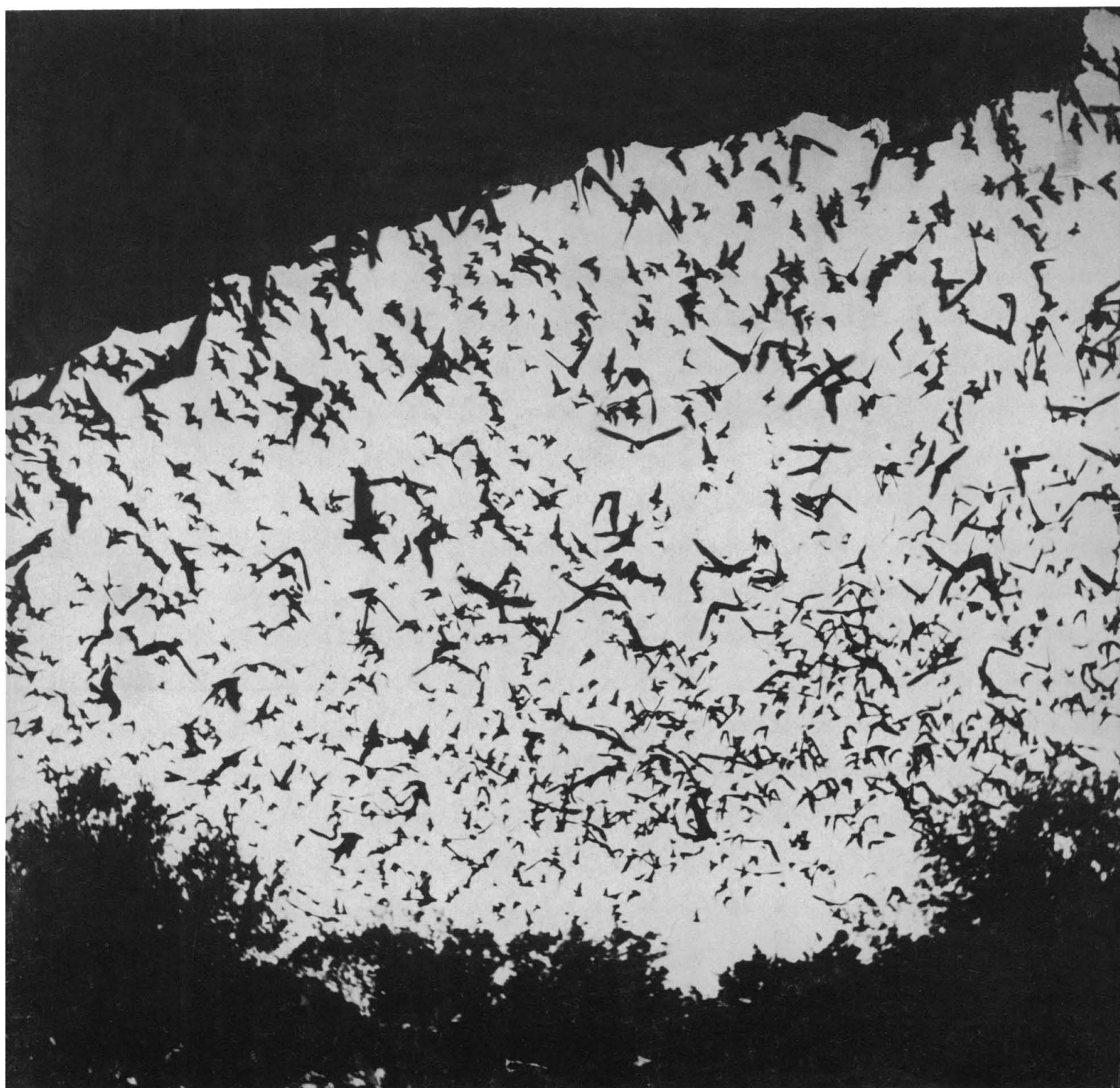


# SCIENCE

26 June 1964

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



CAVE BIOLOGY

Index Issue



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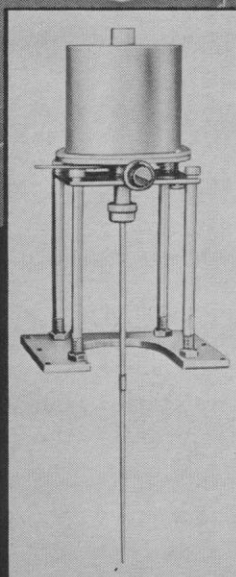
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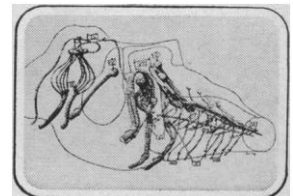
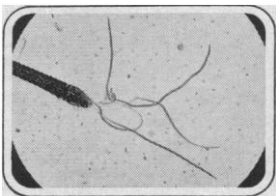
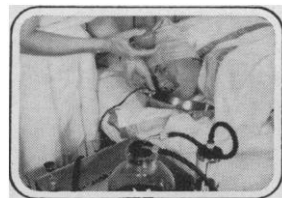
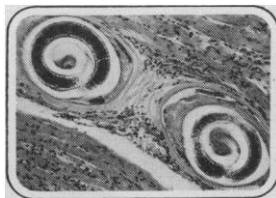
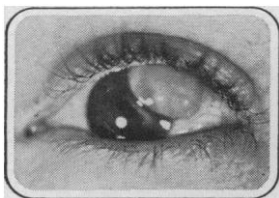
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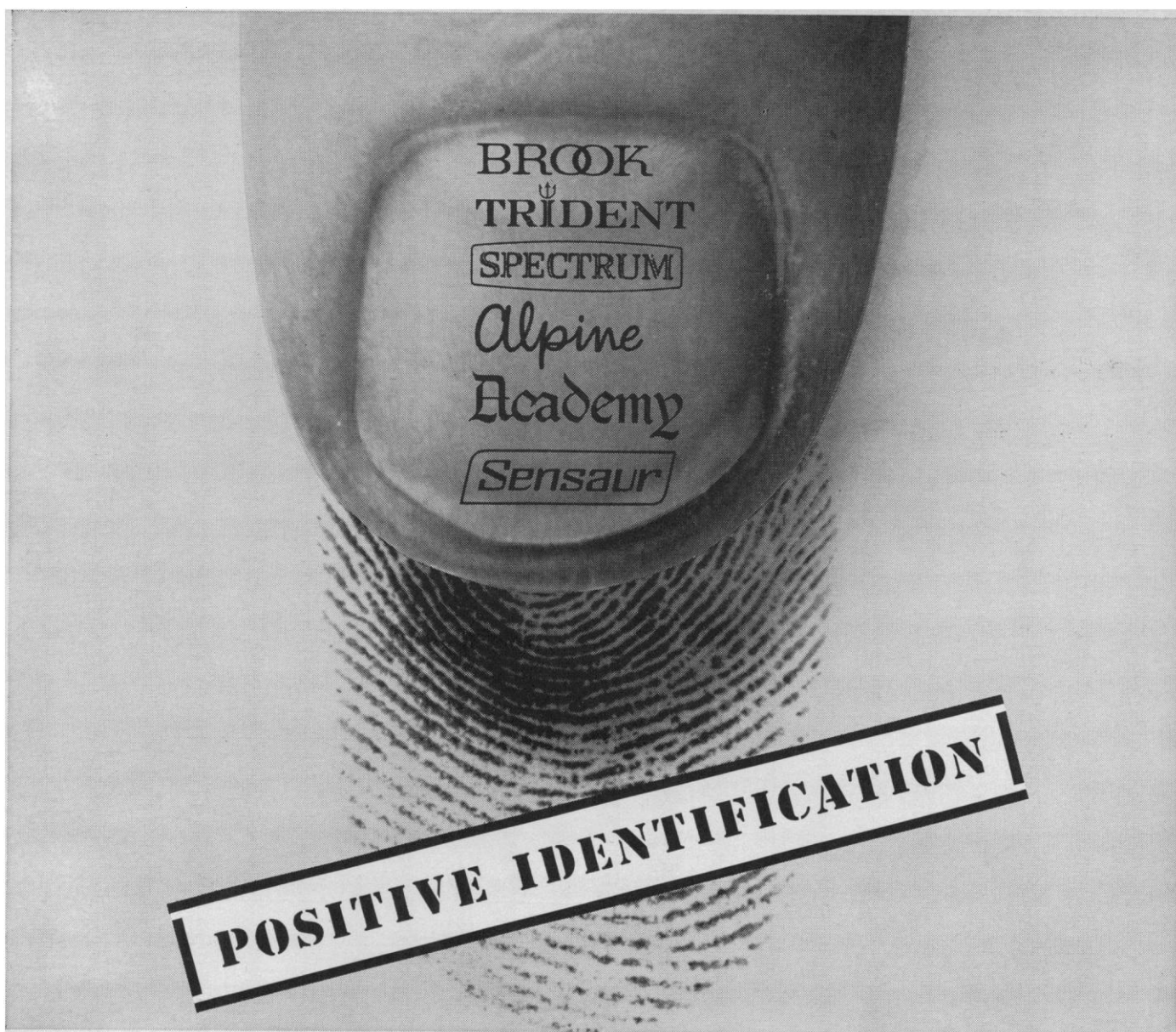
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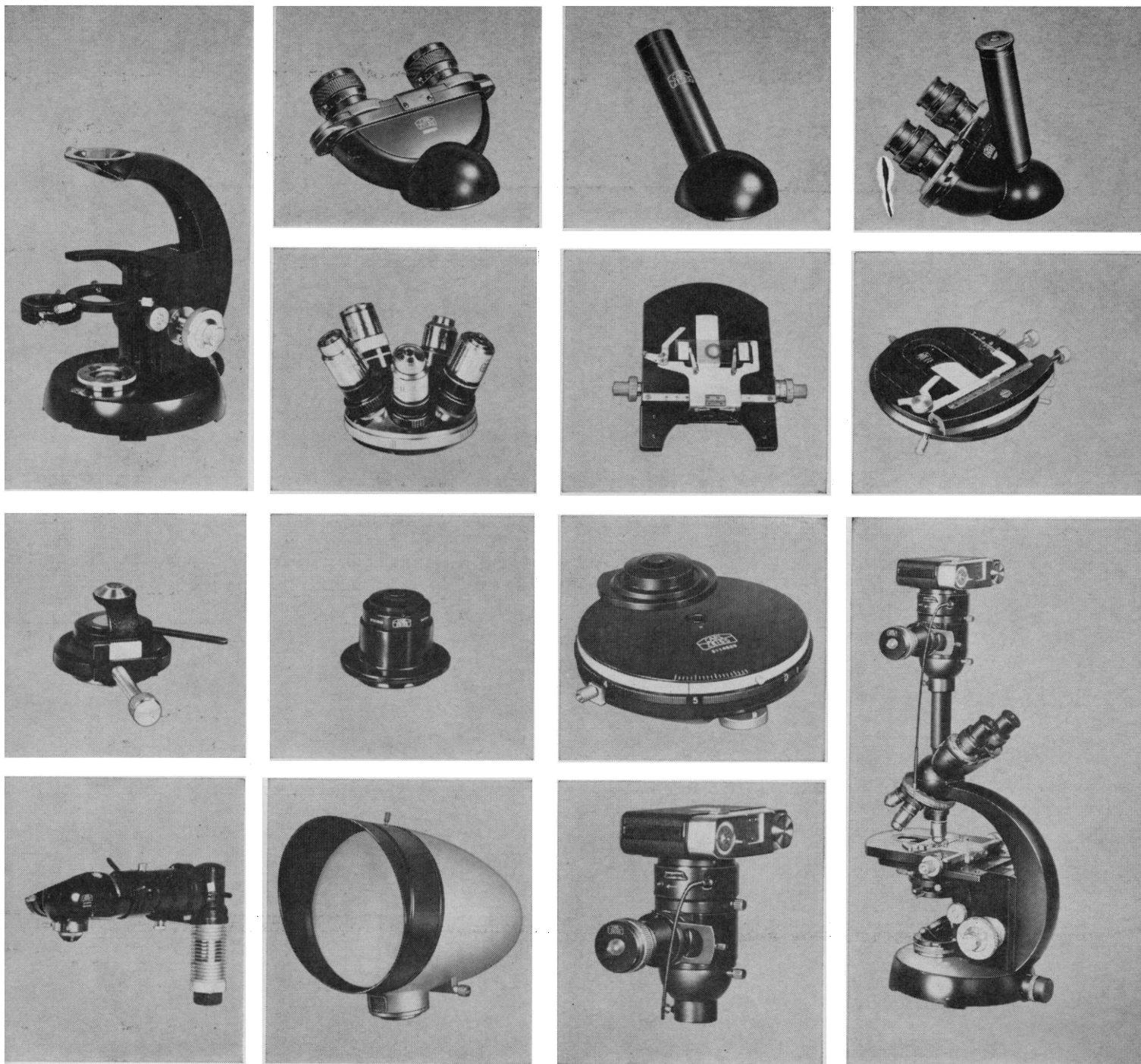
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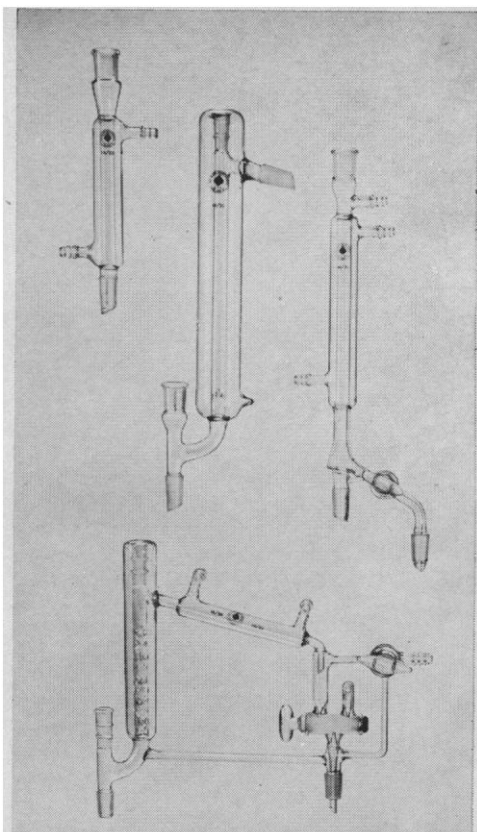
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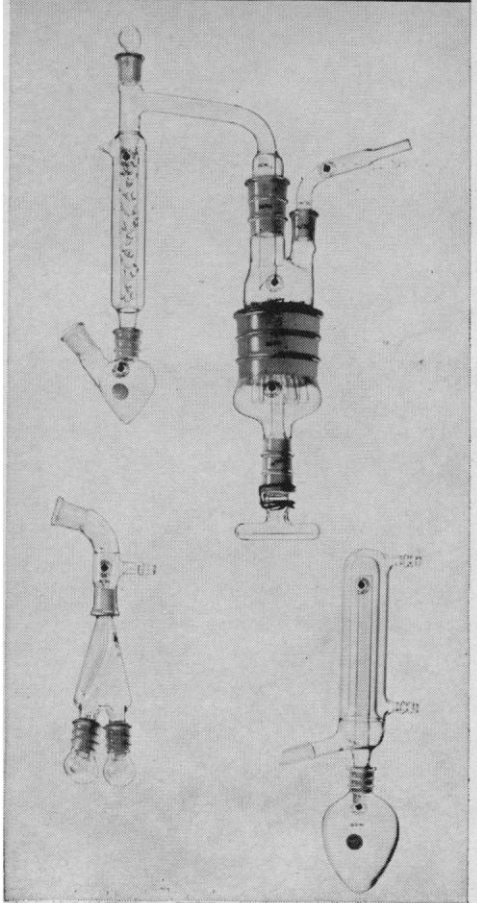


