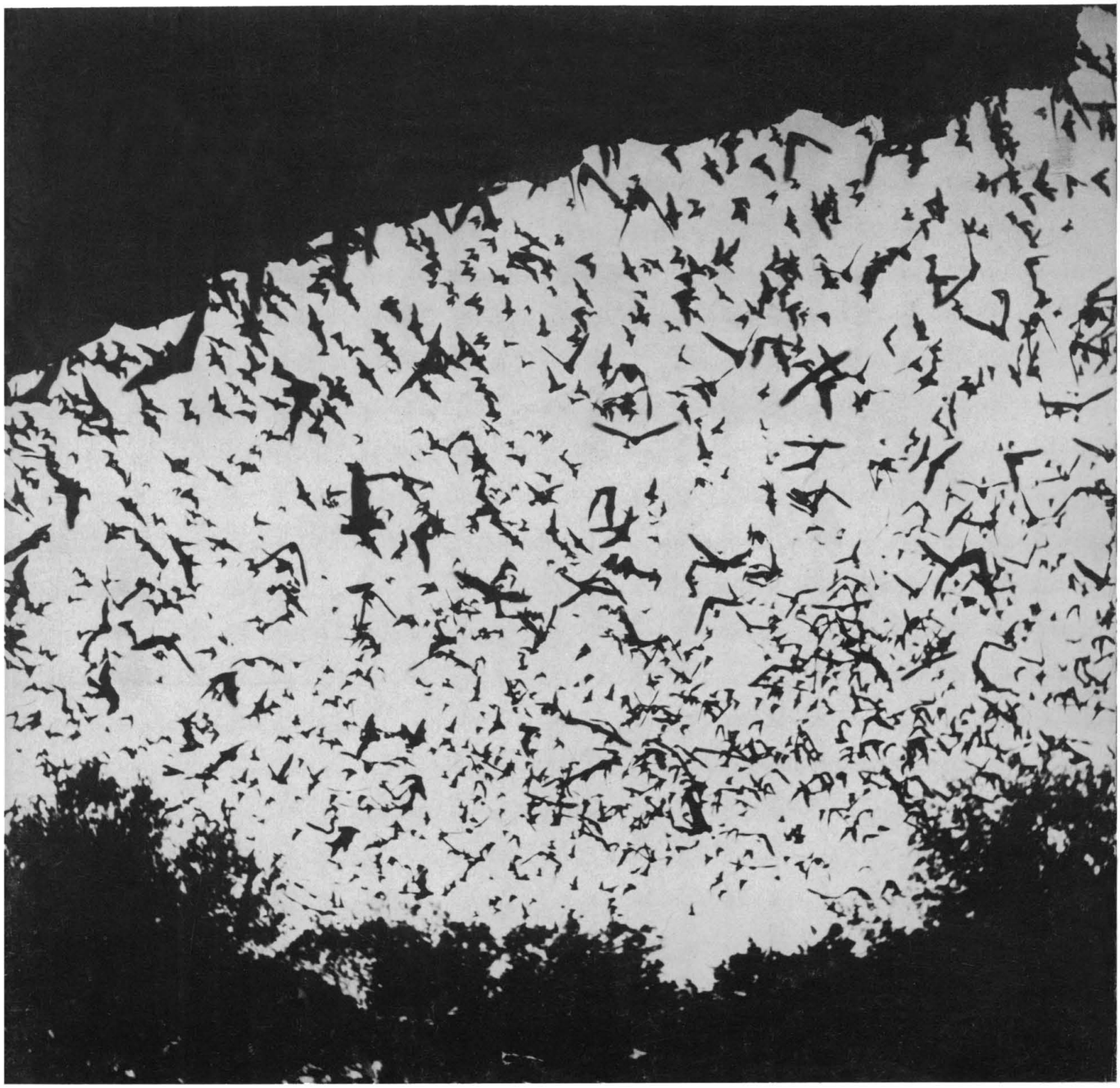
SCIENCE

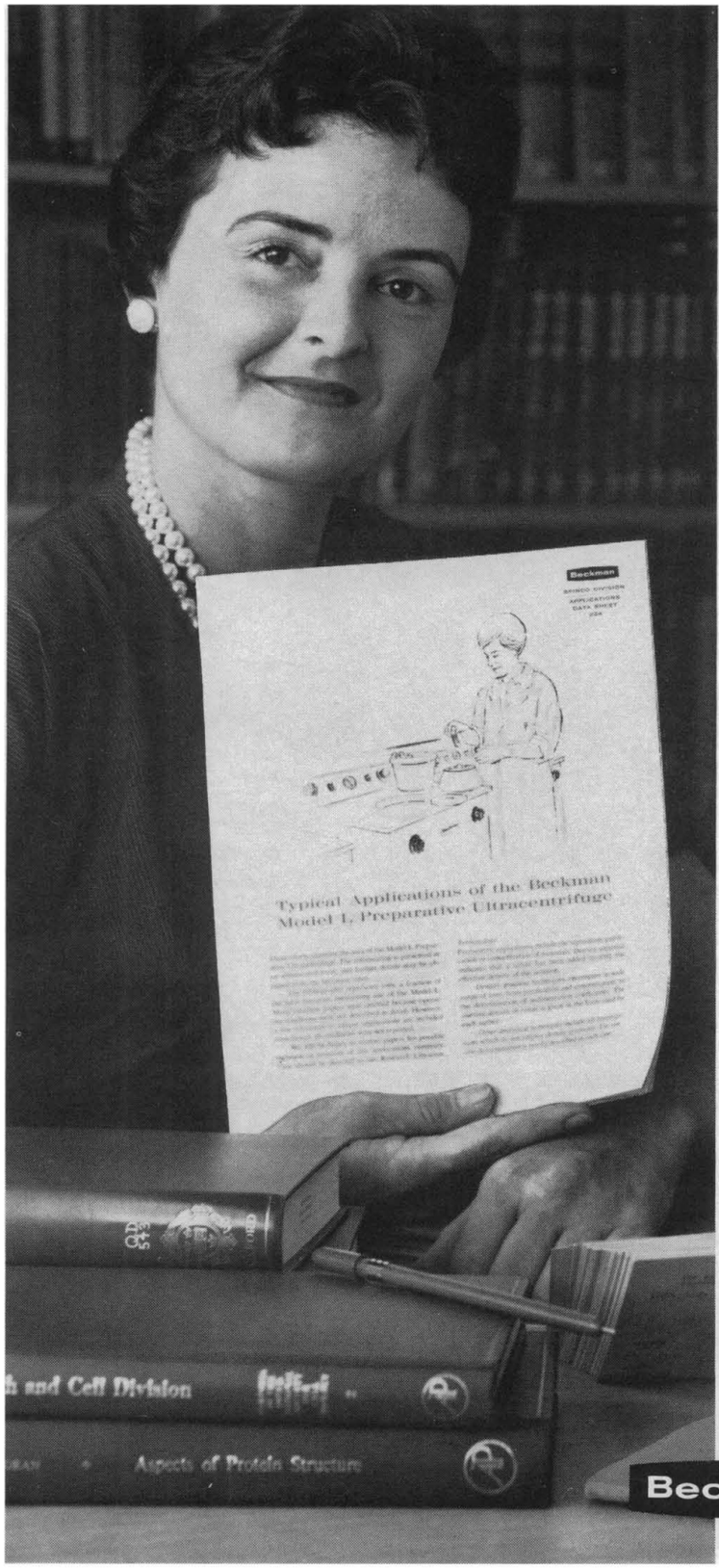
26 June 1964
Vol. 144, No. 3626

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



CAVE BIOLOGY

Index Issue



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SCIENCE

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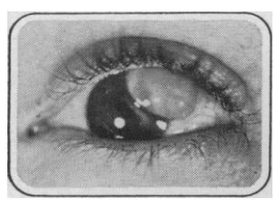

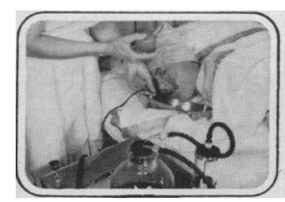
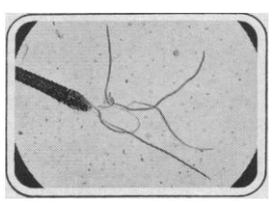

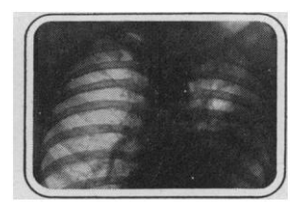
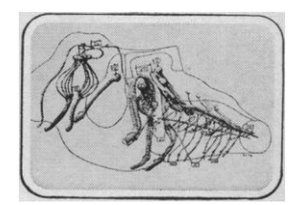

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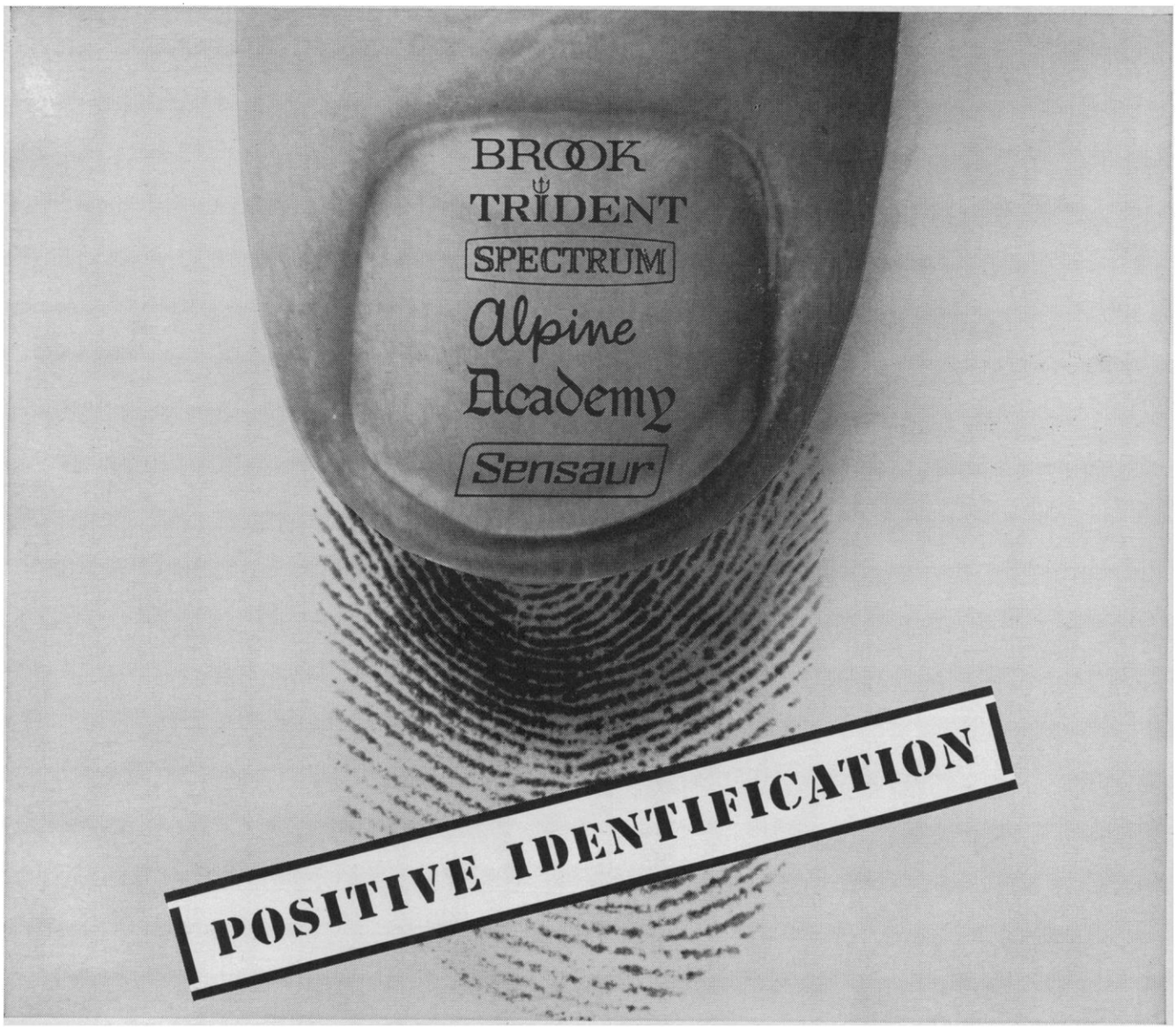

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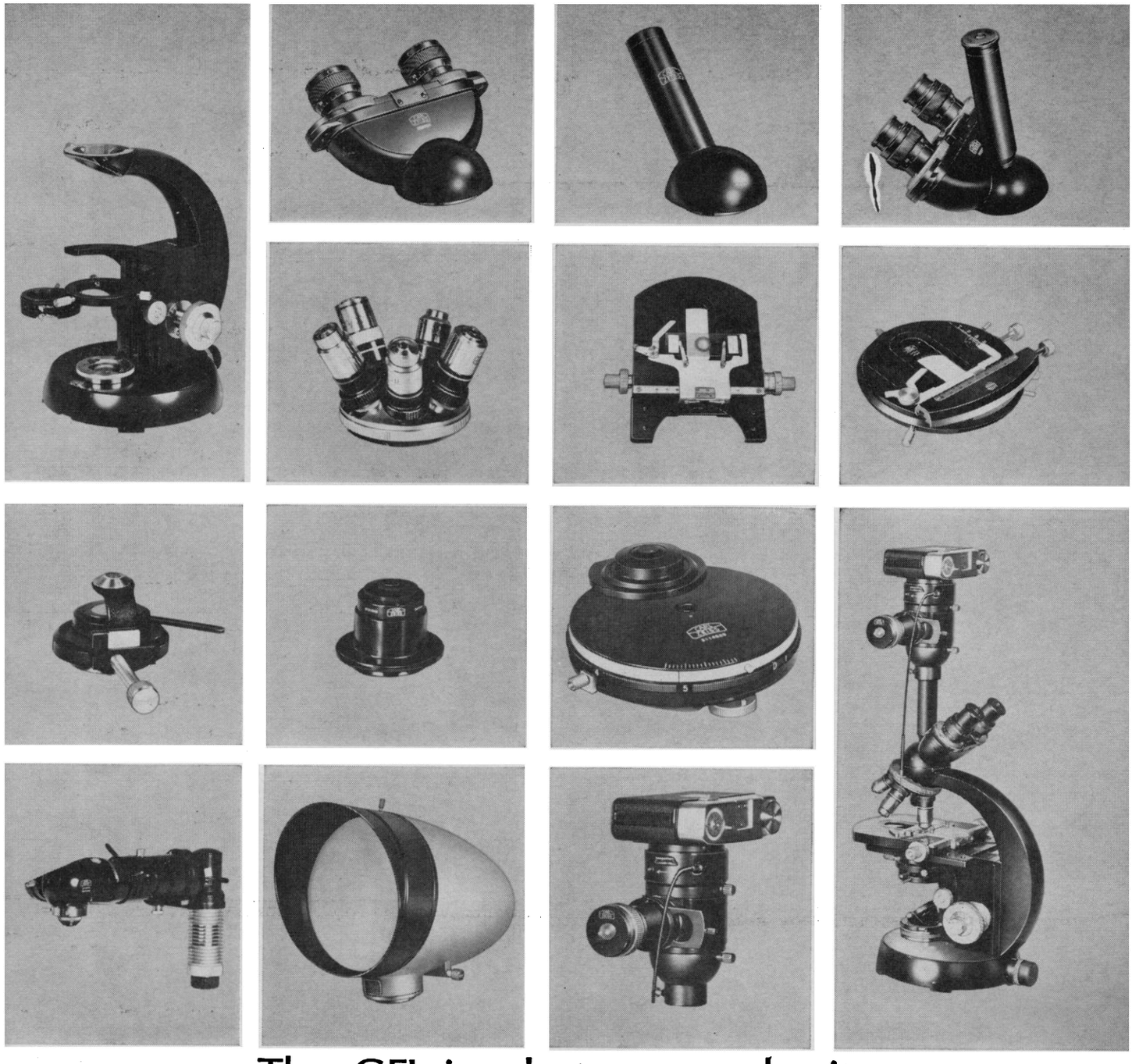

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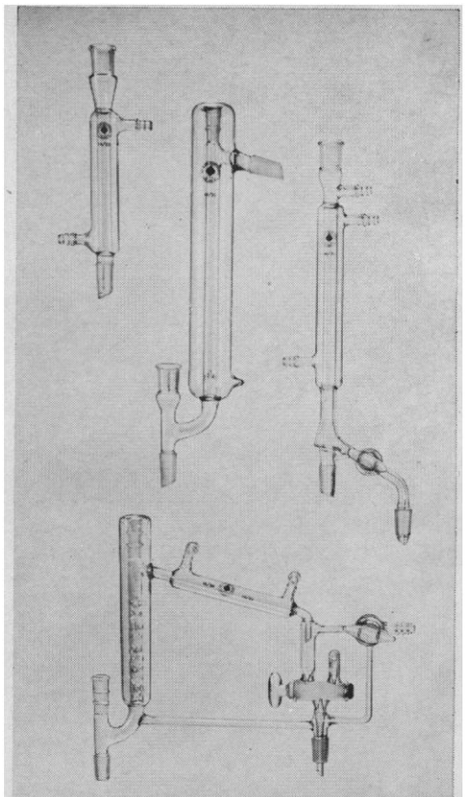
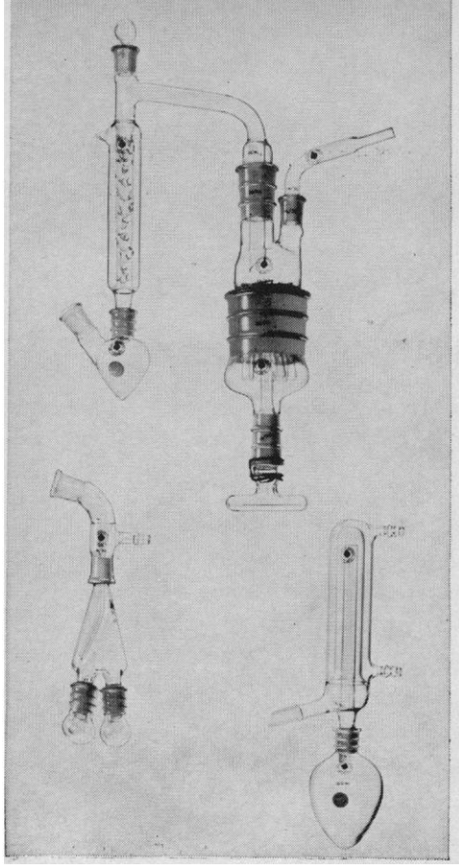


You will like Ace MINI-LAB: Best designed, most complete, all components interchangeable; costs less, uses less space than full scale glassware, reduces consumption of chemicals.



