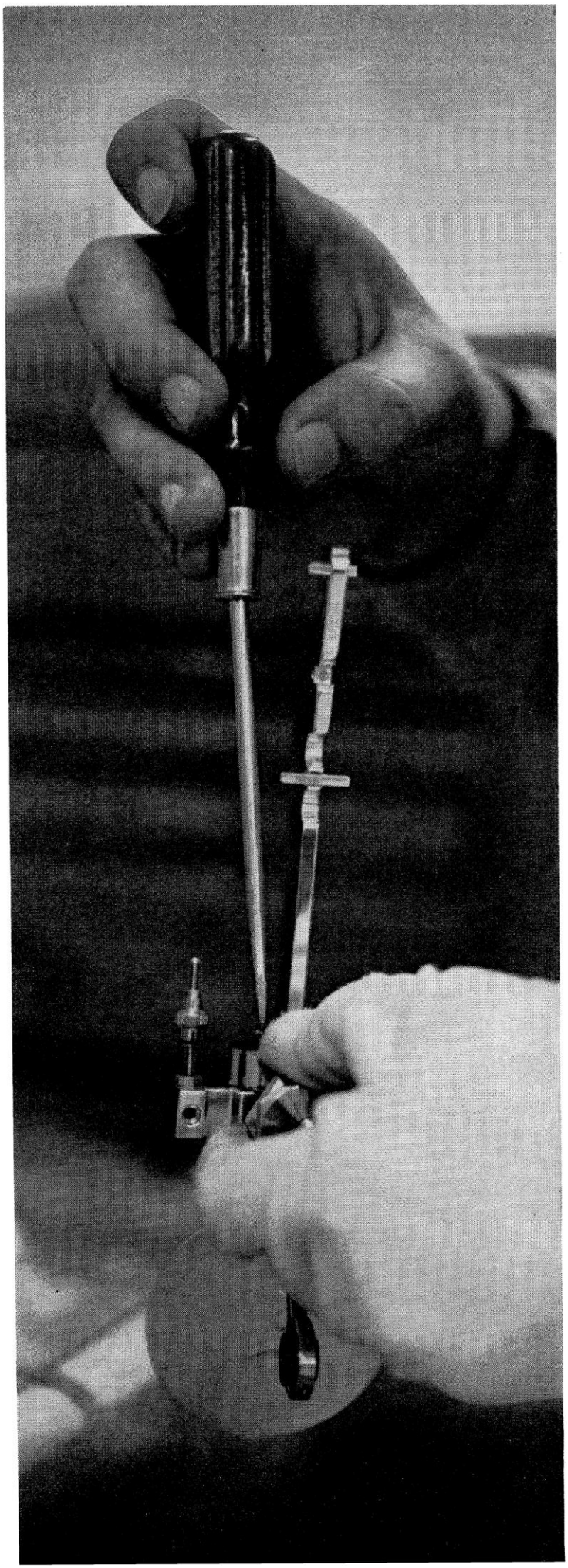

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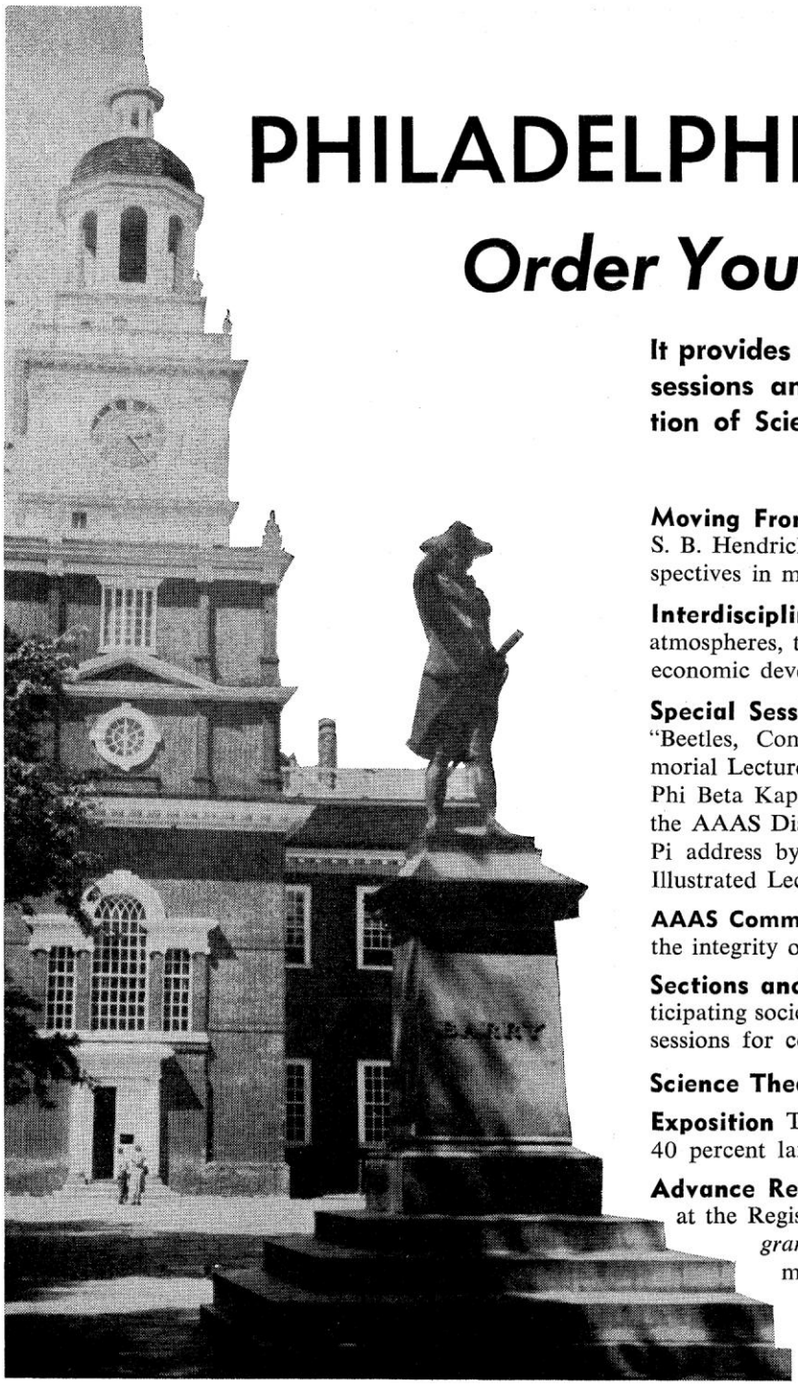

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Special Sessions AAAS Presidential Address by Thomas Park on "Beetles, Competition, and Populations"; the George Sarton Memorial Lecture by Gerald Holton; the Joint Address of Sigma Xi and Phi Beta Kappa by Loren C. Eiseley on "Man: The Lethal Factor"; the AAAS Distinguished Lecture by McGeorge Bundy; the Tau Beta Pi address by C. C. Furnas; and the National Geographic Society Illustrated Lecture by Barry C. Bishop.

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Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 235, SCIENCE, 20 July. The AAAS headquarters is the Sheraton.

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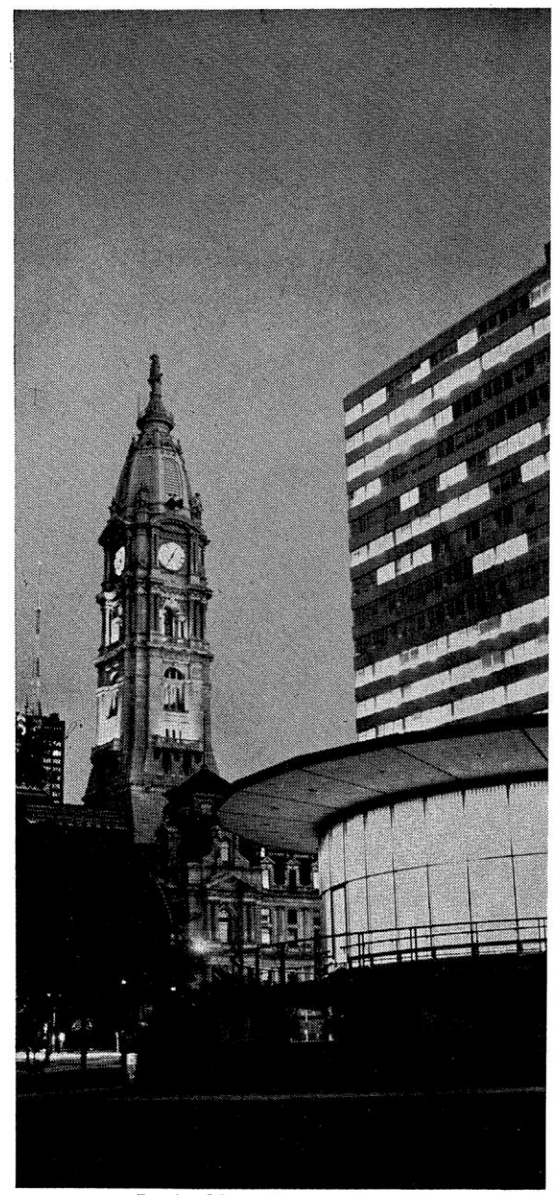

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For a list of the headquarters of each participating society and section, see page 235, *Science*, 20 July.

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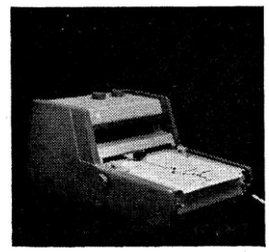

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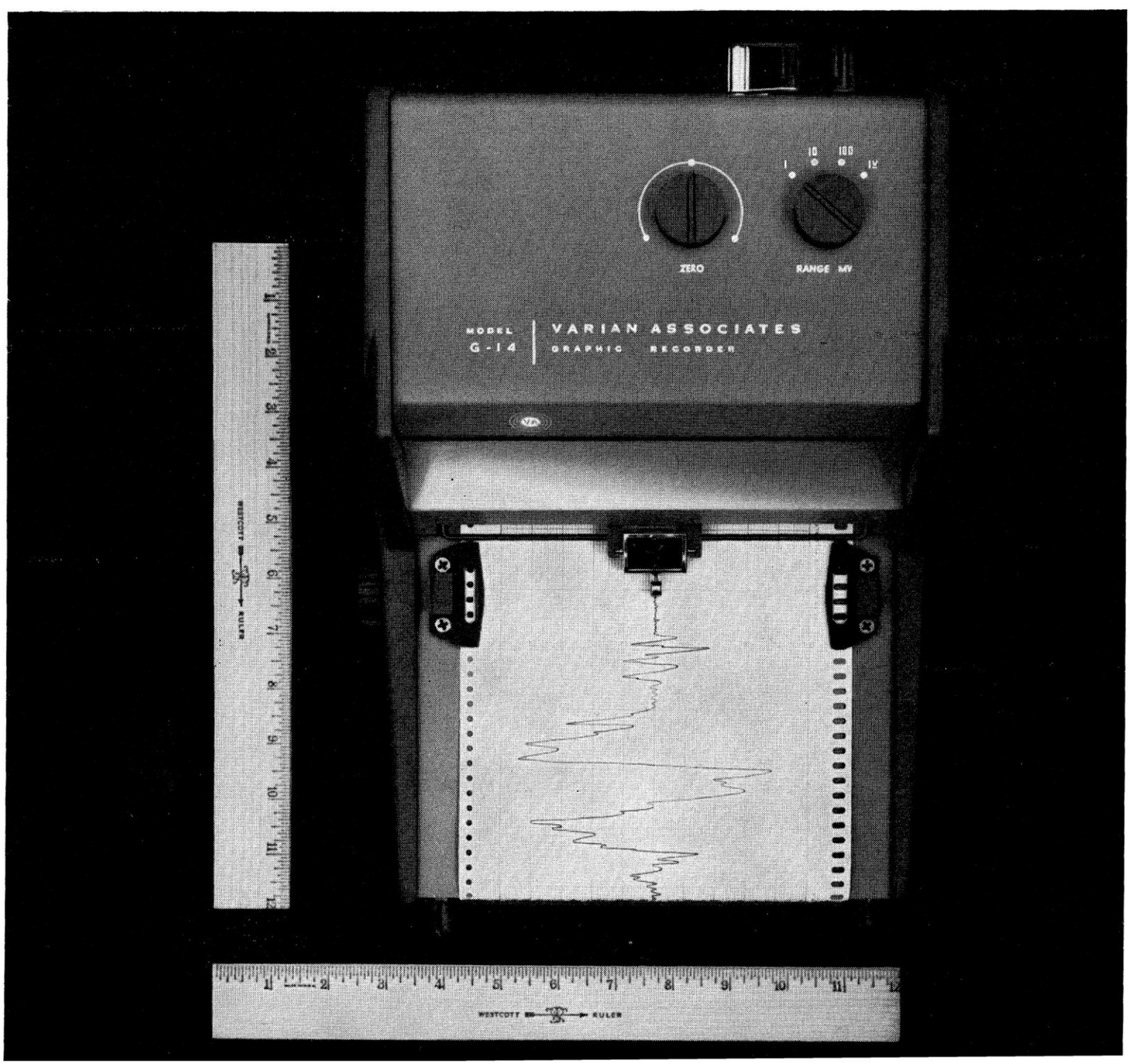

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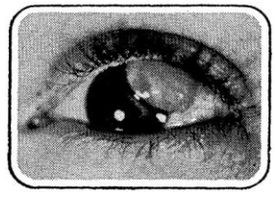
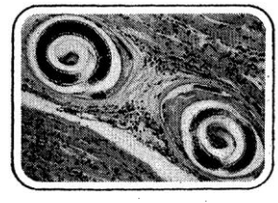
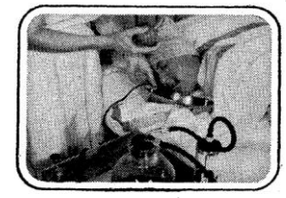
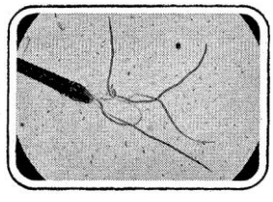

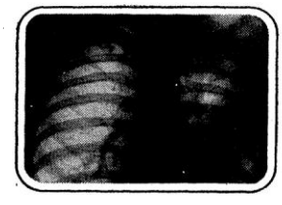
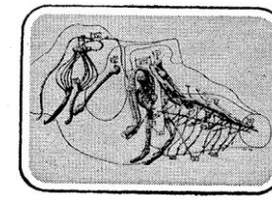

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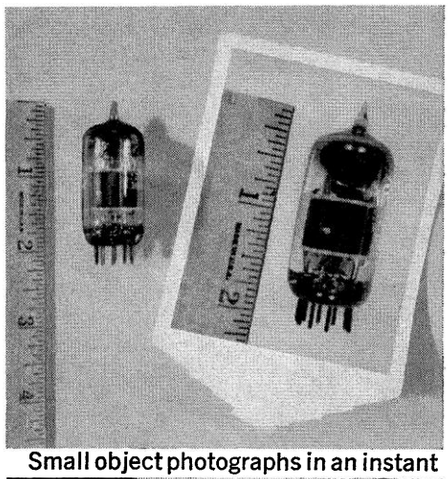

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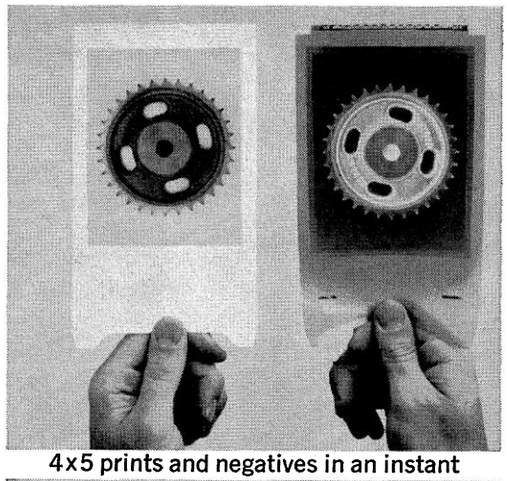

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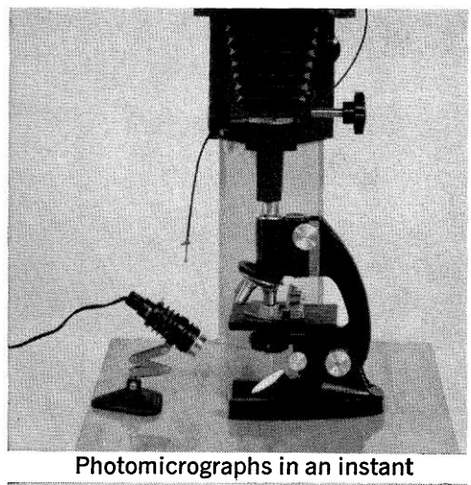

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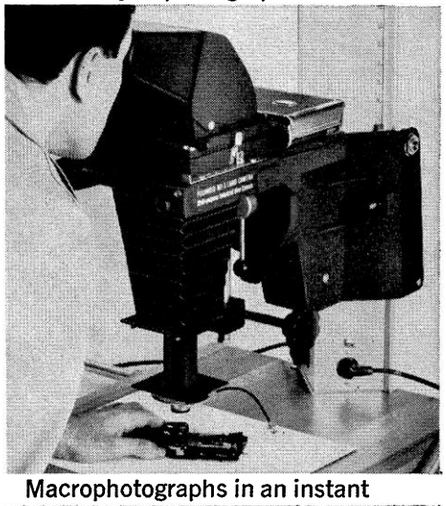

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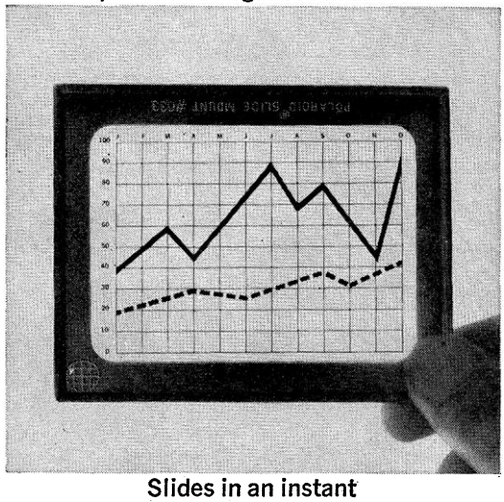

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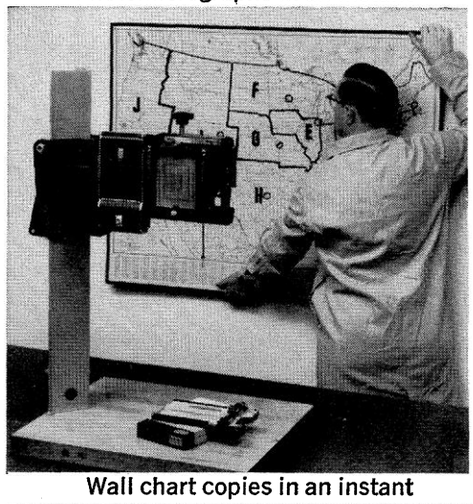

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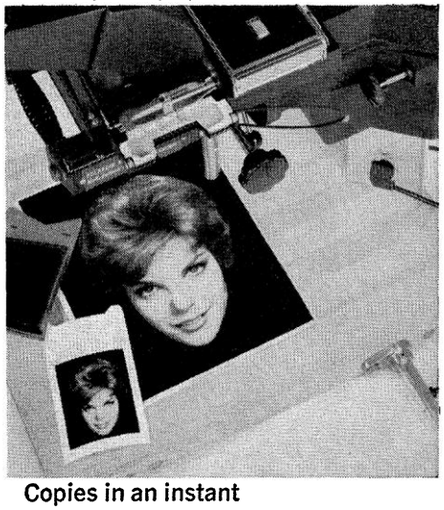

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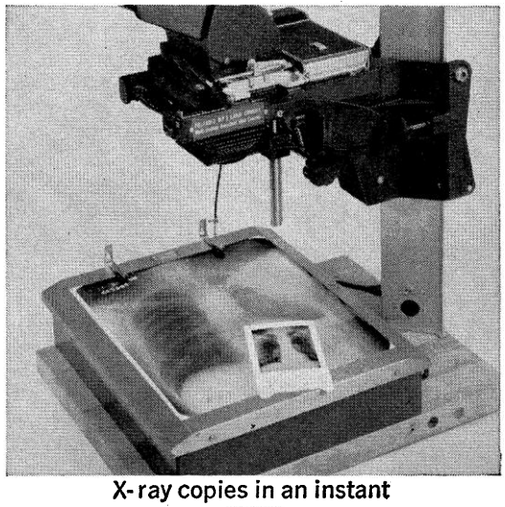

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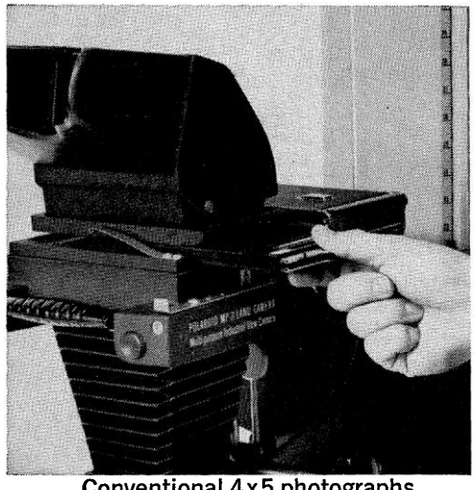

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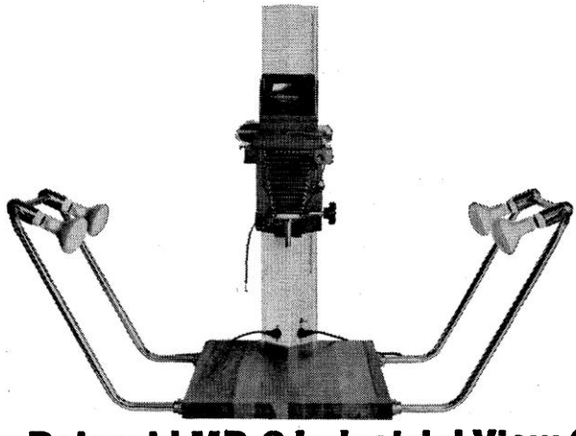

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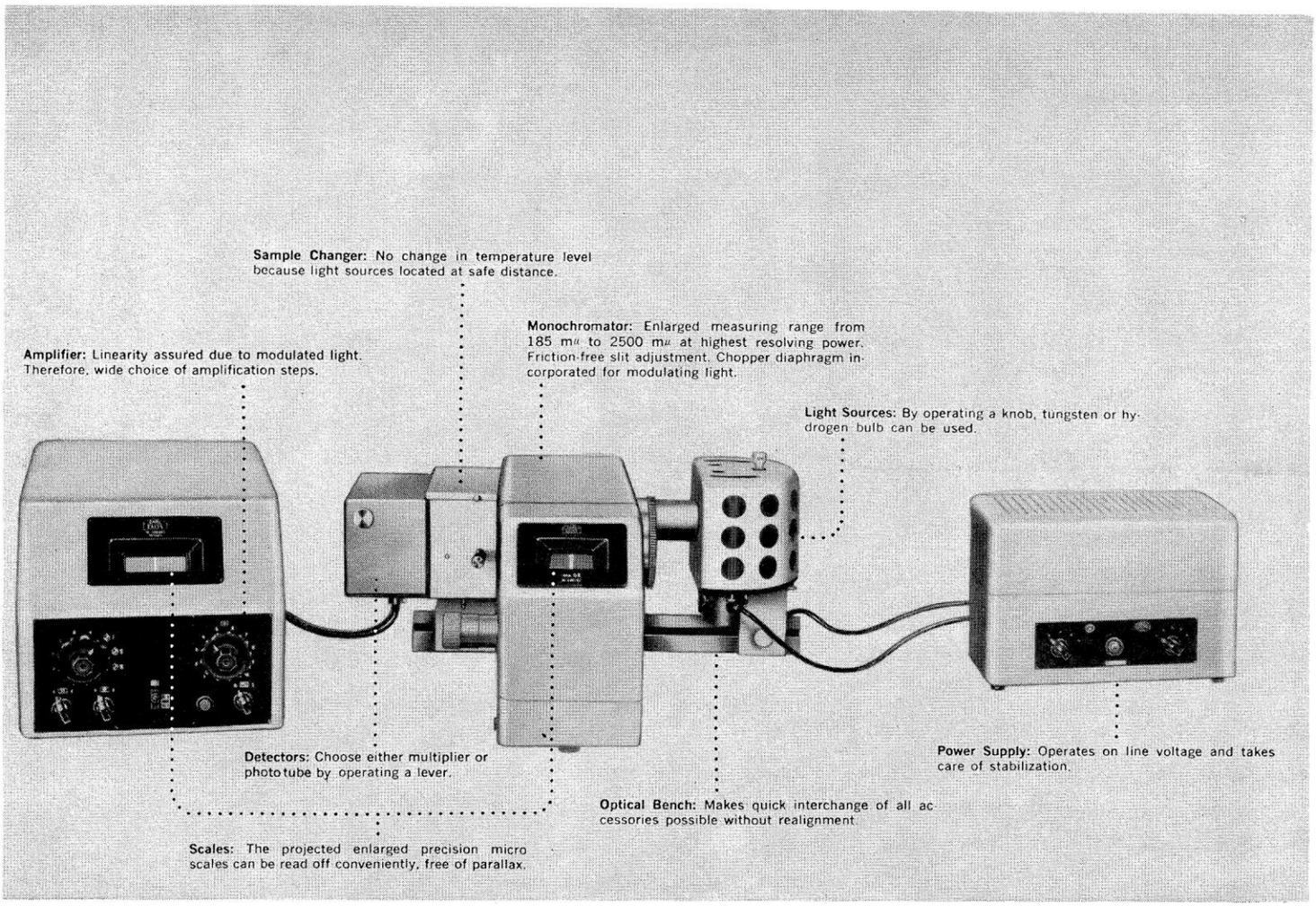

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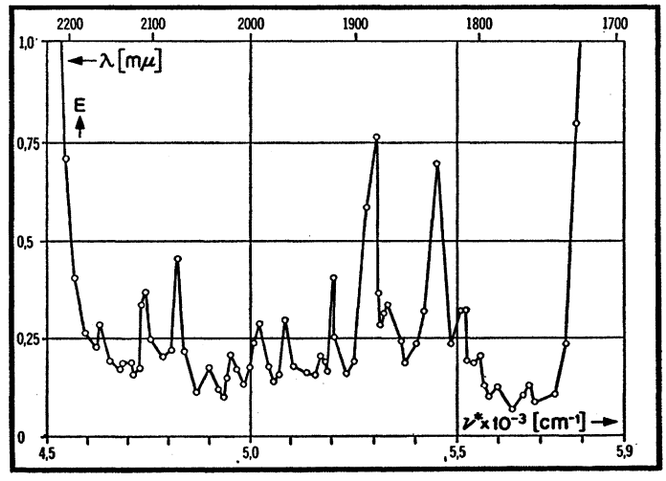

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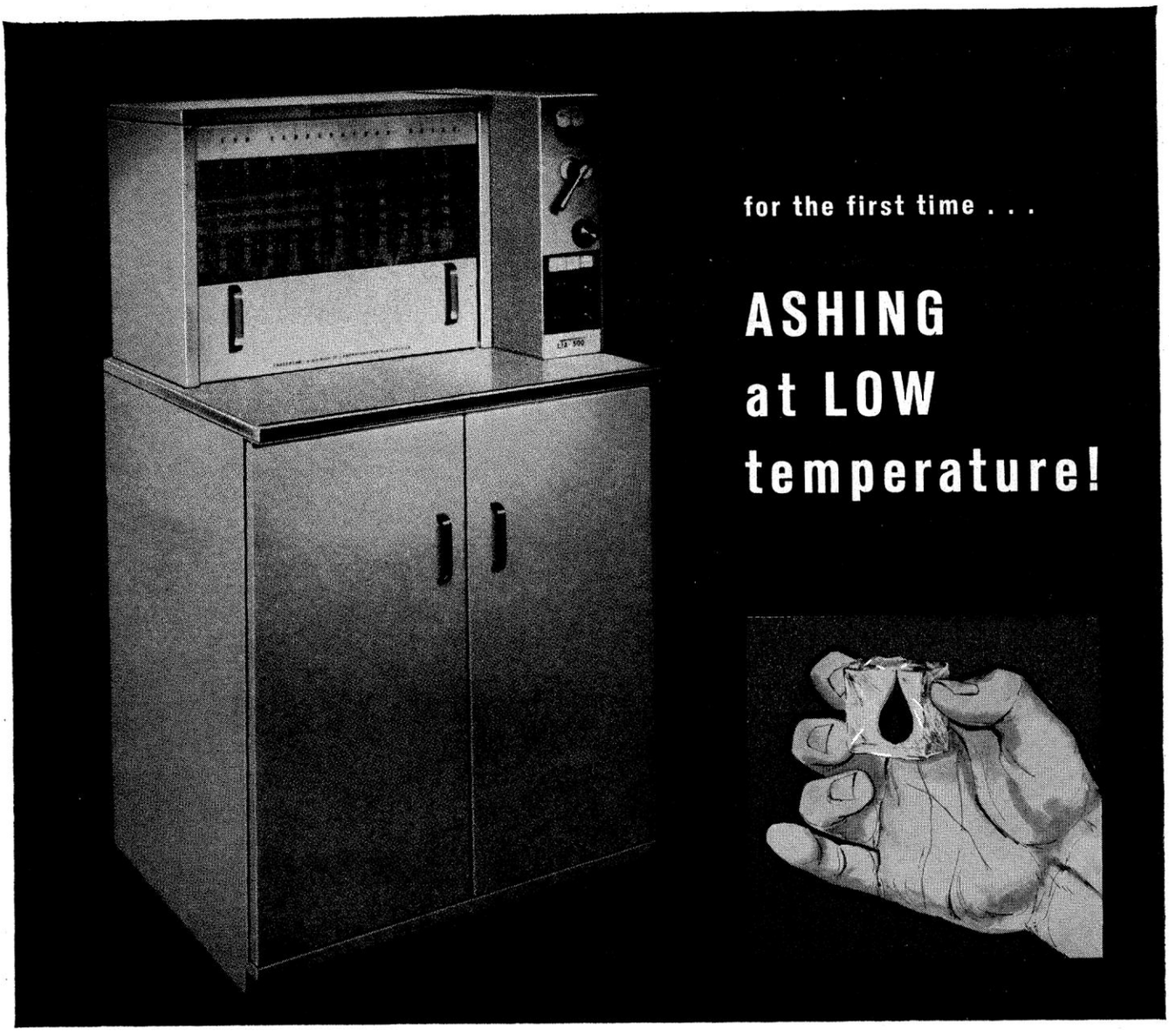

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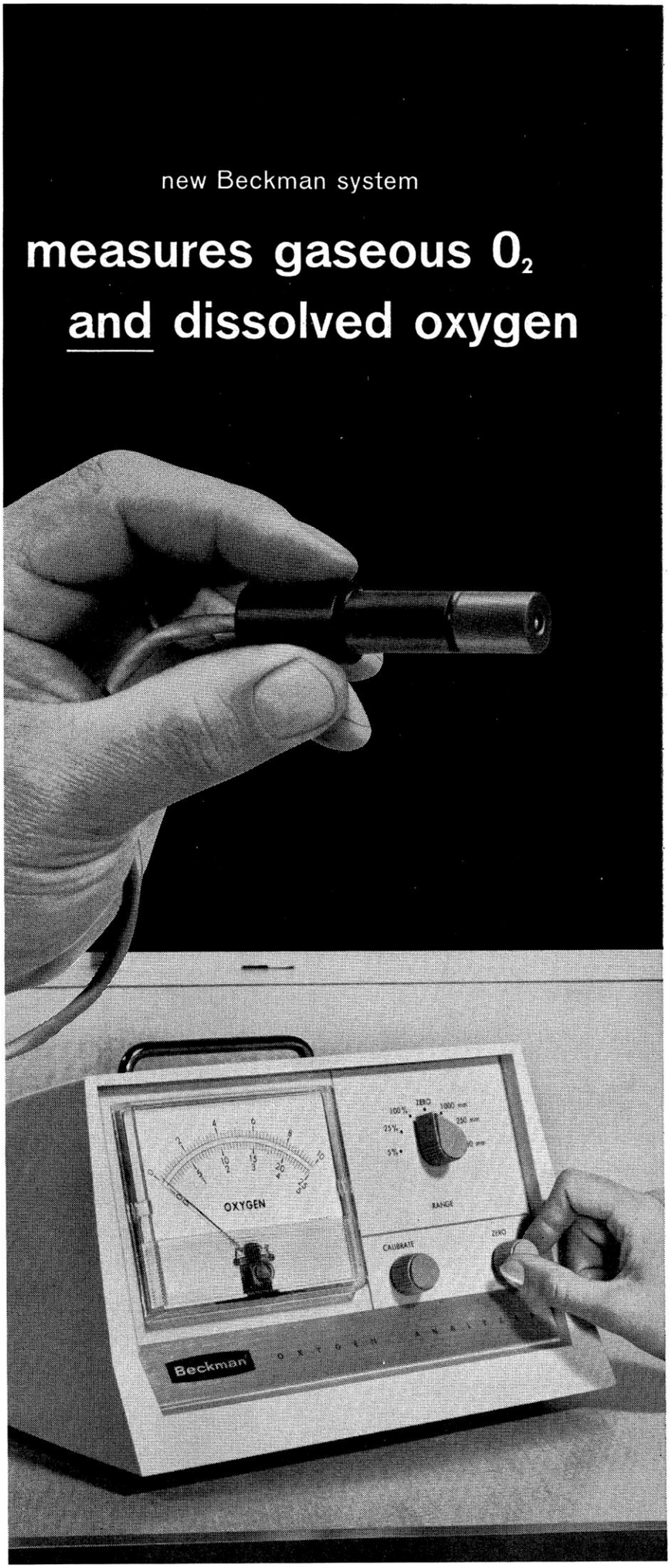

This is the concept developed by Beckman for critical oxygen analyses in the Project Mercury space capsules. Now Beckman offers a commercial version of this rugged, highly successful system for laboratory measurement of gaseous oxygen *or* of dissolved oxygen in aqueous or non-aqueous solutions.

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Your Beckman dealer has full particulars on these exciting new laboratory oxygen measuring devices. Remember too, that Beckman has comparable process oxygen equipment. Ask him, or write for data file LO-38-163.

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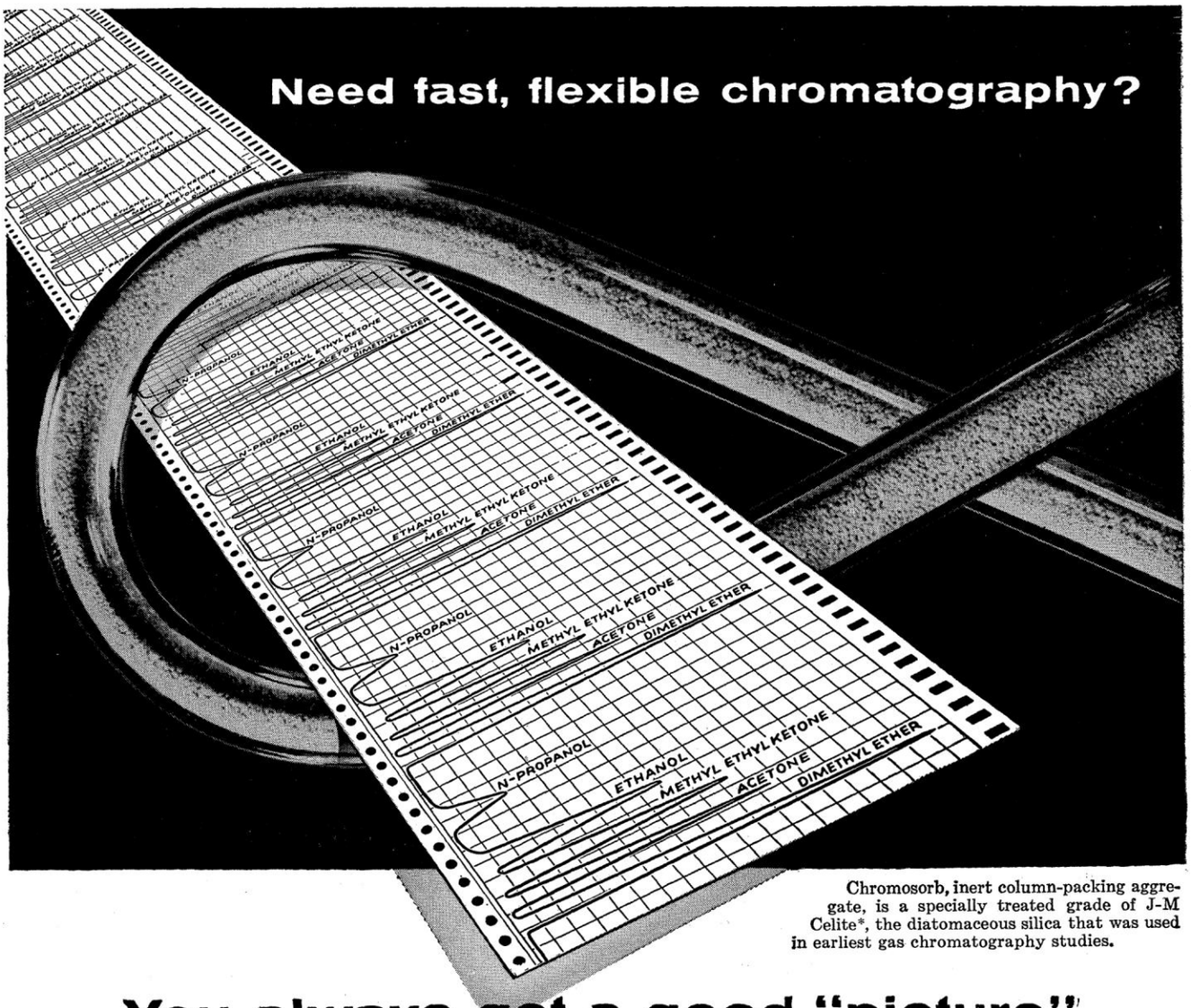

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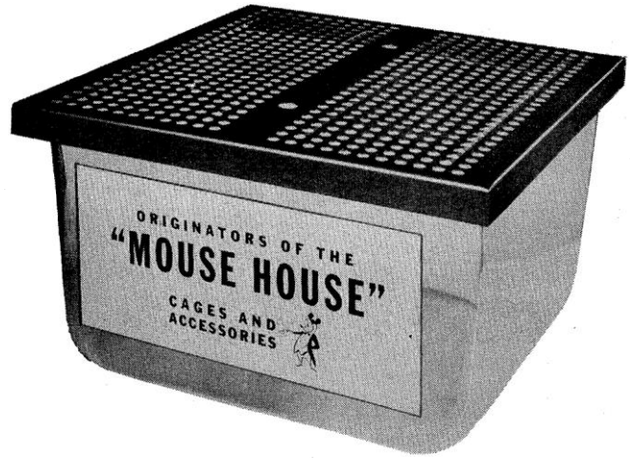

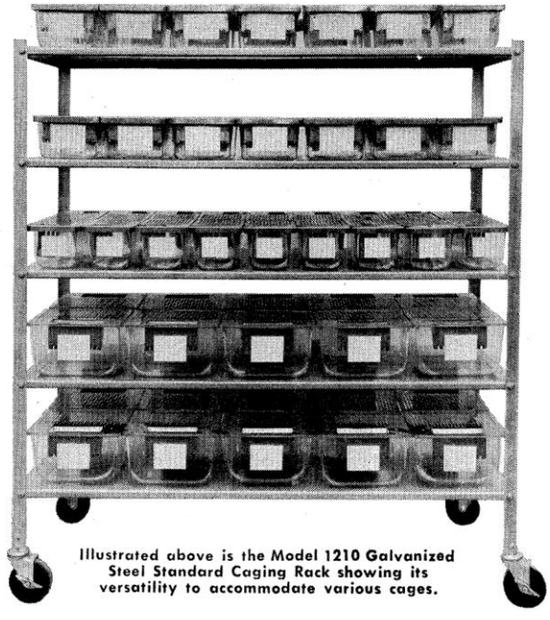

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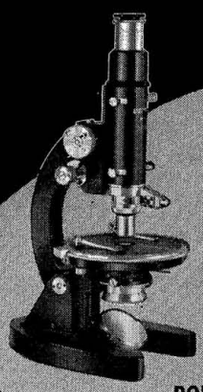

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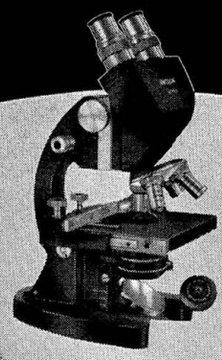

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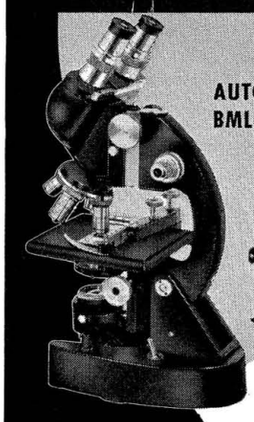

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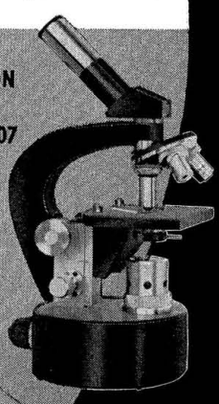

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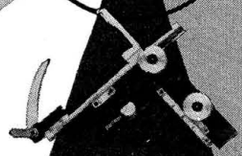

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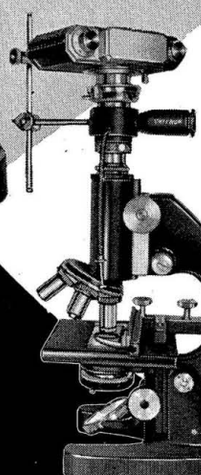

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Edited by Walter Hoffmann, *Zürich*; with 25 contributors. This volume is concerned with digital information processors as information machines and presents a selection of articles related to this topic. Problems of information processing occurring in the course of application and use of digital information processors are also treated. An Interscience Book. *1962. 740 pages. $27.00.*

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By C. J. O. Morris, *London Hospital Medical School, University of London; and* P. Morris. An Interscience Book. *1962. In press.*

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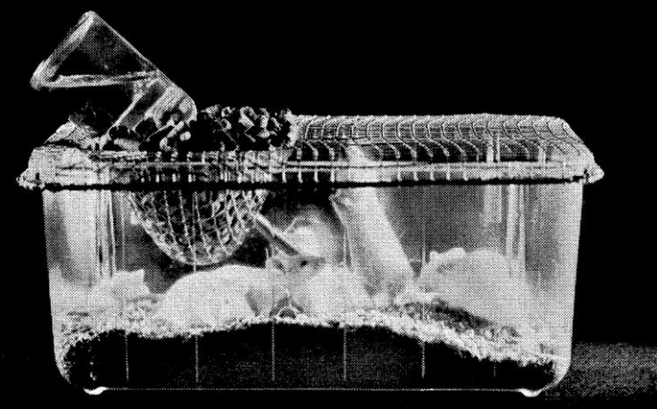

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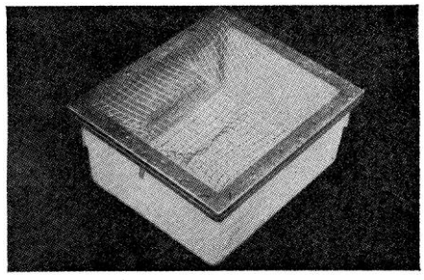

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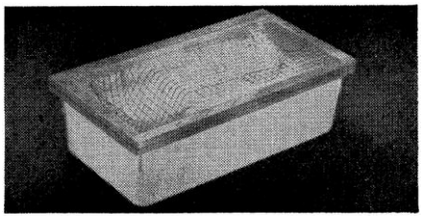

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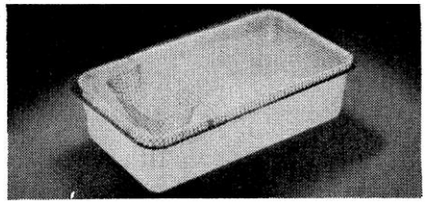

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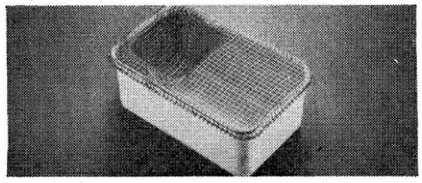

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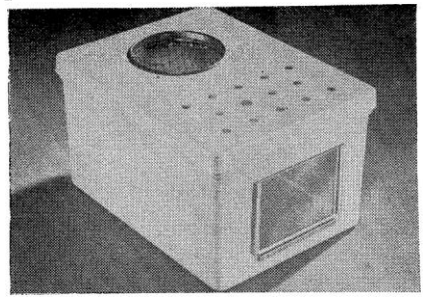

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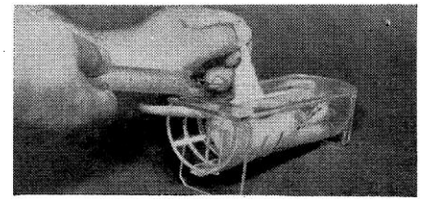

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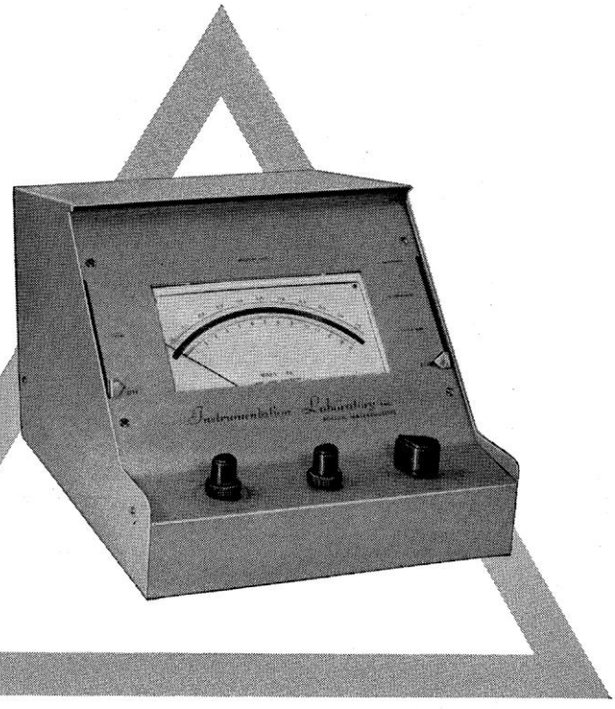

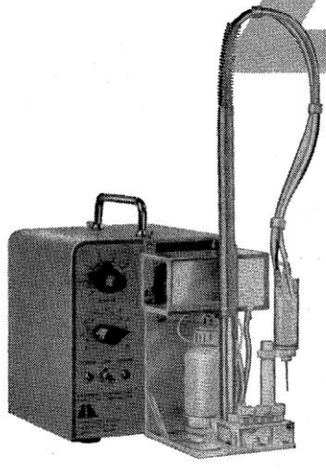

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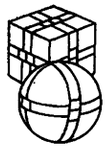

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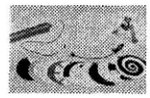

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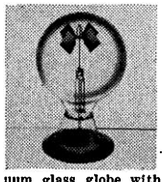

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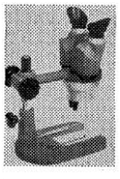

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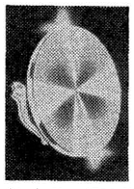

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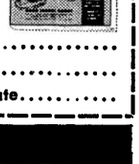

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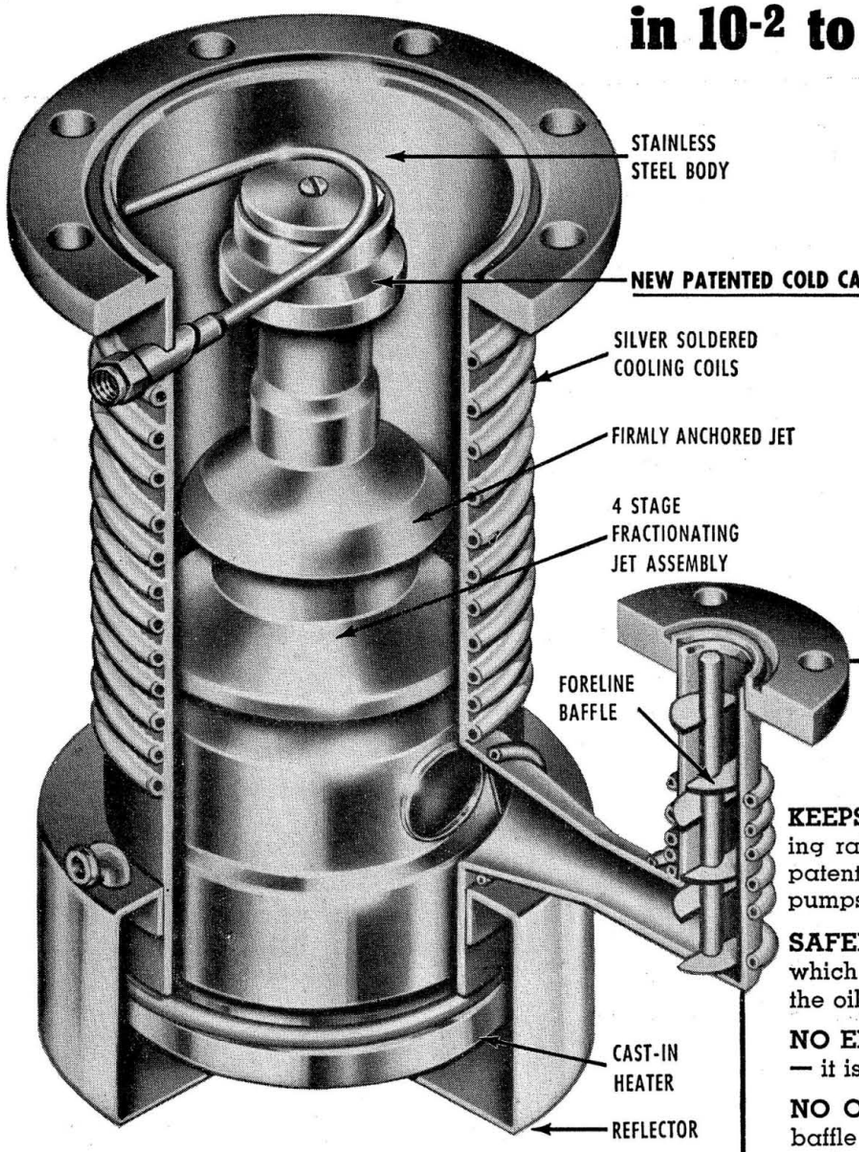