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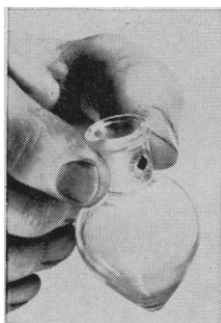
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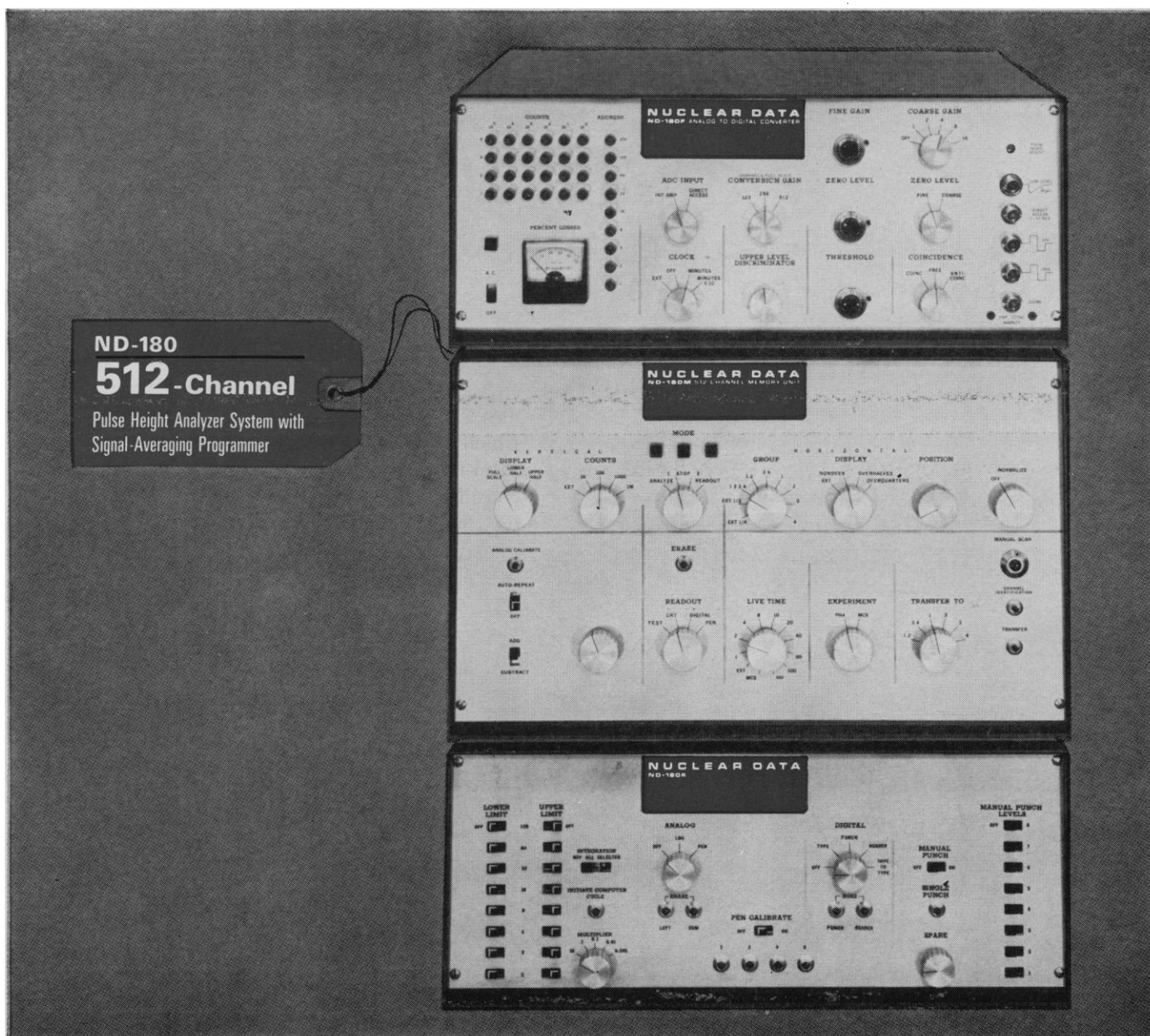


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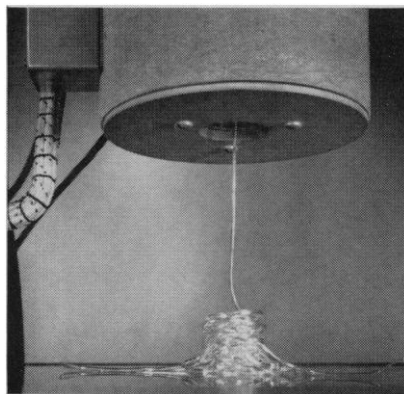
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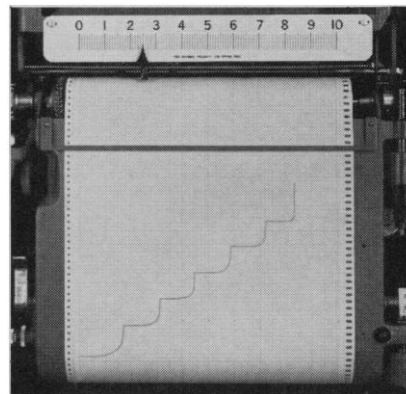
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\*This paper, one of the most comprehensive reports we've seen on the rheology of molten polymers, is available on request. In addition, technical articles covering many other areas of materials testing may be obtained without charge. Tell us your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

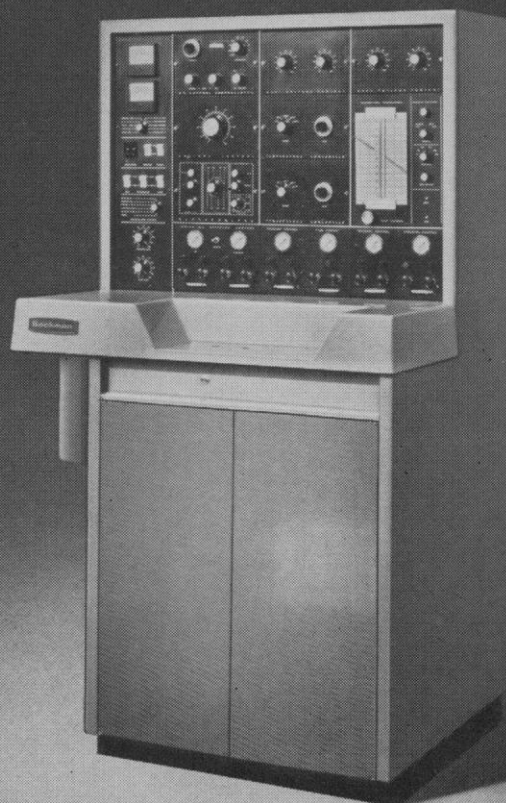
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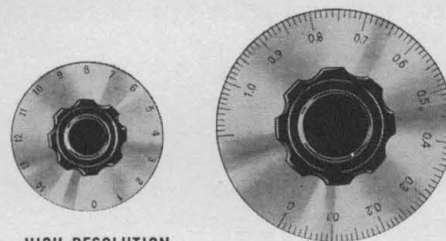
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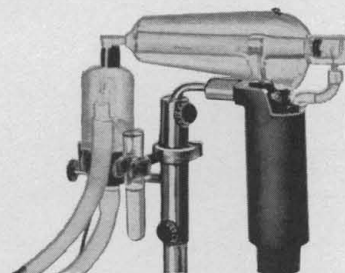
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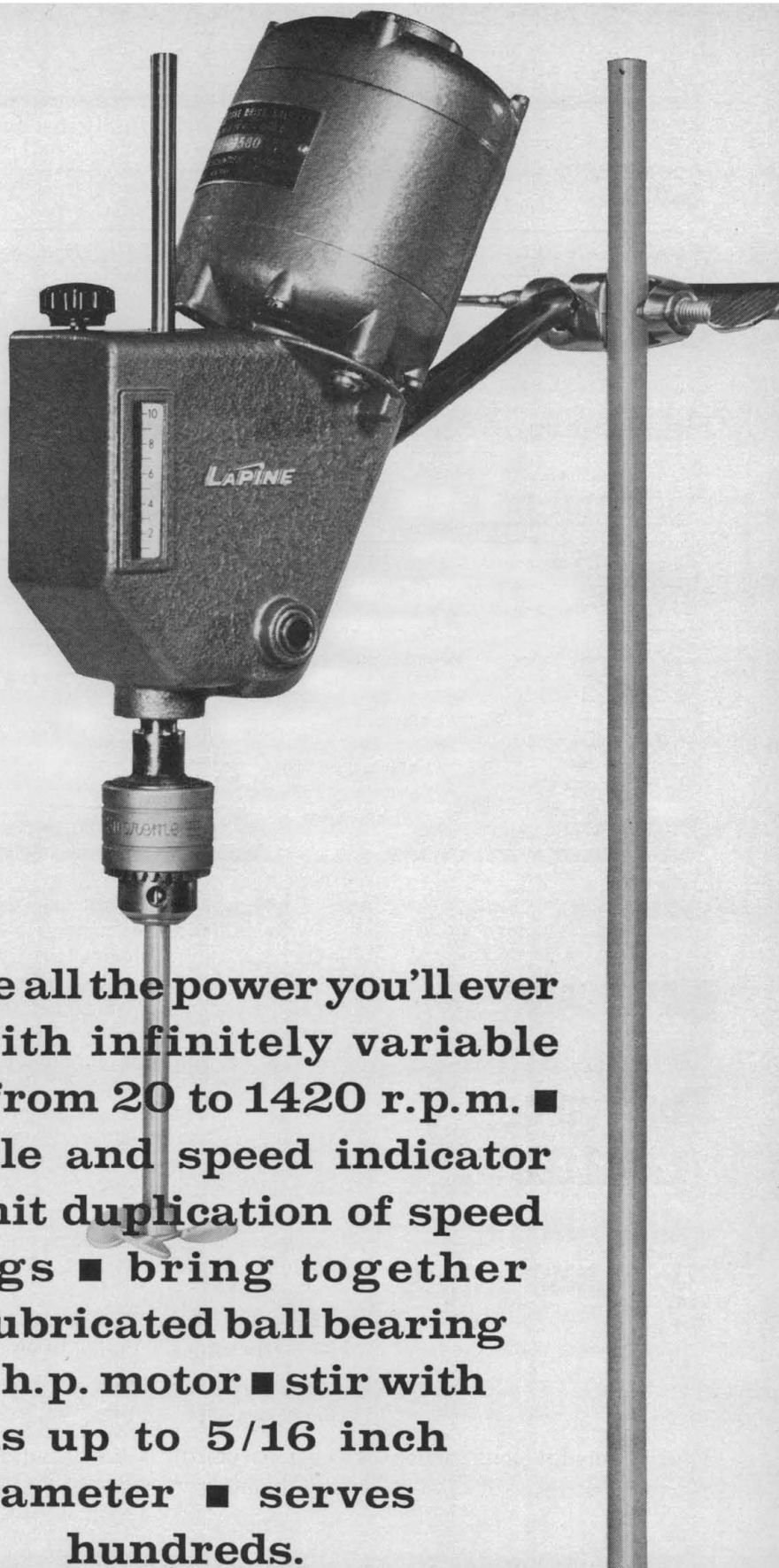