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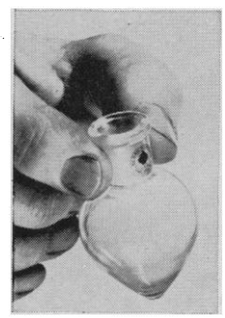

The moment you start working with a simple flask or one of our popular assemblies, a few of which are shown here, you will notice that Ace Mini-Lab not only takes up less space, results in considerable savings in reagent chemicals, but that the good design makes Ace Mini-Lab a pleasure to work with.

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Ace Mini-Lab is the most complete line of miniature glassware. It can function as your complete laboratory. New items are constantly being added. 27 recent additions are featured in the Ace Mini-Lab brochure.

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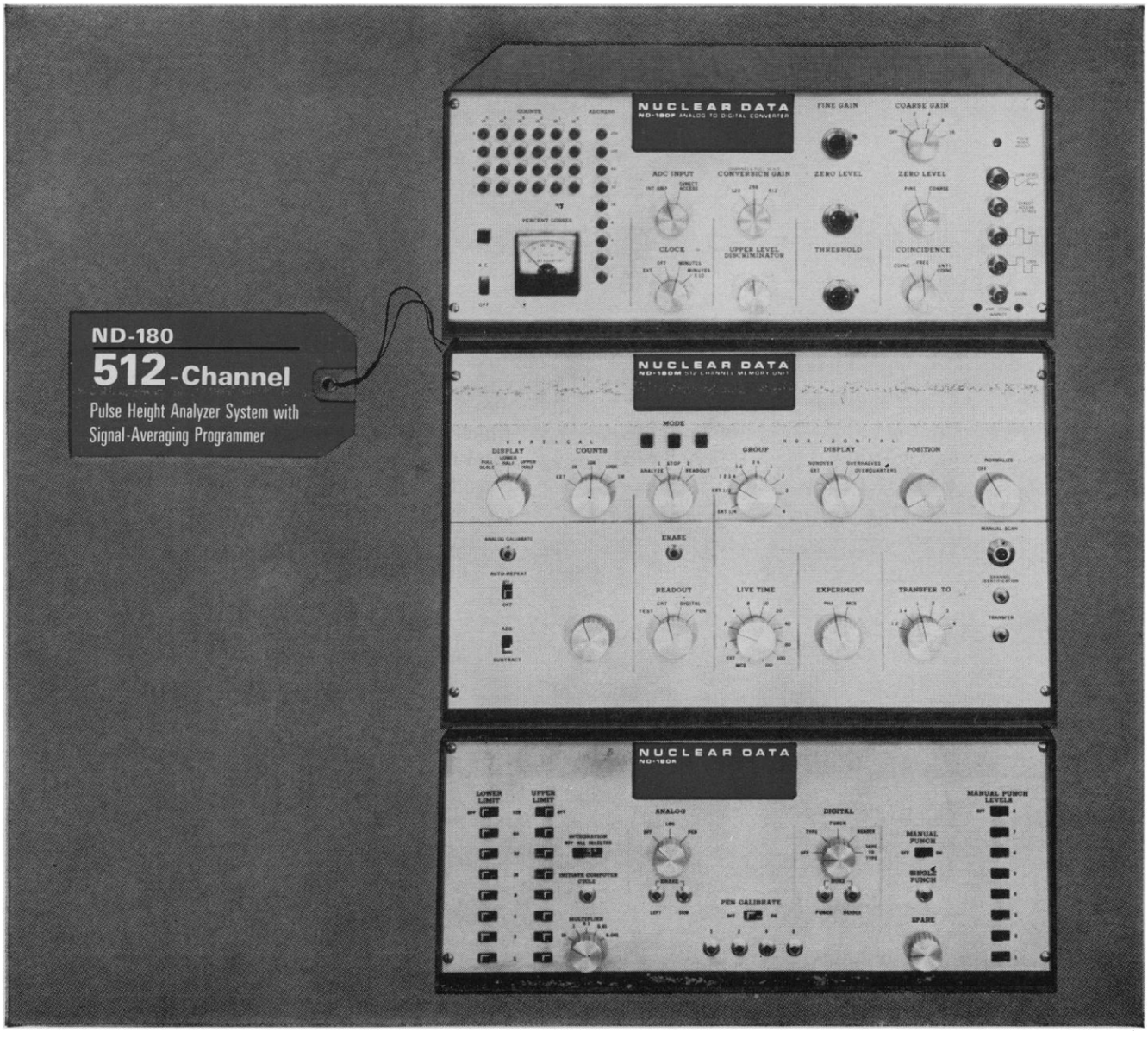

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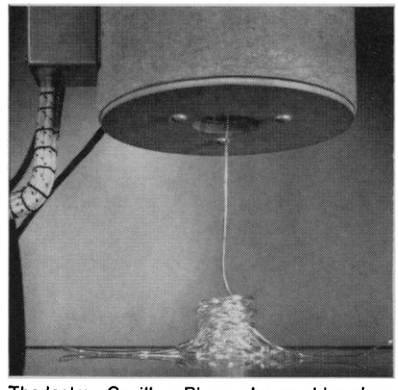
NEW INSIGHT INTO THE PREDICTION OF POLYMER BEHAVIOR IN PROCESSING

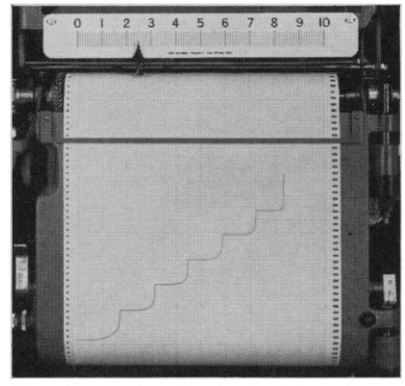
Predicting the flow behavior of molten polymers during processing operations is of basic and practical concern to researchers, manufacturers and fabricators. Unfortunately, the problem is a complex one.

But new insight into the problem is offered as a result of the concentration of work done by Rheologists. An up-to-date, comprehensive summary of several resulting techniques is contained in a recently-translated technical paper.* This paper covers in detail, how Rheometers (and particularly Instron extrusion-type Rheometers) may be used to provide information that can be linked with the molecular and structural as well as elastic properties of polymers. The paper also discusses how these rheological techniques can be used to predict polymer behavior under different manufacturing conditions. As a result, undesirable processing phenomena like melt-fracture can be avoided and products of more uniform characteristics can be obtained.

Rheology is a specialized area of investigation in which Instron Universal Testing Instruments, used in conjunction with Instron extrusion-type Rheometers, are contributing to materials technology. With this equipment an entire flow curve can be developed in a few moments with a single filling of the barrel. High test accuracy is assured by the Rheometer's precision temperature control system which permits accurate temperature control to better than ± 0.5°C. over a range from 10°C. above ambient to 340°C.



The Instron Capillary Rheometer provides close simulation of actual conditions encountered in plastics processing. This unit, mounted on an Instron Tester, is being used to check the steady-state shear viscosity of high-polymer compounds.



Viscosities can be determined quickly and accurately with the Instron Capillary Rheometer. Here, test results from a typical molten polymer show pressures (proportional to shear stress) obtained from a series of constant programmed piston rates (which are proportional to shear rates).

*This paper, one of the most comprehensive reports we've seen on the rheology of molten polymers, is available on request. In addition, technical articles covering many other areas of materials testing may be obtained without charge. Tell us your area of interest and we will send you appropriate literature.
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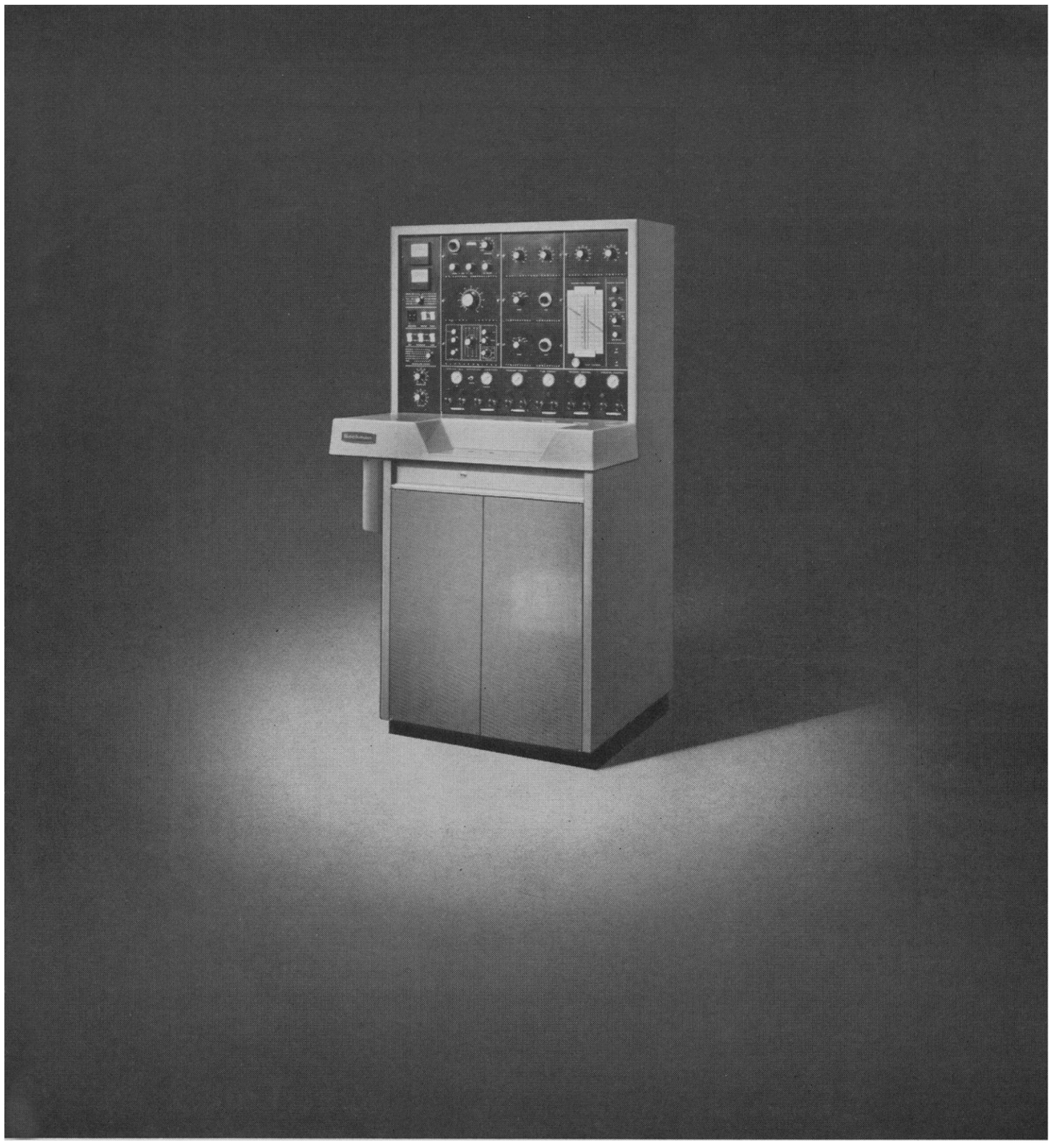

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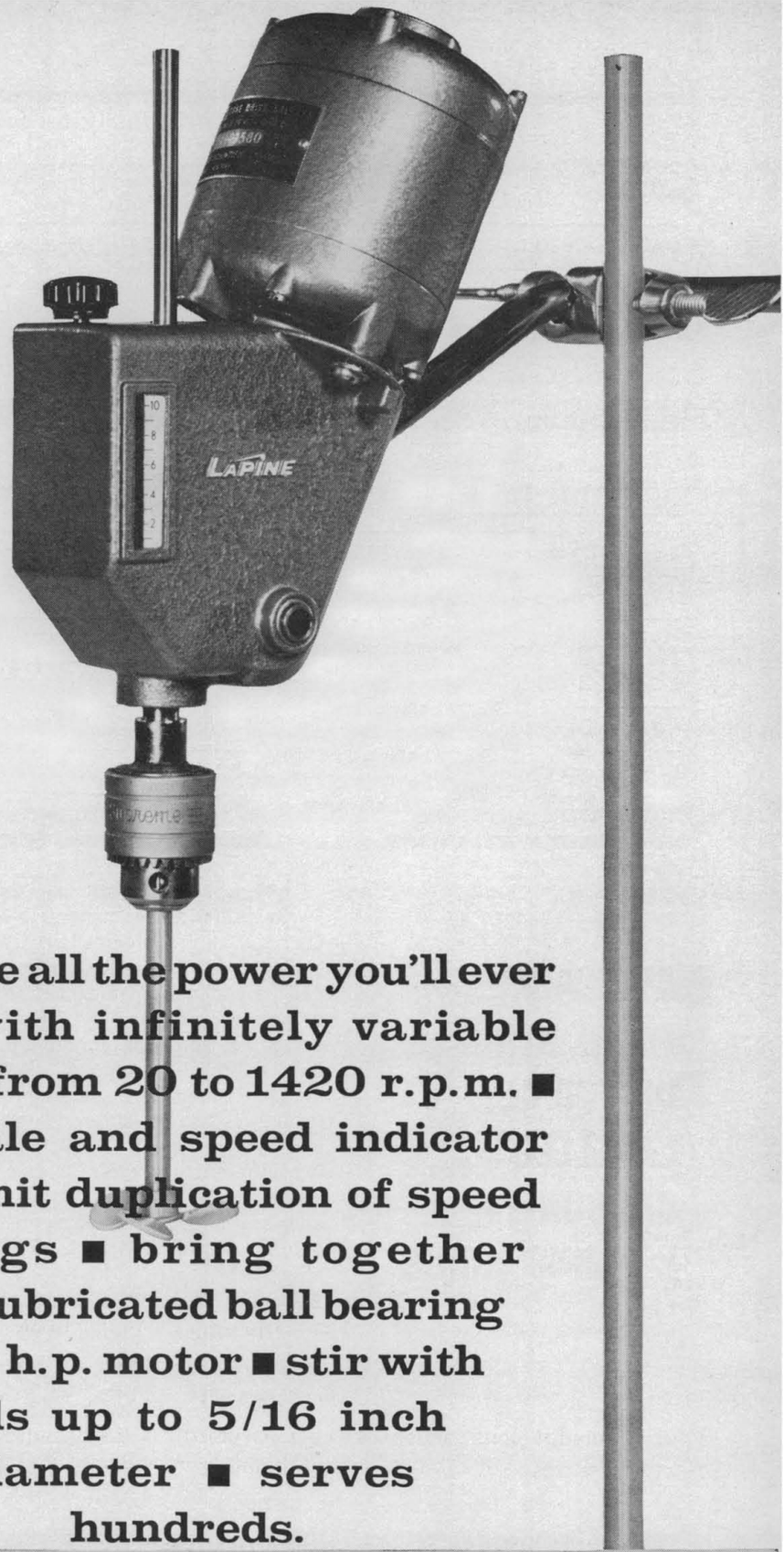