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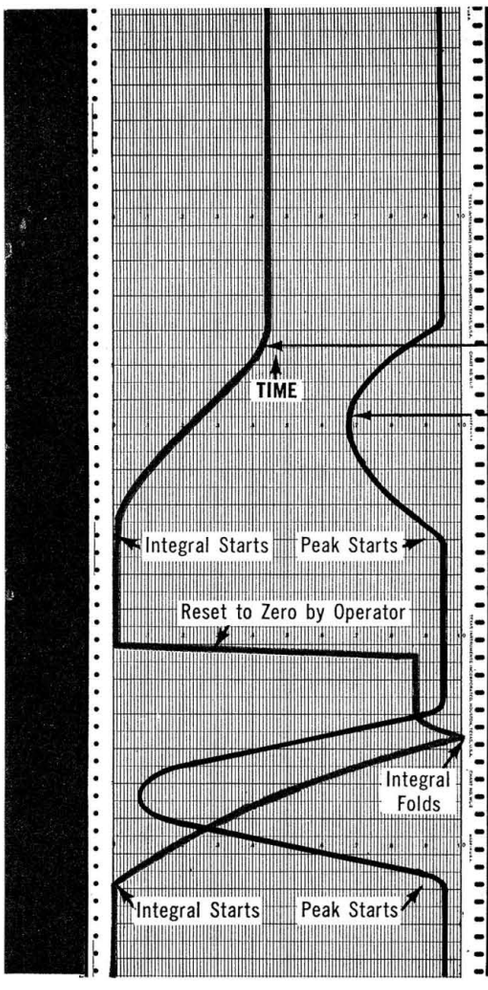

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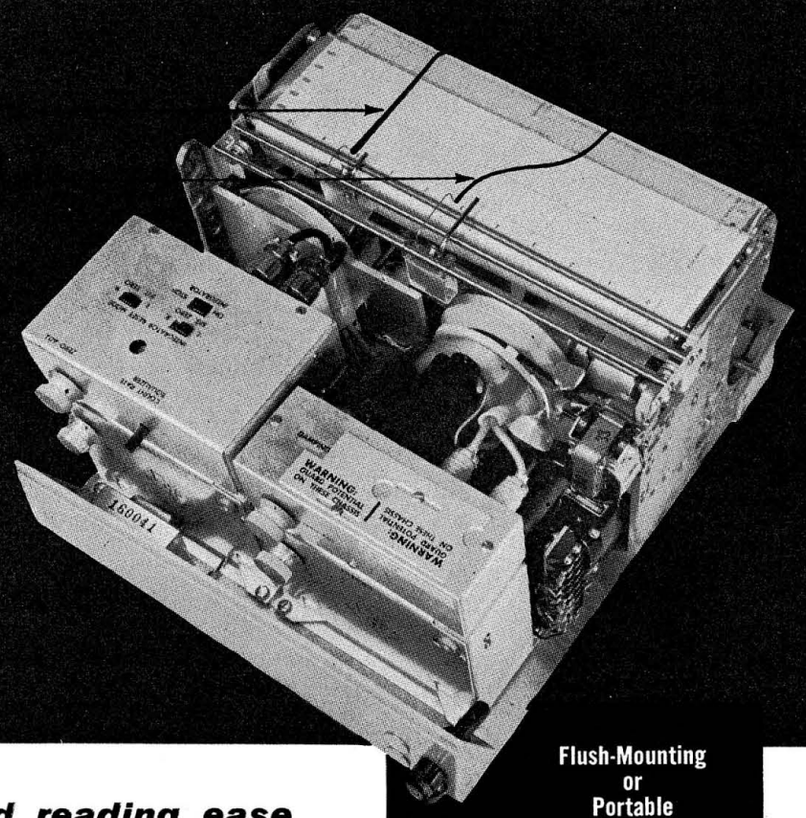

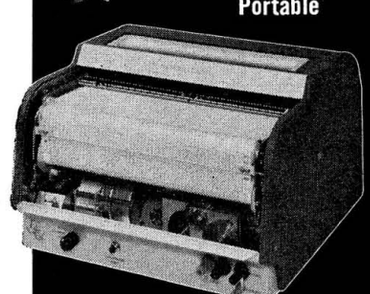

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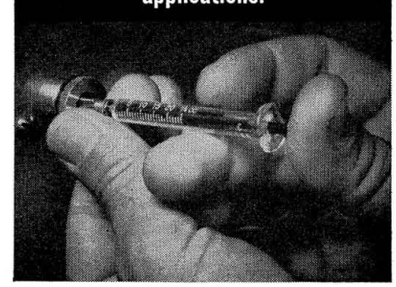

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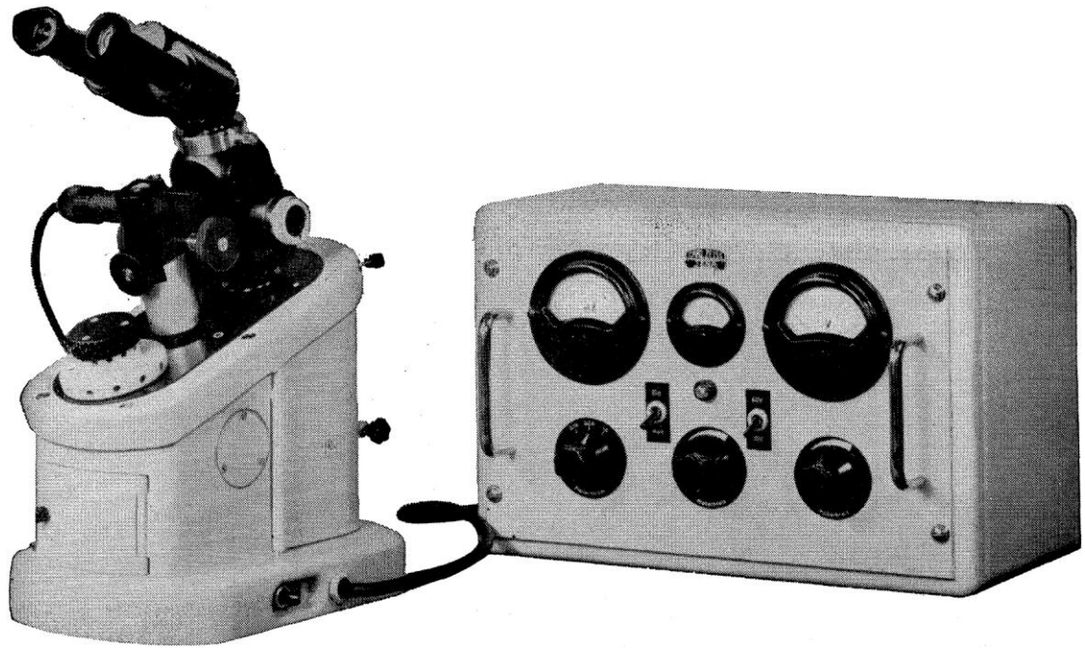

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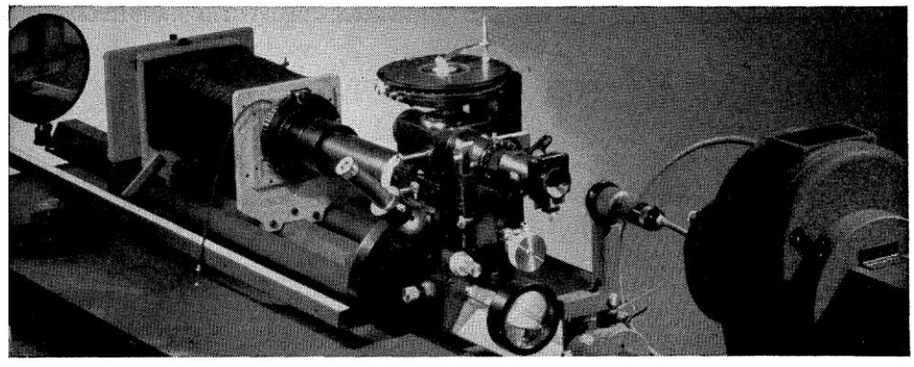

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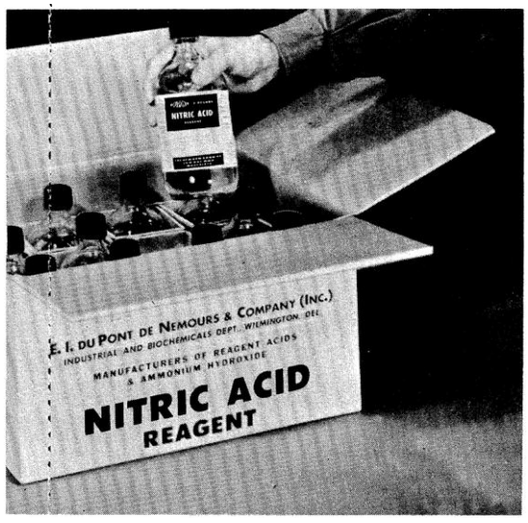

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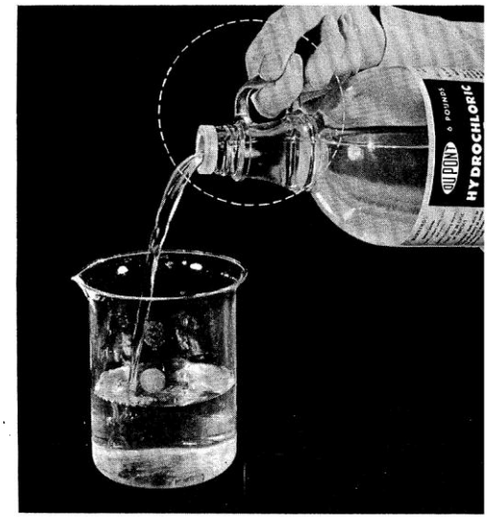

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REAGENT

GLACIAL ACETIC ACID REAGENT

Acetic Acid (CH_3COOH)	Min. 99.7%
Residue after Evaporation	Max. 0.0010%
Chlorides as Cl	Max. 0.00005%
Sulfates as SO_4	Max. 0.00005%
Iron (Fe)	Max. 0.00002%
Heavy Metals as Pb	Max. 0.00005%
Substances reducing $KMnO_4$	Pass ACS Test
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Hydrochloric Acid (HCl)	Min. 36.5%, Max. 38.0%
Sulfites as SO_3	Max. 0.00008%
Sulfates as SO_4	Max. 0.00008%
Free Chlorine (Cl)	Max. 0.00005%
Heavy Metals as Pb	Max. 0.00005%
Residue after Ignition	Max. 0.0004%
Iron (Fe)	Max. 0.00001%
Arsenic (As)	Max. 0.000001%
Ammonium (NH_4)	Max. 0.0003%

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NITRIC ACID REAGENT

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

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Residue after Ignition	Max. 0.0004%
Iron (Fe)	Max. 0.00002%
Heavy Metals as Pb	Max. 0.00005%
Arsenic (As)	Max. 0.0000005%
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AMMONIUM HYDROXIDE REAGENT

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NORTH CAROLINA: CHARLOTTE—F. H. Ross & Co., 3930 Glenwood Dr., EX 2-2121. DURHAM—Cardinal Products Co., P.O. Box 1611, 681-2017. ELON COLLEGE—Carolina Biol. Supply Co., JU 4-8801. GREENSBORO—Axton-Cross Co., 2605 Branchwood Dr., 275-7208.

OHIO: AKRON—Farley Chemical & Solvents Co., 309 Silver St., PO 2-7261. CANTON—Bison Corporation, Canton Platers Supply Div., 1936 Allen Ave., GL 5-0284. CINCINNATI—Harshaw Chemical Co., Harshaw Scientific Div., 6265 Wiehe Rd., RE 1-9100; Laboratory Services, Inc., 4024 Rosslyn Dr., BR 1-5700. McKinley Litho Supply Co., Inc., 1623 John St., CH 1-6323; Merchants Chemical Branch, McKesson & Robbins, Inc., 3025 Exon Ave., PR 1-4311. CLEVELAND—Chemical Rubber Co., 2310 Superior Ave., SU 1-8330; Harshaw Chemical Co., 1945 E. 97th St., RA 1-8300; Inland Chemical Corp., 1681 Fall St., MA 1-5897; Harold M. Pitman Co., 3501 W. 140th St., WI 1-5250; Platers Supply Co., 2059 Hamilton St., TO 1-6670. COLUMBUS—Globe Chemical Co., 648 Concrea, BE 1-3671; McKesson & Robbins, Inc., Merchants Chemical Branch, 1795 S. High St., HI 3-7629. DAYTON—Globe Chemical Co., 967 Deeds Ave., BA 2-4035; Industrial Chemical Prod. Co., 422 E. Bacon St., BA 2-6391. LIMA—Inland Chemical Corp., 619 N. Jackson St., 223-2075. ST. BERNARD—Globe Chemical Co., Murray Rd. & Big Four R.R., AV 1-7400. TOLEDO —Inland Chemical Corp., 1120 Bush St., CH 3-5296; Rigby Scientific Co., 5649 Alexis Rd., TU 2-2028. YOUNGSTOWN—Superior Chemical Products Co., 40 N. Watt St., RI 4-4151.

OKLAHOMA: OKLAHOMA CITY—McKesson & Robbins, Inc., 1700 W. Grand Ave., CE 2-1351. TULSA—Chemical Products, Inc., 501 W. First St., LU 7-8135.

OREGON: PORTLAND—Van Waters & Rogers, 3950 Northwest Yeon Ave., CA 2-1721.

PENNSYLVANIA: PHILADELPHIA—Phillips & Jacobs Co., 622 Race St., WA 2-3655; Pioneer Salt Co., 940 N. Delaware Ave., MA 7-1200. YORK—North Chemical Company, 609 E. King St., 5584.

RHODE ISLAND: PROVIDENCE — McKesson & Robbins, Inc., 68 Traverse, GA 1-0262.

SOUTH CAROLINA: CHARLESTON—Burris Products Co., Stark Industrial Park, SH 4-7421.

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WASHINGTON: SEATTLE—Van Waters & Rogers, 4000 First Avenue South, MA 4-5050. SPOKANE—Van Waters & Rogers, North 809 Washington St., RI 7-4183.

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WISCONSIN: APPLETON—McKesson & Robbins, Inc., Merchants Chemical Branch, 1836 W. Rogers Ave., RE 4-9888. MILWAUKEE—McKesson & Robbins, Inc., Merchants Chemical Branch, 1100 S. Barclay St., MI 5-7909; Topp Oil & Chemical Co., 1033 N. Hawley Rd., BL 8-4235.

November, 1962

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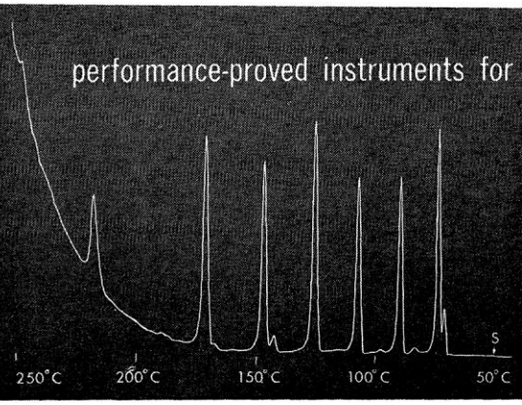
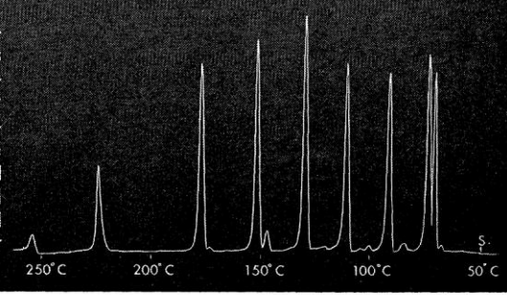


Chromatogram (left) shows conventional single-column analysis of chlorinated hydrocarbons. Unstable baseline is caused by column substrate bleeding at elevated temperature. At right, same sample and conditions, with good stability and definition of final peak, because of differential effect of dual-column/detector feature of Model 800.



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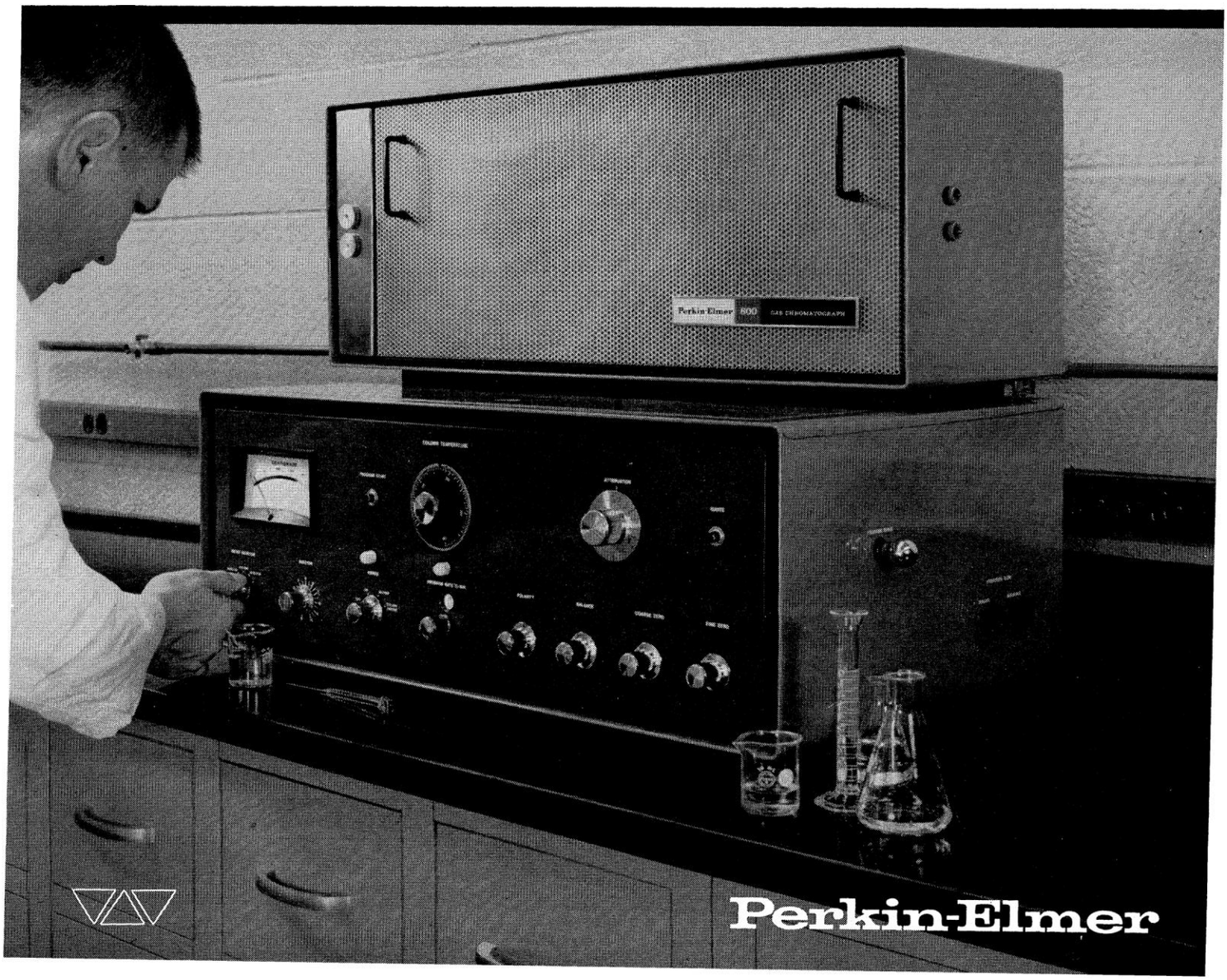
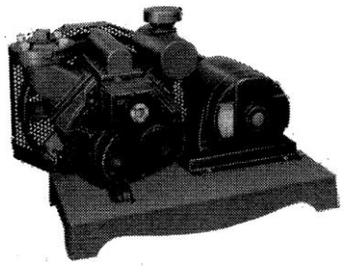
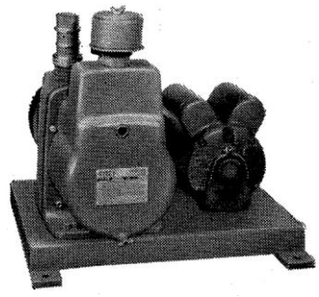
For more information on the Model 800 gas chromatograph, write to Instrument Division, Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Connecticut.

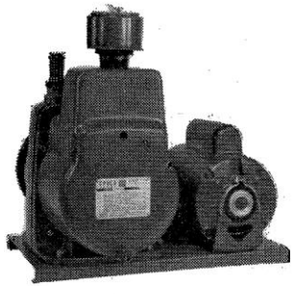




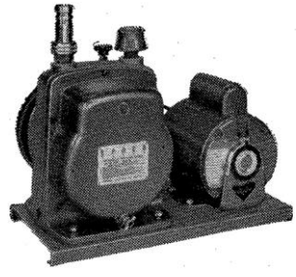
960 liters/min.,
0.1 microns
HYPERVAC 100



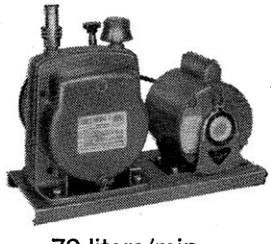
450 liters/min.,
0.05 microns
HYVAC 45



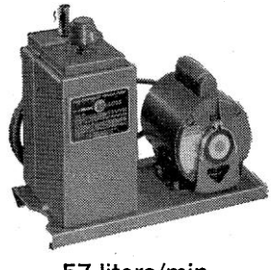
280 liters/min.,
0.05 microns
HYVAC 28



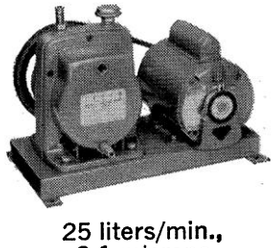
140 liters/min.,
0.1 microns
HYVAC 14



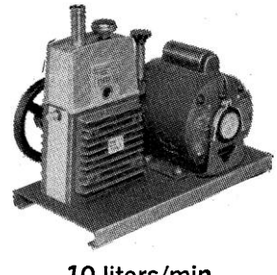
79 liters/min.,
0.1 microns
HYVAC 7



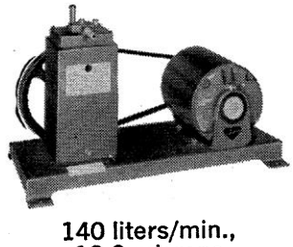
57 liters/min.,
0.1 microns
MEGAVAC



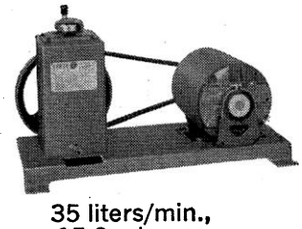
25 liters/min.,
0.1 microns
HYVAC 2



10 liters/min.,
0.3 microns
HYVAC



140 liters/min.,
10.0 microns
HYVAC S14



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HYVAC 14	0.1	140	91705-1	$ 388.00
HYVAC 7	0.1	79	91506-1	$ 284.25
MEGAVAC	0.1	57	92003-1	$ 258.50
HYVAC 2*	0.1	25	91305-1	$ 181.00
HYVAC*	0.3	10	91105-1	$ 119.00
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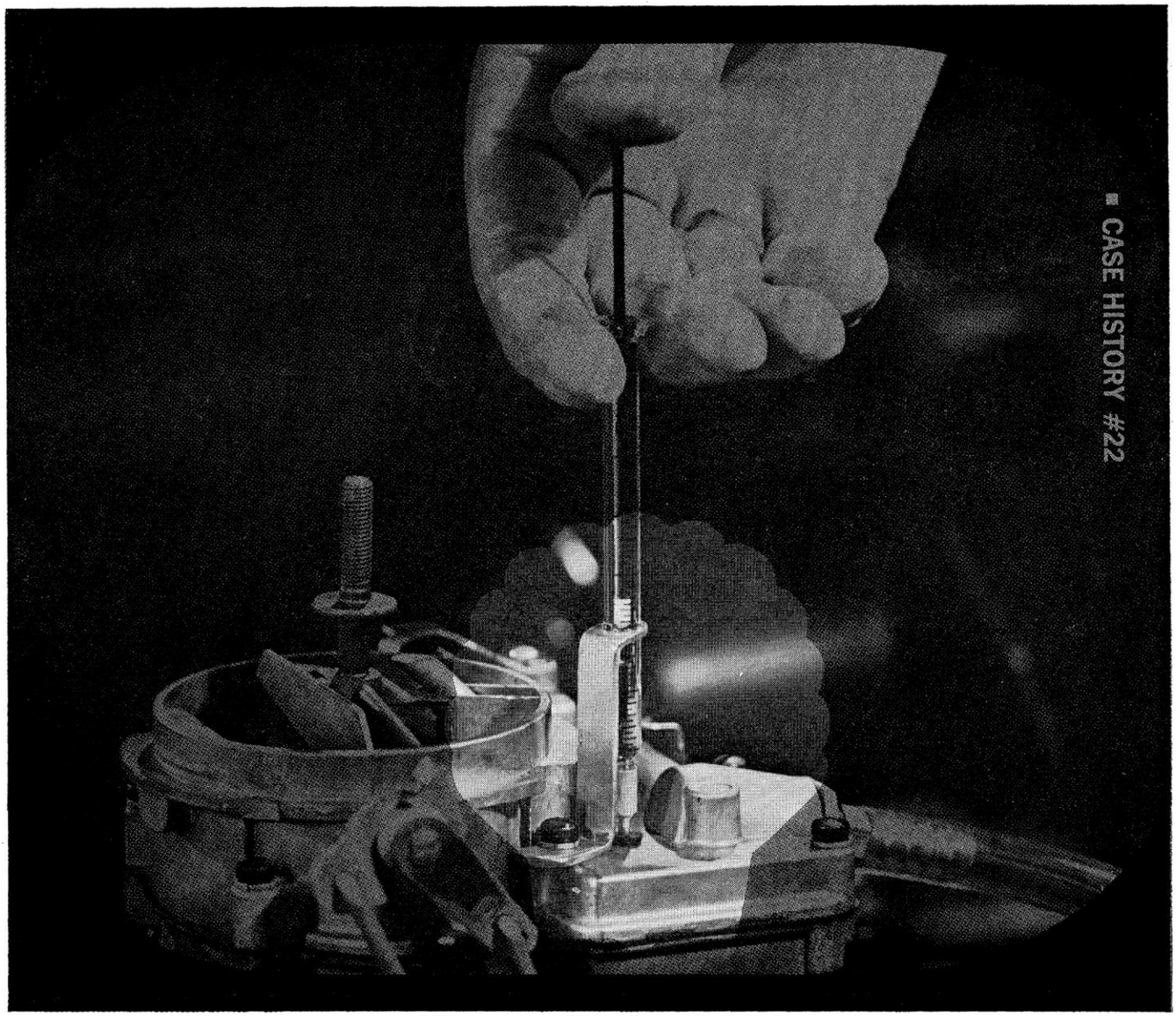

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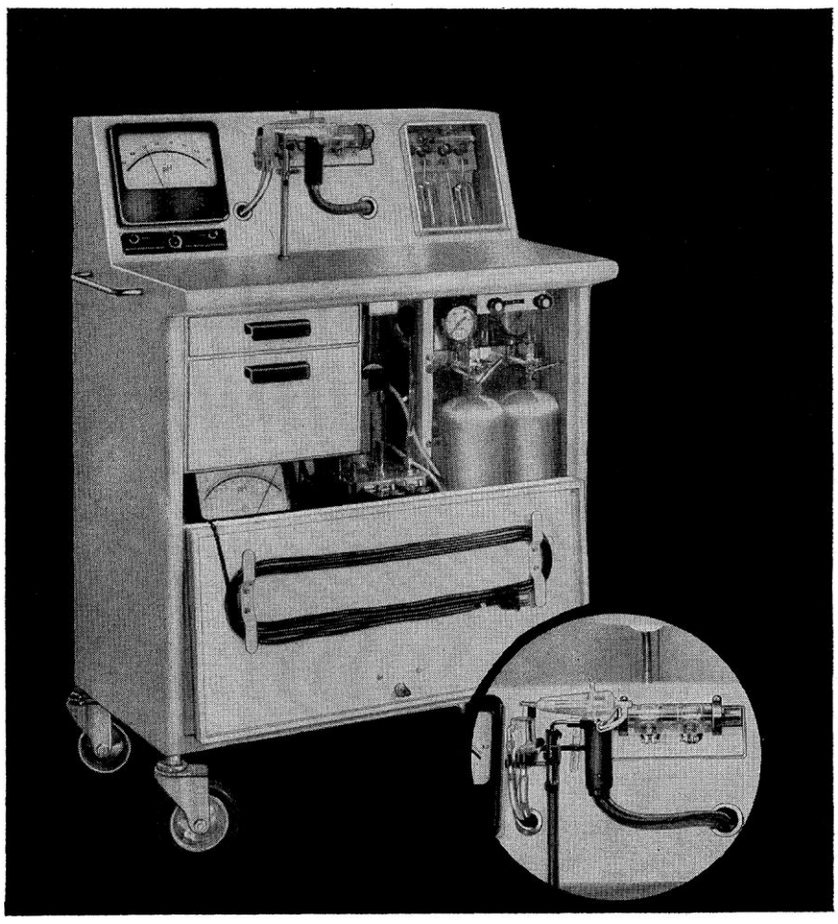

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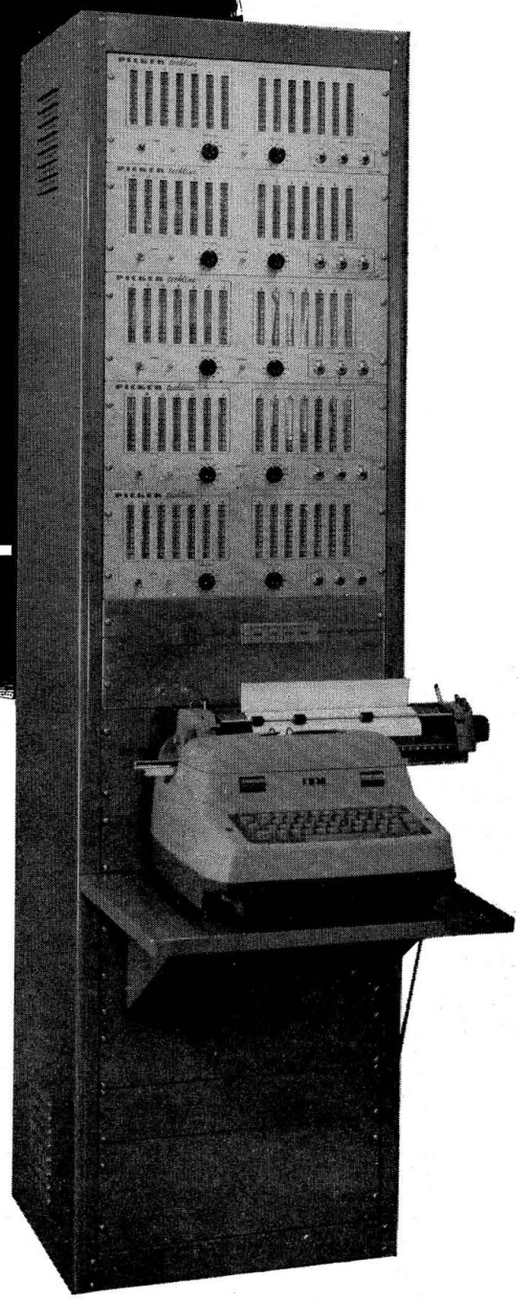

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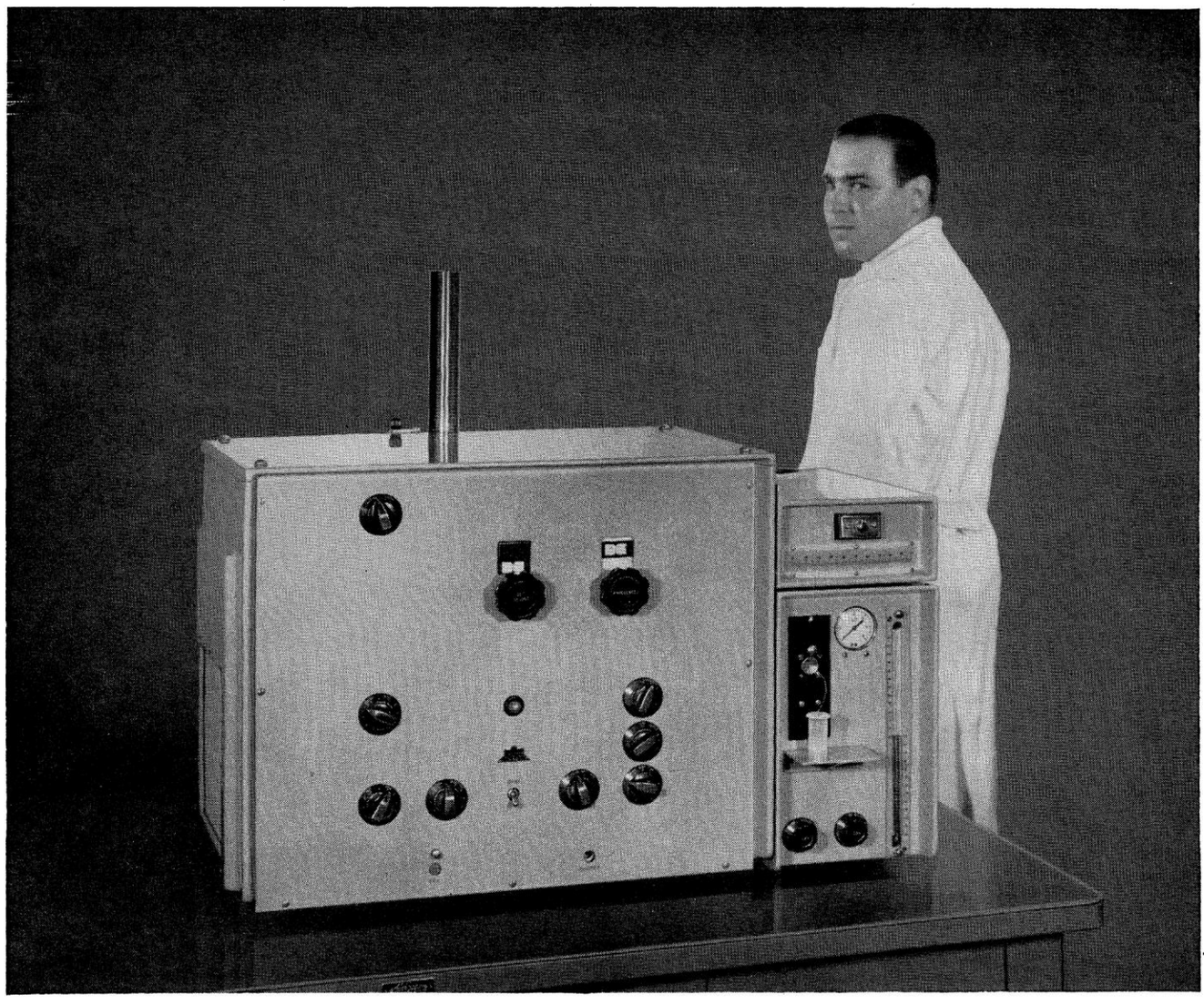

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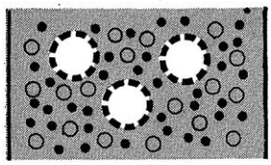
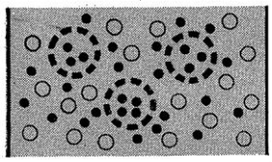
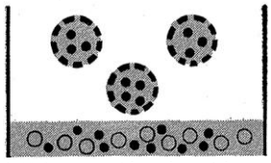


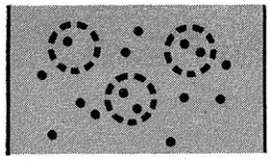
1. Outside water replaced by solution



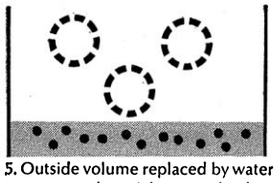
2. Small molecules move into the gel until equilibrium



3. Volume outside gel particles replaced by water



4. Small molecules move from the gel until equilibrium



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

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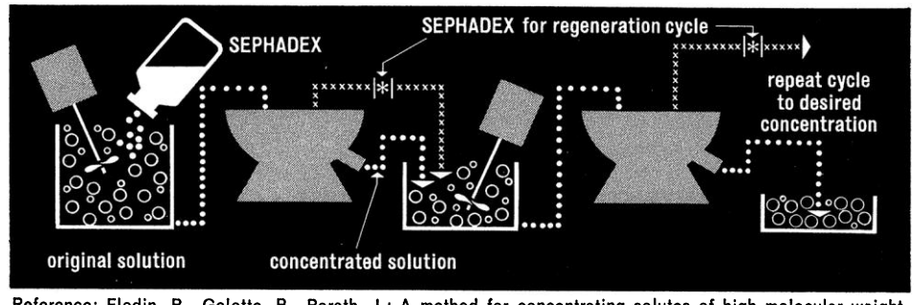

Reference: Flodin, P., Gelotte, B., Porath, J.: A method for concentrating solutes of high molecular weight, Nature, vol. 188, pp. 493-494, 1960.

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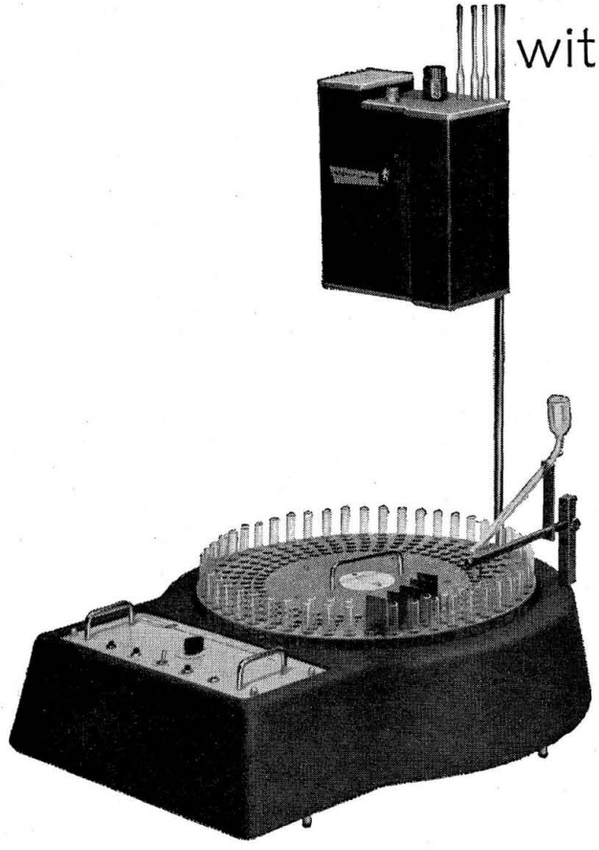
...across the spectrum with just a turn of a **DIAL**



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

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

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

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Now . . . EXPERIMENTAL FREEZE DRYING UNDER ABSOLUTE CONTROL CONDITIONS

AMSCO
Laboratory Freeze Dryer
Model L-3

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

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

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

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

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

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ERIE, PENNSYLVANIA

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

The New Brunswick Scientific Company Presents The PsycroTherm(TM)

A CONTROLLED-ENVIRONMENT INCUBATOR-SHAKER

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

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

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

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

A VERSATILE UNIT

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

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

CHOICE OF SHAKER MECHANISMS

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

CONTINUOUS DUTY SHAKING

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

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

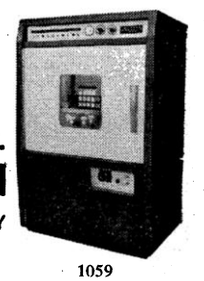
UNCONDITIONAL ONE-YEAR WARRANTY

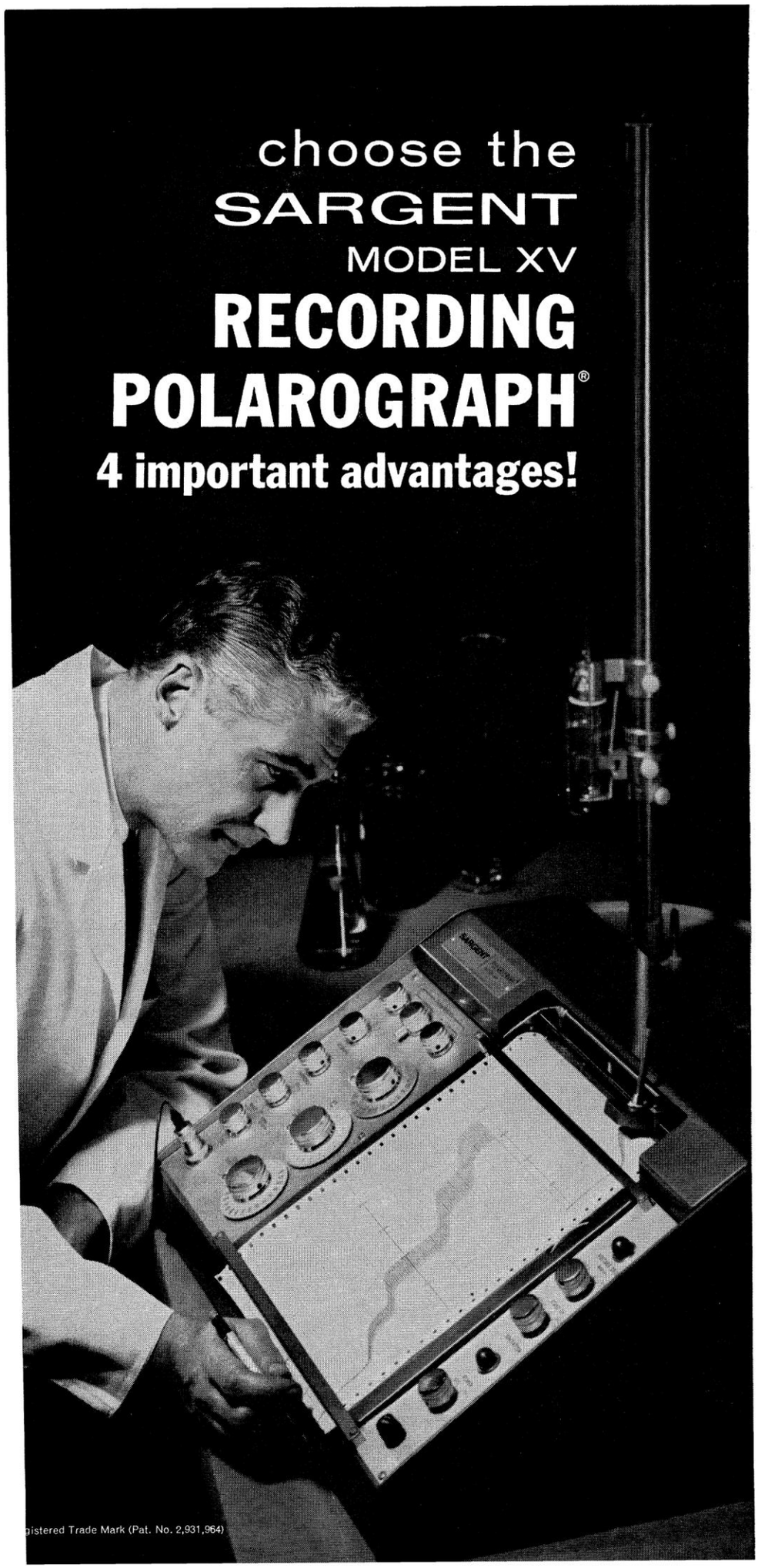
Write for Catalog G26S/1272

NEW BRUNSWICK SCIENTIFIC CO., INC.

PRECISION LABORATORY APPARATUS

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





1. Full 10″ Chart

2. 1/10% Accuracy of Measurement

3. 10 Standardized Polarizing Ranges

4. Low Cost

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

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

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

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

SPECIFICATIONS

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

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

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

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

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

Current Accuracy: 1/10%

Voltage Accuracy: ¼%

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

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

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

Damping: RC, four stage.

Pen: ball point; Leroy type optional.

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

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

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

Dimensions: 23 x 17 x 10 inches.

Net Weight: 65 pounds.

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

For complete information write for Sargent Bulletin P.

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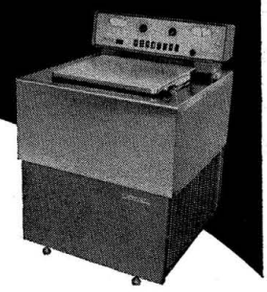
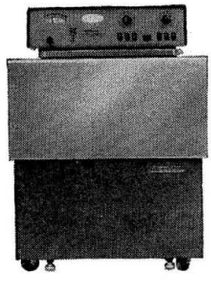
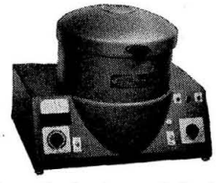


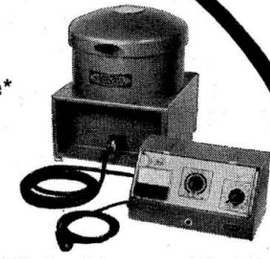
RC-2 Automatic Superspeed Refrigerated Centrifuge* — 17,500 rpm — 37,000 x G
Accepts six different rotors on Gyro-Action direct drive



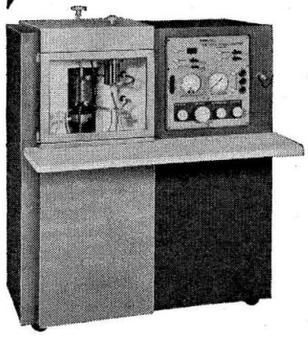
RC-3 Automatic Refrigerated Centrifuge — 5,000 rpm — 5,140 x G — 70 seconds to top speed, 90 seconds to stop. Ideal for routine operations



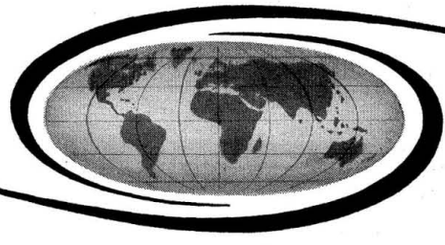
SS-3 Automatic Superspeed Centrifuge* — 17,000 rpm — 34,800 x G with push-button simplicity and armor-plate safety

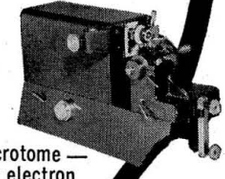


SS-4 Enclosed Superspeed Centrifuge* — 17,000 rpm — 34,800 x G with removable control panel for cold room or fume hood use



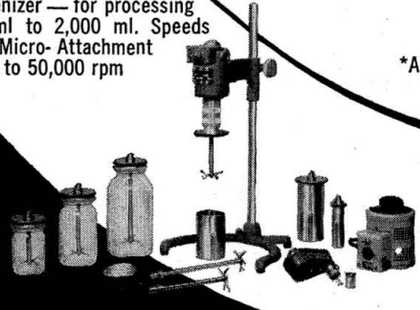
Ribi Refrigerated Cell Fractionator — for isolating cell walls and subcellular particles of the cytoplasm



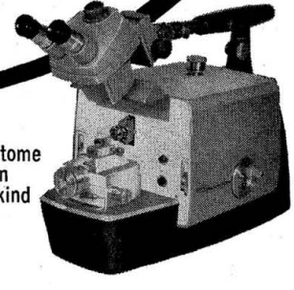


"Porter-Blum" MT-1 Ultra-Microtome — 1/40μ to 1/2μ — for electron and light microscopy

Omni-Mixer Micro-Macro Homogenizer — for processing 0.5 ml to 2,000 ml. Speeds with Micro- Attachment up to 50,000 rpm



*Adaptable to "Szent-Gyorgyi & Blum" Tube Type Continuous Flow System



"Porter-Blum" MT-2 Ultra-Microtome — 100 Å to 4μ — automatic operation — the finest instrument of its kind in the world

Researchers in every branch of the life sciences in more than thirty different countries rely on the Centrifuges and Laboratory Instruments with the SERVALL trademark.

Centrifuges offering a full range of forces up to 37,000 x G, and a wide selection of angle, horizontal and special purpose rotors, provide the researcher with the utmost in versatility. Models include refrigerated, non-refrigerated, automatic, manual, remote control, and continuous flow.

SERVALL's unequalled quality of design and reliability is available also in the prize-winning Ribi Refrigerated Cell Fractionator, "Porter-Blum" Microtomes, and the Omni-Mixer Micro-Macro Homogenizer.