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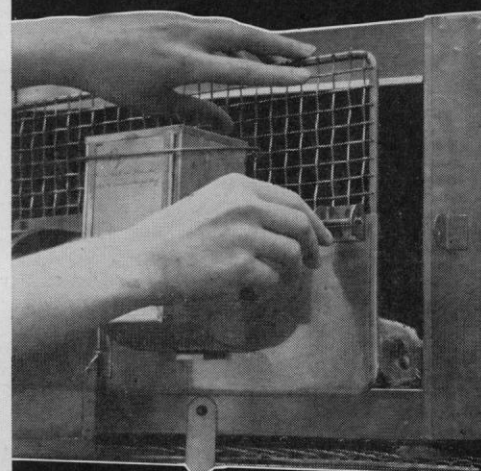
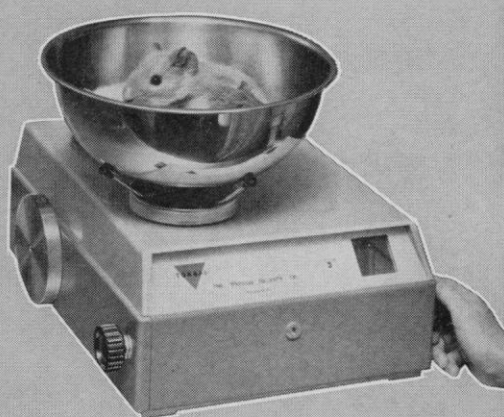
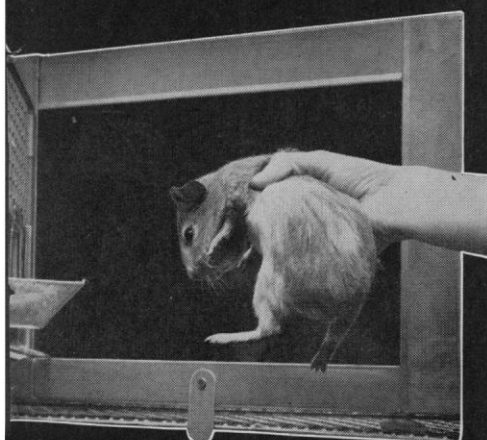
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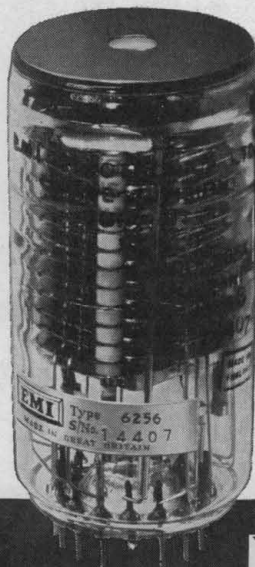
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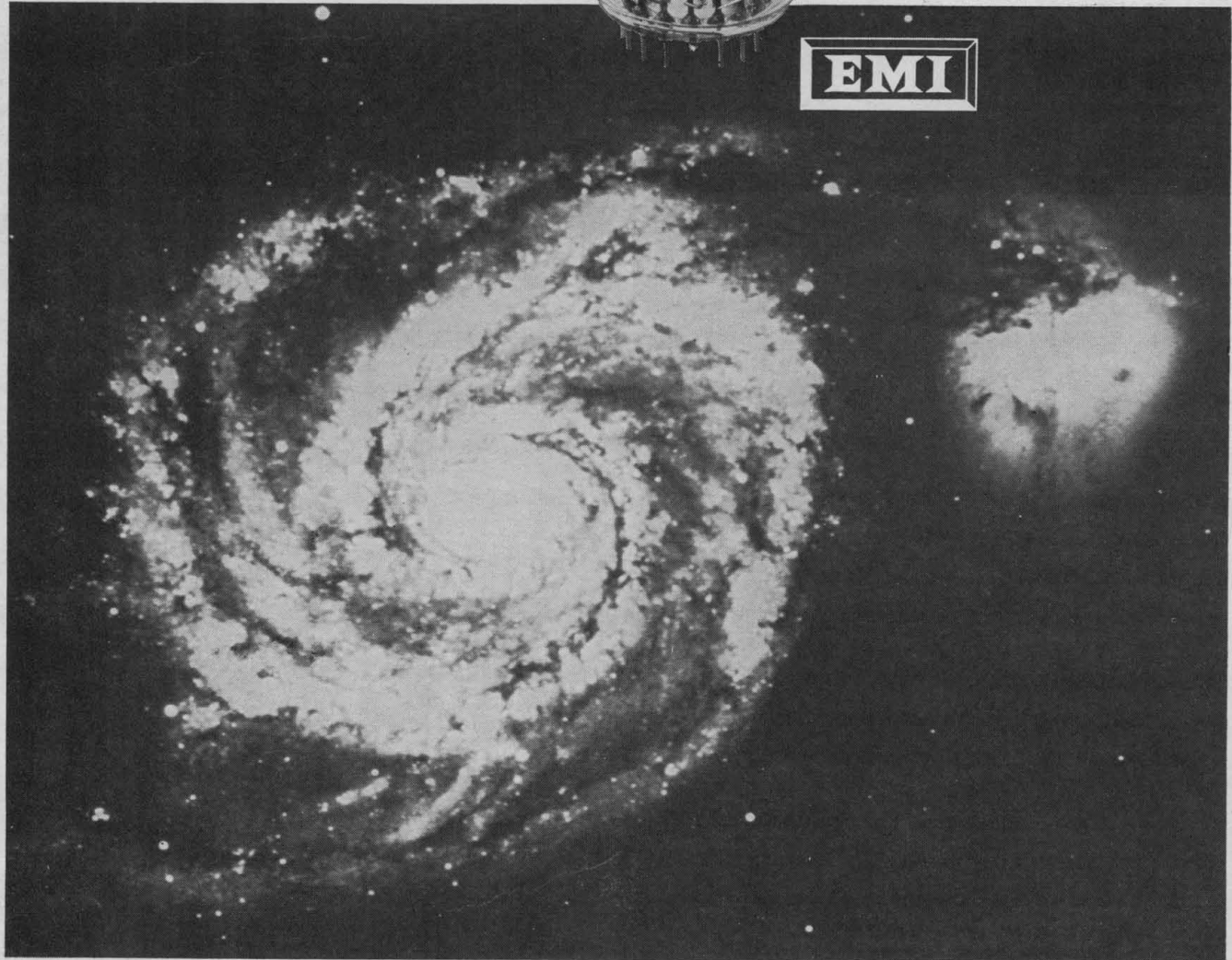
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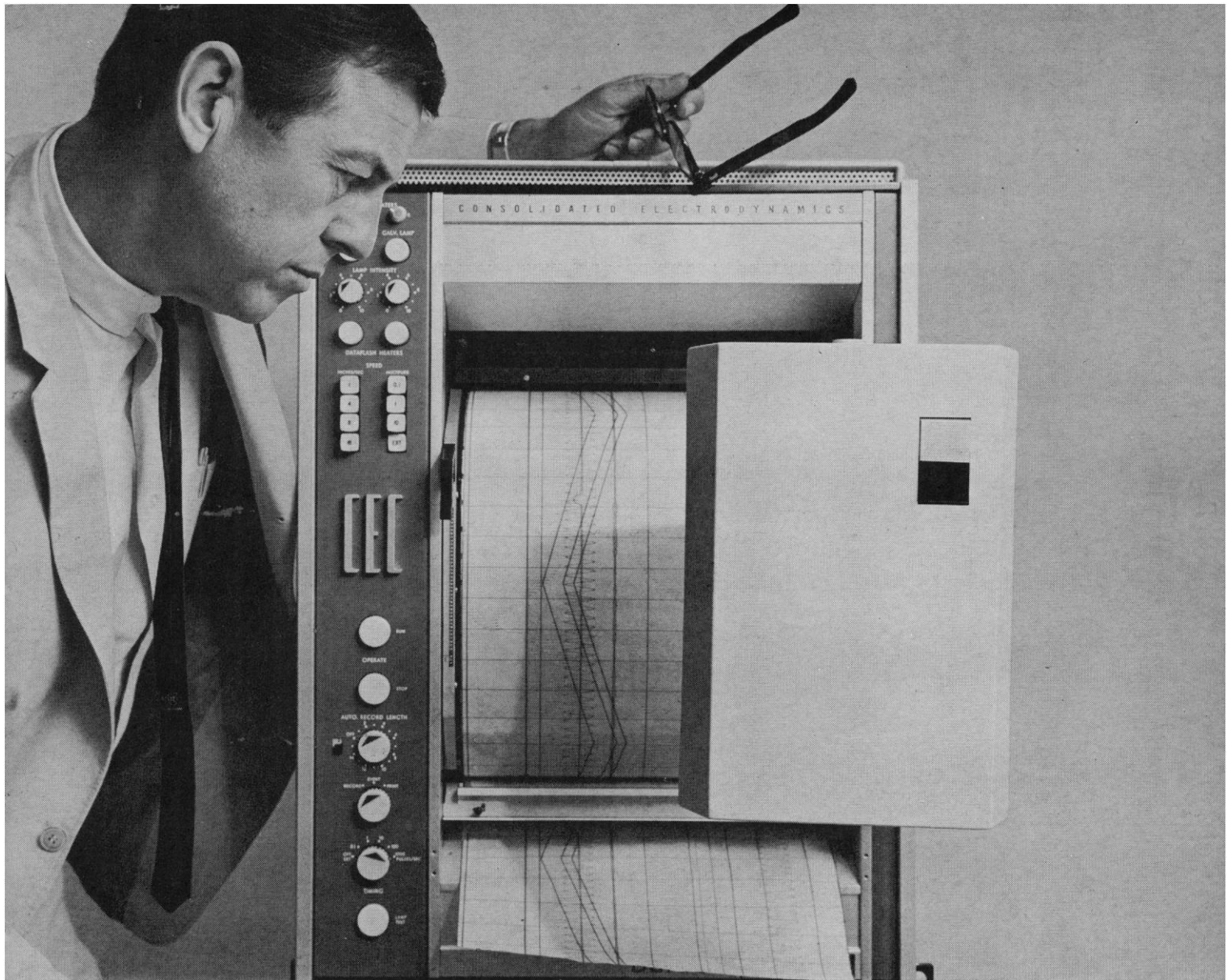
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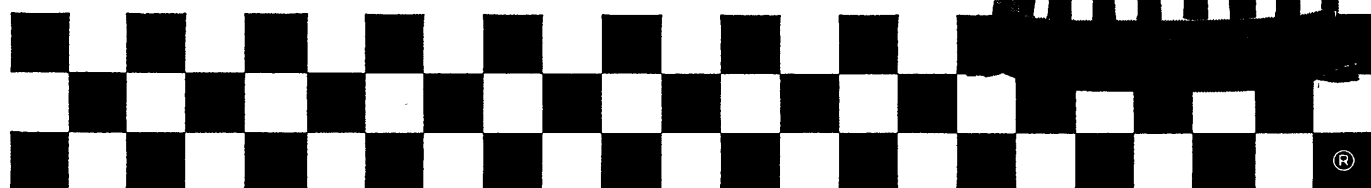
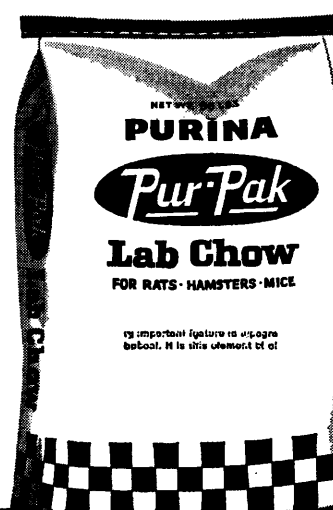
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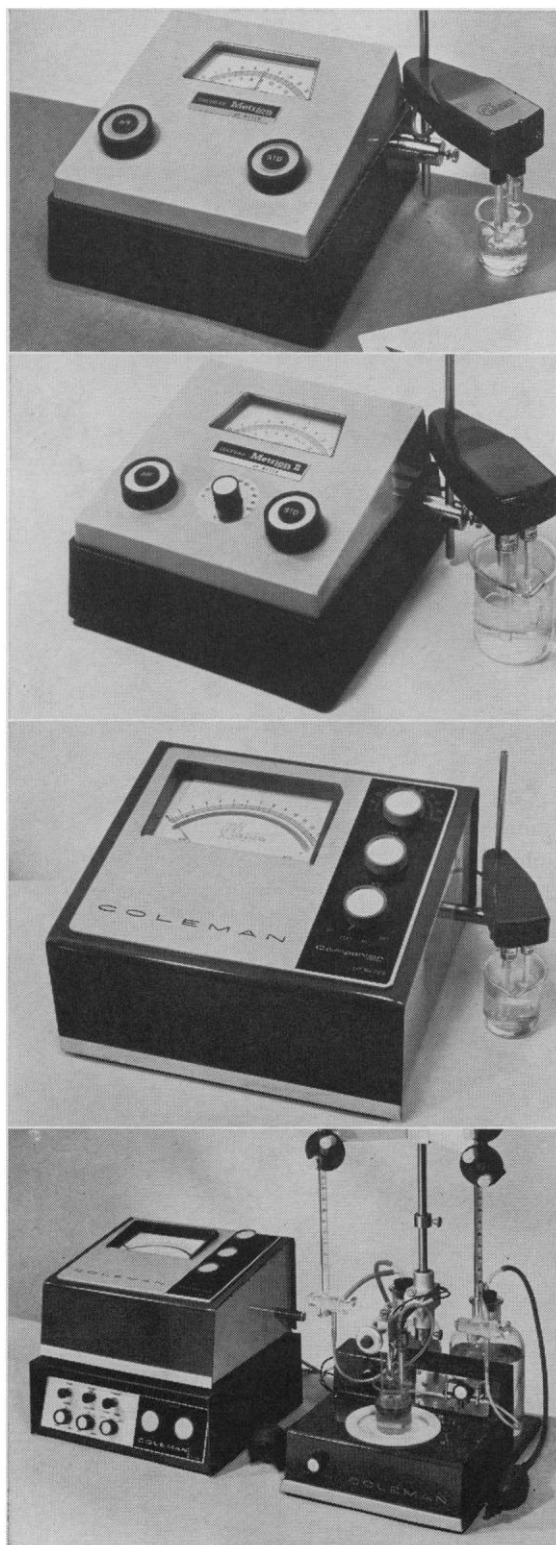
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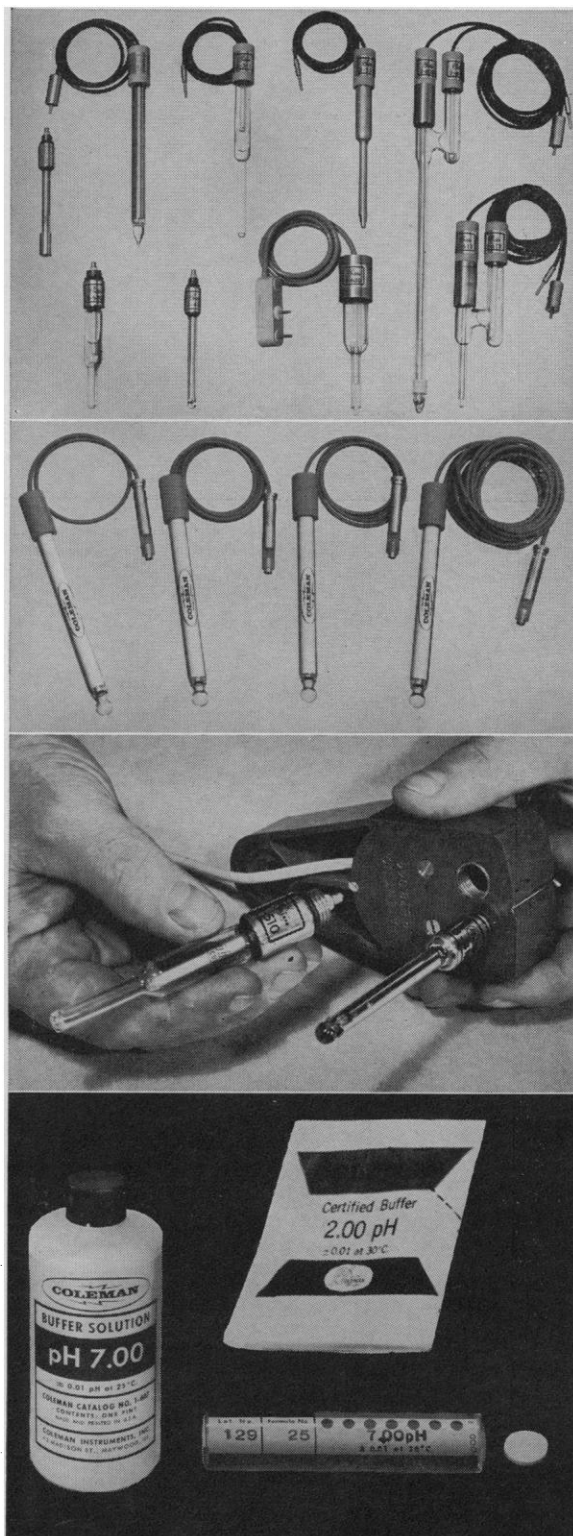
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*Available through your regular laboratory supply dealer. Technical literature available upon request. Write to Department C.*

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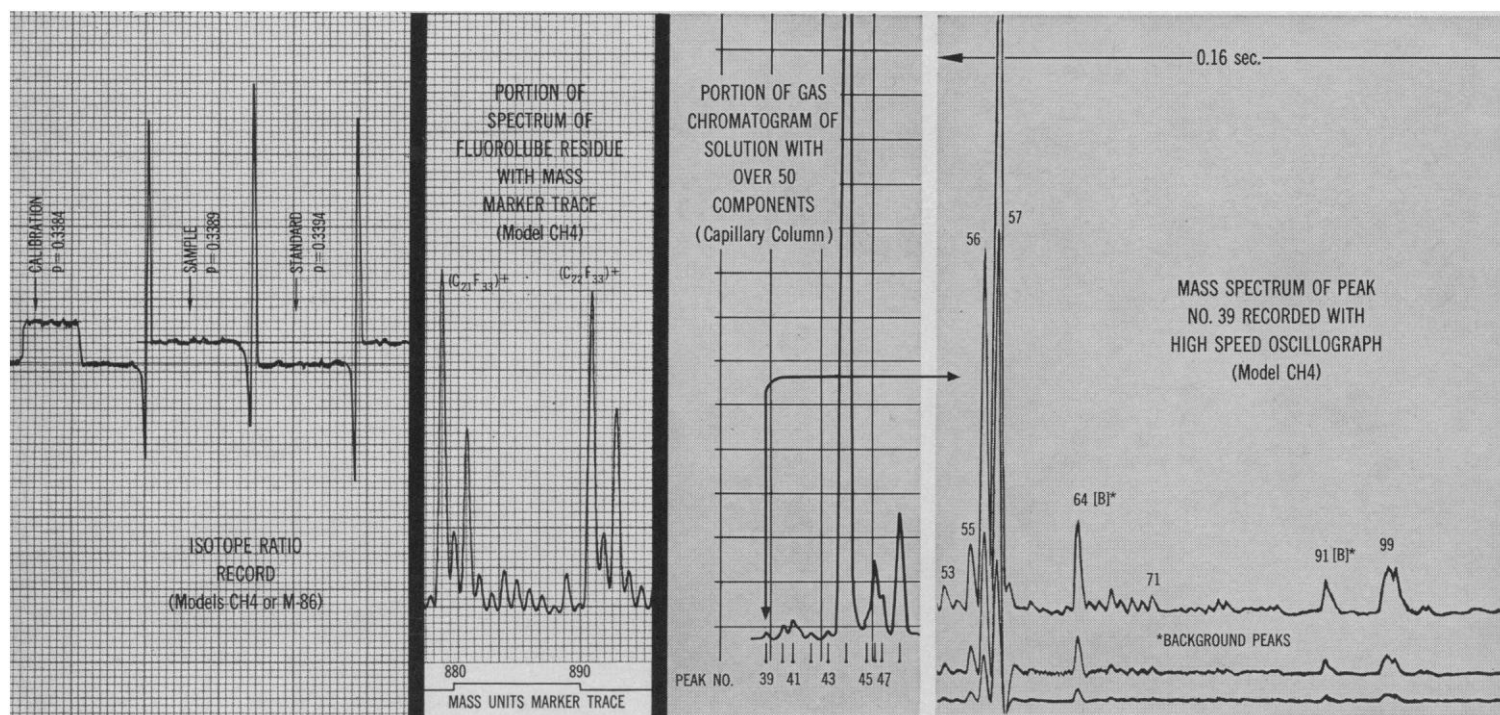
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# ATLAS-MAT MASS SPECTROMETERS FOR STRUCTURE ANALYSES, ISOTOPE RATIOS, MULTI-COMPONENT ANALYSES, GAS CHROMATOGRAPHY



See the CH4 Mass Spectrometer on display, Pittsburgh Conference, March 2-6, 1964. For specifications, write for Data File E310-64

**Proven in nearly 200 installations,** Atlas-MAT Mass Spectrometers offer unequalled versatility and performance. For example, the Model CH4 is available with 3 unique interchangeable TO-4 ion source cartridges. Used with the vacuum lock unit, these permit exchange and analyses of over 50 samples (solid) as well as conversion to a variety of measurements without breaking vacuum or contaminating the ion source. Also, the TO-4 source analyzes thermally sensitive compounds with minimal decomposition and memory.

**Accessories offering added versatility** include electron multipliers, high speed recording oscillographs, mass markers to 1000 u. Other units for the CH4 include the patented Beckey field emission source, the double ion source for simultaneous mass and gas chromatograph analyses, and a variety of simultaneously mounted viscous and molecular leak inlet systems.

**Several models to choose from,** in addition to the CH4: SM1, double focusing, combines spark and electron sources with photo-plate and multiplier collectors; AMP3 quadrupole mass filter; several units designed specifically for isotope ratio (M86), UF<sub>6</sub>, respiratory gas, and low-cost-low-mass applications.

**Performance benefits of the CH4 Spectrometer** include: Resolution over 1500, mass range 1—3600 u, ten 2.5 mass octave scans/sec., 0.05 ppm sensitivity, 0.005% isotope ratio accuracy.

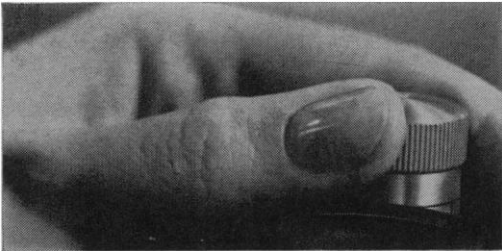
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*Cary*  
**INSTRUMENTS**

UV-VIS / IR / Raman Recording Spectrophotometers • Spectropolarimeters • Vibrating Reed Electrometers and Amplifiers



A simple way to answer this question would be to say "ask the man who owns one." Because thousands of users have found out "why" for themselves. But, let's start off by asking you some questions: Have you ever needed more working distance? . . . an increased real field-of-view? . . . or increased depth-of-focus? Have you ever wanted a flatter field? . . . or more image brightness? If you answer "yes" to just one of these, Advanced DynaZoom® is for you! ■ For instance, by



# WHY ZOOM?

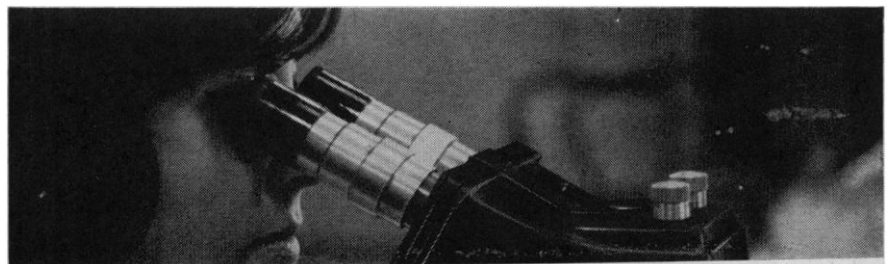
achieving a desired magnification using a lower power objective and the plus magnification of the DynaZoom system—you increase the working distance—the real field-of-view is increased—the depth-of-focus is increased and you have a much flatter field of view. ■ Or, in dark field and fluorescence microscopy—by using a lower power eyepiece in combination with the DynaZoom system and a higher power, higher N.A. objective, you get greatly increased image brightness—brightness that is an absolute necessity in these methods.

■ Obtaining high magnification through the use of the DynaZoom system, rather than using the highest power eyepiece—adds no field curvature and there is no change in eye relief.

■ DynaZoom provides the only means of getting "in-between" magnifications, exactly . . . through a continuously variable range. ■ And more . . . many more capabilities are yours . . .

that only the DynaZoom system can offer. And best of all . . . IT'S FREE . . . because it's standard on Advanced DynaZoom microscopes at no extra cost. ■ Ask for a demonstration and see for yourself. Write Bausch & Lomb Incorporated, 75906 Bausch Street, Rochester, New York 14602.

In Canada, write Bausch & Lomb Optical Co., Ltd., Dept. 759, Scientific Instrument Division, 16 Grosvenor St., Toronto 5, Ont.