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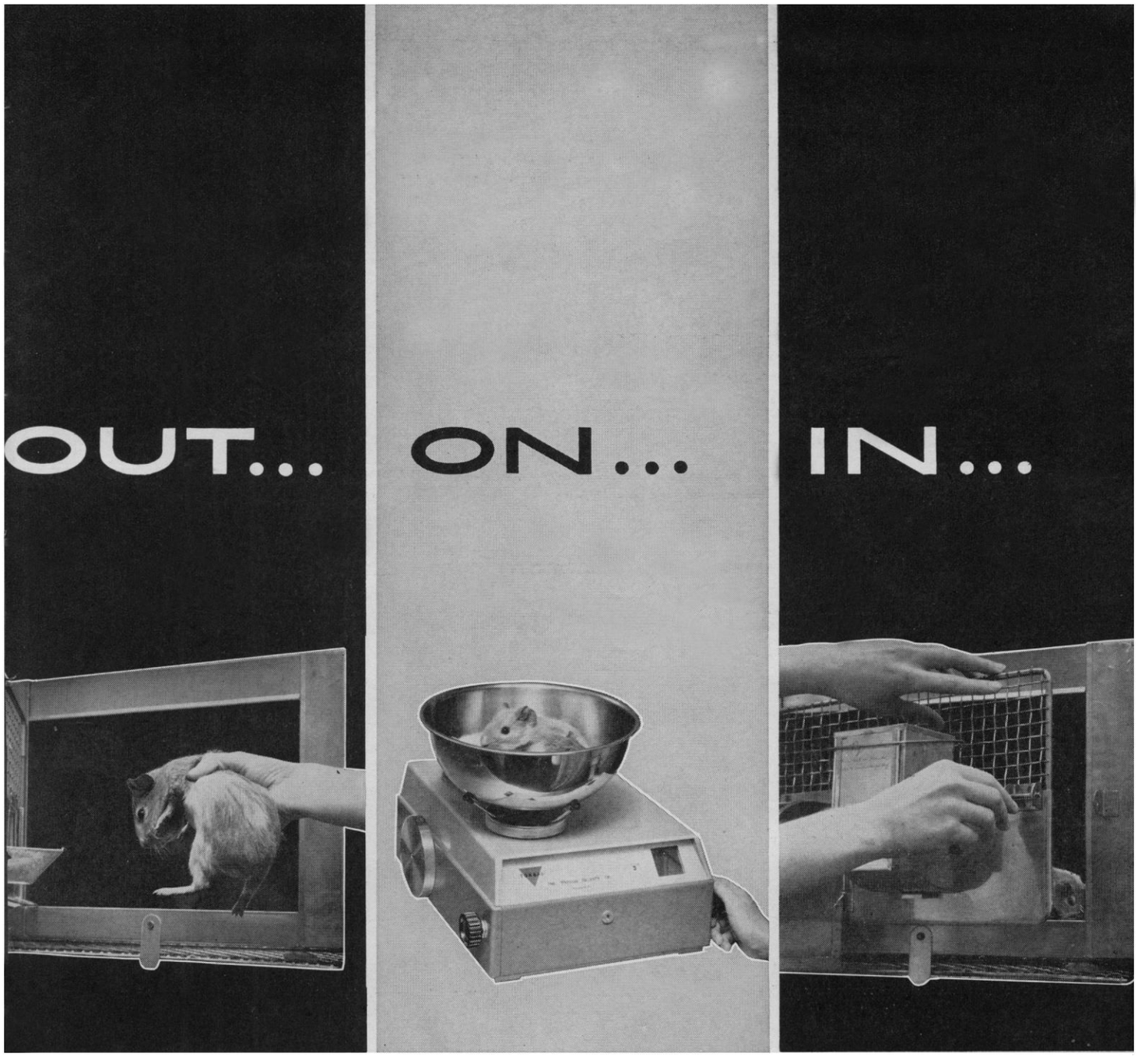

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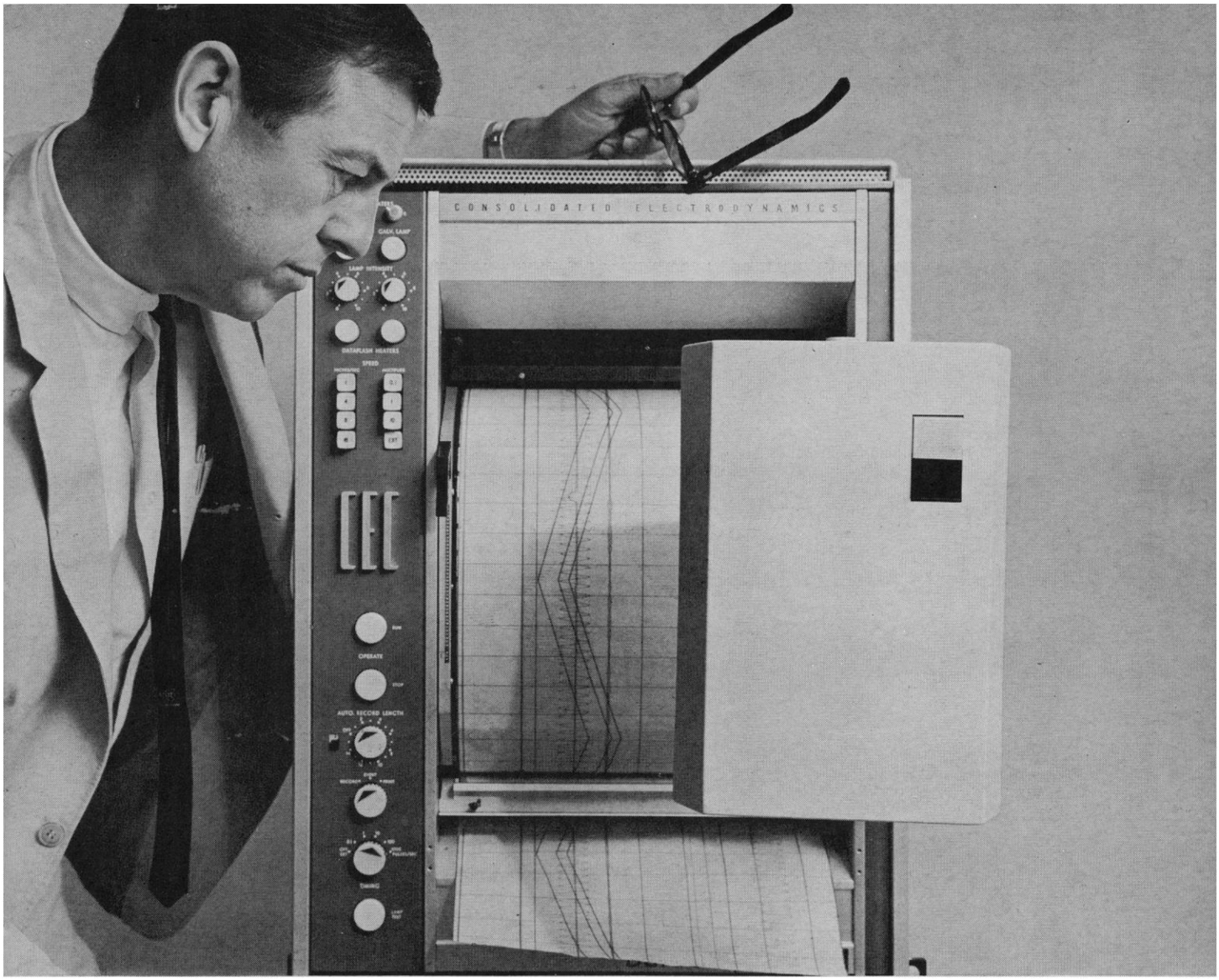

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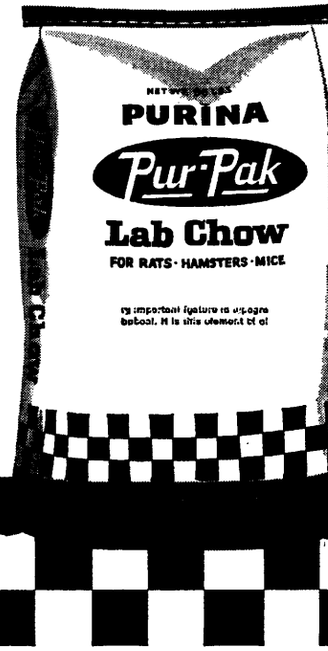

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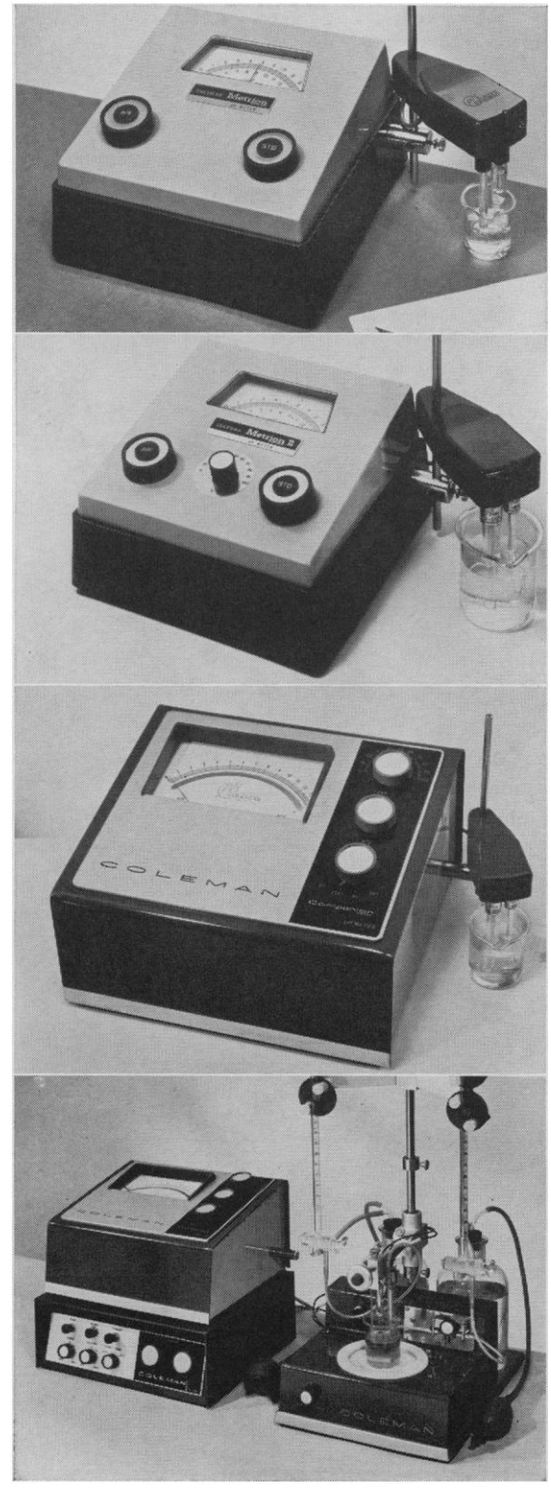

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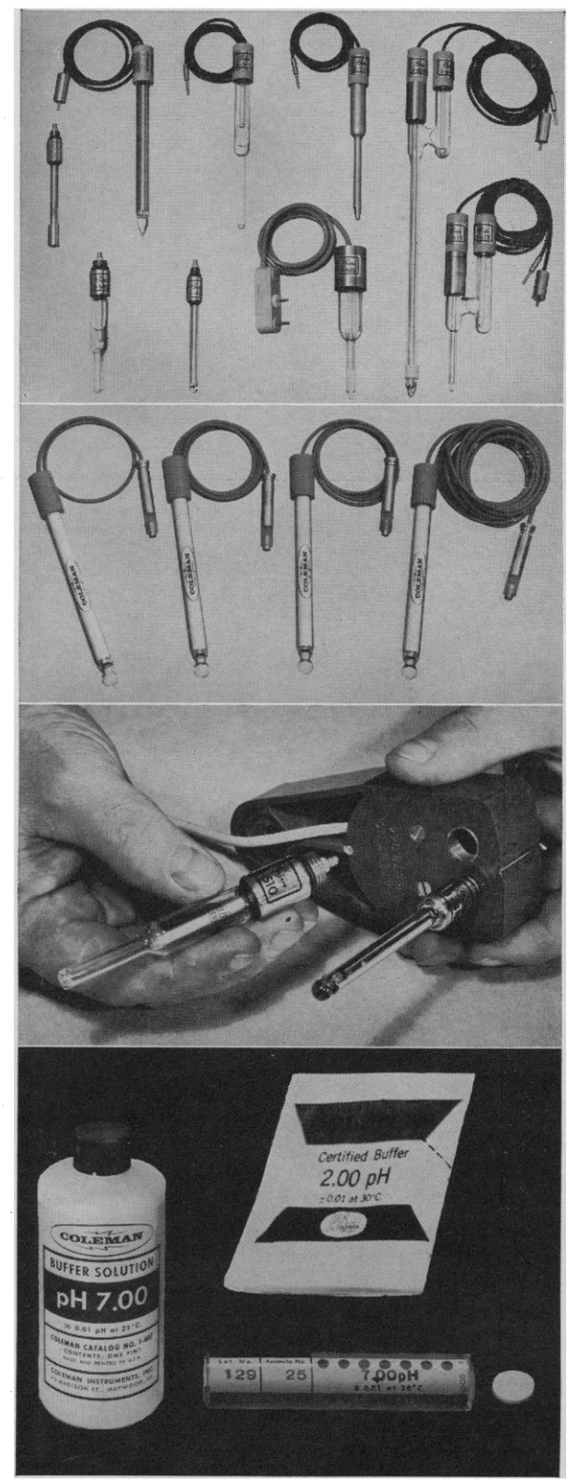

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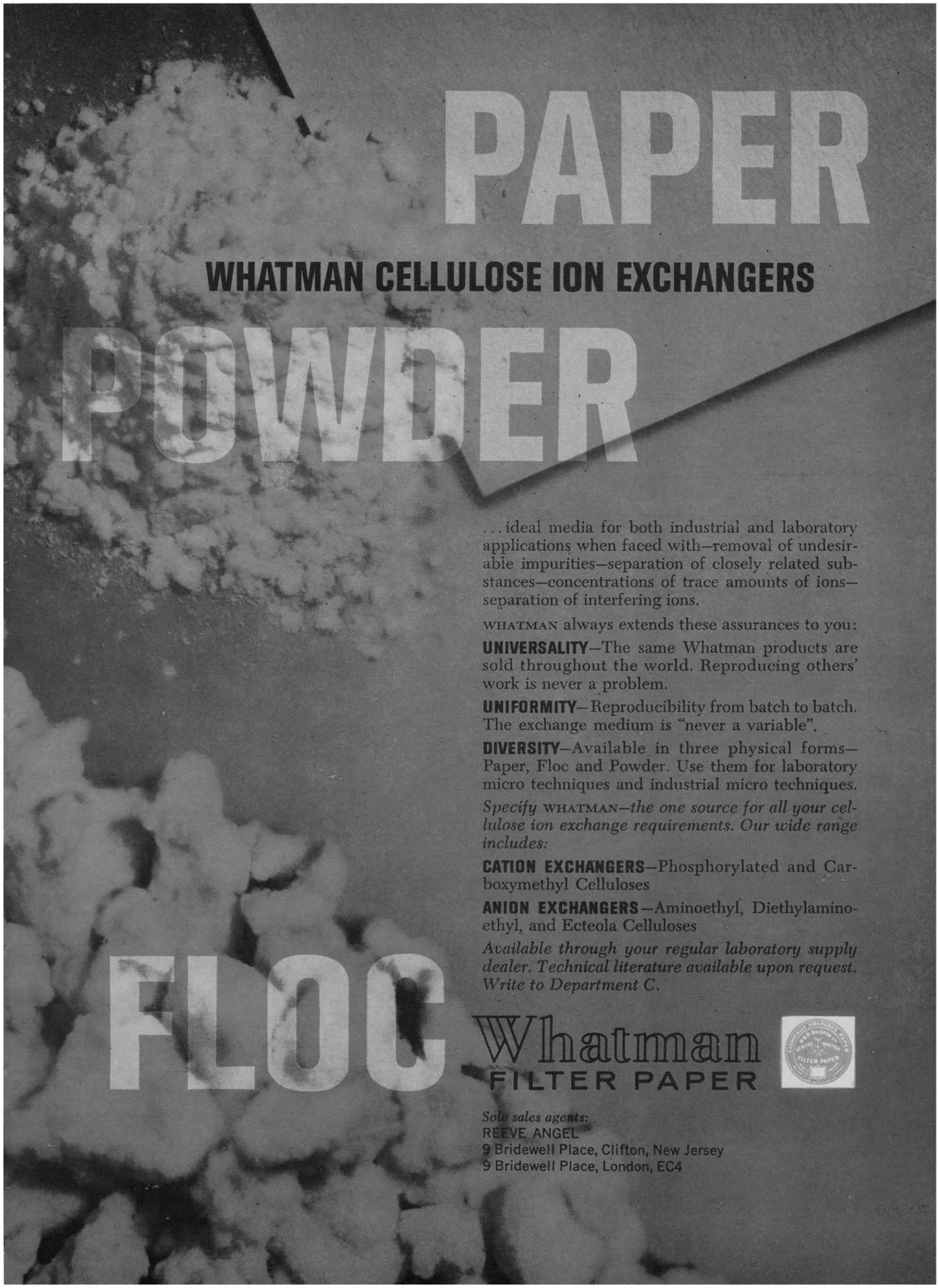

