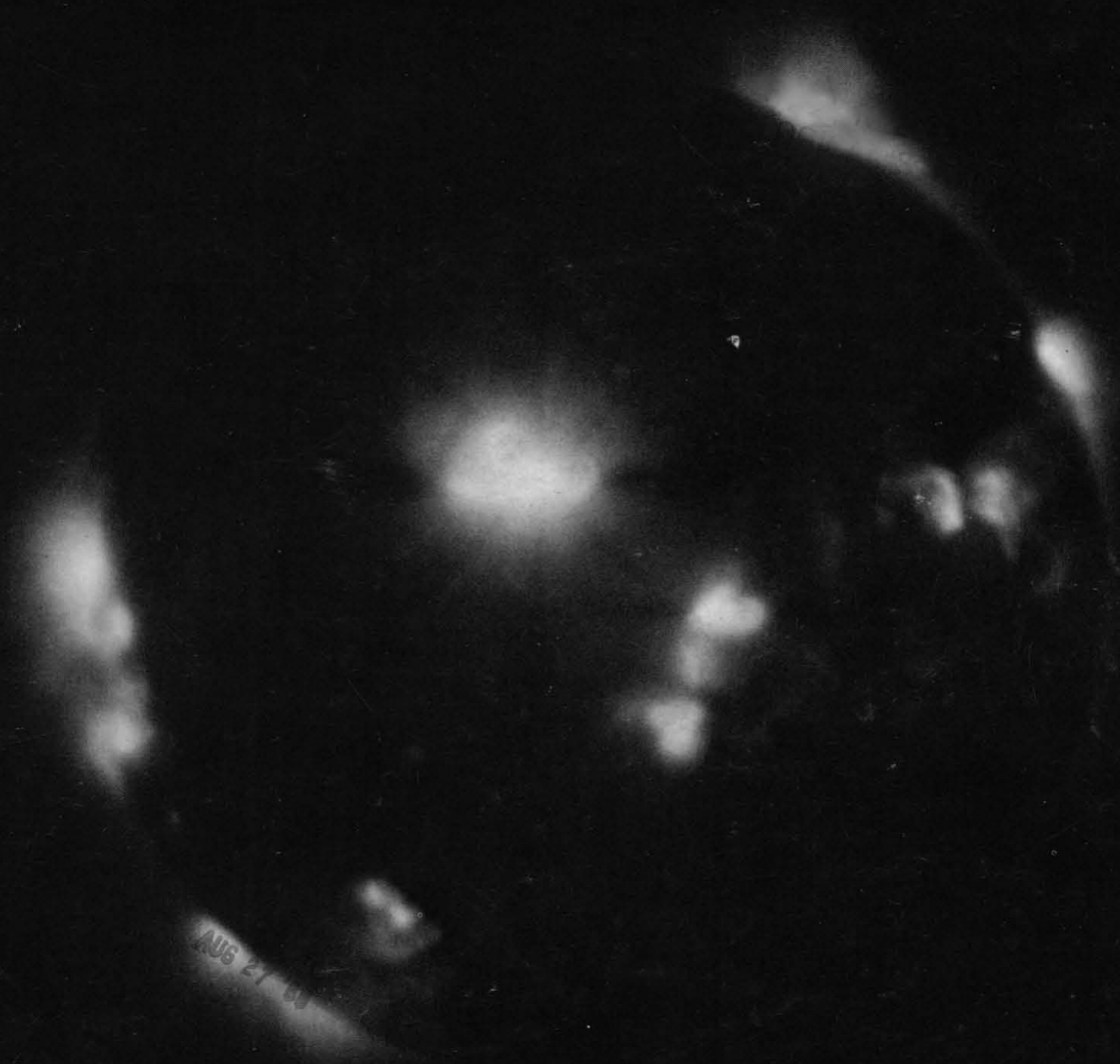


# SCIENCE

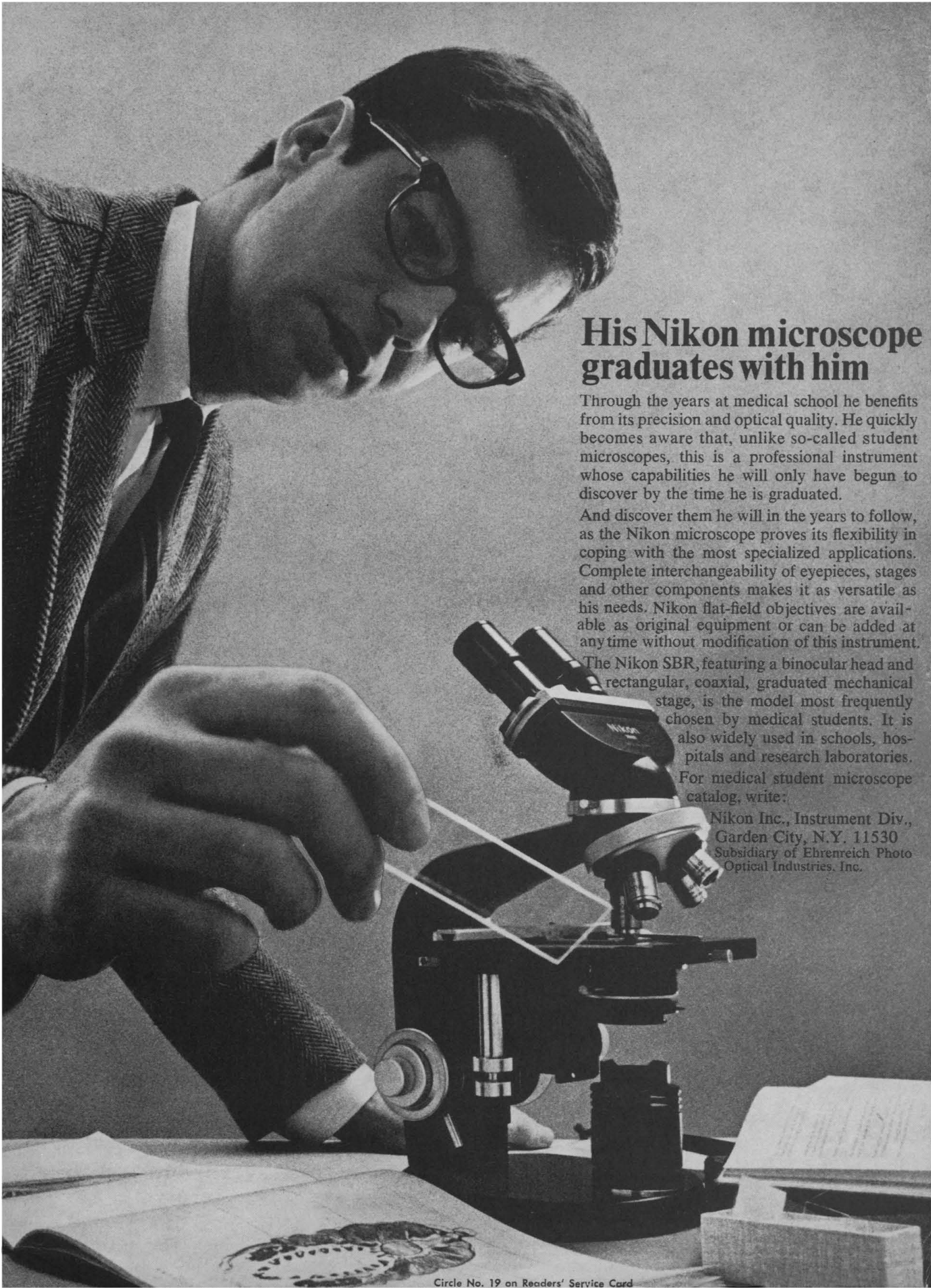
9 August 1968

Vol. 161, No. 3841

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



FLARING X-RAY SUN



## His Nikon microscope graduates with him

Through the years at medical school he benefits from its precision and optical quality. He quickly becomes aware that, unlike so-called student microscopes, this is a professional instrument whose capabilities he will only have begun to discover by the time he is graduated.

And discover them he will in the years to follow, as the Nikon microscope proves its flexibility in coping with the most specialized applications. Complete interchangeability of eyepieces, stages and other components makes it as versatile as his needs. Nikon flat-field objectives are available as original equipment or can be added at any time without modification of this instrument.

The Nikon SBR, featuring a binocular head and rectangular, coaxial, graduated mechanical stage, is the model most frequently chosen by medical students. It is also widely used in schools, hospitals and research laboratories. For medical student microscope catalog, write:

Nikon Inc., Instrument Div.,  
Garden City, N.Y. 11530  
Subsidiary of Ehrenreich Photo  
Optical Industries, Inc.

# Mettler guide to the budget balance

Low cost, a fair consideration in any purchase, is only one of several compelling benefits resulting from Mettler's thoughtful re-design of its classic substitution balance.

Mettler's objective was to produce five new weighing instruments providing the ultimate in balance performance for the user, whether he be researcher or technician or student. To this end, Mettler applied the latest in design, manufacturing and human engineering concepts.

## **SIMPLICITY IS THE KEY**

Mettler began by simplifying the balance mechanism.

- Individual molded parts were substituted for multi-part assemblies.
- Mettler's exclusive concentric ring weights were used, cutting in half the number of weights needed.
- Optical and mechanical control systems were simplified by placing them at the operator's eye level.

From this re-design comes better balances that are faster and easier to make . . . and they cost considerably less than the instruments they replace.

## **IMPROVED PERFORMANCE, NEW CAPACITIES**

The five new balances range from an economical student model through standard analytical models to a semi-micro balance. All have capacities of 160 grams or greater.

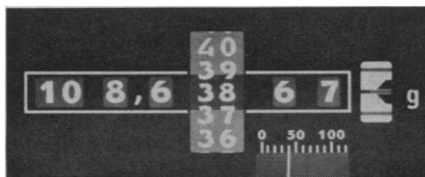
Their new beam designs and pan brakes make them far more stable and permit faster weighings than conventional balances.

Their precision-to-capacity relationships are exceptional. The Model H20, for example, combines the 160.1-gram capacity of an analytical balance with the  $\pm 0.01$  mg precision of a semi-micro instrument.

## **READING DIGITS IS EASIER**

The new Mettlers are available with either digital or vernier readout of weighing data.

Vernier reading costs less and sometimes is preferred by those who want to read that last numeral without adjusting a digital control knob. Digital readout is preferred by most users because of its speed and convenience. Human factors research has shown digital readout to be twice as fast and three times as accurate as reading dials or scales.



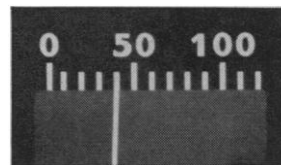
Clear, aligned digital readout

Mettler's digital readout has all numerals grouped and clearly aligned. Even an inexperienced technician or student can obtain highest levels of accuracy in weighing after only a few minutes of instruction.