Ivan Sorvall, Inc.
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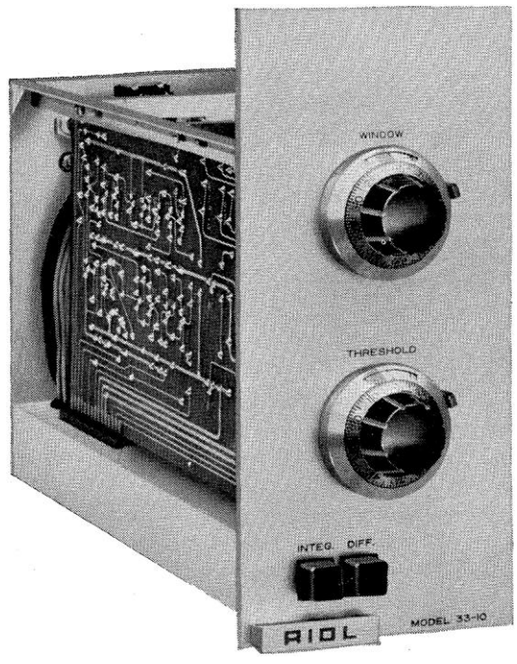
For descriptive literature on the above please ask us for Bulletin SC-12GCW

RIDL

DESIGNER SERIES

ANTI-WALK SINGLE CHANNEL ANALYZER



- **Full 100% Window**
- **High Dynamic Range**
- **Fast Coincidence Capabilities**

RIDL MODEL 33-10

The RIDL Model 33-10 Anti-walk Analyzer is a precision, ultra stable differential single channel pulse height analyzer. Either double delay line amplifiers or standard exponential amplifiers such as the RIDL 30-19 may be used. The analyzer consists of a novel lower level discriminator and an upper level discriminator whose outputs are in anticoincidence. The Anti-walk Analyzer features a zero crossing type lower level discriminator allowing extremely stable fast coincidence experiments.

SPECIFICATIONS

Base Line:	0.1 to 10 Volts.
Window:	0 to 10 Volts.
Output Pulse Time Stability:	Less than 10 nanoseconds shift for 1 to 10 Volt double delay line input pulse with 0.25 μsec or less rise time.
Output (switch selected):	3 Volt positive pulse, 12 nanoseconds rise time, 0.3 μsec duration when terminated in 100 ohms or 10 Volt positive pulse, 50 nanoseconds rise time, 0.5 μsec duration.
Input (switch selected):	0-10 Volt positive, double delay line shaped (for use with amplifiers such as RIDL Model 30-23 Double Delay Line Amplifier) or 0-10 Volt positive, single RC clipped (for use with amplifiers such as RIDL Model 30-19 Amplifier and Discriminator).
Temperature Stability:	0.5 millivolt/°C.
Integral Linearity:	0.25%
Resolving Time:	1 μsec.

Solid State Nuclear Instruments

The Model 33-10 Anti-walk Single Channel Analyzer is shown at the right in a typical system with a High Voltage Power Supply, an Amplifier, and a Scaler.

DESIGNER SERIES instruments utilize a transistorized modular plug-in concept which offers complete versatility in the design of systems to meet every specific counting application. Up to four instruments may be inserted into the Instrument Case and Power Supply which provides operating voltages. DESIGNER SERIES instruments include Scalers, Timers, Power Supplies, Gas Flow Counters, Pulse Height Analyzers, Pulse Generators, Rate Meters, Amplifiers and Preamplifiers, **also Solid State Detector—Preamplifiers, Amplifiers, Noise Meters and Power Supplies.**

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Radiation Instrument Development Laboratory, Inc.

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NO KNIFE EDGES IN NEW OPTICAL PROJECTION TORSION BALANCE

By eliminating knife edges with Torsion's practically one-piece construction, Model PL-2 is designed to operate even in severely corrosive or dust-laden atmospheres where maintenance costs for ordinary "knife-edge" balances would be prohibitive. ● The long lasting accuracy of this Torsion construction, with Dynavar bands, has been proved by a testing device that made continuous weighings 24 hours a day for six months. Over 1,750,000 operations later the Torsion mechanism still had its original sensitivity and accuracy.

Model PL-2
Capacity 2000 g. • Accuracy ± 0.15 g.
List Price $425

ADDITIONAL FEATURES

True Weight even when out of level

Zero point does not shift even when balance has been moved to a position that is out-of-level.

Weight Loading

Weight loading knobs are conveniently located on both sides of the balance for easy operation by either right or left hand. Weighing by substitution to 1000 grams is used in this New Torsion Laboratory Balance.

Unlimited Tare Range

Taring through a 125 gram range is accomplished with a built-in knob on the side of the balance. By adding weights to the second pan the balance can be made to tare throughout its 2 kilogram capacity.

In addition to these features, Torsion's Model PL-2 offers a sharp image with a high degree of illumination for easy reading and an oil damper to speed up weighing.

Ask your laboratory supply salesman for a demonstration or write us for Bulletin PL-2 which gives complete specifications.

The
Torsion Balance
Company

Main Office and Factory: Clifton, New Jersey
Sales Offices: Chicago, Ill., San Mateo, Cal.

7 December 1962, Volume 138, Number 3545

SCIENCE

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The Venus Mission

Mariner II is already a record-breaking success. The pre-calculated flight trajectory has been followed, all interplanetary experiments have functioned, and many engineering data have been acquired. Though Mariner II is now more than 23 million miles away, data from 90,000 measurements a day are being received.

In this issue we are pleased to present scientific results obtained during the interplanetary phase of the mission. Our pleasure contrasts with corresponding sadness at five consecutive fiascos in the lunar program. The Venus shot is feasible for only a short period once every 584 days. Yet our first real lunar or interplanetary triumph has attended the more difficult mission.

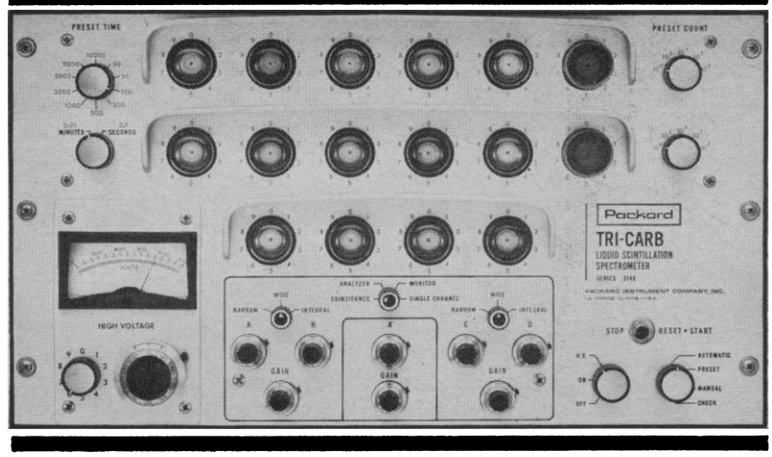
The prerequisite for a successful space flight is functioning of all components. During launch phases, vibration and acceleration place unusual stresses on the vehicle. Even partial failure of one of hundreds of thousands of components can nullify the performance of all. After ascent to a circular parking orbit 115 miles from the earth, Mariner II was allowed to coast to a calculated point and was then boosted to escape velocity. During the next eight days the space craft was tracked to determine its path, and a slight corrective maneuver was made. The magnitude of the guidance problem can easily be seen. When Mariner II misses Venus by 21,000 miles on 14 December, it will be 26.3 million miles from Earth. The space craft will have traveled 182 million miles at highly variable speeds. Starting from rest with respect to Earth, the velocity rose quickly to 18,000 miles per hour. The vehicle was later accelerated to 25,503 mph, a speed in excess of escape velocity. After three days the velocity had decreased to 6874 mph. Then the space craft was moving about the sun 6874 mph slower than the earth's 66,000 mph, that is, about 59,400 mph. From that time the velocity of Mariner II increased as it moved toward the sun. The craft will attain a velocity of 84,000 mph and catch up with Venus, which moves about the sun at 78,300 mph. These figures make evident the complexity of calculating the trajectory and attaining it; this is only one facet of a successful flight.

The experimental and engineering data sensors must operate, and their information must be transmitted back to Earth. Hence the space craft must be positioned so that the solar batteries can operate and the antenna is directed toward Earth. Miraculously, all the components of Mariner II have functioned.

Prospects are excellent that worthwhile measurements will be made during planetary approach. At that time two additional instruments will be turned on, a microwave radiometer and an infrared radiometer. They should measure temperature distribution on Venus and tell whether there are discrete clouds with breaks. Previous measurements from Earth seem to indicate a surface temperature of 300°C, but this value is not universally accepted.

The magnetic field of the planet will also be measured. If it is comparable with that of Earth, the observation will be interpreted as indicating that Venus has a hot molten core. Other similarities of Venus and Earth such as a history of differentiation would also be inferred.

The striking success of Mariner II is reassuring. We now have grounds to hope that the Space Administration will ultimately shake down into an organization capable of sponsoring and carrying out solid scientific research.—P.H.A.



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IN NEW TRI-CARB® SPECTROMETERS

■ Solid-state circuits that meet the demanding requirements of gamma counting are an exclusive feature of new Tri-Carb Liquid Scintillation Spectrometers. Even if you work only with Betas, the accuracy and stability of operation which gamma analysis demands are your assurance of superior beta counting performance. If you also work with gamma emitters, you'll appreciate the versatility that allows you to perform simultaneous single channel analysis from two detectors or dual channel gamma counting from a single detector. ■ Other features of new Tri-Carb Spectrometers: Tritium counting efficiency greater than 40% • 200 sample capacity automatic changer with high speed indexing and reset • simultaneous visual data presentation for timer and both channels of pulse-height analysis • precise temperature control—accurate within ± ½°C • one year warranty (no exclusions) on parts and labor. ■ For more information call your Packard Sales Engineer or write for bulletin 1019.

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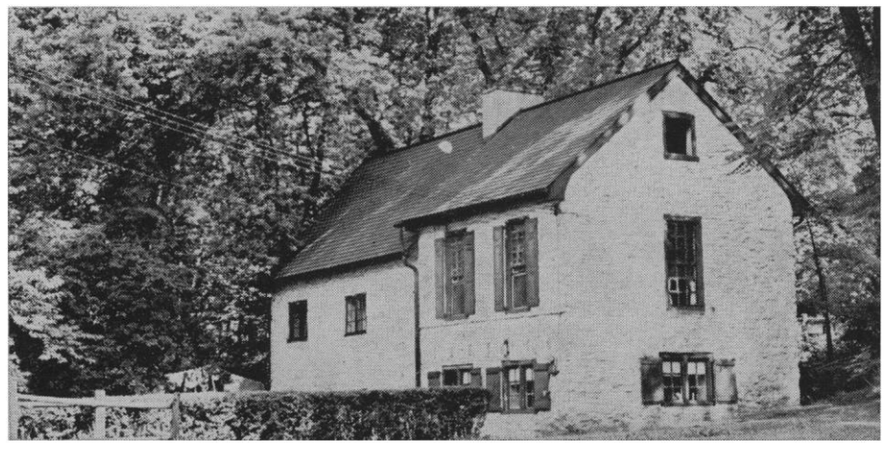
129th Annual Meeting

Philadelphia

26–30 December



Papers have been submitted, travel reservations are being made, and hotel accommodations are being confirmed—all in preparation for attendance at the 129th AAAS meeting in Philadelphia, 26–30 December. With headquarters at the Sheraton Hotel, this year's meeting will cover every principal field of science with representation from practically every state in the union and from several foreign nations. Over 300 sessions have been planned by the 20 AAAS sections and the 87 participating societies. In addition to the general sessions, several special sessions presented by outstanding authorities in their fields have been planned; they have been scheduled so as to not conflict with any other symposia. For more complete details concerning the Philadelphia meeting, consult the following pages of this issue and your General Program.

(Top) The Rittenhouse Homestead. Built in 1707, it was the home of David Rittenhouse, America's first astronomer. Near the house is another ancient building which served as the first paper mill in America; it was erected and operated by the grandfather of the astronomer, William Rittenhouse. (Center) View of Philadelphia. (Bottom) The oldest zoo in the United States opened its gates in 1874. Through the efforts of its Penrose Research Laboratory, the zoo has won international renown for its pioneering work in studying the dietary requirements of captive animals and for its success in breeding rare animals and establishing longevity records for species in captivity. [*Picture credits: top and bottom, Philadelphia Visitors and Convention Bureau; center,* Greater Philadelphia Magazine.]

What To See and Do in Philadelphia

Rich in tradition and landmarks, Philadelphia offers its visitors many places to visit and sights to see. A recommended way to view the historic shrines is a walking tour of Old Philadelphia.

Independence Hall (1732), Chestnut at 6th St. Birthplace of the United States. Declaration of Independence adopted and Constitution written here. Home of the Liberty Bell . . . *Congress Hall*, Chestnut at 6th. U.S. Congress met here 1790-1800 . . . *Old City Hall* (1789), Chestnut at 5th. Home of the first U.S. Supreme Court, 1791–1800 . . . *American Philosophical Society Building* (1789) (not open to public) 5th St. side of Chestnut. Home of the oldest learned society in America (1743), founded by Benjamin Franklin . . . *Second Bank of the United States*, Chestnut St. between 4th and 5th. Also used as U.S. Custom House, it contains portraits of signers of the Constitution . . . *Carpenter's Hall* (1770), south from Chestnut St., between 3rd and 4th. Meeting place of the First Continental Congress . . . *The First Bank of the United States* (1795), Dock and 3rd. Oldest bank building in the United States and the first home of the Bank of the United States. Set up by Alexander Hamilton . . . *Christ Church* (Episcopal, 1695), Market and 2nd. Washington and members of the Continental Congress worshipped here . . . *Elfreth's Alley*, nation's oldest residential street . . . *Betsy Ross House*, 239 Arch St. Home of the seamstress who made the first American flag . . . *Friend's Meeting House*, Arch at 4th. William Penn donated this land to the Quakers for a burial place; it was the first community cemetery in the city . . . *Christ Church Burial Ground*, Arch and 5th. Resting place of Benjamin Franklin and his wife . . . *Washington Square*, Walnut west from 6th. One of the four original squares provided by William Penn's plan for the City. The monument to the Revolutionary War's Unknown Soldier is located here . . . *Atwater Kent Museum*, 15 So. 7th St. History of Philadelphia depicted in hundreds of exhibits; scenes of Indian and colonial life . . . *Walnut St. Theatre* (1808). Oldest theatre building in Philadelphia and one of the oldest in the United States . . . *Mikveh Israel Cemetery*, Spruce and 8th. Burial ground of Haym Salomon, Revolutionary War financier, and Rebecca Gratz, model for Ivanhoe's "Rebecca." . . . *Pennsylvania Hospital* (1751), Spruce St. between 8th and 9th. First hospital in the country, founded by Benjamin Franklin and Dr. Thomas Bond. . . . *Old Pine Street Presbyterian Church* (1768), Pine and 4th. Only colonial Presbyterian church still standing . . . *St. Mary's Church* (1763), 244 S. 4th St. Nation's first Catholic cathedral; Commodore John Barry, "father of the U.S. Navy," interred in graveyard. . . . *Dilworth-Todd-Moyland House*, Walnut and 4th. Home of Dolly Madison.

Other points of interest which participants of the AAAS meeting will want to visit include museums, libraries, galleries, educational institutions, and recreation centers.

Some of the famous *museums, libraries, and galleries* include:

Academy of Natural Sciences, 19th and Parkway. America's first natural history museum now celebrating its 150th anniversary.

American Museum of Photography, 338 So. 15th. Periodic and permanent exhibits depicting the history of photography.

American-Swedish Historical Museum, 1900 Pattison. Interesting exhibits relating to colonial and present-day American Swedes.

Hospitality Center, Philadelphia.

Barnes Art Gallery, Latch's Lane and Lapsley, Merion. World famous Albert C. Barnes collection, open to public for first time.

Commercial Museum, 34th St. below Spruce. Nation's largest exhibit on city planning shows Philadelphia in past, present, and future.

Drexel Library Center, 32nd and Woodland Ave. One of the oldest and largest library schools in the world.

Fels Planetarium, at the Franklin Institute. Its new Zeiss planetarium instrument affords visitors a closer look at the heavens.

Franklin Institute, Franklin Parkway at 20th. One of the world's finest scientific and technical museums.

Free Library, 19th and Vine. It contains two million books, pictures, magazines, recordings and music.

Germantown Historical Society, 5214 Germantown Ave. Exhibits depicting Germantown's colonial history.

Historical Society of Pennsylvania, 13th and Locust. Items associated with Penn, Washington, and Lincoln.

Library Company (1731), Broad and Christian. Founded by Franklin. Oldest of its kind in America and largest surviving colonial library.

Lankenau Hospital Health Museum, Lancaster and City Line. "Pandora," the plastic woman, is one of the many interesting health exhibits.

Pennsylvania Academy of the Fine Arts, Broad and Cherry. America's oldest art institution.

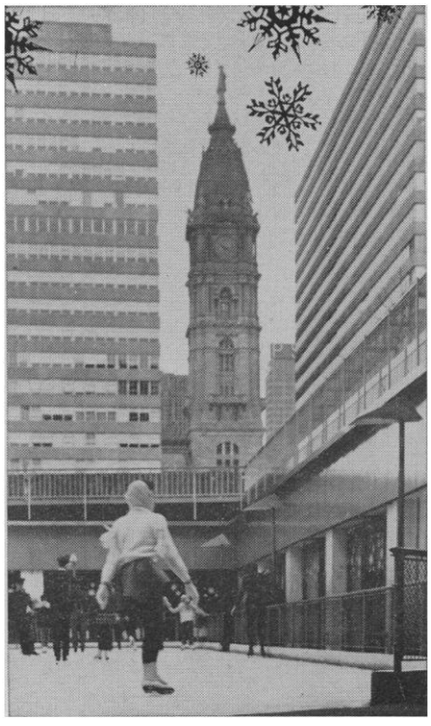
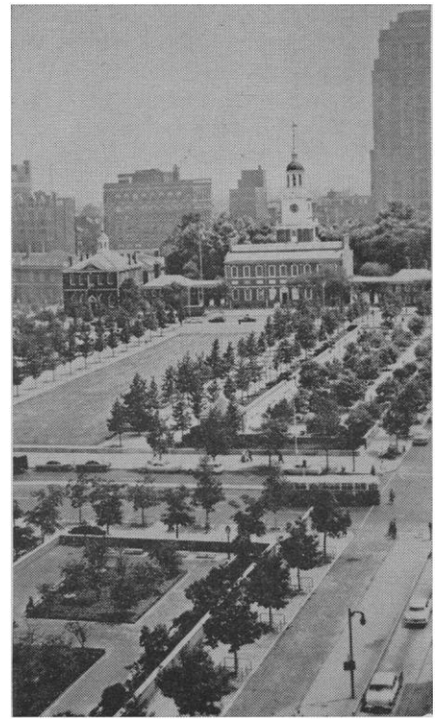
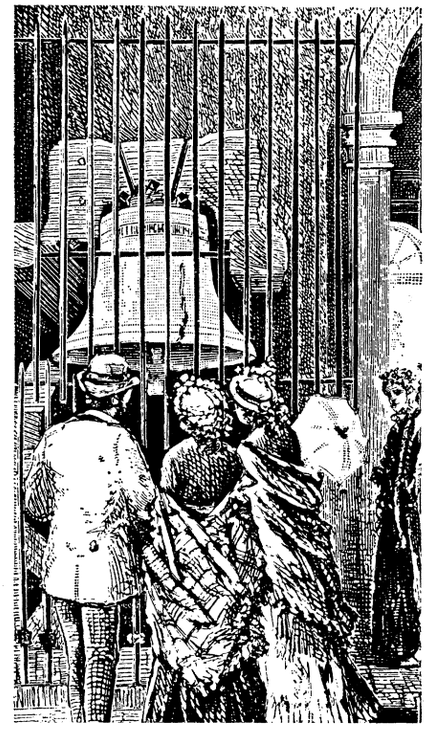
Philadelphia Art Alliance, 251 So. 18th St. Continuous exhibits of contemporary paintings.

Philadelphia Maritime Museum, 219 So. 6th St. Exhibits include ship models, figureheads, weapons, and relics of the sea.

Philadelphia Museum of Art, 26th and Parkway. Priceless collections of paintings, sculpture, and period rooms.

Edgar Allen Poe House, 530 No. 7th St. Museum of the works of Poe.

Rodin Museum, 22nd and Parkway.

(Left to right) Ice skating at Penn Center. Independence Hall. Visitors viewing the Liberty Bell. [Picture credits, left to right: Mayor's Office for Information (Phila.), Convention and Visitors Bureau, and *Greater Philadelphia Magazine*.]

Largest collection of Rodin sculptures outside France.

Rosenbach Museum, 2010 Delancey St. Books, paintings, furnishings, tapestries.

University of Pennsylvania Museum, 33rd & Spruce. Collections from Europe, Egypt, Middle East, prehistoric times to the fall of Rome; American Indians; African, Pacific art.

U.S.S. Olympia, pier 4 south, foot of Chestnut. Marine museum. Commodore Dewey's flagship.

Educational institutions in the Philadelphia area include: University of Pennsylvania; Temple University, Broad St. & Montgomery Ave.; Drexel Institute of Technology, 31st and Chestnut; Girard College, Corinthian and Girard; Hahnemann Medical College, 235 N. 15th; Jefferson Medical College, 10th and Sansom; Philadelphia College of Pharmacy and Science; Wagner Free Institute of Science, 17th and Montgomery; Wistar Institute of Anatomy and Biology; and Woman's Medical College.

Of special interest to the zoologists, botanists, and oceanographers attending the eighth Philadelphia meeting will be the following.

Aquarama, theatre of the sea, 3300 S. Broad. Exotic fresh and salt water marine life. Sharks, octopus and trained porpoises, and rare tropical fish.

Aquarium, east bank of Schuylkill River. Fresh water and ocean fish and turtles.

Bartram's Gardens, 54th and Lindbergh Blvd. First botanical gardens in the nation include restored home of John Bartram, country's first botanist.

Bird Sanctuary, Verree Rd., east side of Pennypack Creek.

Horticultural Hall, Belmont Drive E. Variety of tropical and native flora.

Morris Arboretum, 9414 Meadowbrook Ave. Acres of native and exotic trees, shrubs, rose gardens, and drug plant garden.

Tinicum Wildlife Preserve. Only wildlife preserve within an American city.

Zoological Garden, 34th and Girard. America's first zoo.

Families of the members of the meeting and those members who have no conference scheduled will find a variety of recreational opportunities in Philadelphia. For active recreation there are ice skating, horseback riding, golf, or just hiking in the park. For spectators, there are concerts by the Philadelphia orchestra, plays by the Philadelphia Children's Theatre, the legitimate theatre, movies, and special events, such as the ice follies. In addition, many interesting tours of local industrial plants can be made: Newspaper plant of the *Evening Bulletin* (30th and Market); National Biscuit Co. (Roosevelt Blvd. and Byberry Rd.); Phillies Cigars (9th and Columbia Ave.); and Torresdale Pushbutton Water Works (State Rd. near Torresdale Ave.). Arrangements should be made prior to visiting.

For the gourmet, Philadelphia is virtually unsurpassed. Its restaurants offer a variety of food and drink ranging from American to oriental types, all tastefully served. Some of the more famous restaurants include: Arthur's Steak House, 1512 Walnut St.; Da Vinci's, 2007 Walnut St.; Cathay Tea Garden, 1221 Chestnut St.; Bookbinders Sea Food House, 215 So. 15th St.; and Kelly's, 16 No. 12th St.

Other aspects of modern Philadelphia which will be of interest are City Hall with its 26-ton statue of William Penn; the U.S. Mint, the first U.S. mint and now the largest in the United States; and the new Penn Center with its shopping facilities and ice skating rink.

For details of the AAAS Philadelphia meeting, 26–30 December, see page 1114 of this issue.

AAAS Special Sessions

One of the characteristic and most important features of the annual meetings of the Association is the series of outstanding general addresses by distinguished scientists, sponsored by the Association or by organizations that meet regularly with it. These special events are open to the general public.

Moving Frontiers of Science. Part I, 26 Dec., evening. "Space science: past, present, and future," Homer E. Newell, director, Office of Space Sciences, National Aeronautics and Space Administration; "Biological timing," Sterling B. Hendricks, chief scientist, Mineral Nutrition Laboratory, U.S. Department of Agriculture. Henry Eyring, member, AAAS board of directors will preside.

The House of Science. 27 Dec. The unusual motion picture that was presented from 21 April to 21 October 1962 as the introduction to the U.S. Science Exhibit at the Seattle World's Fair. There will be two showings, one at 8 P.M., the other at 10 P.M.

AAAS Distinguished Lecture. 27 Dec., evening. McGeorge Bundy, special assistant to the President for National Security Affairs. Alan T. Waterman, AAAS president elect, will preside.

Moving Frontiers of Science. Part II, 28 Dec., afternoon. "Coupling independent industrial research and modern science," William O. Baker, vice president for research, Bell Telephone Laboratories; "Perspectives in molecular biology," Sydney Brenner, Medical Research Council, Molecular Biology Unit, Cambridge University, England. William W. Rubey, member, AAAS board of directors, will preside.

George Sarton Memorial Lecture, combined with vice-presidential address of Section L, History and Philosophy of Science. 28 Dec., afternoon "The three types of scientific hypothesis: toward a program of thematic analysis," Gerald L. Holton, professor of physics, Harvard, and vice president for Section L. Mina S. Rees, member, AAAS board of directors, will preside.

AAAS Presidential Address. 28 Dec., evening. "Beetles, competition, and population," by Thomas Park, retiring president of the AAAS. Paul M. Gross, AAAS president, will preside. Before the address, Henderson Supplee, Jr., president of the Atlantic Refining Company and general chairman of the Philadelphia meeting will speak briefly, and AAAS awards will be presented.

After the address there will be an informal reception for the president and retiring president of the AAAS. Simple refreshments will be served; in addition, nearby there will be a "Dutch treat" bar. All registrants and members of the local committees are cordially invited to attend.

Joint Annual Address of the Society of the Sigma Xi and the United Chapters of Phi Beta Kappa. 29 Dec., evening. "Man: the lethal factor," Loren C. Eiseley, University professor of anthropology and the history of science and chairman of the department of the philosophy and history of science, Graduate School of Arts and Sciences, University of Pennsylvania. H. Bentley Glass, member, AAAS board of directors, will preside.

Annual Address of the Tau Beta Pi Association. 29 Dec., evening. "Organizing complexity—the role of the engineer and the scientist," Clifford C. Furnas, chancellor of the University of Buffalo. Paul A. Scherer, AAAS treasurer, will preside.

Annual Illustrated Lecture of the National Geographic Society. 30 Dec., evening. "Wintering on the roof of the world," Barry C. Bishop, National Geographic Society staff member. Margaret Mead, member, AAAS board of directors, will preside.

AAAS General Sessions

The general sessions are broad interdisciplinary programs, sponsored by the Association as a whole, by AAAS sections, by AAAS committees, or by AAAS affiliates; they are given here in chronological sequence.

Committee on Meetings. 26 Dec., afternoon. Arranged by the committee. Symposium, Recent Results of Space Research. The details of this program will be announced just prior to the meeting; they will depend upon the successful conclusion of several experiments now in progress. John F. Clark, associate director and chief scientist, Office of Space Sciences, National Aeronautics and Space Administration, will preside.

Committee on Desert and Arid Zones Research. Part I. 27 Dec., morning. Symposium, Advances in Arid Lands Research. Program of the AAAS Committee on Desert and Arid Zones Research. Arranged by Harold E. Dregne, New Mexico State University, who will preside. "Arid lands: the problem and a reply," Terah L. Smiley, University of Arizona. "Relations of landscapes and soils in southern New Mexico," R. V. Ruhe, U.S. Soil Conservation Service, Ames, Iowa; L. H. Gile, Jr., U.S. Soil Conservation Service, State College, New Mexico; F. F. Peterson, University of California, Riverside; and, R. B. Grosman, U.S. Soil Conservation Service, Lincoln, Neb. "The American Indian's social and technological approaches to water management," Richard B. Woodbury, University of Arizona. "Capabilities and limitations of man in arid lands," Douglas H. K. Lee, U.S. Public Health Service, Cincinnati.

Part II. 27 Dec., afternoon. (Same sponsor and arranger as for part I.) J. A. Schufle, New Mexico Institute of Mining and Technology, will preside. "The importance of dew," Edward C. Stone, University of California, Berkeley. "Watershed management research in the Rocky Mountain alpine and subalpine zones," M. Martinelli, Jr., U.S. Forest Service, Fort Collins, Colo. "Plant resources of arid lands and potential utilization," Howard Scott Gentry and Quentin Jones, U.S. Agricultural Research Service, Beltsville, Md. "The Saguaro population—a cooperative study," Stanley M. Alcorn, U.S. Agricultural Research Service, Tucson.

AAAS Day—Interdisciplinary Symposium in the Physical Sciences. Dynamics of Planetary Atmospheres. 28 Dec., morning. Joint program of the AAAS sections on Physics (B) and Astronomy (D), cosponsored by the American Geophysical Union, the American Meteorological Society, and Sigma Pi Sigma. Arranged by Julius London, University of Colorado, who will preside. "The role of convection in the dynamics of planetary atmospheres," Philip D. Thompson, National Center for Atmospheric Research, Boulder, Colo. "The vertical propagation of energy in the atmosphere," Arnt Eliassen, University of Oslo. "Turbulence in the upper atmosphere," Colin O. Hines, University of Chicago. "The atmospheric circulations of Venus, Mars, and Jupiter," Seymour L. Hess, Florida State University.

AAAS Day—Interdisciplinary Symposium in the Chemical and Biological-Medical Sciences. The transfer of Genetic Information. 28 Dec., morning. Joint program of AAAS sections on Chemistry (C), Zoological Sciences (F), Botanical Sciences (G), and Medical Sciences (N). Arranged by Severo Ochoa, New York University, and

Philip H. Abelson, who will preside. "Characteristics of RNA codewords," William Jones and Marshall W. Nirenberg, National Institutes of Health. "Synthetic polynucleotides and the animo acid code," Joseph Speyer, Peter Lengyel, Carlos Basilio, Albert Wahba, and Severo Ochoa, New York University. "Properties of the mechanism which reads the genetic book," Sol Spiegelman, University of Illinois. "The doublet code and its implications," Richard B. Roberts, Carnegie Institution of Washington.

AAAS Day—Interdisciplinary Symposium in the Social Sciences. Diffusion of Technical Knowledge as an Instrument of Economic Development. 28 Dec., morning. Joint Program of AAAS sections on Social and Economic Science (K), Agriculture (O), Industrial Science (P), Education (Q), and Information and Communication (T). Arranged by Bert F. Hoselitz, University of Chicago, who will preside. "Mechanisms of transfer of knowledge between nations," William N. Parker, Yale. "The spread of technical information through industrialization," Paul Strassman, Michigan State University. "The diffusion of technical knowledge in agriculture," E. A. Wilkening, University of Wisconsin. "Scientific communities and technological adaptation," Robert S. Merrill, University of Rochester.

Committee on Science in the Promotion of Human Welfare. 30 Dec., morning. Symposium, The Integrity of Science. Part I. Modern Science and the Control of Nature: Three Recent Problems. Arranged by the committee. T. C. Byerly will preside. "The scientific consequences of large-scale experimentation in space," James Alfred Van Allen, State University of Iowa and James W. Warwick, University Corporation for Atmospheric Research. "Synthetic detergent and water pollution," Waldo C. Ault, U.S. Department of Agriculture, and Charles Beultman, Soap and Detergent Association. "Hazards associated with new drugs," Walter Modell, Cornell University Medical School.

Part II. The State of the Nation's Scientific Establishment. 30 Dec., afternoon. Barry Commoner will preside. This session will be a panel discussion, with participants as follows: Richard Bolt, deputy director, National Science Foundation; Hugh L. Dryden, deputy administrator, National Aeronautics and Space Administration; David R. Goddard, provost, University of Pennsylvania; J. Herbert Hollomon, Assistant Secretary of Commerce for Science and Technology; Howard K. Nason, president, Monsanto Research Corporation; John H. Rubel, Assistant Secretary of Defense, and Deputy Director, Office of Defense Research and Engineering; William J. Sweeney, vice president, Esso Research and Engineering Development Company. A general discussion period will follow.

AAAS Science Theatre

The AAAS Science Theatre, a permanent feature of the Association's annual meeting, presents each year a selection of the latest domestic and foreign scientific films, throughout the meeting period. Programs are repeated at different times to increase the opportunities for those attending the sessions of the 129th meeting to see particular films. The association is indebted to all those who made these pictures and lent them for showing, and indebted for his assistance to Malcolm S. Ferguson, National Institutes of Health.

The AAAS Science Theatre may be reached by passing through the Annual Exposition of Science and Industry on the concourse level of the Sheraton Hotel. Admission is restricted to those who wear the AAAS Convention Badge. (Children under 16 are not registered.)

27 December, 10 A.M. to 2 P.M.

Nuclear Research. Produced by Argonne National Laboratory.

Trinidad. Produced by Jack Robinson, National Institute of Arthritis and Metabolic Diseases.

Anatomy of the Cell. Produced by E. R. Squibb & Sons.

Around a Big Lake. Produced by Kenneth Campbell for International Film Bureau, Inc.

Atomic Weatherman: Strontium-90 Isotopic Applications. Produced by the Martin Corporation for the U.S. Atomic Energy Commission.

Culture Slime Mold Plasmodium. Thorne Films, Inc.

Introduction to High Vacuum. Produced by Brookhaven National Laboratory and Audio Productions for the U.S. Atomic Energy Commission and the American Vacuum Society.

The Medical Use of Hypnosis. Produced by Robert Anderson Associates, Ltd., for the Canadian Broadcasting Corporation.

Observation on Cultured Chick Myocardial Cells. Produced by Richard J. Blandau, University of Washington.

Land and Water. Produced by Department of Sociology and Anthropology, Pennsylvania State University.

Submerged Glory—A Study in Stone. Produced by the United Nations.

Thursday 27 December, 2 P.M. to 6 P.M.

Eruption of Kilauea, 1959–1960. Produced by U.S. Geological Survey with cooperation of National Park Service, U.S. Department of the Interior.

Micropuncture of Cells by U.V. Microbeam. Produced by Marcel Bessis for Squibb Division, Olin.

Wild Highland. British Transport Films, England.

Analysis by Mass. Produced by Associated Electrical Industries, Ltd., London.

Spawning Fish. Produced by Toei Motion Picture Co., Ltd., Japan.

Ductile Cast Iron. Produced by The International Nickel Co., Inc.

Turtle Heart Neural Control. Produced by Thorne Films, Inc.

The Diagnosis of Viral Meningitis. Produced by the University of Kansas Medical Center and Kansas City Field Station Unit of the U.S. Public Health Service.

Plutonium Fuel Fabrication, EBR-1, Mark IV. Produced by Argonne National Laboratory.

Life in the Deciduous Forest. Produced by Kenneth Campbell for International Film Bureau, Inc.

Nauru. Produced by Australian News and Information Bureau.

Friday 28 December, 10 A.M. to 2 P.M.

Xenon Tetrafluoride. Produced by Argonne National Laboratory.

Telstar. Produced by the Bell System.

Expedition South. Produced by Australian News and Information Bureau.

The Embryonic Development of Fish. Produced by National Film Board of Canada.

Photography in the USAF-Optical Instrumentation at Vandenberg Air Force Base. Produced by the United States Air Force.

The Flowers. Produced by Films Bureau, Gakken Co., Ltd., Japan.

Leucocytes in Tissue Culture with Phytohaemagglutinin. Produced by E. H. Cooper and P. N. Cardew of St. Mary's Hospital Medical School, London, England.

Ceramic Fuel Fabrication Development for PRTR. Produced by Hanford Atomic Products Operation, General Electric Company, as contractor for

the U.S. Atomic Energy Commission at the Hanford Works.

Seaweed. Toei Motion Picture Co., Ltd., Japan.

Highlights of Heart Research. Produced by Heart Information Center, National Heart Institute.

The Stream. Produced by Kenneth Campbell for International Film Bureau, Inc.

Blueprint for Discovery. Produced for National Science Foundation by Victor J. Jurgens in cooperation with the National Academy of Sciences. Released by International Film Bureau, Inc.

Friday 28 December, 2 P.M. to 6 P.M.

Same as Thursday 27 December, 10 A.M. to 2 P.M.

Saturday 29 December, 10 A.M. to 2 P.M.

Same as Thursday 27 December, 2 P.M. to 6 P.M.

Saturday 29 December, 2 P.M. to 6 P.M.

Same as Friday 28 December, 10 A.M. to 2 P.M.

Sunday 30 December, 9 A.M. to 1 P.M.

The Dragon of Domodo. French Cultural Center, New York.

Balloon-Borne Radiation Spectrometer. Produced by Argonne National Laboratory.

Lyophilization. French Cultural Center.

An African Cat, The Serval (Felis serval) "Catching Prey." Produced by Institut für den Wissenschaftlichen Film, Germany.

Wandering Continents. Gateway Film Production, London, England.

Calories and Proteins. Produced by H. J. Heinz Co.

Xenon Tetrafluoride. Produced by Argonne National Laboratory.

Turtle Heart Neural Control. Produced by Thorne Films, Inc.

Submerged Glory—A Study in Stone. Produced by the United Nations.

Blueprint for Discovery. Produced for National Science Foundation by Victor J. Jurgens in cooperation with the National Academy of Sciences. Released by International Film Bureau, Inc.

Land and Water. Produced by Department of Sociology and Anthropology, Pennsylvania State University.

Anatomy of the Cell. Produced by E. R. Squibb & Sons.

Eruption of Kilauea, 1959–1960. Produced by U.S. Geological Survey with cooperation of National Park Service, U.S. Department of the Interior.

Sunday 30 December, 1 P.M. to 3:30 P.M.

The first nine films of Sunday morning's program will be repeated.

AAAS Business Sessions

The Council of the Association will meet in two sessions. The first one will take place on 27 Dec. at 4 P.M. and the second, on 30 Dec. at 9 A.M. Both will be held in the Pennsylvania Ballroom West, Sheraton Hotel.

Subjects to be considered by the Council (in addition to the agenda prepared) usually are first brought before the Board of Directors through the Executive Officer. During the meeting, communications for the Board of Directors should be submitted in writing and left at the Sheraton Hotel mail desk, addressed to Dr. Dael Wolfle.

Registration

Main Registration–Information Center. The AAAS Main Registration–Information Center will be located in the lobby of the Sheraton Hotel. It will be open as follows: 26 Dec., 8 A.M. to 10 P.M.; 27–29 Dec., 8 A.M. to 8 P.M.; 30 Dec., 8 A.M. to 4 P.M.

Badges and general programs may be obtained at the supplementary registration desks, but supplementary literature, maps, and the like will be available only at the Main Registration Center. Advance registrants (who will have received programs and badges prior to the meeting) are urged to visit the Main Registration Center at any time to obtain these additional items.

Supplementary Registration Desks. For the convenience of those attending the 129th meeting, there will be three supplementary hotel registration desks, at the Bellevue Stratford, Warwick, and Sheraton hotels. (The supplementary desk at the Sheraton will be located at the entrance to the exhibits.) These will be open as follows: *Bellevue Stratford*: 26 Dec., 9 A.M. to 9 P.M.; 27–28 Dec., 8A.M. to 8 P.M.; 29 Dec., 8 A.M. to 6 P.M. *Warwick*: 26 Dec., 1 P.M. to 9 P.M.; 27 Dec., 8 A.M. to 8 P.M.; 28 Dec., noon to 8 P.M.; 29 Dec., 8 A.M. to 6 P.M. *Sheraton*: 27 Dec., 10 A.M. to 6 P.M.; 28–29 Dec., 10 A.M. to 6 P.M.; 30 Dec., 9 A.M. to 4 P.M.

Registration Fee. The AAAS registration fee, which has been kept to a minimum, is $3. A spouse or child who wants a separate program may register for $1 if he or she registers at the same time as the accompanying regular registrant. Each regular registrant will receive a receipt, a convention badge, and the *General Program* —the only publication containing the programs of the 20 AAAS sections and of the 87 participating organizations. Any person who purchases an advance copy of the *General Program* but does not register in advance and who then attends the meeting has agreed to complete his registration and is expected to do so by paying $1 at the Main Registration Center or at one of the three supplementary registration desks; after this he will receive his convention badge and the privileges that go with it.

Every thoughtful person will want to register and thus pay his share of the expenses of the meeting. The AAAS Convention Badge indicates that you are participating fully in this 129th convention of the Association. You should wear the badge throughout the meeting because (i) it reminds others to register; (ii) it is needed for admission to the Annual Exposition of Science and Industry, the AAAS Science Theatre, and the reception that follows the AAAS presidential address; and (iii) it helps your friends to find you.

Visible Directory of Registrants. The Visible Directory of Registrants will be located in the assembly room or ballroom foyer of the Sheraton Hotel; it will be open day and night.

The registration cards of all registrants are placed in the Visible Directory soon after registration. The arrangement is alphabetical. The cards of advance registrants are typed and completely alphabetized, since they are posted prior to the meeting; all other registration cards are filed to the second or third letter of the surname. Members of the press, exhibit personnel, and guests are also listed in the Visible Directory—on blue cards instead of yellow. Registrants will find the Visible Directory invaluable in determining the convention addresses of friends attending the meeting.

Mail, Telegrams, and Messages. Mail and telegrams addressed in care of the AAAS will be held at the AAAS

office on the convention (3rd) floor of the Sheraton Hotel. Telephone and personal messages will also be filed alphabetically in the AAAS Office, and the names of those for whom they are intended will be posted on a bulletin board near the Visible Directory. The Association assumes no responsibility for the delivery of mail or telegrams.

Society Dinners and Luncheons. Tickets to the dinners and luncheons of any section or any participating society will be obtainable from representatives of the section or society, either during preceding sessions or at the Main Registration–Information Center in the lobby of the Sheraton.

Hotel Headquarters

The Sheraton will be official headquarters hotel of the AAAS. There the Council of the Association will meet and other business sessions will be held. The Pressroom—the center for receipt of authors' abstracts and the only source of press releases—will be located in rooms 540–546.

The AAAS Office, the Main Registration–Information Center, the Visible Directory of Registrants, the AAAS Science Theatre, and the Annual Exposition of Science and Industry will also be located in the Sheraton Hotel.

The headquarters of the 20 sections and of the participating societies will be as follows (the societies are grouped in the sequence of the letters of the sections with which they are affiliated).

Sheraton (1000 rooms), 1725 Pennsylvania Boulevard

AAAS; AAAS Office; AAAS Pressroom.

AAAS Main Registration–Information Center; Visible Directory of Registrants; AAAS Annual Exposition of Science and Industry; AAAS Science Theatre.

AAAS Business Sessions (Board of Directors, Council, Section Officers), General Events, and Special Sessions.

AAAS Committee on Desert and Arid Zones Research; AAAS Committee on Meetings; AAAS Committee on Science in the Promotion of Human Welfare.

AAAS sections B–Physics, D–Astronomy, F–Zoological Sciences, N–Medical Sciences, Nd–Dentistry, P–Industrial Science, and T–Information and Communication.

American Astronautical Society, American Meteorological Society, American Rocket Society, National Aeronautics and Space Administration, Sigma Pi Sigma.

American Association of Clinical Chemists.

American Society of Zoologists, Herpetologists' League, Society of Systematic Zoology.

American Society of Limnology and Oceanography, American Society of Naturalists, Biomedical Information–Processing Organization, Ecological Society of America, Mountain Lake Biological Station, Society for the Study of Evolution.

Tau Beta Pi Association.

Academy of Psychoanalysis, Alpha Epsilon Delta, American Physiological Society.

American College of Dentists; American Dental Association; International Association for Dental Research, North American Division.

Society for Industrial Microbiology.

National Association of Science Writers.

American Geophysical Union, Scientific Research Society of America, Sigma Delta Epsilon, Society of the Sigma Xi, United Chapters of Phi Beta Kappa.

Bellevue Stratford (750 rooms), Broad and Walnut Streets

AAAS Cooperative Committee on the Teaching of Science and Mathematics.

AAAS sections A–Mathematics, E–Geology and Geography, H–Anthropology, K-Social and Economic Sciences, L–History and Philosophy of Science, M–Engineering, Np–Pharmaceutical Sciences, O–Agriculture, Q–Education, and U–Statistics.

Association for Computing Machinery, Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America, Society for Industrial and Applied Mathematics.

Association of American Geographers, Middle Atlantic Division; Geological Society of America.

American Phytopathological Society.

American Economic Association, American Political Science Association, American Society of Criminology, American Sociological Association, Institute of Management Sciences, Metric Association, National Institute of Social and Behavioral Science, Population Association of America.

Conference on Science Manuscripts, History of Science Society, Society for General Systems Research, Society for the History of Technology.

American Society for Agricultural Engineers, Engineers Joint Council, Engineering Manpower Commission.

American Dietetic Association, American Psychiatric Association.

American Association of Colleges of Pharmacy; American College of Apothecaries; American Pharmaceutical Association, Scientific Section; American Society of Hospital Pharmacists; National Association of Boards of Pharmacy.

American Dairy Science Association American Society for Horticultural Science, American Society of Agronomy, American Society of Animal Science, International Association of Milk and Food Sanitarians, Potato Association of America, Poultry Science Association.

Institute of Management Sciences.

American Educational Research Association, American Nature Study Society, Council for Exceptional Children, National Association of Biology Teachers, National Association for Research in Science Teaching, National Science Teachers Association, Science Service.

American Statistical Association; Biometric Society, Eastern North American Region; Institute of Mathematical Statistics.

Academy Conference, Conference on Scientific Manpower, National Academy of Sciences–National Research Council, National Science Foundation, Scientific Manpower Commission.

Warwick (900 rooms), Locust and 17th Streets

AAAS sections C–Chemistry, G–Botanical Sciences, and I–Psychology.

American Chemical Society, Delaware Valley Sections.

Botanical Society of America, Philadelphia Botanical Club.

Society for Research in Child Development, Society for the Psychological Study of Social Issues.

Tours and Points of Interest

There will be no formal tours sponsored by the AAAS as a whole, but certain sections and participating societies have planned tours and field trips, as noted in their programs.

Academy of Natural Sciences (19th St. and Benjamin Franklin Parkway). Natural history museum. Open Monday through Saturday, 10 A.M. to 5 P.M.; Sunday, 1 P.M. to 5 P.M. Adults, $0.50; children, $0.25.

Aquarium (Schuylkill River above Spring Garden St.). Open Wednesday through Saturday, 8 A.M. to 4:30 P.M.; Sunday, 9 A.M. to 5 P.M. Free.

Atwater Kent Museum (7th St. between Market and Chestnut Sts.). A "folk museum" of Philadelphia's 300-year history. Open Monday through Saturday, 9 A.M. to 5 P.M.; Sunday, 9:30 A.M. to 5 P.M. Free.

Betsy Ross House (Arch St. between 2nd and 3rd Sts.). Associated with the first American flag. Open daily 10 A.M. to 4:30 P.M. Free.

Carpenters' Hall (Chestnut and 4th Sts.). Site of First Continental Congress, 1774. Open daily except Sunday and holidays, 9 A.M. to 4 P.M. Free.

City Hall (intersection of Broad and Market Sts.). Panoramic view from 548-foot tower surmounted by 37-foot statue of William Penn. Monday through Friday, 9 A.M. to 5 P.M. Free.

Franklin Institute and Fels Planetarium (20th St. and Benjamin Franklin Parkway). Museum of mechanics and applied physical sciences, with many pushbutton exhibits. Open Tuesday through Saturday, 10 A.M. to 5 P.M.; Sunday, noon to 5 P.M. Adults, $0.75; children, $0.50. Additional planetarium shows, Wednesdays and Fridays, starting 8 P.M.; adults, $1, children, $0.60.

Independence Hall (Chestnut and 6th Sts.). Where the Declaration of Independence and the Constitution of the United States were adopted. Site of the Liberty Bell. Open daily, 8:45 A.M. to 5:15 P.M. Free.

Philadelphia Museum of Art (at Fairmount Park end of Benjamin Franklin Parkway, 26th St.). Open daily except holidays, 9 A.M. to 5 P.M. Free.

United States Mint (16th and Spring Garden Sts.). Guided tours at 10 A.M. and 2 P.M., Monday through Friday.

University of Pennsylvania Museum (33rd and Spruce Sts.). Extensive archeological and ethnological material and art. Open Tuesday through Saturday, 10 A.M. to 5 P.M.; Sunday, 1 P.M. to 5 P.M. Free.

Zoological Gardens (Fairmount Park at 34th St. and Girard Ave.). Nation's oldest zoo. Open daily 10 A.M. to 5 P.M. Free.

Anton Bruun

The *MV Anton Bruun*, first American oceanographic vessel to be outfitted primarily for biological research at sea, will be formally dedicated during this year's AAAS meetings in Philadelphia.

The ship, principal feature of the United States Biology Program for the International Indian Ocean Expedition, is the former presidental yacht *Williamsburg* on which many historic conferences took place during the Roosevelt administration. It was turned over to the National Science Foundation by President Kennedy in February 1961. Built by the Bath Iron Works in 1930, the 243-foot twin-screw, diesel-powered vessel has been completely reconverted and equipped for biological research. She will be renamed the *Anton Bruun* in memory of Anton Fr. Bruun, Denmark's leading oceanographer and one of the world's great marine biologists. Leader of the famed Danish deep-sea expedition Galathea and holder of many international honors, Bruun served, until his untimely death in December 1961, as the first chairman of the Bureau for the Intergovernmental Oceanographic Commission of UNESCO, under whom the International Indian Ocean Expedition is being coordinated.