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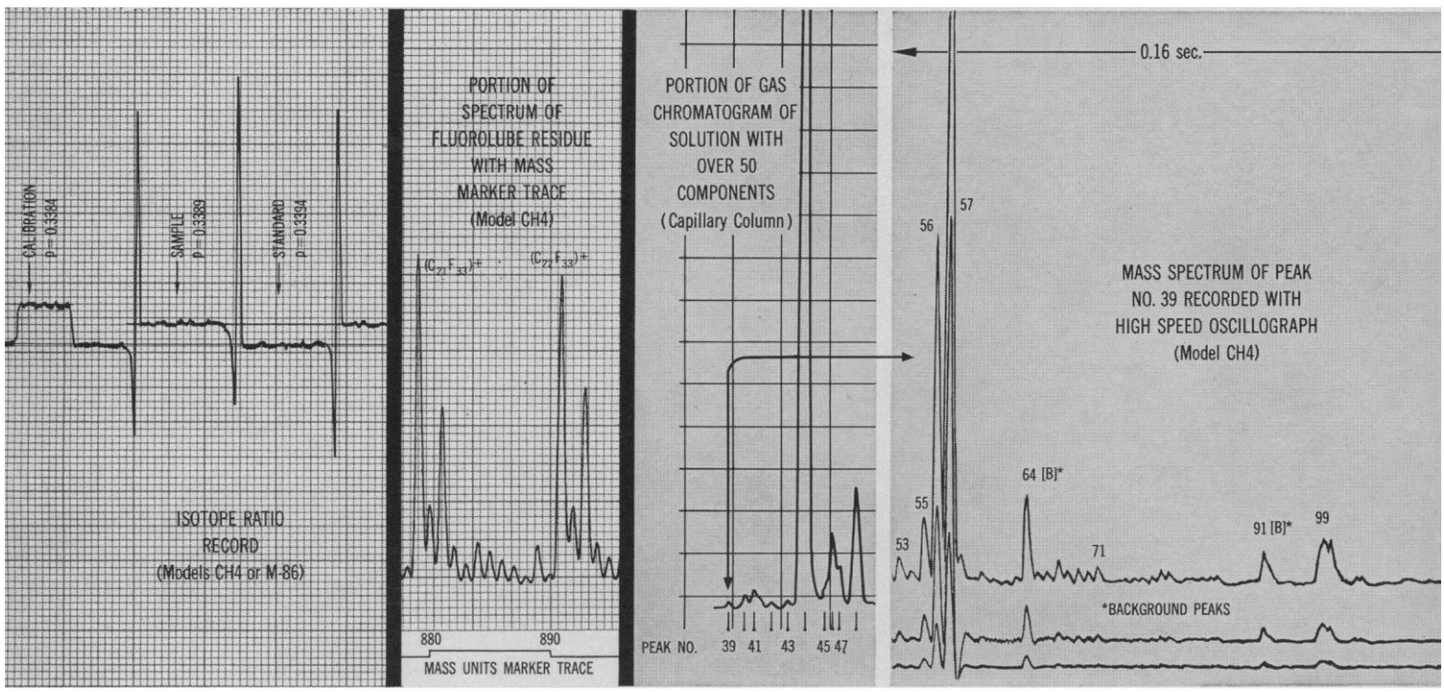

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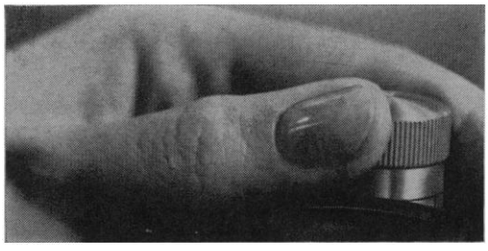

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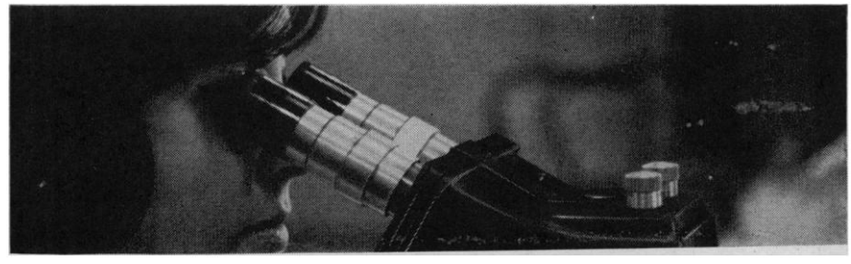

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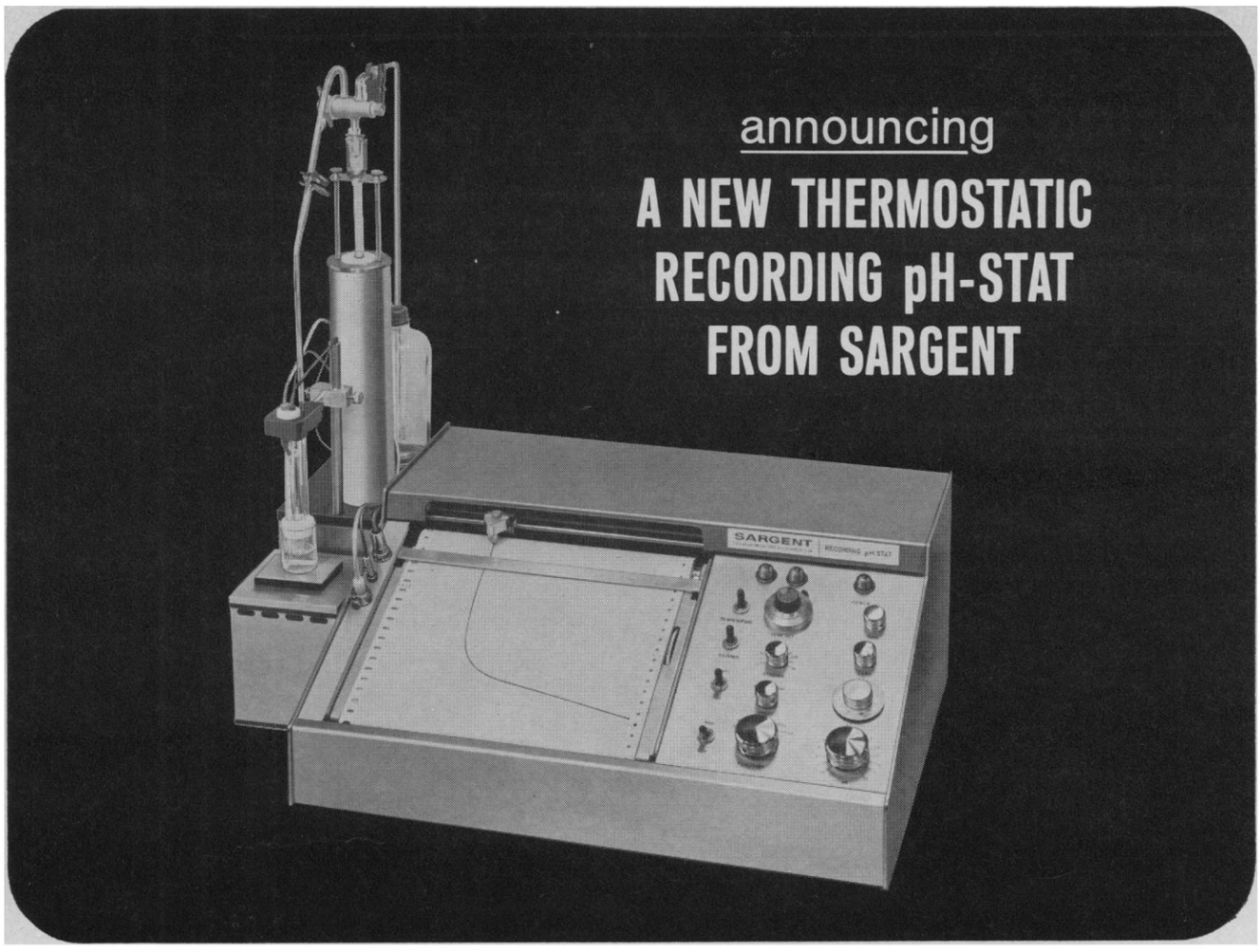

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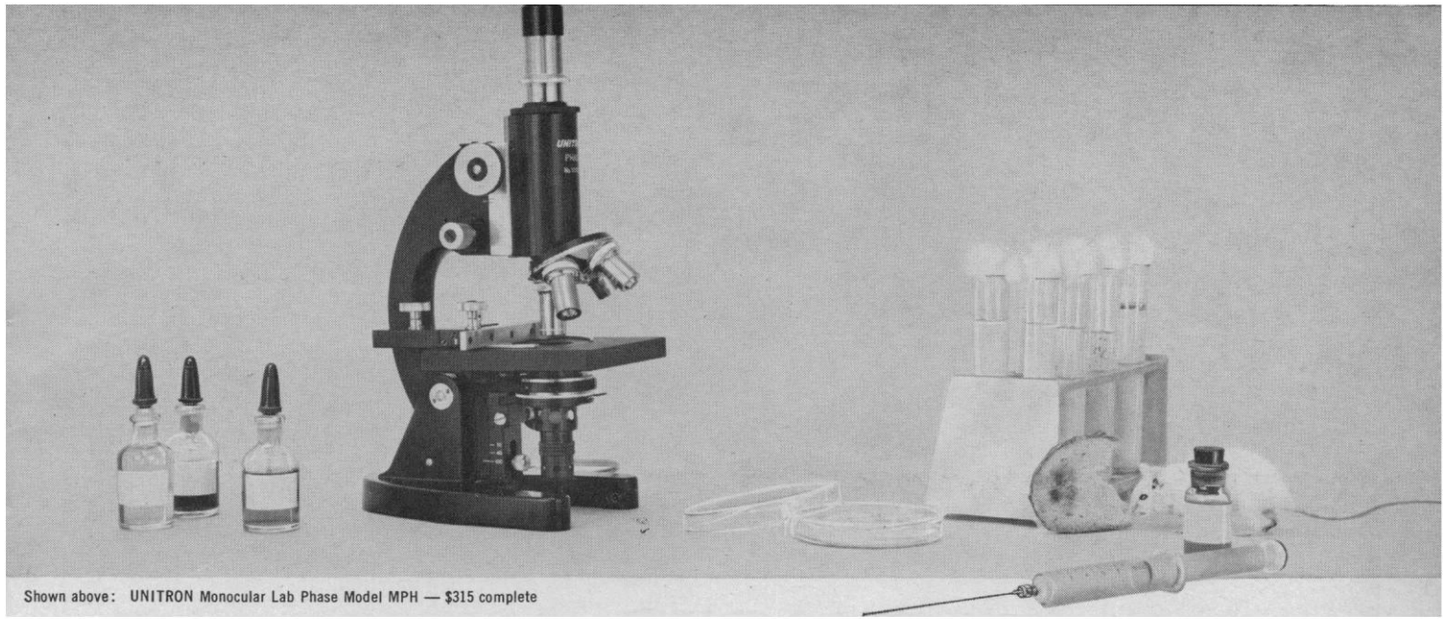

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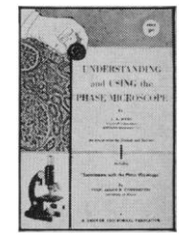

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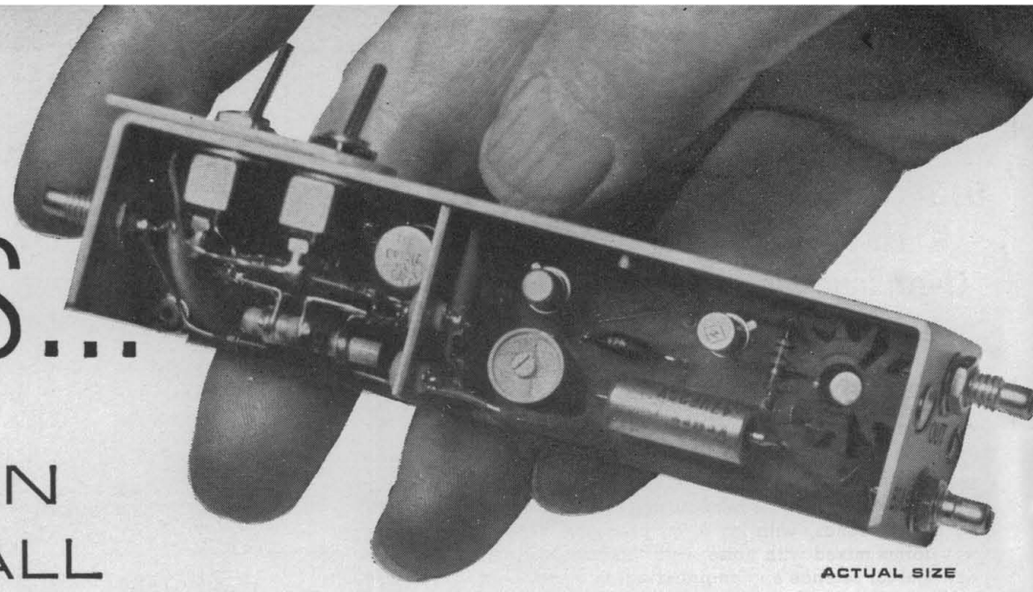

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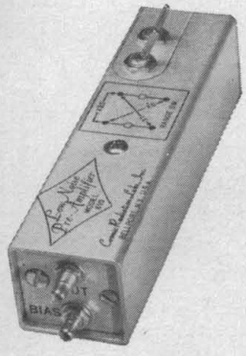

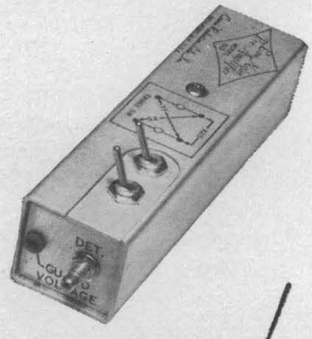

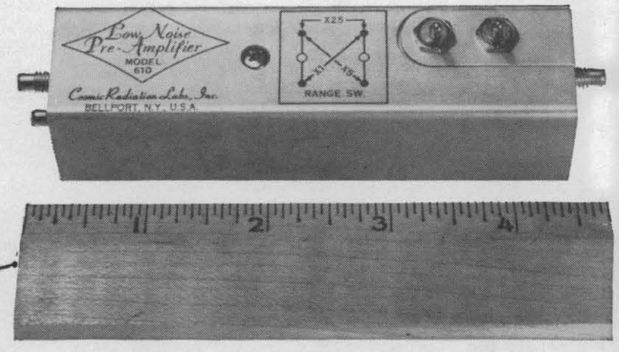

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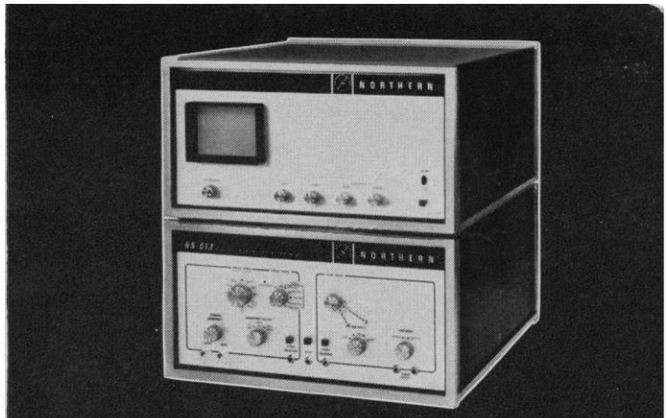
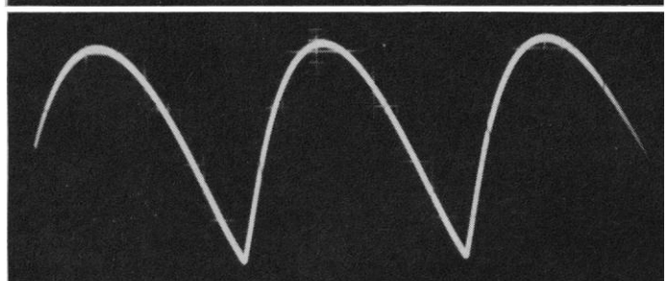
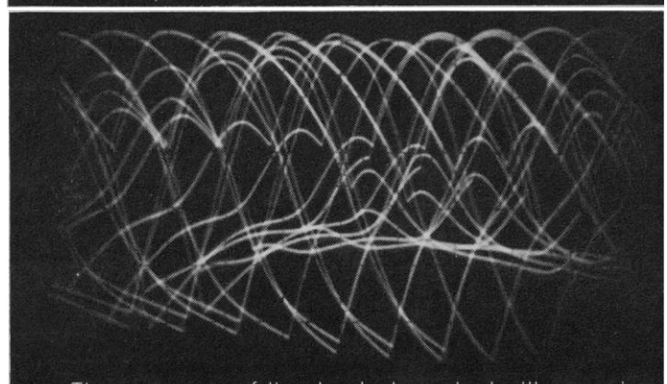


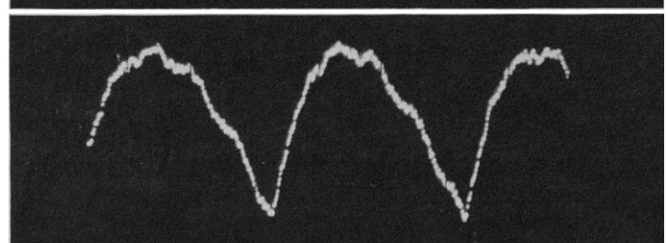
the NS-513 Digital Memory Oscilloscope ...
fast ... easy ... precise



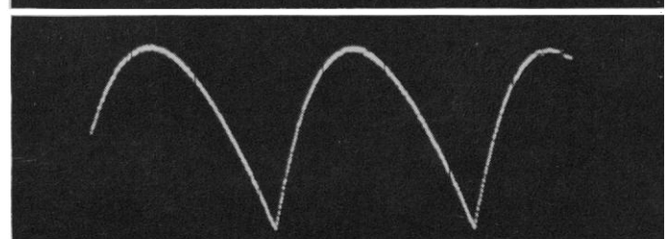
A periodic input signal, 150 cps, 660 millivolts peak to peak, as seen by use of a conventional oscilloscope, before mixing with noise.



The appearance of the signal when mixed with approximately five volts of noise (a distorted 60 cps sine wave).



The appearance of the model NS-513 cathode ray tube display after a short measurement. Most of the noise has been averaged out.



After a few minutes, the display appeared as in this photograph. No alteration in the instrument controls was made for this final photograph; the signal doesn't "grow" with time; it merely shapes itself to conform with the true signal of interest.

*PATENTS PENDING

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This remarkable offer* allows you to use the finest pipets ever made for the rest of 1964 without paying for a single replacement

In late 1963, a totally *new* pipet became available. COREX® brand pipets have since proved themselves so superior to any pipet, we now make you this offer:

*** We will replace . . free . . any COREX serological or Mohr pipet that you buy between now and October 9, 1964, which becomes unusable for any reason in normal use before December 31, 1964.**

Why do we make this offer? We feel that the best way to convince you of the real value of these pipets is for you to use them under your own specific conditions. We believe you will find they outlast other pipets by at least 6 to 1. We know you will also be pleasantly surprised at how much longer these pipets remain new looking.