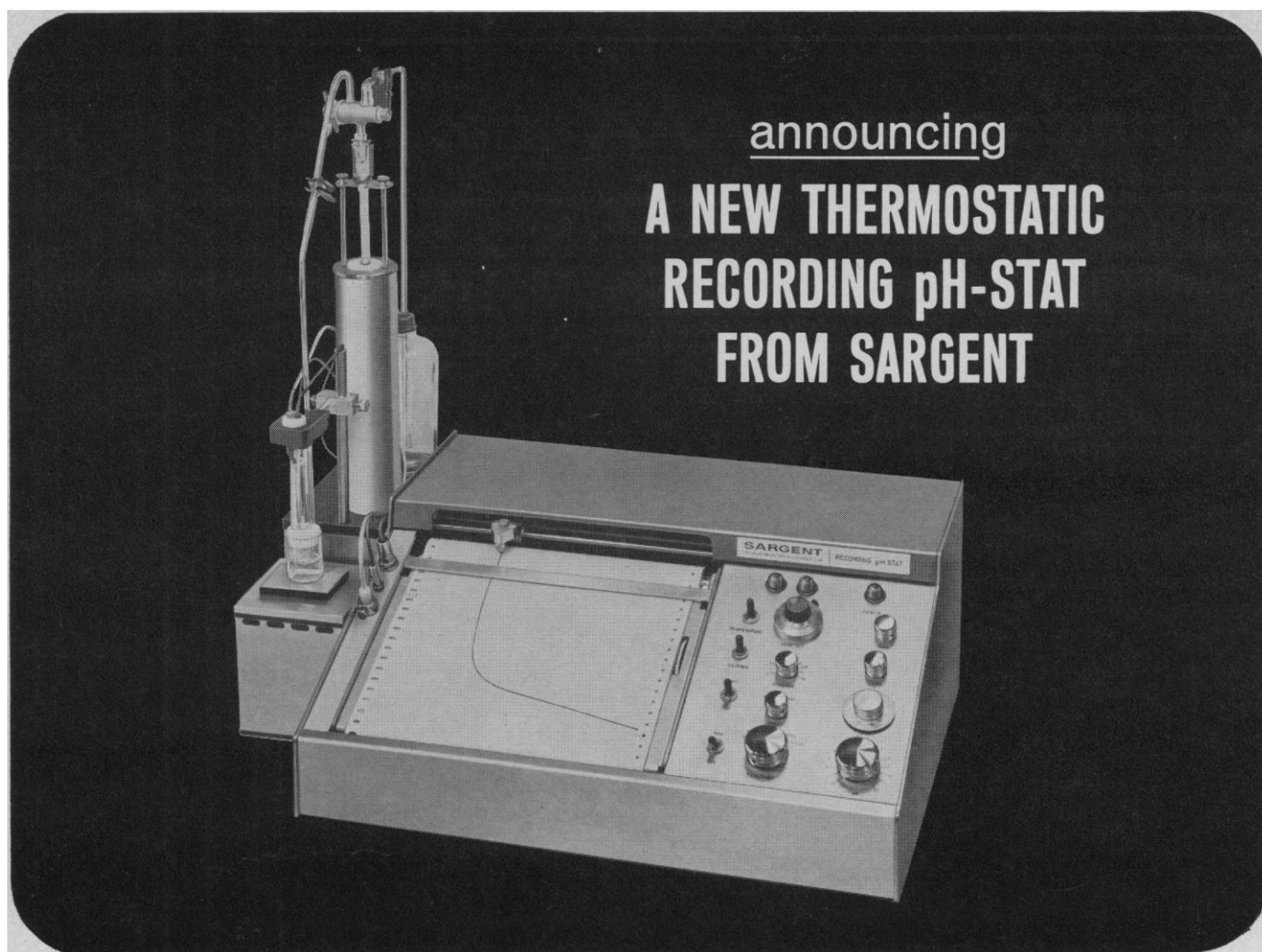


**BAUSCH & LOMB**



FOR THE INQUIRING MIND SEARCHING FOR BETTER MICROVISION...

*Advanced DynaZoom*



For both research and routine studies of reaction kinetics and stoichiometry by high-precision recording of reaction curves under closely controlled conditions of temperature, mixing, and pH.

A compact, easily operated instrument which combines the functions of pH control, temperature control, reagent delivery and mixing, and volume recording—thus replacing the complex of separate instruments, apparatus, and accessory devices formerly required.

## it controls

**pH** • by addition of acid or base reagent from an all-glass precision displacement burette. • by precise measurement and comparison through a chopper input, stabilized amplifier sensitive to 0.005 pH and accommodating all types of electrodes. • at a value dial-selected to 0.01 pH over the range 0 to 14 pH. • reliably with a long-term stability of  $\pm 0.01$  pH, no drift. **temperature** by automatic addition or withdrawal of heat through a solid state thermoelectric element in a stirring plate. • at a temperature set by a single dial selector and detected by an immersed thermistor element. • with a precision of  $\pm 0.05^\circ\text{C}$  over the range 20 to  $50^\circ\text{C}$ . • without water jackets, baths, liquid circulating devices, refrigerants, or compressors; without any visual or mechanical impedimenta.

## it records

**volume** • on a chart whose 250 mm axis may be made to represent from 0.05 ml to 10 ml, accommodating 0.25, 2.5 or 10 ml burette systems. Five-to-one drive reduction selector permits recording of  $\frac{1}{5}$  burette capacity over full scale. • with an accuracy  $\pm 0.1\%$  of capacity. **time** • on the other axis of a chart graduated in 1-inch and 0.1-inch divisions. • at chart speeds of 1 inch per hour,  $\frac{1}{60}$  inch per minute, or 1 inch per minute, instantly interchangeable by 3-speed electrical switching mechanism. Motors of other speeds are available and easily installed. **S-30240 pH STAT, Sargent.....\$2475.00**

*It provides additional convenience in such features as variable speed magnetic stirring, swing-away sample platform, and rapid-drive burette systems for flushing and filling. It accommodates 5 ml, 10 ml, or larger sample beakers.*



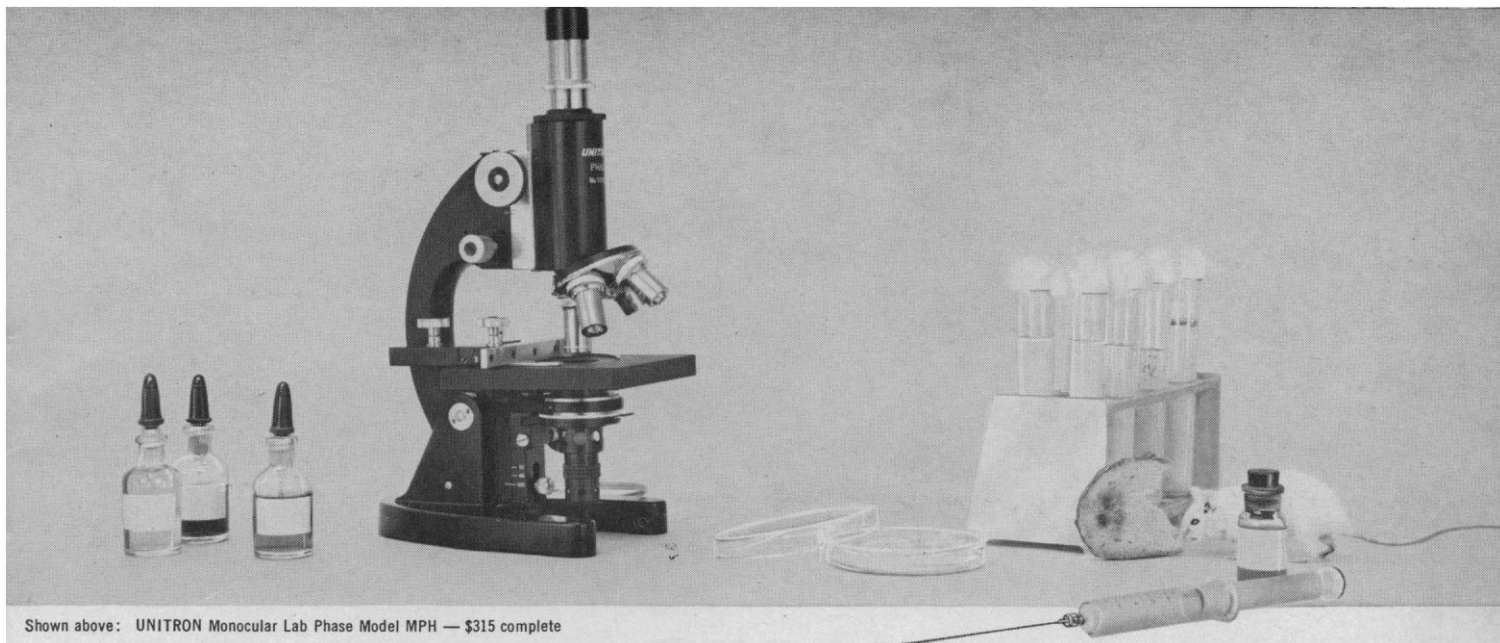
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Shown above: UNITRON Monocular Lab Phase Model MPH — \$315 complete

## There are 3 microscopes in this picture ... at a distinctly singular UNITRON price

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

So is UNITRON's MPH.

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

So can UNITRON's MPH.

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

So does UNITRON's MPH.

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

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

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

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

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

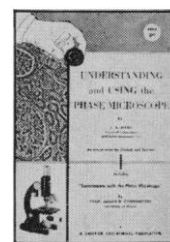
**There's more.** UNITRON's built-in illuminator provides five intensities . . . more than enough to meet your visual and photographic needs. Even the eyepieces are special . . . the widefield type for comfortable viewing.

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

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

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

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



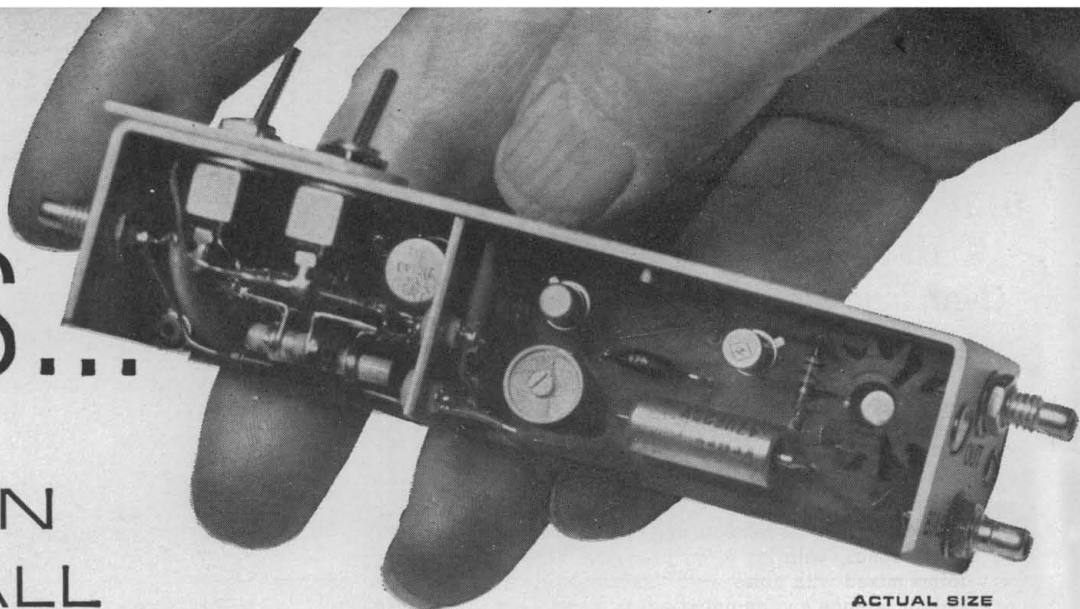
**Ask for a free 10-day trial.** Please specify whether you want to try Model MPH or BPH. A phase booklet is shipped with each microscope . . . or, you may request the booklet separately.

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MICROSCOPE SALES DIVISION • DEPARTMENT 4-Y  
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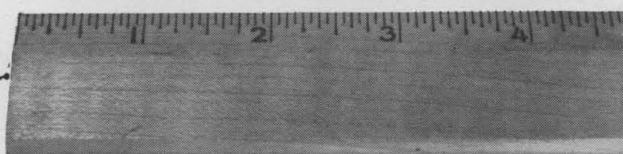
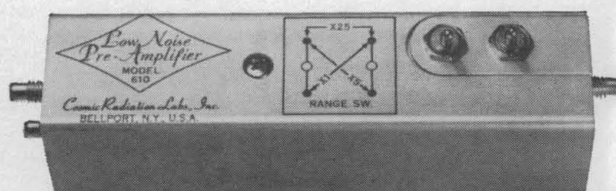
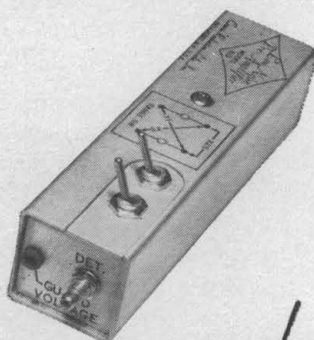
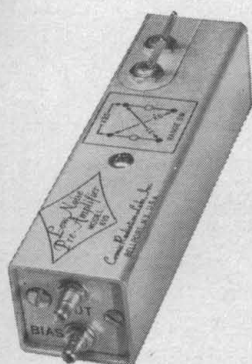


# GOOD THINGS...

## ...COME IN SMALL PACKAGES...



ACTUAL SIZE

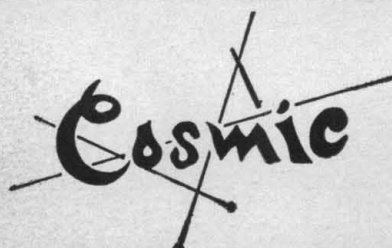


## ...FROM Cosmic!

### LOW-NOISE PRE-AMPLIFIER MODEL PA-610 (Fully transistorized with FET)

Designed primarily for use with low-noise high resolution solid state detectors and engineered for use in vacuum systems, this compact unit can be operated within a vacuum chamber without exceeding its components thermal rating. Specifications of model PA 610 Low Noise Preamplifier are detailed in the table below. It is completely compatible with Cosmic's Model 901 Linear Amplifier and is connected to the  $-32$  v. supply. Charge gain of the Preamp is adjusted with the use of 2 miniature toggle switches for .9, 4.6 and 23 mv/Mev of energy loss in silicon.

Noise level (Kev, fwhm)			Charge Sensitivity (mv/Mev)			Pulse-shape dimensions out			Saturation characteristics		Permissible counting rate (10-Mev particle)	Power requirements	Price
0 pf	10 pf	100 pf	X1	X5	X25	Rise Time (nanosec)	Fall Time		Neg. Output	Pos. Output	10 <sup>5</sup> cps	32 volts at 12 ma	\$450
6-12	8-14	25-35	0.9	4.6	23	X25 250	X5 50	X1 10-20 $\mu$ sec time constant	1 volt	3-5 volts (depends on load)			



RADIATION LABS., INC. / BELLPORT, NEW YORK, U.S.A.

"ENGINEERED QUALITY FOR BETTER PERFORMANCE"

*From Northern Scientific.....  
an amazing NEW digital oscilloscope.*

## **DIGITIZES TIME DEPENDENT SIGNALS & TIME INDEPENDENT VARIABLES (both quiet and noisy) WITH PRECISION (and ease!)**

**T**he model NS-513 digital memory oscilloscope\* is an exceedingly versatile new measurement tool.

Of all the characteristics of the model NS-513 digital oscilloscope, we are most pleased with its digitizing precision. It precisely digitizes signal waveforms, even those having full scale changes as sudden as 40 microseconds, with  $\pm 0.1\%$  precision. It also digitizes signal waveforms mixed with noise, with this precision. It is an astonishing new tool for science and engineering, to no small extent just because of this high accuracy.

But in addition, this is an amazingly versatile digitizer. Unlike earlier signal digitizers and averagers, this oscilloscope operates in the XY mode as well as the time-base mode. This means, simply, that an independent variable applied to the X deflection terminal controls the digital address, while measurements are made of the independent variable applied to the Y deflection terminal. This means in turn that measurements (requiring digital results or requiring noise elimination) in which it is impossible (or best not) to control the independent variable can now be carried out with precision and ease. For example pressure versus temperature, or NMR detector signal versus irregularly swept magnetic field intensity, or radio noise versus telescope position, or strain versus stress, or Mössbauer resonance detector counting rate versus nonlinearly changing absorber velocity, or temperature versus water depth, or a hundred other measurements in which the independent variable is not time nor a linear function of time.

Of course, all those measurements in which time *is* the independent variable can be easily made. (We even use the instrument as a handy precision voltmeter or ohmmeter; here the independent variable is fixed.)

Where the independent variable is not time, but needs controlling, the model NS-513 provides an experiment-control sweep voltage locked precisely with the oscilloscope sweep. The sweep may be sweep-flyback, or for astronomy or spectroscopy, sweep-sweep back.

Where the sweep is not self-recurrent, there are internal circuits which permit positive or negative external triggering as well as positive or negative internal triggering directly from a prominent signal feature such as the R wave in EKG (heartbeat) signals.

And as a signal averager it is no less than amazing. It averages over periods of a few seconds or a few hours. And the final results are in absolute form, rather than constantly growing as in other averagers. An ordinate typed out as the number 999 means 999 millivolts, and doesn't change if the measurement continues unnecessarily long.

Yet this instrument is so very easy to use. Touch the signal probe to ground, set the zero adjustment control as desired, and then operate just like an ordinary oscilloscope or XY plotter. If no noise is present, the digitizing can be completed in less than two seconds.