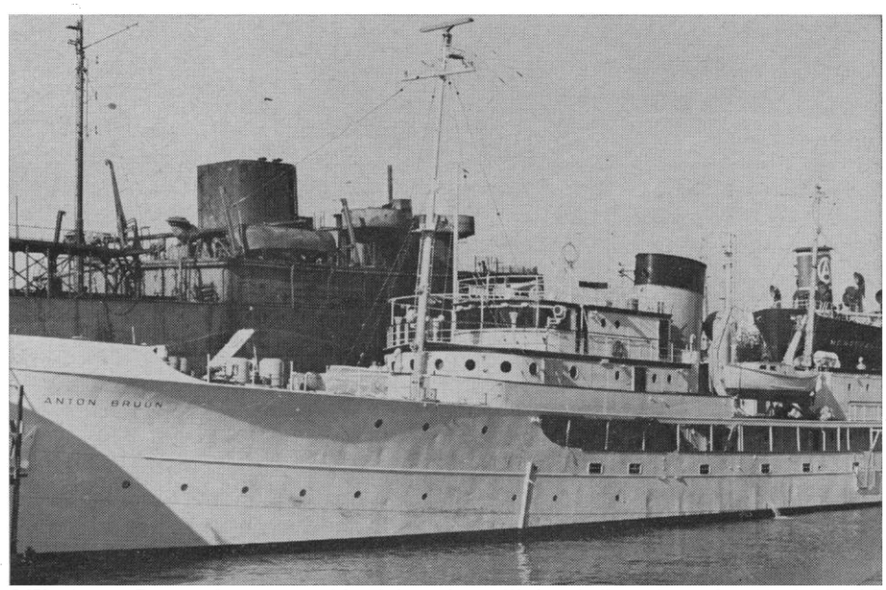
The *Anton Bruun* is scheduled to leave for the Indian Ocean in early January 1963, where she will remain for 2 years. During this time about 125 biological scientists will participate in one or more of nine different cruises.

Ceremonies rechristening and dedicating the ship to its new mission of international cooperation in marine science will be announced. Specific information about the time and place of this program will be available at the AAAS meeting.

AAAS Public Information Service

The general public must be kept informed, whenever feasible, of the results of the scientific research and development that it supports, directly or indirectly. Organized science and the individual scientist must have the understanding and support of intelligent citizens in all walks of life if they are to contribute effectively to the advance of American democracy. It is, of course, equally important that information concerning advances in science be disseminated clearly and accurately and without sensationalism. Progress in this direction in recent years has been in most instances outstanding, thanks largely to members of the National Association of Science Writers, other accredited science reporters, managing editors of American newspapers, and program managers of radio and television stations.

One of the four objectives of the AAAS is to try to increase public understanding and appreciation of the



MV Anton Brunn, former presidential yacht, will be dedicated at the 129th AAAS Philadelphia meeting. Picture was taken Thanksgiving Day, after completing her first trial run.

importance and promise of the methods of science in human progress. For this reason, and to protect authors of papers from being misquoted by the press, the Association maintains a public information service for each of the annual meetings. Professor Sidney S. Negus of the Medical College of Virginia, Richmond, has been director of this service for most meetings since 1938.

In the interest of accuracy and completeness, science writers frequently wish to discuss various research results with investigators during the meeting. If you are asked to cooperate in this respect or to participate in a press conference, please do so—not only for your own protection but for the benefit of science in general. Scores of science writers will be covering this great scientific convention from the Press-room in the Sheraton Hotel. News stories filed by them will be published and broadcast throughout the world. The assistance of authors in helping to make these stories accurate is earnestly solicited by the Association.

This year the AAAS is fortunate in again having the services of Dr. Negus and in having the services of its Local Committee on Public Information, headed by Harry A. Batten, chairman of the board of N. W. Ayer and Son.

Philadelphia Committees

It would be impossible to arrange this large and complex meeting and to carry it through to a wholly successful conclusion if it were not for the devoted services of many local scientists and other members and friends of the Association. They merit the unstinted appreciation of all who attend. Henderson Supplee, Jr., accepted the general chairmanship of the Philadelphia meeting early in 1962, appointed the local committees promptly, and has kept in close touch with all phases of committee operations.

General Chairman

Henderson Supplee, Jr., president, Atlantic Refining Company.

Vice Chairman

Robert D. Bent, vice president and general manager, Atlantic Refining Co.

Committee on Exhibits

John C. Haas, executive vice president, Rohm & Haas Co., *chairman.*

Karl H. Beyer, Jr., vice president, Merck, Sharp and Dohme Research Laboratories.

David B. Coghlan, assistant to the director of research and development, Foote Mineral Company.

E. M. Kipp, manager of basic research, Sun Oil Company.

F. Haydn Morgan, director of project research and grants, University of Pennsylvania.

William P. Ratchford, assistant director, Agricultural Research Service, Eastern Utilization Research and Development Division, U.S. Department of Agriculture.

James Robins, director of research, Drexel Institute of Technology.

Robert S. Rose, manager of administrative and technical services section, Atlas Chemical Industries, Inc.

George H. Schneller, director of project coordination, Wyeth Laboratories.

Leo Steg, manager, space sciences laboratory, General Electric Company.

I. Melville Stein, president, Leeds & Northrup Company.

Irven Travis, vice president–research, Burroughs Corporation.

Darrel J. Butterbaugh, assistant director of research, Rohm & Haas Company, *secretary.*

Committee on Finance

William P. Drake, president, Pennsalt Chemicals Corporation, *chairman.*

Francis Boyer, chairman, Smith, Kline & French Laboratories.

William L. Day, chairman, First Pennsylvania Banking and Trust Co.

Wilfred D. Gillen, president, Bell Telephone Company of Pennsylvania.

H. Thomas Hallowell, Jr., president Standard Pressed Steel Company.

Committee on Physical Arrangements

David R. Goddard, provost, University of Pennsylvania, *chairman.*

Charles F. Farrell, University of Pennsylvania.

Frank L. Hopkins, University of Pennsylvania.

Henry G. Sparks, University of Pennsylvania.

Edward F. Lane, assistant to the vice president for development and public relations, University of Pennsylvania, *secretary.*

Committee on Public Information

H. A. Batten, N. W. Ayer & Son, Inc., *chairman.*

Allen T. Bonnell, Drexel Institute of Technology.

Marjorie R. Carmosin, Hahnemann Hospital.

George W. Corner, American Philosophical Society.

J. Frank Cox, Bell Telephone Company of Pennsylvania.

Albert D. Hollingsworth, Franklin Institute.

Marc J. Parsons, Philco Corporation.

Kenneth W. Prescott, Academy of Natural Sciences of Philadelphia.

G. F. Roll, Smith, Kline & French Laboratories.

Edward Sharp, Philadelphia County Medical Society.

Donald T. Sheehan, University of Pennsylvania.

William H. Wilcox, Greater Philadelphia Movement.

Committee on Women's Events

The Committee on Women's Events is under the direction of the Philadelphia Branch of the American Association of University Women.

Carolyn R. Ancker, *chairman.*

Honorary Reception Committee

Walter H. Annenberg, editor and publisher, Philadelphia *Inquirer.*

Lt. Gen. Milton G. Baker, superintendent, Valley Forge Military Academy.

Samuel S. Baxter, president, Engineers' Club.

Hugh Borton, president, Haverford College.

William W. Bodine, Jr., president, Jefferson Medical College and Medical Center.

Brother Daniel Bernian, president, LaSalle College.

Charles S. Cameron, president, Hahnemann Medical College and Hospital.

Radcliffe Cheston, Jr., president, board of directors, Philadelphia Zoological Society.

George R. Clark, president, Academy of Natural Sciences of Philadelphia.

G. Miles Conrad, director, *Biological Abstracts.*

George W. Corner, executive officer, American Philosophical Society.

James Creese, president, Drexel Institute of Technology.

James H. Duckrey, president, Cheyney State College.

Marion Fay, president-dean, Woman's Medical College of Pennsylvania.

Lawrence Fitch, president-dean,

Pennsylvania State College of Optometry.

Edward D. Gates, president, Beaver College.

Millard E. Gladfelter, president, Temple University.

Robert F. Goheen, president, Princeton University.

Emerson Greenaway, director, Free Library of Philadelphia.

W. Layton Hall, dean, College of South Jersey, Rutgers University.

Gaylord P. Harnwell, president, University of Pennsylvania.

Bertrand W. Hayward, president, Philadelphia College of Textiles and Science.

Donald L. Helfferich, president, Ursinus College.

Coleman Herpel, director, Ogontz Division, Pennsylvania State University.

Vincent J. Keenan, president, Philadelphia College of Pharmacy and Science.

Philip Klein, president, Harcum Junior College.

Rev. John A. Klekotka, president, Villanova University.

Hilary Koprowski, director, Wistar Institute of Anatomy and Biology.

W. Laurence Lepage, president, Franklin Institute.

Rev. William F. Maloney, president, St. Joseph's College.

Edwin L. Martin, president, Trenton State College.

Katherine Elizabeth McBride, president, Bryn Mawr College.

Clarence Rullel Moll, president, Pennsylvania Military College.

Franklin F. Moore, president, Rider College.

Mother Mary George, S.H.C.J., president, Rosemont College.

John A. Perkins, president, University of Delaware.

H. Radclyffe Roberts, director, Academy of Natural Sciences of Philadelphia.

Thomas E. Robinson, president, Glassboro State Teachers College.

Sister Catharine Frances, president, Chestnut Hill College.

Sister M. Aloysius, president, Holy Family College.

Sister Mary Gregory, president, Gwynedd-Mercy Junior College.

Sister Mary of Lourdes, president, Immaculata College.

Courtney Smith, president, Swarthmore College.

Earl F. Sykes, acting president, West Chester State College.

Robert L. Taylor, president and general manager, Philadelphia *Bulletin*.

Marvin Wachman, president, Lincoln University.

P. A. Wells, director, Eastern Utilization Research and Development Division, U.S. Department of Agriculture.

Allen H. Wetter, superintendent, Philadelphia Public Schools.

R. N. Williams II, director, Historical Society of Pennsylvania.

James Work, president, Delaware Valley College of Science and Agriculture.

Joint Meeting of Section Officers and Committee on AAAS Meetings

The Section Officers and members of the Committee on AAAS Meetings will meet at a luncheon and planning session for the 1963 meeting on 28 December. Dael Wolfle and Raymond L. Taylor are cochairmen of the luncheon.

Mathematics

Wednesday 26 December

A Ten-Year Report on Applied Mathematics. Invited papers, program of the Society for Industrial and Applied Mathematics, cosponsored by AAAS section on Mathematics (A). Arranged by John W. Cell, North Carolina State College, and presided over by Robert F. Rinehart, Weapons Systems Evaluation Group, Department of Defense. Memorial to William F. G. Swann, Francis L. Jackson, Franklin Institute. Survey of advances in numerical methods in the past 10 years, C. B. Tompkins, Institute for Defense Analyses, Princeton, N.J. A decade of mathematical control theory, J. P. Lasalle. RIAS, Baltimore, Md. The mathematician in the scientific and engineering community, F. J. Weyl, Office of Naval Research, Washington, D.C.

Thursday 27 December

Vice Presidential Address: The geometry of zeros of extremal polynomials with certain prescribed coefficients, by the retiring vice president of the section on Mathematics, J. L. Walsh, Harvard. Wallace Givens, Argonne National Laboratory, will preside.

Probability and Mathematical Statistics: Joint program of sections on Mathematics (A) and Statistics (U). For details see program for section (U).

Computer Applications. Symposium, arranged by William F. Cahill, Goddard Space Flight Center, NASA, who will preside. Joint program of the Association for Computing Machinery and the AAAS section on Mathematics. The application of computers to orbit determination problems, Henry Wolfe, Analytical Mechanics Associates, New York City. Line computation and the solution of scientific problems, Glen J. Culler and Burton D. Fried, Thompson Ramo Wooldridge, Los Angeles. What decision theory will do to the computer industry, J. R. Simpson, Bureau of Supplies and Accounts, Department of the Navy.

Saturday 29 December

Mathematics for Applications. Part I: Symposium of invited papers, arranged by R. J. Walker, Cornell. A. H. Taub, Institute for Advanced Study, Princeton, will preside. Joint program of section on Mathematics and the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America. The conflict between mathematicians and scientists, Bernard Friedman, University of California, Berkeley. Mathematics for engineering applications, H. O. Pollak, Bell Telephone Laboratories. What kind of a world can be built out of curved empty space?, John Archibald Wheeler, Princeton. Mathematics in space science, Harry Pollard, Purdue.

Part II: Vice presidential address, The role of mathematics in the colleges, by H. Frederic Bohnenblust, California Institute of Technology, vice president of Section A. Wallace Givens will preside.

Part III: Invited addresses. A. H. Taub will preside. Molecular biology and life, Vincent P. Dole, Rockefeller Institute. The mathematics used in mathematical psychology, R. Duncan Luce, University of Pennsylvania.

Physics

Friday 28 December

Interdisciplinary Symposium in the Physical Sciences. Dynamics of Planetary Atmospheres. Arranged by Julius London, University of Colorado. Joint program of AAAS sections on Physics (B) and Astronomy (D), cosponsored by the American Geophysical Union,

the American Meteorological Society, and Sigma Pi Sigma. For details see AAAS General Sessions.

The Earth's Magnetic Field. Effects on Cosmic Radiation. Symposium, arranged by Martin A. Pomerantz, Bartol Research Foundation, Swarthmore, Pa. Program of the American Geophysical Union, cosponsored by AAAS section on Physics. For details see program of the American Geophysical Union.

Saturday 29 December

Current Educational Problems in Physics. Symposium, arranged by Stanley S. Ballard, University of Florida. Marsh W. White, Pennsylvania State University, will preside. The educational program of the American Association of Physics Teachers, Vincent E. Parker, Oak Ridge Institute of Nuclear Studies. Program of the Commission on College Physics, Walter C. Michels, Bryn Mawr. The Science Teaching Center at the Massachusetts Institute of Technology, N. H. Frank, M.I.T. Manpower program of the American Institute of Physics, William C. Kelly, American Institute of Physics. After the four lectures the speakers will participate in a round-table discussion on physics teaching on the collegiate level.

Physicists' Luncheon. Joint session of AAAS section on Physics and Sigma Pi Sigma. Stanley S. Ballard, past president, Sigma Pi Sigma, will preside. The activities of the International Atomic Energy Agency, Henry D. Smyth, Princeton, U.S. representative to the IAEA.

Contributed Papers. Physics teaching. The detailed program will be distributed at the door.

American Astronautical Society

Program chairman: J. Gregg Stephenson, Airborne Instruments Laboratory Division, Cutler-Hammer, Deer Park, N.Y.

Thursday 27 December

Welcome Address. J. Gregg Stephenson will preside. Address by Alfred M. Mayo, president, AAS.

Keynote Address. Alfred M. Mayo will preside. Scientific satellites — a perspective, Alexander Kossiakoff, Applied Physics Laboratory, Johns Hopkins.

Scientific Satellites. Part I, Current Scientific Satellites. Symposium of the AAS, cosponsored by the National Aeronautics and Space Administration. John E. Naugle, director of geophysics and astronomy programs, NASA, will preside. S-6, An aeronomy satellite, Richard Horowitz, NASA. Topside sounding of the ionosphere, John H. Chapman, Defence Research Telecommunication Establishment, Ottawa. NASA topside sounding program, John E. Jackson, Goddard Space Flight Center, Greenbelt, Md. Geophysical research with Injun I, II, and III, Brian J. O'Brien, State University of Iowa.

Part II: The Observatory Generation of Satellites. (Same sponsors as for part I.) John W. Townsend, Jr., Goddard Space Flight Center, will preside. The mission of the orbiting geophysical observatories, Wilfred E. Scull, Goddard Space Flight Center. The engineering design of the orbiting geophysical observatories, George E. Gleghorn, Space Technology Laboratories, Redondo Beach, Calif. The mission of the advanced orbiting solar observatory, John C. Lindsay, Goddard Space Flight Center. One approach to the engineering design of the advanced orbiting solar observatory, A. J. Cervenka, Goddard Space Flight Center. The mission of the orbiting astronomical observatory, Robert R. Ziemer and James E. Kupperian, Jr., Goddard Space Flight Center. The engineering design of the orbiting astronomical observatory, Walter H. Scott, Grumman Aircraft Engineering Company, Bethpage, N.Y.

American Meteorological Society

Thursday 27 December

Biometeorology. Symposium, arranged by Frederick Sargent, II, University of Illinois, who will preside. Program of the American Meteorological Society. The Piccardi effect, James P. Lodge, Jr., W. H. Fisher, B. Ammons, and L. Corruccini, National Center for Atmospheric Research, Boulder, Colo. Air pollution, meteorology, and health, L. Greenburg and Franklyn Field, Albert Einstein College of Medicine. The effect of rising humidity with falling barometric pressure on arthritic symptoms and signs, J. L. Hollander, University of Pennsylvania. Somatic aspects of selected environmental factors, I. H. Kornblueh, University of Pennsylvania. Biometeorology in plant disease forecasting, R. D. Schein, Pennsylvania State University. National and international programs in biometeorology, Frederick Sargent.

American Rocket Society

Program chairman: Norman J. Oliver, A.F. Cambridge Research Laboratory, Bedford, Mass.

Friday 28 December

The Meteorological Rocket Program, Part I. Symposium, program of the Physics of the Atmosphere and Space Committee of the American Rocket Society. Francis S. Johnson, Graduate Research Center of the Southwest, Dallas, Texas, will preside. Applied meteorological requirements, Robert S. Long, Andrews Air Force Base, Washington, D.C. Theoretical meteorological requirements, Richard A. Craig, Florida State University. Rocket vehicles for meteorology, Willis L. Webb, White Sands Missile Range, New Mexico. Meteorological rocket instrumentation, Robert Leviton, Air Force Cambridge Research Laboratories. Survey of the balloon program, Thomas Kelly, Air Force Cambridge Research Laboratories.

Saturday 29 December

Part II. (Same sponsor as for part I.) Warren H. Berning, Ballistic Research Laboratory, Aberdeen Proving Ground, Md., will preside. Analysis of meteorological rocket and balloon data, Frederick G. Finger, U.S. Weather Bureau. Meteorological data above 60 kilometers, Francis S. Johnson. Global aspects of sounding rocket research, Maurice Dubin, Goddard Space Flight Center. IQSY—the year of the quiet sun, Martin Pomerantz, Bartol Research Foundation, Swarthmore, Pa. Ten-year goals in aeronomy (speaker to be announced). After the lectures of this symposium the speakers will participate in a panel discussion.

National Aeronautics and Space Administration

NASA is a cosponsor of the symposium, Scientific Satellites, of the American Astronautical Society, 27 Dec., and a joint sponsor with the American Physiological Society of the symposium, Space Biology and Life Support Problems, 30 Dec.

Sigma Pi Sigma

Sigma Pi Sigma, national physics honor society, is a cosponsor of the Physicists' Luncheon, 29 Dec.

Chemistry

Program chairman: James R. White, Socony Mobil Oil Company, Princeton, N.J.

Wednesday 26 December

Contributed Papers. Program of AAAS section on Chemistry (C), with the assistance of the American Chemical Society, Delaware Valley Sections. James R. White will preside. Dicarbenes and the chemistry of bisdiazo compounds, and Observations of ground state triplet and quintet molecules, Robert W. Murray and Anthony M. Trozzolo, Bell Telephone Laboratories (E. Wasserman, BTL, is third author of latter paper; papers to be presented by Murray and Trozzolo, respectively). Carriers and some unpaired spins in organic semiconductors, H. A. Pohl, Brooklyn Polytechnic Institute and E. Bretz, Rutgers (paper to be presented by Pohl). Degradation of chemically modified and cross-linked caprolactam systems under ultraviolet irradiation, Stephen D. Bruck, Applied Physics Laboratory, Johns Hopkins. Nucleic acids and proteolytic enzyme interaction, Anwar A. Hakim, Armour Pharmaceutical Company, Kankakee, Ill. Electrochemical determination of enzymes using potential poisers: determination of glucose oxidase with diphenylamine sulfonic acid, George C. Guilbault, Bruce C. Tyson, Jr., David N. Kramer, and Paul L. Cannon, Jr., U.S. Army Chemical Center, Md. (paper to be presented by Kramer). The absorption and identification of chymotrypsin, B. L. Kabacoff, B. Prytz, M. Umhey, A Wohlman, and S. Avakian, Denver Chemical Manufacturing Company and the Burns Research Laboratory, St. Vincent's Hospital, New York. The biochemical identification of the carrier state of Tay-Sachs' disease, Stanley M. Aronson, Guta Perle, Abraham Saifer, and Bruno W. Volk, Isaac Albert Research Institute, Jewish Chronic Disease Hospital, and the State University of New York, Downstate Medical Center, Brooklyn. Serum acid phenylphosphatase activity as an index of kidney disease, Myron R. Schoenfeld and Fanya Woll, Lincoln Hospital, New York, N.Y. (paper to be presented by Schoenfeld).

Thursday 27 December

Breakfast Meeting. Chairmen, speakers, and guests of symposia on Advances in Organic Chemistry and Nuclear and Radiochemistry will attend.

Concurrent Symposium on Advances in Organic Chemistry. Part I. Arranged by Paul von R. Schleyer, Princeton, who will preside. Charge transfer complexing in systems of biological interest, Edward M. Kosower, State Universtiy of New York, Long Island Center, Oyster Bay. Mechanistic aspects of organophosphorus chemistry, Donald B. Denney, Rutgers. Chlorinolysis of carbon-sulfur bonds, Harold Kwart, University of Delaware. The chemistry of some small ring systems, Jerrold Meinwald, Cornell.

Concurrent Symposium on Nuclear and Radiochemistry. Part I. Arranged by Robert A. Naumann, Princeton, who will preside. Molecular structure from resonant gamma ray absorption, Rolfe H. Herber, Rutgers. Extremely reactive chemical species produced in nuclear reactions, Colin Mackay, Haverford. Radioactive investigations in geological research (speaker to be announced).

Concurrent Symposium on Advances in Organic Chemistry. Part II. Arranged by Paul von R. Schleyer, who will preside. The chemistry of phenyl anions, Joseph F. Bunnett, Brown. Determination of carbonium ion stabilities from hydride transfer experiments, Norman C. Deno, Pennsylvania State University. Basic properties of various organic functional groups, Edward M. Arnett, University of Pittsburgh. Spectroscopic investigation of hydrogen bonding, Paul von R. Schleyer.

Concurrent Symposium on Advances in Nuclear and Radiochemistry. Part II. Arranged by Robert A. Naumann, who will preside. A radiochemical method for detecting neutrinos, Raymond Davis, Brookhaven National Laboratory. Nuclear chemical research with high energy accelerators, Gerhart Friedlander, Brookhaven National Laboratory. Prospect for research in radioactivity, Robert A. Naumann.

Saturday 29 December

Breakfast Meeting. Chairmen, speakers, and guests of the symposium on Techniques of Structural Chemistry will attend.

Symposium on Techniques of Structural Chemistry. Part I. Arranged by M. K. Wilson, Tufts, who will preside. Nuclear magnetic resonance spectroscopy, W. D. Phillips, E. I. du Pont de Nemours, Wilmington, Del. Molecular beams, John Ross, Brown. Molecular structure and magneto-optical rotation spectra, Victor Shashoua, E. I. du Pont de Nemours. Electronic spectra, D. A. Ramsey, National Research Council, Ottawa.

Part II. Arranged by M. K. Wilson, who will preside. Crystal structure analysis by x-ray diffraction, Kenneth N. Trueblood, University of California, Los Angeles. Mossbauer effect, S. S. Hanna, Argonne National Laboratory. Electron spin resonance spectroscopy, S. I. Weissman, Washington University. Neutron diffraction, Walter C. Hamilton, Brookhaven National Laboratory.

American Association of Clinical Chemists

Program chairman: Carl Alper, Hahnemann Medical College and Hospital.

Thursday 27 December

Symposium on Newer Applications of Instrumentation in Biological Analysis. Carl Alper will preside. The usefulness of gas chromatography in the clinical chemistry laboratory, D. A. Turner, Sinai Hospital of Baltimore. *p*H methodology, S. R. Gambino, Englewood Hospital, Englewood, N.J. Fluorescence assay of nucleic acids, purines, and pyrimidines, S. Udenfriend, National Heart Institute. Recent advances in electrophoretic analysis, S. Raymond, University of Pennsylvania.

Dinner and Reception. American Association of Clinical Chemists. Arranged by Margaret E. Ryland, Woman's Medical College.

Astronomy

Friday 28 December

Interdisciplinary Symposium in the Physical Sciences. Dynamics of Planetary Atmospheres. Arranged by Julius London, University of Colorado. Joint program of AAAS sections on Physics (B) and Astronomy (D), cosponsored by the American Geophysical Union, the American Meteorological Society,

and Sigma Pi Sigma. For details, see AAAS General Sessions.

Saturday 29 December

Statistical Problems of Astronomy. Joint program of AAAS sections on Astronomy (D) and Statistics (U). See program for AAAS section on Statistics (U).

Vice Presidential Address. Frank K. Edmondson, Link Observatory, Indiana University, will preside. The B stars and the galaxy, by Robert M. Petrie, Dominion Astrophysical Observatory, Royal Oak, British Columbia (Canada), retiring vice president of AAAS Section D.

Geology and Geography

Thursday 27 December

Symposium on Coal in the United States. Problems and Promises. Part I. Today's Problems. Arranged by George F. Deasy, College of Mineral Industries, Pennsylvania State University. Chairman, and cochairman, respectively, David R. Mitchell, College of Mineral Industries, Pennsylvania State University, and Lewis E. Evans, Mines and Mineral Industries, Commonwealth of Pennsylvania. Coal and man, E. Willard Miller, Pennsylvania State University. The bituminous coal industry today: a status report, H. Vernon Fritchman, Rochester and Pittsburgh Coal Company. The anthracite industry today: a status report, Daniel H. Connelly, Mines and Mineral Industries (Anthracite), Commonwealth of Pennsylvania. The unemployment problem in the coal regions, Joseph T. Kennedy, United Mine Workers of America. Competitors of coal: a problem of markets, W. W. Bayfield, National Coal Association. Atomic energy—the coming great rival of coal, Philip Sporn, American Electric Power Company. Discussants at this symposium will include: John J. Schanz, Jr., Pennsylvania State University, and Perry D. Teitelbaum, Resources for the Future, Inc.

Part II. Tomorrow's Promises. (Same sponsors and arranger as for part I.) Chairman and cochairman, respectively, Marling J. Ankeny, U.S. Bureau of Mines, and Richard H. Jahns, College of Mineral Industries, Pennsylvania State University. New frontiers in our fundamental knowledge about coal, Homer H. Lowry, Pittsburgh Coal Research Center, U.S. Bureau of Mines. New frontiers in the coal mining process, J. W. Woomer, consulting engineer, Pittsburgh. Revolution in coal transport—is it near?, Harry Perry, Division of Bituminous Coal, U.S. Bureau of Mines. Could coal become a fabulous new industrial raw material?, Charles Bliss and George B. Mock, Arthur D. Little, Inc. Does the world need our coal?, a study of possible future foreign markets, Myles E. Robinson, National Coal Association. After coal is strip-mined, what then?, George F. Deasy and Phyllis R. Griess, Pennsylvania State University. Discussants for this symposium will include Donald C. Jones, Pennsylvania State University; Michael Mischaikow, West Virginia University; and Michael F. Widman, Jr., United Mine Workers of America.

Saturday 29 December

Symposium on Coastal Geomorphology and Sedimentology. Part I. Arranged by Donn S. Gorsline, University of Southern California, who will preside. Joint session of the AAAS section on Geology and Geography and the Geological Society of America, cosponsored by the American Geophysical Union. Land and sea—relative change of level, William G. McIntire, Louisiana State University. The age of submergence of the Connecticut coast, Arthur L. Bloom, Cornell. Sea level and crustal movements at Chesapeake Bay entrance, 10,000–15,000 years ago, W. Harrison, Virginia Institute of Marine Science, and Gene A. Rusnak, Marine Laboratory, University of Miami. Origin and significance of sand-ridge and mud-flat complex, Back Bay area, southeastern Virginia, John Sanders and Robert Q. Oaks, Jr., Yale. Barrier Island sedimentation, coastal Georgia, John H. Hoyt and Vernon J. Henry, University of Georgia Marine Institute. Coastal development in Volusia and Brevard counties, Florida, John W. Kofoed, U.S. Coast and Geodetic Survey, Washington, D.C. Geomorphology of a terrace paralleling the Florida reefs, G. F. Jordan and R. J. Malloy, U.S. Coast and Geodetic Survey.

Contributed Papers. Geography. Part I. Program of the Association of American Geographers, Middle Atlantic Division, cosponsored by AAAS section on Geology and Geography (E). For details, see program for Association of American Geographers.

Symposium on Dating Man and the Pleistocene. Parts I and II. Joint program of AAAS sections on Anthropology (H) and Geology and Geography (E). Arranged by Ralph Solecki, Columbia, and Sheldon Judson, Princeton. For details, see program for AAAS section on Botanical Sciences (H).

Symposium on Coastal Geomorphology and Sedimentology. Part II. (Sponsor and arranger same as for part I.) Arthur N. Strahler, Columbia, will preside. Coastal morphology and sediment disposition in a coastal plain estuary, B. W. Nelson, Virginia Polytechnic Institute. Modern sediment patterns in the Morehead City area, North Carolina, Roy L. Ingram, University of North Carolina. A new sediment depositional cycle in southern New England waters, Robert L. McMaster, University of Rhode Island. Nearly ideal drift system along Florida Panhandle coast, William F. Tanner, Florida State University. Beach studies along the west Florida coast, Donn S. Gorsline. Aerial photographic study of coastline changes along the outer banks of North Carolina, William D. Athearn and Claude Ronne, Woods Hole Oceanographic Institution. Study of foreshore sand movement by means of fluorescent dyed sand, James C. Ingle, Jr., University of Southern California. Beach geometry and shore processes, Sandy Hook, New Jersey, Warren E. Yasso, Columbia.

Contributed Papers. Geography. Part II. Program of the Association of American Geographers, Middle Atlantic Division, cosponsored by AAAS section on Geology and Geography (E). For details, see program for Association of American Geographers.

Vice Presidential Address. Guy-Harold Smith, Ohio State University, will preside. The retreat of cliffy coasts, Richard J. Russell, Coastal Studies Institute, Louisiana State University; retiring vice president of Section E.

Sunday 30 December

Contributed Papers. Geology. Arranged by Richard H. Mahard, secretary of Section E. Guy-Harold Smith will preside. Program of AAAS section on Geology and Geography (E), cosponsored by the Geological Society of America. Ordovician-Silurian relations on New World Island, Notre

Dame Bay, Northeast, Newfoundland, Marshall Kay, Columbia. Aspects of early Paleozoic zoogeography, William B. N. Berry, University of California, Berkeley. Petrology of the Flora Lake stock, Lake of the Woods region, Ontario, Richard A. Heimlich, Kent State University. Monzonites of the Beartooth Mountains, Helen Stobbe, Smith. Electron-microscopic studies of the textures of sand grains on the Atlantic shore of Long Island, N.Y., David Krinsley, Walter S. Newman and M. L. Silberman, Queens College, and Taro Takahashi, University of Rochester. Simultaneous individual studies versus team research in geomorphology and allied subjects, Wakefield Dort, Jr., University of Kansas. Geology, a worldwide view, Norman L. Thomas, William Carr, and Gerald Mendenhall, Pure Oil Company, Denver, Colo. The nutria monocline, Gallup, New Mexico, Raymundo J. Chico.

Association of American Geographers

Thursday 27 December

Symposium on Coal in the United States. Problems and Promises. Parts I and II. Joint program of AAAS section on Geology and Geography (E) and the Association of American Geographers, Middle Atlantic Division, cosponsored by AAAS section on Social and Economic Sciences (K) and the Geological Society of America. Arranged by George F. Deasy, College of Mineral Industries, Pennsylvania State University.

Saturday 29 December

Contributed Papers. Geography. Part I. Program of the Association of American Geographers, Middle Atlantic Division, cosponsored by AAAS section on Geology and Geography (E). Arranged by Guy N. Parmenter, Army Map Service, and A. Joseph Wraight, U.S. Coast and Geodetic Survey. Guy N. Parmenter will preside. Urban expansion in Montgomery County, Pennsylvania, Arthur F. Loeben, Montgomery County Planning Commission. Geography in the service of integrated social planning: theory research and action, Edward C. Haskins, Temple. The impact of the federal government on the population of Maryland, George Beishlag, State Teachers College at Towson (Md.). Commuter time-distance relations in the Nation's Capital, J. Slaten Jenner, National Capital Transportation Agency, and June S. Jenner, Area Redevelopment Administration, Washington, D.C. The Philadelphia iron and steel district: its relation to the seaways, Cyrus J. Sharer, Villanova. Tocks Island Dam and the eastern Poconos, Harold F. Creveling, East Stroudsburg (Pa.) State College. External boundaries of British Honduras, Anthony S. Reyner, Howard.

Part II. (Same sponsor and arranger as for part I.) A. Joseph Wraight will preside. The Colorado beet sugar industry, M. John Loeffler, University of Colorado. Expansion of irrigation and related problems in the Indus Basin, David Firman, State Teachers College at Towson (Md.). Instrumentation's role in geographic science, James P. Latham, Bowling Green State University, Ohio. The Army's tropical and desert research and development program, Leo Alpert, Army Research Office, Washington, D.C. The Army's research and development program for cold regions, Donald C. Hilton, Army Research Office. Earth sciences research in the Army, Hoyt Lemons, Army Research Office. Atmospheric research and development in the Army, Richard Terwilliger, Army Research Office.

Events for Women

Arranged by the Committee on Women's Events, Carolyn Ancker, chairman.

27 Dec., morning—2-hour historical tour of Old Philadelphia (Independence Hall, Carpenters Hall, Betsy Ross House, Elfreth's Alley, Waterfront, and so forth). Afternoon—1-hour tour of U.S. Mint.

28 Dec., morning—3-hour tour of five historic homes in Fairmont Park. Afternoon—1-hour tour of art museum.

National Speleological Society

Saturday 29 December

Symposium on Biological Aspects of Cave Conservation. Arranged by Brother G. Nicholas, La Salle College, who will preside. Present status of state conservation policies. Victor H. Schmidt, Carnegie Institution of Technology. Protection of cave fauna in Central and South American caves, Russell H. Gurnee, Closter, N.J. Effects of pollution on subterranean water passages, John R. Holsinger, Lee High School, Springfield, Va. Contamination of cavernicolous ecosystems, Brother G. Nicholas. Biological versus geological conservation, John V. Thrailkill, Princeton. Population fluctuations of cave bats, Lyle E. Conrad, J. E. B. Stuart High School, Falls Church, Va.

Contributed Papers. Cave Geology. Program of the National Speleological Society, cosponsored by AAAS section on Geology and Geography (E) and the Geological Society of America, Arranged by John V. Thrailkill, who will preside. Applications of experimental geology to problems in cavern development, Ralph O. Ewers, Cincinnati Museum of Natural History. Processes of cavern breakdown, Elizabeth L. White, Cave Research Foundation, and William B. White, Pennsylvania State University. Dolomite speleothems, Dwight E. Deal, University of New Mexico. A comparison between laboratory models and naturally occurring dome pits, Max W. Reams, University of Kansas. The chemical evolution of some cave waters, Heinrich D. Holland, Princeton.

National Geographic Society

Sunday 30 December

Illustrated Lecture. "Wintering on the roof of the world," Barry C. Bishop, National Geographic Society staff member. Margaret Mead, member, AAAS board of directors, will preside.

Zoological Sciences

Saturday 29 December

Zoologists' Dinner and vice presidential address. Arranged by Charles E. Wilde, Jr., University of Pennsylvania School of Dentistry, and David W. Bishop, Carnegie Institution of Washington, Baltimore, Md.

Program of AAAS section on Zoological Sciences, cosponsored by the zoological societies meeting in Philadelphia. Curt Stern, president, American Society of Zoologists, will preside. Ernst W. Caspari, University of Rochester, vice president of the section on Zoological Sciences, will speak on "Genes and the study of behavior." All zoologists are welcome.

The section on Zoological Sciences is a cosponsor of the symposia of the American Society of Zoologists and the

Society of Systematic Zoology. For details, see the programs of those societies. Section F is also a cosponsor of other programs, as follows.

Program of the Biometric Society, Some Problems of Mathematical Biology (27 Dec.). Symposium of the section on Statistics (U), Statistical Problems of Genetics (27 Dec.). The AAAS interdisciplinary symposium, The Transfer of Genetic Information (28 Dec.). Symposium of the section on Medical Sciences (N), New Concepts Regarding Biological Control Mechanisms (27 and 29 Dec.). Symposium of the section on Dentistry (Nd), Mechanisms of Hard Tissue Destruction (29 and 30 Dec.). Symposium of the section on Agriculture (O), Food Quality as Affected by Production and Processing (27, 29, and 30 Dec.). Symposium of the section on Anthropology (H), Culture and Direction of Human Evolution.

American Society of Zoologists

Program officer: Ray L. Watterson, University of Illinois.

Wednesday 26 December

AAAS Program. Moving Frontiers of Science. Part I. "Biological Timing," Sterling B. Hendricks, Mineral Nutrition Laboratory, U.S. Department of Agriculture, Beltsville, Md. For details see AAAS Special Sessions.

Thursday 27 December

The Evolution of Behavior. Part I. Symposium, joint program of the Division of Animal Behavior and Sociobiology of the American Society of Zoologists and the Section of Animal Behavior and Sociobiology of the Ecological Society of America, cosponsored by AAAS section on Psychology (I). Arranged by William C. Dilger, Cornell, who will present introductory remarks. Peter Marler, University of California, Berkeley, will preside. The evolution of mating behavior in arthropods, Richard D. Alexander, University of Michigan. Evolution of parental behavior in teleost fishes, George W. Barlow, University of Illinois. Behavioral evolution in the parrot genus *Agapornis*, William C. Dilger. Behavioral evolution in the Rodentia, John F. Eisenberg, University of British Columbia.

Principles and Methods of Phylogeny. Part I. Symposium, program of the American Society of Naturalists, cosponsored by the American Society of Zoologists and the Society of Systematic Zoology. For details, see program of American Society of Naturalists.

Contributed Papers. Radioecology. Part I. Radioisotope Studies. Program of the Ecological Society of America, cosponsored by the American Society of Zoologists. Arranged by Francesco B. Trama, Rutgers. For details, see program of Ecological Society of America.

New Concepts Regarding Biological Control Mechanisms. Part I. Symposium, Repression Mechanisms. Program of AAAS section on Medical Sciences (N), cosponsored by the American Society of Zoologists and AAAS section on Zoological Sciences (F). Arranged by DeWitt Stetten, Jr., National Institutes of Health, and Oscar Touster, Vanderbilt. For details see program of section N.

New Concepts Regarding Biological Control Mechanisms. Part II. Feedback Control of Enzyme Action. (Same sponsors and arrangers as for part I.) For details see program of section N.

The Evolution of Behavior. Part II. (Same sponsor as for part I.) Arranged by William C. Dilger, who will preside. Testosterone and the evolution of behavior, Richard J. Andrew, Yale. Species specificity in animal communication signals, Peter Marler. Evolutionary phenomena as illustrated by bird behavior, Robert W. Ficken, University of Maryland. Summation and integration, George W. Barlow, University of Illinois.

Principles and Methods of Phylogeny. Part II. (Same sponsors and arrangers as for part I.) For details see program of American Society of Naturalists.

Contributed Papers. Radioecology. Part II. (Same sponsors and arranger as for part I.) For details see program of Ecological Society of America.

Statistical Problems of Genetics. Symposium, joint program of AAAS section on Statistics (U) and the Biometric Society ENAR, cosponsored by the American Society of Zoologists and others. Arranged by Jerzy Neyman, University of California, Berkeley, and T. A. Bancroft, Iowa State University. For details see program of section U.

Friday 28 December

Interdisciplinary Symposium in the Chemical and Biological-Medical Sciences. Joint program of AAAS sections on Chemistry (C), Zoological Sciences (F), Zoological and Botanical Sciences (G), and Medical Sciences (N). Arranged by Severo Ochoa, New York University, and Philip H. Abelson, AAAS. For details, see AAAS General Sessions.

Population Endocrinology. Symposium, program of the Ecological Society of America, cosponsored by the American Society of Zoologists. Arranged by John J. Christian, Albert Einstein Medical Center, Philadelphia. For details see program of Ecological Society of America.

Growth. Part I. Symposium, program of the Division of Comparative Endocrinology of the American Society of Zoologists. Arranged by Lawrence I. Gilbert, Northwestern. Howard A. Schneiderman, Western Reserve, will preside. Plant growth substances, Bruce B. Stowe, Yale. Control of growth in hydra, Allison L. Burnett, Western Reserve. Control of growth in crustacea, Dorothy E. Bliss, American Museum of Natural History. Control of growth and development in insects, Howard A. Schneiderman. Control of growth in amphibians, William Etkin, Albert Einstein College of Medicine.

Contributed Papers, Session I. Animal Behavior and Sociobiology, I. Innate Behavior and Early Behavior. Joint session of the Division of Animal Behavior and Sociobiology and the Section of Animal Behavior and Sociobiology of the Ecological Society of America. E. B. Hale, Pennsylvania State University, will preside. Head movements in human neonates, Gerald Turkewitz, Edmund W. Gordon, and Herbert G. Birch, Albert Einstein College of Medicine. Maternal behavior in the domestic hen, Richard Maier, Loyola. Visual recognition of the parent by newly hatched gull chicks, Jack P. Hailman, Duke. Grouping behavior of the zebrafish as influenced by social isolation, John P. Kerr, University of Michigan. Maturation of the young-to-parent response in the cichlid fish, *Etroplus maculatus*, G. W. Barlow and J. W. Tate, University of Illinois. The role of auditory stimulation in initiating the following response of ground nesting ducklings (*Anas platyrhynchos*), Gilbert Gottlieb, Dorothea Dix Hospital, Raleigh, N.C. Investigations of the auditory stimuli for laying budgerigars (*Melopsittacus undulatus*), Barbara F. Brockway, Western Reserve. The development of foliage preferences in birds, Peter H. Klopfer, Duke. The role of learning in habitat selection by the prairie deer mouse, *Peromyscus maniculatus bairdii*, Stanley C. Wecker, Hofstra College.

Contributed Papers, Session II. Comparative Physiology, I. G. Fraenkel, University of Illinois, will preside. Dendritic action potentials in insect chemoreceptors, F. E. Hanson and M. L. Wolbarsht, Naval Medical Research Institute, Bethesda, Md. Efferent control of a proprioceptive system in the crab leg, B. S. Dorai Raj and M. J. Cohen, University of Oregon. The sensory function of modified fins of some marine fishes, John E. Bardach, University of Michigan, and James Case, University of California, Santa Barbara. Changes in cold-block of fish nervous systems by acclimation, C. Ladd Prosser, University of Illinois. Biochemical adaptation to temperature-induced stress in the central nervous system of *Fundulus heteroclitus*, Morris H. Baslow, New York Aquarium and New York University. The anatomy and innervation of giant muscle fibers of the barnacle, *Balanus nubilis*, Thomas Smyth, Jr., Pennsylvania State University, and Graham Hoyle, University of Oregon. Neuromuscular physiology of giant muscle fibers of barnacle, *Balanus nubilis*, Graham Hoyle and Thomas Smyth, Jr. Physiology of the heart of *Cryptochiton stelleri* Middendorf, 1847, Michael J. Greenberg, University of Illinois. Effect of cold on a skin gland of the golden hamster, *Mesocricetus auratus*, B. J. Moberly and W. R. Moberly, University of California, Riverside; R. R. J. Chaffee, University of Michigan; and C. D. Howell, University of Redlands, California.

Contributed Papers, Session III. Vertebrate Morphology, I. Carl Gans, University of Buffalo, will preside. Erythroblast and hemoglobin production in the developing blood islands of the chick embryo, Victor Jelin, S. J. Piliero, and P. T. Medici, New York Medical College and St. John's University Graduate School. Sauropsid-theropsid relationships among Pennsylvanian reptiles, Theodore H. Eaton, Jr., University of Kansas. Aspects of the functional anatomy of the chelonian pectoral girdle and limb, Warren F. Walker, Jr., Oberlin. Avian portal systems and flight, John C. Cralley, University of Illinois. Kinetics of the avian skull, Walter J. Bock, University of Illinois. The systematics of birds, Malcolm Jollie, University of Pittsburgh. The quadrupedal gaits of primates, Milton Hildebrand, University of California, Davis. Variations in the structure of the choanae of turtles, Thomas S. Parsons, University of Toronto.

Contributed Papers, Session IV. Protozoology, Parasitology, and Ecology. John R. Preer, Jr., University of Pennsylvania, will preside. Use of protozoa in measuring the neutralizing value of antivenomous serums, Charles H. Philpott, Durham, N.C. Tolerance of four ciliates to low oxygen concentrations, Stuart S. Bamforth and Leni K. Lorenz, Tulane. A growth-supporting medium for *Paramecium trichium*, Sister Clarence Paul Keeshan, College of Saint Rose, Albany, N.Y. Stimulation of growth in *Paramecium caudatum* by products of *Colpidium campylum*, Rosalie H. Stillwell and Daniel M. Lilly, St. John's University, New York. Malaria in Georgia lizards, Helen B. Jordan, Georgia State College, Atlanta. Phosphatase activity in hepatopancreatic cells of *Helisoma trivolvis* infected with rediae of *Echinoparyphium* sp. (Trematoda: Echinostomatidae), Thomas C. Cheng, Lafayette, and Randall W. Snyder, Jr., University of Virginia School of Medicine. Experimental studies of Müllerian mimicry in neotropical butterflies, Lincoln P. Brower and Jane Van Zandt Brower, Amherst, and Charles T. Collins, University of Michigan. Ecological observations on bog-inhabiting Pselaphid beetles, David E. Reichle, Northwestern. Patterns of survivorship in laboratory populations of freshwater fairy shrimp, *Eubranchipus vernalis* (Verrill), Charles H. Southwick, A. J. Reading, and Brenda K. Sladen, Johns Hopkins. Life history and behavior differences between ranids in isolated populations in the Sierra Nevada, Brother Lawrence Cory, St. Mary's College of California.

Moving Frontiers of Science. Part II. Special attention is called to the paper by Sydney Brenner, perspectives in molecular biology. For details see AAAS Special Sessions.

Growth. Part II. Symposium. (Same sponsor and arranger as for part I.) Dorothy Price, University of Chicago, will preside. Hormonal factors in the growth of fishes, K. France Baker-Cohen, Albert Einstein College of Medicine. Growth hormone in mammals, Ernst Knobil, University of Pittsburgh School of Medicine. Hormonal control of embryonic gonad growth, Dorothy Price. Steroid hormone interactions and uterine growth, Richard A. Edgren, Wyeth Laboratories, Philadelphia. Local action of thyroid hormone in amphibia, Jane C. Kaltenbach, Mount Holyoke.

Contributed Papers, Session V. Animal Behavior and Sociobiology, II. Behavior Genetics and Neurophysiological Behavior. (Same sponsor as for part I.) Demorest Davenport, University of California, Santa Barbara, will preside. Mating patterns in mice, Louis Levine, City College of New York. The quantitative inheritance of mating ability in chickens, P. B. Siegel and H. S. Siegel, Virginia Polytechnic Institute. A further investigation of the swimming reaction of *Stomphia coccinea*, Jack A. Ward, University of Illinois. The contraction response of *Hydra pirardi* to stimuli of light and mechanical agitation, Norman B. Rushforth, Western Reserve. Tonic immobility: decreased inhibitory activity as an effect of three different drugs in the induced catatonic state in goats, Marvin Amstey, Cornell, and A. Ulric Moore, Duke University Medical Center. Effects of a sensory deprivation on the sexual behavior of experienced adult male cats, Madeline Cooper and Lester R. Aronson, American Museum of Natural History. Male sexual behavior induced in female turkeys by brain stimulation, M. W. Schein and F. M. Hart, Pennsylvania State University. Loss of salt preference in rats with lateral hypothalamic damage, Harry R. Kissileff and Alan N. Epstein, University of Pennsylvania. Effects of rhinencephalic lesions on maternal behavior, Burton M. Slotnick, University of Illinois.

Contributed Papers, Session VI. Comparative Physiology, II. (Same sponsor as for part I.) John H. Welsh, Harvard, will preside. Factors affecting arterial and venous pressures in the lizard, *Sauromalus obesus*, James R. Templeton, University of Texas, Houston. Pulmonary and cutaneous respiration in the spotted salamander, *Ambystoma maculatum*, Walter G. Whitford and Victor H. Hutchinson, University of Rhode Island. Growth of juvenile turtles during continual exposure to high gravity, Charles C. Wunder, Christopher H. Dodge, and Charles G. Duttweiler, State University of Iowa. Body temperature regulation in the California mastiff bat, *Eumops perotis*, Philip Leitner, St. Mary's College of California. Effects of body size and wind speed on rates of cooling of lizards, Calvin B. DeWitt, University of Michigan. Cytochemical changes and kidney function in normal and cold-stored summer bats (*Myotis keenii*), Arnold Melman, City College of New York and Albert Einstein College of Medicine. The effect of temperature and the reproductive cycle on the reserve energy supply of the red-winged black-

bird, Fred J. Brenner, Pennsylvania State University. Carbon dioxide fixation and respiratory quotients in flatworms, Carl S. Hammen, Adelphi. Incorporation of tyrosine into the melanin of the fiddler crab, *Uca pugnax*, Jonathan Green, University of Minnesota.