How can we make this offer? COREX pipets are a result of an outstanding breakthrough in glass technology. They are made from a completely new glass that is chemically strengthened by an ion-exchange process. Experience has shown they can reduce your pipet replacement costs by at least 50%.

Because the glass in COREX pipets is more resistant to both acids and alkalies, it clouds far less and far more slowly than that in ordinary pipets.

The graduations and size code markings on COREX pipets are *fused* into the glass so they stay crisply legible for the life of the pipet. We tried conventional color coding on COREX pipets, but those markings faded and disappeared long before anything else affected the pipet's usefulness.

These are the reasons we will give you free replacement for any COREX serological or Mohr pipet that becomes unusable for any reason—chipping, breakage, clouding, fading —in normal use between now and December 31.

Get complete information on this unique offer from your Corning representative or from your favorite lab-supply dealer salesman.

Call him now. Put your order in today to take fullest advantage of our free replacement offer on COREX pipets. Remember, your purchase deadline for this offer is October 9.

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The Picker Magnachanger is your best investment for doing this job in all its ramifications because

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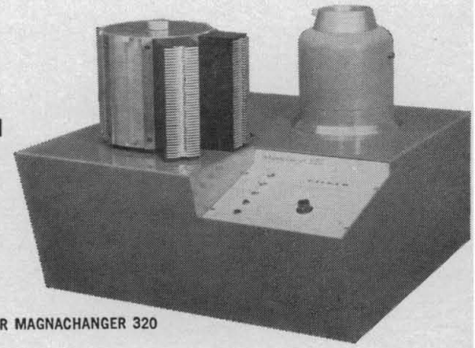
Backing up this versatile performance is the comforting assurance of dependability buttressed by modern design, quality production and on-site installation and service.

From the moment of its installation your Magnachanger will be under the continuous shepherding of Picker's unique service organization with local offices everywhere.



PICKER MAGNACHANGER 320

PICKER nuclear

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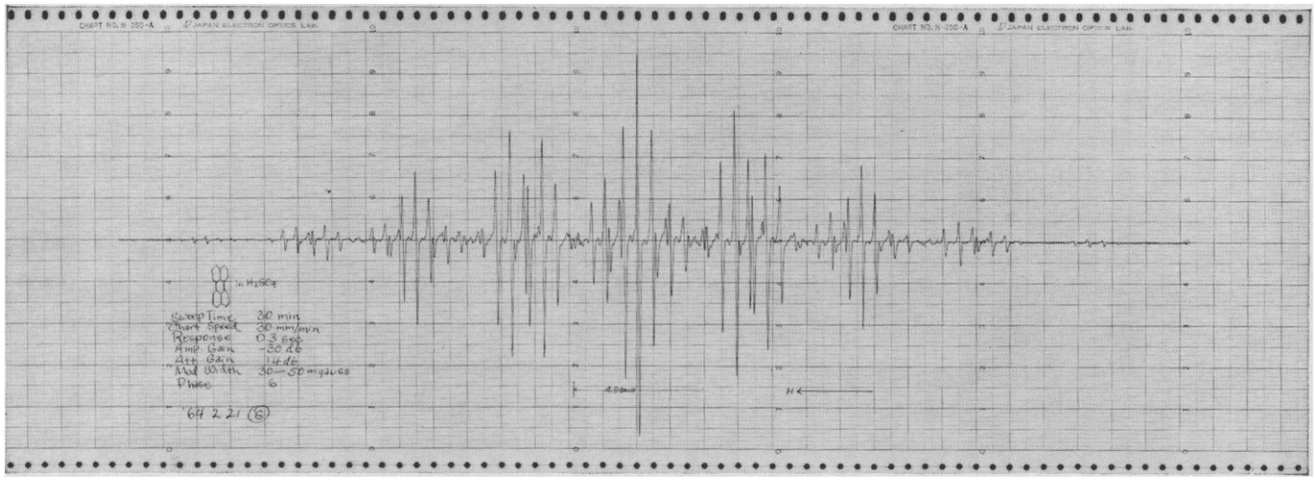
WHITE PLAINS, NEW YORK

ESR

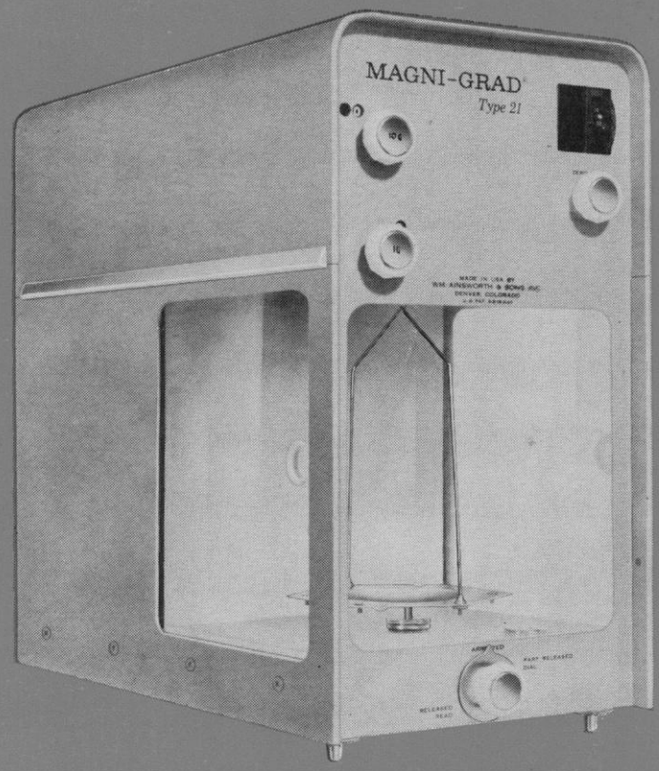


ESR spectrum of perylene positive ion in sulphuric acid showing highly resolved hyperfine structure due to interaction with proton spins.

SENSITIVITIES TO 1×10^{11} SPINS/GAUSS, RESOLUTION 1×10^{-5}

A complete line of versatile Electron Spin Resonance equipment and accessories is now available from Japan Electron Optics Laboratory Co., Ltd. Unusually high sensitivity to 1×10^{11} spins/gauss and 1×10^{-5} resolution with broad operational flexibility make them important research tools for a wide variety of applications. Units for K and Q-band operation with sensitivity of 1×10^{10} spins/gauss are also available. ■ Feeble ESR spectra produced by free radicals of organic compounds and aqueous solution samples used in biochemical research can be clearly recorded and analyzed. Unlike conventional instruments, JEOL's equipment can record second derivative curves for more precise analysis. Samples can be measured under varying conditions of mixture, temperature and rotation as well as under UV radiation. ■ Japan Electron Optics Laboratory Co., Ltd. has established a complete domestic servicing network to provide technical assistance and assure continuous trouble-free service. Complete technical data and sales information on ESR equipment can be obtained by contacting JEOLCO (U.S.A.), Inc., 461 Riverside Avenue, Medford 55, Mass., telephone 396-6241, area code 617.

AINSWORTH



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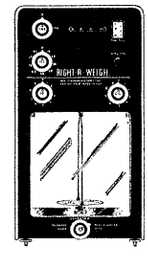
Full line of one-pan balances

speed / accuracy / convenience

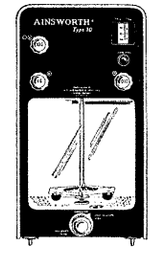
All weights are built in, just dial weights and read results. Following exclusive Ainsworth features are included as standard at no extra cost:

- **patented compensated beam.**
- **"add weight" and "remove weight" signals.**
- **all metal case.**
- **eye-level, unobstructed readout.**

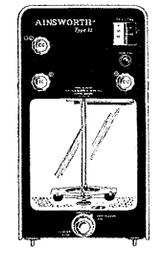
SPECIFICATIONS	TYPE SC	TYPE 10	TYPE 21	TYPE 12
Capacity	200 gr.	160 gr.	160 gr.	80 gr.
Tare	—	60 gr.	—	40 gr.
Total Load	—	220 gr.	—	120 gr.
Sensitivity	0.1 mg.	0.1 mg.	0.1 mg.	0.01 mg.
Readability by estimation	0.05 mg.	0.05 mg.	0.05 mg.	0.005 mg.
Reproducibility	±0.03 mg.	±0.03 mg.	±0.05 mg.	±0.01 mg.
Dimensions	10¼"w x 19¾"h x 18½"d	8¼"w x 15⅝"h x 16"d	8¼"w x 15⅝"h x 16"d	8¼"w x 15⅝"h x 16"d
PRICE	**$895.00**	**$670.00**	**$550.00**	**$875.00**



Standard size Type SC "Right-A-Weigh" analytical



Compact size Type 10 analytical



Compact size Type 12 semi-micro

MODIFICATIONS:

weigh below attachments available on all 1 pans, add B to type No.; Explosion proof available on all 1 pans, add A to type No.; at extra cost. Type SCD diamond balance; Type SCH with high weighing chamber; Type SC 300 extended capacity.

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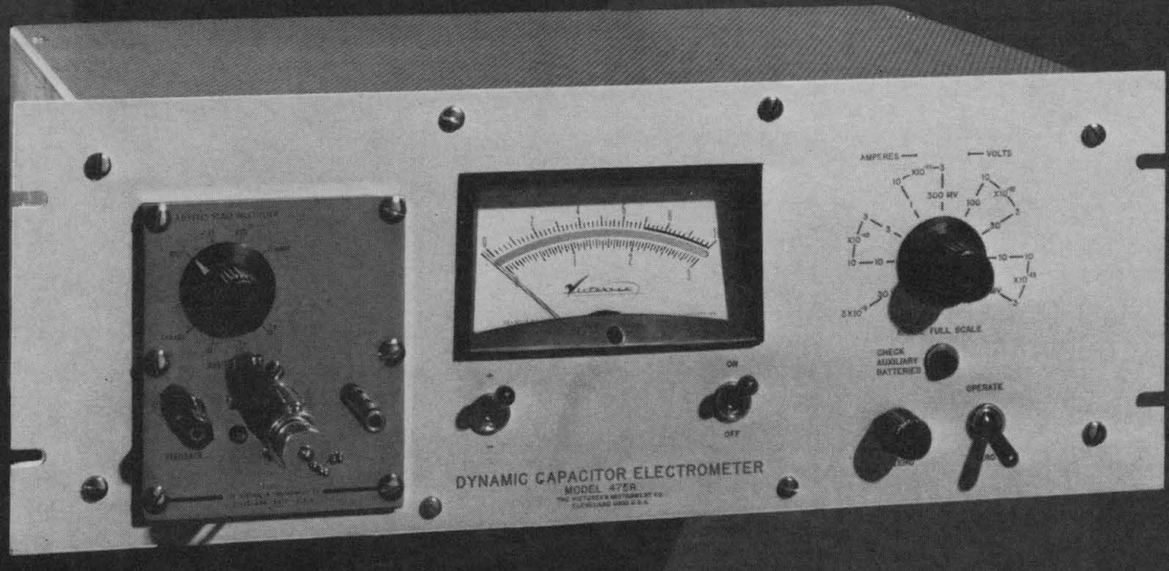
MEASURE FEMTOAMPS

Victoreen dynamic capacitor electrometer measures 3×10^{-15} amperes full-scale at immeasurably high input impedances



Incredibly minute currents in the femtoampere range (only about 6000 electrons/second) can now be precisely measured with the Victoreen Model 475 Femtometer. Stability is unsurpassed.

This remarkable capability makes the Femtometer the ideal measuring instrument in nuclear studies involving ion currents . . . in electronics for measuring transistor base or tube grid currents, and contact potentials . . . in chemistry for pH, chromatography and mass spectrometry . . . in physics for many research applications.

Check the following specification data. Then request full information and arrange to see this remarkable instrument in use in your own laboratory.

CONDENSED SPECIFICATIONS

Full-Scale Ranges: 3 millivolts to 30 volts at over 10^{16} ohm input impedance; 3×10^{-15} ... 3×10^{-7} amps.

Power Requirements: 115-230v, 50-60 cps; or 4 "D" flashlight batteries. Switches itself on to battery if AC fails. (No batteries needed for AC-only operation.)

Full line of input adaptors and accessories available.

Accuracy: Better than 2% on panel meter readout; order of 0.25% with calibrated capacitor and rate of charge measurement with external potentiometer.

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VANGUARD

NEW MODEL 885 GLASS PLATE SCANNER FOR THIN LAYER CHROMATOGRAPHY

The Model 885 Glass Plate Scanner now extends the range and versatility of the Model 880 Low Background Autoscanner for applications involving the assay of thin layer chromatograms. Designed as an accessory system to operate in conjunction with the Autoscanner, the Model 885 provides a convenient, low cost system for assaying TLC glass plates with unequalled accuracy and sensitivity. The compact design of Model 885 allows it to be operated atop the Model 880 Autoscanner so that no additional bench space is required.

Utilizing the electronics of the Model 880 Autoscanner, the Model 885 provides 2 pi windowless detection for tritium, carbon-14, sulphur-35 and other beta-emitting radioisotopes. A pushbutton transmission provides 10 scanning speeds identical to those available on the Model 880 Autoscanner, assuring absolute correlation between the glass slides and recorder chart paper. An automatic marking system places a distinctive "pip" on the chart record to denote the beginning and end of each TLC plate. This assures accurate location of radioactive zones.

Model 885 is furnished with three interchangeable stainless steel collimators of ½ cm., ¼ cm., and ⅛ cm. width to meet varying requirements of chromatogram resolution while maintaining maximum detection sensitivity. Standard glass plates from ½"—2½" wide and up to 12" in length may be scanned.

To facilitate the scanning of either paper or TLC chromatograms, an automatic power and gas control system incorporated in the Model 885 Glass Plate Scanner switches both electronics and counting gas supply from the Model 880 to the Glass Plate Scanner when power is applied.

To further increase the versatility of the Model 885 Glass Plate Scanner, the Model 880 ADS digital integration system may also be used to provide quantitative evaluation with digital presentation of radioactive zones.

For additional information on the new Model 885 Glass Plate Scanner, write Vanguard, P. O. Box 244, LaGrange, Illinois, or one of the local sales offices.

Model 885 shown atop the Model 880 Autoscanner

Model 885 Glass Plate Scanner

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26 June 1964, Volume 144, Number 3626 **SCIENCE**

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

Science Dropouts

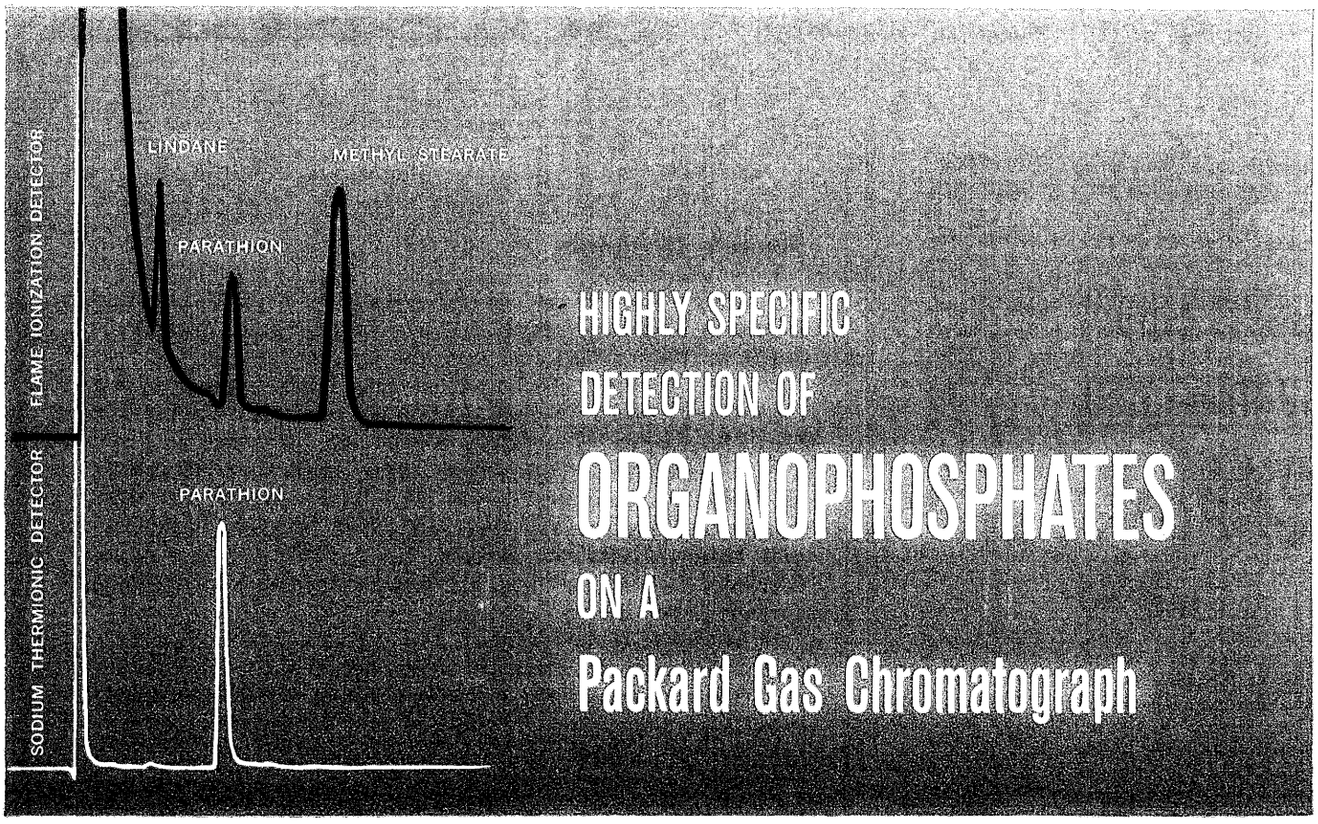
The high attrition rate among talented undergraduates planning careers in scientific research calls for reexamination of educational practices. The existence of a troublesome problem was delineated recently by Robert C. Nichols in an article appearing in this journal (*Science*, 12 June). Nichols is program director of the National Merit Scholarship Corporation, which each year tests as many as 596,000 juniors from high schools which enroll about 90 percent of all high school students. About 10,000 semifinalists are selected, representing approximately the 1 percent of high school seniors who rank highest in scholastic aptitude. Since 1956 the successive groups have been carefully followed, and detailed statistics are now available on their career choices.