All controls are clearly labeled and the readout has directional indicators, arrows on the readout panel to tell which way to dial the weight set.

## **PRE-WEIGHING UNLIMITED**

One balance, the Mettler H10W, is equipped with an advanced pre-weighing feature. Pre-weighing gives an immediate indication of approximate weight with no intermediate dialing step. The new Mettler pre-weighing feature operates over the full range of the balance, avoiding the delay of a second dialing step if the sample exceeds 100 grams.



High-speed filling guide

## **ONCE AGAIN, WITH FILLING**

All five have the exclusive Mettler filling guide. This lets you do one of the most common and time-consuming weighing jobs—filling to a target weight—in less than half the usual time. There are no repeated interruptions to the work. You proceed in orderly manner, filling to within the last few milligrams.



## **OPTICAL RANGE TARING**

Taring across the optical range enables you to return the balance scale to zero to compensate for odd or fractional weights of the container. It goes a long way toward eliminating arithmetic calculations from the weighing operation.

## **BELOW-BALANCE ACCESSORY**

Weighing objects below the balance, as in specific gravity measurements, is a simple job with the new Mettlers. An accessory kit which attaches directly to the balance pan provides the means.

## **TRY ONE NOW**

Call any major laboratory supply dealer. Or write us for descriptive literature. We are Mettler Instrument Corporation, 20 Nassau Street, Princeton, New Jersey 08540.

**METTLER®**

Instrument	Capacity	Precision	Readout
H8 Semi-analytical	160 grams	$\pm 0.3$ mg	Vernier
H10 Analytical	161 grams	$\pm 0.05$ mg	Digital
H10W Analytical pre-weighing	161 grams	$\pm 0.05$ mg	Digital
H18 Analytical	160.1 grams	$\pm 0.03$ mg	Vernier
H20 Semi-micro	160.1 grams	$\pm 0.01$ mg	Digital



9 August 1968  
Vol. 161, No. 3841

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## COVER

X-ray photograph of the sun (taken with a rocket-borne x-ray telescope) shows coronal plasmas at temperatures of millions of degrees. Solar north is approximately at 5 o'clock, with east to the right. The x-ray emitting regions, shaped by magnetic fields and sometimes rich in superthermal particles, provide a natural astrophysical laboratory. The flare (center), probably a sudden release of magnetic energy, reveals for the first time its x-ray structure. See page 564. [G. S. Vaiana, W. P. Reidy, T. Zehnpfennig, L. VanSpreybroeck, and R. Giacconi, American Science and Engineering, Cambridge, Massachusetts]

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Electrophoresis  
on Gels...



## New Automatic Electrophoretic Elutor **BUCHLER FRACTOPHORATOR™**

**Now You Can Use Almost Any Gel...  
Any Buffer... Any Fraction Collector!**

The Fractophorator, for disc electrophoresis, is designed for the separation of proteins, hemoglobin, albumin, enzymes and other compounds using polyacrylamide or any other supporting medium. It automatically elutes in pre-determined amounts of buffer solution, individual bands emerging from the electrophoretic column and delivers the fractions to a collector. The complete unit can be attached to any electrically driven fraction collector and is activated by the collector's timing system. Load capacity is from a few micrograms to 25 mgm in a 13mm diameter by 130mm long column.

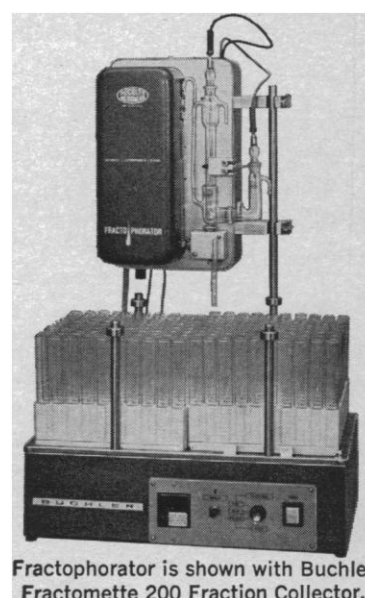
No other instrument offers all these advantages: very simple to set up and operate; automatic synchronizations with any fraction collector; all glass columns; extreme flexibility in selection of buffer and gel composition; no loss of sample; may be operated in refrigerator or cold room. **Price: \$570.00**



For further information request Technical Bulletin S3-1800

**BUCHLER INSTRUMENTS, INC.**  
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Fractophorator is shown with Buchler Fractometre 200 Fraction Collector.

When you call or write us about our new DR Direct-Reading pH Meter, you'll learn all this:

The DR reads directly, in digits, to 0.001 pH.

Has an absolute accuracy of  $\pm 0.01$  pH (with a repeatability of  $\pm 0.002$  pH).

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And is priced at \$600.00 (with combination electrode and solutions).



Conclusion: Request a demonstration. B-217

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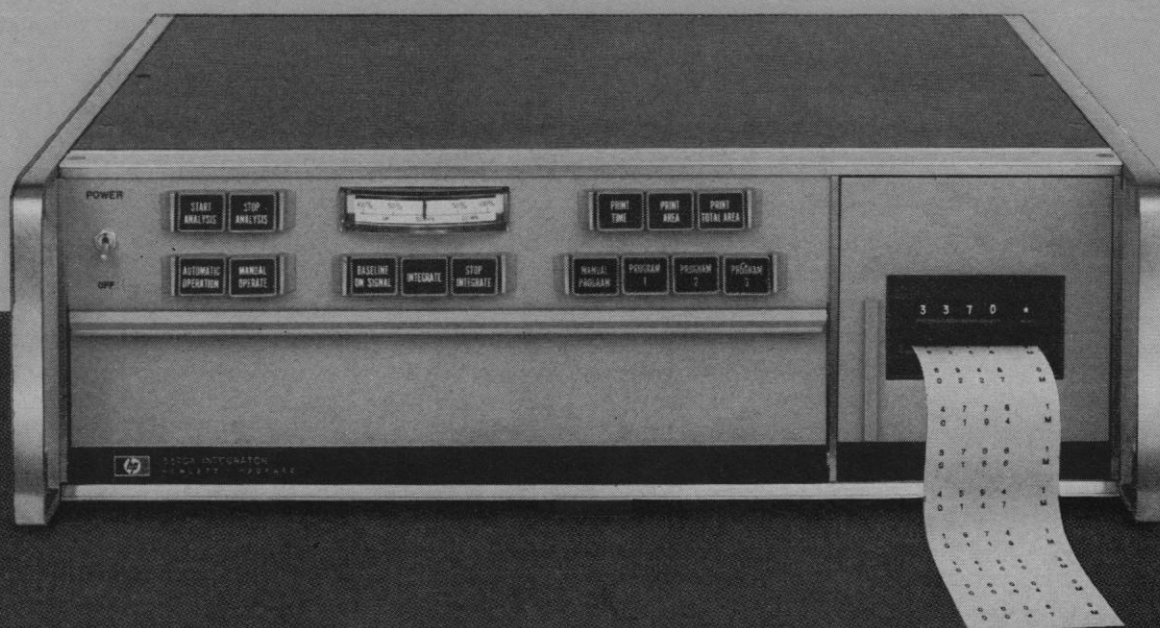
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**New GC INTEGRATOR  
lets you pushbutton-select  
any of four programs  
... to optimize  
performance for different  
sample types, even  
for individual peaks**



With the new H-P 3370A Electronic Digital Integrator, four different sets of pre-set analysis parameters are instantly available to the operator, at the touch of a pushbutton.

For the research laboratory, this feature allows the experienced chromatographer to choose precisely the correct program for different sections of a chromatogram . . . changing the program at will in order to optimize the integration of every peak.

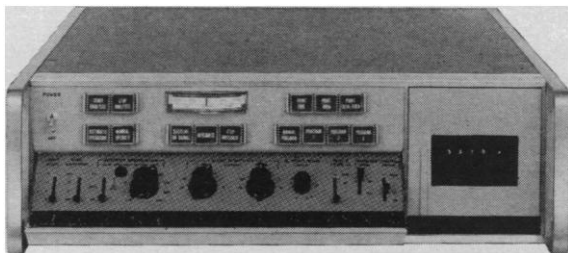
For the control laboratory, selectable programs give the chief chemist the opportunity to optimize the analysis parameters for each kind of sample, while reducing the set-up and actual integration procedure to simple 1-2-3-4 instructions for technician operators.

### A UNIQUE PROGRAMMING FLEXIBILITY

Like all other electronic digital integrators, the 3370A has a full complement of adjustments that enable it to detect the beginning, apex and end of a peak, to distinguish noise and reject it, and to provide baseline correction when desired.

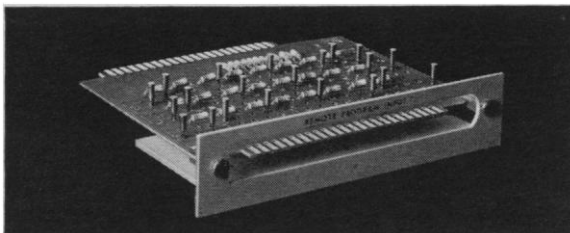
Unlike any other integrator, regardless of price, the 3370A incorporates a unique programming feature that allows the chromatographer a choice of four pushbutton-selected sets of analysis parameters.

#### MANUAL PROGRAM



The *Manual Program* pushbutton activates a series of adjustments on a swingdown panel. In addition to a control for each of the important analysis parameters, the swingdown panel also contains a number of drawings which greatly facilitate the use of the controls by graphically showing how each affects the integration.

#### THREE PLUG-IN BOARD PROGRAMS



The three other pushbuttons activate one of three programs contained on a printed circuit board that plugs into the back of the 3370A. Each program is completely changeable by moving plug-in circuit pins to various positions on the board which correspond to the analysis parameter settings on the swingdown panel.

Additional boards can be pre-set and plugged into the 3370A when desired, thus giving it literally an unlimited choice of pushbutton-selected programs to meet changing requirements.

The 3370A enjoys other exclusive programming features that are equally useful to the chromatographer. Separate up and down slope sensitivity controls let the chromatographer optimize the integration of tailing, overloaded and all imperfectly shaped peaks . . . rather than compromise it as he must when using any other integrator. Separate front and rear shoulder controls and a peak summation control give him a new dimension of flexibility for the integration of complex peak shapes. Coded superimposed event markers graphically establish the precise relationship of all integrator functions to the recorded chromatogram. And in all three of the most important measures of performance, the 3370A sets new standards: precision of  $\pm 0.05\%$ , linearity of  $\pm 0.1\%$ , dynamic range of 1,000,000:1.

Get a full description of the 3370A Electronic Digital Integrator by calling the nearest H-P sales office . . . or write for Bulletin 3370A. Price is \$4500 including the built-in printer; total area accumulator option is available for an additional \$300; and 8-digit visual display costs an additional \$700.