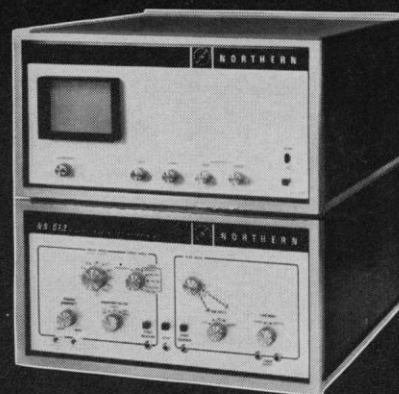
There are 512 coordinate points. The speed of full scale response is 40 microseconds for recurrent or repeatable signals and ten milliseconds for single signals. It contains only silicon semiconductors and has built-in typewriter controls and provisions for digital sub-totalling for easy and precise area integration.

The internal time-base sweep is quartz crystal oscillator controlled, providing sweep speeds of from 50/second to one per 200 seconds. Or longer if you let us know in advance.

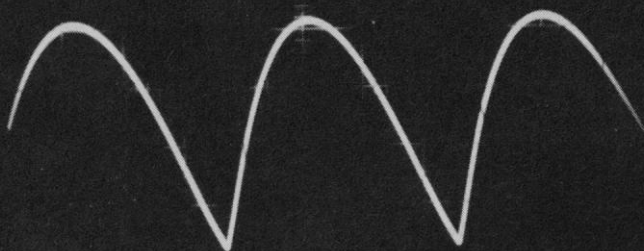
There is no other instrument in its class. You will hear lots more about it, and Northern Scientific. \$8,800, less typewriter, FOB Madison. For further information write or phone (608) 238-4741.



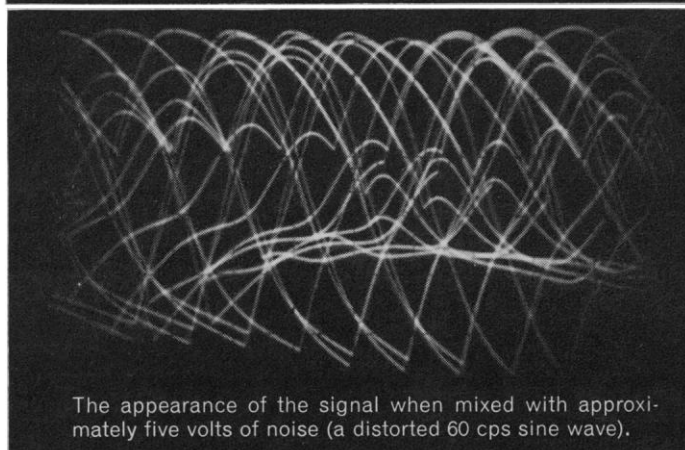
**N O R T H E R N  
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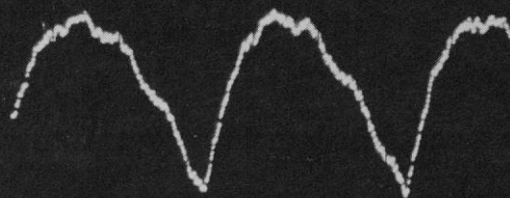
*the NS-513 Digital Memory Oscilloscope ...  
fast ... easy ... precise*



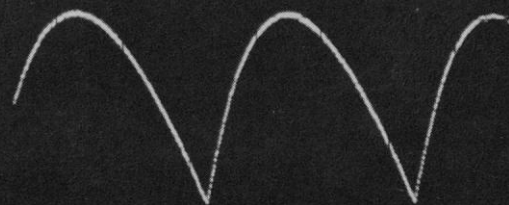
A periodic input signal, 150 cps, 660 millivolts peak to peak, as seen by use of a conventional oscilloscope, before mixing with noise.



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

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

**I**N 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.**

**W**HY 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.

**H**OW 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.

**T**HESE 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.

Laboratory Glassware Department,  
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**CORNING**  
THE MAKERS OF PYREX® BRAND WAR

SCIENCE, VOL.



with so many automatic  
sample changers on the market

why pick the  
most expensive?



Why buy the most expensive?

Logical question: compelling answer . . .

*because it gives you most for your money.*

Simply put, the job of a changer is to automatically present a numerous<sup>1</sup> series of planchets holding radioactive samples<sup>2</sup> to a radiation detector<sup>3</sup> for individual measurement.

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

- 1 it will consecutively measure the largest **number** of samples (up to 320 on one model, up to 40 on another).

*true only of Magnachanger*

- 2 it will measure the broadest **range** of radioactive samples in terms of sample volume (planchet size) and type and energy of radiation.

*true only of Magnachanger*

- 3 it will accept the greatest **variety** of detectors — alpha, beta, gamma, low background, windowless flow or windowed flow.

*true only of Magnachanger*

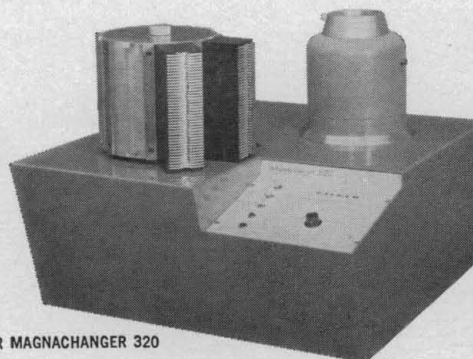
Backing up this versatile performance is the comforting assurance of dependability buttressed by modern design, quality production and on-site installation and service.

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

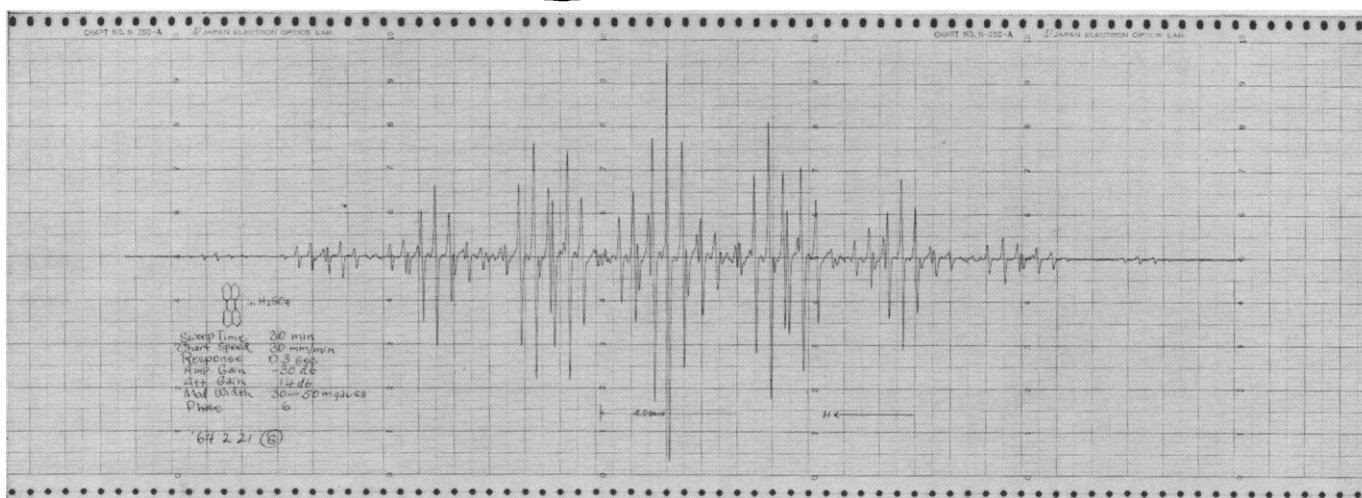
**PICKER**  
nuclear

PICKER NUCLEAR / Division of PICKER X-RAY CORPORATION  
WHITE PLAINS, NEW YORK

PICKER MAGNACHANGER 320



# ESR



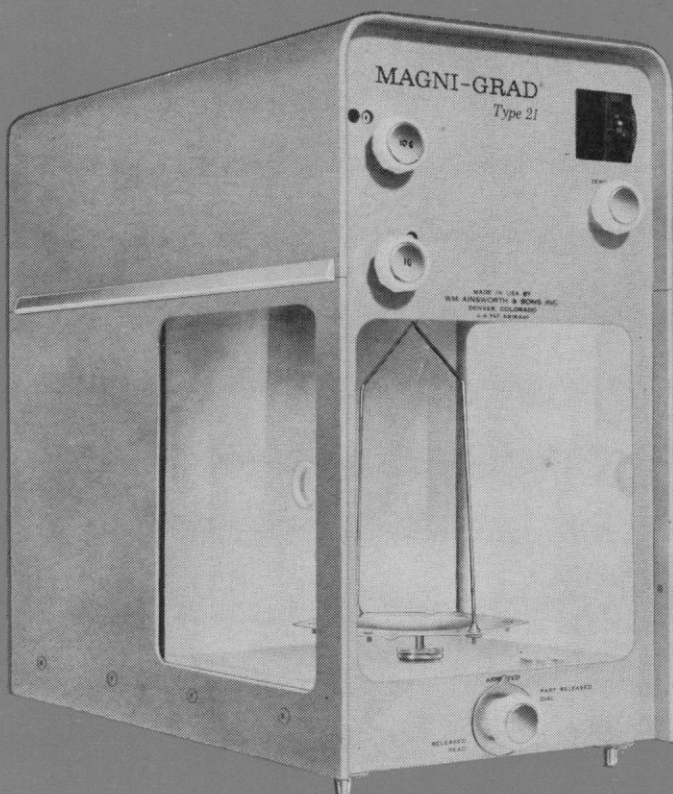
ESR spectrum of perylene positive ion in sulphuric acid showing highly resolved hyperfine structure due to interaction with proton spins.

## **SENSITIVITIES TO $1 \times 10^{11}$ SPINS/GAUSS, RESOLUTION $1 \times 10^{-5}$**

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  $1 \times 10^{11}$  spins/gauss and  $1 \times 10^{-5}$  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  $1 \times 10^{10}$  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



Compact size Magni-Grad Type 21 analytical

## ■ QUALITY ■ PRICE

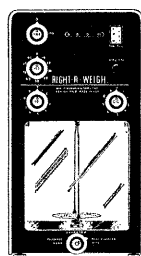
Full line of one-pan balances  
*speed / accuracy / convenience*

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

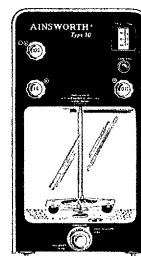
- patented compensated beam.
- "add weight" and "remove weight" signals.
- all metal case.
- eye-level, unobstructed readout.

### SPECIFICATIONS

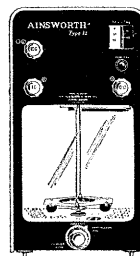
	TYPE SC	TYPE 10	TYPE 21	TYPE 12
Capacity	200 gr.	160 gr.	160 gr.	80 gr.
Tare	—	60 gr.	—	40 gr.
Total Load	—	220 gr.	—	120 gr.
Sensitivity	0.1 mg.	0.1 mg.	0.1 mg.	0.01 mg.
Readability by estimation	0.05 mg.	0.05 mg.	0.05 mg.	0.005 mg.
Reproducibility	±0.03 mg.	±0.03 mg.	±0.05 mg.	±0.01 mg.
Dimensions	10¼" w x 19¾" h x 18½" d	8¼" w x 15½" h x 16" d	8¼" w x 15½" h x 16" d	8¼" w x 15½" h x 16" d
PRICE	<b>\$895.00</b>	<b>\$670.00</b>	<b>\$550.00</b>	<b>\$875.00</b>



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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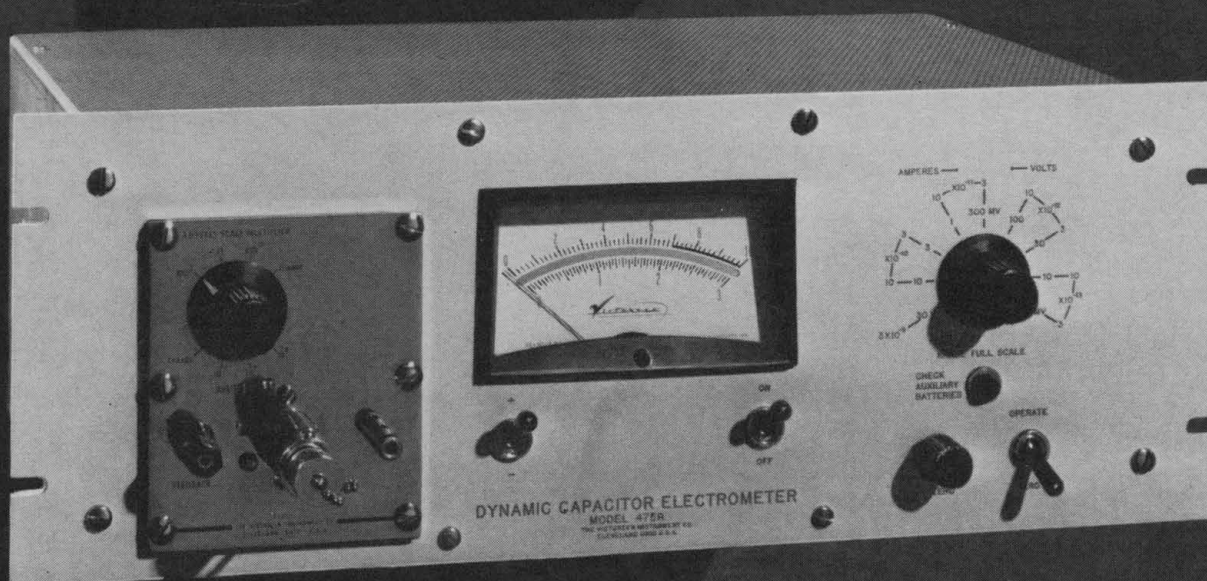
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# MEASURE FEMTOAMPS



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## EPR IN THE WORLD OF BIOCHEMISTRY

### STOICHIOMETRY OF A FREE RADICAL REACTION

The stoichiometry of a reaction involving a free radical intermediate can only be determined if the concentration of the intermediate can be quantitatively measured. The lifetime of most free radical intermediates is generally too short to allow accurate concentration measurements by standard techniques. However, quantitative measurements of these radicals can be made by EPR when used in conjunction with liquid flow systems.

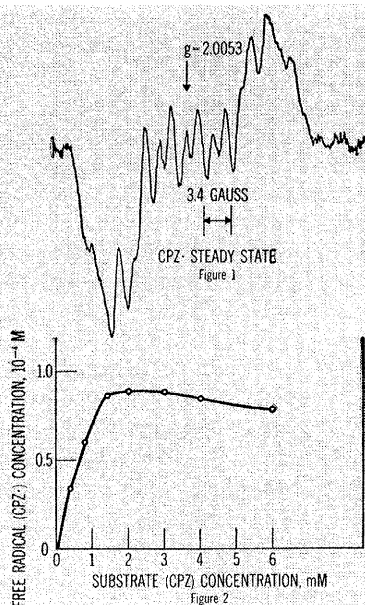
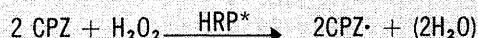


Figure 1 is the steady state EPR spectrum of the free radical obtained from the enzymic oxidation of chlorpromazine (CPZ) by peroxidase- $H_2O_2$ .† A plot of the free radical concentration (CPZ•) as a function of the substrate concentration (CPZ) is shown in Figure 2. At a particular substrate concentration a free radical concentration is reached which does not increase with increasing substrate. The enzyme concentration has a similar effect on the free radical concentration, i.e. no further increase for enzyme concentration above  $10^{-7}$  M.

As illustrated in Figure 2, the accumulated free radical concentration is very nearly twice the concentration of hydrogen peroxide and the stoichiometry of the reaction is established as:



This result is consistent with previous observations of the peroxidase reaction.‡

† L. H. Piette, G. Bulow & Isao Yamazaki, in print.

‡ I. Yamazaki, & L. H. Piette, Biochem. Biophys., 41, 416, (1952).

\*Horseradish peroxidase.