Contributed Papers, Session VII. Vertebrate Morphology, II. (Same sponsor as for part I.) Thomas S. Parsons, University of Toronto, will preside. Photoviscosity study on anguilliform locomotion, Vladimir Walters, University of California, Los Angeles. Recent trends in comparative anatomy, D. Dwight Davis, Chicago Natural History Museum. Comments on the function of allotherian premolars, W. A. Clemens, Jr., University of Kansas. The tongue protrusion mechanism in *Rana catesbeiana*, Carl Gans, State University of New York, College of Education. A neuroanatomical basis for the evolution of behavior, E. Lloyd Du Brul, University of Illinois Colleges of Medicine and Dentistry. Action of the xiphihumeralis, sterno-glenoidalis, and latissimus dorsi on the shoulder joint of the nutria, Stuart O. Landry, Jr., Louisiana State University. The mechanism of upper jaw protrusion in sharks, Sanford A. Moss, Cornell. Function of jaw joints in dogs, Robert P. Scapino, University of Illinois Colleges of Medicine and Dentistry.

Contributed Papers, Session VIII. Developmental Biology I. Louis De Lanney, Wabash, will preside. Maintenance of melanocytes in the skin of pet mice by surgical trauma, Willie M. Reams, Jr., and David T. Rovee, Louisiana State University. Acquired tolerance to skin homografts in mice, Bertie F. Argyris, Syracuse University. Reaction of skin grafts in tadpoles, Ann M. Bovbjerg, State University of Iowa. Culture of dissociated thyroid cells from rats exposed to reduced barometric pressure, John M. Mallette and Adam Anthony, Pennsylvania State University. The appearance of slow alpha-2 globulin after carbon tetrachloride poisoning and partial hepatectomy, Werner G. Heim and J. M. Kerrigan, Wayne State University. Implants of the embryonic eye into the anterior chamber of the adult eye in *Triturus viridescens*, Randall W. Reyer, West Virginia University School of Medicine. Activity of acid phosphatases in regenerating and resorbing limbs of larval *Amblystoma*, Charles Weiss, Albert Einstein College of Medicine. Transfilter action of the "apical ectoderm maintenance factor" in the chick wing bud, John W. Saunders, Jr., and Mary T. Gasseling, Marquette. Growth of the embryonic chick wing bud, John M. Cairns, Roswell Park Memorial Institute, and Allan Allenspach, Albright.

Contributed Papers, Session IX. Developmental Biology, II. (Same sponsor as for part I.) Charles Metz, Florida State University, will preside. Implantation and lethality in the yellow mouse, Gordon J. Eaton and M. M. Green, University of California, Davis. Experimental recombination of cells in the developing mouse egg: normal and lethal mutant genotypes, Beatrice Mintz, Institute for Cancer Research, Philadelphia. Some factors involved in the production of polyploids in non-enucleated transplant eggs of *Rana pipiens*, Stephen Subtelny and Carole Bradt, Institute for Cancer Research, Philadelphia. Overripeness of the eggs in *Xenopus laevis* Daudin, K. Mikamo, State University of Iowa. Chemical nature of a preparation which induces aspermatogenesis in the guinea pig, G. L. Carlson and D. W. Bishop, Carnegie Institution of Washington, Baltimore, Md. Antigenic analysis of Chinese hamster sperm, Lajos Piko and Albert Tyler, California Institute of Technology. Localization of components of the jelly-coat involved in fertilization in the frog egg, S. H. Barch and J. R. Shaver, Michigan State University.

AAAS Presidential Address and Reception. Beetles, competition, and populations, Thomas Park, University of Chicago. See AAAS Special Sessions.

Contributed Papers, Session X. Animal Behavior and Sociobiology, III. Film program. (Same sponsor as for parts I and II.) E. M. Banks, University of Illinois, will preside. Consequences of the removal of legs on the locomotion of crayfish, Dwain W. Parrack, University of Illinois. Aggressive behavior in the crayfish, *Orconectes propinquus* (Girard), H. William Lunt, University of Illinois. Reproductive behavior of Pacific salmon, C. Groot, Fisheries Research Board of Canada, Biological Station, Nanaimo, B.C. The biology and reproductive behavior of the northern elephant seal, George Bartholomew and Richard A. Boolootian, University of California, Los Angeles. The sea otter, Richard A. Boolootian.

Saturday 29 December

New Concepts Regarding Biological Control Mechanisms. Part III. Hormonal Phenomena. (Same sponsors and arrangers as for parts I and II.) For details, see program of AAAS Section N.

U.S. and International Programs in Biological Oceanography. Part I. Panel discussion, program of the Society of Systematic Zoology, cosponsored by the American Society of Zoologists and the American Society of Limnology and Oceanography. Arranged by Charles F. Lytle, biological consultant, U.S. Army. For details, see program of Society of Systematic Zoology.

Contributed Papers, Session XI. Animal Behavior and Sociobiology, IV. Behavioral Ecology. (Same sponsors as for parts I–III.) P. H. Klopfer, Duke, will preside. Ecological studies on peritrichs, Harold E. Finley and David McLaughlin, Howard. The development of behavior patterns in male chickens under different flocking situations, J. S. Dawson and P. B. Siegel, Virginia Polytechnic Institute. Stereotyped behavior and cage size, William A. Draper and Irwin S. Bernstein, Yerkes Laboratories of Primate Biology, Orlando, Fla. An examination of the relationship between differential early spatial experience, occurrence of pregnancy, and levels of asymptote in populations of prairie deermice, C. Richard Terman, Taylor. Aggressive behavior of starlings as affected by photoperiodic manipulation, John Vandenbergh, Pennsylvania State University. The endogenous activity rhythm of an Australian marsupial mouse as influenced by light and dark, Kenneth S. Rawson, Swarthmore. Daily activity pattern of reindeer in arctic continuous light, Lorenz O. Lutherer and G. Edgar Folk, Jr., University of Iowa, and Warren O. Essler, University of Vermont. The means of orientation in migrating cloudless sulphur butterflies, Thomas J. Walker, University of Florida. The operation of the sun compass in pigeons upon large latitudinal displacement, Klaus Schmidt-Koenig, Duke University and Max Planck Institut.

Contributed Papers, Session XII. Comparative Physiology, III. (Same sponsor as for parts I and II.) Morris Rockstein, University of Miami, will preside. Effects of inorganic ions on mammalian sperm, Clyde E. Johnson and Charles Norman, West Virginia University. Secretory competence and the sodium and potassium content of effluent of the salt glands of domestic ducklings, Clarence C. Goertemiller, Jr., and R. A. Ellis, Brown. Esterases in the digestive gland of the Roman snail, *Helix pomatia*: a correlated his-

tochemical and electrophoretic study, Bruce Ditzion and Robert Rosenbaum, Albert Einstein College of Medicine. Respiration and phosphorylation in liver homogenates from rats exposed to reduced barometric pressures, F. D. Ziegler and Adam Anthony, Pennsylvania State University. Functional relationships of tocopherols, ubiquinones, and ubichromenols in the guinea pig, Nicholas A. B. Szabo and John W. C. Bird, Rutgers. The relation of vitamin A to vision in *Musca domestica* L., Charles F. Cohen and Roy J. Barker, U.S. Department of Agriculture, Beltsville, Md. Tanning of the adult fly: a new hormone action, G. Fraenkel, University of Illinois. Caste and age differences in rate of water loss and response to peanut oil and alumina in termites of eastern United States, Margaret S. Collins, Florida A. & M. University, and A. Glenn Richards, University of Minnesota. The biochemical basis for aging of flight ability in the male house fly, Morris Rockstein and K. Brandt, University of Miami School of Medicine.

Contributed Papers, Session XIII. Vertebrate Morphology, III. D. Dwight Davis, Chicago Natural History Museum, will preside. The golden hamster (*Mesocricetus auratus*) on the 13th day of gestation, Hulda Magalhaes, Bucknell, and W. A. Briggs, University of Pennsylvania Medical School. Fetal growth and skeletal development in the dog, Howard E. Evans, Cornell University Veterinary College. Preliminary studies for a stereotaxic atlas of the bovine brain, L. N. Das and Robert C. McClure, University of Missouri School of Veterinary Medicine. Genetic influence of growth gradients upon vertebral morphology, Paul B. Sawin, Dorcas D. Crary, and Judith Laubscher, Roscoe B. Jackson Memorial Laboratory.

Contributed Papers, Session XIV. Developmental Biology, III. Hans Laufer, Johns Hopkins, will preside. The in vitro inhibitory effect of thalidomide on the chick embryo, T. E. Smith, Jr., W. O. Berndt, J. F. O'Leary, and D. J. Cavanaugh, U.S. Army Chemical Research and Development Laboratories, Edgewood Arsenal, Md. Synthesis of collagen in the developing chick cornea, John R. Coleman, Heinz Herrmann, and Barbara E. Bess, University of Connecticut. The role of chordamesoderm in chick cephalogenesis, Nina W. Hiliman, Temple. Quantitative and histochemical analyses of alkaline phosphatase in adult tissues and larvae of the sea urchin, *Strongylocentrotus purpuratus*, Richard B. Lyons and David D. Weaver, University of Oregon Medical School. Some effects of temperature on growth and sexual differentiation in *Hydra littoralis*, Helen D. Park and Anne B. Ortmeyer, National Institutes of Health. The intracellular differentiation of cilia, Richard W. Siegel and Larry W. Cohen, University of California, Los Angeles. Effect of 5-fluorouracil on pupal development in *Ephestia*, Wilhelm Muth, University of Rochester. The origin of the sternopleural sclerite in *Drosophila*, Curt Stern, University of California, Berkeley. Effects of maleic hydrazide upon development in *Drosophila melanogaster*, Donald J. Nash, Rutgers.

New Concepts Regarding Biological Control Mechanisms. Part IV. Transport Across Cell Membranes. (Same sponsors and arrangers as for Parts I–III.) For details, see program of AAAS Section N.

U.S. and International Programs in Biological Oceanography. Part II. (Same sponsors and arrangers as for Part I.) For details see program of Society of Systematic Zoology.

Contributed Papers, Session XV. Animal Behavior and Sociobiology, IV. Social and Feeding Behavior. (Same sponsors as for parts I–III.) G. W. Barlow, University of Illinois, will preside. The digging out of trapped or buried ants by other workers, Helen Forrest, Rutgers. Ball-rolling behavior of *Canthon pilularius* (L.) (Coleoptera, Scarabaeidae), Eric G. Matthews, University of Puerto Rico. Food discrimination in kangaroo rats, Robert D. Burns, University of Oklahoma. Reciprocal food sharing of gibbons, Ronald J. Schusterman and Gershon Berkson, Yerkes Laboratories of Primate Biology, Orlando, Fla. Field observations of howler monkeys, Irwin S. Bernstein, Yerkes Laboratories of Primate Biology. Stochastic laws of a primate society, S. A. Altmann, University of Alberta. Hierarchical behavior in the deer mouse, *Peromyscus leucopus*, in the laboratory, Walter Sheppe, University of Buffalo. Marine animal sounds of the Queensland coast, James M. Moulton, Bowdoin. Courtship and sound production in the sand fiddler, *Uca pugilator*, Michael Salmon, University of Maryland.

Contributed Papers, Session XVI. Comparative Endocrinology, I. C. Donnell Turner, Duquesne, will preside. Role of gamete-shedding substance from starfish nerves, Alfred B. Chaet and Robert Smith, American University. Ultrastructural properties of extrinsic and intrinsic secretory granules within the corpus cardiacum of *Leucophaea maderae*, Berta Scharrer, Albert Einstein College of Medicine. Chemical analysis of the blood, fat body, and ovaries, of the blowfly: the effect of the hormonal environment, Charles W. Orr, Johns Hopkins. Seasonal cycle in the hypothalamic neurosecretory system of *Diadophis punctatus*, Robert L. Philibert and F. I. Kamemoto, University of Missouri. Metabolic and cytologic evidence of pineal inhibition by continuous light, W. B. Quay, University of California, Berkeley. The morphology of the neurosecretory system in a strain of rats with familial hypothalamic diabetes insipidus, Hilda Weyl Sokol and Heinz Valtin, Dartmouth Medical School. Neural timing of ovulation in immature rats treated with gonadotrophin: effect of light, William F. Strauss and Roland K. Meyer, University of Wisconsin. Gonadotrophin-releasing activity of sheep median eminence extracts, Donald C. Johnson and Emil Witschi, University of Iowa.

Contributed Papers, Session XVII. Developmental Biology, IV. Samuel Bieber, Wellcome Research Laboratories, will preside. Development of the skull of *Rana sylvatica*: a morphological and histochemical investigation, Joseph Feinsmith, City College of New York. Increase in numbers of nuclei in striated muscle fibers, William B. Muchmore, University of Rochester. Calcium content of the amphibian blastocoel fluid, Louis T. Stableford, Lafayette. The nature and origin of "ECM," a putative mediator of mutual cellular adhesions, Malcolm S. Steinberg, Johns Hopkins. Ribonucleic acid as a genotropic agent, M. C. Niu, Rose Cerroni, and P. Pivar, Temple University. Studies on the active component of the ascites fluid, Lillian C. Niu, Temple University. Protein biosynthesis: a marker for RNA specificity, Carl Cordova, C. L. Radbill, L. C. Niu, and M. C. Niu, Temple University. Differential activities of RNA fractions isolated from calf liver nuclei, Philip Nash and M. C. Niu, Temple.

Contributed Papers, Session XVIII. Radiation Biology. Anna R. Whiting, University of Pennsylvania, will preside. Oxidative phosphorylation in mitochondria from irradiated rats, James C. Hall and Allan L. Goldstein, Rut-

gers. Changes in sperm DNA irradiated in vivo with visible light, Charles Norman and R. Segina, West Virginia University. The effect of x-ray irradiation on the cornea of the axolotl (*Siredon mexicanum*), Victor V. Brunst, Roswell Park Memorial Institute, Buffalo. Time-lapse motion pictures of ultraviolet versus x-ray irradiation of *Arbacia* gametes and zygotes, Carl Caskey Speidel, University of Virginia School of Medicine, and Ralph Holt Cheney, Brooklyn College. Sensitive and resistant time stages of *Arbacia* zygotes to gamma or ultraviolet irradiation during the first cleavage cycle, Ralph Holt Cheney and Carl Caskey Speidel.

Contributed Papers, Session XIX. Invertebrate Zoology. Horton H. Hobbs, U.S. National Museum, will preside. A preliminary account of the life cycle of *Kowalewskius parvula* (Kowalewski, 1904; Yamaguti, 1959) Cestoda: Hymenolepididae, Dominic L. DeGiusti and Newton Kingston, Wayne State University. Observations on movements of infective oncospheres from the tapeworm, *Hymenolepis diminuta,* Robert E. Ogren, D. R. Rilling, and C. A. Wellington, Dickinson. A new host and habitat for a branchiobdellid, Perry C. Holt, Virginia Polytechnic Institute. The effect of environmental factors on the respiration of *Tubifex tubifex,* Dona J. Fowler and Clarence J. Goodnight, Purdue. Development and function of neurosecretory sites in the eyestalks of larval *Palaemonetes* (Decapoda; Natantia), Jerry H. Hubschman, Robert A. Taft Sanitary Engineering Center, Cincinnati. The location and development of certain crustacean tegumental glands, J. Ross Stevenson, Kent State University. Histology of the bivalve rectum, Michael J. Greenberg and T. C. Jegla, University of Illinois. Surface behavior of the gastropod, *Pomacea* (*Ampullaria*) *paludosa,* Andrew McClary, University of Wisconsin. The role of the coelomic fluid in the transport of nutrients in the starfish, *Asterias forbesi,* John Carruthers Ferguson, Cornell. Occurrence and possible function of "related metals" in three species of *Eudistoma*: recommendations for reclassification, Estees Potter Levine, Hopkins Marine Station, Stanford University.

Zoologists' Dinner, Vice Presidential Address of AAAS section on Zoological Sciences (F). Program of Section F, cosponsored by the zoological societies meeting in Philadelphia. Arranged by Charles E. Wilde, Jr., University of Pennsylvania School of Dentistry, and David W. Bishop, Carnegie Institution of Washington. Curt Stern, president of the American Society of Zoologists, will preside. Genes and the study of behavior, by Ernst W. Caspari, University of Rochester, vice president for Section F.

Sunday 30 December

Space Biology and Life Support Problems of Manned Space Flight. Part I. Symposium, program of the American Physiological Society and NASA, cosponsored by the American Society of Zoologists. Arranged by Freeman H. Quimby, William A. Lee, and Orr E. Reynolds, NASA, and Robert Smith, University of California, Los Angeles. For details see program for American Physiological Society.

Sampling for Zoologists. Program of the Biometric Society ENAR, cosponsored by the American Society of Zoologists. For details, see program for Biometric Society.

The Regulation and Function of Heterosynthetic and Autosynthetic Molecules in Developmental Processes. Part I. Symposium, organized for the Division of Developmental Biology in memory of Dr. A. Mandel Schechtman (1909–62) by a committee as follows: George W. Nace, University of Michigan, chairman; Robert DeHaan, Carnegie Institution of Washington; Reed Flickinger, University of California, Davis; and Laurens Ruben, Reed College. Meredith Runner, University of Colorado, will preside. Introductory remarks on macromolecular manipulations in developmental processes, Albert Tyler, California Institute of Technology. Transfer of native and foreign serum antigens to oviducal mouse embryos, Laurel E. Glass, University of California Medical School, San Francisco. Liver synthesis, plasma transport, and alterations accompanying passage of yolk proteins in egg-laying vertebrates, Ole Arne Schjeide, University of California School of Medicine, Los Angeles. The mechanism of blood protein uptake by insect oocytes, William H. Telfer, University of Pennsylvania.

Energetics. Part I. Symposium, arranged by L. R. Slobodkin, University of Michigan, for the Division of Comparative Physiology. Slobodkin will preside. Photosynthetic energetics, T. R. Punnett, University of Rochester. Chemosynthetic energetics, W. Vishniac, University of Rochester. Nutritional energetics of protozoa, J. J. Blum, Duke.

Contributed Papers, Session XX. Animal Behavior and Sociobiology, VI. Learning and Study Mechanism. P. B. Siegel, Virginia Polytechinc Institute, will preside. The analogue lab: a new kind of teaching device, Howard S. Hoffman, Pennsylvania State University. Discrimination counting in birds, Nicholas Pastore, Queens College, New York. Discrimination on the basis of reinforced and non-reinforced stimulus input in the mynah (*Gracula religiosa*), Joseph H. Grosslight and Barry L. Lively, Kent State University. Learning set formation in young chickens, Marlene Alpert, M. W. Schein, C. H. Beck, and J. M. Warren, Pennsylvania State University. Maze learning and hierarchy position in the fish *Xiphophorus helleri,* Richard H. Gude and James C. Braddock, Michigan State University. Studies in behavior using the "microorganism motion monitor," Demorest Davenport. New apparatus for studying behavior of fishes under varying illumination, Kenneth R. John, Franklin and Marshall College, and Harold Krall, Radio Corporation of America.

Contributed Papers, Session XXI. Comparative Endocrinology, II. Richard A. Edgren, Wyeth Laboratories, Radnor, Pa., will preside. Dynamics of tissue-cultured melanophore responses to hormones, as revealed by frame analysis, Ronald R. Novales and Barbara J. Novales, Northwestern. Postnatal induction of ovogenesis in the rabbit (*Oryctolagus cuniculus*), Raymond Teplitz and Susumu Ohno, City of Hope Medical Center, Duarte, Calif. Gonadotrophin analysis in androgenized rats by use of parabiosis, Emil Witschi and Donald C. Johnson, State University of Iowa. Differentiation of fetal rat ovaries following transplantation to kidneys and testes of adult hosts, C. Donnell Turner and Hiroshi Asakawa, Duquesne. The pituitary-blocking effect of various steroids in the hemicastrate rat, Deann L. Peterson, R. A. Edgren, and R. C. Jones, Wyeth Laboratories. The decidual cell response in the golden hamster, John G. Turnbull, Louisiana State University. Intraocular autotransplants of corpora lutea of pseudopregnancy: hamster, Albert C. Kirby and George C. Kent, Jr., Louisiana State University. The PAS reaction and the mouse estrous cycle, Robert J. Merklin, Jefferson Medical College, Philadelphia. Growth-promoting

effect of testosterone in tadpoles, Milton Eisler and Leon Helman, Montefiore Hospital, New York City.

Contributed Papers, Session XXII. Cytology. Theodore R. F. Wright, Johns Hopkins, will preside. Anomalous meiosis in living cricket spermatocytes, Laurence Levine, Wayne State. An electron microscope study of nebenkern formation and differentiation in the spermiogenesis of an hemipteran insect, Susan Allison Pratt, University of Rochester. The ring canals of *Drosophila*, E. H. Brown and R. C. King, Northwestern. Vitelline membrane formation in *Drosophila*, Elizabeth A. Koch and R. C. King, Northwestern. Chorion formation in *Drosophila*, R. C. King and Elizabeth A. Koch. Studies on the ultrastructure of teleost blood cells, Eva Lurie Weinreb, Cornell University Medical College. Virus array in lymphocystis cells of sunfish, Roland Walker, Rensselaer Polytechnic Institute, and Ken Wolf, Eastern Fish Disease Laboratory, Kearneysville, West Va.

Space Biology and Life Support Problems of Manned Space Flight. Part II. Symposium. (Same sponsors and arrangers as for part I.) For details see program of American Physiological Society.

Energetics. Part II. Symposium. (Same sponsor and arranger as for part I.) K. Schimdt-Nielsen, Duke, will preside. Energetics of muscular contraction, K. F. Guthe, University of Michigan. Energetics of populations, L. R. Slobodkin. Irreversible thermodynamic processes, I. Prigogine, University of Liége, Belgium.

The Regulation and Function of Heterosynthetic and Autosynthetic Molecules in Developmental Processes. Part II. Symposium (Same sponsors and arranger as for part I.) Heterosynthetic and autosynthetic antigens in the early stages of frog development, George W. Nace, University of Michigan. Control of cellular differentiation by regulation of protein synthesis, Reed A. Flickinger, University of California, Davis. The interaction of environmental stimuli and inherited susceptibility to congenital deformity, C. P. Dagg, Jackson Memorial Laboratory, Bar Harbor, Maine. The labile chorioallantoic membrane; changes effected by antibodies and viruses, James D. Ebert, Carnegie Institution of Washington.

Contributed Papers, Session XXIII. Comparative Endocrinology, III. Donald C. Johnson, State University of Iowa, will preside. Metabolism of I-125 in the goldfish, *Carassius auratus* L., Benjamin N. Bouman and Walter Chavin, Wayne State. Thyroid response to perchlorate and thiourea in developing *Porichthys notatus,* Sister Marie Therese Dimond, Trinity College, Washington, D.C. Effects of thyroidectomy on the fine structure of the salamander pituitary gland, Robert Cardell, Edsel B. Ford Institute for Medical Research, Detroit. Seasonal changes in the hematopoietic potency of pituitary glands of the perch (*Perca fluviatilis* L.), Anna M. Slicher, Yale, and Donald R. Swift, Freshwater Biological Association, United Kingdom. Autotransplantation of the pituitary in the red eft, Sandra Kazahn Mazur, Albert Einstein College of Medicine and City College of New York. Parathyroid-mediated hydroxyproline levels during peritoneal lavage, William K. Bates, Charles Yates, and Roy V. Talmage, Rice. Increased parathyroid activity caused by addition of sodium fluoride to peritoneal lavage, S. B. Doty, Charles Yates, and Roy V. Talmage. Comparative effects of mammalian corticotropin and chicken pituitary extracts on in vitro corticoid production by chicken adrenals, Roger deRoos and Carolyn deRoos, University of Missouri. Isotopic determinations of blood volume in intact and regenerated rat adrenals during cold stress, Norma J. Kolthoff, I. A. Macchi, and Leland C. Wyman, Boston University.

Contributed Papers, Session XXIV. Experimental Biology. Robert D. Allen, Princeton, will preside. Studies on cell aggregation in marine sponges, Gustave A. Candelas and Graciela C. Candelas, University of Puerto Rico. The effects of ethylene glycol and glycerine on the freezing of rabbit spermatozoa, Richard R. Fox and J. F. Burdick, Roscoe B. Jackson Memorial Laboratory. Age-related changes in the DNA of non-dividing cells, M. Richard Segina and Charles Norman, West Virginia University. Endocrine differences of audiogenic-seizure-susceptible and -resistant female Wistar rats, A. M. Sackler, A. S. Weltman, A. S. Kreger, H. Owens, and R. Jacobs, Brooklyn College of Pharmacy. Bone resorption after tenotomy and fluoride treatment in rabbits, Robert J. Toft, Bowdoin College. Immunological distances among some gallinaceous birds as determined by red blood cell antigens, Bob G. Sanders and Leslie I. Novikoff, Lafayette. Drosopterins in the dewlap of some anoline lizards, Evelina Ortiz, University of Puerto Rico. Collection of mucus from the newt, *Diemictylus viridescens,* with pilocarpine stimulation, Sophie Jakowska, New York Aquarium. Adaptive utilization of propionate by *Polytomella agilis,* Marvin H. Cantor and T. W. James, University of California, Los Angeles.

In addition, 68 papers are to be presented by title only. For a complete listing, consult the General Program.

Herpetologists' League

Thursday 27 December

Contributed Papers. Arranged by Wade Fox, Jr., Louisiana State University School of Medicine, New Orleans; vice president, Herpetologists' League. Herndon G. Dowling, New York Zoological Society, will preside. *Thamnophis proximus,* a valid species of garter snake, Douglas A. Rossman, University of North Carolina. Supposed mimicry in salamanders, Lowell P. Orr, Kent State University. The use of paratoid secretion chromatograms of the genus *Bufo* as a taxonomic character, Frederick Schuierer, Cabrillo College. Some observations on the geckos of West Pakistan, Sherman A. Minton, Jr., New York, N.Y. Variation in the ringneck snakes of the Southwest and Mexico, Frederick R. Gehlbach, University of Michigan. The biology of *Uta stanstburiana* in the Colorado River area, Wilmer W. Tanner, Brigham Young University. The turtles of Panama: preliminary report on relationships and distribution, John M. Legler, University of Utah. Homing and orientation in three species of anuran amphibians, Denzel E. Ferguson, A. M. Hammond, and C. E. Boyd, Mississippi State University. Cases of insecticide resistance in three species of vertebrates, Claude E. Boyd, S. B. Vinson, and D. E. Ferguson, Mississippi State University. Reptiles of the Galapagos, Herndon G. Dowling, New York Zoological Society.

Saturday 29 December

Visit to Philadelphia Zoological Gardens.

Society of Systematic Zoology

Thursday 27 December

Principles and Methods of Phylogeny. Parts I and II. Symposium, program of the American Society of

Naturalists, cosponsored by the American Society of Zoologists and the Society of Systematic Zoology. Arranged by Ernst Caspari, University of Rochester. For details see program for American Society of Naturalists.

Friday 28 December

Contributed Papers. Curtis W. Sabrosky, president of the Society of Systematic Zoology, will preside. On the distribution of the genus *Xironogiton* (Branchiobdellidae; Oligochaeta), Perry C. Holt, Virginia Polytechnic Institute. Trap-nesting for solitary wasps and bees, a useful taxonomic tool, Karl V. Krombein, U.S. Department of Agriculture, Washington, D.C. Some implications of host relationships among the disk fishes, family Echoneidae, Ernest A. Lachner, U.S. National Museum. Weaknesses and controversial points in the new international code of zoological nomenclature, Curtis W. Sabrosky.

U.S. and International Programs in Biological Oceanography. Part I. Panel, program of the Society of Systematic Zoology, cosponsored by the American Society of Zoologists, the American Society of Limnology and Oceanography, and AAAS section F. Curtis W. Sabrosky will preside. U.S. National Museum Oceanographic Sorting Center, I. Eugene Wallen, Smithsonian Institution. Indian Ocean expedition, John H. Ryther, Woods Hole Oceanographic Institution. Tropical Atlantic oceanographic investigations, Vernon E. Brock, Bureau of Commercial Fisheries, Biological Laboratory, Washington, D.C. Biological oceanography organization and facilities on the *Eltanin*, George R. Toney, Office of Antarctic Programs, National Science Foundation.

Saturday 29 December

Part II. (Same sponsor as for part I.) Waldo L. Schmitt, U.S. National Museum, will preside. The Marine Biological Laboratory systematics ecology program, Melbourne R. Carriker, Marine Biological Laboratory, Woods Hole. Review of activities and plans at American marine laboratories, Dixy L. Ray, University of Washington and National Science Foundation. The Te-Vega expeditions program, Rolf L. Bolin, Hopkins Marine Station, Stanford University. The Duke University oceanographic program, Robert L. Menzies, Duke University Marine Laboratory.

Zoological and Botanical Sciences

Thursday 27 December

Biologists' Smoker. Arranged by Pat Hodge, Academy of Natural Sciences. Joint program of AAAS sections on Zoological Sciences (F) and Botanical Sciences (G), and all biological societies. All biologists are cordially invited.

American Society of Limnology and Oceanography

The American Society of Limnology and Oceanography is a cosponsor of the two-session panel, U.S. and International Programs in Biological Oceanography, of the Society of Systematic Zoology (29. Dec.). See program for Society of Systematic Zoology.

American Society of Naturalists

Thursday 27 December

Principles and Methods of Phylogeny. Part I. Symposium, program of the American Society of Naturalists; cosponsored by the American Society of Zoologists and the Society of Systematic Zoology. Arranged by Ernst W. Caspari, University of Rochester, who will preside and present introductory remarks. Evolutionary trends in the crustacea, Howard Sanders, Woods Hole Oceanographic Institution. Evolution and phylogeny in morphologically uniform groups, Walter Bock, University of Illinois. Some problems and guiding principles of flowering plant phylogeny, Robert F. Thorne, Santa Ana Botanic Garden, Claremont, Calif. Experimental approaches to the phylogeny of bacteria, Arnold W. Ravin, University of Rochester.

Part II. (Same sponsor and arranger as for part I.) Colin S. Pittendrigh, Princeton, will preside. On the variability of biochemical structures and metabolic systems, Seymour S. Cohen, University of Pennsylvania. Phylogeny and the dimension of time, Edwin H. Colbert, American Museum of Natural History. Cytology and phylogeny of *Drosophila*, Marvin Wasserman, Queens College.

Friday 28 December

Presidential Address. Ernest W. Caspari will preside and present the address, "What is a fauna?"

Biomedical Information-Processing Organization (BIO)

Friday 28 December

Computer Programs To Aid Biology and Medicine. Session of invited papers, arranged by Robert S. Ledley, National Biomedical Research Foundation, Silver Spring, Md., who will preside. Literal models by computer printout, M. O. Dayhoff, National Biomedical Research Foundation. Game theory in problems of public health and medicine, C. D. Flagle, Johns Hopkins. Photomicrographic analysis by computers, L. S. Rotolo, National Biomedical Research Foundation. Use of digital computers for electrocardiogram analysis, T. Y. Young, Johns Hopkins.

Biometric Society, ENAR

The program of the Biometric Society, concerned with the statistical aspects of biology, is included under AAAS section U.

Ecological Society of America

Meeting committee chairman: Robert B. Platt, Emory.

Wednesday 26 December

Contributed Papers. General Ecology. Philip R. Pearson, Jr., Temple, will preside. Population studies of the highlands salamander, *Plethodon jordani* melaventris, James A. MacMahon, Dayton (Ohio) Museum of Natural History, and Robert E. Gordon, University of Notre Dame. A quantitative method for jackrabbit stomach content analysis, W. E. Saul and J. B. Echo, U.S. Atomic Energy Commission. The role of earthworms in the decomposition of leaf litter in three types of deciduous forests, Albert E. Augustson and Richard E. Puetz, University of Wisconsin. Nesting behavior of *Isodontia harrisi* Fernald (Hymenoptera; Sphecidae), C. S. Lin, Huston-Tillotson College. Germination influencing substances in living and dried plants, Robert T. Brown, Michigan College of Mining and Technology. A radiocarbon-dated pollen profile from sunbeam prairie bog, Darke County (Ohio), Ronald O. Kapp, Alma College, and Ansel M. Gooding, Earlham. Distribution of *Larrea* in relation to a temperature inversion in

Yucca Flat, Nevada, Philip V. Wells, University of Kansas and Lora M. Shields, New Mexico Highlands University. The ecology of forest toposequences in the central Appalachians, W. A. van Eck and R. L. Smith, West Virginia University. Phytocenology of forest toposequences in the central Appalachians, van Eck and Smith. Phytosociology of some red pine forests in the Lake Superior region, Frederick B. Bevis, Michigan College of Mining and Technology. Terminal northern hardwood forests in northeastern Minnesota, E. Flaccus, University of Minnesota, and L. F. Ohmann, Rutgers.

Thursday 27 December

Contributed Papers. Radioecology, Part II. Radioisotope Studies. Program of the Ecological Society of America, cosponsored by the American Society of Zoologists. Arranged by Francesco B. Trama, Rutgers, for the Radioecology Committee. Stanley I. Auerbach, Oak Ridge National Laboratory, will preside. Use of specific activities for interpretation of ecological tracer studies, Daniel J. Nelson, ORNL. Observations on the movement of radionuclides in selected marine environments, Thomas W. Duke, U.S. Bureau of Commercial Fisheries. Studies of root extension by the use of I-131, Frank W. Woods, M. L. McCormack, M. D. Ferrill, and W. A. Hough, Duke and Southern Illinois University. Cycling of cesium-134 in white oak trees, John P. Witherspoon, ORNL. Influence of environmental factors on microbial immobilization of certain radionuclides in forest litter, Martin Witkamp, ORNL. Radioecological studies of millipedes (*Dixidesmus erasus*), D. A. Crossley, Jr., ORNL.

The Evolution of Behavior. Part I. Joint program of the Division of Animal Behavior and Sociobiology of the American Society of Zoologists and the Section of Animal Behavior and Sociobiology of the Ecological Society of America, cosponsored by AAAS section on Psychology (I). Arranged by William Dilger, Cornell. For details, see program for section I.

Contributed Papers. Radioecology, Part II. Radiation Effects Studies. (Same sponsors and arranger as for part I.) Francesco B. Trama will preside. Immediate effects of a nuclear detonation on desert vegetation, William E. Martin, University of California. Some influences of an underground nuclear detonation on close-in populations of whiptailed lizards (*Cnemidophorus tigris*) at the Nevada Test Site, Frederick B. Turner, University of California. Accumulation of Cs-137, Sr-90 in forage, humans, and milk from ecologically dissimilar areas, Robert C. Pendleton, C. W. Mays, R. D. Lloyd, A. L. Brooks and H. G. Pollock, University of Utah. Environmental effects of iodine-131 in milk and humans, Robert C. Pendleton, A. L. Brooks, C. W. Mays, and R. D. Lloyd, University of Utah. Variation in jackrabbit bone strontium-90 with age and fallout, Zola M. Fineman and R. McBride, U.S. Atomic Energy Commission. Miniature glass rod dosimeters in radiation ecology, Stephen V. Kaye, ORNL. Hematology of cotton rats on a radioactive area, Paul B. Dunaway, ORNL. Close-in effects of an underground nuclear detonation on small mammals at the Nevada Test Site, Clive D. Jorgensen and Donald M. Allred, Brigham Young University. The oxygen effect with respect to radiation dose–survival curves for microorganisms, A. A. van Soestbergen, Mercy Hospital, Toledo.

The Evolution of Behavior. Part II. For details see program for section I.

Friday 28 December

Contributed Papers. Fresh Water and Marine Ecology, Ruth Patrick, Academy of Natural Sciences of Philadelphia, will preside. Experimental epidemics in the host-parasite system *Hydra* and *Hydramoeba hydroxena*, Alan E. Stiven, University of North Carolina. A comparative study of carbohydrate metabolism in fish as affected by temperature and exercise, John Mark Dean and Clarence J. Goodnight, Purdue. Changes in the planktonic and suspended-matter load of tidal waters as related to populations of suspension feeders, Nelson Marshall, Bernice Wheeler, and Johnes K. Moore, University of Rhode Island. Studies on the food habits of whiting, redfish, and pollock in the Gulf of Maine, Ralph W. Dexter, Kent State University. Patterns of survivorship in laboratory populations of freshwater fairy shrimp, *Eubranchipus vernalis* (Verrill), Charles H. Southwick, A. J. Reading, and Brenda K. Sladen, Johns Hopkins. Annual fluctuations in the fairy shrimp populations of certain ponds in Illinois and Ohio, 1936–62, Ralph W. Dexter. The effects of an artificial impoundment on the benthic organisms, James J. Sawtell, Rutgers. Successful relations of major communities in shallow coastal waters of the Caribbean, Bruce L. Welch, College of William and Mary.

Contributed Papers. Conservation and Human Ecology. Ian McHarg, University of Pennsylvania, will preside. The inadequacy of Newtonian mechanics as a mathematical model for ecological systems, Harry Lobel, Nebraska Iowa Electrical Council. Ecological understanding diminishes with increasing environmental uniformity, John Brainerd, Springfield College. Putting our technobiological ecology in balance, John A. Waring, research writer and consultant. Stochastic laws of a primate society, S. A. Altmann, University of Alberta. Human ecology as a science, George B. Happ, Institute of Human Ecology.

Population Endocrinology. Symposium, program of the Ecological Society of America; cosponsored by the American Society of Zoologists. Arranged by John J. Christian, Albert Einstein Medical Center, who will preside. Influence of population density on the weight and histology of the woodchuck (*Marmota monax*), James A. Lloyd, Zoological Society of Philadelphia. Behavioral and physiological correlates of density and subordination, F. H. Bronson, Jackson Memorial Laboratory. Measurements of adrenal steroid levels from laboratory populations of house mice, Paul G. Pearson, Janet Anilane, and John L. Gerlach, Rutgers. Endocrine adaptation to chronic environmental stimuli, Rodney T. Houlihan, Pennsylvania State University. The effects of grouping and social rank on the endocrine organs of chickens, G. L. Flickinger, R. L. Snyder, and H. L. Ratcliffe, University of Pennsylvania. Catechol amine content of the adrenal medulla of mice at different densities of groupings, Bruce L. Welch. Seasonal endocrine changes in cottontail rabbits, Vernon Stevens, Ohio State University.

In addition to these programs there will be six sessions of contributed papers on animal behavior and sociobiology—joint programs of the Division of Animal Behavior and Sociobiology of the American Society of Zoologists and the Section of Animal Behavior and Sociobiology of the Ecological Society of America. See the program of the American Society of Zoologists.

Saturday 29 December

Field Trip to Pine Barrens of New Jersey. Joint program of the Ecological Society of America and the Philadelphia Botanical Club. Arranged by Robert H. MacArthur, University of Pennsylvania. For details, consult the General Program.

Sunday 30 December

Statistical Problems of Ecology. Program of AAAS section on Statistics (U), cosponsored by the section on Zoological Sciences (F) and the Ecological Society of America. Arranged by Jerzy Neyman, University of California. Lamont C. Cole, Cornell, will preside. For details, see program of Section U.

Mountain Lake Biological Station

Saturday 29 December

Annual Breakfast, meeting of former students, investigators and staff. Arranged by C. Willard Hart, Jr., Academy of Natural Sciences of Philadelphia. Horton H. Hobbs, Jr., U.S. National Museum, will preside.

National Association of Biology Teachers

For details, see the coordinated programs of the Science Teaching Societies.

Society for the Study of Evolution

This society is a cosponsor of the session on genetics in the joint program of the section on Statistics (U) and the Biometric Society ENAR. For details, see program of Section U.

Botanical Sciences

Wednesday 26 December

Contributed Papers. Harriet B. Creighton, Wellesley, will preside. Observations on the development of the date palm (*Phoenix dactilifera*), Theodor Philipp Haas. The antibiotics of *Sargassum natans* and *Sargassum fluitans* related to epiphyte, pariphyte, and parasite load with respect to distribution of the center of the Sargasso Sea, John T. Conover, Narragansett Marine Laboratory, University of Rhode Island. Recognized bamboos of the genus *Arundinaria* (Gram: Bambusoideae) native in the Western Hemisphere, F. A. McClure, Smithsonian Institution. Remarks on a new anatomical feature in the rhizome of *Arundinaria tecta*, Yang-No Lee, Ewha Woman's University. Variation in the *Scirpus cyperinus* complex, Alfred E. Schuyler, Academy of Natural Sciences of Philadelphia.

Thursday 27 December

Plant Biology Today. Advances and Challenges, Part I. Symposium, joint program of AAAS section on Botanical Sciences (G) and the Botanical Society of America. Arranged by Harriet B. Creighton, who will preside. Phytochrome and the red-far red system in plants, Bruce A. Bonner, Harvard. Modern concepts of cell behavior, Herbert Stern, University of Illinois. Studies of root development in vitro, John G. Torrey, Harvard.

Botanists' Luncheon and Vice-Presidential Address. Harriet B. Creighton will preside. Are bacteria and fungi related?, John N. Couch, University of North Carolina; vice president for Section G.

Plant Biology Today. Advances and Challenges, Part II. Symposium. (Same sponsor, arranger, and presiding officer as for part I.) Concepts of shoot growth, Ralph O. Erickson, University of Pennsylvania. Long-distance transport in large intact plants, Martin H. Zimmerman, Harvard. Modern research on evolution in the ferns, Warren H. Wagner, Jr., University of Michigan.

American Phytopathological Society

The society is a cosponsor of the symposium Plant Biology Today, Botanical Sciences (G). For details, see program of Section G.

Philadelphia Botanical Club

The program includes an illustrated lecture, The flora of Philadelphia and vicinity, by Edgar T. Wherry, University of Pennsylvania, and a field trip to the Pine Barrens of New Jersey. For more details, see program of the Ecological Society.

Anthropology

Wednesday 26 December

Contributed Papers. Ruth Bunzel, Columbia, will preside. Drake's island of thieves—ethnological sleuthing, William A. Lessa, University of California. Citizenship and sources of political authority in the Marianas, Robert R. Solenberger, Pennsylvania State Teachers College. Significant parallels in Dongson and Mochica art, Douglas Fraser, Columbia. Human behavior and the contagious diseases: research problems in the study of leprosy, Zachary Gussow, Louisiana State University. Motives for the practice of male circumcision among preliterate and literate peoples, Charles Weiss, Albert Einstein Medical Center. Non-European heritage of western civilization, Alexander Grigolia, Eastern Baptist Theological Seminary.

Thursday 27 December

Ethnic Minorities Around the World. Policies and Cases. Part I. Symposium, arranged by Morton Fried, Columbia, who will preside. Australia: The Tiwi see themselves as the dominant minority, Arnold R. Pilling, Wayne State University. Canada: An aspect of domestic group structure among northern Canadian hunting societies, R. W. Dunning, University of British Columbia. United States, 1: The Wisconsin Winnebago, tribe-minority group-tribe, Nancy Lurie, University of Michigan. United States, 2: The American white, a social science view, Kenneth Clark, City College of New York.

Part II. (Same arranger and presiding officer as for part I.) Portuguese Africa: When the majority is a minority: the case of Mozambique, Eduardo Mondlane, Syracuse. West Africa: The African "stranger" in West Africa, Elliott Skinner, New York University. Brazil: Race, class, and descent in Brazil, Marvin Harris, Columbia. Japan and Viet-Nam: Majority-minority relations in east Asia—the Eta in Japan and the Chinese in Viet-Nam, John D. Donoghue, Michigan State University.

Saturday 29 December

Analytic Methods I. Contemporary Uses of Sociological Methods in the Anthropological Study of Complex Societies. Symposium, program of AAAS

section on Anthropology (H), cosponsored by the section on Social and Economic Sciences (K). Arranged by Pauline Mahar Kolenda, who will preside. Some ethnographic uses of Guttman scaling analysis, Ward H. Goodenough, University of Pennsylvania. Sampling methods in cross-cultural research, Judith Brown, Michigan State University. Social surveys in cross-cultural perspective: some theoretical considerations, Gideon Sjoberg, University of Texas. Comparative field techniques in two African urban towns, William B. Schwab, Temple University.

Dating Man and the Pleistocene, Part I. Symposium, joint program of AAAS sections on Anthropology (H) and Geology and Geography (E). Arranged by Ralph S. Solecki, Columbia, and Sheldon Judson, Princeton, who will preside. Geochronology and temporal problems, Terah L. Smiley, University of Arizona. The dating of early man and his cultures by the potassium-argon method, J. F. Evernden and G. H. Curtis, University of California. Uranium disequilibrium studies in the Great Basin, Aaron Kaufman, Lamont Geological Observatory. Methodological problems of C^{14} dating, Elizabeth K. Ralph, University of Pennsylvania. Late Cenozoic stratigraphy and the evolution of the Hominidae, Cesare Emiliani, University of Miami.

Analytic Methods II. Linguistic Analysis and Cultural Problems. (Same sponsor as for part I.) Arranged by Muriel Hammer, Columbia, who will preside. The gathering of linguistic data in natural settings, Vera John, University of Rochester, and William F. Soskin, McLean Hospital. Statistical distribution of modes of qualifying: a cross-cultural study, Murray S. Miron, University of Illinois. The study of second language acquisition, Susan M. Ervin, University of California. Multiple alternatives in semantic analysis, Robbins Burling, University of Pennsylvania.

Dating Man and the Pleistocene, Part II. Symposium. (Same sponsor, arrangers, and presiding officer as for part I.) Fossil mammals and man in Asia, D. A. Hooijer, Rijksmuseum van Natuurlijke Historie. Dating early man in Java and Africa, G. H. R. von Koenigswald, Mineralogisch-Geologisch Instituut, der Rijks-Universiteit te Utrecht. Dating methods and American archaeology, Frederick Johnson, Robert S. Peabody Foundation for Archaeology. A roundtable discussion will follow.

Vice Presidential Address. Eleanor Leacock, secretary of the Anthropology Section (H), will preside. The speaker will be William S. Laughlin, University of Wisconsin; vice president for Section H.

Sunday 30 December

Analytic Methods III. The Logic of Archaeology. Symposium. (Same sponsor as for parts I and II.) Arranged by Robert Ascher, Cornell, who will preside. Some assumptions in archaeological interpretation, Raymond H. Thompson, University of Arizona. The processing and presentation of archaeological data, George L. Cowgill, Brandeis. Towards a science of prehistory, Kwang-Chih Chang, Yale. Interaction spheres in prehistory, Joseph R. Caldwell, Illinois State Museum. A review of archaeological interpretations of religious and social data, William H. Sears, University of Florida. A review of archaeological problems in Chibcha Territory, Columbia, Sylvia M. Broadbent, Barnard. The function of archaeology in historic site research, John L. Cotter, U.S. Department of the Interior.

Culture and the Direction of Human Evolution. Symposium, program of the Anthropology Section (H), cosponsored by the Zoology Section (F). Arranged by Stanley M. Garn, Antioch, who will preside and present the first lecture, Culture and the direction of human evolution. Some comments on dental facial evolution, Albert A. Dahlberg, University of Chicago. Direction of human evolution: a zoologist's view, John Crenshaw, University of Maryland. Interpreting the evolution of the brain, Harry Jerison, Antioch. Cultural determinants of biochemical evolution, Samuel Boyer, Johns Hopkins. Culture and biosocial evolution, William Etkin, City College of New York. The summation of cultural direction of human evolution, Theodosius Dobzhansky, Rockefeller Institute.

Analytic Methods IV. The Structure of Meaning Systems. Symposium. (Same sponsor as for parts I–III.) Arranged by Anthony Leeds, Pan American Union, who will preside. Studies in the cross-cultural generality of meaning systems, I: an analysis of the stimulus and responses characteristic of restricted associations, Murray S. Miron, University of Illinois. Meaning systems and crises of identity: paradigms, Benjamin Nelson, State University of New York. Binary opposition and linear progression: the ideological structure in Buddhism, Robert J. Miller, University of Wisconsin. A formal analysis of ideological components of behavior, Richard Jung, University of Pittsburgh. Some formal properties of three-place value hierarchies, Anthony F. C. Wallace, University of Pennsylvania.

Psychology

Saturday 29 December

The Concept of Maturity. Symposium, program of Psychology Section (I), cosponsored by the Society for Research in Child Development. Arranged by Dale B. Harris, Pennsylvania State University, who will preside. Maturity as a biological concept, Wilton M. Krogman, Philadelphia Center for Research in Child Growth. Concepts of maturity, physiological aspects, Nathan W. Shock, Baltimore City Hospitals. The concept of maturity in psychiatry, Leon Saul and Sydney Pulver, University of Pennsylvania. Psychological explorations in the concept of maturity, F. R. Wake, Carleton. The concept of maturity in contemporary philosophy, Bernard J. Boelen, Duquesne.

Contributed Papers. Memory, Arthur W. Melton, University of Michigan, will preside. Reading out the visual buffer storage, Emanuel Averbach, Bell Telephone Laboratories. The relation between the visual image and postperceptual memory, Jane F. Mackworth, Defence Research Medical Laboratories, Toronto. A forced-choice technique for the study of recognition memory under steady-state conditions, Roger N. Shepard and Jih-Jie Chang, Bell Telephone Laboratories. Immediate memory as a function of repetition, Nancy C. Waugh, Harvard University. Associative memory over brief intervals of time, Lloyd R. Peterson, Indiana University. The influence of relationships among items to be recalled upon short-term retention, L. Starling Reid, University of Virginia. Retention as a function of degree of learning and letter-sequence interference, Benton J. Underwood, Northwestern University. A reexamination of the shape of retention curves, Edward A. Bilodeau, Tulane. Recall as a form of data processing, Douwe B. Yntema, Massachusetts Institute of Technology. Memory storage as a function of arousal and time, Edward L. Walker, University of Michigan.