Hewlett-Packard, Route 41, Avondale, Pennsylvania 19311. In Europe: 54 Route des Acacias, Geneva.



ANALYTICAL INSTRUMENTS

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43801



Model 400S Electron Microprobe Analyzer provides the following displays—primary electrons, secondary electrons (including voltage contrast), electron beam induced conductivity, cathodoluminescence, specimen current, and x-ray. Displays in either intensity modulation or oblique projection. Reduced area TV scan for focusing.

## A mosquito makes history

Back-scattered electron image of mosquito (**specimen uncoated**). **Instrument:** Materials Analysis Company Model 400S Combination Electron Microprobe Analyzer-Scanning Electron Microscope. **Voltage:** 24 KV. **Specimen Current:** 200 picoamps. **Magnification:** 80X. **Date:** March 18, 1968.

This remarkable photograph—taken in just 20 seconds—illustrates the unique performance of a new combination electron microprobe analyzer-scanning electron microscope developed by Materials Analysis Company. There's just no other way to get a picture like this.

The mosquito image was produced by the new Model 400S, which provides both microprobe x-ray analysis and scanning electron microscopy capabilities. Resolution is 1,000 Å or better in the scanning mode! And, a spot-size of 0.15 microns is guaranteed. Image magnifications range from 30X to 50,000X. With the x-ray system, both qualitative and quantitative chemical analyses of micron-sized volumes can be performed. All elements from boron up through the periodic table can be analyzed.

The 400S also features solid-state, modular design, up to three fully-focusing Johansson-type x-ray spectrometers, and a wide range of accessories.

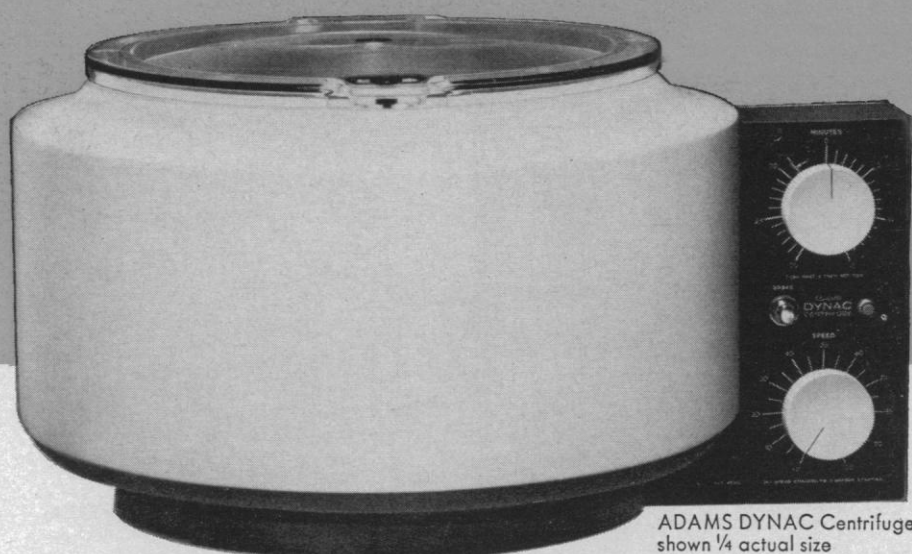
There's more good news. For high-resolution scanning microscopy, Materials Analysis Company has developed the Model 700. And for analysis of highly radioactive specimens, MAC offers the Model 450 Electron Microprobe Analyzer.

All three instruments are available on a leasing basis. For complete details, please write to us at 1060 East Meadow Circle, Palo Alto, California 94303. Phone (415) 326-6556.

**MAC**  
MATERIALS ANALYSIS COMPANY



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ADAMS DYNAC Centrifuge  
shown 1/4 actual size

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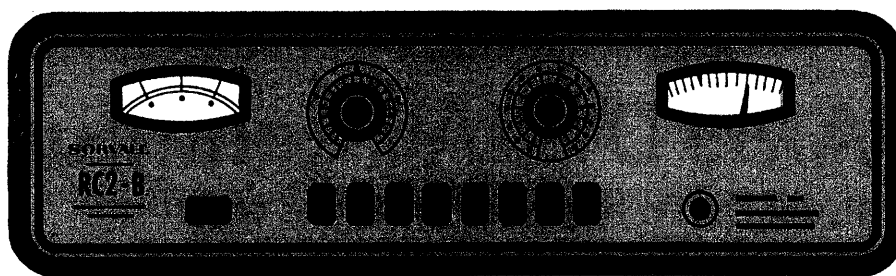
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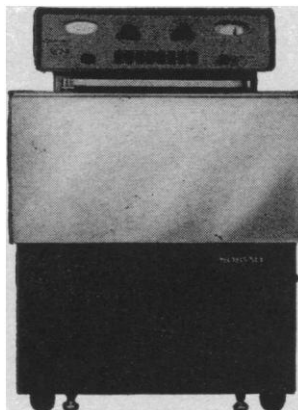
*SORVALL automatic reproducibility is just as simple as...*

## **...PUSHING A BUTTON**



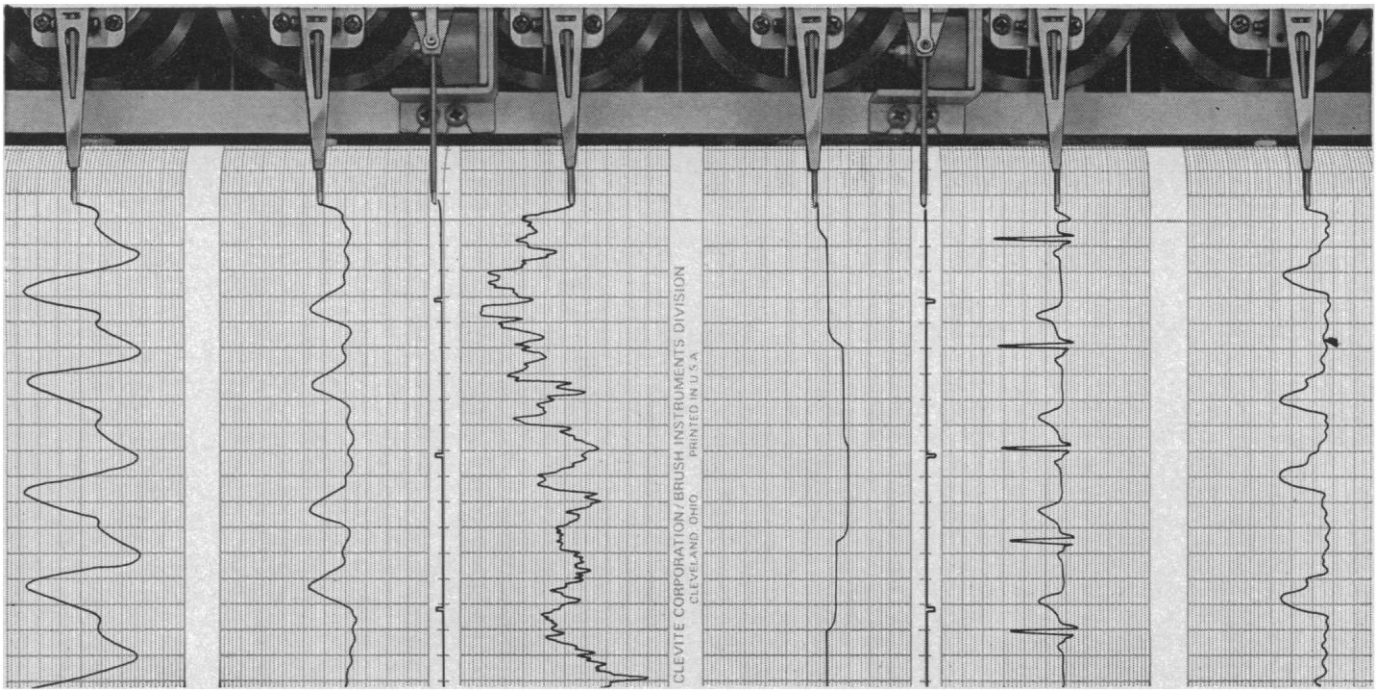
The RC2-B Automatic Refrigerated Centrifuge provides the researcher with reliable, programmed acceleration, timing, and automatic braking that can be duplicated as many times as the operator requires. The Control Panel of the RC2-B is a feature in itself! It was designed for operator convenience and located for safety. Its elevated, rear position makes it easy to read and use while protecting it from accidental damage. All switches and dials are logically arranged, and plug-in components simplify any required maintenance. Controls may be altered (purposely or accidentally) while the centrifuge is running, and the instrument will respond automatically, without danger to user or instrument. Dynamic braking provides smoother deceleration than any other system available. Consequently, resuspension problems are eliminated. Briefly, if you want the best possible control over your separations — rely on SORVALL controls. Just write:

Ivan Sorvall, Inc., Norwalk, Connecticut 06852. **SORVALL®**



For additional information, ask  
for Bulletin SC-8RC2-PB.

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Close-up of a Brush medical recorder shows trace clarity, sharpness and high resolution that contribute to superb accuracy of Brush instruments.

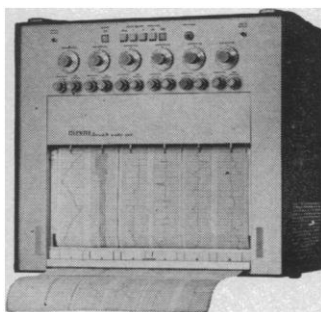
## Brush medical recorders deliver more physiology and less fooling than any other make you can buy

We take the fooling out of recording . . . both kinds: the deceptive traces which result from intermingling physiology with artifact, and the need to fool with calibration controls. Unlike ordinary medical recorders, the calibration of Brush recorders remains constant regardless of baseline position, attenuator setting, or gain. Test after test, year after year.

More physiology and less artifact. That's what Brush delivers.

In addition, Brush medical recorders maintain specified system accuracy from one edge of the chart to the other and at *all points* in between.

You can believe the high degree of resolution and system accuracy only when you see some physiological wave forms actually recorded on a Brush instrument. Write for your set of samples.

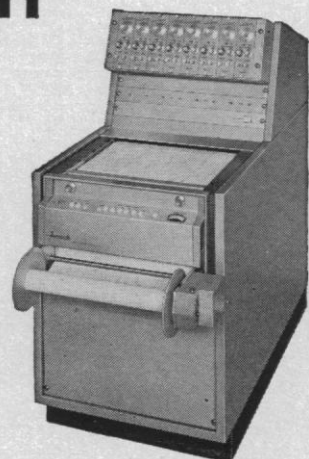


### CLEVITE BRUSH

There are Brush medical recorders with 1, 2, 3, 4, 5, 6, 7, and 8 channels for physiological data acquisition. Illustrated are the Mark 200 lowboy and the Mark 260.