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Model 885 shown atop  
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## Science Dropouts

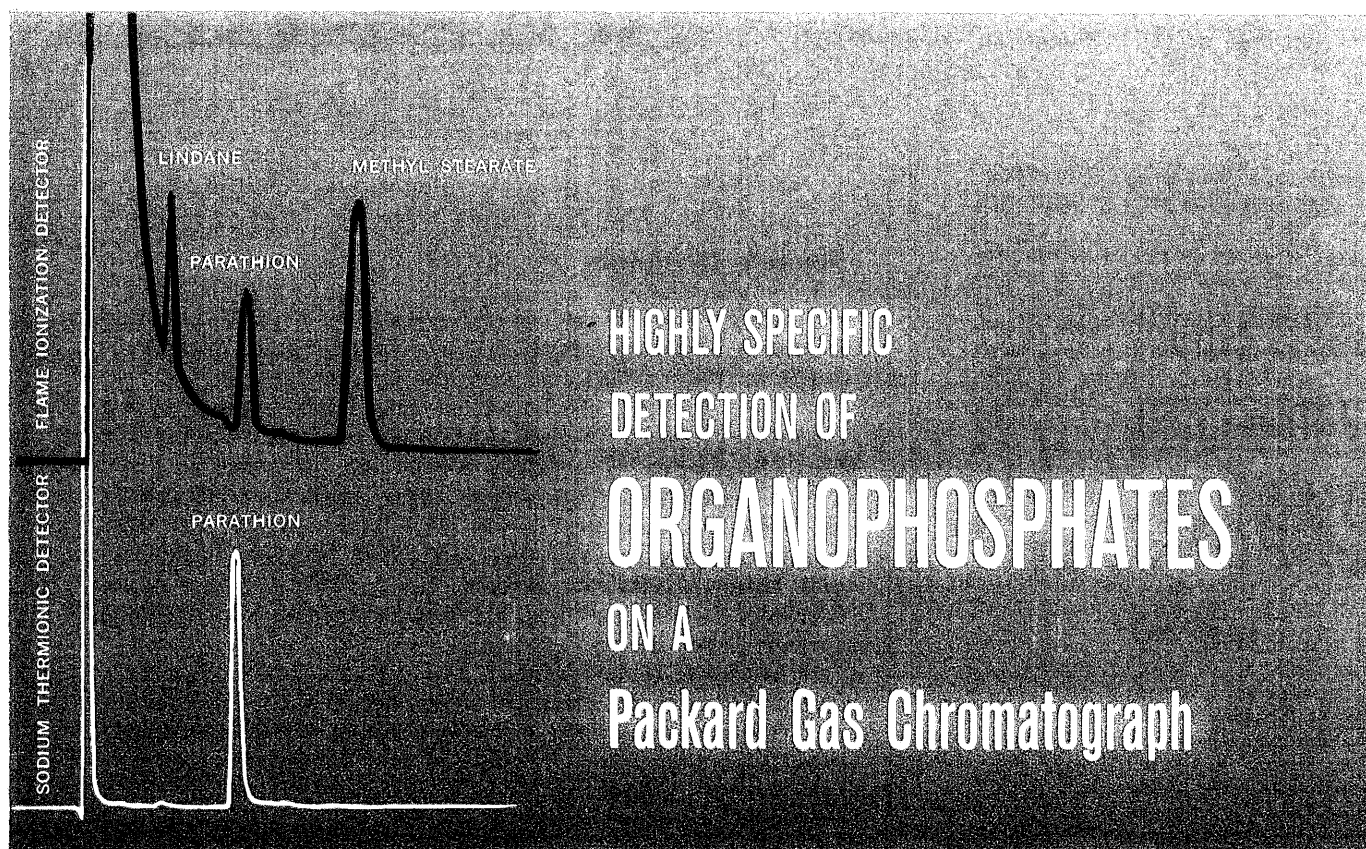
The high attrition rate among talented undergraduates planning careers in scientific research calls for reexamination of educational practices. The existence of a troublesome problem was delineated recently by Robert C. Nichols in an article appearing in this journal (*Science*, 12 June). Nichols is 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.

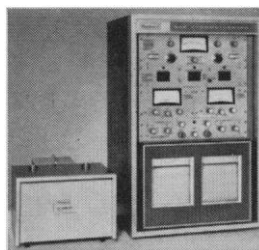
If a large proportion of the college freshmen who decide on scientific research as their life's work are to hold to that decision, they must be given special motivation during this initial year. They should be taught by gifted lecturers and brought in contact with enthusiastic research men. Laboratory 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



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**DETECTOR VOLTAGE:** 300 volts

**NOISE LEVEL:**  $1 \times 10^{-11}$  amperes full scale

**CHART SPEED:** 30 inches/hour

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

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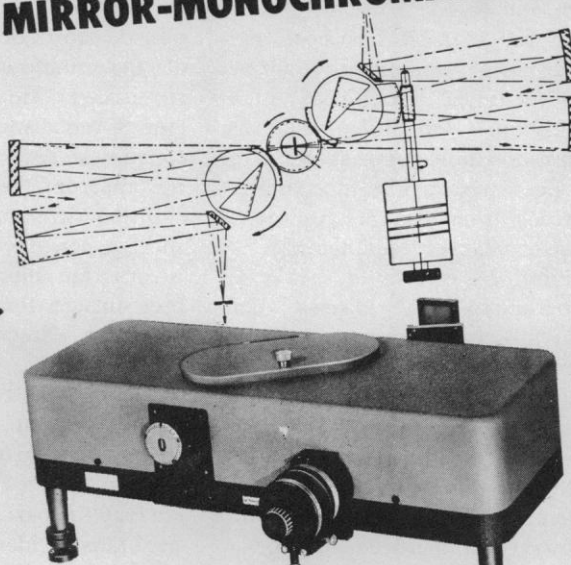


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lary columns and applying Golay's equation for the dispersion of a small zone of vapor introduced in an instant at one point in the pipe. Measurement of the dispersion some 30 kilometers away showed the plate height to be smaller by many powers of 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 research-

ers 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.

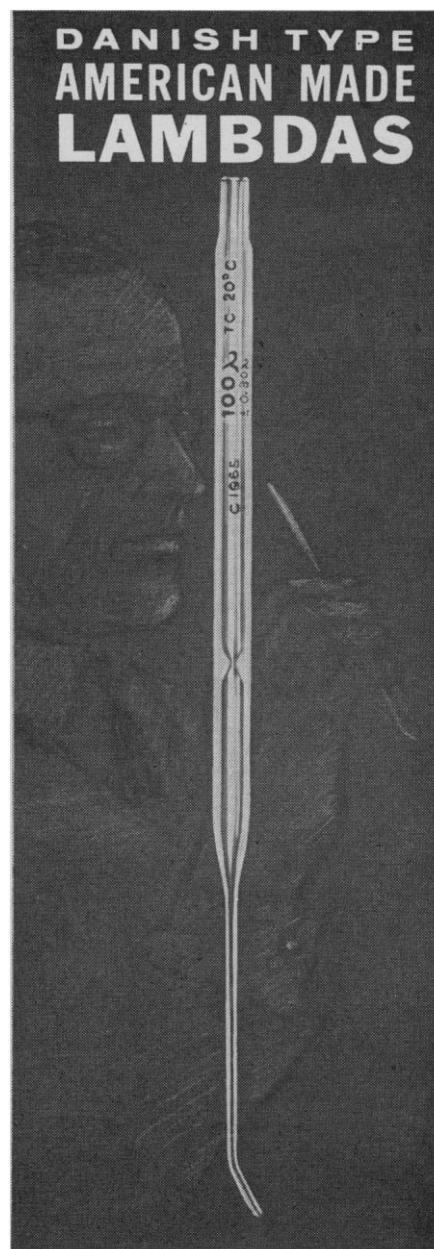
A. B. LITTLEWOOD  
*The University, Newcastle upon Tyne, England*

### 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



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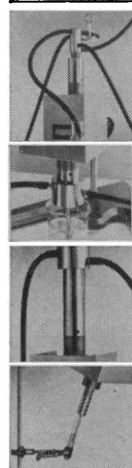
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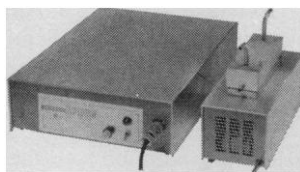
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decision-making games. These sessions were made possible through the cooperation of the Texas Technological College Computer Center.

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<sup>e</sup>)

**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<sup>e</sup>)

**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**,

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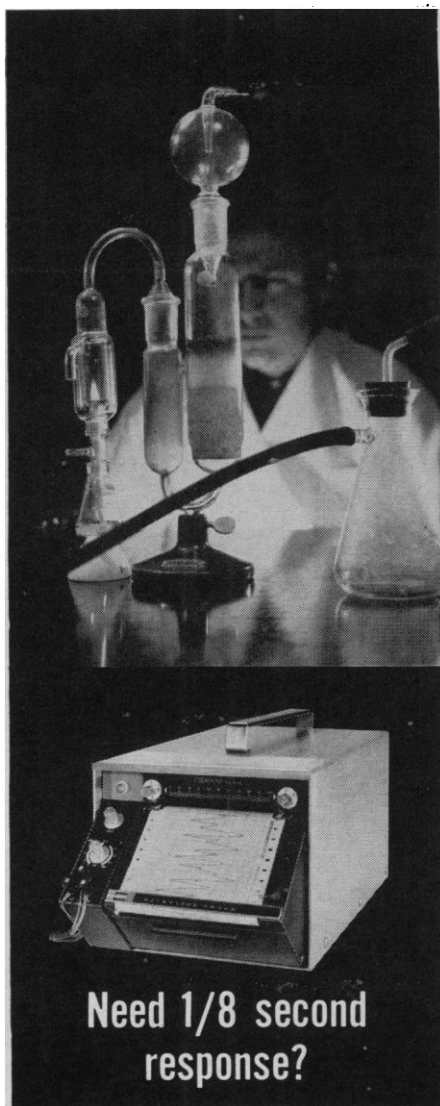
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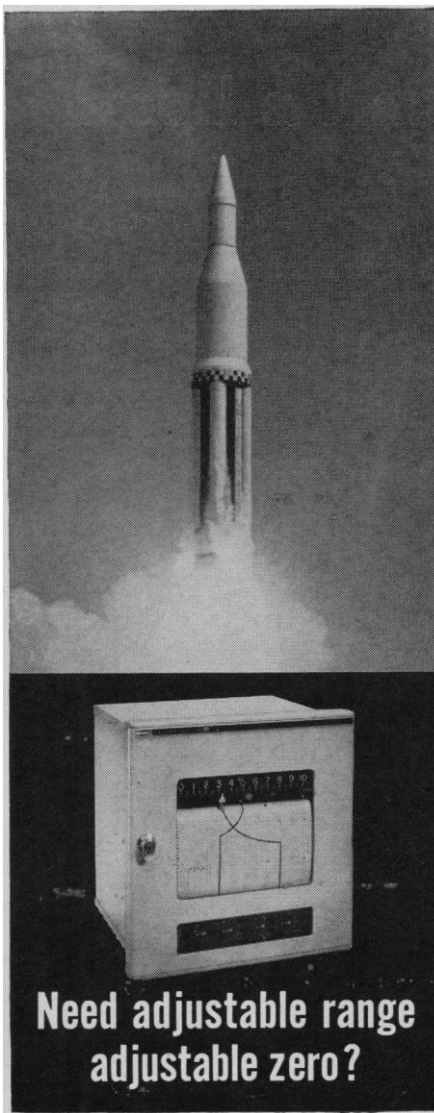
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21-28. International **Geographical Union**, 20th intern. congr., London, England. (T. H. Elkins, Royal Geographical Soc., Kensington Gore, London, S.W.7)

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)

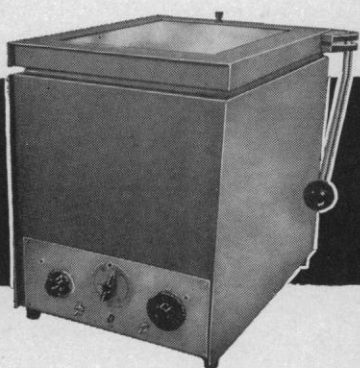
3-5. Compounds of Interest in **Nuclear Reactor Technology**, intern. symp., Boulder, Colo. (J. T. Waßer, Los Alamos Scientific Laboratories, P.O. Box 1663, Los Alamos, N.M. 87544)

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**

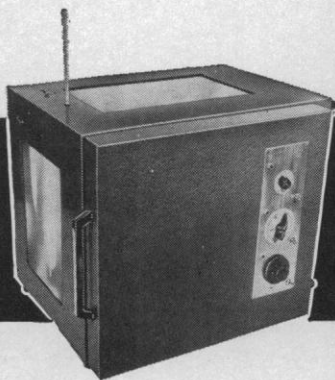
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**Health**, 17th annual, Bern, Switzerland. (F. Cloutier, 1, rue Gevray, Geneva, Switzerland)

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)

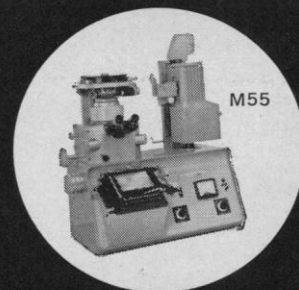
9-14. **South American Union of Engineers' Federations**, 10th conv., Rio de Janeiro, Brazil. (Federação Brasileira de Associações de Engenheiros, Caixa Postal 1229, Rio de Janeiro)

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,



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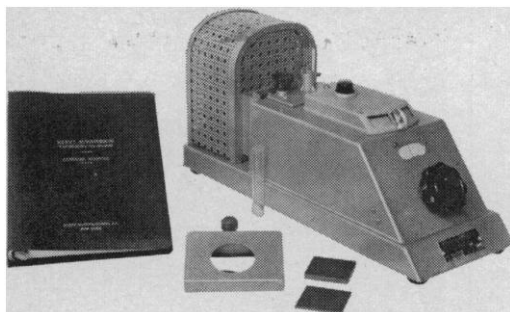


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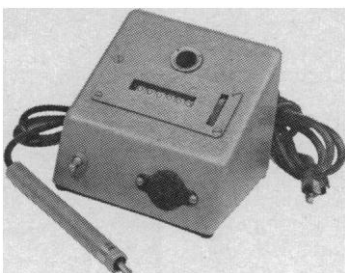


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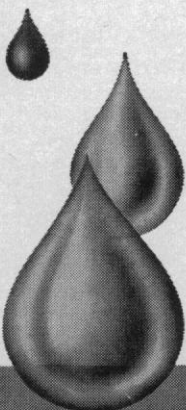
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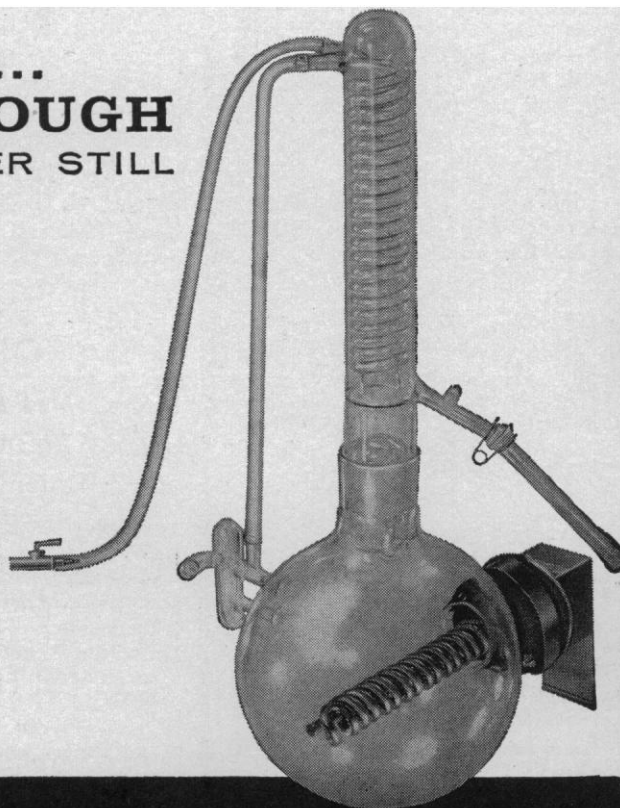


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12-14. **Galaxies**, preliminary conf., Uppsala, Sweden. (T. Page, Van Vleck Observatory, Wesleyan Univ., Middletown, Conn. 06457)

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.)

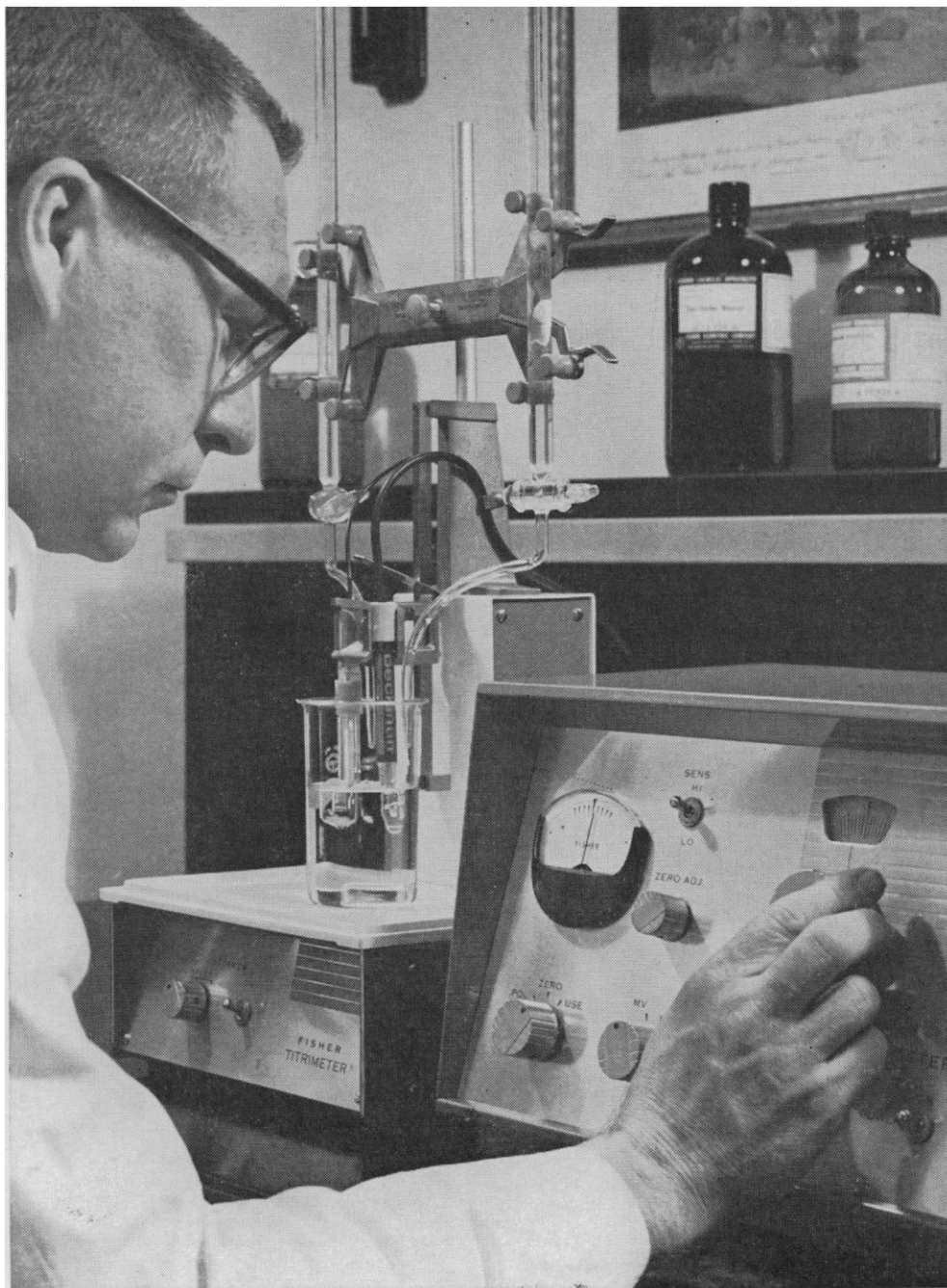
18-20. **International Assoc. of Milk and Food Sanitarians**, Portland, Ore. (H. L. Thomasson, P.O. Box 437, Shelbyville, Ind.)