In his article Nichols presents two different studies. The first is a compilation of career choices of these talented students for the period 1957–63. The percentage of those selecting scientific research declined from a peak of 37.77 percent in 1958 (the first post-Sputnik year) to 28.87 percent in 1963. More serious was a high tendency (shown in the second study) to abandon, during college years, plans for a research career. Students entering college in 1957 were queried in 1961. Among those originally choosing scientific research, 55.2 percent of the males and 58.9 percent of the females had changed to other career choices. These trends came at a time when every kind of social pressure was being exerted to induce young people to choose careers in scientific research.

Science courses have won a deserved reputation for being difficult. In the past there has been substantial attrition among students choosing these fields, and this was to be expected among students of lesser intellectual ability. But the top 1 percent of high school graduates surely have the intelligence necessary to do well in science. In some instances special aptitude may be lacking, but in general, given sufficient motivation, this top group should have little difficulty in ranking high among their peers.

The high rate of science dropouts perhaps has many origins, but surely an important factor is motivation. High school training does not provide students with much basis for making judgments concerning their future careers. Given a climate of public opinion in which the value of research is emphasized, some students who are not highly motivated choose science. Once enrolled, they suddenly find, as freshmen, that college science courses are difficult. Too often the beginning instruction is mediocre, and science faculties seem to have little time for the young students. The talented student is likely to find better teaching and more warmth in various fields of the humanities.

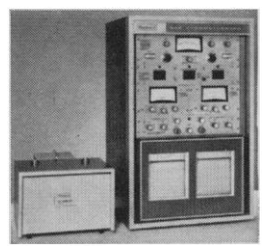
If a large proportion of the college freshmen who decide on scientific research as their life's work are to hold to that decision, they must be given special motivation during this initial year. They should be taught by gifted lecturers and brought in contact with enthusiastic research men. Laboratory assistants should be chosen from among the best and most experienced of the graduate students. A special effort should be made to give freshmen better understanding of the challenges, disappointments, and rewards of a research career. Other steps can be taken, but even these simple measures should materially ease the dropout problem.—PHILIP H. ABELSON



HIGHLY SPECIFIC DETECTION OF ORGANOPHOSPHATES ON A Packard Gas Chromatograph

Phosphorous-containing compounds are one of the most recent groups to yield to a Packard Gas Chromatograph. The chromatogram which is shown above was made on a Packard Model 7611 dual system (dual column oven, dual detectors, dual electronics and dual recorders) and represents an important achievement in simultaneous determination of compounds of widely separated concentration.

A modified flame ionization detector with a sodium emission grid and termed a SODIUM THERMIONIC DETECTOR (STD) has been found to be nearly 1000 times more sensitive to phosphorous-containing pesticides than the standard flame ionization detector (FID). The sample was separated on a single column and passed through a 1:1 ratio stream splitter before simultaneous detection in the normally sensitive FID and the highly sensitive STD. In this manner, all the organic materials were detected in the FID (upper curve) while the trace amount of phosphorous compounds was readily detected in the STD unit (lower curve).



Packard Gas Chromatographs offer many significant advantages to research workers in the biochemical and biomedical disciplines. Fast, stable, highly sensitive determination, versatility and convenience of operation are some of the reasons why you should know more about these superb instruments. Your Packard Sales Engineer can provide complete details and performance criteria. Write for Bulletins and Specifications.

EXPERIMENTAL CONDITIONS*

1 μg lindane
1 μg parathion.
2 μg methyl stearate

COLUMN: 5 ft. x 4 mm all glass

LIQUID PHASE: 10% Dow Corning Silicone Fluid (DC200)

SUBSTRATE: 80-90 mesh Anacrom ABS (acid and base washed, and silanized)

CARRIER GAS FLOW RATES:
Nitrogen 60 cc/min
Hydrogen FID 40 cc/min; STD 60 cc/min
Air 300 cc/min

TEMPERATURES:
Inlet Heater 225°C
Column 205°C
Detectors 200°C
Outlet 200°C

DETECTORS: Standard Packard Hydrogen Flame Ionization (FID); Modified Packard Ionization Detector with sodium emission grid (STD)

ELECTROMETER RANGES:
FID 1 x 10^{-9} amperes full scale
STD 3 x 10^{-7} amperes full scale

DETECTOR VOLTAGE: 300 volts

NOISE LEVEL: 1 x 10^{-11} amperes full scale

CHART SPEED: 30 inches/hour

*L. Guiffrida, *J.A.O.A.C.*, **47**, No. 2, 293 (1964)

Packard

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lary columns and applying Golay's equation for the dispersion of a small zone of vapor introduced in an instant at one point in the pipe. Measurement of the dispersion some 30 kilometers away showed the plate height to be smaller by many powers of 10 than would be expected if turbulent flow did not occur. More evidence that columns performed better than would be expected at very fast flow rates came from J. C. Sternberg (Beckman Instruments) and others, but whether this high performance was due to turbulence or to any of many other features of a complicated subject was not really clear.

Gas chromatography is at present less used than many other analytical techniques for the cataloging of reliable numerical data for analytical use. Experience has shown that analysts are reluctant to determine partition coefficients of vapors in various stationary liquids, or to use such determinations, and even reliable tables of relative retention data are rather few in number. A few years ago E. Kovats (Technische Hochschule, Zurich) proposed compilation of a "Retention Index" in which a retention volume for a given vapor in a given solvent is expressed by logarithmic interpolation between the retention volumes of the successive *n*-alkanes which are eluted before and after the vapor of interest. At the meeting Kovats pointed out the advantages of his index, and there are many indications that it will gain wide acceptance as a satisfactory means of presenting data.

A new type of liquid-liquid and liquid-solid chromatography was described by E. Bayer (Tubingen, Germany). This technique, in which surface-activated capillaries are used at ambient temperatures, is suitable for nonvolatile compounds, such as amino acids, carbohydrates, and steroids. The analysis of 22 amino acids was effected in 90 minutes. The improvement of detectors for this system should cause a renaissance of liquid chromatography.

At this conference techniques of gas chromatography, rather than its applications, were emphasized. However, several cases were noted in which solutions to problems, which could be studied by no other method, were obtained by gas chromatography (for example, the analysis of small quantities of complicated mixtures of amines of biochemical origin and the analysis of polluted air). It is important for researchers involved solely with the technique to realize that study of the detailed characteristics of the flow of a gas through an absorptive tube is trivial unless it leads to some useful result.

This symposium, the second international one to be held on this subject, was sponsored by the University of Houston.

A. B. LITTLEWOOD
The University, Newcastle upon Tyne, England

AAAS: Southwestern and Rocky Mountain Division 40th Annual Meeting

The Southwestern and Rocky Mountain Division of the American Association for the Advancement of Science held its 40th annual meeting in Lubbock, Texas, 26–30 April 1964. Texas Technological College served as host institution and provided facilities for the meetings.

Specially featured addresses at general sessions of the meetings included "Antarctica, frontier of international science," by Laurence M. Gould (president, American Association for the Advancement of Science). The annual John Wesley Powell Memorial Lecture was given by Eugene Shoemaker (chief, Branch of Astrogeology, U.S. Geological Survey, and research associate in Astrogeology, California Institute of Technology). Shoemaker spoke on "The history of the moon." The address of the retiring president of the Division, Edwin R. Helwig (University of Colorado) was "Chromosomal polymorphism in various populations of *Trimerotropis suffusa* (Orthoptera)."

Special symposiums consisting of invited papers included a full-day series on "Indian and Spanish American Adjustments to Arid and Semi-arid Environments," under the sponsorship of the Division's Committee on Desert and Arid Zones Research, and a single session presentation on the "Improvement of Science Teaching," sponsored by the Division's committee for that purpose. Programs of the sections of the Division included 102 individual research papers. The sessions for these papers were well attended, and generated a great deal of interest. An innovation in the sessions of the section for the Social Sciences was a series of lecture and audience-participation demonstrations in which the computer is used as a teaching machine in various

decision-making games. These sessions were made possible through the cooperation of the Texas Technological College Computer Center.

Newly elected officers of the Division include president-elect, Earl D. Camp (Texas Technological College) and a member of the Executive Committee, John Lacher (University of Colorado). A. B. Meinel (University of Arizona), having served during the past year as president-elect, becomes the president. Marlowe G. Anderson (New Mexico State University) will continue as executive secretary-treasurer and as council representative.

Flagstaff, Arizona, was duly confirmed as the location for the 1965 meetings, and invitations were accepted to hold the 1966 meetings in Las Cruces, New Mexico, 1967 in Tucson, Arizona, and 1968 in El Paso, Texas.

MARLOWE G. ANDERSON
New Mexico State University, University Park

Forthcoming Events

July

10–11. Rocky Mountain **Cancer** Conf., Denver, Colo. (N. P. Isbell, 1809 E. 18 Ave., Denver 80218)

10–15. **Pleistocene Geomorphology**, symp., Exeter, England. (T. H. Elkins, Royal Geographical Soc., Kensington Gore, London, S.W.7)

12–15. **Solid Propulsion**, NASA meeting, Philadelphia, Pa. (W. H. Hunter, Office of Program Development, Washington, D.C. 10025)

12–16. **Gastroenterology**, 9th Pan American congr., Bogotá, Colombia. (C. A. Estape, Soriano 877, Montevideo, Uruguay)

13–15. Problems of **Capillary Permeability** in Health and Disease, Univ. of Michigan 1964 summer symp., Ann Arbor, Mich. (M. M. Dewey, Dept. of Anatomy, Univ. of Michigan, Ann Arbor)

13–15. **Data Processing and Acquisition in Biology and Medicine**, conf., Rochester, N.Y. (K. Enslein, 42 East Ave., Rochester 14604)

13–17. **Canadian Teachers'** Federation, Lac Beauport, P.Q., Canada. (G. Nason, 444 MacLaren St., Ottawa, Ont., Canada)

13–17. Chemistry of **Carbohydrates**, intern. symp., Münster, Germany. (F. Micheel, Organisch-Chemisches Institut, Universität, Hindenburgplatz 55, Münster)

13–17. International Assoc. for **Child Psychiatry** and Allied Professions, London, England. (F. H. Stone, Royal Hospital for Sick Children, 70 University Ave., Glasgow, W.2 Scotland)

13–18. **Instrumental Analytical Chemistry**, 3rd annual symp., Bethlehem, Pa. (A. J. Diefenderfer, Dept. of Chemistry, Lehigh Univ., Bethlehem)

13–18. Latin Federation of **Medical**

Electro-Radiological Socs., 6th congr., Brussels, Belgium. (Secretariat, 256 Chaussee de Wavre, Heverle-Louvain, Belgium)

14–17. **Rarefied Gas Dynamics**, 4th intern. symp., Toronto, Ont., Canada. (G. N. Patterson, Inst. of Aerophysics, Univ. of Toronto, Toronto 5)

14–17. **Regional Science** Assoc., 4th congr., Ghent, Belgium. (W. Isard, Univ. of Pennsylvania, Philadelphia 19104)

14–17. **Western Resources** Conf., Boulder, Colo. (Bureau of Continuation Education, 352 Chemistry Bldg., Univ. of Colorado, Boulder)

14–19. **Sociology**, 7th Latin American congr., Bogotá, Colombia. (C. E. Angulo, Facultad de Sociologia, Universidad Nacional de Colombia, Bogotá)

15–19. **Pleistocene Geomorphology**, symp., Cambridge, England. (T. H. Elkins, Royal Geographical Soc., Kensington Gore, London, S.W.7, England)

16–24. **British Medical Assoc.**, annual, Manchester, England. (D. Gullick, BMA, Tavistock Sq., London, W.C.1, England)

16–24. **Organic Photochemistry**, intern. symp., Strasbourg, France. (G. S. Hammond, Gates and Crellin Laboratories of Chemistry, California Inst. of Technology, Pasadena)

18–22. International Union of **Biological Sciences**, 15th general, Prague, Czechoslovakia. (G. L. Stebbins, Dept. of Genetics, Univ. of California, Davis)

19–24. American **Veterinary Medical** Assoc., 101st annual, Chicago, Ill. (AVMA, 600 South Michigan Ave., Chicago 5)

19–25. **Polarography**, 3rd intern. congr., Southampton, England. (D. A. Pantony, Dept. of Metallurgy, Royal School of Mines, Prince Consort Rd., London, S.W.1, England)

19–26. Comparative **Endocrinology**, 4th intern. symp., Paris, France. (L. Gallien, Laboratoire d'Embryologie, Faculte des Sciences de Paris, 9 quai St.-Bernard, Paris 5°)

20–22. **Magnetic Resonance** in Biological Systems, Boston, Mass. (R. G. Shulman, Bell Telephone Laboratories, Murray Hill, N.J.)

20–23. New Mexico Acad. of **General Practice**, Ruidoso. (H. L. Douglas, Box 767, Tatum, N.M.)

20–24. International **Diabetes** Federation, 5th congr., Toronto, Ont., Canada. (H. Best, Organizing Council, 477 Mt. Pleasant Rd., Toronto 7)

20–24. **Nuclear Radiation** Effects, technical conf., Seattle, Wash. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y.)

20–24. **Organic Reaction Mechanism**, intern. symp. Cork, Ireland. (General Secretary, Chemical Soc., Burlington House, London, W.1, England)

20–24. **Semiconductor Physics**, intern. conf., Paris, France. (M. Balkanski, Laboratoire de Physique, Ecole Normale Supérieure, 24, rue Lhomond, Paris 5°)

20–25. **Catalysis**, 3rd intern. conf., Amsterdam, Netherlands. (D. M. Brouwer, c/o Badhuisweg 3, P.O. Box 3003, Amsterdam-N, Netherlands)

21–23. Physiology and Experimental Psychology of **Color Vision**, Ciba Foundation symp., London, England. (Ciba Foundation, 41 Portland Pl., London, W.1)

21–24. American **Malacological** Union,

New Orleans, La. (M. C. Teskey, Rt. 2, Box 318, Marinette, Wis.)

21–28. International **Geographical** Union, 20th intern. congr., London, England. (T. H. Elkins, Royal Geographical Soc., Kensington Gore, London, S.W.7)

25–1. **Religion and Science**, 11th conf., Star Island, Portsmouth, N.H. (Religion and Science, 280 Newton St., Brookline, Mass. 02146)

26–29. **Photobiology**, 4th intern. congr., Oxford, England. (Blandford Site, Whiteknights Park, Reading, England)

26–31. American **Crystallographic** Assoc., Bozeman, Mont. (B. Post, Brooklyn Polytechnic Inst., Brooklyn, N.Y.)

26–31. **Mineralogical** Soc. of America, Bozeman, Mont. (G. Switzer, MSA, U.S. Natl. Museum, Washington, D.C. 20560)

26–31. **Pharmacology**, Teachers' Seminar, Univ. of Connecticut, Storrs. (M. H. Malone, School of Pharmacy, Univ. of Connecticut, Storrs)

26–1. **Biochemistry**, 6th intern. congr., New York, N.Y. (R. A. Harte, 6th Intern. Biochemistry Congr., 9650 Wisconsin Ave., NW, Washington, D.C. 20014)

27–28. International **Cartographic** Assoc., 2nd general assembly, London, England. (D. E. Imhof, Kartographisches Institut, Eidgenössische Technische Hochschule, Zurich, Switzerland)

27–30. Technical Assoc. of the **Pulp and Paper Industry**, engineering conf., Seattle, Wash. (TAPPI, 360 Lexington Ave., New York, N.Y. 10017)

27–31. American **Dietetic** Assoc., 47th annual, Portland, Ore. (ADA, 620 N. Michigan Ave., Chicago, Ill. 60611)

27–21. **Engineering Foundation** Research Confs. Andover, N.H. (United Engineering Center, 345 E. 47 St., New York 17)

30–1. International Soc. for **Human and Animal Mycology**, 3rd, Edinburgh, Scotland. (R. Vanbreuseghem, Inst. of Tropical Medicine, 155 rue National, Antwerp, Belgium)

August

2–4. American Assoc. of **Colleges of Pharmacy**, New York, N.Y. (C. W. Bliven, 1507 M St., NW, Washington, D.C. 20005)

2–7. American **Pharmaceutical** Assoc., 111th annual, New York, N.Y. (G. B. Griffenhagen, Div. of Communications, 2215 Constitution Ave., NW, Washington, D.C.)

2–8. **Applied Psychology**, 15th intern. conf., Ljubljana, Yugoslavia. (B. Petz, Inst. of Psychology of Zagreb, Djure Salaja b.b., Zagreb, Yugoslavia)

2–8. **Reactivity of Solids**, 5th intern. symp., Munich, Germany. (B. Stuke, Physikalische-Chemisches Institut, Sophienstr. 11, Munich)

3–5. Compounds of Interest in **Nuclear Reactor Technology**, intern. symp., Boulder, Colo. (J. T. Waber, Los Alamos Scientific Laboratories, P.O. Box 1663, Los Alamos, N.M. 87544)

3–7. Instrument Soc. of America, **instrumentation** conf., Geneva, N.Y. (H. S. Kindler, 530 William Penn Place, Pittsburgh, Pa.)