The Mark 200 lowboy (right) is an eight-channel system that combines solid-state electronics with modular construction to economically meet your specific requirements. Choice of channel widths and bio-medical front ends. Range of chart speeds 0.05 to 200 mm/sec. Patented pressure-fluid writing system.

The Mark 260 (left) is a high-performance portable recorder at half the big-system price. Six analog channels and four event channels. Features the Brush patented pressure-fluid system. Frequency response: 70 Hz at 0.5 full scale; 40 Hz at full scale.





# Six important reasons why Brush medical recorders are best for physiological data acquisition

## 1. Self-calibrating

Brush medical recorders are factory calibrated with instrument standards one step removed from The National Bureau of Standards. Unlike ordinary recorders, they stay that way, test after test, year after year, regardless of baseline position, attenuation, or gain setting.

## 2. More Physiology

We take the fooling out of recording . . . both kinds: the deceptive traces which result from intermingling physiology with artifact, and the need to fool with calibration controls.

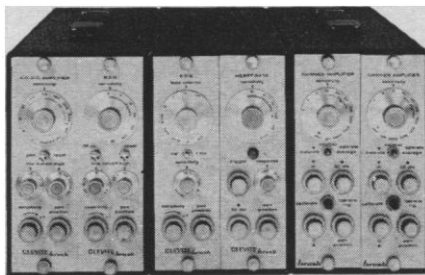
## 3. Wide Application

Brush data acquisition systems will accommodate a wide variety of physiological parameters, including:

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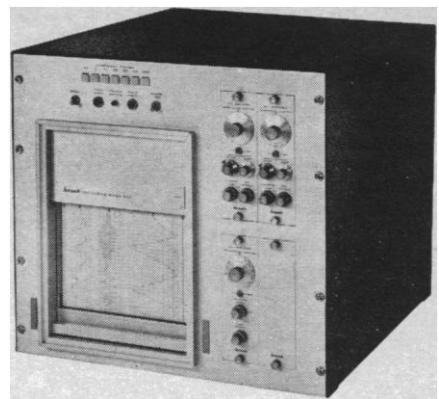
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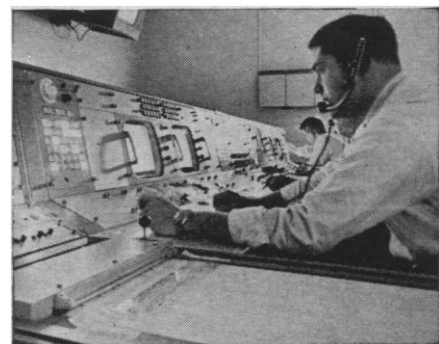
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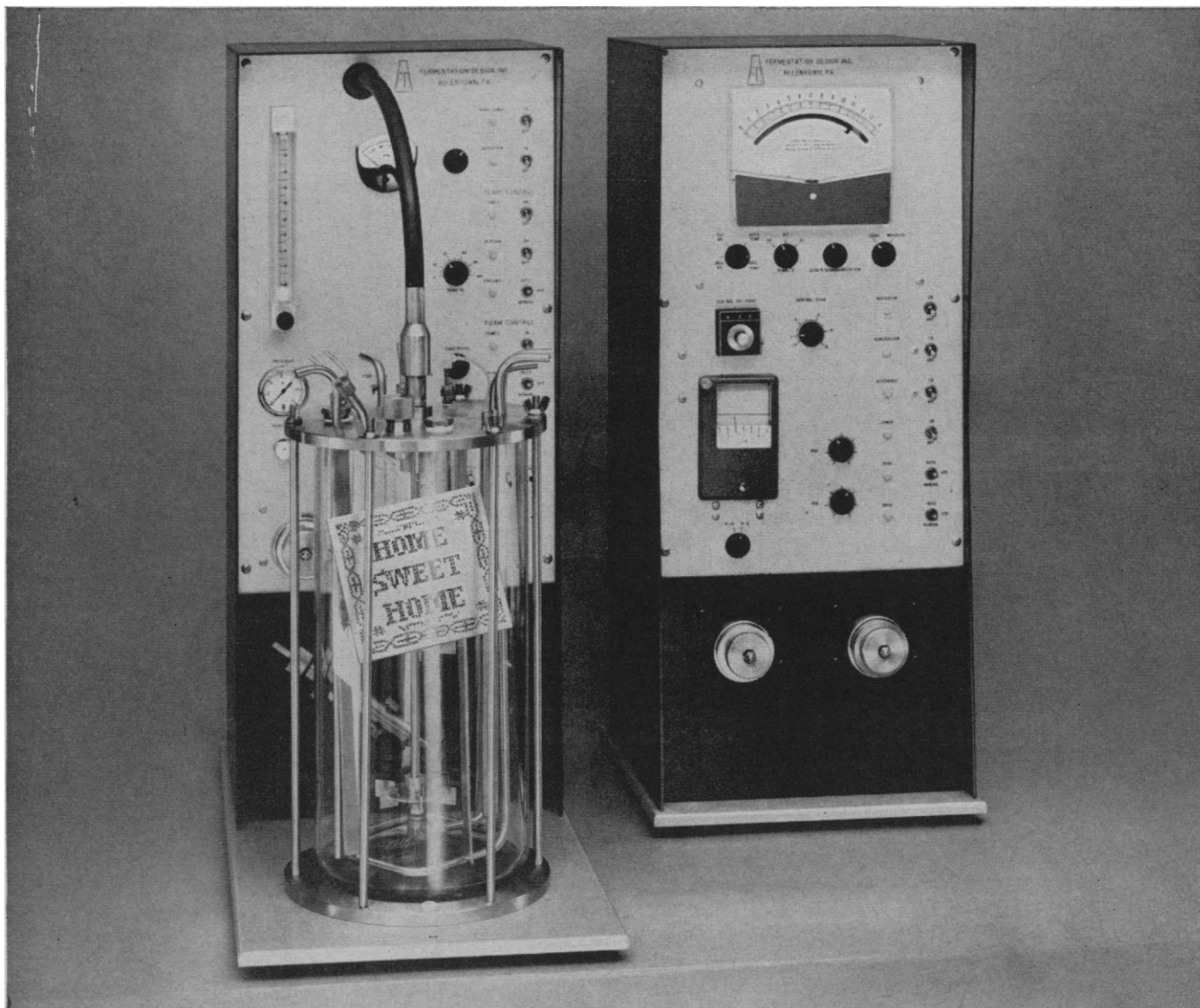
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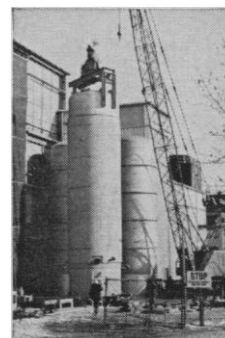
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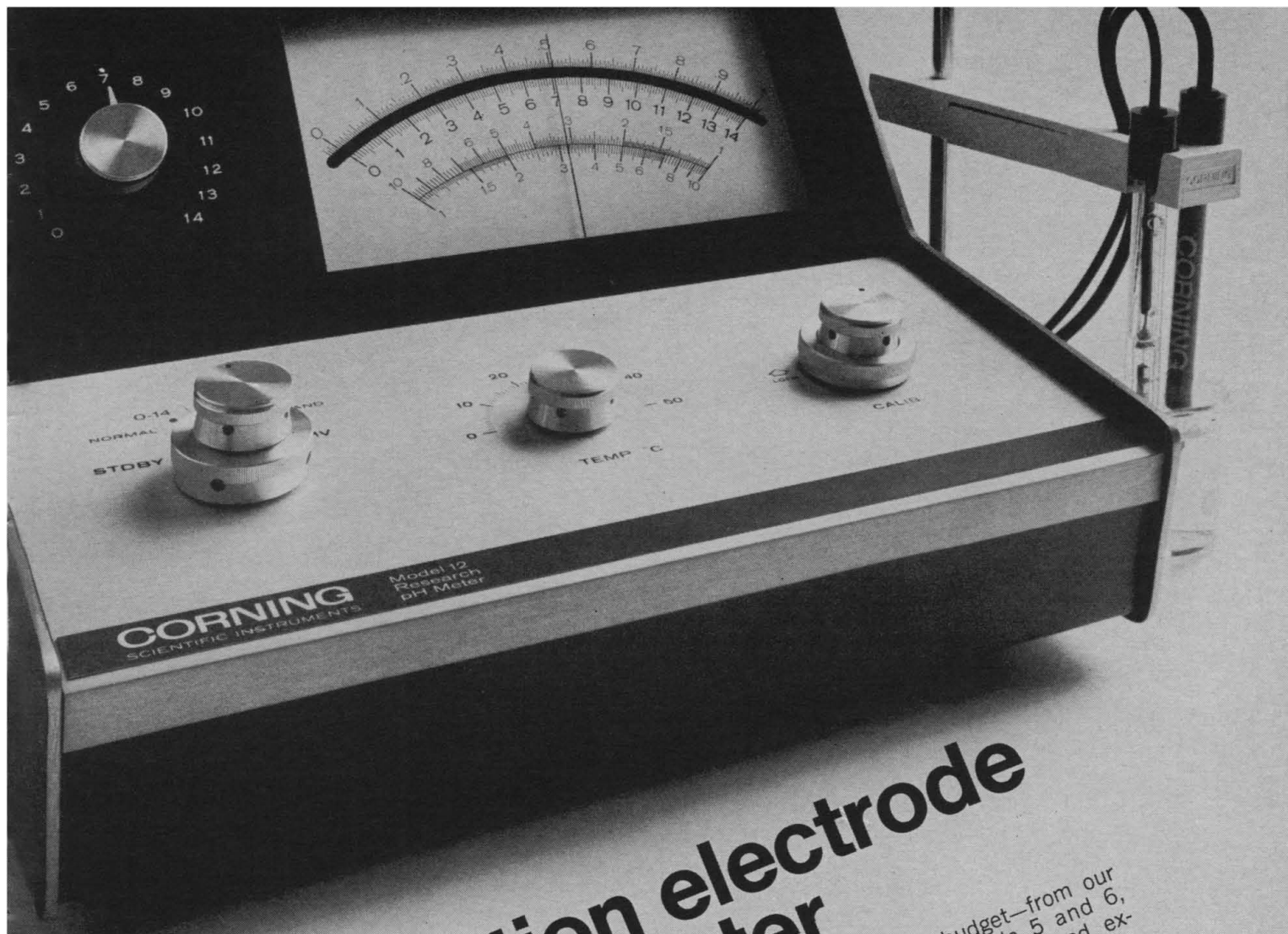
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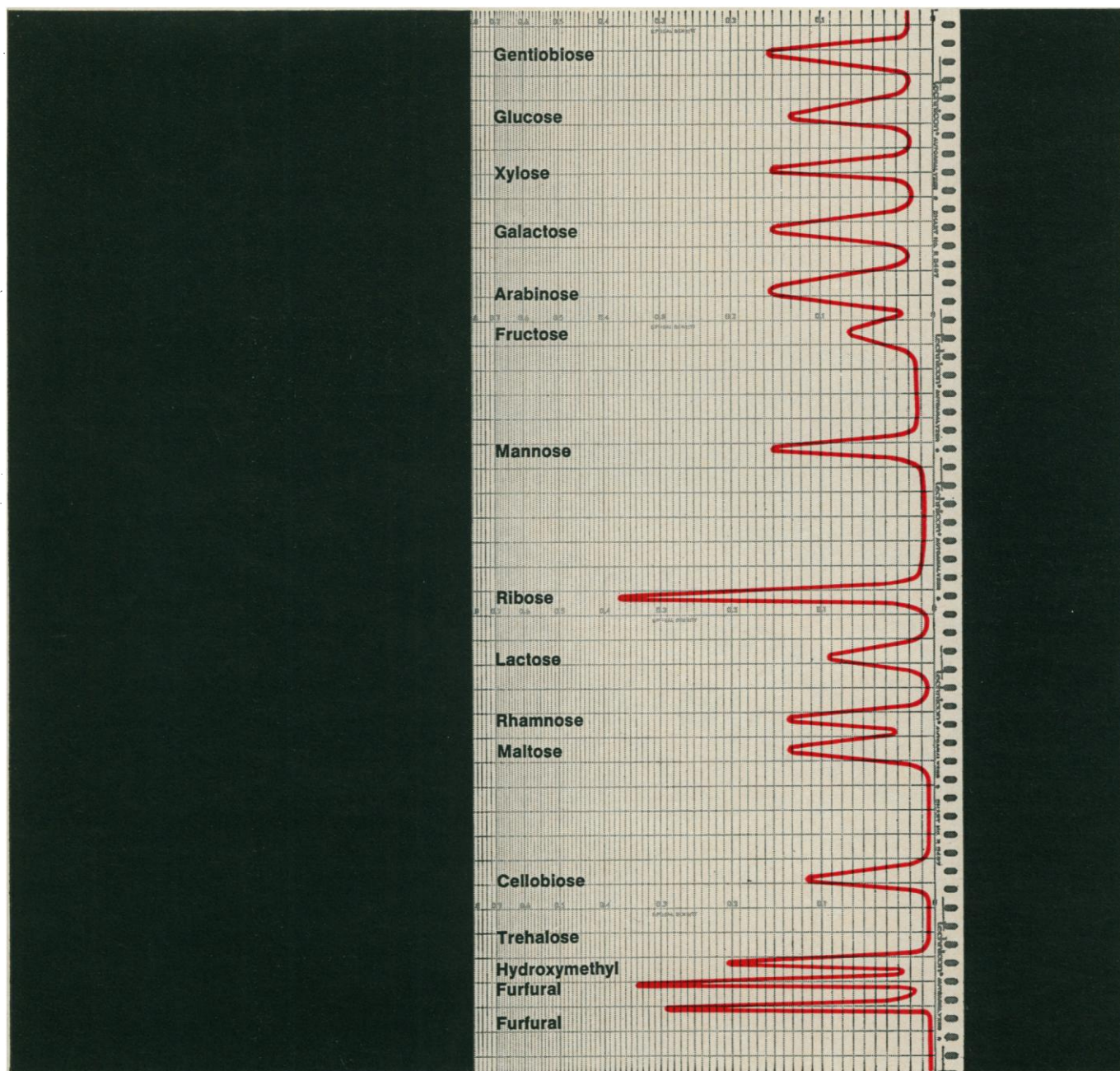
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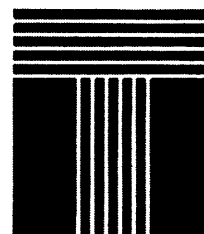