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)

26 JUNE 1964



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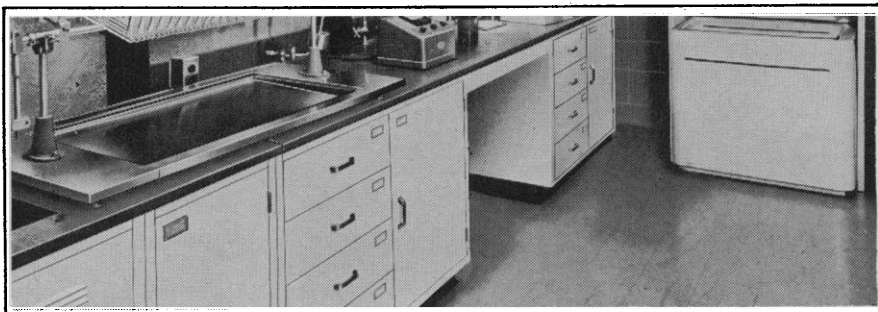
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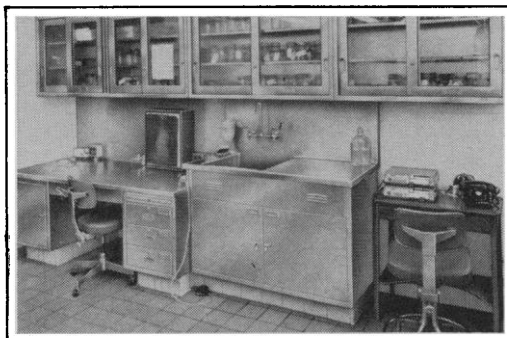
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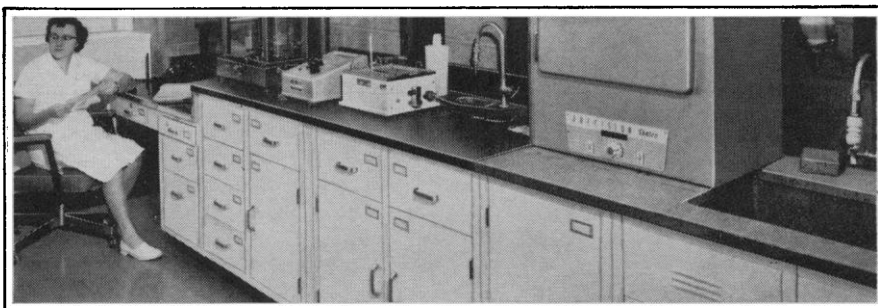


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22-28. **American Soc. of Human Genetics**, Boulder, Colo. (S. H. Boyer, Johns Hopkins Hospital, Baltimore, Md.)

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 polarization 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)].

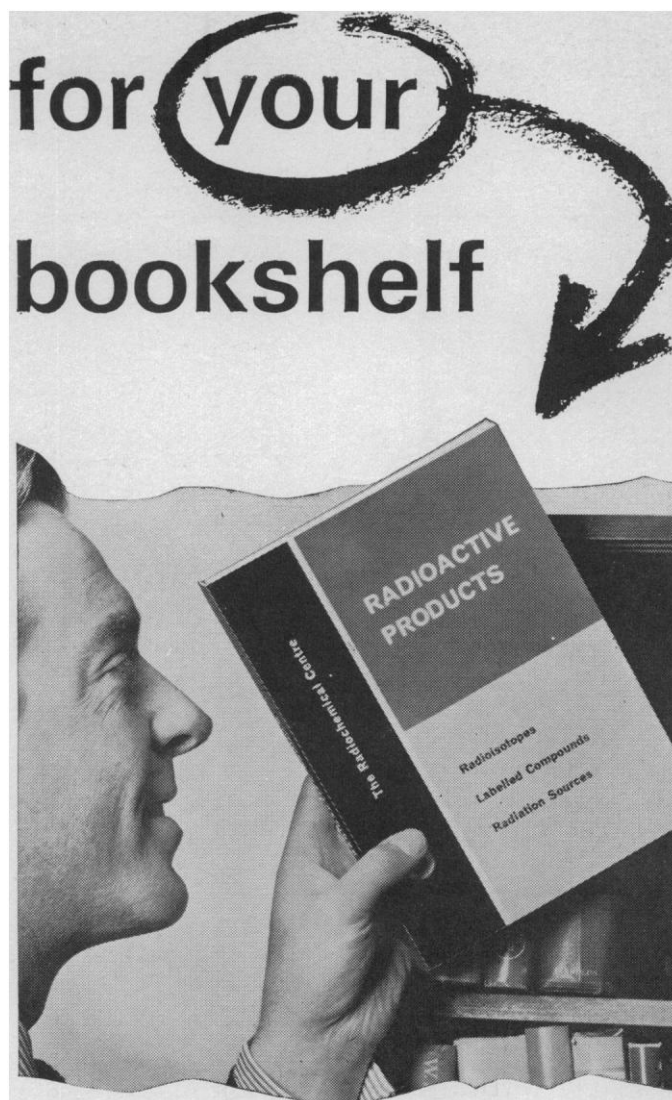
Besides soybean trypsin inhibitor, Steiner and Edelhoch have applied polarization of fluorescence to the study of structural transitions in native and denatured thyroglobulin [*J. Am. Chem. Soc.* **83**, 1435 (1961)] and in antibody and normal gamma globulins [*J. Am. Chem. Soc.* **84**, 2139 (1962)].

As far as we were able to trace the literature, it appears that C. Singletary 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 protio-phycocyanin 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.



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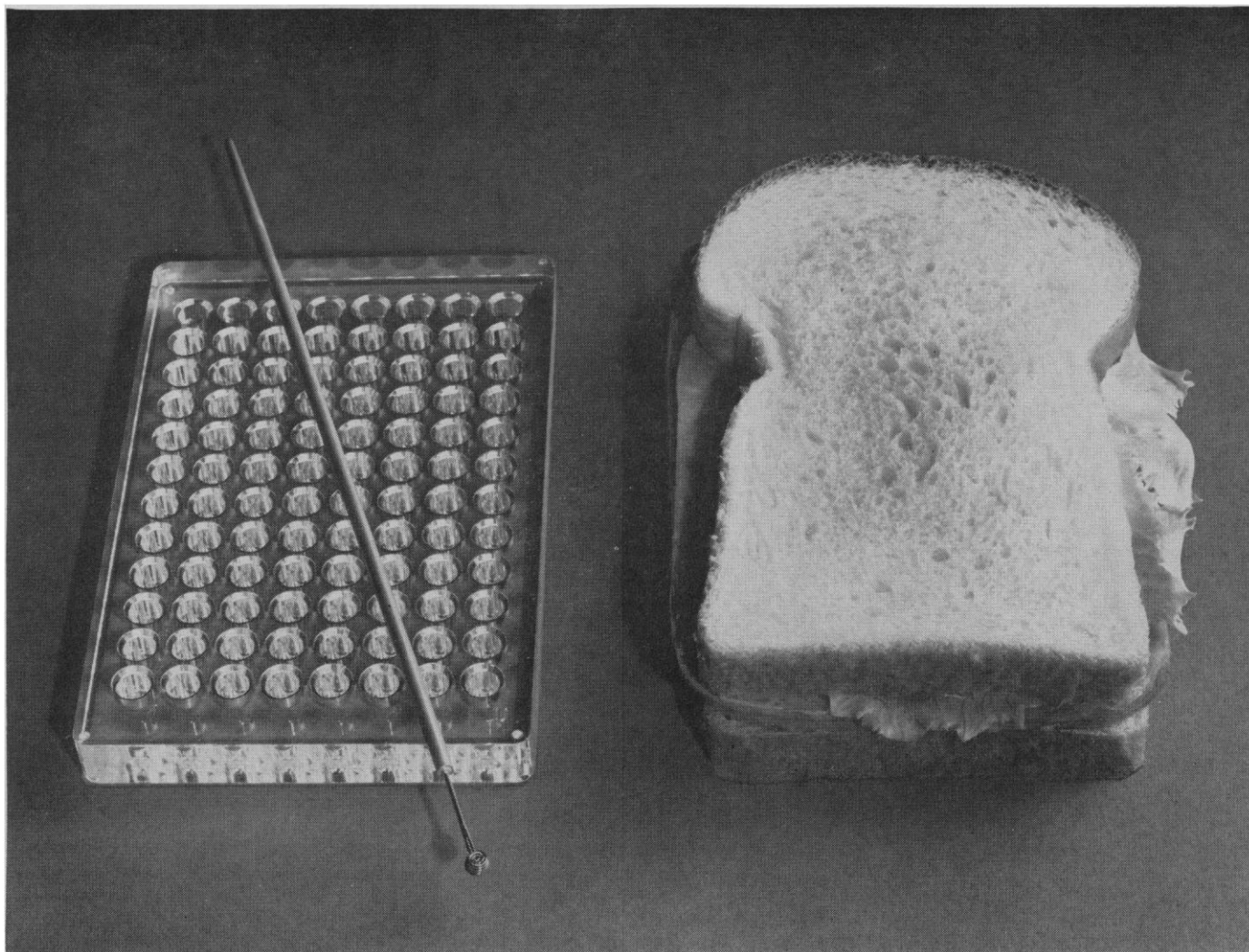
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*This is an exciting new technic that can best be appreciated by reviewing the following papers: "A Simplified Method for Virus-Tissue Culture Procedures in Microtitration Plates," Proceedings of the Society for Experimental Biology and Medicine, Vol.*

*113, 1963; "Application of a Microtechnique to Viral Serological Investigations," The Journal of Immunology, March, 1962; "Protocol for Micro Anti-streptolysin O Determinations," Journal of Bacteriology, May, 1964.*

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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  $\mu$ . 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.)

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terfering 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  $\mu\text{g}$  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)

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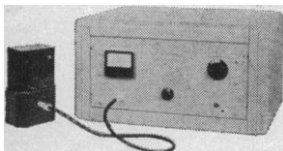
Robert L. Bowman (R.L.B.), with the assistance of Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

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

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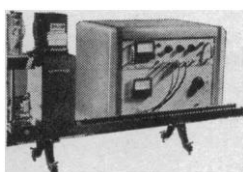
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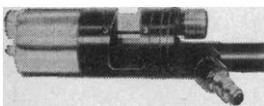
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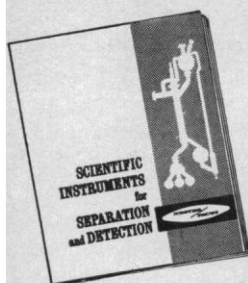
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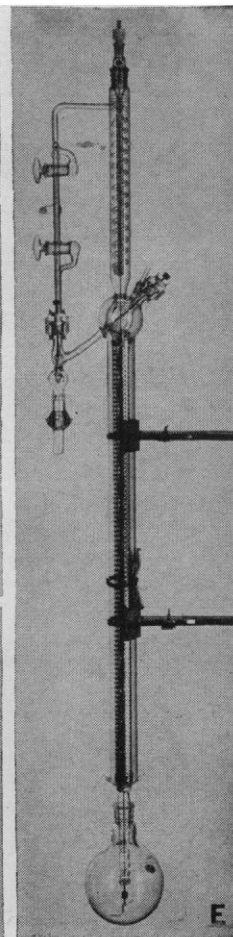
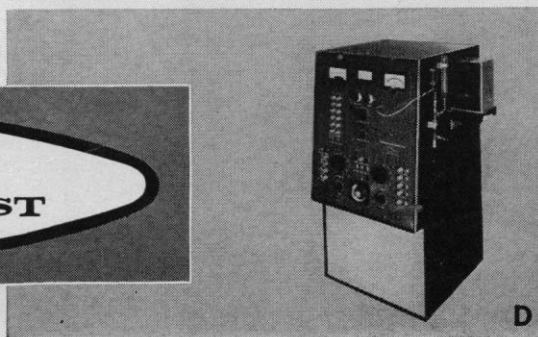
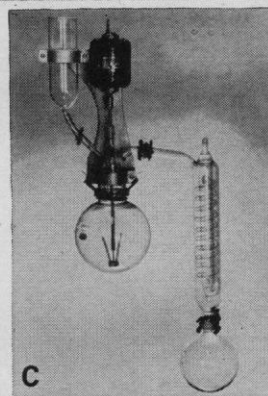
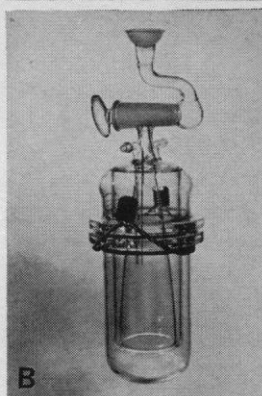


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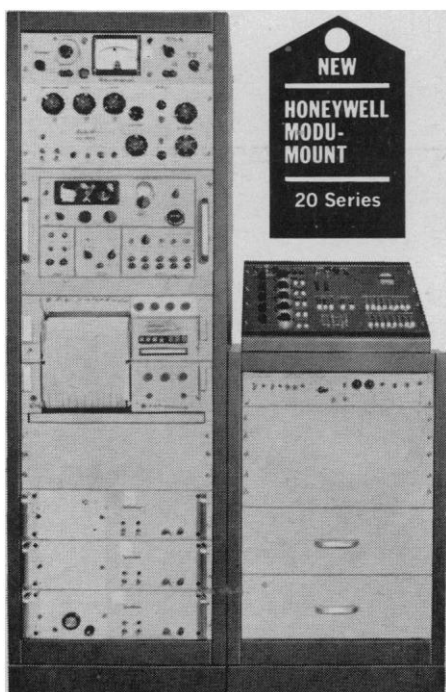
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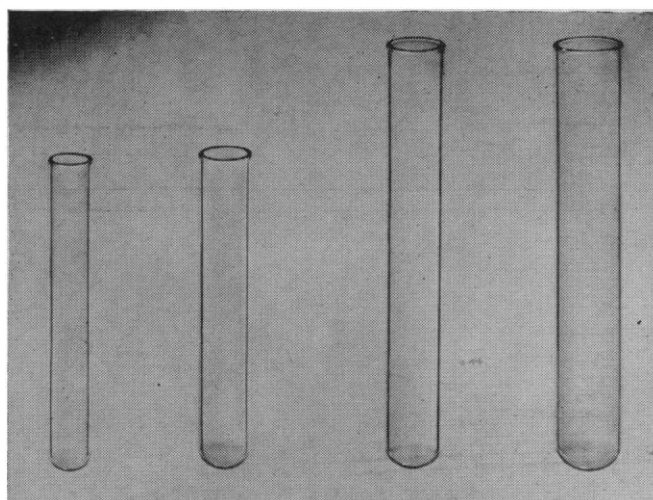
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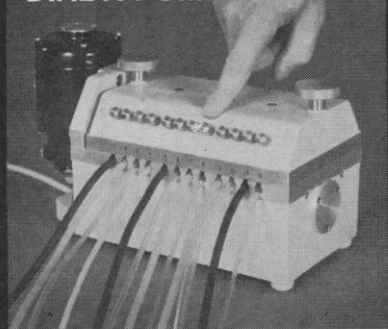
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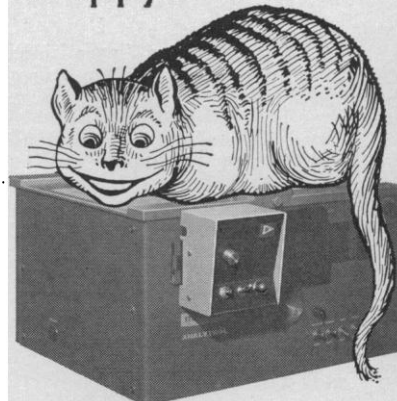
**Glass tissue-culture flask** with 82 in.<sup>2</sup> (529 cm<sup>2</sup>) of growing surface has a ground and polished flat bottom surface which provides more growing area and permits accurate viewing of tissue growth with a microscope. Cells remain in focus even when the field of view is changed because 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  $\pm 2^\circ$  and are 50 mm apart,  $\pm 2$  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 10 $\frac{1}{4}$  inches (26 cm). A nonprotruding opening takes a No. 4 stopper. The  $\frac{1}{4}$ -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.)

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**A.** That's right.