3–7. World Federation for **Mental**

Health, 17th annual, Bern, Switzerland. (F. Cloutier, 1, rue Gevray, Geneva, Switzerland)

3–8. International **Years of the Quiet Sun**, regional symp., Buenos Aires, Argentina. (J. G. Roederer, Facultad de Ciencias, Perú 272, Buenos Aires)

3–10. **Anthropologists and Ethnologists**, 7th world conf., Moscow, U.S.S.R. (American Anthropological Assoc., 1530 P St., NW, Washington, D.C. 20005)

3–12. **Botanical** Congr., 10th intern., Edinburgh, Scotland. (Miss S. C. Penny, 5 Hope Park Sq., Edinburgh 8)

4–7. **Poultry Science** Assoc., annual, Minneapolis, Minn. (E. L. Johnson, Dept. of Poultry Science, Univ. of Minnesota, St. Paul 55101)

4–17. Methods of **Hydrological Forecasting**, 3rd inter-regional seminar, World Meteorological Organization/UN Economic Commission for Asia and the Far East, Bangkok, Thailand. (WMO, Secretariat, Geneva, Switzerland)

5–7. Sonic Investigations on **Internal Damping in Solids**, symp., London, England (Administration Assistant, Institute of Physics and the Physical Society, 47 Belgrave Square, London, S.W.1)

5–12. **Atmospheric Radiation**, symp., World Meteorological Organization/Intern. Union of Geodesy and Geophysics, Leningrad, U.S.S.R. (Secretariat, WMO, Geneva, Switzerland)

5–15. **High Energy Physics**, 12th intern. conf., Dubna, U.S.S.R. (M. L. Goldberger, Commission on High Energy Nuclear Physics, IUPAC, Princeton Univ., Princeton, N.J. 08540)

6–11. American **Podiatry** Assoc., New York, N.Y. (F. A. Kalbacher, American Podiatry Assoc., 3301 16th St., NW, Washington, D.C. 20010)

7–14. Scientific Study on **Mental Retardation**, intern. congr., Copenhagen, Denmark. (A. Dupont, Statens Andssvageforsorg, Nyropsgade 28.2, Copenhagen 5)

9–12. **Heat Transfer**, 7th natl. conf., Cleveland, Ohio. (W. Chenoweth, American Inst. of Chemical Engineers, 345 E. 47 St., New York 17)

9–13. American Soc. of **Animal Science**, Knoxville, Tenn. (J. E. Oldfield, Dept. of Animal Science, Oregon State Univ., Corvallis)

9–14. South American Union of **Engineers'** Federations, 10th conv., Rio de Janeiro, Brazil. (Federacão Brasileira de Associacões de Engenheiros, Caixa Postal 1229, Rio de Janeiro)

10–14. **Structural Developments in Inorganic Chemistry**, New Hampton, N.H. (W. G. Parks, Dept. of Chemistry, Univ. of Rhode Island, Kingston)

10–15. Pan American Federation of **Engineering** Socs., 8th biennial conv., Caracas, Venezuela. (L. K. Wheelock, Engineers Joint Council, 345 E. 47 St., New York 10017)

11–14. American Soc. for **Pharmacology and Experimental Therapeutics**, San Francisco, Calif. (H. G. Mandel, George Washington Univ. Medical School, Washington, D.C. 20005)

12–14. **Ballistic Missile and Space Technology**, 9th symp., U.S. Naval Training Center, San Diego, Calif. (C. Morrow,

Aerospace Corp., P.O. Box 95085, Los Angeles, Calif. 90045)

12–14. **Galaxies**, preliminary conf., Uppsala, Sweden. (T. Page, Van Vleck Observatory, Wesleyan Univ., Middletown, Conn. 06457)

12–14. **X-Ray Analysis** Applications, 13th annual conf., Denver, Colo. (W. G. Mueller, Metallurgy Div., Denver Research Inst., Denver 80210)

13–15. International Soc. for **Horticultural Science**, Edinburgh, Scotland. (G. de Bakker, Le v.d. Boschstraat 4, The Hague, Netherlands)

16–21. **Histochemistry and Cytochemistry**, intern. congr., Frankfurt am Main, Germany. (T. H. Schiebler, Anatomisches Institut der Universität, Koellikerstr. 6, 87 Würzburg, Germany)

16–23. Latin American **Schools of Medicine**, 4th conf., Pocos de Caldas, Brazil. (O. Versiani Caldeira, Univ. of Minas Gerais Medical School, Belo Horizonte, Minas Gerais, Brazil)

16–24. **Human Economy**, conf., Inst. of Paper Chemistry, Appleton, Wis. (A. N. McLeod, IPC, Appleton)

17–20. American Assoc. of **Clinical Chemists**, 16th natl., Boston, Mass. (F. F. Ronan, AACC, 19 Bay State Rd., Boston 15)

17–20. **Natural Ultra Low Frequency Electromagnetic Fields**, symp., Boulder, Colo. (W. H. Campbell, National Bureau of Standards, Boulder)

17–21. **Combustion**, 10th intern. symp., Cambridge, England. (Combustion Inst., 986 Union Trust Bldg., Pittsburgh 19, Pa.)

17–21. **Cryogenic Engineering**, conf., Philadelphia, Pa. (K. D. Timmerhaus, Engineering Research Center, Ketchum 129, Univ. of Colorado, Boulder)

17–21. **Simulation in Space Technology**, Blacksburg, Va. (F. J. Maher, Virginia Polytechnic Inst., Blacksburg)

17–22. International **Astronomical** Union, symp., Thessaloniki, Greece. (Maj. B. R. Agins, Air Force Office of Scientific Research, SRMA, Washington, D.C. 20333)

17–22. **Cardiology**, 4th European congr., Prague, Czechoslovakia. (H. Kafka, Karlovo nám. 32, Prague 2)

17–22. **Endocrinology**, 2nd intern. congr., London, England. (A. S. Mason, London Hospital, Whitechapel, London, E.1)

17–22. **Social Psychiatry**, 1st intern. congr., London, England. (J. Bierer, 7 Hollycroft Ave., London, N.W.3)

17–28. **Molecular Biophysics**, intern. inst., Squaw Valley, Calif. (Prof. Weissbluth, Biophysics Laboratory, Stanford Univ., Stanford, Calif.)

18–20. International Assoc. of **Milk and Food Sanitarians**, Portland, Ore. (H. L. Thomasson, P.O. Box 437, Shelbyville, Ind.)

19–21. Physiology of **Digestion in the Ruminant**, 2nd intern. symp., Ames, Iowa. (R. W. Dougherty, Box 70, Ames)

20–21. National **Council of Teachers of Mathematics**, Minneapolis, Minn. (J. D. Gates, NCTM, 1201 16th St. NW, Washington, D.C. 20036)

22. American Inst. of **Ultrasonics in Medicine**, 9th annual, Boston, Mass. (W. J. Fry, Biophysical Research Laboratory, Univ. of Illinois, Urbana)

22–24. **History of Astronomy**, symp., Hamburg, Germany. (B. Sticker, Institut für Geschichte der Naturwissenschaften, Universität Hamburg, Hartnungstr. 5, 2 Hamburg 13, Germany)

22–28. American Soc. of **Human Genetics**, Boulder, Colo. (S. H. Boyer, Johns Hopkins Hospital, Baltimore, Md.)

23. American Assoc. of **Electromyography**, annual, Boston, Mass. (M. K. Newman, 16861 Wyoming Ave., Detroit, Mich. 48221)

23–26. American **Phytopathological** Soc., Lafayette, Ind. (J. R. Shay, Purdue Univ., Lafayette)

23–26. **Soil Conservation** Soc. of America, 19th annual, Jackson, Miss. (SCS, 7515 Northeast Ankeny Rd., Ankeny, Iowa)

23–28. American Inst. of **Biological Sciences**, annual, Boulder, Colo. (AIBS, 2000 P St. NW, Washington, D.C. 20036)

23–28. American Congr. of **Physical Medicine and Rehabilitation**, Boston, Mass. (G. Gullickson, Jr., 30 N. Michigan, Chicago, Ill.)

24–26. American Inst. of **Aeronautics and Astronautics**, Los Angeles, Calif. (AIAA, 1290 Sixth Ave., New York, N.Y.)

24–26. Society for **Cryobiology**, annual, Washington, D.C. (V. P. Perry, Tissue Bank Dept., U.S. Naval Medical School, National Naval Medical Center, Bethesda, Md. 20014)

24–26. **Education in the Nuclear Power Era**, conf., Gatlinburg, Tenn. (M. L. Nelson, Education Div., Oak Ridge Natl. Laboratory, P.O. Box 117, Oak Ridge, Tenn.)

24–26. **Mathematical** Assoc. of America, summer meeting, Univ. of Massachusetts, Amherst. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

24–27. American **Hospital** Assoc., Chicago, Ill. (E. L. Crosby, 840 N. Lake Shore Dr., Chicago 11)

24–27. **Toxicology and Occupational Medicine**, 4th inter-American conf., Miami Beach, Fla. (W. Machle, Univ. of Miami School of Medicine, Coral Gables, Fla.)

24–28. International Council of the **Aeronautical Sciences**, 4th congr., Paris, France. (American Inst. of Aeronautics and Astronautics, 2 E. 64 St., New York, N.Y. 10021)

24–28. **Astrodynamics Guidance and Control**, conf., Los Angeles, Calif. (K. Watanabe, 4731 B Engineering Building III, University of California, Los Angeles 24)

24–28. American **Astronautical** Soc., military space applications symp., Stanford, Calif. (AAS, 516 Fifth Ave., New York, N.Y.)

24–28. Society for **Industrial and Applied Mathematics**, Amherst, Mass. (W. S. Dorn, T. J. Watson Research Center, I.B.M., P.O. Box 218, Yorktown Heights, N.Y.)

24–28. Scandinavian **Mathematical** Congr., Copenhagen, Denmark. (Secretariat, The Congress, c/o Mathematical Inst., H. C. Ørsted Inst., Universitetsparken 5, Copenhagen Ø)

24–28. American **Mathematical** Soc., New York, N.Y. (G. L. Walker, AMS, 190 Hope St., Providence, R.I.)

Dissymmetries

The application of Brice-Phoenix Light Scattering Photometers to the study of molecular weight, size, and shape of synthetic and biological macromolecules and their interactions in solution is well-known and needs no special comment in these columns. Instead, in this column and in several future ones, we would like to discuss some less orthodox fields of application of light scattering instruments.

FLUORESCENCE POLARIZATION

One of these fields is the use of the Brice-Phoenix Light Scattering Photometer in the measurement of the polarizarion of fluorescence of fluorescent protein conjugates. In these conjugates, a fluorescent group is linked to the protein. Such derivatives have been found very useful in studies of protein structure and interactions. Thus, for instance, R. F. Steiner and H. Edelhoch in two papers published recently [J. Biol. Chem. *238*, 925 and 931 (1963)] described the results of their investigations on the structural transitions of soybean trypsin inhibitor both in water and in a denaturing solvent (concentrated urea). Among the properties studied was polarization of fluorescence of a fluorescent conjugate of soybean trypsin inhibitor as a function of pH and temperature. From such measurements the mean relaxation time of the labeled protein molecule may be determined. This in turn can be correlated with the shape of the macro-molecule (spherical or ellipsoidal), hydrodynamic properties (hydration), and the deviation of the protein molecule from the limiting state of complete rigidity. In this way, polarization of fluorescence is capable of detecting incipient changes in molecular structure not observable by other techniques. For a comprehensive and up-to-date discussion of the technique, theoretical basis, and the application to the study of structural transitions and association of proteins we refer readers to a review article by Steiner and Edelhoch ["Fluorescent Protein Conjugates," Chem. Revs. *62*, 457 (1962)].

Besides soybean trypsin inhibitor, Steiner and Edelhoch have applied polarization of fluorescence to the study of structural transitions in native and denatured thyroglobulin [J. Am. Chem. Soc. *83*, 1435 (1961)] and in antibody and normal gamma globulins [J. Am. Chem. Soc. *84*, 2139 (1962)].

As far as we were able to trace the literature, it appears that C. Singleterry and L. Weinberger [J. Am. Chem. Soc. *73*, 4574 (1951)] were the first to adapt a Brice-Phoenix Light Scattering Photometer for polarization of fluorescence experiments in connection with their study of the size of soap micelles in benzene solutions. For the purpose of measuring the polarization of fluorescence, the only modification to the standard model of the Brice-Phoenix Light Scattering Photometer that must be made is the introduction of a cell holder through which water from a thermostated bath can be circulated (Steiner and Edelhoch varied the temperature in their experiments from 10° to 60° C). Also, colored glass filters must be inserted in the incident and emitted beams to isolate the fluorescent radiation from any scattered or stray light. Other optional accessories are available to further facilitate this technique.

FLUORESCENCE INTENSITY VARIATION

Another type of fluorescence measurement has been used by D. S. Berns, H. L. Crespi, and J. J. Katz, of the Argonne National Laboratories, Argonne, Illinois [J. Am. Chem. Soc. *85*, 8 (1963)] in the study of the protein phycocyanin. A Brice-Phoenix Light Scattering Photometer was adapted for following the change of fluorescence intensity during the temperature denaturation of the hydrogen-containing protiophycocyanin and the corresponding fully deuteriated protein (deuterio-phycocyanin). The temperature at which the thermal transition begins in both proteins, as indicated by the irreversibility of the change in relative fluorescence intensity, was determined for several buffers. Significant differences in the transition temperatures were noted for the two proteins, which were ascribed to differences in hydrophobic bonding caused by different isotopic composition of the non-polar side chains.

If you have a problem under study where measurements similar to those described above could be applied, contact the **Phoenix Precision Instrument Company,** 3803 North 5th Street, Philadelphia, Pa. 19140. Prompt attention will be given to your special requirements.

New Products

Pre-coated thin-layer **chromatography plates** prepared by a unique preparation and application procedure, currently being patented, is said to give the pre-coated plates an unusually high degree of uniformity and durability. Plates are guaranteed to arrive intact, and to give reproducible results from day to day or year to year. Sample plates from each batch are checked against a standard separation, and each plate is individually inspected for uniformity. Although thin-layer chromatography is a well-proven analytical technique, the difficulty of applying absorbent coatings of a uniform consistency and thickness has limited its use. The fragile nature of coatings now being used has thus far dictated that plates be handmade in the laboratories where they are used. Thin-layer chromatography provides an excellent base for quality control programs, or other repetitive operations. Quick detection of residues or trace elements is easily accomplished. Isolation of components needed for further analysis is also sure and rapid. Ten-inch by 15-inch (25- by 38-cm) preparative plates with coatings 0.25 inch (0.64 cm) thick, for instance, have been used to isolate up to 2 of sample material in one separation. On the other hand, as little as 0.02 μg of a steroid ingredient, for example, can be isolated. The technique can also be used to follow the course of a reaction as a function of time. By periodically removing and testing a sample of the reaction mixture, fleeting intermediates as well as reaction products can be isolated. The point in a reaction at which maximum product is formed can also be determined. Most thin-layer chromatography is completed in less than 15 min, and can be handled by laboratory technicians. Using multiple separations on an 8- by 8-inch plate (20 by 20 cm), one technician can run up to several hundred routine analyses per day. More than 16 stock coatings, including silica gel, alumina, kieselguhr, and cellulose are available, plus a wide selection of custom adsorbents. Standard coating thickness is 250 μ. Standard plate sizes range from 1 by 3 inches (2.5 by 7.6 cm) for routine in-plant use, to 10- by 15-inch (25- by 38-cm) preparative units.—R.L.B. (Custom Service Chemicals, Inc., Box 566, Wilmington, Del.)