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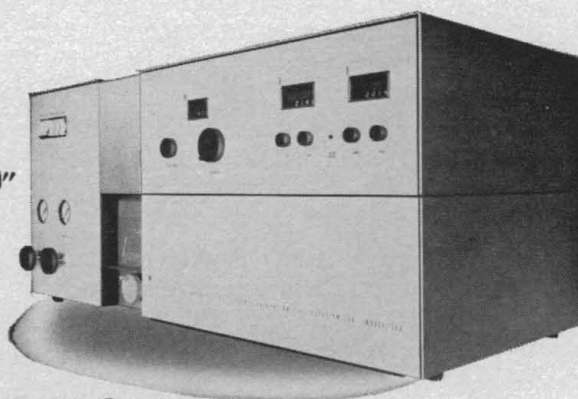
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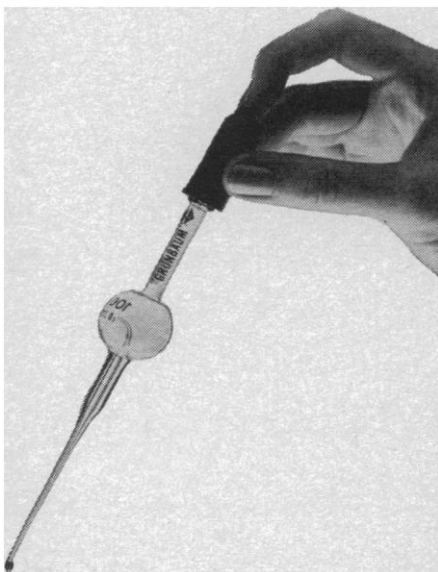
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contextual relativity of social behavior of dogs that has appeared. Although I would have liked to have seen more of the studies reported in greater detail, sufficient information is given to permit attempts to extend the work (1).

Clearly the volume is not free of defects: Kuo is polemical, sometimes to a fault; he fails to relate his ideas to recent movements in ethological and learning theory; there is a lack of precision in his use of some concepts, making them vulnerable to misinterpretation. Nevertheless, it is a major statement of position from a distinguished comparative psychologist on issues that are still very much alive. To this reader at least, Kuo's insights (and research) continue to be provocative and stimulating.

ROBERT B. CAIRNS

Department of Psychology,  
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## References and Notes

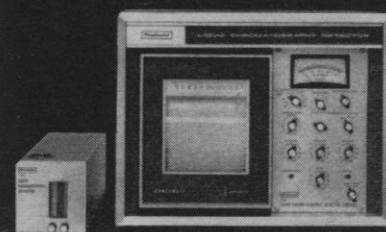
1. Findings generally consistent with Kuo's results have already appeared. See, for example, G. M. Burghardt and E. H. Hess, *Science* **151**, 108 (1966); R. B. Cairns, *J. Comp. Physiol. Psychol.* **62**, 298 (1966); R. B. Cairns and J. Werboff, *Science* **158**, 1070 (1967); V. H. Denenberg, G. A. Hudgens, M. X. Zarrow, *ibid.* **143**, 380 (1964); H. Goot, *Anim. Behav.* **10**, 232 (1962).

A careful reading of Kuo's book will indicate that my review dealt directly with the major positions adopted by the author. My basic objections to the book are not to the positions themselves but to the extreme form in which Kuo would have us adopt these positions. The framework provided by Kuo is a framework within which the science of behavior cannot proceed, and this was the theme of my review.

In response to Cairns's first specific comment, my reference to a "cop-out" was a reference to Kuo's handling of criticisms of the relationship between movements before hatching and later behavior. This example indicated to me that Kuo carries to an extreme the position that behavioral development is a continuous process. I think that if we carry things to the extreme that this example suggests, hypotheses concerning specific relationships (for example, the relationship between embryonic actions of the chick and later specific behavior patterns) are exchanged for vague and certainly much less meaningful statements such as the one made by Kuo on page 114.

Just as the prenatal visual responses and leg movements are historical antecedents of postnatal food-getting behavior, the prenatal movements of the beak, the head,

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and, in fact, the whole visceral system are part and parcel of innumerable gradient patterns of postnatal behavior such as "courtship," "threat," "preening," "running," "attacking," and innumerable other patterns of social behavior.

Cairns's second specific criticism of my review concerns Kuo's treatment of behavior and evolution. Certainly, environmental contributions to the evolutionary process cannot be denied. It should, however, be kept in mind that the very plasticity with which Kuo would have us deal has not appeared independent of genetic changes, nor can we ignore the adaptive value of changes of behavioral patterns and their selective value on the genetic composition of surviving generations. If Kuo thus couples an evolution of behavior independent of somatic changes with a freedom from "the rather dubious twin concepts of 'natural selection' and 'survival value' of behavior for the species . . .," I think calling this view of evolution mystical is justified.

The remainder of Cairns's comments are matters of individual taste, and not subject to the same kind of discussion as the aforementioned material. I do agree, however, that the experiments included are not reported in great detail, and this is a factor which interferes with proper evaluation.