**Q.** More clear and reproducible, too?

**A.** Yes.

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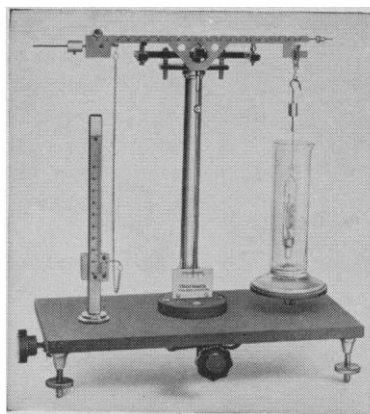
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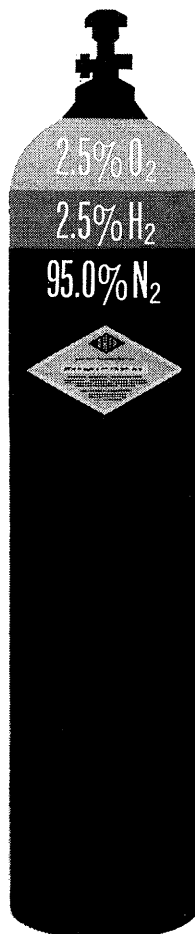
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## NEWS AND COMMENT

(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

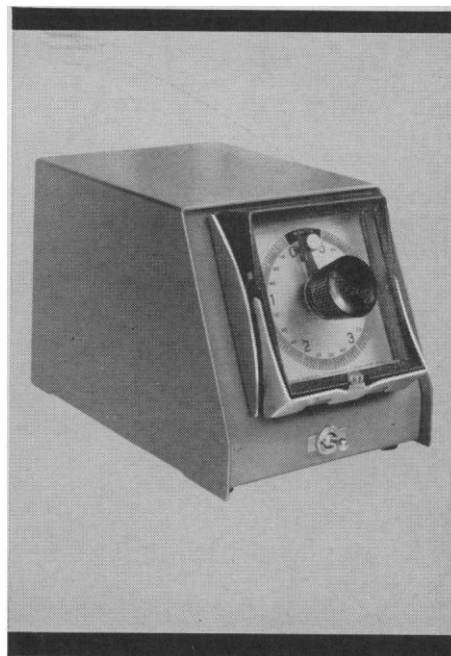
The Office of Naval Research, Harvard's Museum of Comparative Zoology, and the American Geographical Society have made available an inventory of material and data on the **marine environment of the western North Atlantic**. The inventory is the result of a project begun in 1960 to assemble information 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-

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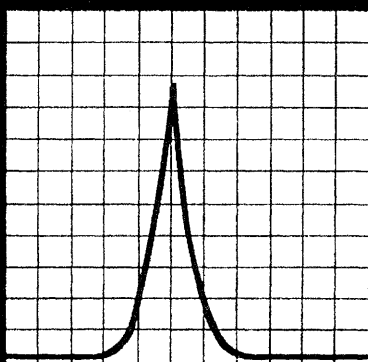
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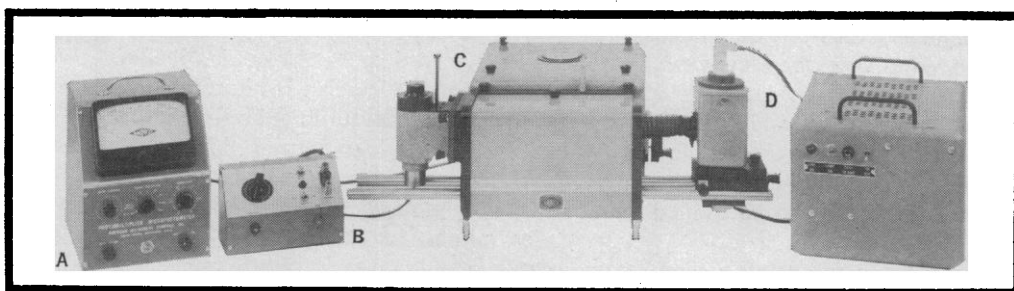


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line for receipt of abstracts in duplicate: *15 August*; for papers: *15 November*. (Convener, Symposium, Marine Biological Association of India, Marine Fisheries P.O., Mandapam Camp, S. India)

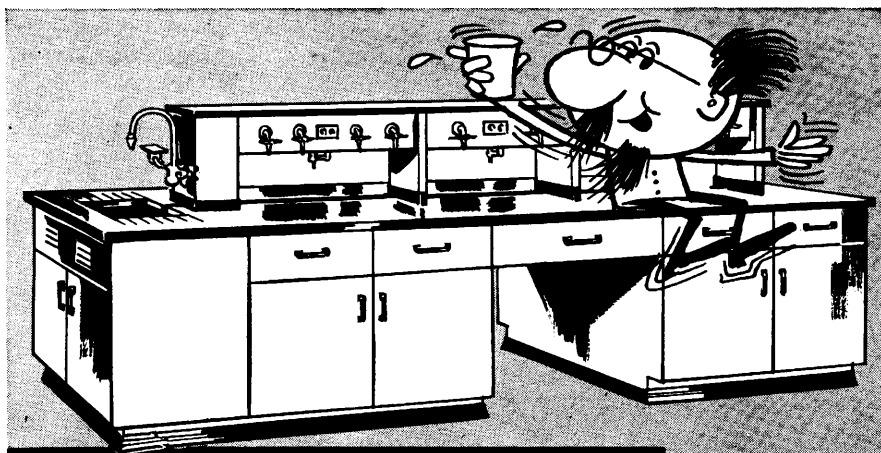
The Association of Official **Agricultural Chemists** will hold its 78th annual meeting 19–22 October in Washington, D.C. Approximately 300 papers will be presented on analytical methods, and an exhibit of laboratory equipment and supplies is also scheduled. Registration is free. (L. G. Enslinger, AOAC,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



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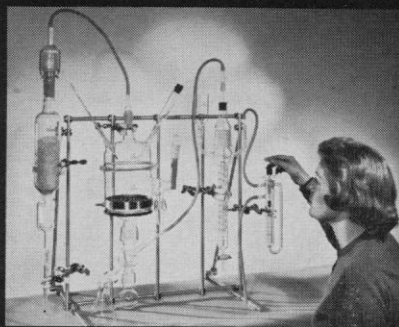
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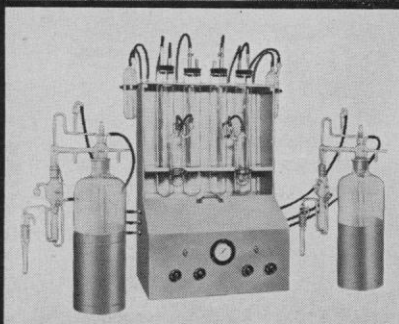
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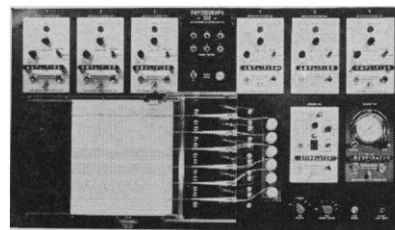
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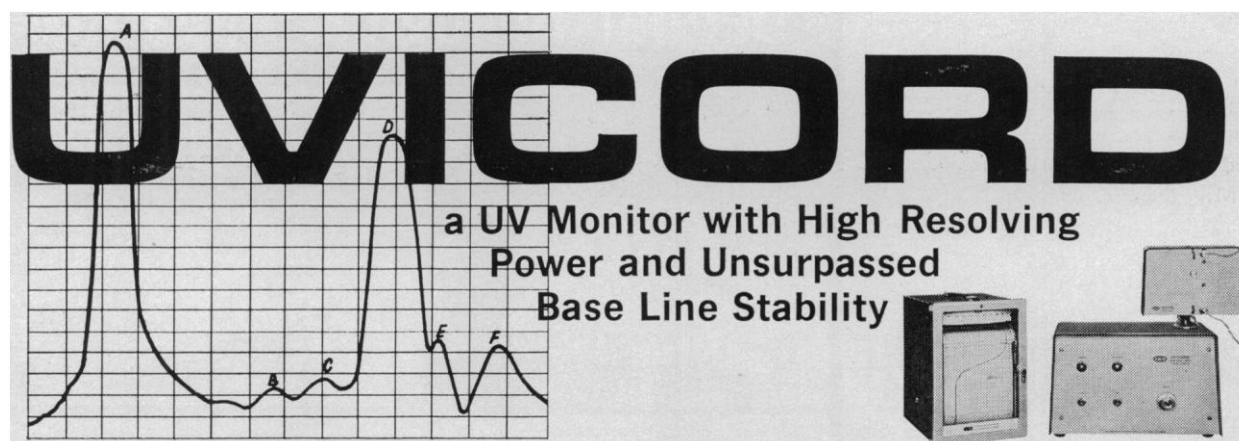
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Spanish; facilities for simultaneous translation will be available. Abstracts of 100 words are required. Deadline: 15 September. (Abstracts from the U.S. and Canada: W. H. Holtzmann, Hogg Foundation for Mental Health, University of Texas, Austin 12; 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

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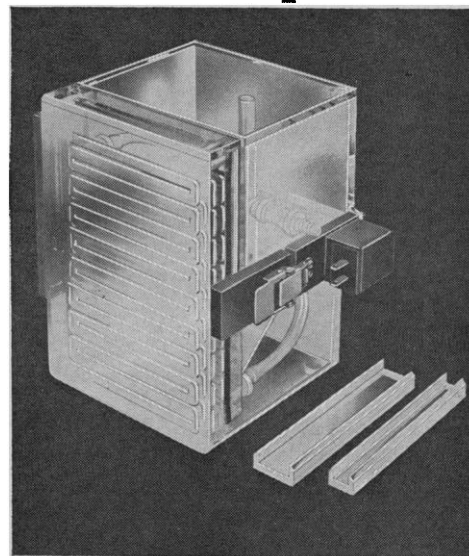
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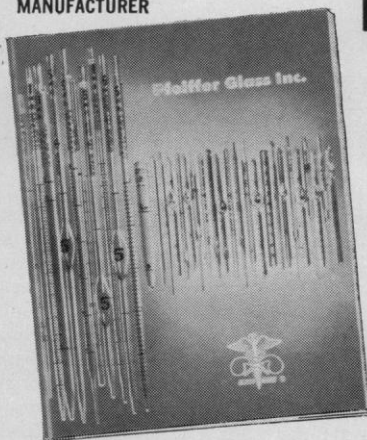
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devices and new device technology. Abstracts of 200 words, without figures, are needed. Deadline: *1 August*. (R. W. Peter, Watkins-Johnson Co., 3333 Hillview Ave., Palo Alto, Calif.)

### 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.

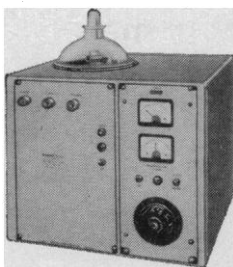
**Jack B. Bresler**, associate professor of biology at Boston University, has been appointed director of research development at the university, as of 1 August.

**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.

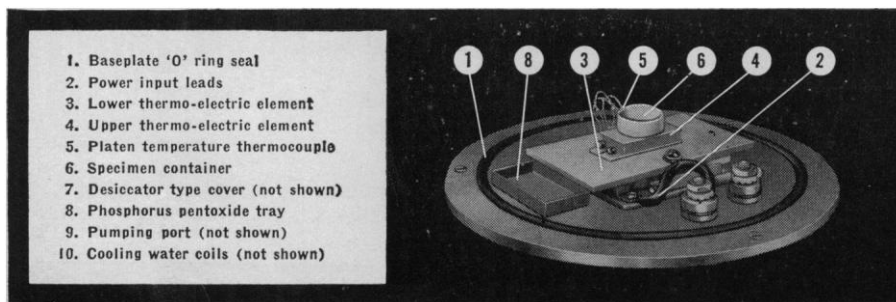
**Bruce Charles Heezen**, assistant geology professor at Columbia, has been awarded the H. B. Bigelow medal by Woods Hole Oceanographic Institution, for "his contributions to knowledge of the ocean floor and the geologic processes peculiar to the oceanic crust." The award carries a \$2500 honorarium.

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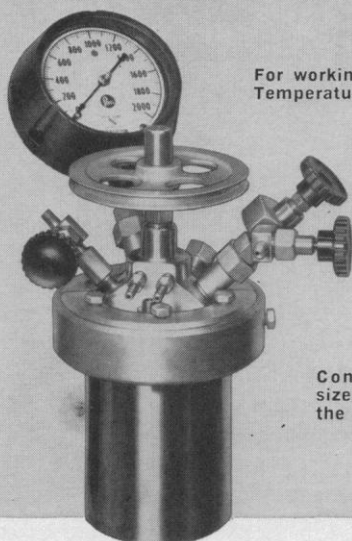
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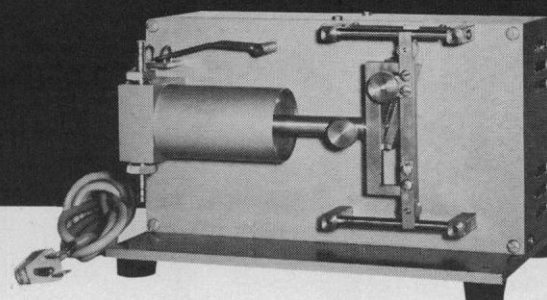
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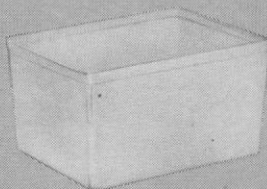
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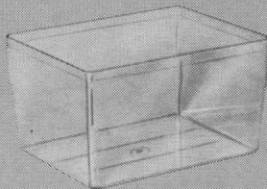
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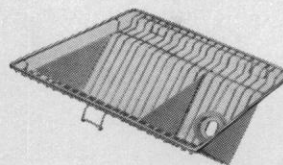
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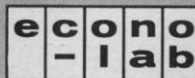
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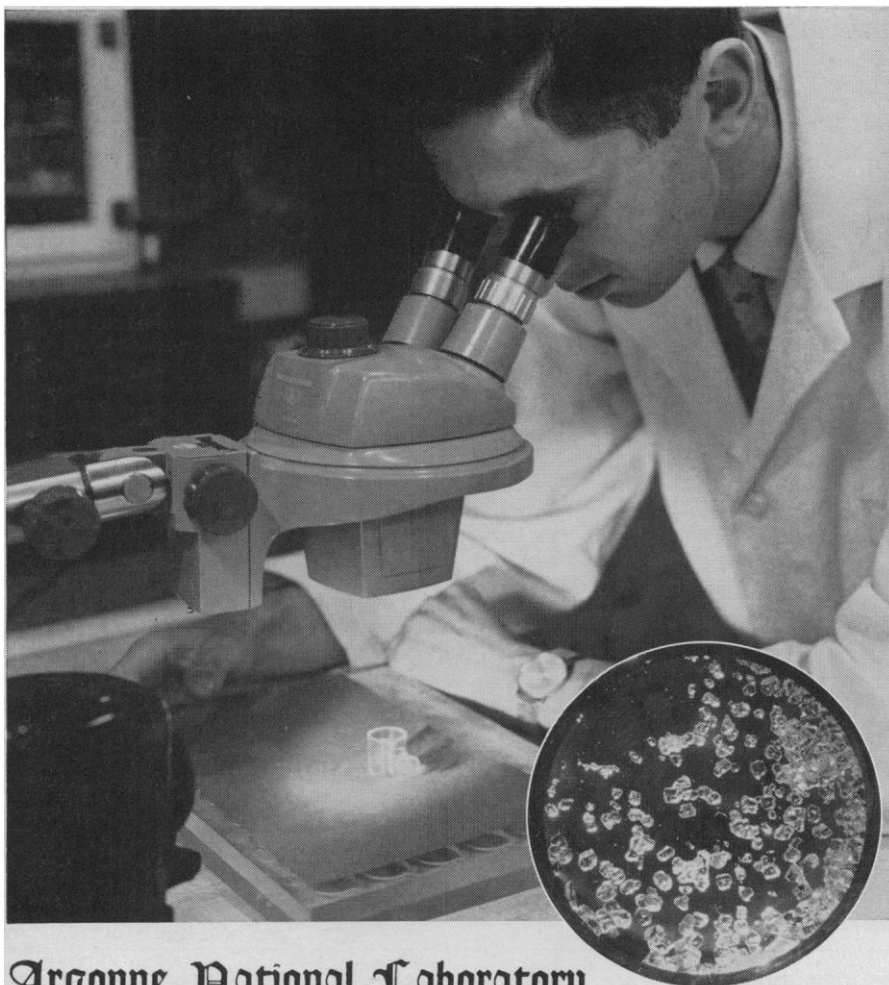
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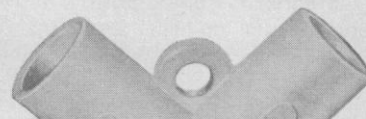
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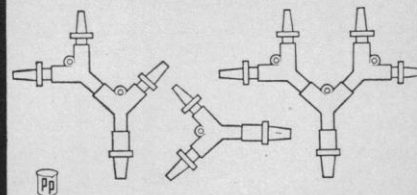
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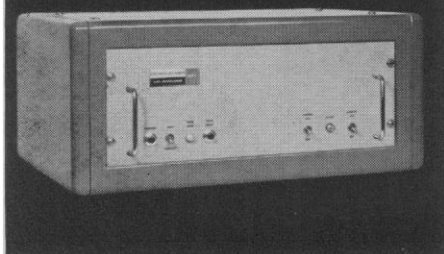


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# PERKIN-ELMER

**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

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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 *Thoraxchirurgie*.