Sunday 30 December

Theoretical-Experimental Approaches to Memory. Symposium, arranged by Arthur W. Melton, University of Michigan, who will preside. Neurons and mnemonics, Ralph W. Gerard, University of Michigan. Flow of information within the organism, Donald E. Broadbent, Applied Psychology Research Unit, Cambridge, England. Implications of interference theory, Leo Postman, University of California. Simulation and analytic models, Earl B. Hunt, University of California.

Vice-Presidential Address. Frank W. Finger, University of Virginia, will preside. Implications of short-term memory for a general theory of memory, Arthur W. Melton, vice president for Psychology Section (I).

The Psychological Implications of Increasing Population. A Neglected Perspective. Symposium, program of the Psychology Section (I), cosponsored by the Society for the Psychological Study of Social Issues. Arranged by Esther Milner, Brooklyn College. Clarence Senior, Brooklyn College, will preside. Obstacles to programs of population control—facts and fancies, J. Mayone Stycos, Cornell. Effects of information on population control on student attitudes, Josef Garai, Pratt Institute. Some questions that need answering, Esther Milner, Brooklyn College.

The Psychology Section (I) is also a cosponsor of the following programs. The two-session symposium, The Evolution of Behavior, 27 Dec., a joint program of the Division of Animal Behavior and Sociobiology of the American Society of Zoologists and the Section of Animal Behavior and Sociobiology of the Ecological Society of America. For details see program of American Society of Zoologists. Symposium of Statistics Section (U), Developments in Mathematical Psychology, 29 Dec. For details see program of Section U. Symposium of Anthropology Section (H), Analytic Methods II (Linguistic Analysis and Cultural Problems, 29 Dec.) and IV (The Structure of Meaning Systems, 30 Dec.). For details, see program of Section H.

Society for Research in Child Development

The society is cosponsor of the symposium of the Psychology Section (I), The Concept of Maturity. For details, see program of Section I.

Society for the Psychological Study of Social Issues

The society is cosponsor of the symposium of the Psychology Section (I), The Psychological Implications of Increasing Population. For details, see program of Section I.

Social and Economic Sciences

Wednesday 26 December

The Economic Impacts of Disarmament. Symposium, program of the American Economic Association, cosponsored by AAAS section on Social and Economic Sciences (K). For details, see program of American Economic Association.

Thursday 27 December

Coal in the United States. Problems and Promises, Parts I and II. Symposium, joint program of AAAS sections on Geology and Geography (E) and the Association of American Geographers, cosponsored by the section on Social and Economic Sciences (K). For details, see program of Section E.

Scientists and Politicians. Some Political Science Studies of Scientists in Politics. Program of the American Political Science Association, cosponsored by Section K. For details, see program of the American Political Science Association.

Economic Growth. Some Theories and Concepts. Symposium, program of the section on Social and Economic Sciences (K), cosponsored by the American Economic Association and the National Institute of Social and Behavioral Science. Arranged by Donald P. Ray, National Institute of Social and Behavioral Science. Kenneth E. Boulding, University of Michigan, will preside. Institutional change in modern economic growth, Wilbert E. Moore, Princeton. Economic development and changing social values, Bert F. Hoselitz, University of Chicago. Vice-presidential address of Section K, Problems in measuring economic growth, Simon S. Kuznets, Harvard; vice president for Section K.

Friday 28 December

The Diffusion of Technical Knowledge as an Instrument of Economic Development. Interdisciplinary symposium, joint program of AAAS sections on Social and Economic Sciences (K), Agriculture (O), Industrial Science (P), Education (Q), and Information and Communication (T). For details, see AAAS General Sessions.

Saturday 29 December

Analytic Methods I. Contemporary Uses of Sociological Methods in the Anthropological Study of Complex Societies. Symposium, program of Anthropology Section (H), cosponsored by Social and Economic Sciences Section (K). For details, see program of Section H.

Education, Science, and the National Interest. Invited papers, program of the American Sociological Association, cosponsored by the AAAS section on Social and Economic Sciences (K). For details see program of the American Sociological Association.

Population Research. Invited papers, joint program of the American Sociological Association and the Population Association of America, cosponsored by the AAAS section on Social and Economic Sciences (K). For details, see program of the American Sociological Association.

Sunday 30 December

Statistical Problems in Social and Economic Research. Program of the AAAS section on Statistics (U), cosponsored by the Social and Economic Sciences Section (K). For details, see program of Section U.

Contributed Papers. Arranged by Donald P. Ray, who will preside. Political literacy in rapidly transforming underdeveloped countries, Monte H. Koppel, University of Puerto Rico. Attracting private business capital for economic development, Reuben E. Slesinger, University of Pittsburgh. Corporate decision-making as a social process, Walter G. O'Donnell, University of Massachusetts. The problem of urban adjustment and its relationship to the antecedents of immigrant workers, Lyle W. Shannon, State University of Iowa. Some suggestions for a theory of social dynamics, George K. Zollschan, Purdue.

American Economic Association

Wednesday 26 December

The Economic Impacts of Disarmament. Symposium, program of the American Economic Association, co-

sponsored by Social and Economic Sciences Section (K). Arranged by Kenneth E. Boulding and Emile Benoit, Columbia. Seymour Melman, Columbia, will preside. Strategy of economic adjustments to disarmament, Emile Benoit. Economic impact of world disarmament: the quantitative approach, Wassily Leontief, Harvard. The impact of arms reduction on research and development, Richard R. Nelson, Council of Economic Advisors.

American Political Science Association

Thursday 27 December

Scientists and Politicians: Some Political Science Studies of Scientists in Politics. Program of the American Political Science Association, cosponsored by the Social and Economic Sciences Section (K). Arranged by Ithiel de Sola Pool, Massachusetts Institute of Technology. Don K. Price, Harvard, will preside. The establishment of NASA: the political role of advisory scientists, Enid Burtis Bok and Robert C. Wood, Massachusetts Institute of Technology. National policy and the president's science advisors, Robert Gilpin, Princeton. Scientists and conservative legislators, Harry S. Hall, Temple.

American Society of Criminology

Saturday 29 December

The program of the American Society of Criminology is a four-session symposium on the interdisciplinary approaches to the problems of crime and delinquency.

Session I. Psychology, Psychiatry, and Criminology. Marcel Frym, University of Southern California, will preside. Joined responsibility in the prophylaxis of criminality, Hector Ritey. Cooperation versus coercion: therapeutic alternatives to prosecution and punishment, Henry Weihofen, George Washington University. Delinquency and biology, Sanford J. Fox, Boston College Law School. Psychodrama, group psychotherapy, and sociometry in the treatment of offenders, Jacob Moreno, Moreno Institute. The careless American: a problem in adventitious criminality, Michael Fooner, Association for Applied Psychoanalysis. Measuring criminality a century ago, Thorsten Sellin, University of Pennsylvania.

Session II. Sociological Approaches to Problems in Criminology. Marvin Wolfgang, University of Pennsylvania, will preside. Contemporary criminology as a scientific discipline, Peter Lejins, University of Maryland. The new criminal: a socio-psychological theory of the contemporary offender, Lewis Yablonsky, University of California. The impact of a large state detention facility on its delinquent population, Walter C. Reckless and Thomas G. Eynon, Ohio State University. Problems in foster care programs for delinquents, Charles Newman, Kent School of Social Work. Recidivism among federal penal releasees, Daniel Glaser, University of Illinois. Offense 'patterns and family structures of delinquents from urban and rural communities, Theodore N. Ferdinand, Northeastern.

Sunday 30 December

Session III. Problems in the Administration of Criminal Justice. Austin MacCormick, Osborne Association, will preside. Bail problems of indigent defendants, Herbert Sturz, Vera Foundation. Building a criminal research and information center, John Scanlon, National Council on Crime and Delinquency. Some observations on the penal system of Israel, Joseph W. Eaton, University of Pittsburgh. The Pound-Cardozo concept of a Ministry of Justice, Arthur L. Beeley, Utah State Council on Criminal Justice Administration. Report of the Committee on Correctional Training Standards, Walter Lunden, Iowa State University. Criminological revival in Great Britain, Leon Radzinowicz, Institute of Criminology.

Session IV. Problem Areas in American Policing. Howard Lear, Deputy Police Commissioner, Philadelphia, will preside. Industrial security and crime control, Timothy J. Walsh, American Society of Industrial Security. Role of the police in the interdisciplinary approach to problems of delinquency, Lynn D. Swanson, U.S. Department of Health, Education, and Welfare. The development of modern policing in California, John P. Kenney, Los Angeles Police Commission. Organized gambling and law enforcement, Alvin J. T. Zumbrun, Maryland Crime Investigating Committee. Report of the Police Training Standards Committee, G. Douglas Gourley, Los Angeles State College.

American Sociological Association

Saturday 29 December

Education, Science, and the National Interest. Invited papers, program of the American Sociological Association, cosponsored by Social and Economic Sciences Section (K). Arranged by Burton R. Clark, University of California, who will preside.

The inevitable conflict between science and humanism, Bernard Barber, Barnard College. College experience and choice of science as a career, James A. Davis, University of Chicago and National Opinion Research Center.

The national interest in federal support of university research, Charles V. Kidd, National Institutes of Health. Science and American higher education in 1970, A. H. Halsey, Oxford University.

Population Research. Invited papers, joint program of the American Sociological Association and the Population Association of America, cosponsored by AAAS section on Social and Economic Sciences (K). Arranged by Charles F. Westoff, who will also preside.

Demographic and other revolutions, Irene B. Taeuber, Princeton University. Demographic research on Africa, Frank Lorimer, American University.

A reconstruction of annual birthrates in the United States back to 1855, Melvin Zelnik, Ohio State University.

The recruitment and training of demographers, Vincent H. Whitney, Population Council.

Metric Association

Friday 28 December

Annual Meeting. Session I. Robert P. Fischelis, president, Metric Association, will preside. Public aspects of metric system promotion, John P. Dubois, editor of *Design News*.

Annual Meeting. Session II. (Same presiding officer as for session I.) International aspects of unit systems chaos, Carl F. Kayan, Columbia.

Congress and the metric system, Hon. John W. Davis, member of Congress, Georgia.

Some problems in estimating the cost and optimum time of conversion, A. T. McPherson, U.S. Department of Commerce.

History and Philosophy of Science

Thursday 27 December

History of the Industrial Research Laboratory. Symposium, program of the Society for the History of Technology, cosponsored by AAAS sections on History and Philosophy of Science (L) and Industrial Science (P). For details, see program of the Society for the History of Technology.

History of the Technology of Atomic Energy. Symposium, program of the Society for the History of Technology, cosponsored by AAAS section on History and Philosophy of Science (L). For details, see program of the Society for the History of Technology.

Science Manuscripts. Program of the Conference on Science Manuscripts, cosponsored by AAAS section on History and Philosophy of Science (L). For details, see program of Conference on Science Manuscripts.

Friday 28 December

The History of Rocket Technology. Symposium, program of the Society for the History of Technology, cosponsored by AAAS section on History and Philosophy of Science (L). For details, see program of the Society for the History of Technology.

Saturday 29 December

Topics in the History of Science. Invited papers, program of the History of Science Society, cosponsored by Section L. For details, see program of the History of Science Society.

Work in Progress in the History of Technology. Invited papers. For details, see program of the Society for the History of Technology.

Conference on Science Manuscripts

Thursday 27 December

Science Manuscripts. Program of the Conference on Science Manuscripts, cosponsored by the section on History and Philosophy of Science (L). Arranged by Nathan Reingold, Library of Congress, who will preside. Report on the American Institute of Physics' project on the history of recent physics in the United States, W. James King, American Institute of Physics. The papers of the atomic scientists' movement, Robert Rosenthal, University of Chicago.

History of Science Society

Saturday 29 December

Topics in the History of Science. Invited papers, program of the History of Science Society, cosponsored by the section on History and Philosophy of Science (L). Arranged by Philip George, University of Pennsylvania, who will preside. Panspermia and some of its complications, Conway Zirkle, University of Pennsylvania. Twentieth-century thermodynamics, Erwin Hiebert, University of Wisconsin.

Society for General Systems Research

Saturday 29 December

The International System. Symposium. Arranged by Kenneth E. Boulding. W. Ross Ashby, University of Illinois, will preside. Indicators of integration in a multi-state system: the American example, Richard Merritt, Yale. Utilization of simulation data in the analysis of inter-nation systems, Dorothy L. Meier, Northwestern. Some general system approaches to international relations, Anatol Rapoport and William J. Horvath, University of Michigan.

Contributed Papers. Gerald M. Weinberg will preside. Cybernetics and a general systems model, Daniel Howland, Ohio State University. Presidential address, W. Ross Ashby, University of Illinois.

Society for the History of Technology

Program chairman: Thomas P. Hughes, Washington and Lee University. The AAAS section on Engineering (M) is a cosponsor of the entire program of the Society for the History of Technology.

Thursday 27 December

History of the Industrial Research Laboratory. Symposium, program of the Society for the History of Technology, cosponsored by AAAS sections on History and Philosophy of Science (L) and Industrial Science (P). Cyril S. Smith (M.I.T.) will preside. The General Electric Laboratories, Kendall Birr, State University of New York. Edison and industrial research, Matthew Josephson. European precedents of the industrial laboratory, John Beer, University of Delaware.

History of the Technology of Atomic Energy. Symposium, program of the Society for the History of Technology, cosponsored by AAAS section on History and Philosophy of Science (L). Arranged by Ralph Sanders, Industrial College of the Armed Forces, who will preside. The historical role of military research and development in atomic energy, Gerald W. Johnson, assistant to the Secretary of Defense (for Atomic Energy). Pioneering on nuclear frontiers: two early landmarks in reactor technology, Richard G. Hewlett, U.S. Atomic Energy Commission. The genesis of the Atoms for Peace Program, Rear Admiral Lewis L. Strauss, USNR (ret.)

The History of Rocket Technology. Symposium, program of the Society for the History of Technology, cosponsored by AAAS section on History and Philosophy of Science (L). Arranged by Eugene M. Emme, NASA, who will preside. Robert H. Goddard and early A.R.S. rockets, G. Edward Pendray, Pendray and Company. The V-2 rocket, Walter E. Dornberger, Bell Aerosystems. Viking and Vanguard, John P. Hagen, Pennsylvania State University. Atlas, Titan, and Thor, Simon Ramo, Thompson-Ramo-Wooldridge, Inc.

Saturday 29 December

Work in Progress in the History of Technology. Invited papers. Arranged by Joseph Rossman. James Kip Finch, Columbia, will preside. Speakers: Carl W. Condit, Northwestern; Peter F. Drucker, New York University; Eugene S. Ferguson, Iowa State University; W. David Lewis, Hagley Museum; Frank D. Prager; Robert M. Vogel, Smithsonian Institution; and Lynn T. White, Jr., University of California.

Engineering

Thursday 27 December

Information Systems—Essential Tools in Engineering Application of Science for the Needs of Society. Panel, joint program of AAAS section on Engineering (M) and Engineers Joint Council.

Bernard M. Fry, National Science Foundation, will preside. An information center for engineers, Ralph H. Phelps, United Engineering Center. The engineering index, a catalyst for information retrieval, Carolyn M. Flanagan, United Engineering Center. Information services of the American Institute of Chemical Engineering, Bart E. Holm, American Institute of Chemical Engineers. An action plan for the engineering profession, Engineers Joint Council. Information resources for tomorrow's engineers, Walter M. Carlson, Engineers Joint Council.

Forestalling Obsolescence in Technological Personnel. Arranged by Merritt A. Williamson, Pennsylvania State University, and Howard A. Meyerhoff, Scientific Manpower Commission. Williamson will preside. Responsibility of the engineering societies in continuing education, Harold K. Work, New York University, and Clarence E. Davies, United Engineering Center. Updating the training for research and development personnel, Monroe W. Kriegel, Jersey Production Research Company. Advance training and education for scientific and engineering personnel, John W. Macy, Jr., U.S. Civil Service Commission. Prevention and remedy for obsolescence in engineering and scientific manpower, T. Paul Torda, Illinois Institute of Technology.

Medical Sciences

Symposium on New Concepts Regarding Biological Control Mechanisms. Program of the Medical Sciences Section (N), consisting of four sessions and cosponsored by the Zoological Sciences Section (F) and the American Society of Zoologists. Arranged by DeWitt Stetten, Jr., National Institute of Arthritis and Metabolic Diseases, and Oscar Touster, Vanderbilt University. (A round table discussion will follow each session.)

Thursday 27 December

Part I. Repression Mechanisms. B. Magasanik, Massachusetts Institute of Technology, will preside. Control by repression of a biosynthetic pathway, L. Gorini, Harvard. Genes, enzymes, and control mechanisms in histidine biosynthesis, B. Ames, National Institute of Arthritis and Metabolic Diseases. Selective utilization of metabolic routes in *Escherichia coli*, H. L. Kornberg, University of Leicester, England. Remarks on the metabolic control of enzyme synthesis, B. Magasanik.

Part II. Feedback Control of Enzyme Action. H. E. Umbarger, Long Island Biological Association, will preside and present the first lecture. The role of endproduct inhibition in the regulation of biosynthetic pathways. The control of biosynthesis in the aspartate family of metabolites, G. N. Cohen, Centre National de la Recherche Scientifique. Feedback control reflected in cell behavior and enzyme structure, J. C. Gerhart, University of California, and A. B. Pardee, Princeton. Endproduct sensitive enzyme: newly recognized targets for interference with metabolic pathways, H. S. Moyed, Harvard.

Saturday 29 December

Part III. Hormonal Phenomena. E. W. Sutherland, Jr., Western Reserve, will preside. Hormonal regulation of adenyl cyclase, T. W. Rall, Western Reserve. Phosphofructokinase as a control factor in glycolysis, O. H. Lowry, Washington University. Certain aspects of the action of steroid hormones, G. M. Tomkins, National Institute of Arthritis and Metabolic Diseases.

Part IV. Transport across Cell Membranes. C. R. Park, Vanderbilt, will preside. Vice-presidential address of Medical Sciences Section (N), Forecasts in medical education, DeWitt Stetten, Jr., vice president for Section N. Electrical excitability in synthetic bimolecular lipid membranes, D. O. Rudin, Eastern Pennsylvania Psychiatric Institute. Membrane ATP-ase and the transport of Na^+ and K^+, J. Skou, University of Aarhus, Denmark. Some factors regulating permeability of a transporting epithelium, A. Leaf, Harvard.

Academy of Psychoanalysis

Saturday 29 December

Symposium on the Role of Violence in Human Behavior. Four-session program of the Academy of Psychoanalysis, cosponsored by the AAAS committee on Science in the Promotion of Human Welfare.

Part I. Robert G. Heath will preside. Introduction, David MacK. Rioch, Walter Reed Army Institute of Research. Aggressive behavior and ritualized fighting in animals, Irenäus Eibl-Eibesfeldt, Max Planck Institut für Verhaltensphysiologie. Aggressive stimuli, aggressive responses, and hostility catharsis, Leonard Berkowitz, University of Wisconsin. The ecology of violence, John B. Calhoun, Stanford.

Part II. John A. P. Millet will preside. Creative aspects of anger and rage, Bella S. Van Bark. Conflict, violence, and the prevention of war, Harold I. Lief. Paradoxical features of nuclear fear, Joost A. M. Meerloo. From sibling rivalry to nuclear war: man's inherited predisposition to conflicts of interest, his rage, and his pride, Sandor Rado.

Sunday 30 December

Part III. Edwin A. Weinstein will preside. Commitment, contract, group boundaries, and conflict: an approach to the choice of violence in inter-group relations, David H. Marlowe, Walter Reed Army Institute of Research. The social control of violence, Lewis A. Coser, Brandeis. Towards an analysis of the functions of war, Anthony Leeds, Pan American Union.

Part IV. Franz Alexander will preside. Comments on violence seen cross-culturally, Margaret Mead. The place of hostility and conflict in a disarmed world, Arthur Waskow, Peace Research Institute. Summary, Jules H. Masserman.

American Physiological Society

Sunday 30 December

Space Biology and Life Support Problems of Manned Space Missions, Part I. Symposium, joint program of the American Physiological Society and NASA, cosponsored by the American Society of Zoologists. Freeman H. Quimby, NASA, will preside. Theoretical studies on absence of mechanical stress, Ernest C. Pollard, Pennsylvania State University. Detection and characterization of extraterrestrial life, Carl Sagan, Stanford. An integrated model of abiogenesis, Sidney Fox, Florida State University. General biological environments and space, Colin S. Pittendrigh, Princeton. Space radiation biology, Cornelius A. Tobias, University of California.

Part II. (Same sponsor as for part I.) Stanley C. White, NASA, will preside. NASA's manned space flight programs, William A. Lee, NASA. Spacecraft life support environment, Richard S. Johnston, NASA. Space suits, James Correale, NASA. Radiation, Joseph A. Conner, NASA. Acceleration and weightlessness, Edward J. McLaughlin, NASA.

American Psychiatric Association

Program chairmen: Milton Greenblatt, George H. Grosser, and Henry Wechsler, Harvard Medical School. The program of the Committee on Research of the American Psychiatric Association is a four-session symposium on human reactions to the threat of impending disaster.

Thursday 27 December

Part I. Theoretical Perspectives on Human Reactions to Threat. Milton Greenblatt will preside. A theoretical review of individual and group psychological relations to stress, James G. Miller, University of Michigan. Laboratory approach to the dynamics of psychological stress, Richard S. Lazarus, University of California. Group reactions to stress, Kurt Lang and Gladys Lang, Queens College. A discussion period will follow the lectures.

Part II. Reactions to Nuclear Threat. Unacceptability of disquieting facts, Lester Grinspoon, Harvard. Personality organization and reaction to external threat, Roy Menninger, The Menninger Foundation. Sequential accommodations to threat, Stephen B. Withey, University of Michigan. Psychological effects of the atomic bomb in Hiroshima, Robert J. Lifton, Yale. Hiroshima and its aftermath (panel discussion), George W. Baker, National Academy of Sciences; Jerome D. Frank, Johns Hopkins; Donald Michael, Peace Research Institute; and Peter Rossi, National Opinion Research Center.

Friday 28 December

Part III. The Threat of Unpredictable Consequences. Francis J. Braceland, Hartford Institute of Living, will preside. *Studies of the Astronauts.* Personality characteristics of the Mercury astronauts, Sheldon J. Korchin, National Institutes of Health, and George E. Ruff, University of Pennsylvania. Psychological responses of Mercury astronauts to stress, George E. Ruff and Sheldon J. Korchin. *Reactions to Arbitrary Authority and Power.* Emotional reactions to internally and externally derived threat of annihilation, Claus Bahne Bahnson, University of Connecticut and Jefferson Medical College. Captivity lore and behavior in captivity, Albert D. Biderman, Bureau of Social Science Research.

Part IV. The Threat of Unpredictable Consequences (continued). Human factors in warning-and-response systems, Harry B. Williams, South Regional Education Board, Atlanta, Ga. Cultural variations in attitudes towards disease and death, John P. Spiegel, Harvard. Human reactions to the imminence of death, Thomas P. Hackett and Avery D. Weisman, Massachusetts General Hospital.

Dentistry

The program of the Dentistry Section (Nd) is a four-session symposium, Mechanism of Hard Tissue Destruction, cosponsored by AAAS sections on Medical Sciences (N) and Zoological Sciences (F), the American College of Dentists, the American Dental Association, and the International Association for Dental Research, North American Division.

Saturday 29 December

Session I. Reider F. Sognnaes, University of California, will preside. Rock boring by biological organisms, Charles M. Yonge, Glasgow University. The boring sponges as controlling factors in the formation and maintenance of coral reef communities on the fore-reef slope in Jamaica, Thomas F. Goreau, University of the West Indies, and Willard D. Hartman, Yale. Demineralization mechanism of muricid boring gastropods, Melbourne R. Carriker, Woods Hole Marine Biological Laboratory, and David B. Scott, National Institute for Dental Research. On the deciduous nature of deer antlers, Richard J. Goss, Brown University. Bone remodeling during dental eruption and shedding, Surindar N. Bhaskar, U.S. Army Institute for Dental Research. Dento-alveolar resorption in periodontal disorders, Ingjald Reichborn-Kjennerud, University of Oslo.

Session II. George E. Nichols, Harvard, will preside. Rarifying diseases of the skeleton with special reference to osteoporosis, Marshall R. Urist, University of California. Internal remodeling of compact bone, Franklin C. McLean, University of Chicago, and Robert E. Rowland, Argonne National Laboratory. Microradiography of bone resorption, Jenifer Jowsey, Einstein Medical Center. Structure-function relationships in the osteoclast, Norman M. Hancox, University of Liverpool. Bone destruction by multinucleated giant cells, James T. Irving, Harvard, and Chester S. Handelman, Forsyth Dental Infirmary. Resorption without osteoclasts (osteolysis), Leonard F. Belanger, J. Robichon, and B. B. Migicovsky, University of Ottawa; Harold Copp, University of British Columbia; and Jacques Vincent, Louvanium University.

Sunday 30 December

Session III. Franklin C. McLean, University of Chicago, will preside. Histophysical studies on bone cells and bone resorption, Richard W. Young, University of California. In vitro studies of bone resorption mechanisms, George Nichols, Harvard. Alterations in carbohydrate metabolism in bone induced by parathyroid hormone, Bernard K. Forscher, University of Kansas City, and David V. Cohn, Veterans Administration Hospital. Some chemical factors influencing bone remodeling in tissue culture, Paul Goldhaber, Harvard. Animal collagenase and collagen metabolism, Charles M. Lapiere and Jerome Gross, Harvard and Massachusetts General Hospital. The possible role of chelation in decalcification of biological systems, G. Neil Jenkins, King's College, and C. Dawes, Harvard.

Session IV. Seymour Kreshover, National Institute of Dental Research, will preside. Factors influencing the transmission and inhibition of experimental caries, Paul Keyes and Harold Jordan, National Institute for Dental Research. Microstructural changes in early dental caries, A. I. Darling, University of Bristol. Ultrastructural observations on dental caries, Erling Johansen, University of Rochester. Physical chemistry of enamel dissolution, John A. Gray and Marion David Francis, Procter and Gamble Company. Dental erosion in vivo and in vitro, Reidar F. Sognnaes, University of California. A general discussion and summary will follow presentation of the papers.

Pharmaceutical Sciences

The program of the AAAS section on Pharmaceutical Sciences (Np) is cosponsored by the American Pharmaceutical Association (Scientific Section), the American Association of Colleges of Pharmacy, the American Society of Hospital Pharmacists, the American College of Apothecaries, and the National Association of Boards of Pharmacy.

Thursday 27 December

Contributed Papers. Hospital Pharmacy. Part I. Arranged by George F. Archambault, U.S. Public Health Service; Don E. Francke, University of Michigan Hospital; and Joseph A. Oddis, American Pharmaceutical Association. Oddis will preside. Opening remarks and announcements, John E. Christian, secretary of Section Np. Standards for prescription containers—1962, George F. Archambault. A course in administrative principles for the hospital pharmacist, Herbert L. Flack and Charles M. King, Jr., Jefferson Medical College Hospital. The hospital pharmacist's role in an adverse drug reaction program, Louis P. Jeffrey, American Society of Hospital Pharmacists. Recent progress in nonproprietary nomenclature for drugs, Joseph B. Jerome, American Medical Association. Information needs in clinical testing of drugs, Paul V. Buday and Eric W. Martin, Lederle Laboratories. Allergic preparations—an expansion of sterile prescription compounding, Robert E. Lawson and W. Douglas, University of Maryland Hospital.

Part II. Luncheon.

Part III. Vice Presidential Address. George F. Archambault will preside. Pharmacy and space, John A. Autian.

Part IV. (Same arranger as for part I.) Don E. Francke will preside. The role of the pharmacist in civil defense, Gabriel Ferrazzano, U.S. Public Health Service. The federal law and regulations relating to the control of narcotics in hospitals, Carl DeBaggio, U.S. Treasury Department.

Part IV includes a symposium on some aspects in the developing, handling, and control of investigational drugs from the viewpoint of (i) the government (Ralph G. Smith, U.S. Department of Health, Education and Welfare); (ii) industry (George Schneller, Wyeth Laboratories); (iii) the clinical investigator (Robert I. Wise, Jefferson Medical College and Medical Center); and (iv) the pharmacist (Milton W. Skolaut, American Society of Hospital Pharmacists).

Saturday 29 December

Contributed Papers. Arranged by John E. Christian. Wayne V. Kessler, Purdue, will preside. Effects of nicotinamide pretreatment on the pharmacodynamic action of chloral hydrate and ethanol, R. G. Brown, E. A. Armstrong, and B. B. Wylie, University of Texas. An investigation of tissue response in rabbits by certain unit-packaged plastic tubings, W. H. Lawrence, J. L. Mitchell, W. L. Guess, and J. Autian, University of Texas. An investigation of in vivo tracer techniques (whole body counter) in drug screening studies, B. D. Rupe, W. F. Bousquet, and John E. Christian. Studies of the effect of nutritionally complete food substitute therapy on the body composition of obese human subjects, J. E. Christian, L. W. Combs, and W. V. Kessler, Purdue. Effect of certain drugs on perfused human placentas II: vasodilators, H. P. Cinchta and R. F. Gautieri, Temple. The effects of pooled rabbit serum in alkaloidal poisoning, G. C. Schmidt, R. G. Miller, and H. C. Shirkey, University of Cincinnati. The synthesis and pharmacology of some basic esters of 3, 4, 5,-trimethoxybenzoic acid, A. J. Vazkas and J. T. Doluisio, Temple. Proton magnetic resonance and steriochemistry of 1-ethynl-2-tolyl-cyclohexanols, A. C. Huitric, W. S. Stavropoulos, and B. J. Nist, University of Washington. Identification of complex salt species of triamterene through *p*H-solubility profiles, L. W. Dittert and D. R. Reese, Smith, Kline, and French Laboratories. A dynamic measurement of stress, C. Chong, Smith, Kline, and French Laboratories; S. P. Eriksen, University of Wisconsin; and J. V. Swintosky, Smith, Kline, and French Laboratories. Free radicals in alkaloidal color: identification tests, D. W. Schieser, University of California. Peppermint and spearmint tissue culture III: carboy culture of spearmint tissue, C. J. Wang and E. J. Staba, University of Nebraska.

Rational Use of Computers in Pharmacy and Medicine. Symposium, arranged by John Autian, who will preside. Introduction to computers, Eric W. Weiss, Sun Oil Company. Application of computers to storage and retrieving of information, Eric W. Martin, Lederle Laboratories. Some experiences with a small computer in pharmaceutical research and development, John F. Pauls, Smith, Kline, and French Laboratories. The application of analog computers to problems of pharmacokinetics and drug dosage, Edward R. Garrett, University of Florida. Computer applications to neural and behavioral problems: developments in the east and west, William Ross Adey, University of California Medical Center.

Contributed Papers. Arranged by John E. Christian. Lee H. MacDonald, Upjohn Company, will preside. Studies on the excretion and metabolism of carbon-14-labeled 2-acetamido-5-nitrolthiazole in turkeys, W. F. Bousquet, J. C. Rogler, John E. Christian, A. M. Knevel, J. L. Spahr, and F. N. Andrews, Purdue. The study of the interaction of drugs with plastics utilizing liquid scintillation spectrometry as a means of detection, I: diffusion and sorption of sulfuric acid by an insoluble polyamide, W. H. Briner, National Institutes of Health; John Autian; and M. W. Skolaut. Computer simulation of problems in pharmaceutical stability, I: specific acid- and base-catalyzed degradations in unbuffered solutions, N. G. Lordi, Rutgers. Inclusion compounds of urea and thiourea with quaternary ammonium compounds, D. E. Cadwallader and J. Barry Richards, University of Georgia. Determination of potassium in solids and liquids by measuring naturally radioactive potassium-40, W. G. Harris, W. V. Kessler, and John E. Christian, Purdue. Theoretical considerations in the zone melting of organic substances, R. Friedenberg, W. Hilding, and P. Jannke, University of Connecticut. Critical in vitro factors in evaluation of gastric antacids, S. Desai and J. L. Kanig, Columbia. The influence of adrenergic receptors on the blood sugar and lactic acid levels in the rat, B. W. Lei, Georgetown, and R. S. McCutcheon, Oregon State. The effectiveness of antibacterial agents presently employed in ophthalmic preparation as preservatives against *Pseudomanas aeruginosa*, S. R. Kohn, Johnson and Johnson Laboratories; L. Gershenfeld, Philadelphia College of Pharmacy and Science; and M. Barr, Wayne State University. Temperature dependence of the interaction of parabens and phenols with certain micromolecules, N. K. Patel, Duquesne, and N. E. Foss, University of Maryland. An empirical and a priori approach to business ethics—a review, E. J. W. Hall and D. R. Fennekohl, University of Texas. Three early 19th century French views of science in pharmacy, A. Berman, University of Texas. Manufacture and control of an all-purpose hormone cream, S. L. Co, Manila Central University.

Agriculture

Food Quality as Affected by Production Practices and Processing. Five-session symposium, program of Agriculture Section (O), cosponsored by Zoological Sciences Section (F), Botanical Sciences Section (G), Medical Sciences Section (N), and Industrial Science Section (P) and by various societies, as

follows: American Dairy Science Association, American Dietetic Association, American Phytopathological Society, American Society for Horticultural Science, American Society of Agricultural Engineers, American Society of Agronomy, American Society of Animal Production, Institute of Food Technologists, International Association of Milk and Food Sanitarians, Potato Association of America, and Poultry Science Association. Arranged by George W. Irving, Jr., U.S. Department of Agriculture.

Wednesday 26 December

Part I. Fruits and Vegetables. W. T. Pentzer, U.S. Department of Agriculture, will preside. Introduction by chairman. Evaluation and measurement of fruit and vegetable quality, Amihud Kramer, University of Maryland. Potato quality as related to heredity and environment, Frederick J. Stevenson and Robert V. Akeley, U.S. Department of Agriculture. Protection of fruits and vegetables during production, B. B. Pepper, Rutgers. Protecting the quality of fruits and vegetables after harvest, A. Lloyd Ryall, U.S. Department of Agriculture. Effect of processing factors on the quality of fruits and vegetables, A. W. Gould, Ohio State University.

Thursday 27 December

Part II. Cereals. A. H. Moseman, Rockefeller Foundation, will preside. Introduction by chairman. Evaluation of wheat quality, K. F. Finney, U.S. Department of Agriculture. Performance as influenced by genotype and environment, W. L. Brown, Pioneer Hi-Bred Corn Company. Protection of cereal crops during production, U.S. Department of Agriculture. Moisture content, storage fungi, and quality of stored grains, C. M. Christensen, University of Minnesota. Effects of processing factors on food quality, D. B. Pratt, Jr., Pillsbury Company.

Part III. Dairy Products. R. E. Hodgson, U.S. Department of Agriculture, will preside. Introduction by chairman. The evaluation and measurement of quality of dairy products, V. H. Nielsen, Iowa State. Genetic and environmental factors in development and performance, Ned D. Bayley, U.S. Department of Agriculture. Protection of milk quality through management practices, W. M. Roberts, North Carolina State College. Effects of processing factors on quality of dairy products, Stuart Patton, Pennsylvania State University.

Saturday 29 December

Part IV. Poultry and Eggs. A. W. Brant, University of California, will preside. Introduction by chairman. Evaluation and measurement of quality of poultry and eggs, O. J. Cotterill, University of Missouri. Genetic and environmental factors influencing poultry, meat, and eggs, W. J. Stadelman, Purdue. Protection of product quality through management practices, B. S. Pomeroy, University of Minnesota. Effects of processing factors on quality of poultry and eggs, Carl H. Koonz, Swift and Company.

Part V. Meats. D. M. Doty, American Meat Institute Foundation, University of Chicago, will preside. Introduction by chairman. Evaluation and measurement of quality, H. D. Naumann, University of Missouri. Genetic and environmental factors in development and performance, T. C. Byerly. Protection of product quality through management practices, A. M. Pearson, Michigan State University. Effect of processing factors on food quality, George Wilson, Klarer Meat Packing Company.

Industrial Science

Thursday 27 December

Communications in Industry, Part I. Contributions of the Behavioral and Social Sciences. Symposium. Ralph W. Tyler, Center for Advanced Study in the Behavioral Sciences, will preside. Major communication problems in industrial organization and operation, Gerry E. Morse, Minneapolis-Honeywell Regulator Company. Solutions suggested by research in the behavioral and social sciences, Rensis Likert, University of Michigan. A panel discussion will follow presentation of the papers.

Part II. Social and Economic Implications of Man-Machine Relationships. Irven Travis, Burroughs Corporation, will preside. Electronic professional clerk, Edward L. Glaser, Burroughs Corporation. Display devices, G. Gerrell Sandy, Mitre Corporation. Industrial process simulation—a valuable tool, Robert C. Ficke, E. I. du Pont de Nemours & Co. Information retrieval, Claire K. Schultz, Institute for the Advancement of Medical Communication.

The Industrial Science Section (P) is a cosponsor of the symposia of the Society for Industrial Microbiology and the Institute for Management Services. It is also a cosponsor of other symposia, as follows: Symposium of the Agriculture Section (O), 26–29 Dec.; symposium (History of the Industrial Research Laboratory) of the Society for the History of Technology, 27 Dec.; interdisciplinary symposium (The Diffusion of Technical Knowledge as an Instrument of Economic Development) of AAAS General Sessions, 28 Dec.

Society for Industrial Microbiology

The program of the Society for Industrial Microbiology is sponsored by the Delaware Valley Section of the Society for Industrial Microbiology.

Thursday 27 December

Synthetic Detergents in Water and Sewage Systems. Part I. Symposium. W. J. Payne will preside. The detergent situation to date, December 1962, James C. Vaughn, City of Chicago Department of Water and Sewers. The degradation of syndets in biological treatment processes, W. W. Eckenfelder, Jr., Hydroscience, Inc. Rationale to the detergent problem in water pollution control, Peter E. Gaffney, Georgia Institute of Technology. Degradation of ABF in unsaturated soils, Jesse M. Cohen, Gordon G. Robeck, and Richard L. Woodward, United States Public Health Service. Removal of synthetic detergents from water by physico-chemical methods, Charles D. Gates, Cornell University.

Part II. (Same presiding officer.) Biochemical aspects of syndet degradation, C. N. Sawyer, Metcalf, and Eddy. Transient intermediates in the biodegradation of straight chain alkyl benzene sulfonates, Robert D. Swisher, Monsanto Chemical Company. Bacterial utilization of ethoxy glycols, Edward L. Fincher and W. J. Payne, University of Georgia. Bacterial utilization of dodecyl sulfate and dodecyl benzene sulfonate, W. J. Payne and Victor Feisal, University of Georgia.

Contributed Papers. Aaron A. Wasserman will preside. The use of water-soluble plastic films (polyvinyl alcohols) as testing surfaces for disinfectants, Bernard Witlin, Philadelphia College of Pharmacy and Science. Control of bacteria in flayed bovine skins by benzalkonium chloride, Theone C. Cordon, United States Department of Agriculture.

Institute of Management Sciences

Program chairman: Burton V. Dean, Technion-Israel Institute of Technology.

Wednesday 26 December

Use of Judgments in Making Optimal Decisions, Part I. Program of the Institute of Management Sciences, cosponsored by the Statistics Section (U). Arranged by Glenn L. Bryan and Maynard W. Shelly, Office of Naval Research. Bryan will preside. A definition of judgment and its implications, C. West Churchman, University of California. On open and closed value judgments, Russell L. Ackoff and J. S. Minas, Case Institute of Technology. On flexibility of future preferences, Tjalling C. Koopmans, Cowles Commission and Yale. Men as probability transducers in Bayesian command and controls systems, Ward Edwards, University of Michigan.

Research and Development Management. Arranged by Murray A. Geisler, Rand Corporation, who will preside. Measuring the returns on research—where we stand, I. Horowitz, Indiana University. A dynamic programming approach to research and development budgeting and project selection, S. W. Hess, Atlas Chemical Industries. An overview of current research on the research and development process, A. H. Rubenstein, Northwestern. Project management and control techniques, P. V. Norden, IBM Corporation.

Use of Judgments in Making Optimal Decisions, Part II. (Same sponsors and arrangers as for Part I.) Maynard W. Shelly will preside. Developments in the foundations of statistics, Francis J. Anscombe, Princeton. Practical specification of goals for decision problems, Roy Radner, University of California. Individual differences in judgments, Ledyard R. Tucker, University of Illinois. On subjectively optimum selections among multi-attribute alternatives, Roger Shepard, Bell Telephone Laboratories.

Thursday 27 December

Experimental Design in Simulation. Arranged by Betty W. Holz, Radio Corporation of America, who will preside. Sampling efficiency in Monte Carlo analysis, Charles E. Clark, System Development Corp. The use of sequential estimation as a sample reducing device in simulation studies. Jack Moshman, CEIR, Inc. The combination of alternative research techniques in logistics systems analysis, Murray A. Geisler.

Education

Wednesday 26 December

Session I. Joint Session of Education Section (Q) and the Council for Exceptional Children. Arranged by Jack W. Birch, University of Pittsburgh, who will preside. Differential responses of mentally retarded children to social and non-social stimulation, John H. Hollis, Parsons State Hospital and Training Center. Mentally advanced children and early school admission: studies in effectiveness and feasibility, William David Barney, University of Auckland.

Session II. (Same sponsors as for session I.) Programmed self-instruction in language for deaf children: procedures and results, E. Ross Stuckless, University of Pittsburgh. Respect for talent: a report of field research on the education of the gifted, L. Kathryn Dice Reier, Department of Public Instruction, Harrisburg, Pa.

Saturday 29 December

Contributed Papers I. Vice Presidential Address. Arranged by Herbert A. Smith, Pennsylvania State. Clarence E. Boeck, University of Minnesota, will preside. Appraisal of various American colleges as indicated by the number of women graduates listed in *Who's Who Among American Women*, Arthur E. Traxler, Educational Records Bureau. Studies of television and our children, Paul Witty, Northwestern. Vice presidential address, A comparative study of student self-ratings on the influence of inspirational teachers in science and mathematics in the development of intellectual curiosity and persistence, Kenneth E. Anderson, University of Kansas, vice president for Education Section (Q).

Report on NASDTEC-AAAS Studies. Program of Education Section (Q), cosponsored by the AAAS Cooperative Committee on the Teaching of Science and Mathematics. Arranged by William P. Viall, AAAS. John R. Mayor, AAAS, will preside. Guidelines for preparation programs of teachers of secondary school science and mathematics, William P. Robinson, Jr., Deputy Commissioner of Education, Rhode Island. Guidelines for science and mathematics in the preparation program of elementary school teachers, Louise Combs, Division of Teacher Education and Certification, Kentucky. The guidelines and the institution, H. Seymour Fowler, Pennsylvania State University. Survey: the qualifications and service loads of teachers of secondary science and mathematics, Clemens Johnson, University of Michigan. Regional conferences of school administrators on new science curricula, Robert C. Stephenson, American Geological Institute.

Contributed Papers II. (Same arranger as for part I.) H. Craig Sipe, George Peabody College for Teachers, will preside. Fairleigh Dickinson University program for enriching the curriculum of gifted secondary school students in the fields of philosophy of science and natural science, Dolores E. Keller, Fairleigh Dickinson. Education, yes; metaphysics, no, Frederick C. Neff, Wayne State. The image of the teacher as seen by public and parochial, male and female, high school students, Manny Sternlicht and Zev W. Wanderer, Willowbrook (N.Y.) State School. A clinical approach to the anatomy and physiology of learning and human behavior, Ralph Pino.

Sunday 30 December

The Scientific Study of Classroom Behavior. Symposium, joint program of Education Section (Q) and the American Educational Research Association. Arranged by Harry N. Rivlin, City University of New York. Harold E. Mitzel, Pennsylvania State University, will preside. Measuring social-emotional climate and interaction in classrooms, Ned A. Flanders, University of Michigan. Development of classroom behavior dimensions for student teachers and pupils, Donald M. Medley, City University of New York. Study of the logic of teaching in secondary schools, B. Othanel Smith, University of Illinois.

Contributed Papers III. (Same arranger as for parts I and II.) Joseph D. Novak, Purdue, will preside. Physical and earth science inservice education for elementary school teachers in New York State—an experiment, Gene W. Moser, University of Rochester. The importance of experience and meaning in elementary science, Ruth Lofgren, Brooklyn College. Changes in academic attainment and personality characteristics following a special education program for underachieving secondary school boys, Anthony Davids and Jean M. Andrews, Brown. Selection and training of graduate students in America and Europe, Samuel Strauss.

Research in the Problems of Education in Large Cities. Symposium, joint session of Education Section (Q) and

the American Educational Research Association. Arranged by Harry N. Rivlin, who will preside. Participants include Martin Deutsch, New York Medical College; Robert J. Havighurst, University of Chicago; and Carl Marburger, Detroit Public Schools.

Contributed Papers IV. (Same sponsors and arranger as for parts I–III.) William E. Martin, U.S. Office of Education, will preside. A field course in biology and geology motivating individual investigations in natural science, George F. Linn and E. J. Cranston. Scientific literacy begins in the elementary school, Alma S. Wittlin, Radcliffe. Jean Piaget's theory of perception, Gloria Wolinsky, Hunter. Perception of authority in relation to open and closed belief systems, C. Gratton Kemp, Ohio State University.

AAAS Cooperative Committee on the Teaching of Science, Mathematics

Thursday 27 December

Elementary Science. Reports from Projects on the Improvement of Instruction in Elementary and Junior High School Science. Joint session of the AAAS Cooperative Committee on the Teaching of Science and Mathematics and the American Nature Study Society, National Association of Biology Teachers, National Association for Research in Science Teaching, and National Science Teachers Association. Arranged by Dorothy Matala, State College of Iowa. John R. Mayor will preside. AAAS Commission on Science Instruction, J. Stanley Marshall, Florida State University. The Educational Services, Inc., Project, Philip Morrison, Cornell. The new project at the University of Illinois, Gilbert C. Finlay, University of Illinois. The University of Minnesota Project, Paul C. Rosenbloom, University of Minnesota. A community plan, Glencoe, Ill., John Sternig.

Saturday 29 December

Report on NASDTEC-AAAS Studies. Program of Education Section (Q), cosponsored by AAAS Cooperative Committee on the Teaching of Science and Mathematics. For details, see program of Section Q.

Sunday 30 December

Interdisciplinary Considerations in the New Science Programs. Invited papers, arranged by John R. Mayor. Thorton Page, Wesleyan, will preside. For biology, Gairdner Moment, Goucher. For chemistry, F. B. Dutton, Michigan State University. For physics, Ernest Pollard, Pennsylvania State University.

Science Service

Saturday 29 December

Science Youth Activities. Panel discussion. Watson Davis will preside. Panel members: Thomas E. Bowman, Jr.; Clifford Shaw, director of Providence (R.I.) Community Affairs; and Jacob L. Rhodes, Jr., Lebanon Valley College.

Science Teaching Societies

Thursday 27 December

Recent Research and Its Implications for Teaching. Symposium, joint program of the American Nature Study Society, the National Association of Biology Teachers, the National Association for Research in Science Teaching, and the National Science Teachers Association. Paul Klingle, Indiana University, will preside. Complementarity of structure and function, David R. Goddard, University of Pennsylvania. Critical periods in the development of behavior, J. P. Scott, Jackson Memorial Laboratory. Structure and function at the ecosystem level, Eugene P. Odum, University of Georgia.

American Nature Study Society

Thursday 27 December

Session I. The Nature Study Movement—Past and Present. J. A. Gustafson, State University of New York, will preside and present the first lecture, Motivation in nature study. The past and future for nature study, Stanley B. Mulaik, University of Utah. Shell clubs and the nature study movement, Katherine Palmer, Paleontological Research Institution. Nature study in Newfoundland, John I. Green, Cornell. Natural history observations in Asia, Richard L. Weaver, University of Michigan.

Session II. Early Naturalists. Richard Wason, Sand Ridge (Ill.) Nature Center, will preside. Early animal exhibits and development of museums in the United States, Robert M. McClung. John Muir—champion of wilderness, Richard Wason. Early Philadelphia naturalists, Charles W. Hart, Jr., Academy of Natural Sciences of Philadelphia.

Friday 28 December

Session III. Natural History Papers, Part A: Nature Education Resources in the Delaware Valley—A Blueprint. Charles E. Mohr, Kalamazoo (Mich.) Nature Center, will preside. Arboretums and botanic gardens, Carlton Lees, Pennsylvania Horticultural Society A unique state park nature program, Norman C. Fisher, Washington Cross State Park.

Progress in acquiring and administering natural areas, Frank McLaughlin, New Jersey Audubon Society. Sources of support for museum education, Ray J. Howe, Academy of Natural Sciences of Philadelphia. The watershed approach to resource use, Brandywine Valley Association. There will be a discussion period following the lectures.

Natural History Papers, Part B. John A. Gustafson will preside. Colonies of great blue heron, *Ardea herodias*, in Kansas, 1961, T. F. Andrews, Kansas State Teachers College. Synchronization of the life cycle of fairy shrimp to the temporary pond, Edmund S. Broch, Colgate.

Museum Tours to the Academy of Natural Sciences of Philadelphia and the Franklin Institute. The coordinator of the tours is John I. Green, Cornell University.

Saturday 29 December

Session V. Means and Media of Nature Instruction. Verne Rockcastle, Cornell University, will preside.

Nature instruction through the press, E. Laurence Palmer, Cornell University. The effect on the nature study idea of TV and ETV, Benedict A. Hall, State University of New York. Field trips: their place in biological science teaching, John Wanamaker, Principia College. Developing teaching exhibits and training nature interpreters in the National Park Service, Myron Sutton, National Park Service.

Session VI. Nature Reports. Beth Schultz, Western Michigan University, will preside. How to photograph wildflowers, Richard B. Fischer, Cornell. Using governmental agencies for helps in nature study, Homer Hoffman, Principia College.