ERNST W. HANSEN

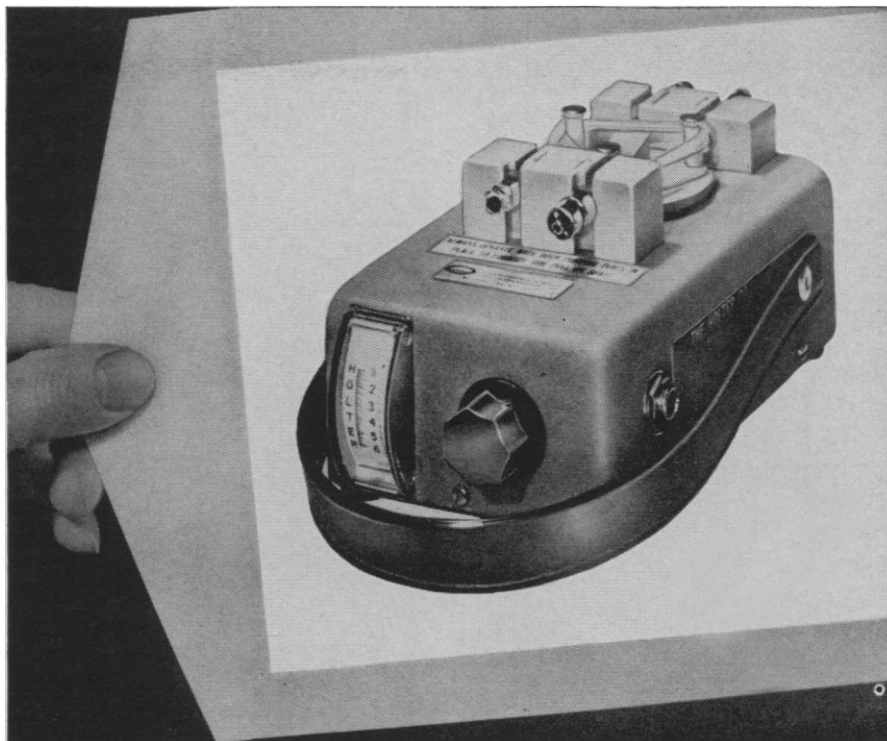
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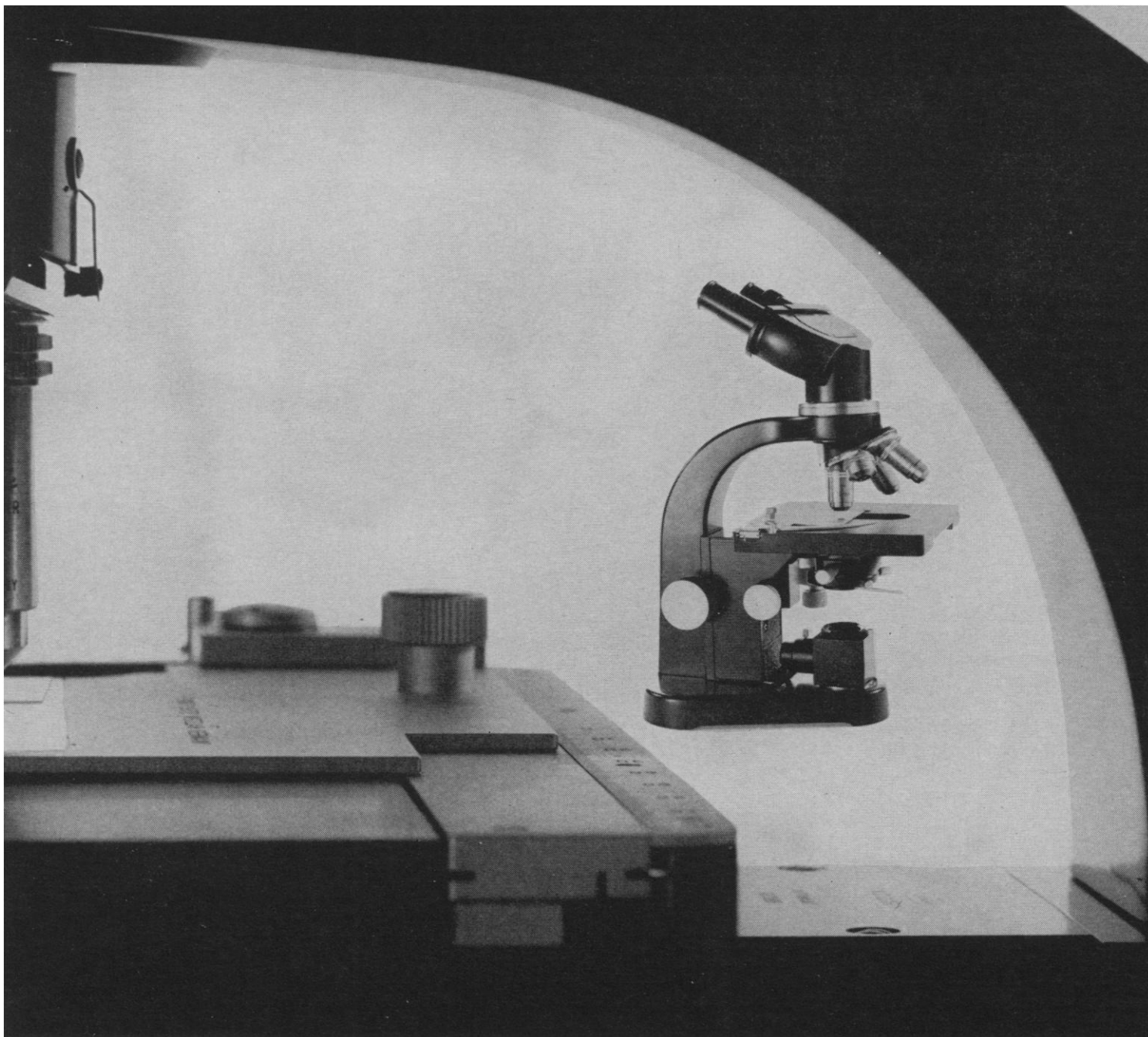
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**EDITORIAL CORRESPONDENCE:** 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page 1709, *Science*, 29 December 1967. **ADVERTISING CORRESPONDENCE:** Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

## University Response to Social Needs

The violence and lawlessness on some college campuses obscure the general student demand that universities devote more energy and attention to the pressing problems of the moment. The students who are not engaged in strikes or sit-ins nonetheless do object to the emphasis placed on certain forms of research and scholarship.

Students are appalled by the energy expended by faculty members in doing seemingly trivial things. They note how often research involves reducing and limiting a problem until it is small enough to be reported within the pages of a single journal article or book. They believe that a professor devotes himself to some tiny sub-area because he seeks to gain recognition within his lifetime as a leading authority.

We remind students that scientific progress evolves by this very process of reduction, that new knowledge stems from the work of thousands of persons and many tiny discoveries. Great men of science have made great breakthroughs only as a consequence of enormous amounts of work done previously.

The academic setting provides rewards not for good intentions but for completed work that adds to knowledge. And attacks on large problems seldom yield definitive results. Those few who have dealt successfully with large-scale problems are esteemed. However, the likelihood of a young professor's attaining this status is remote. When he tries, he gambles with his future academic position.

Our students point to the tremendous effects of organized concentration on a problem. For example, they note that the first nuclear reaction was produced by massive expenditure of money and effort and that our space program thrives when huge numbers of people devote their energies to it. They ask us to direct the energies of professors toward truly critical problems—to find peace, to eradicate poverty, to attain universal civil rights.

Students can see within our society no institution other than the university capable of launching the attack on the problems that must be solved. They consider it a defect when our courses present subject matter within a disciplinary rather than a problem-oriented framework, and when we do not assign problems for study to the faculty or do not require that they join together to cure the ills of our society.

The choice of research strategy is especially difficult in the social sciences, where one finds very few examples of great benefits accruing from research unrelated to major problems. Breakthroughs with enormous multiplying effects observable in the physical sciences are unlikely or, at least, have not yet occurred. To learn more about a given social phenomenon it seems almost inevitable that we must study it directly.

It is clearly within the capability of the university to assume an expanded role in dealing with society's problems while assuring that the modes of attack are in accord with scholarly values. We can review the objectives of our programs of graduate education, reorient our textbooks, and restructure introductory courses to attract students who can apply our knowledge and techniques. Departments in our universities can manage to emphasize problem areas while maintaining solid subject orientation. We can recognize, reward, and establish as models those of our colleagues brave enough to tackle the major problems of the real world and smart enough to find how to do it. If our students, by their protests and dissents, stir us to speed this process, we shall be in their debt.—KENNETH E. CLARK, *Dean, College of Arts and Sciences, University of Rochester, Rochester, New York*

# 4 ways to view displays with the Tektronix Type 564

## split-screen storage oscilloscope

The Tektronix Type 564 is virtually two instruments in one. It offers all the advantages of a storage oscilloscope plus those of a conventional oscilloscope.

### Split-Screen Displays

An unique split-screen display area enables you to simultaneously use either half of the screen for storage and the other half for conventional displays, or use the entire area for stored or conventional displays.

Independent control of both halves of the screen permits you to take full advantage of the storage facilities. For example, you can use half the screen to store a reference waveform, the other half to display waveforms for comparison. You can erase or retain either half of the display area as you choose.

### Bistable Storage Advantages

With bistable storage oscilloscopes, such as the Type 564 and Type 549, the contrast ratio and brightness of stored displays are constant and independent of the viewing time, writing and sweep speeds, or signal repetition rates. This also simplifies waveform photography. Once initial camera settings are made for photographs of one stored display, no further adjustments are needed for photographs of subsequent stored displays.

Storage time is up to one hour, and erase time is less than 250 milliseconds. An illuminated 8 cm by 10 cm graticule facilitates measurements and aids in taking photographs with well-defined graticule lines. Adding to the operating ease is a trace position locator that indicates, in a nonstore area, the vertical position of the next trace or traces.

Tektronix bistable storage cathode ray tubes are not inherently susceptible to burn-damage and require only the ordinary precautions taken in operating conventional oscilloscopes.

### Plug-In Unit Adaptability

The Type 564 accepts Tektronix 2 and 3-series plug-in units for both vertical and horizontal deflection. Display capabilities of these units include single and multi-trace with normal and delayed sweep; single and multiple X-Y; low-level differential; dual-trace sampling; spectrum analysis, and many other general and special purpose measurements.

Type 564, without plug-in units . . . . . \$ 925

Rack-Mount RM564 . . . . . \$1025

Similar electrical characteristics to Type 564. 7" high.

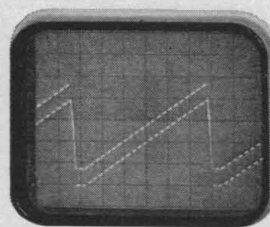
Type 3A6 Dual-Trace Amplifier Unit . . . . . \$ 525

DC to 10 MHz from 10 mV/div to 10 V/div. 5 display modes. Internal signal delay line.

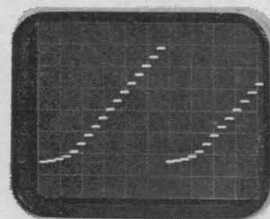
Type 3B4 Time Base Unit . . . . . \$ 425

Sweep speeds from 0.2  $\mu$ s/div to 5 s/div. Single sweep. Up to X50 direct-reading magnifier extends fastest sweep to 50 ns/div.

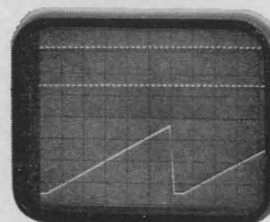
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Entire screen can be used for a stored display.