Circle 1 on Readers' Service card

Polarograph displays the difference in current between two dropping mercury electrodes that are synchronized in drop time. A cathode ray oscillograph presents the curve of current against voltage changing at a rate of 0.25 volt/sec. The rapid voltage change produces a peaked polarogram which arises because of the rapid transfer of charge to the electrode when the reaction potential is attained. This fast sweep method has a sensitivity advantage in that peak current in terms of peak current per unit concentration is $4n$ greater than the diffusion current measured in conventional polarography, n being the number of electrons per ion reacting. Resolution is enhanced, and maxima, often a source of difficulty in the conventional technique, are rarely encountered. The differential mode permits the determination to be carried out in the presence of ordinarily interfering substances, as the blank can be used to cancel out unwanted materials, permitting the wave to remain on scale with high amplification. When the voltage sweeps applied to each drop are slightly displaced in time the derivative of the current provides a sharper resolution without loss in sensitivity, so that waves only 40 mv apart can be resolved, and with additional resistance-capacitance differentiation waves only 25 mv apart are said to be usable. Sensitivity to metals permits determination of the order of .01 μg with precision as good as 0.1 percent of content. In addition to inorganic determinations, many organic species can be determined, such as quinones, nitro compounds, unsaturated or conjugated carboxylic acids, aldehydes, some ketones, many heterocyclic compounds, and many types of sulfur-containing compounds. Examples include determination of antibiotics in sera, pesticide residues on foods, residual and monomer in polymers.—R.L.B. (Bendix Corp., Cincinnati Div., 3625 Hauck Rd., Cincinnati 41, Ohio)

Circle 2 on Readers' Service card

Spectropolarimeter and double beam ratio recording spectrophotometer provides a continuous record of optical rotary dispersion or ultraviolet and visible absorption in the range from 185 to 700 mμ. Units of specific rotation, percent transmittance, or absorbance on a linear scale are presented on a single sheet of chart paper. In addition, simultaneous records of slit width and photomultiplier voltage during scanning are presented on the same graph. The light source is a water-cooled, 500-watt high-pressure xenon arc. The monochromator which is common to both components, is a double prism Czerny Turner monochromoter with two 30° far ultraviolet transmitting fused silica prisms providing a wavelength range of 185 to 700 mμ with a precision of 1.0 mμ. Two photomultipliers with S-19 cathodes and ultraviolet transmitting envelops are used. As a spectropolarimeter, the exit beam from the monochromator goes through a Rochon polarizing prism to provide a beam of linearly polarized light. Modulation of this beam is produced by rotating the prism through + 1° at a frequency of 12 cy/sec. The Rochon analyzing prism is fixed in a cross position relative to the polarizing prism so that no light is transmitted to the detector when the polarizer is in the zero position. As the

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

Robert L. Bowman (R.L.B.), with the assistance of Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

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

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writers assume responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on pages 1507 and 1613. Circle the department number of the items in which you are interested on this card.

polarizer oscillates symmetrically about the zero position, equal amounts of light are transmitted by the analyzer, resulting in 24 equal pulses of light reaching the photomultiplier each second. When an optically active substance is placed in the cell, the plane of polarization of the polarized light will be rotated to the left or right. This disrupts the symmetry of the original system, the light pulses to the detector are no longer equal, and the resultant output is used to drive a servo system that rotates the analyzer to a null position. The angle through which the analyzer must turn to reach a null is equal to the optical rotation by the sample. This angle is recorded in degrees as a function of wavelength. Full-scale optical rotary dispersion (ORD) ranges are continuously variable over entire wavelength range from +0.1° to 2.0° and may be increased to +4.0° by zero suppression. ORD reproducibility is +0.001° with a linearity of 0.001°. When used as an ultraviolet/visible spectrophotometer, the instrument utilizes a double beam, single photomultiplier, ratio recording design. This system permits cancellation of all effects common to both beams, such as light source distributions, losses in the optical system, and atmospheric and solvent absorption. Chopping of the light is accomplished by two rotating secro mirrors. The recorder measures the sample/reference ratio and records it as either percent transmittance or absorbance in density units. Ultraviolet reproducibility is 0.5 percent with a linearity of 0.5 percent. Slit width from 0.01 mm to 2.0 mm is continuously variable and programmed automatically or manually. Wavelength scanning speed is continuously variable from 5 to 125 minutes for entire wavelength region. The sample compartment, which may be thermostated, provides a maximum path length of 100 mm. Fourteen sample cells and a wavelength calibration glass are furnished in a convenient wooden storage case. The only facilities required are a 115-volt, 60-cycle source and a supply of tap water. The unit weighs 900 lb (408 kg).—D.J.P. (Durrum Instruments Corp., 925 E. Meadow Drive, Palo Alto, Calif.)

Circle 3 on Readers' Service card

Variable-path-length infrared cells are designed to be used with all Perkin-Elmer and Beckman spectrophotometers as well as with the Cary 90 and Unicam SP-200. Two stainless-steel

cells are available with variable path lengths of 0 to 3 mm (model SR-05) and 0 to 6 mm (model PE-1). In these models, cell aperture is 1 inch (2.54 cm) in diameter and the path length can be set and read directly to 0.5 μ. Repeatability of path-length setting is better than 1.5 μ at all path lengths. Windows, one plain and one flanged, remain parallel to better than 10 fringes of Hg green line when path length is altered. Cells are sealed with a Teflon sleeve but are readily dismantled, cleaned, and reassembled without loss of accuracy. Filling ports are fitted with Luer lock syringe holders. A Teflon-lined cell (model VT-01) has a variable path length of 0 to 5 mm which can be set and read to 0.6 μ. This cell is lined throughout with Teflon so the liquid sample comes in contact only with Teflon and the windows. This cell is essentially the same as the stainless-steel cells except that it has two flanged windows and one Teflon filling port and reservoir. Windows normally supplied with all three of these cells are NaCl and KBr. However, fused silica, CaF_2, BaF_2, CsBr, CsI, KRS-5, and Irtran-2 are available on special order.—D.J.P. (Limit Research Corp., P.O. Box 852, Darien, Conn. 06821)

Circle 4 on Readers' Service card

Glass tissue-culture flask with 82 in.^{2} (529 cm^2) of growing surface has a ground and polished flat bottom surface which provides more growing area and permits accurate viewing of tissue growth with a microscope. Cells remain in focus even when the field of view is changed because of the flat surface. Corning's tests show that this flask provides up to 400 percent more efficient use of medium, since the growing surface is completely flat. Top and bottom of the flask are parallel within ± 2° and are 50 mm apart, ± 2 mm. For easy handling and storage, the flask is 2 inches (5 cm) high and weighs 3.14 lbs. (1.42 kg). Inside diameter is 10¼ inches (26 cm). A nonprotruding opening takes a No. 4 stopper. The ¼-inch (0.64 cm) neck permits easy cleaning and is convenient for work with pipets. The Pyrex brand product is inert borosilicate glass. It is noncontaminating and heat resistant, and will retain its optical qualities through countless washings and sterilizations, the manufacturer said.—R.L.B. (Corning Glass Works, Corning, N.Y.)

Circle 5 on Readers' Service card

(*Continued from page 1560*)

itself to finding a new way to get the *Savannah* going. Gone with the contract were about $8½ million paid out to States Marine, the only crew trained to operate the nuclear ship, and a good deal of the *Savannah's* public appeal. Of the engineers' performance in the affair, Secretary of Commerce Luther Hodges said: "They have taken advantage of the evident unavailability of trained personnel who would . . . compete with them for their positions on board the *Savannah*. Having been trained at public expense to perform important duties aboard the only nuclear-powered merchant vessel in the world, they have turned on the government and dared it to incur the disappointment and damage to the nation's prestige which would inevitably attach to the delay which has now been forced upon us."

What should be done next? The government considered several alternatives for running the *Savannah*. It was proposed that the Maritime Administration take over and run the ship directly, on a civil-service basis. It was proposed that the Navy operate the ship. And it was proposed, warily, that the government try again to run the *Savannah* as a commercial venture by contracting with a different shipping company. Finally, the third alternative was chosen, and in July 1963 the American Export and Isbrandtsen Lines took over as the *Savannah's* General Agent.

Although a handful of deck officers and engineers changed their union affiliation to follow the *Savannah* from States Marine to American Export (where deck officers and engineers are members of the same union, the Brotherhood of Marine Officers), the new crew had essentially to be trained from scratch.

Where training of the first crew had lasted in some cases nearly 2 years, for the second there was no such luxury. Academic training lasted about 4 months, and there was an additional 10 weeks for work on the *Savannah* itself before the ship was taken out for sea trials with the new crew in February. Trials and training continued until May, when, 1 year late, the *Savannah* left Galveston for the trip that marked the beginning of the real work of the nuclear ship. A future article will discuss the *Savannah's* current problems and prospects.

—ELINOR LANGER

Announcements

The Office of Naval Research, Harvard's Museum of Comparative Zoology, and the American Geographical Society have made available an inventory of material and data on the **marine environment of the western North Atlantic**. The inventory is the result of a project begun in 1960 to assemble information on the locations of oceanographic data and specimens for the convenience of the scientific community, to determine gaps in the geographic distribution of collection efforts, and to preserve unpublished data which might otherwise be lost. It includes items on fauna, geology, research vessel cruises, and uncorrected water temperatures. Information is recorded on small file cards, and unpublished or obscure documents are either reproduced on microcards or abstracted. The data are available from the Director, National Oceanographic Data Center, Washington, D.C. 20550, or the Director, Museum of Comparative Zoology, Harvard University, Cambridge 38, Mass.

Columbia University plans to initiate a program this fall combining study in **science and Soviet affairs**, leading to an advanced degree in science or engineering and the certificate of the Russian Institute. Participants will be required to complete all the requirements both for the science or engineering degree and for the Institute certificate. Enrollment will be limited, and the program will be adjusted to meet the needs of each participant. The program is designed, according to Alexander Dallin, director of the Russian Institute, to provide training "useful in analyzing Soviet economic and agricultural policies, in evaluating achievements in science and space technology, and in estimating Soviet military capabilities and the sincerity of initiatives in disarmament and arms control." Additional information on the program is available from Professor Dallin, at Columbia.

Meeting Notes

The Marine Biological Association of India invites papers for a symposium on **crustacea**, planned for January 1965, the exact dates to be announced. The meeting is to cover systematics, biology, and fishery. The present position and problems of crustacea will be discussed and future research planned for. Dead-

line for receipt of abstracts in duplicate: *15 August*; for papers: *15 November*. (Convener, Symposium, Marine Biological Association of India, Marine Fisheries P.O., Mandapam Camp, S. India)

The Association of Official **Agricultural Chemists** will hold its 78th annual meeting 19–22 October in Washington, D.C. Approximately 300 papers will be presented on analytical methods, and an exhibit of laboratory equipment and supplies is also scheduled. Registration is free. (L. G. Ensminger, AOAC, Box 540, Benjamin Franklin Station, Washington, D.C. 20044)

Papers are invited for presentation at a conference on theoretical aspects of **circuit and system theory**, 28–30 September, in Monticello, Illinois. The meeting will be sponsored by the University of Illinois and the Institute of Electrical and Electronics Engineers, circuit theory group. Authors must submit a title and 100-word abstracts. Deadline *15 August* (W. R. Perkins, Department of Electrical Engineering, University of Illinois, Urbana)

Approximately 2500 medical and dental practitioners and cancer research scientists will attend the fifth national **cancer conference**, scheduled 17–19 September in Philadelphia, Pa. The meeting is sponsored by the American Cancer Society and the National Cancer Institute. It will feature symposia and panel discussions designed, according to C. S. Cameron, president of the Hahnemann Medical College, "to bring research progress into focus and to make it meaningful to the practitioners." (American Cancer Society, 219 East 42 St., New York 10017)

The University of Vermont, Burlington, will be the site of an international conference on **preventive cardiology** 24–28 August. The topics to be covered will include the nonvascular pathophysiological fundamentals, epidemiology, active measures for prevention, and professional and public education. (W. Raab, Preventive Heart Reconditioning Foundation, 206 Summit St., Burlington, Vermont 05401)

The 9th congress of the Interamerican Society of **Psychology** will be held 16–21 December in Miami Beach, Florida. Papers are invited on the theme "psychology for cultural progress"; time limit for presentations will be 15 minutes. Papers may be in English or

Spanish; facilities for simultaneous translation will be available. Abstracts of 100 words are required. Deadline: *15 September.* (Abstracts from the U.S. and Canada: W. H. Holtzmann, Hogg Foundation for Mental Health, University of Texas, Austin 12; from South America: A. L. Angelini, Caixa Postal 8 105, São Paulo, Brazil; from Central America and Mexico: C. M. Malgrat, Apartado 4691, Panama, Republic of Panama)

The **ceramic-metal systems** division of the American Ceramic Society will hold its fall meeting 20–23 September, in French Lick, Indiana. The six technical sessions will focus on the importance of design, fabrication, and testing to the performance of ceramic-metal systems. (American Ceramic Society, 4055 North High St., Columbus, Ohio 43214)

The 2nd symposium on **protection against radiations** in space is scheduled for 12–14 October, in Gatlinburg, Tennessee, sponsored by the AEC, NASA, and the Air Force. The meeting will cover shielding against space radiations and characteristics of space radiations and their effects on man and materials. Unclassified papers are invited. Abstracts of 600 words are required. Deadline: *14 August.* (F. C. Maienschein, Oak Ridge National Laboratory, P.O. Box X, Oak Ridge, Tenn. 37831)

Papers are invited for a conference on **magnetism and magnetic materials,** scheduled 16–19 November in Minneapolis, Minnesota. The topics to be covered include basic theoretical and experimental investigations; potential engineering applications, apparatus, devices, and techniques; and superconductivity. The meeting is sponsored by the American Institute of Physics and the Institute of Electrical and Electronics Engineers, in cooperation with the American Society for Testing and Materials, The Metallurgical Society of the American Institute of Mining, Metallurgical and Petroleum Engineers, and the Office of Naval Research. Abstracts of 200 words are required. Deadline: *7 August.* (J. B. Goodenough, Lincoln Laboratory C182, Lexington, Mass. 02173)

The 1964 **electron devices** meeting of the Institute of Electrical and Electronics Engineers will take place 29–31 October, in Washington, D.C. Papers are invited which deal with the electron

devices and new device technology. Abstracts of 200 words, without figures, are needed. Deadline: *1 August.* (R. W. Peter, Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, Calif.)

Scientists in the News

Harvard University announced this month the appointment of **Roger Revelle** to head the university's new Center for Population Studies, effective 1 October. He will also be Saltonstall professor of population policy. He is currently University Dean of Research at the University of California and director of the Scripps Institution of Oceanography, La Jolla.

John F. Mueller, professor of medicine at the University of Colorado and chief of medicine at the Veterans Administration Hospital, Denver, has been appointed physician-in-chief of the combined departments of medicine at the Brooklyn-Cumberland Medical Center and professor of medicine at the State University of New York Downstate Medical Center. **Stanley S. Bergen, Jr.**, medical director of St. Luke's Convalescent Hospital, New York, and a faculty member of Columbia's College of Physicians and Surgeons, will become director of medicine at the Cumberland Hospital division, and associate professor of medicine at the Downstate Medical Center. Both appointments are effective 1 July.

Jack B. Bresler, associate professor of biology at Boston University, has been appointed director of research development at the university, as of 1 August.

Bryce L. Crawford, Jr., dean of the graduate school, University of Minnesota, has been elected president of the Associated Midwest Universities, Inc.

William A. Fowler, director of development for the University of Colorado, has been appointed director of development for Michigan Technological University.

Bruce Charles Heezen, assistant geology professor at Columbia, has been awarded the H. B. Bigelow medal by Woods Hole Oceanographic Institution, for "his contributions to knowledge of the ocean floor and the geologic processes peculiar to the oceanic crust." The award carries a $2500 honorarium.

Stewart Sharpless, director of the astrometry and astrophysics division of the U.S. Naval Observatory, has been appointed director of the C. E. Kenneth Mees Observatory at the University of Rochester, as of 1 August.

Wilfred E. Razzell, head of the enzymology section and administrative director at the Syntex Institute for Molecular Biology, Palo Alto, California, has been appointed associate professor of agricultural microbiology at the University of British Columbia, Vancouver, Canada, effective 1 July.

S. Paul Johnston, executive secretary of the American Institute of Aeronautics and Astronautics, has been named director of the Smithsonian's National Air Museum, succeeding **Philip S. Hopkins**, who plans to retire as of 1 August.

Los Angeles State College has appointed **Donald Hudson** professor of physics and chairman of the department. He has been an associate professor of physics at Iowa State University.

Henri-Paul Koenig, a former physics professor at Laval University, has been appointed scientific counsellor at the Canadian Embassy in Paris.

Seymour Shapiro, biology professor at the University of Oregon, has been named professor and head of the botany department at the University of Massachusetts, Amherst, effective 1 September.

W. Deming Lewis, executive director of the research department of Bell Telephone Laboratories, has been named president of Lehigh University, Bethlehem, Pa. He will be installed 11 October, succeeding Harvey A. Neville, who will become president emeritus.

The Department of State has appointed **Donald L. Fuller** scientific attaché to the American Embassy in New Delhi, India. He has been vice president of the research division, W. R. Grace & Co.

Recent Deaths

W. Alistair Bryce, 42; professor and acting head of the chemistry department, University of British Columbia, Canada; 15 May.

Parker H. Daggett, 79; former dean

of the Rutgers college of engineering; 31 May.

Wilton R. Earle, 61; chief of the tissue culture section, National Cancer Institute; 30 May.

Milton W. Eddy, 80; professor emeritus of biology, Dickinson College; 14 June.

John Frazer, 82; former dean of the Towne scientific school of the University of Pennsylvania and retired secretary of the committee on science and the arts at the Franklin Institute, Philadelphia; 31 May.

Frederick Grover, 96; professor emeritus of botany at Oberlin College; 2 June.

Pyotr Kupalov, 76; member of the Academy of Medical Sciences of the U.S.S.R. and former head of the physiology department, at the first Medical Institute of Leningrad; 17 March.

Jasper Maruzzella, 42; professor of microbiology at Long Island University; 13 June.

Harry L. Parr, 84; professor emeritus of engineering at Columbia University; 31 May.

Robert N. Pease, 69; retired chairman of the chemistry department, Princeton University; 15 June.

Lowell A. Rantz, 52; professor of medicine at Stanford University medical school; 5 June.

Nicholas de Rochefort, 62; research analyst at the Library of Congress, for the Agency for International Development; 5 June.

Carl C. Salzman, 62; clinical professor of obstetrics and gynecology at the New York Medical College and attending obstetrician and gynecologist, Flower and 5th Avenue Hospitals; 11 June.

Isaac Schour, 64; dean of the University of Illinois college of dentistry; 5 June.

Charles Clarkson Stelle, 54, died in Washington, 11 June, of complications following an operation. He was a disarmament specialist with the Arms Control and Disarmament Agency, and helped negotiate the nuclear test ban treaty, and the Washington-Moscow "hot line" link, which he signed for the United States last year. Since December he had been on a NASA-sponsored assignment at the Space Sciences Laboratory of the University of California, Berkeley.

Erratum: The journal cited in references *4* and *10* of the report "Emphysema in lung macrosections correlated with smoking habits," by A. E. Anderson, Jr., J. A. Hernandez, P. Eckert, and A. G. Foraker [*Science* **144**, 1025 (22 May 1964)] is the British journal *Thorax*, rather than *Thoraxchirugie*.