Sunday 30 December

Field Trip to Brigantine National Wildlife Refuge, N.J. Joint program of American Nature Study Society and National Association of Biology Teachers. Roger Tory Peterson is leader of the trip.

National Association of Biology Teachers

Thursday 27 December

Manning the Frontiers, Part I. Recent Developments in College Biology. Addison Lee, University of Texas, will preside. Construction and evaluation of programmed biology materials, C. A. Lawson and Manfred Englemann, Michigan State University. The commission on undergraduate education in biological sciences, Thomas Hall, Washington University. Collegiate standards in biology (exclusive of curriculum): An interim report of the AIBS Subcommittee on Standards, Willis Johnson, Wabash.

Friday 28 December

Manning the Frontiers, Part II. The Evaluation of BSCS Biology. William V. Mayer will preside. The BSCS evaluation program, Bentley Glass, Johns Hopkins. The measurement of objectives, William V. Mayer. The achievement of goals, Evelyn Klinckmann. The results of the evaluation program, Wimburn Wallace, Psychological Corp.

Films. Richard L. Fox, Richwoods Community High School, will preside. *Vacant Lot. The Pond. The Singing Frogs and Toads. The Living Mammal. The Living Bird. The Story of BSCS. Culturing Slime Mold Plasmodium. Neurospora Techniques. Histological Techniques.*

NABT Special Tour. Coordinator, Robert G. Hudson. Hahnemann Medical College and Hospital.

Saturday 29 December

Manning the Frontiers, Part III. Planning Facilities for Biological Sciences. W. Edgar Martin, U.S. Office of Education, is moderator. Panel discussants: William B. Hopp, Indiana State College; John Bodel, Hotchkiss School; S. S. Coston, J. Sjostrom Company; and William P. Merci, American Institute of Architects.

Manning the Frontiers, Part IV. Acquiring and Using Open Areas for Nature Study. Joint session of American Nature Study Society and National Association of Biology Teachers. John Brainerd, Springfield College, will preside.

Session I. Nature and Nurture of Scientists. Famous scientists and their debt to open areas, John Brainerd.

Session II. The Design of Open Space. Designing space in our cluttered culture, Charles W. Eliot, Harvard. Opening space in our crowded cities,

Arthur A. Davis, HHFA Urban Renewal Administration. Preserving rural open space, Robert Coates, National Park Service. Land-use planning for schools and colleges, John W. Brainerd.

Session III. The Use of Open Space for Training in Natural Sciences. Odd lots—the big bargain in urban science, Phyllis S. Busch. The urban park, Maurice Sullivan, National Capital Parks. A regional program for sponsorship of natural science centers, John Ripley Forbes, Natural Science for Youth Foundation. The community nature center program of the National Audubon Society, Joseph J. Shomon, National Audubon Society. Rural recreation areas for natural science training, Daniel B. Beard, National Park Service.

Manning the Frontiers, Part V. Joseph Novak, Purdue, will preside. Great experiments in biology—a summer program for academically talented high school students, Burton Voss, Pennsylvania State University. A unique program in support of teacher-student science research in the high school, Theodore Varbalow, Olney High School. Enrichment—opportunity or farce?, Raymond Howe, Academy of Natural Sciences. The child's view of the living world, with implications for the preparation of elementary school teachers, Herman Kranzer, Temple.

National Science Teachers Association

Friday 28 December

Experimentation and Measurement. John H. Marean, Reno (Nev.) High School, will preside. Experimentation and measurement, William J. Youden, National Bureau of Standards. Panel discussions by (i) a science educator, Herbert A. Smith, Pennsylvania State University; (ii) a science supervisor, Helen E. Hale, Board of Education of Baltimore County; and (iii) a science classroom teacher, James DeRose, Marple-Newton (Pa.) Senior High School.

Information and Communication

Program cochairmen: Paul S. Feinstein, National Science Foundation, and Mordecai Hoseh, National Federation of Science Abstracting and Indexing Services.

Wednesday 26 December

Other Tongues of Science. Assimilating the Literature of Other Nations. **Part I.** Approaches to Foreign Scientific Literature. Symposium, program of the Information and Communication Section (T), cosponsored by the National Science Foundation. Joseph Gray Jackson, William Steell Jackson and Sons, will preside. Papers by (i) editors of scientific journals, Milton O. Lee, Federation of American Societies for Experimental Biology, and Elmer L. Hutchisson, American Institute of Physics; (ii) editors of technical journals, F. J. Van Antwerpen, American Institute of Chemical Engineers, and Martin Summerfield, Princeton; and (iii) editors of abstract journals, James L. Wood, American Chemical Society, and Malcolm Rigby, American Meteorological Society.

Part II. Resources of Foreign Scientific Literature. (Same sponsor as for part I.) Claire K. Schultz will preside. Acquisition on a national scale, Jerrold Orne, University of North Carolina. Announcement and availability, G. Miles Conrad, *Biological Abstracts*. Papers on the overcoming of language barriers (i) by the federal government (Paul S. Feinstein, National Science Foundation); (ii) by private efforts and activities (Kurt Gingold, American Cyanamid Company); and (iii) by the professional societies (Robert T. Beyer, American Institute of Physics; Robert C. Stephenson, American Geological Institute; and Sydney H. Gould, American Mathematical Society).

Thursday 27 December

Part III. How Other Countries Approach the Problem of Foreign Science. (Same sponsor as for parts I and II.) Dwight E. Gray, National Science Foundation, will preside. Great Britain, D. J. Gerhard, British Embassy. Canada, Ralph E. McBurney, National Research Council of Canada. Japan, Yukio Yamamoto, Embassy of Japan. Scandinavia, Elin Tornudd, Scandinavian Council for Applied Research.

Part IV. Evaluation of Current Programs and Projections. (Same sponsor as for parts I–III.) Hugh C. Wolfe, American Institute of Physics, will preside. Panel discussion: Richard J. Belknap, American Chemical Society; Hiden T. Cox, American Institute of Biological Sciences; Eugene Wall, Engineers Joint Council; and Robert A. Harte, American Society of Biological

Chemists. Summary: Identification of important problems and steps toward solution, Burton W. Adkinson, National Science Foundation.

Statistics

In addition to being a cosponsor of the following joint program, the American Statistical Association is a cosponsor of all sessions arranged by the Statistics Section (U).

Wednesday 26 December

Session for Teachers of Statistics I. Bayesian Decision Theory and Applications. Joint program of the Statistics Section (U) and the American Statistical Association. John de Cani, University of Pennsylvania, will preside. Speakers: John de Cani and Richard C. Clelland, University of Pennsylvania.

Session for Teachers of Statistics II. Applications of Bayesian and Non-Bayesian Inference Contrasted. (Same sponsor as for part I.) John de Cani will preside. Speakers: John de Cani and Paul E. Green, University of Pennsylvania.

Use of Judgments in Making Optimal Decisions, II. Program of the Institute of Management Sciences, cosponsored by the Statistics Section (U). For details, see program of the Institute of Management Sciences.

Thursday 27 December

Some Uses of High Speed Computers in Statistics. Program of the Biometric Society ENAR, cosponsored by the Statistics Section (U). For details, see program of the Biometric Society.

Some Problems of Mathematical Biology. Program of the Biometric Society ENAR, co-sponsored by AAAS sections of Zoological Sciences (F), Botanical Sciences (G), and Statistics (U). For details, see program of the Biometric Society.

Probability and Mathematical Statistics. Joint program of the Statistics Section (U), the Mathematics Section (A), and the Institute of Mathematical Statistics. Arranged by Jerzy Neyman, University of California. T. W. Anderson, Columbia, will preside. Combinatorial methods in the theory of probability, H. F. Bohnenblust, California Institute of Technology. Random walk and some applications, Frank Spitzer, Cornell. Approximation problems in statistical decision theory, Lucien M. Lecam, University of California. Compound statistical decision problems, Herbert E. Robbins, Columbia.

The Statistical Problems of Genetics. Joint program of the Statistics Section (U) and the Biometric Society ENAR, cosponsored by the Zoological Sciences Section (F), the Botanical Sciences Section (G), the Society for the Study of Evolution, the American Society of Zoologists, and the Institute of Mathematical Statistics. Arranged by Jerzy Neyman and T. A. Bancroft, Iowa State University of Science and Technology. Mina S. Rees, City University of New York, will preside. Stochastic models in genetics, S. Karlin, Stanford. Stochastic theory of gene frequency distribution, Howard Levine, Columbia. Stochastic process in evolution, Sewall Wright, University of Wisconsin. Chance processes determining recombinanat frequencies of bacteriophage, F. W. Stahl, University of Oregon.

Saturday 29 December

Statistical Problems of Astronomy. Joint program of Astronomy Section (D) and Statistics Section (U). Arranged by S. W. McCuskey, Case Institute of Technology, and Elizabeth L. Scott, University of California. F. K. Edmondson, Goethe Link Observatory, will preside. Orientation in pairs of galaxies, Thornton Page, Van Vleck Observatory. Galaxies in clusters and in the field, Jerzy Neyman and Elizabeth L. Scott. Estimation of stellar masses above the main sequence from long-period visual binaries, C. B. Stephenson, Warner and Swasey Observatory. The distribution of A and F stars within 100 parsecs in the mass-age diagram, Bengt Stromgren, Institute for Advanced Studies.

Development in Mathematical Psychology. Program of the Statistics Section (U), cosponsored by the Psychology Section (I). Arranged by R. Duncan Luce, University of Pennsylvania, who will preside. Recent developments in stimulus sampling theory, Richard C. Atkinson, Stanford. Recent research in mathematical learning theories, Robert R. Bush, University of Pennsylvania. Recent developments in the theory of reaction time, William J. McGill, Columbia. The many faces of the computer in psychological research, Alan Newell, Carnegie Institute of Technology.

Session in Appreciation of the Late Sir Ronald Fisher. Joint session of the Statistics Section (U) and the Biometric Society ENAR, cosponsored by the In-

stitute of Mathematical Statistics and the American Statistical Association. Chester I. Bliss, Yale, will preside. Fisher's contributions to the theory of statistics, Harold Hotelling, University of North Carolina. Fisher's contribution to scientific method, W. J. Youden, National Bureau of Standards. Fisher's contributions to mathematical and statistical genetics, Oscar Kempthorne, Iowa State University.

Sunday 30 December

Sampling for Zoologists. Program of the Biometric Society ENAR, cosponsored by the American Society of Zoologists, the Zoological Sciences Section (F), and the Statistics Section (U). For details, see program of the Biometric Society.

Statistical Problems in Social and Economic Research. Program of the Statistics Section (U), cosponsored by the Social and Economic Sciences Section (K). Morris H. Hansen, Bureau of the Census, will preside. Measurement of gross flows in the labor force, Robert Pearl, Bureau of the Census. Use of control classification: adjustment for inadequacy of broad classes, John W. Tukey, Princeton. The accuracy of social statistics, Frederick F. Stephan, Princeton.

Statistical Problems of Ecology. Program of the Statistics Section (U), cosponsored by the Zoological Sciences Section (F) and the Ecological Society of America. Arranged by Jerzy Neyman. Lamont C. Cole, Cornell, will preside. The life and death of flour beetles, W. J. Youden, National Bureau of Standards; David B. Mertz and Thomas Park, University of Chicago. Genetic and environmental factors affecting productivity in *Tribolium castaneum*, A. Sokoloff, University of California. The influence of "social velocity" on the sequence and duration of behaviors of rats, John B. Calhoun, National Institutes of Health.

Statistical Problems in Novel Domains of Science. Program of the Statistics Section (U), cosponsored by the Institute of Mathematical Statistics. Arranged by Jerzy Neyman; S. S. Wilks, Princeton, will preside. Stochastic problems in system and control theories, L. Zadeh, University of California. Impact of repair on reliability, Leon Gilford and William H. Cook, Operations Research, Inc. Adaptive processes, Richard Bellman, Rand Corporation.

Biometric Society, Eastern North American Region

Program chairman: T. A. Bancroft, Iowa State University of Science and Technology.

Thursday 27 December

Some Uses of High Speed Computers in Statistics. Program of the Biometric Society, cosponsored by the Statistics Section (U). T. A. Bancroft will preside.

Solutions of statistical distribution problems by Monte Carlo methods, H. O. Hartley, Iowa State University of Science and Technology. Preparation of presumptive diagnosis by computers, Max A. Woodbury, New York University, and Martin Lipkin, Cornell. Statistical aspects of electrocardiographic classification, Lee D. Cady and Max Woodbury, New York University. A critical review of computer uses in medical diagnosis, Murray Eden, Massachusetts Institute of Technology.

Some Problems of Mathematical Biology. Program of the Biometric Society cosponsored by the Zoological Sciences Section (F), the Botanical Sciences Section (G), and the Statistics Section (U). H. L. Lucas, North Carolina State College of Agriculture and Engineering, will preside. Teaching modern mathematics to biologists, H. R. van der Vaart, North Carolina State College of Agriculture and Engineering. Reliability of biological systems, W. S. McCulloch, Massachusetts Institute of Technology.

Statistical Problems of Genetics. Joint program of the Biometric Society and the Statistics Section (U), cosponsored by the Zoological Sciences Section (F), the Botanical Sciences Section (G), the Society for the Study of Evolution, the American Society of Zoologists, and the Institute of Mathematical Statistics. For details, see program of the Statistics Section (U).

Sampling for Zoologists. Program of the Biometric Society, cosponsored by the American Society of Zoologists and the sections on Zoological Sciences (F) and Statistics (U). E. Fred Schultz, Jr., U.S. Department of Agriculture, will preside. Problems in ecological sampling, L. Lee Eberhardt, General Electric Company. Sampling in fisheries, D. S. Robson, Cornell. Problems in the analysis of tagging experiments, with particular reference to fur seal experiments, Douglas G. Chapman, University of Washington.

Science in General

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

Academy Conference

Program chairman: Robert C. Miller, Academy of Sciences.

Wednesday 26 December

Session on Junior Academies. Myron S. McCay, University of Chattanooga, will preside. Report of the standing committee on junior academies, Myron S. McCay. Brief report on the national survey of junior academies, John D. Hopperton, New Mexico Institute of Mining and Technology. The program of the Pennsylvania Junior Academy of Science, Charles L. Bickle, Milton Hershey School. The NSF programs for junior academies of science, Howard J. Hausman, National Science Foundation.

National Junior Academy of Science Program, Sections A and B. Titles of papers and list of speakers will be available at the meeting. Elnore Stoldt, Jacksonville (Ill.) High School, will preside at Section A; Robert C. Fite, Oklahoma State University, at Section B.

Thursday 27 December

Financing the Academies. Gerald Acker, president elect, Academy Conference, will preside. Problems of the incorporation of academies of science, J. Teague Self, University of Oklahoma. Problems relating to the tax exemption of nonprofit organizations, John R. Barber, Bureau of Internal Revenue Service. Papers on the activities and sources of support of academies of science: The Virginia Institute for Scientific Research, an outgrowth of the Virginia Academy of Science, Foley F. Smith, Virginia Academy of Science. Support of an academy having a museum program, H. Radclyffe Roberts, Academy of Natural Sciences of Philadelphia. State, federal, and local support of academies of science, Charles D. Vaughn, South Dakota Academy of Science.

Annual Junior Scientists Assembly

Program chairman: Kenneth W. Prescott, Academy of Natural Sciences. The Academy Conference is a cosponsor of the Conference on Scientific Manpower.

Thursday 27 December

Program. Kenneth W. Prescott will preside. Hunting with a cheetah (illustrated lecture), Daniel P. Mannix. Propulsion in air and space (demonstration lecture), Stewart Way.

American Geophysical Union

Friday 28 December

The Earth's Magnetic Field and its Effects on Cosmic Radiation. Symposium, program of the American Geophysical Union, cosponsored by the Physics Section (B). Arranged by Martin Pomerantz, Bartol Research Foundation. Serge A. Korff, New York University, will preside. Earth's magnetic field and its variations, Scott E. Forbush, Carnegie Institution of Washington. Cosmic rays in the earth's magnetic field, Martin A. Pomerantz. U.S. Navy project MAGNET, Wilburt H. Geddes, U.S. Naval Oceanographic Office.

Conference on Scientific Manpower

Friday 28 December

Community Programs for Motivation to Science and Engineering Training. Part I. Program of the Conference on Scientific Manpower, cosponsored by the Engineering Manpower Commission, Scientific Manpower Commission, National Research Council, National Science Foundation, Engineering Section (M), Academy Conference of AAAS, and Engineering and Technical Societies Council of Delaware Valley. James Creese, Drexel Institute, will preside. Local industry-school cooperation in science instruction, Glenn W. Giddings, General Electric Company. Oklahoma frontiers of science program, James G. Harlow, Frontiers of Science Foundation. Bending the twig—Franklin Institute program, Robert W. Neathery, Franklin Institute. The program of the Engineering and Technical Societies Council of the Delaware Valley, Kenneth E. Karmel and Lyle H. Phifer, members of the Council.

Part II. (Same sponsors as for part I.) Samuel Schenberg, New York Board of Education, will preside. Role of state academies of science, John D. Hopperton, New Mexico Institute of Mining and Technology. Panel on counseling and guidance: National Defense Education Act support for training counselors, Ralph Bedell, U.S. Office of Education; Implications of school-industry

cooperation for school guidance progams, Richard B. Scheetz, New Jersey Department of Education; High School counseling from the student viewpoint, Stewart Wood, Washington Junior Academy of Sciences; Public school counseling, W. Donald Baughan, Centennial Joint Schools (Pa.).

Exposition of Science and Industry

The AAAS Annual Exposition of Science and Industry will be held on the concourse level of the Sheraton Hotel. It will be open only to registrants; children under 16 are not registered. All booth space has been sold. Hours: 27–29 Dec., 10 A.M. to 6 P.M.; 30 Dec., 9 A.M. to 4 P.M.

Those who wish to join the Association at this time are cordially invited to visit the AAAS New Member Service, in the AAAS booth in the main lobby of the Sheraton. Whether or not one is a AAAS member, everyone is cordially invited to visit the AAAS booth for information concerning the Association and its activities. Since its founding in 1848, the Association has admitted to membership not only professional scientists but also other men and women who have a general interest in science, who wish to keep informed of the progress of science, and who would like to support the high purposes of the one organization that represents all science. The New Member Service will be pleased to accommodate those who wish to join the Association, and those who are already members can nominate others for membership.

Upon payment of the annual dues of $8.50 (for 1963), each member receives the scientific newsweekly, *Science*, and the quarterly *Bulletin*. Sample copies will be available, and symposium volumes and AAAS membership insignia will be on display.

AAAS Science Library Program

Booth 23. Since 1955 the AAAS has administered an experimental science library program with the financial support of the National Science Foundation to encourage the improvement of science and mathematics instruction, to make young people better informed concerning science, to encourage those with appropriate aptitude to choose science careers, and to stimulate the enlargement and improvement of col-

lections of science and mathematics books in elementary schools, secondary schools, and public libraries. An important activity of the program is the continuous staff review and evaluation of science books as they are published, with the advice of qualified specialists.

To aid schools and libraries in selecting and purchasing science and mathematics books, particularly with the aid available under the provisions of the National Defense Education Act and other federal legislation, the AAAS has published *The AAAS Science Book List* (an annotated list for secondary schools and public libraries) and *The Science Book List for Children* (an annotated guide for elementary schools and public libraries). These lists are used as purchase guides by school systems throughout the world. The AAAS will exhibit all of the "double-starred" books (indispensable) and most of the "single-starred" books (highly desirable) recommended in these lists so that they may be examined by scientists, educators, and others. Copies of these lists will be distributed without cost to registrants, as well as copies of the following: *An Inexpensive Science Library*, the 1961 edition of an annotated list of 679 paper-bound science books recommended for high school students, college undergraduates, teachers, and the education general public; and *Careers in Science*, a bibliography of career guidance and college information publications prepared especially for secondary school students, teachers and vocational counselors.

Academic Press, Inc.

Booth 76. New books, journals, treatises, and monographs will be on view. Also on display will be the first three paperbacks: *Division of Labor in Cells*, G. H. Bourne; *Design and Function at the Threshold of Life: The Viruses*, H. Fraenkel-Conrat; and *Time, Cells, and Aging*, B. L. Strehler. Members of our staff will be available for discussion of our publishing program.

Addison-Wesley Publishing Company, Inc.

Booth 14. Our display consists primarily of advanced level text and reference books in the fields of biology, chemistry, and mathematics. Some of the 1962 publications that will be shown are: *Twenty-six Afternoons of Biology: An Introductory Laboratory Manual* by Wald, Albersheim, Dowling, Hopkins, and Lacks; *Collection of Problems in Physical Chemistry* by Bares, Cerny, Fried, and Pick; *Set Collection of Prob-*

lems in Reaction Heats and Bond Strengths by Mortimer. Of interest to statisticians as well as mathematicians, *Index of Mathematical Tables* by Fletcher, Miller, Rosenhead and Comrie.

Affiliated Publishers

Booth 38. We are distributors for Golden Press, Inc., Pocket Books, Inc., and Simon and Schuster. Our books for schools and libraries cover the natural sciences, social sciences, and mathematics.

American Edelstaal, Inc.

Booth 130. Our exhibit "Maximat" and "Unimat", multi-functional machine tools, will be exhibited and demonstrated. These two extremely versatile machine tools offer a complete machine shop capability to all medical and scientific research and development facilities. "Maximat" includes a precision lathe, vertical milling machine, drill press, and external and internal cylindrical grinder. "Unimat" is a smaller version. New models are now available and will be on display.

American Electronic Laboratories, Inc.

Booth 101. We will display the latest advances in the field of physiological and biomedical instrumentation. Physiological stimulators, stimulus isolators, and other stimulus accessories will be shown in operation; our line of temperature telemetering systems will be introduced. A system which includes a miniature temperature transmitter for subcutaneous implantation in small animals will be shown in operation, and the AEL basal temperature recording and monitoring system which is used in fertility studies and provides an exceptionally accurate means of sensing and recording basal temperatures will be shown.

American Institute of Biological Sciences

Booths 27, 28, 29 and 30. The exhibit will contain displays of various projects including the Biological Sciences Curriculum Study, the AIBS Film Series, the Biological Sciences Communications Projects, Publications, and other educational and research projects. AIBS staff members will be on hand to discuss and provide information on these projects. A lounge area will be provided for inspection and perusal of publications and brochures. Free copies of the AIBS publications catalog and other brochures will be available.

American Optical Company

Booths 109 and 110. A number of outstanding instruments will be exhibited. Among them are the new AO Spencer "fluorolume," a fluorescence illuminator for fluorescent antibody methods and other microscope techniques; the TS meter, a temperature compensated, direct reading instrument that gives immediate accurate determinations of total solids, specific gravity, refractive index, protein or water concentration in serum, plasma and urine; and an AO phase microscope with special long working distance accessories for blood platelet counting. Also to be shown are the new concept in teaching microscopes, the AO Spencer Series Sixty, and the AO overhead delineascope. A complete line of photomicrographic and photomacrographic cameras will also be exhibited.

American Telephone and Telegraph Company

Booths 77, 78, 79. The Bell Telephone System will present an exhibit on one of the most significant advances in telephony since the transistor—the optical maser. The maser, now being used in the Telstar experiment, has an unlimited potential in transmission. The principle of sending calls and other communications over a controlled beam of light will graphically show how sound can be transmitted from one city to another, or directed to the moon with uncanny accuracy. The exhibit also will review the capacity of present facilities and the potential of the maser, including other applications for the future.

American Viscose Corporation

Booth 119. Avisco, the nation's largest producer of rayon and the second largest manufacturer of cellophane, is fast becoming recognized as a leader in the manufacture of a broad line of packaging materials and ingredients. These packaging items, which will be displayed, include a wide variety of cellophane films, Avistrap cord strapping, cellulose bands, meat casings, cello-celsior, reinforced paper, films, and tapes. The newest product of Avisco research is Avicel microcrystalline cellulose, a snow-white, free flowing, edible flour which is odorless, tasteless, and non-caloric. This product now, in semi-commercial production, is being evaluated by the food, pharmaceutical and cosmetic industries. Sample items made with Avicel will be shown.

Americana Corporation

Booth 97. *Encyclopedia Americana*, the 30-volume reference set covering all science fields, will be displayed. Other reference volumes to be exhibited include *The Book of Popular Science, Richards Topical Encyclopedia, Lands & Peoples*, and *Funk & Wagnalls International Dictionary*. All are publications of Grolier, Inc.

Association of American University Presses

Booths 127 and 128. The member presses of AAUP have sent their most recent publications in scientific fields to this cooperative exhibit. Visitors may examine a wide selection of scholarly books in the biological, medical, and physical sciences; in mathematics and engineering; in social and economic sciences, anthropology, and archeology; and in the history and philosophy of science. Representatives of AAUP will be at the booth to answer questions concerning AAUP and the publications of its member presses, each of which is a separate publishing organization. Free catalogs of the books on display will be distributed. Books may be ordered either at the booth or directly from the presses.

Atlantic Refining Company

Booth 12. The Atlantic Refining Company will exhibit recent technical developments in the petroleum industry which have resulted from the application of basic research by scientists in the various disciplines. Among these research developments is MET-X, a method of removing metal contaminants from cracking catalysts by use of an ion exchange resin. The process is now being licensed to others in the petroleum industry through arrangements with the M. W. Kellogg Company. Another development to be displayed will be a miscible slug process for the secondary recovery of crude oil from petroliferous formations.

Atlantic Research Corporation

Booth 129 A. This exhibit will emphasize the company's research and development capabilities, showing through photographs its extensive facilities in the national capital area, in New England, and on the West Coast and some of its specialized laboratories and equipment for research and development in propellant and fuel chemistry, materials technology, combustion, nuclear engineering, and radiochemistry. Accomplishments in the missile and space field are illustrated through photographs and full-scale models of several advanced rockets. Some of the specialized laboratory equipment developed and produced by the company is also displayed.

Atomic Accessories, Inc.

Booth 64. This exhibit will consist chiefly of miniaturized nuclear equipment for teaching nuclear science on the post graduate, college and high school levels, and nuclear instruments and related accessories for use in educational institutions, laboratories, and in general industrial research work. Items to be exhibited are education kits and training labs, radiation detectors, scalers, ratemeters and timers, miniaturized radiochromatogram scanners, and many more.

Beck Kassel Laboratories, Inc.

Booth 44. Beck Kassel microscopes are a product of Christian Beck and Sons of Kassel, West Germany, who, for over a half century, have produced optical instruments of the finest design. The various models of microscopes and accessories offer a wide range of instruments to suit those needs in the fields of teaching and research or in the lines of production and control. In our catalogue, you will find a wide range of standardized microscopes, each of rugged and precision design incorporating the finest of materials and workmanship. Interchangeability enables us to "tailor-fit" your individual specification. Upon inspection of the various models on display in our booth, you will appreciate the fineness of these microscopes and the comparatively low prices.

Biological Abstracts

Booth 18. *Biological Abstracts* is a scientific information service that reports the world's biological research. The exhibit describes the use and application of B.A.S.I.C., a computer generated retrieval system that quickly discerns present and past research interest areas from over 100,000 scientific articles annually. On display will be illustrations of B.A.S.I.C. and other time-saving selection techniques. See copies of *Biochemical Title Index*—a current, automated current-awareness service specializing in the important field of biochemistry. During the meeting representatives will be on hand to welcome visitors, demonstrate retrieval systems, answer questions, and solicit abstracters.

Butterworth, Inc.

Booth 114. As a leading international publisher for science, we offer a wide selection of valuable works in every field of science, from agriculture to zoology. We invite you to visit our exhibit and examine the many new publications. Numerous advance proofs of forthcoming texts will also be available for your inspection. As official publishers for the International Union of Pure and Applied Chemistry, we will be displaying all of these important publications, documenting the most recent advances in every area of chemical theory and application. In particular, we call your attention to the newly published third edition of Smithell's *Metals Reference Book*, a work of primary importance to all scientific and industrial interests.

Cadillac Optical Corporation

Booth 33. A full line of microscopes, made in Japan and Western Germany, with registered trade names "Monolux," "Binolux," and "Microlux" will be displayed. Microscopes for elementary and high school teaching purposes and a complete line of binocular stereoscopic microscopes for industrial use are available from Cadillac.

Cambosco Scientific Company

Booth 59. Our exhibit will provide you with the opportunity to examine some of the latest teaching tools in the physical and biological sciences. Also available is the latest Cambosco catalogue which illustrates and describes thousands of items in the fields of physics, chemistry, biology and the earth sciences. Representatives will be present to answer questions concerning our products.

Cambridge University Press

Booths 19 and 20. Cambridge University Press will exhibit an up-to-date list of well over a hundred cloth books, together with more than 40 paperbacks, and 24 scientific journals. These are the works of some of the world's most distinguished scientists—Neils Bohr, Sir Charles Snow, George Gamow, and so forth. Titles cover all branches of the natural and physical sciences.

Carolina Biological Supply Company

Booth 75. Staff members from our Burlington, No. Carolina, laboratories will be present to discuss new offerings with you, and we will be trying to find ways to make our service to

biologists even more effective. Our display will include the Wolfe biological and medical microscopes, our Carolina plastic Blue Box for flat microscope slide storage, the Carolina culture dishes in three sizes, our improved line of classroom teaching models, and packages demonstrating the new Caro-pak method of shipping and storing specimens in sealed plastic bags.

Central Scientific Co.

Booth 67. Chosen from Cenco's complete line of instruments and supplies for the biological sciences, a number of unusual teaching pieces are being announced including the Cenco Programmed Learner, a disposable 500-frame teaching machine enabling a whole class to try out the programmed teaching at a minimal cost. Other equipment includes the Minivac 6010, a digital computer simulator; the CHEM Study series of wall charts, a bioradiological laboratory, a unique microscope-Polaroid camera support; and a number of 35-mm sound filmstrips on nuclear radiation.

Childrens Press, Inc.

Booth 57. Heading our list of science publications for 1962 is the new *Young People's Science Encyclopedia* Set (20 volumes). This set was published by Childrens Press, Inc., in cooperation with the National College of Education, Evanston, Ill. Other outstanding science titles are *Discovering Science on Your Own* and *101 Science Experiments* by Ila Popendorf. Also on exhibit will be 35 titles from our *True Book Series* and an additional 35 titles from Childrens Press and Melmont Publishers, Inc. All of our books are specially bound in reinforced cloth and are unconditionally guaranteed both in binding and in content.

The Coca-Cola Company

Booth 56. Ice-cold Coca-Cola served through the courtesy and cooperation of The Philadelphia Coca-Cola Bottling Company and The Coca-Cola Company.

Columbia University Press

Booth 60. Recent books published in all fields of science will be on display, and information will be available on forthcoming spring 1963 titles. Please stop by the booth and browse; a Columbia editor will be present to answer any inquiries.

The Combined Book Exhibit, Inc.

Booths 1, 2, 3, 4, and 39. This is a subject-arranged exhibit of science books of many publishers where you are invited to browse and check the printed bibliography of books on display. The exhibit includes books on all levels.

Consultants Bureau Enterprises, Inc.

Booth 122. In addition to translating and publishing Soviet scientific journals for American learned societies, CB publishes many scientific books and journals translated from Russian under its own colophon. These journals include: *Artificial Earth Satellites, Kinetics and Catalysis*, and the forthcoming translations of *Soviet Powder Metallurgy* and *Soviet Radiochemistry*. CB books are carefully selected from current Soviet publications in all fields of science and are translated into English by bilingual scientists. Plenum Press, Inc., also publishes monographs of note and the proceedings of conferences held by American and British learned societies.

Coulter Electronics Sales Co.

Booth 83. This exhibit will include the Coulter Counter which is used for routine counting and provides accuracy and speed not heretofore possible.

George F. Cram Company, Inc.

Booth 37. The Cram exhibit will feature the new See-Thru Thin Man, an anatomical presentation through the use of transparent overlays. This life-size representation portrays the human anatomy in depth layers. It was edited by James H. Otto, widely known author of health and biology textbooks. The artist was Ernest W. Beck, medical artist for many scientific works and consultant to the American Medical Association Journal. Also on display will be a variety of science and mathematical charts, celestial and slated globes and planetariums.

Current Magazine

Booth 115. *Current*, a relatively new monthly journal of public affairs, is the product of a unique editorial process which begins by isolating the frontier problems worth a concerned citizen's attention. It then seeks material on these problems that contains new ideas or information, or comes from an unusual source, or provides a better way of saying something. The exhibit for

Current magazine provides a visual illustration of this editorial process. Sample copies of back issues will be distributed.

F. A. Davis Company

Booth 43. Our exhibit will feature a greatly expanded list of publications in the fields of science. Among those in the series of the Council for International Organizations of Medical Sciences will be: support of medical research, oxygen supply to human foetus, brain mechanisms and learning, radioisotopes and bone. Many other timely Davis titles will be displayed.

Dell Publishing Company, Inc.

Booth 99. Dell will display two Science Series, both published initially in 1962. First and foremost are Dell *Visual* books, a completely original and unique combination of text and artistic presentation covering many fields of science. European and American authors and artists have cooperated in creating this series which places emphasis on the visual rendering of scientific data.

Denoyer-Geppert Company

Booth 15. Our display will consist of a representative selection of unbreakable plastic models for human anatomy and physiology, zoology and botany, and of a wide selection of charts covering these same areas. There will be colored charts on nuclear physics and charts dealing with the terrestrial atmosphere and space, the laws of planetary movement and a chart of the cell as seen under the electron microscope. On display will also be a wide selection of our "Biocraft" plastic embedded specimens, a representative selection of skeletal preparations, and monocular and stereoscopic microscopes.

Division of Air Pollution, Public Health Service

Booth 86. This exhibit consists of three separate units—two internally lit, concave panels, separated by a walk-through ramp. On two faces of the panels are painted faces—one illustrating the dirty face of air pollution—and the other the fresh, unpolluted countenance of clean air. Explanatory, descriptive signs are attached to the ramp and panels by means of modern bars. To the back of one panel is attached a motor-driven rotating pinwheel, creating the illusion of air movement.

Division of Research Grants, National Institutes of Health, Public Health Service

Booth 100. Grant and Award Programs of the Public Health Services describes the areas of financial support available from PHS: research grants, program grants, research training, and fellowships, and health research facilities construction grants. Series of slides illustrate the review and appraisal of applications, the categories of eligibility, and the various types of grants and fellowships. Publications concerning the various programs will also be available.

Doubleday & Company, Inc.

Booths 106 and 107. Doubleday will display selected titles in the sciences, both hardbound and paperback, including the Anchor series: *Science Study Series* and *Natural History Library*. Also on display will be new titles in the Tutor-Text series, programmed instruction in book form and selected new books of science for the layman and student.

Encyclopaedia Britannica

Booth 34. We welcome visitors to examine the new edition of Britannica. Official delegates may now purchase this magazine set at an exhibit offer available only at our convention exhibits.

The Exact Weight Scale Company

Booth 6. This exhibit will consist of a working demonstration of scales and balances for use in small animal weighing, which are currently being used in cancer research, nutritional studies, and behaviorial studies. Also shown will be Shadowgraph scales and balances which weigh and automatically record the weight on digital or analogue tapes and charts.

F & M Scientific Corporation

Booth 126. The F & M Scientific Corporation of Avondale, Pa., will exhibit the model 720 Dual Column Programmed High Temperature Gas Chromatograph, the model 1609 Flame Ionization Attachment, and the model 240 Power Proportioning Temperature Controller.

The Franklin Institute

Booths 35 and 36. This exhibit will portray the two basic missions of the Institute: education and research. It will feature current and projected experiments in science education and the Institute's program to inspire and en-

courage pre-high school students to become interested in science. It will also describe the Institute's research laboratories, computing center, and the Bartol Research Foundation.

General Biological Supply House, Inc. (Turtox Products)

Booths 47 and 48. Featured in the display of items for teaching biology will be a group of the famous Jewell models and contributions from the various laboratory divisions of Turtox —including special museum preparations and a section dealing with "what's new." Turtox staff members will be present to answer questions and to discuss your teaching as well as technique problems.

General Electric Company

Booth 40. Scientists of the General Electric Research Laboratory will present new research results from some of the areas in which significant advances have occurred during 1962. These will include, among others a high current vacuum interrupter; the ultimate strength of glass; band structures, collective excitations, and the optical properties of solids.

Graf-Apsco Company

Booth 111. Functionally-designed Graf-Apsco microscopes will be displayed for your examination and use. The newest item is the American-made *Stereograf* low power binocular microscope which is an instrument of the highest quality at prices that are even lower than the imports. As America's leading microscope repair house, we welcome the opportunity to discuss any of your repair or obsolescence problems. Also displayed will be a wide assortment of magnifiers and dissecting instruments.

Great Books of the Western World

Booth 93. Great Books of the Western World with the amazing syntopicon is the modern key to knowledge. The accumulated wisdom of mankind is made instantly accessible to anyone through the syntopicon, the modern idea index. These works are a great aid for business men, professional men, students, or anyone who writes, speaks, and communicates with others.

Grolier Incorporated

Booth 121. This booth will display the reference sets, the *Encyclopedia Americana, The Book of Popular Science*, and *Our Wonderful World*, pub-

lished by the Americana Corporation, The Grolier Society, Inc., and Spencer International Press, respectively. There will also be an exhibit by Teaching Materials Corp., a division of Grolier, Inc., which publishes programmed learning courses, and distributes Min-Max II, the teaching machine which implements these courses.

Harvard University Press

Booth 102. A wide selection of Harvard's diverse science list will be displayed. More recent titles include: *The Red Cell* by John Harris and *Polarized Light* by William Shurcliff.

D. C. Heath and Company

Booth 17. Heath will exhibit elementary, secondary school, and college science textbooks. For elementary schools we show the *Heath Science Series*, grades 1–8, by Herman and Nina Schneider, the most widely used series. Also displayed will be *Heath Science Kits*, and for use in colleges, *Physical Science* by Omer, Knowles, Mundy, and Yoho of the University of Florida.

Holt, Rinehart and Winston, Inc.

Booth 71. Twenty-five titles of books in the fields of biology, botany, chemistry, mathematics, and physics will be displayed. Books from the Athena Series will be exhibited.

Institute for Scientific Information

Booth 63. The Institute will display and demonstrate a new dimension in documentation, "The Citation Index," a research project sponsored by the National Institutes of Health and the National Science Foundation. The "Citation Index" is a unique bibliographic tool to update and unify scientific literature. Stop by the booth and learn how citation indexes are prepared and used. Actual literature searches will be demonstrated on the spot. More than 1,000,000 reference citations taken from approximately 52,000 source documents will be available.

Kontes Glass Company

Booths 94 and 95. Kontes will introduce the latest addition to its line of technical glassware—Kontes Kem-Kits, which are designed for student use in organic chemistry courses. Also included in the exhibit will be bantamware kits, bio-medical glassware, and newly developed laboratory apparatus.

Lea & Febiger

Booth 32. Several 1962 and other recent books will be on display at our booth. To mention a few—*Water, Electrolytes and Acid-Base Syndromes*, by Goldberger; *Psychosomatic Medicine*, by Nodine and Moyer; *Parasitology*, by Noble and Noble. Our representative will be pleased to discuss your book needs with you.

Leeds & Northrup Company

Booth 62. Included in the equipment which will be shown is a 7556-A1 Six Dial Guarded Voltage Measuring Facility which utilizes guarded construction in the mounting of each component to minimize errors that might result from leakage currents under high humidity conditions. Also to be shown is a Speedomax H Azar Recorder which brings new recording versatility to research and development work. Finally, the exhibit will also feature a 7401 *p*H Indicator, which is a large, easy-to-read 7-inch meter with five ranges.

E. Leitz, Inc.

Booth 55. Among the new items to be exhibited are the Leitz orthomat photomicrographic camera, the SM fluorescence microscope, and the new powerful Xenon light source.

J. B. Lippincott Company

Booth 41. Professional books and journals geared to the latest and most important trends in current medicine and surgery will be displayed. These publications, written and edited by men active in clinical fields and teaching are a continuation of more than 100 years of traditionally significant publishing.

Lipshaw Manufacturing Company

Booth 53. Specializing in the manufacture of equipment and supplies for the pathologist, the pathology laboratory, and the tissue technologists, the major products of Lipshaw include the following: automatic tissue processors, microtomes and accessories, autopsy tables, and miscellaneous equipment for the dehydrating and processing of tissue.

The Macmillan Company

Booths 84 and 85. Books in all phases of the physical and biological sciences will be exhibited. Representatives will be present to discuss new and forthcoming books.

WHAT'S NEW!

Announcing **Shulman Life Structures Sets of Courtauld Atomic Models.** The Courtauld Atomic Models are uniquely suited for constructing various "life structures" including amino acids, peptide chains and alpha-helixes; and the nucleic structures, the purines and pyrimidines.

Now, in cooperation with Dr. Sidney Shulman, Associate Professor of Biophysics and Immunochemistry at the University of Buffalo, The Ealing Corporation presents a series of five new Courtauld Atom model sets uniquely suited to the *teaching* of these structures.

The Medical and Dental school at the University of Buffalo has equipped their laboratory with 50 of these sets, providing one per group of four students.

Dr. Shulman's detailed instruction manual accompanies the sets. It presents for each of the 25 naturally occurring amino acids the classical formula, the ionized form at pH 7, and the choice of Courtauld atom for each position of the ionized form. The L configuration about the alpha carbon is used; instructions are given for the D configuration.

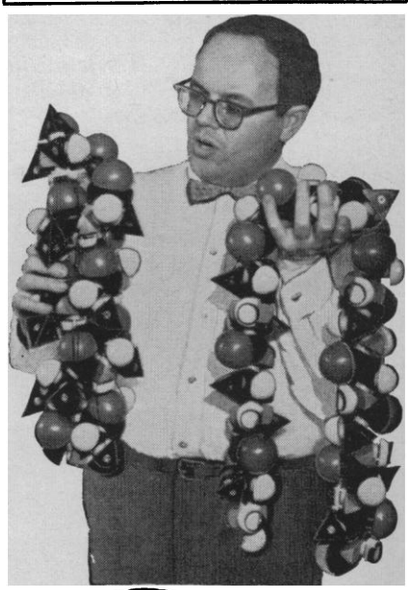
The nucleic bases, nucleotides and related structures are also depicted in detail. The purines and pyrimidines are shown in both keto and enol forms. Instructions for hydrogen bonding of base pairs are given.

A series of forty-five 2″x2″ color slides is being assembled showing all of the structures described in the manual. The slides are included in the larger sets as is an Angstrom caliper.

The principal differences among the sets lie in the number of things which can be built simultaneously. The sets are put up in sturdy boxes with the atoms organized in compartmented trays. As an aid in teaching, each set also contains offprints of several relevant articles by noted authors which have appeared in the *Scientific American* in recent years.

A detailed list of contents of the various sets and their capabilities is available. The color slides separately are $20.00; the Instruction Manual is $3.50. The sets range in price from $118 to $1250.

You can get the "feel" of Courtauld atoms with our **$10 Basic Peptide Residue Set:** 7 atoms, links, collars and spacers or our **$5 Introductory Set:** 4 assorted atoms, links, collars and spacers.



THE Ealing CORPORATION
Cambridge 40, Massachusetts

McGraw-Hill Book Company, Inc. Encyclopedia Division

Booth 31. The *Encyclopedia of Science and Technology* will be featured at the exhibit. The 15 volumes contain contributions from over 2000 specialists and are well illustrated with 9500 photographs, drawings, maps, and diagrams. Also exhibited will be the *1962 Yearbook of Science and Technology*, a single volume containing a summation of all the significant developments in science and technology during the past 12 months.

McGraw-Hill Book Company

Booths 9 and 10. Approximately 200 scientific and technical books will be displayed. Prominent among the newer publications are new books in physics and mathematics and the series of advanced chemistry.

Mechrolab, Inc.

Booth 69. Equipment to be displayed includes model 301A vapor pressure osmometer, model 501 membrane osmometer, and model 401 auto manometer. Application information on over 300 users in the organic and polymer field will be available.

Merck, Sharp and Dohme

Booths 49 and 50. The model heart, one of the biggest attractions of several medical conventions, will be displayed. Registered nurses will be on hand to explain the functions of the heart and its various components.

G. & C. Merriam Company

Booth 112. Webster's Third New International Dictionary, the first completely revised, unabridged published in 27 years will be featured. Also included in the Merriam-Webster exhibit will be other dictionaries designed for a variety of reference purposes.

Mistaire Laboratories

Booth 42. Mistaire will demonstrate a variety of checks for a more accurate interpretation of three-dimensional microscopic structure, and give observers an opportunity to experiment. Models, outline drawings, mathematical comparisons, and beautiful photomicrographs of tetrads and spores will be shown as a preview to a book soon to be available, *Spores, Ferns, Microscopic Illusions Analyzed.*

Mnemotron

Booth 5. Equipment to be exhibited include the new model 700 multiple channel instrumentation tape recorder for physiological variables and the multipurpose digital computer for biological research, the CAT (computer of average transients for four simultaneous variables).

C. V. Mosby Company

Booth 24. Books concerning new knowledge, new ideas, new research, and new techniques will be displayed. Representatives will be present to discuss any book.

National Bureau of Standards

Booth 7. A working model of the NBS acoustical interferometer, operating at liquid helium temperatures, will be exhibited. Results obtained from this instrument represent a breakthrough in the measurement of absolute temperature in the 4–14° K range. It is expected that the interferometer will be used to calibrate semi-conductor reference thermometers, thereby providing science and industry with temperature standards never before available in this range.

National Geographic Society

Booth 92. The *National Geographic Magazine* and the *National Geographic School Bulletin* will be featured. Also on display will be maps, books, pictures, and other special educational materials.

National Heart Institute

Booths 90 and 91. "Directions of Present Day Research in Gerontology" presents research of the Gerontology Branch, National Heart Institute and the Baltimore City Hospitals. This research is directed toward finding answers to questions concerning age changes occurring in the total man, within a single system, and within tissue and cells.

National Science Foundation

Booths 123 and 124. This exhibit presents in graphic form National Science Foundation programs for promoting basic research, education in the sciences, and dissemination of scientific information. Other activities of the Foundation of interest to AAAS members are those concerned with maintaining the National Register of Scientific and Technical Personnel, making fact-finding studies and analyses of the national research and development effort, and with developing national science policy.

New American Library

Booth 66. The Mentor and Signet books on display make it possible for schools and individuals to have an inexpensive library of science. The new *Signet Science Library* has been introduced recently, and the new volumes in this series will be on display.

Office of Naval Research

Booth 58. This exhibit will illustrate ONR-sponsored research in the field of physiological stress. It describes studies being made of high pressure respiratory physiology, ice crystal formation in various fluids of biological interest, body heat regulatory mechanisms, chemical analysis of protoplasm, etc. It also includes a model of the heart and a phonocatheter.

Office of Technical Services U.S. Department of Commerce

Booth 8. The Office of Technical Services, the federal government's collecting center for government research reports, will explain in its exhibit its publications and services to science and industry.

Ohaus Scale Corporation

Booth 87. A complete line of balances and weights for use in science, industry, and education will be displayed. Provision will be made for testing sample materials at the exhibit.

Pennsalt Chemicals Corporation

Booths 25 and 26. The Pennsalt exhibit will feature several key areas of its research and development activity in such areas as organic and inorganic polymers, high energy chemicals, halogen chemistry, organic sulfur and nitrogen chemistry, and certain other important fields of specialty chemical research.

Percival Refrigeration and Manufacturing Company

Booth 134. Percival will feature their new plant growth chambers, Walk-Ins and Compacts, which are designed and engineered to specific requirements. Their new "Microbiotron" will also be displayed.

Phipps & Bird, Inc.

Booth 70. Equipment useful in the physiology, pharmacology, and other teaching and research laboratories will be displayed. Recorders, respirators, square wave simulators, Kymographs and accessories, and infusion pumps will be featured.

Precitec Co., Inc.

Booth 108. Precitec is presenting the new model 10-25 telemicroscope. This unit can project the image of anything from a book to bacteria on one or several television screens. It can be used as a microprojector, opaque projector, dissecting microscope, etc. Images of prepared and live specimens with magnification ranging from one to 3000 diameters will be shown.

Prentice-Hall, Inc.

Booth 13. The newest publications designed to meet the educational needs of the scientist, teacher, and student will be featured. Included in the display is the complete *Foundations of Modern Biology* and other new text and reference books in all fields of science.

Reinhold Publishing Company

Booth 11. A large selection of titles from the company's line of scientific, technical, and college textbooks will be on display. The exhibit presents a broad sampling of Reinhold titles in all scientific disciplines.

Rohm & Haas Company

Booth 65. Rohm & Haas, offering a complete line of enzyme products for use in the food and allied industries, will exhibit good grade enzymes. A brief description of other products for various industries will also be included.

W. B. Saunders Company

Booth 74. New books in biology, chemistry, and the medical sciences will be available for examination. Representatives will be present for consultation and further information.

Savant Instruments, Inc.

Booth 103. Electrophoresis equipment demonstrated will cover the range of 400 to 10,000 volts. An educational electrophoresis system will be introduced for paper and gel media for use in demonstrating electrophoresis as well as performing serious research.

Scholastic Magazines, Inc.

Booth 61. Scholastic offers two editions of its bi-weekly classroom magazines, *Science World*, for junior and senior high school students. In addition, a new science paperback series entitled *Vistas of Science* has been introduced and will be displayed.

Schwarzer Corporation

Booth 98. Different sizes of "Physioscript" and "Cardioscript," multichan-

nel directwriting polygraphs, will be displayed and demonstrated. Also shown will be a new complete assist pump unit and a multibeam large screen oscilloscope.

Science Electronics, Inc.