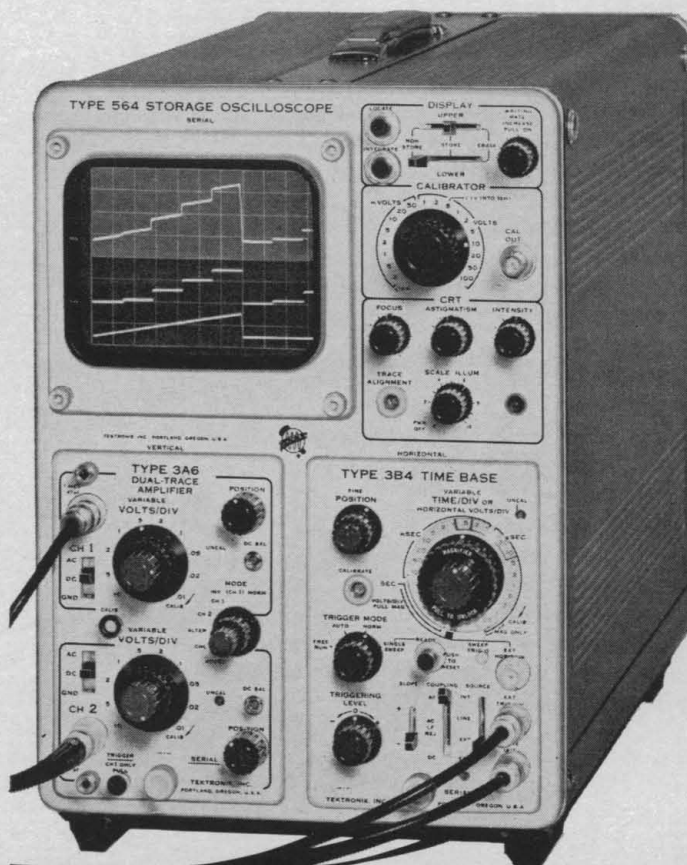


Entire screen can be used for a nonstored display.



Each half of split-screen can be used independently for stored displays.

Either half of the split-screen can be used for a stored display, the other half for a nonstored display. (Shown below).




**Tektronix, Inc.**

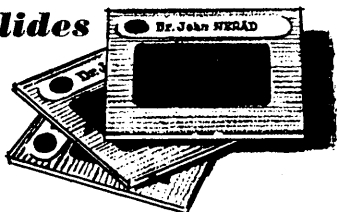


For a demonstration, contact your nearby Tektronix field engineer or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.



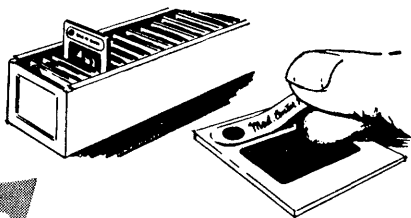
identify all slides

with 



## TIME red dot PHOTO-SLIDE LABELS

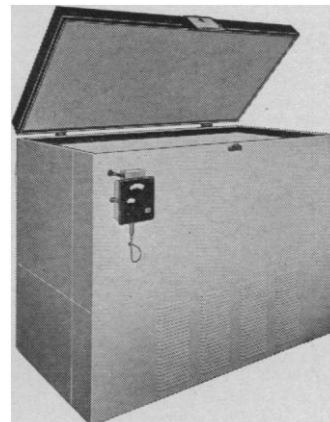
Self-sticking labels provide space for identification and ownership plus a red dot to insure correct placement of the slide in projector. Pressure-sensitive adhesive requires no moistening and stick permanently to any surface. Labels may be used on photographs, lantern slides, 2" x 2" mounts, or negatives. May be imprinted. Write for complete information and samples.



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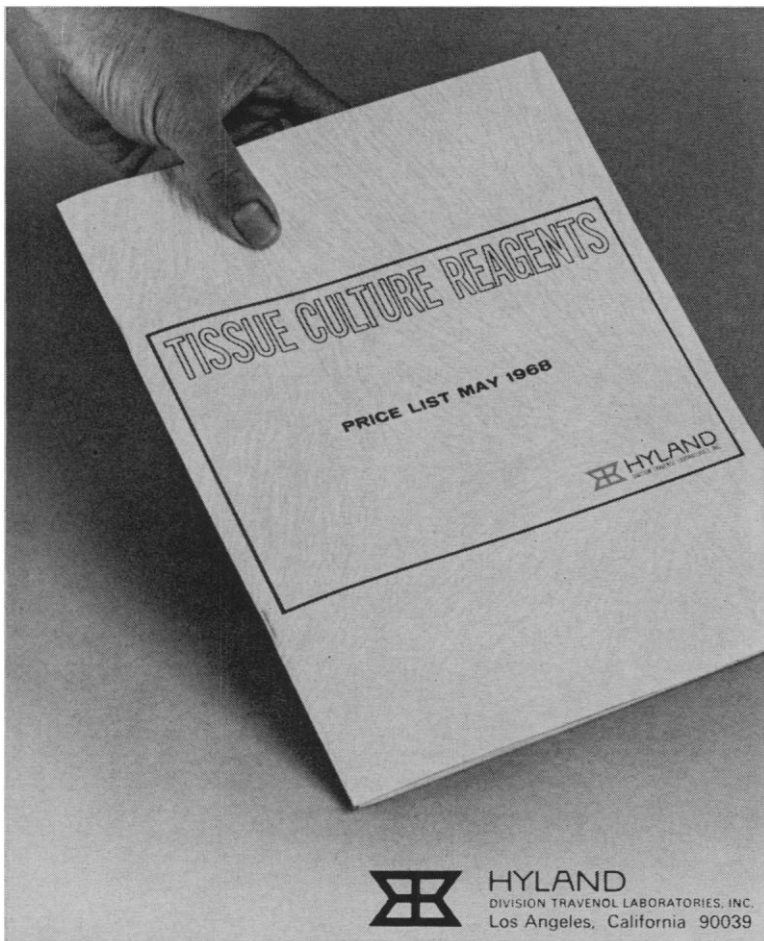
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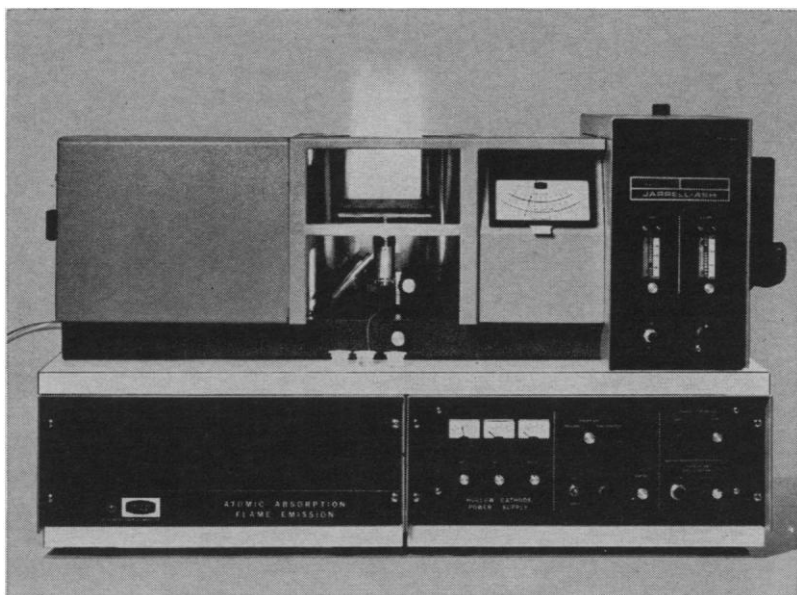
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tors, Chicago, Ill. (C. S. Holt, 738 Keystone Ave., River Forest, Ill. 60305)

30. Society for **Pediatric Radiology**, New Orleans, La. (J. L. Gwinn, Children's Hospital, 4614 Sunset Blvd., Los Angeles, Calif. 93027)

30-3. American **Psychiatric Assoc.**, 20th, Washington, D. C. (Public Information Officer, 1700 18th St., NW, Washington, D. C. 20009)

30-3. American **Roentgen Ray Soc.**, Washington, D. C. (T. F. Leigh, Emory Univ. Clinic, Atlanta, Ga. 30322)

### International and Foreign Meetings

#### September

1-6. Asian-Pacific Congr. of **Cardiology**, 4th, Jerusalem and Tel Aviv, Israel. (L. Sherf, Tel Hashomer Government Hospital, Ward 22, Tel Hashomer, Israel)

1-6. International Soc. of **Hematology**, 12th, New York. (P. Reznikoff, 449 E. 68 St., New York 10021)

1-7. Italian Soc. of **Electron Microscopy**, Rome. (D. S. Bocciarelli, Conference Secretary, c/o Instituto Speriere di Sanita, Viale Regina Elena 299, Rome)

1-7. European Regional Conf. on **Electron Microscopy**, 4th, Rome, Italy. (D. S. Bocciarelli, Inst. Superiore di Sanita, Viale Regina Elena 299, Rome)

1-7. **Embryology**, 6th intern. congr. Paris, France. (Secretariat, Faculté des Sciences, Bat C, 9, Quai Saint-Bernard, Paris 5)

1-8. Balkan **Medical Union**, 9th, Istanbul. (A. M. Popescu Buzen, 10 rue Pregresului, Bucharest, Rumania)

2-5. International Conf. on **Laboratory Astrophysics**, Lunteren, Netherlands. (J. Rosenberg, Sterrewacht Sonneborgh der Rijksuniversiteit, Zonnenburg 2, Utrecht, Netherlands)

2-5. National Conf. of **Pure and Applied Physical Chemistry**, Bucharest, Rumania. (V. E. Sahini, Conferinta de Chimie Fizica, str Dumbrava Rosie 23, Bucharest 9)

2-6. International **Ophthalmologic Symp.**, Johannesburg, South Africa. (Secretary, Dept. of Ophthalmology, Medical School, Univ. of Witwatersrand, Hospital St., Johannesburg)

2-6. Asian Cong. of **Pharmaceutical Sciences**, 2nd, Seoul, Korea. (K. Haw, B1 18-2 Dwan-Chul-Dong Chong-Bo-Ky, Seoul)

2-6. International **Fermentation Symp.**, 3rd, New Brunswick, N.J. (G. M. Shull, Squibb Inst. for Medical Research, 5 Georges Rd., New Brunswick, N.J. 08903)

2-7. International Conf. on **Coordination Chemistry**, 11th, Haifa and Jerusalem, Israel. (M. Cais, Technion, Haifa)

2-7. International Union of **Pure and Applied Chemistry**, Toronto, Ont., Canada. (Organizing Committee, Box 932, Terminal A, Toronto)

2-8. World Commission on **Cerebral Palsy**, Hong Kong. (B. S. Miller, United Cerebral Palsy, 321 W. 44 St., New York 10036)

3-5. **Drugs Affecting Lipid Metabolism**, 3rd intern. symp., Milan, Italy. (H. J. Prián, Inst. of Pharmacology, Via Vanvitelli, 32, 20129 Milan)

3-6. **Archives**, intern. congr., 6th, Madrid, Spain. (L. S. Belda, Direction

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Espagne, Eduardo Dato 31-33, Madrid  
10)

3-6. International Symp. on **Macromolecular Chemistry**, Toronto, Ont., Canada. (Intern. Symp. on Macromolecular Chemistry, Box 932, Terminal A, Toronto)

3-6. **European Malacological Congr.**, 3rd, Vienna, Austria. (Organizing Committee, Naturhistorisches Museum, Burgring 7, A-1014 Vienna)

3-10. International Union of **Anthropological and Ethnological Science**, 8th, Tokyo and Kyoto, Japan. (Organizing Committee, Science Council of Japan, Ueno Park, Tokyo)

3-12. International Congr. of **Surveyors**, 12th, London, England. (R. Steel, Intern. Federation of Surveyors, c/o Basingstoke Development Group, Erdesley, Cliddesden Rd., Basingstoke, Hampshire, England)

3-14. International **Electrotechnical Commission**, 33rd, London, England. (L. Rupper, 1 rue de Varembe, Geneva, Switzerland)

4-6. International Conf. on **Electrophotography**, Rochester, N.Y. (W. L. Hyde, Inst. of Optics, Univ. of Rochester, Rochester, N.Y.)