Booth 131. Science Electronics, a division of the General Electronics Corp., manufactures and sells the Linguatrainer Language Laboratory, Linco physics apparatus, and the Erectronic system for teaching electronics. Its display will include several of its products.

Sesco, Inc.

Booth 29. The Sesco (Universal Scientific Co., Inc.) line of teaching materials designed for the electricity and electronics fields will be exhibited.

Sharp Laboratories, Inc.

Booth 132. The exhibit will feature the first complete carbon dating laboratory available, model CDL-14 radiocarbon dating laboratory.

Sherer-Gillett Company

Booth 54. A new compact plant growth room, model 37-14, will be exhibited. This unit includes several features which provide for easier and more efficient handling by users.

Special Libraries Association Translations Center

Booth 133. SLA Translations Center serves as a national depository for translations of foreign scientific and technical literature from all fields of theoretical and applied sciences. Informative brochures describing the services and activities of the Center will be distributed at the booth.

E. R. Squibb & Sons

Booth 120. The results of our diligent research are available to the medical profession in new products or improvements in products already marketed. Representatives at our exhibit will be pleased to present up-to-date information on these advances.

Stechert-Hafner, Inc.

Booth 125. This year's exhibition will show for the first time publications of the *History of Medicine Series* published under the auspices of the New York Academy of Medicine. Other important new publications to be shown are the volumes in the series *Studies in Medical Geography*, volumes 2 and 3, published for the American Geographical Society.

Sun Oil Company

Booth 104. This exhibit will be based on the subject of geobiochemical prospecting. Recent research by Sun Oil will be explained.

3 M Company

Booth 96. The "thermofax" visual communications system, which incorporates the standard "thermofax" copying machine as a method of producing transparencies for use on overhead projectors, will be exhibited.

Tobacco Industry Research Committee

Booth 80. The scientific research program developed and directed by the Scientific Advisory Board to the Tobacco Industry Research Committee is described. The research program contains three main areas of investigation within which are the specific fields of research.

U.S. Atomic Energy Commission

Booths 81 and 82. The "AEC Research—Biological—Medical—Environmental" exhibit explains the nature of this program in its various aspects of both basic and applied research and portrays the breadth of the basic research program. Inspection of a generous sampling of current literature and references on various aspects of the program, and free copies of a number of catalogs, bibliographies, and other source materials will be offered. Finally, the exhibit shows professional viewers how they may participate in the program and obtain AEC financial support for their efforts.

University of Chicago Press

Booth 46. The *Phoenix Science Series* of paperback editions, which now numbers 15 titles of both general interest and textbook utility, will be featured. A supply of Zweifel's popular *Handbook of Biological Illustrations* will be on hand for immediate sale. The display of recent hardbound publications will show a concentration in the fields of radiobiology, cancer research, and astronomy.

University of Michigan Press

Booth 118. Scientific books of general interest by noted specialists will be featured. Technical titles in the natural and physical sciences will also be on display. Free examination copies of Albert Sussman's *Biology Through Microbes*, and all twelve Ann Arbor Science paperbacks, will be available for review by teachers.

D. Van Nostrand Company, Inc.

Booth 21. Many new and recent technical and scientific books are displayed in our exhibit. They range in subject from space flight to the latest titles in biology, genetics, geology, chemistry, and photography.

Veterans Administration Hospital Reference Laboratory

Booth 113. This exhibit is on antibiotic sensitivity monitoring of staphylococci. Staphylococci submitted for phage typing to the Reference Laboratory served as the source of sampling in this survey.

Video Engineering Co., Inc.

Booth 105. The TV Educator, a self-contained, mobile, multi-purpose closed-circuit television system, will be displayed. This audio-visual unit is a magnification system which displays solid objects, microscopic specimens, opaque or transparent printed matter with and without overlays, live television, motion pictures, filmstrips, microfilm, slides . . . all from a single compact console. It also features a built-in sound system.

Ward's Natural Science Establishment, Inc.

Booth 117. A wide variety of fine teaching materials for biology and geology will be available. The director of the new Educational Service Department will be present to discuss teaching problems and ideas.

Welch Scientific Company

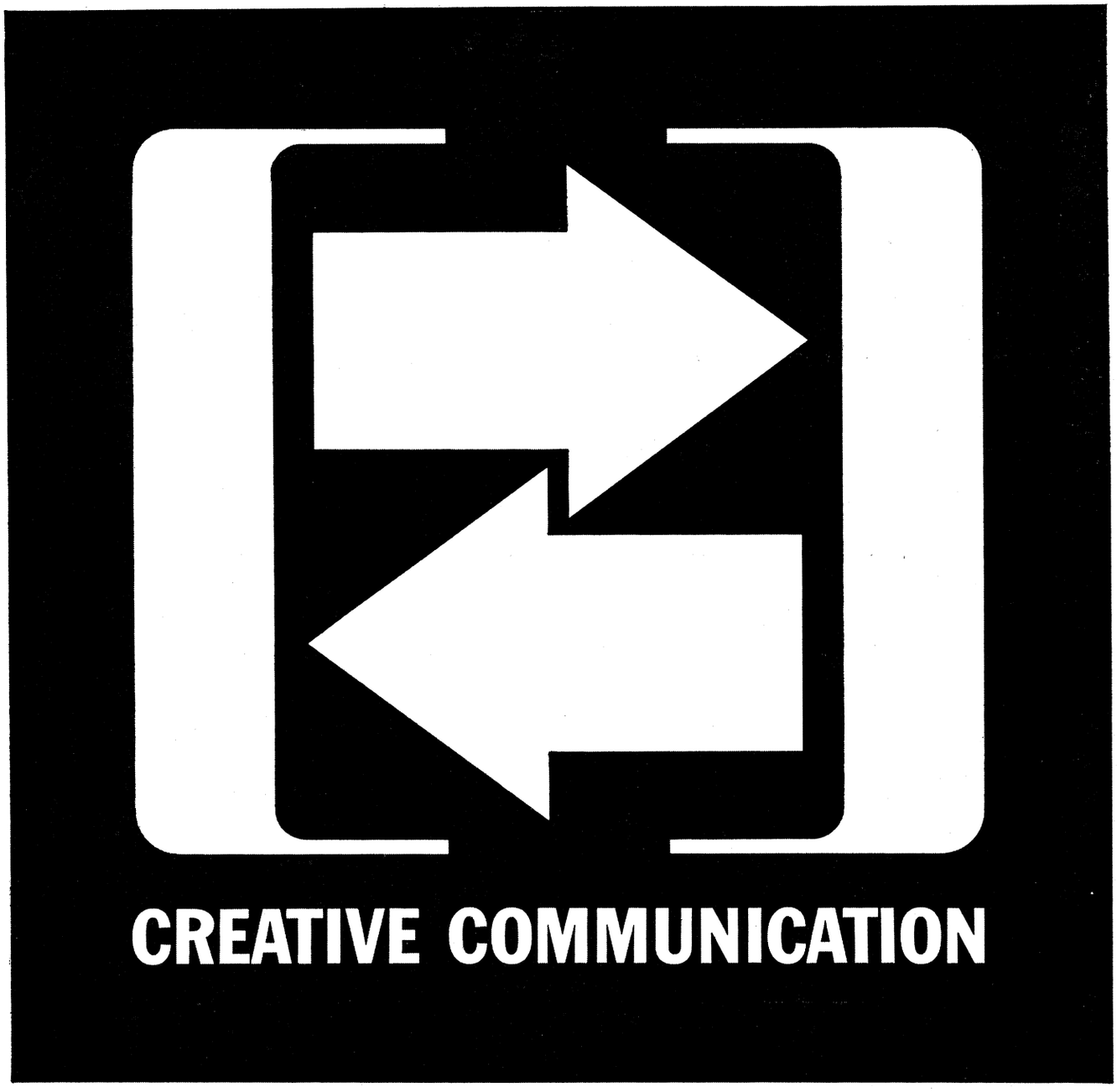
Booth 16. Selected apparatus for physics, chemistry, and biology laboratories in schools, colleges, and industry will be displayed. The Densichron, an electronic device for measuring optical density, color saturation, paper chromatograms, etc. will also be shown.

John Wiley & Sons, Inc.

Booth 22. Many important new and recent titles in science and technology will be on display. Of particular interest will be Holum's *Elements of General and Biological Chemistry* and Alexpoulos' *Introductory Mycology*.

Worthington Biochemical Corporation

Booth 51. The Worthington Biochemical Corporation specializes in crystalline and purified enzymes, and in prepared enzymatic reagents, both diagnostic and analytical. Literature will be available and personnel will be present to answer questions and to discuss any problems concerning Worthington products.



In chemical shorthand, the double arrow [⇄] represents interaction...the dynamic equilibrium set up between two groups. And, in the development of new and effective products, there is a similar need for constructive and creative interaction–for the give and take of new ideas and freshly observed relationships. This need–for a complete and clear mutual understanding of immediate and long-range objectives–can be filled when you start to communicate creatively with...

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7–9. Relations between the Structure and Mechanical Properties of **Metals**, conf., Teddington, Middlesex, England (by invitation only). (D. McLean, Metallurgy Div., Natl. Physical Laboratory, Teddington, Middlesex)

7–10. **Millimeter** and **Submillimeter**, conf., Orlando, Fla. (H. L. Bassett, Millimeter Conf., Martin Company-MP-75, Orlando)

9–12. National Soc. of **Professional Engineers**, winter meeting, San Antonio, Tex. (P. H. Robbins, 2029 K St., NW, Washington 6)

13–18. American **Chemical** Soc., Cincinnati, Ohio. (A. H. Emery, 1155 16th St., NW, Washington 6)

14–16. **Radiation Research**, intern. conf., Natick, Mass. (Army Quartermaster Research and Engineering Center, Natick)

14–18. Association of **Surgeons** of West Africa, Ibadan, Nigeria. (V. A. Ngu, University College Hospital, Ibadan)

14–19. Atomic and Molecular **Quantum Theory**, symp., Sanibel Island, Fla. (D. W. Smith, Chemistry Dept., Univ. of Florida, Gainesville)

15–15 Feb. World Meteorological Organization, Working Group on **Meteorological Transmissions**, Paris, France. (WMO, 41 Avenue Giuseppe Motta, Geneva, Switzerland)

15–17. Association of **American Colleges**, annual, Atlantic City, N.J. (T. A. Distler, AAC, 1818 R St., NW, Washington 9)

15–17. **Sesame**, intern. conf., Maracay, Venezuela. (D. G. Langham, Sesamum Foundation, Milford, Conn.)

15–19. **Immunopathology**, intern. symp., La Jolla, Calif. (by invitation). (Science Information Div., National Foundation, 800 Second Ave., New York 17)

17–19. **Engineers' Training**, conf., Strasbourg, France. (Council of Europe, Avenue de l'Europe, Strasbourg)

17–19. Royal College of **Physicians and Surgeons** of Canada, annual, Edmonton, Alberta. (J. H. Graham, RCPSC, 74 Stanley Ave., Ottawa 2, Ont., Canada)

18–19. **Blood**, annual symp., Detroit, Mich. (G. F. Anderson, Dept. of Physiology and Pharmacology, Wayne State Univ., 1401 Rivard St., Detroit 7)

21–23. Chemistry and Biochemistry of **Seed Proteins**, intern. conf., New Orleans, La. (C. H. Fisher, Southern Utilization Research and Development Div., Agricultural Research Service, U.S. Dept. of Agriculture, P.O. Box 19687, New Orleans 19)

21–23. Institute of the **Aerospace Sciences**, annual, New York, N.Y. (IAS, 2 E. 64 St., New York 21)

21–24. American **Meteorological** Soc., annual, New York, N.Y. (R. L. Pfeffer, Lamont Geological Observatory, Columbia Univ., Palisades, N.Y.)

21–24. Advances in **Gas Chromatography**, intern. symp., Houston, Tex. (A. Zlatkis, Chemistry Dept., Univ. of Houston, Houston)

22. Infectious Diseases of the **Heart and Circulation**, conf., New York, N.Y. (C. A. R. Connor, New York Heart Assoc., 10 Columbus Circle, New York 19)

22–24. **Reliability and Quality Control**, natl. symp., San Francisco, Calif. (L. W. Ball, Boeing Co., P.O. Box 3707, Seattle 24, Wash.)

23–25. **Elevated Temperature Mechanics**, intern. conf., 3rd Navy Structural Mechanics Symp., New York, N.Y. (by invitation). (A. M. Freudenthal, 624 Mudd Bldg., Columbia Univ., New York 27)

23–26. American Assoc. of **Physics Teachers**, New York, N.Y. (R. P. Winch, Williams College, Williamstown, Mass.)

23–26. American Group **Psychotherapy** Assoc., annual, Washington, D.C. (AGPA, 1790 Broadway, New York 19)

24–27. American **Mathematical** Soc., annual, Berkeley, Calif. (AMS, 190 Hope St., Providence 6, R.I.)

25–6. International College of **Surgeons**, West Indies congr., aboard *S.S. Santa Rosa.* (Secretariat, 1516 Lake Shore Dr., Chicago 10, Ill.)

26. Association for **Symbolic Logic**, Berkeley, Calif. (T. Hailperin, Dept. of Mathematics, Lehigh Univ., Bethlehem, Pa.)

26–28. **Mathematical** Assoc. of America, annual, Berkeley, Calif. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

27–1. American Inst. of **Electrical Engineers**, winter general meeting, New York, N.Y. (R. S. Gardner, AIEE, 33 W. 39 St., New York 18)

28–2. American **Library** Assoc., Chicago, Ill. (D. H. Clift, ALA, 50 E. Huron St., Chicago 11)

28–2. **Body Composition**, conf., New York, N.Y. (J. Brozek, Dept. of Psychology, Lehigh Univ., Bethlehem, Pa.)

30–1. Military **Electronics**, natl. winter convention, Los Angeles, Calif. (F. P. Adler, Space Systems Div., Hughes Aircraft Co., Culver City, Calif.)

31–1. American Soc. for **Engineering Education**, college-industry conf., Atlanta, Ga. (W. L. Collins, Univ. of Illinois, Urbana)

31–1. Society of **Rheology**, annual western regional meeting, Emeryville, Calif. (T. L. Smith, Stanford Research Inst., Menlo Park, Calif.)

31–2. Western Soc. for **Clinical Research**, annual, Carmel-by-the-Sea, Calif. (H. R. Warner, Latter-day Saints Hospital, Dept. of Physiology, Salt Lake City 3, Utah)

February

4–8. **Rice Genetics** and **Cytogenetics**, symp., Los Baños, Laguna, Philippines. (Inter. Rice Research Inst., Manila Hotel, Manila, Philippines)

4–9. Recent Trends in **Iron and Steel Technology**, symp., Jamshedpur, India. (Secretary, Indian Inst. of Metals, 31 Chowringhee Rd., Calcutta, India)

4–20. Application of **Science and Technology** for the Benefit of Less Developed Areas, U.N. conference, Geneva, Switzerland. (Science Conference Staff, Agency for International Development, 826 State Dept. Annex 1, Washington 25)

5–14. International **Radio** Consultative Committee, Plan Subcommittee for Asia, New Delhi, India. (V. Barthoni, 128 rue de Lausanne, Geneva, Switzerland)

6–9. American College of **Radiology**, Chicago, Ill. (F. H. Squire, Presbyterian–St. Luke's Hospital, 1753 W. Congress St., Chicago 12)

8–18. United Nations Committee on **Industry and Natural Resources** in Asia and the Far East, Bangkok, Thailand. (S. Santitham, Rajadamnern Ave., Bangkok)

10–15. **Management** Function in Research and Development, conf., Pasadena, Calif. (Management Development Section, Industrial Relations Center, California Inst. of Technology, Pasadena)

10–16. **Planned Parenthood**, intern. conf., Singapore. (V. Houghton, Intern. Planned Parenthood Federation, 69 Eccleston Sq., London, S.W.1, England)

11–14. American Soc. of **Heating, Refrigerating, and Air-Conditioning Engineers**, New York, N.Y. (R. C. Cross, 345 E. 47th St., New York 17)

11–14. Industrial **Lubrication**, intern. conf. and exhibit, London, England. (E. V. Paterson, Scientific Lubrication, 217a Kensington High St., London W.8)

11–15. Quantum **Electronics**, intern. symp., Paris, France. (Secrétariat, Troisième Congrès International d'Electronique Quantique, 7 rue de Madrid, Paris 8°)

12–14. **Lysozomes**, symp. (by invitation), London, England. (Ciba Foundation, 41 Portland Pl., London W.1)

13–15. **Electrochemistry**, 1st Australian conf., part I, Sydney, Australia. (F. Gutmann, Physical Chemistry Dept., Univ. of New South Wales, Kensington, N.S.W., Australia)

13–16. National Soc. of College Teachers of **Education**, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute)

14–15. American Soc. for **Quality Control**, Textile and Needles Trades Div., an-

nual conf., Clemson, S.C. (H. F. Littleton, c/o Charles H. Bacon Co., Lenoir City, Tenn.)

15–14 Apr. **Aeronautics and Space,** intern. exhibition, São Paulo, Brazil. (Santos Dumont Foundation, Avenida Ipiranga N°. 84, São Paulo)

16–23. Caribbean **Dental** Convention, Port of Spain, Trinidad. (A. V. Awon, 43–45 Frederick St., Port of Spain)

17–21. Technical Assoc. of the **Pulp and Paper** Industry, annual, New York, N.Y. (TAPPI, 360 Lexington Ave., New York 17)

18–20. American **Standards** Assoc., natl. conf., New York, N.Y. (ASA, 10 E. 40 St., New York 16)

18–20. **Biophysical** Soc., annual, New York, N.Y. (A. Mauro, Rockefeller Inst., New York)

18–20. **Electrochemistry,** 1st Australian conf., part II, Hobart, Tasmania. (J. N. Baxter, Chemistry Dept., Univ. of Tasmania, Hobart)

18–25. Expert Committee on **Food Additives,** FOA/WHO, Rome, Italy. (Intern. Agency Liaison Branch, Office of the Director General, Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome)

19–22. **Radiochemistry,** inter-American conf., Montevideo, Uruguay. (Pan American Union, Washington 6)

20–22. Fundamental **Cancer** Research, annual symp., Houston, Tex. (L. Dmochowski, Section of Virology and Electron Microscopy, M. D. Anderson Hospital, Houston 25)

20–22. **Solid-State Circuits,** intern. conf., Philadelphia, Pa. (F. J. Witt, Bell Telephone Laboratories, Inc., Murray Hill, N.J.)

20–23. National Assoc. for Research in **Science Teaching,** Washington, D.C. (J. D. Novak, Biological Science Dept., Purdue Univ., Lafayette, Ind.)

20–24. Diseases of the **Chest,** intern. congr., New Delhi, India. (M. Kornfeld, American College of Chest Physicians, 112 E. Chestnut St., Chicago 11, Ill.)

21–22. American Soc. for **Quality Control,** regional conf., Las Vegas, Nev. (S. R. Wood, Dept. 61, Bldg. 160, Aerojet-General Corp., Azusa, Calif.)

22–23. American **Psychopathological** Assoc., annual, New York, N.Y. (F. A. Freyhan, c/o St. Elizabeths Hospital, Washington 20, D.C.)

23–28. American Soc. for **Testing** and **Materials,** annual, Atlantic City, N.J. (H. H. Hamilton, 1916 Race St., Philadelphia 3, Pa.)

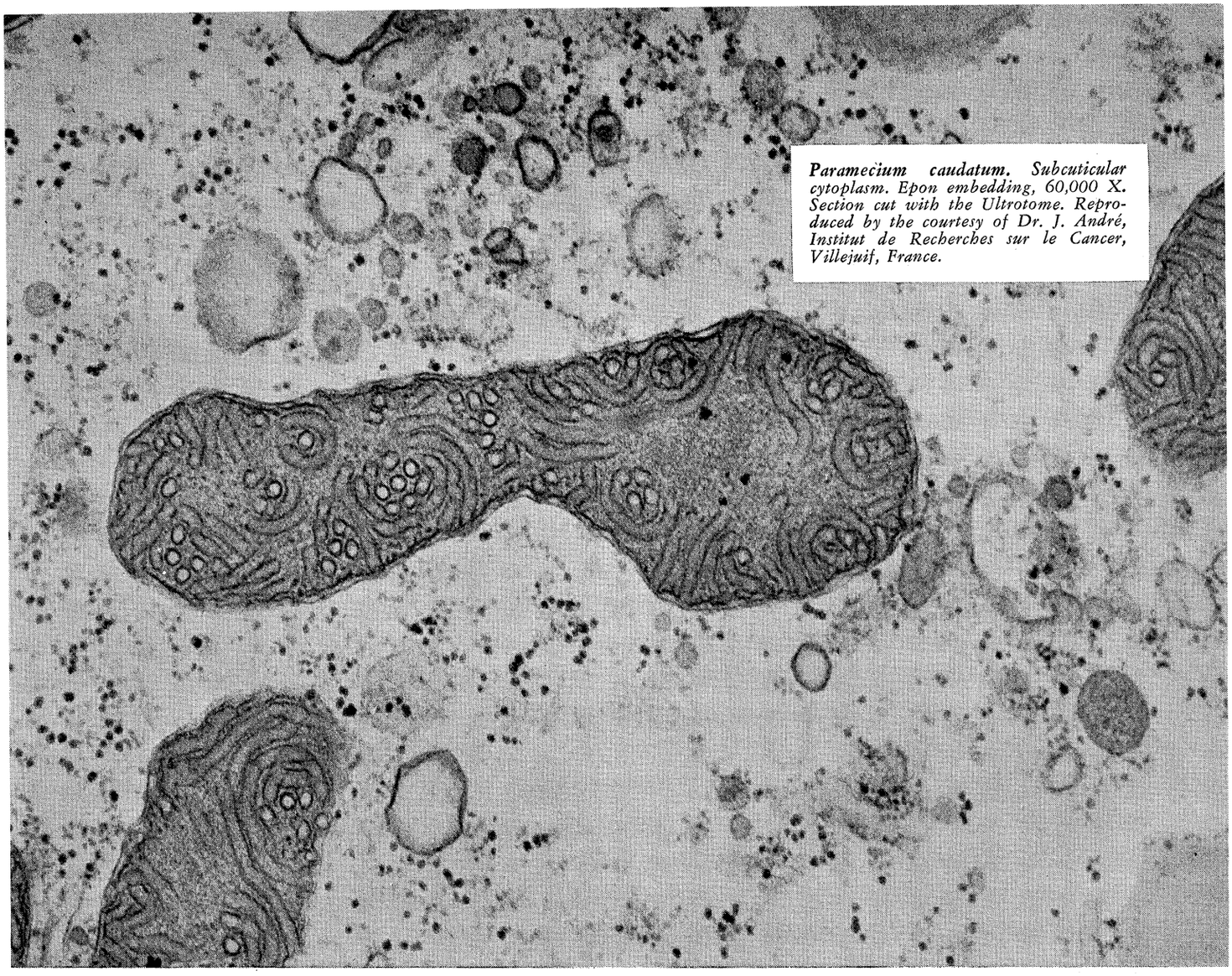
24–25. Unit Processes in **Hydrometallurgy,** symp., Dallas, Tex. (F. T. David, Colorado School of Mines, Golden)

24–27. **Diffusion,** intern. conf., Palm Springs, Calif. (J. A. Biles, Univ. of Southern California, School of Pharmacy, Los Angeles 7)

24–28. American Inst. of **Mining, Metallurgical, and Petroleum Engineers,** annual, Dallas, Tex. (E. Kirkendall, AIME, 345 E. 47 St., New York 17)

25–27. Advanced **Marine Engineering** Concepts for Increased Reliability, symp., Ann Arbor, Mich. (G. L. West, Jr., Dept. of Marine and Nuclear Engineering, Univ. of Michigan, Ann Arbor)

(See 23 November Issue for comprehensive list)



Paramecium caudatum. Subcuticular cytoplasm. Epon embedding, 60,000 X. Section cut with the Ultrotome. Reproduced by the courtesy of Dr. J. André, Institut de Recherches sur le Cancer, Villejuif, France.

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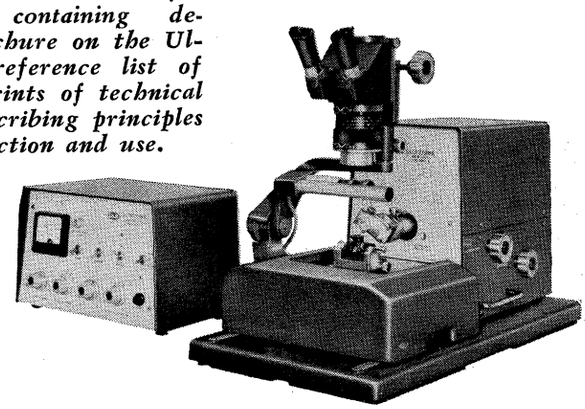

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just as awkward a while ago. (Again, "down" turned out to be a relative direction instead of an absolute one.)

Experiments have proved the time dilatation, but only in the case where two frames of reference pass one another in unaccelerated flight. No experiments have been possible for the case of returning objects, but they may be possible in future years. Artificial satellites still have velocities much lower than that of light, thus their time dilatation is extremely small. But with the best atomic clocks we could build, it would become just possible to measure the difference. The only problem is how to build such a clock small enough, and capable of working for many years without any maintenance.

S. VON HOERNER
Astronomisches Rechen-Institut, Heidelberg, Germany

Flow through a Permeable Membrane

Leslie F. Nims concludes in a recent article [*Science* **137**, 130 (1962)] that "the rate of flow of a tagged species of a material substance through a permeable membrane is proportional to the rate of flow of the substance itself when, and only when, the species mole fraction of the substance is the same on both sides of the barrier." This conclusion is disturbing in view of the common assumption in kinetic experiments "that the flow of tagged material *is* proportional to the flow of normal material" [L. F. Nims, *Yale J. Biol. Med.* **31**, 373 (1959)] (italics mine). Is not the difficulty resolved by precise specification of the meaning of the word *flow* in a given situation?

Thus, Nims's Eq. 1, from Harned and Owen,

$$-\dot{n}_s = \sum_k M_{sk} \frac{\mathrm{d}\mu_k}{\mathrm{d}x}$$

relates to *net* flow of species s. Even when derived directly from Newton's laws of motion, *net* flows rather than *unidirectional* flows are involved, since, as Nims has pointed out [*Am. J. Physiol.* **201**, 987 (1961)], it is the "drift velocities of a species" which are being treated rather than "thermal velocities of the individual molecules." Similarly, his Eq. 12

$$(-\dot{n}_{s'} = -N_1\dot{n}_s + M_{ex}RT\frac{\mathrm{d}\ln N_1}{\mathrm{d}x})$$

depends also on the application of the Onsager relation, valid only when fluxes are related to conjugate forces derived from an appropriate dissipation function, which again would involve *net* fluxes.

Accordingly, while Eq. 12 indicates the need for considering the gradient of the mole fraction of a tracer in relating *net* flows of tagged and untagged species, it does not seem to invalidate the common use of tracer isotope to evaluate *unidirectional* flow of untagged substance across a membrane. When tracer is added only to the source side, assumption of equivalent kinetic characteristics of tagged and untagged species implies that every molecule, whether tagged or not, has equal probability of moving completely across the barrier, hence that unidirectional flow of tracer must be proportional to unidirectional flow of untagged substance from source to sink.

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One may assume that material transfer through the membrane of the unit transfer system phase α, membrane, phase β is accomplished by a two-path-

ordered mechanism. In this case the observable variables of interest pertaining to the phases are related to the material currents in the paths as follows:

$$\frac{dn_1^{\alpha}}{dt} = \dot{n}_1^{m1} - \dot{n}_1^{m2}$$

and (1)

$$\frac{dn_2^{\alpha}}{dt} = \dot{n}_2^{m1} - \dot{n}_2^{m2}$$

where the dn/dt's are the rates of change of the number of moles in the phases and $\dot{n}$ indicates the material currents in the membrane. Furthermore, the basic assumption requires that the composition of a particular segment of the current remains constant as it traverses the path, and that it has the same composition as the phase of origin, or

$$\dot{n}_1^{m2} = N_1^{\alpha}\dot{n}_k^{m2},\ \dot{n}_1^{m1} = N_1^{\beta}\dot{n}_k^{m1}, \ldots \quad (2)$$

where N_1^{α} is the mole fraction of the subspecies of k within phase α, and so on. These equations imply that the flow of the subspecies is not due to their concentration gradients but is due to the action of a "pump." Equation 1 may now be written

$$\frac{dn_1^{\alpha}}{dt} = N_1^{\beta}\dot{n}_k^{m1} - N_1^{\alpha}\dot{n}_k^{m2}$$

and (3)

$$\frac{dn_2^{\alpha}}{dt} = N_2^{\beta}\dot{n}_k^{m1} - N_2^{\alpha}\dot{n}_k^{m2}$$

To account for the selectivity exhibited by all membranes, one must further assume that a separate "pump" and pair of paths exist for every kinetic species. In addition, since the experimental evidence indicates that the flow of one species can depend upon the simultaneously occurring flows of other species, one must also assume that the pumps are coupled together in some fashion as yet undefined in physical terms.

Alternately, one may assume that the material currents in the membrane are representative of spontaneous irreversible phenomena associated with differences in the temperatures, pressures, or compositions of the phases. The membrane merely acts as a resistance to material flow. Such a mechanism may be called single-path-random mechanism. Our observational quantities are now related to the physically definite "net" flows, the material currents in the membrane, when the kinetic substance k does not participate in any

chemical reactions which may be occurring in the phases, or

$$\frac{dn_1^{\alpha}}{dt} = \dot{n}_1^{m}$$

and (4)

$$\frac{dn_2^{\alpha}}{dt} = \dot{n}_2^{m}$$

No physically definite material currents as defined by Eq. 2 now exist, since each segment of the material current as it crosses the barrier suffers a change in composition. Equations 1 and 2, if now used, merely estimate the magnitude of hypothetical currents which correspond to rates of transfer obtained by an equivalent two-path-ordered mechanism. In contrast to the implications of Eq. 2, the material currents defined by Eq. 4 may be said to be actual currents, and they do depend upon the concentration gradients.

Therefore, the comments made by Essig and by others, including C. W. Sheppard in his excellent book *Basic Principles of the Tracer Method* [(Wiley, New York, 1962), p. 165], are largely concerned with semantics. The physical meanings of *"net" flow, inflow, outflow, material current,* and so on, are to be found in the assumptions, implicit or otherwise, made in the attempt to answer the question, "Why do material currents appear within the membrane of a unit transfer system?" In the quantitative description of any system, the smaller the number of unverifiable assumptions required to give physical meaning to the terms appearing in the mathematical relations representing the behavior of the system, the better the description.

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"Grantitis"

I am prompted by the excellent editorial "The need for skepticism" [*Science* **138**, 75 (1962)] to mention some thoughts which have long been on my mind.

Over the past several years a disease has spread rampant throughout science, until today it shows promise of becoming pandemic. The proper name for this affliction is "grantitis," and it exists in all phases of scientific endeavor. From my own very small

niche I see individuals and programs ridden with the disease.

The etiology and description of grantitis is clear. An individual engaged in solitary research requiring and receiving little or no logistical support is, of course, in a nonprestigious position. The way to prestige (in the eyes of his peers and administrative superiors) is through the acquisition of a grant. This immediately gives the project an air of respectability, regardless of the quality of the work. The receipt of a grant is immediately accompanied by notices in local newspapers, announcements to the faculty by college presidents, and accolades by department chairmen, even occasionally by somewhat pompous declarations by senators. This is heady recognition for one accustomed to obscurity. It appears, then, that the individual is impelled to apply for the grant not only to further his research but also to win the prestige he so richly deserves (all of us, of course, richly deserve prestige!). The acquisition of the grant now assumes importance in its own right, with the research project, perhaps, subordinate. The question becomes, "What kind of proposal is most likely to be favorably received by those who act upon such things?"

Answering this question requires that much time be spent learning who the people are that dispense the money, what disciplines are represented, and what kinds of grants have been given in the past. It is also very helpful to make the acquaintance of someone in a position of authority in such things. Once this "background" work has been accomplished, the interminably long application forms must be completed to the satisfaction of those who must be satisfied about such things. A diagnosis of grantitis may be made when an individual begins to adapt his area of research concern to what he believes will be favorably received by the grantors. A lesser form of the affliction is manifested by a willingness to modify approach and procedure while retaining the major area of concern.

Science programs may be infected in a slightly different, but related, way. In my own department it is increasingly apparent that our better graduate students in science education are being lured to those schools that have grant-sponsored institutes providing liberal stipends. Ours, then, is a problem of survival—we must woo them back or attract suitable replacements. This requires that we also have an institute with liberal stipends. Symptoms similar to those in the individual now appear in the institution. We must determine what sort of institute will be favorably received by those with whom we must court favor, and develop our request accordingly. The question becomes, "What kind of institute will sell?" not, "What kind of institute should we offer in terms of our capabilities?" The disease has once more appeared.

In the credentials of applicants for science jobs, lists and amounts of grants received appear more and more often. As evidence of research ability, administrators view these as equal in significance to the published works (if any) of the applicant. Departments of science and colleges disseminate lists of grants with great pride, and scientists frequently view these as evidence of scholarly achievement. Grantitis is widespread.

The prognosis is far from simple. The greatest danger lies in the increased willingness, indeed the eager desire, on the part of individuals and departments of science to become the servants of the granting organizations rather than seekers of knowledge. The founts of creativity lie not in the granting organizations but in healthily

skeptical individuals who operate "in spite of" rather than "because of" the desire for financial support.

The cure for the disease is also complex. Surely complete honesty would be palliative. In lieu of this, perhaps greater control in the hands of the individuals seeking support is indicated. This could be accomplished through a plan whereby appropriations are made to colleges and universities, grants then being allocated to individuals and programs by representative local committees.

Whatever cure is indicated, I hope it will soon be applied, for I, too, have grantitis!

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Tenate and Dialysate

The simple new word *tenate* is proposed as a general term for that which is held back or retained in various chemical operations. *Tenate* has the same root as *tenant* or *tenable*. It can be both noun and adjective.

The need for a new word grew out of the search for a single word to describe the part which does not pass through the membrane during dialysis —the dialysis residue or the nondialyzable fraction. However, it seems reasonable to refer to the "tenate" in filtration and distillation also. This would lead to the following sets of terms.

Operation	Feed material
dialysis	*dialysand*
filtration	*filtrand*
distillation	*distilland*
Part which passes	**Part retained**
dialysate	*tenate*
filtrate	*tenate*
distillate	*tenate*

Note that the world *dialysate* should be applied only to the part that passes through the membrane. This is general usage (*1*). For one of two reference works where *dialysate* is given another meaning, the author has agreed to correct the usage in the next edition. These corrections should prevent extension of the appalling confusion which led *Webster's* third edition (*2*) to retreat to the following useless definition of *dialysate*: "used either of the material that has failed to diffuse through the membrane or of the diffusate."

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References

1. I. W. D. Hackh, *Chemical Dictionary* (McGraw-Hill, New York, ed. 3, 1944); W. A. N. Dorland, *Illustrated Medical Dictionary* (Saunders, Philadelphia, ed. 23, 1957); *Webster's New International Dictionary of the English Language* (Merriam, Springfield, Mass., ed. 2, 1940).
2. *Webster's Third New International Dictionary of the English Language* (Merriam, Springfield, Mass., 1961).

Delayed Hypersensitivity

By their commendable effort to explain so complex a phenomenon as delayed hypersensitivity when so little is known about it, Karush and Eisen [*Science* **136**, 1032 (1962)] have provided immunologists with a theoretical focal point from which enlightening discussions of various points of view can diverge. I should like to make some contributions to such potential discussions by pointing out a few aspects of delayed hypersensitivity which I believe are not adequately explained by their theory.

They make no allowance for the probability that delayed hypersensitivity exists in more than one form. The allergy which can so readily be induced in experimental animals with minute quantities of protein antigens, which can so readily be suppressed by specific desensitization, and which bears an inverse intensity relationship to immediate (anaphylactic) hypersensitivity seems distinct, phenomenologically, from classic delayed hypersensitivity of the tuberculin type. The latter is not so readily induced, does not depend for reliable elicitation on the use of small quantities of allergen, cannot be suppressed by desensitization except through heroic efforts, and bears no known relationship to anaphylactic hypersensitivity, which may or may not coexist with it. A distinction between evanescent- and tuberculin-types of delayed hypersensitivity to purified protein antigens needs to be made in any discussion of theories meant to explain this kind of allergy, so as to avoid what at first appear to be some very confusing conflicts in experimental results. Its bearing on evaluation of the theory of Karush and Eisen is illustrated by the point that although their theory may satisfactorily explain desensitization to delayed hypersensitivity of the evanescent type, it fails to explain desensitization to hypersensitivity of the tuberculin type. If high-affinity humoral antibodies were responsible for the latter type of allergy, then one would expect them to be removed preferen-

tially with respect to the medium-affinity antibodies of anaphylactic hypersensitivity, and therefore expect also that delayed hypersensitivity would disappear before immediate hypersensitivity disappeared, whereas in fact the opposite occurs.

I doubt whether Karush and Eisen are entirely justified in assuming that the susceptibility of delayed-hypersensitivity reactions to various pharmacologic agents is irrelevant to their hypothesis, because one of the principal questions that must be raised to evaluate their theory is whether the antibodies of delayed and immediate hypersensitivity are manufactured in the same way and by the same cells. Some of these pharmacologic agents and certain physical agents can be helpful in answering this question. For example, once both immediate and delayed hypersensitivities have been established, x-irradiation suppresses only the latter, presumably because the radiosensitive cells responsible for it are harmed and because there is no reservoir of radioresistant humoral antibodies available to maintain delayed hypersensitivity as there is to maintain immediate hypersensitivity. The same objection can be made to the authors' indifference regarding cells to be found at the sites of immediate and delayed hypersensitivity skin reactions, for these may be the cause of the reactions, not necessarily their effect.

If the Karush-Eisen explanation for delayed hypersensitivity reactions in avascular or poorly vascularized areas such as the cornea is accepted, then their explanation for the invulnerability of homograft cells in Algire's Millipore filter chambers seems a very unlikely one, and vice versa. Immunodiffusion experiments performed in various laboratories have shown that humoral antibodies have no difficulty in passing through cellulose nitrate membranes capable of withholding mammalian cells.

Karush and Eisen suggest that delayed hypersensitivity may be transferable with very large volumes of serum or gamma globulin containing high-avidity antibody. Indeed, such transfers seem to have been accomplished occasionally, but the factor responsible for the transfer appears to have been not a gamma globulin and typical antibody but a product of specific allergic cell injury which precedes bleeding of the donor animals, a factor which migrates electrophoretically with serum alpha globulin. If their theory is correct and delayed hypersensitivity is due to very low concentrations of high-avidity antibody (why high concentrations cannot be attained or high-avidity antibody cannot be made rapidly is not explained), then there should be no need for a priming allergic reaction in the donor animal and delayed hypersensitivity should be readily transferable with large quantities of serum or its constituents.

I do not say that high-avidity antibody may not be responsible for delayed hypersensitivity. I do suggest that making the assumption that it is a humoral antibody not unlike ordinary serum antibodies except for its high avidity and implying that it is manufactured in the same way as these serum antibodies introduces several complications in our understanding of the phenomenon with which we do not have to contend in the older theory implicating cellular antibodies in this allergic phenomenon.

Although they do not have vital bearing on evaluation of the Karush-Eisen theory, I should like to cite recent papers by Marcus and his co-

workers (*1*) and by Peck *et al.* (*2*), which offer good evidence that delayed-hypersensitivity skin reactions to blastomycin and to histoplasmin are directed against polysaccharides, not proteins. Thus, the idea mentioned in the Karush-Eisen article to the effect that delayed hypersensitivity to carbohydrate antigens cannot be developed no longer seems tenable.

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References

1. P. Q. Edwards, R. A. Knight, S. Marcus, *Am. Rev. Respirat. Diseases* **83**, 528 (1961); R. A. Knight, S. Coray, S. Marcus, *ibid.* **80**, 264 (1959); R. A. Knight and S. Marcus, *Am. Rev. Tuberc. Pulmonary Diseases* **77**, 983 (1958).
2. R. L. Peck, D. S. Martin, C. Hauser, *J. Immunol.* **38**, 449 (1940).

The article by Karush and Eisen has stimulated a great deal of discussion. We are submitting the following comments in the belief that every good argument is improved by respectful disagreement. To this end we discuss two problems in the theory, which are raised by the authors but which we believe to be more serious than appears to be the case from their article.

The first problem concerns the transferability of delayed hypersensitivity with cells but not with serum. Since in the human, gamma globulin molecules have an average life expectancy of approximately 1 month, it is necessary to transfer only 100 to 200 ml of serum to give the recipient one day's output of the donor's entire lymphoid system. The number of cells one can transfer is obviously a small fraction of this, and for several days, at least, after transfer it is possible to produce a higher concentration of antibody in the recipient with a transfer of serum than of cells. It is, therefore, difficult to explain the development of delayed hypersensitivity in the recipient immediately after transfer of cells but not after transfer of serum.

To solve this problem, Karush and Eisen postulated that the antibody responsible for delayed hypersensitivity was being turned over very rapidly by complexing with circulating antigen (presumably that remaining from the immunizing injection). Thus, the amount of antibody circulating would be at any time a small fraction of that produced each day. The difficulty with this solution of the problem is that the desired effect would be produced over a relatively narrow range of anti-

gen concentration, that of moderate antigen excess. The amount of antigen required to induce delayed hypersensitivity is probably less than that required to produce this level of circulating antigen. If the appropriate antigen concentration is achieved it will remain appropriate very transiently, since the antigen as well as the antibody is cleared by the "immune elimination." If, on the other hand, a large excess of circulating antigen is established, this will suppress the concentration of circulating antibody below its effective level. The antigen would also diffuse into the tissues, making them insensitive to the test antigen.

The second problem relates to the time required to accumulate the antibody from 100 ml of plasma in the tissue of the test site. If we accept the estimate that 3 to 30 ml of blood per hour pass through the capillaries of 1.0 g of skin, an additional problem remains. While small inorganic molecules in the plasma equilibrate with the extravascular fluid on one to two passages through the capillaries (in approximately 1 minute), large molecules such as those of gamma globulin take many hours or require several hundred passages through the body's capillaries. Therefore, one cannot assume that the passage of 100 ml of blood through the test site is equivalent to the removal of the antibody in it unless the capillary walls are coated with a high concentration of antigen. But the delayed reaction appears to be extravascular; in the cornea it clearly is.

We wonder if the tempo and histology of the delayed reaction could not be explained more simply by the assumption that antibody-producing cells accumulate at the test site. To use Karush's and Eisen's reasoning to explain under what circumstance a homograph might be destroyed within a Millipore chamber, "if the chamber [capillary] walls are sufficiently porous to permit host cells to enter, . . . antibody production and secretion will occur directly within the chamber [tissue] and will lead, very probably, to a concentration of free antibody sufficiently high to allow complexes with 'target'-cell antigens to form, with resultant destruction of the homograft [formation of an inflammatory reaction]."

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Iodine-131 Levels in Milk

In his report "Nevada test fallout and radioiodine in milk" [*Science* **137**, 756 (1962)], R. E. Lapp suggested that an iodine-131 level of 100,000 micromicrocuries per liter might have been attained after a "rainout" of I^{131} over the Troy, New York, area on 26 April 1953. The calculations used, while based on many assumptions, are reasonable and indicate that high levels of iodine in milk theoretically can be produced as a result of weapon testing. I would like to make the point that for Troy, New York, at that particular time, the levels of I^{131} in milk in all probability never reached the calculated levels.

In upstate New York it is a usual practice of farmers to feed the cows in the barns until the grass has started to grow, the weather is warm, and the pastures have dried sufficiently to prevent destruction of the sod by the cows' hooves. Usually it is well into May before most farmers allow the cattle to spend all their time on pasture and to obtain all their roughage from pasture.

The weather records for the Albany Airport in 1953 reveal that the average temperature during April was 48.3°F. For 19 of the 30 days, nighttime temperatures of 40°F or less were recorded, a value of 27°F having been reported for the night of 22 April.

From the rainfall records it appears that the spring of 1953 was exceptionally wet. Precipitation collections of 3.4, 2.1, and 6.2 inches above normal were recorded during March, April, and May, respectively. The normal rainfall for these months is about 2.5 inches. In April there were only 8 days in which no rain fell. Since 26 April is early spring in New York, it is probable that there had been little growth of grass. This lack of forage, the wet days, the cold wet nights, and the wet soil make it unlikely that many cows had had access to pasture during that period. Even cows that may have been grazing during the day were certainly being supplied with their normal winter amounts of silage, hay, and grain during the night in the barn. For these reasons it is very unlikely that the levels of I^{131} in milk of the Troy area during the period in question came anywhere near the levels calculated by Lapp. In view of the wide publicity the calculations are likely to get it is important that the situation be assessed correctly.

The I^{131} level in milk is not the only

point of Lapp's article; the opportunity to use this situation to test the "linear response" theory is proposed. If the I^{131} levels in milk never did attain the calculated values, as appears to be the case, failure to observe an increase in the incidence of thyroid cancer in children in the 9- to 11-year group would not be valid grounds for rejecting the "linear response" theory of radiation damage. Moreover, in the event that an increase in the incidence of thyroid cancer was observed in this age group, how valid would it be to assume that this was due solely to the high I^{131} levels that might have been present in milk in April 1953?

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Lengemann contends that because of the late spring of 1953 there was delay in putting the cows out to pasture in northern New York and that thus the iodine-131 levels in milk did not come "anywhere near" those which I estimated. In preparing my report I did check the normal grazing period for the Troy area and found that it coincided with the time period of relevance to the Simon shot fallout. I double-checked this point by referring to Public Health Service measurements of I^{131} contamination in milk in the Troy area in May of this year. While inclement weather may have delayed normal pasturing in 1953, I estimate that the radioactive decay involved would not have reduced I^{131} uptake by a factor of more than 2 or 3. Other factors, such as sluice-off effects due to the heavy precipitation, could have been more significant. However, I did reduce the estimated maximum radiation dose to the thyroid by a factor of 3.

In reviewing my original paper I find that I underestimated the incidence of thyroid cancer by a factor of about 4. I used statistics on thyroid cancer deaths rather than thyroid cancer cases. The latter would of course be applicable to a thyroid survey.

Measurements of the intensity of fallout in the Troy area were very limited; it is entirely possible that the fallout field was more intense than that inferred from the actual spot data.

As for the question raised by Lengemann about the validity of attributing any thyroid cancers to the Simon test fallout, I pointed out in my report that the case histories would have to "correlate with the intake of fresh milk in the April-May period." Apart from

this, I assume that the investigators would employ reasonable methods to rule out cancers induced by radiation diagnosis or therapy and that no cases of previous pathology would be included.

However, Lengemann seems to have missed the main point of the report—namely, that the continental tests involve radiation dosage to humans in excess of any previously acknowledged levels. The single instance of Troy, New York (for which I managed to assemble some data), suggests the possibility that a thyroid survey might reveal evidence of radioiodine injury. But should this not be the case, other areas closer to the Nevada Proving Grounds, such as the Salt Lake City region, should be surveyed. I hope that the Public Health Service will undertake such surveys in the near future.

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Life on Mars

The article by G. V. Levin *et al.* [*Science* **138**, 114 (1962)] on a device ("Gulliver") for detecting microorganisms on Mars is fascinating. There are so many parameters of the testing apparatus which might be changed to improve the chances of a successful test that I suspect the authors will be inundated with suggestions.

The article suggests that a solid medium may be used instead of broth. If this is done it should be possible to use several different media in separated compartments, with a single detector for radioactivity. This would be an important change, since the medium seems to me to be the point most susceptible to improvement.

The medium outlined by Levin *et al.* would be too rich for many terrestrial microorganisms. It might be worse for organisms on Mars. If Martian life forms originated there, their stereospecificity could be the reverse of that found on earth—D-amino acids and L-sugars. In this case—and in many others which can be imagined—the complex medium would probably be toxic. (Similarly, the solidifying agent in the medium should be one of the silicones rather than agar.) I suggest an inorganic salts medium whose only carbon is traces of labeled acetate, glycerol, and glycine.

The article on Martian environ-

ments by F. B. Salisbury [*Science* **136**, 17 (1962)] implies that Martian surface water may be of very high osmotic pressure, and this is a second parameter I should like to see varied. For example, if no radioactivity were detected after some reasonable period of incubation, it might be possible to release crystals of sodium chloride into the media.

It seems to me that it would be better to use all communication channels in "Gulliver" for experimental portions of the program than to reserve half of them for controls. A metabolic inhibitor (chloroform?) could be added to the entire system shortly before the end of transmissions, serving the same purpose as the control described by Levin *et al.*

Any biologist can think of many other variables which might be important: temperature, light, humidity, metabolite concentrations, and so on. To the men who will make the final decisions, I can only say: Happy hunting!

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I have just read about "Gulliver" in *Science*. This letter is an ecologist's plea to NASA and its foreign counterparts to refrain from landing anything on Mars (or on Venus) until they are able to send a man trained to look for evidences of life or to bring back a sample of Martian material.

The authors of the Gulliver piece recognize the danger that possible contamination with organisms from the earth might leave us forever in doubt about the nature or even the existence of indigenous Martian life. They feel that this project is important enough to justify the risk, if suitable precautions in the way of sterilization are taken. I disagree. Mars is the best single hope for exobiology (or xenobiology), and the questions that Martian organisms might answer are fundamental.

It is now widely believed that, on the earth, organic matter evolved gradually in quantity and complexity long before the origin of life. If Mars should be back in the "primeval soup" stage it might take only a fragment of DNA from a dead microorganism, or a spore or pollen grain that stuck to the rocket in its passage through the atmosphere, to initiate an earth-type evolutionary process.