5-11. International Acad. of **Pathology**, 7th, Milan, Italy. (A. Giordano, Inst. of Pathology and Anatomy, Univ. of Milan, Via Francisco Sforza 38, Milan)

7-15. **Tropical Medicine and Malaria**, 8th intern. congr., Teheran, Iran. (C. Mofidi, P.O. Box 1310, Teheran)

8-14. **European Soc. of Cardiology**, 5th, Athens, Greece. (A. Samaras, 24 Ravine St., Athens 140)

9-11. Ciba Foundation Symp. on **Bacterial Plasmids and Episomes**, London, England. (Ciba Foundation, Portland Pl., London W.1)

9-11. European Symp. on **Chemical Reaction Engineering**, 4th, Brussels, Belgium. (R. Jottrand, 50, avenue F. D. Roosevelt, Brussels 5, Belgium, or R. L. Goring, Mobil Oil Corp., Research Dept., Paulsboro, N.J. 08066)

9-12. **South African Urological Assoc.**, Kruger Natl. Park. (E. Abro, 804 Medical Center, Jeppe S., Johannesburg, South Africa)

9-12. International Soc. for **Rehabilitation of the Disabled**, Cork, Ireland. (J. Bermingham, Natl. Organization of Rehabilitation, 133 Oliver Plunkett St., Cork)

9-13. International Council of the **Aeronautical Sciences Congr.**, Munich, Germany. (R. R. Dexter, American Inst. of Aeronautics, 1290 Sixth Avenue, New York 10009)

9-13. World Congr. of **Anesthesiologists**, 4th, London, England. (D. D. C. Howat, Royal Marsden Hospital, Fulham Rd., London, S.W.3)

9-13. International Congr. of **Phlebology**, 3rd, Amsterdam, Netherlands. (J. Van Limbough, Mauritskade 61, Amsterdam)

9-13. International **Seaweed Symp.**, 6th, Santiago de Compostela, Spain. (E. Booth, Inst. of Seaweed Research, Inveresh, Midlothian, Scotland)

9-13. International Congr. on **Surfactants**, 5th, Barcelona, Spain. (Secretary General, 5th Congr. on Surfactants, Avd. Generalissimo Franco 730, Barcelona 14)

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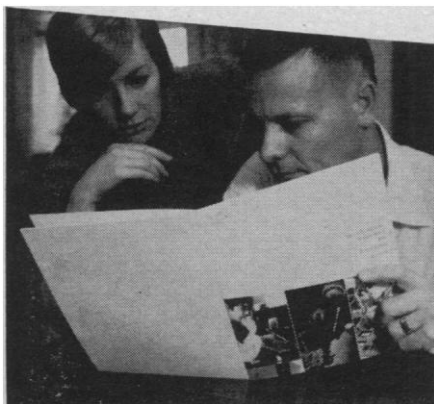
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9-14. **Biodeterioration**, 1st intern. symp., Southampton, England. (First Intern. Biodeterioration Symp., 14 Belgrave Sq., London, S.W.1, England)

9-15. International Conv. on **Vital Substances, Nutrition, and Civilisation Diseases**, Travemunde, Germany. (H. Schmulding, Bemeroder Str. 61, Hannover-Kirchrode)

10-13. French Soc. of **Electronic and Radio Engineers**, Paris, France. [Société Française des Electroniciens et Radioélectriciens, 10 Ave. Pierre-Larousse, Malakoff (Seine), France]

10-13. **Yeast Protoplasts**, 2nd intern. symp., Brno, Czechoslovakia. (A. Svoboda, Dept. of Biology, Medical Faculty, J. E. Purkyne Univ., Brno)

10-14. **Internal Medicine**, 10th intern. congr., Paris, France. (E. Reezzyo, Dept. of Medicine, Inst. for Postgraduate Medical Education, ul. Solec 93, Warsaw 30, Poland)

10-20. International Conf. on **General Relativity and Gravitation**, 5th, Tiflis, U.S.S.R. (A. Mercier, Inst. de Physique Theoretique de l'University, 3000 Berne, Sidlerstrasse 5, Switzerland, or Acad. of Science, U.S.S.R., Lenin Prospekt, Moscow)

12-14. Federation of French Speaking Societies of **Gynecology**, 22nd, Paris. (Sureau, Maternité Pinard, 74 Ave. Denfert-Rochereau, Paris 14)

15-17. Society of **Radiology**, Bucharest, Rumania. (I. Caloenescu, Union of Medical Science, Societies of the Socialist Republic of Rumania, 8, Rue Progresul, Bucharest)

15-19. International Congr. of **Group Psychotherapy**, 4th, Vienna, Austria. (Z. I. Moreno, P.O. Box 311, Beacon, New York 12508)

15-19. **Audiology**, 9th intern. congr., London, England. (R. Hinchcliffe, Inst. of Laryngology and Otology, 330 Gray's Inn Rd., London, W.C.1)

16-18. Conference on **Laser Measurements**, Warsaw, Poland. (S. Hahn, Komitet Narodowy URSI, Warsaw IPPT, Swietokrzyska 21, Poland)

16-20. Austrian **Mathematical Congr.**, 7th, Linz. (A. Adam, Hochschule fur Sozial-und Wirtschaftswissenschaften, A4045 Linz, Auhof, Austria)

16-21. International Soc. for **Fat Research**, 9th, Rotterdam, Netherlands. (Unilever Research Labs., P.O. Box 114, Vlaardingen, Netherlands)

17-20. Society of **Physical Chemistry**, Paris, France. (G. Emschwiller, 10, rue Vauquelin 75, Paris 5)

19-21. International **Leprosy Assoc.**, 9th, London, England. (S. G. Browne, 16 Bridgefield Rd., Sutton, Surrey, England)

20-24. **Fouling and Marine Corrosion**, 2nd intern. congr., Athens, Greece. (Université Technique Nationale d'Athenes, Laboratoire Chimie-Physique, 42, rue 28 Octobre, Athens)

22-25. American Inst. of **Chemical Engineers**, Montreal, P.Q., Canada. (Chemical Inst. of Canada, 48 Rideau St., Ottawa 2, Ont.)

22-27. International Committee on **Electrochemical Thermodynamics and Kinetics**, 19th, Warren, Michigan. (S. E. Beacom, Electrochemistry Dept., Research Labs., General Motors Corp., 12 Mile & Mound Rds., Warren, Michigan 48090)

## BOOKS RECEIVED

(Continued from page 563)

**Auto Fleet Management.** Hermann Botzow. Wiley, New York, 1968. xvi + 197 pp., illus. \$9.95.

**Autoradiographic Techniques.** Localization of Radioisotopes in Biological Material. William D. Gude. Prentice-Hall, Englewood Cliffs, N.J., 1968. xiv + 113 pp., illus. Paper, \$3.95. Biological Techniques Series.

**Basic Algebraic Systems.** An Introduction to Abstract Algebra. Richard Laatsch. McGraw-Hill, New York, 1968. xiv + 224 pp., illus. \$7.95.

**Basic Organic Chemistry.** Part 2. J. M. Scott, Foresman, Glenview, Ill., 1968. xiv + 295 pp., illus. \$8.75.

**Basic Organic Chemistry.** Part 2. J. M. Tedder and A. Nechvatal. Wiley, New York, 1967. xii + 466 pp., illus. Paper, \$7.

**Basic Physics.** Kenneth W. Ford. Blaisdell (Ginn), Waltham, Mass., 1968. xxiv + 968 pp., illus. \$11.75. Blaisdell Book in the Pure and Applied Sciences.

**The Biochemistry of Memory.** With an Inquiry into the Function of the Brain Mucoids. Samuel Bogoch. Oxford University Press, New York, 1968. xii + 254 pp., illus. \$7.50.

**The Biogenesis of Mitochondria.** D. B. Roodyn and D. Wilkie. Methuen, London, 1968 (distributed in the U.S. by Barnes and Noble, New York). viii + 123 pp., illus. \$4. Methuen's Monographs on Biological Subjects.

**Biology.** Helena Curtis. Worth, New York, 1968. xviii + 854 pp., illus. \$10.75.

**A Biology of Lower Invertebrates.** W. D. Russell-Hunter. Macmillan, New York; Collier-Macmillan, London, 1968. x + 181 pp., illus. Paper, \$2.95. Current Concepts in Biology.

**Boston Studies in the Philosophy of Science.** Vol. 3. In Memory of Norwood Russell Hanson. Proceedings of the Boston colloquium, 1964-1966. Robert S. Cohen and Marx W. Wartofsky, Eds. Reidel, Dordrecht-Holland; Humanities Press, New York, 1968. xlx + 489 pp., illus. \$18.50. Synthese Library.

**British Miniature Electronic Components Data 1967-68.** G. W. A. Drummer and J. Mackenzie Robertson, Eds. Pergamon, New York, 1967. xiv + 1461 pp., illus. \$44.

**Calculus.** Robert G. Bartle and C. Ionescu Tulcea. Scott, Foresman, Glenview, Ill., 1968. xviii + 718 pp., illus. \$10.95.

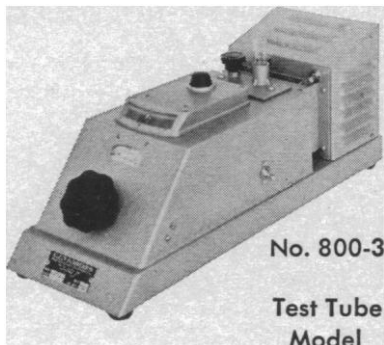
**Calculus I.** Albert A. Blank, with the assistance of Florence L. Elder and Clarence W. Leeds III. Houghton Mifflin, Boston, 1968. xx + 436 pp., illus. \$7.50.

**Casebooks in Production Management.** Basic Problems, Concepts, and Techniques. Arch R. Dooley, William K. Holstein, James L. McKenney, Richard S. Rosenbloom, C. Wickham Skinner, and Philip H. Thurston. Wiley, New York, ed. 2, 1968. xviii + 738 pp., illus. \$10.95.

**Ceramic Processing.** Prepared by the Committee on Ceramic Processing. National Academy of Sciences, Washington, D.C., 1968. xiv + 296 pp., illus. \$15. National Academy of Sciences Publication No. 1576.

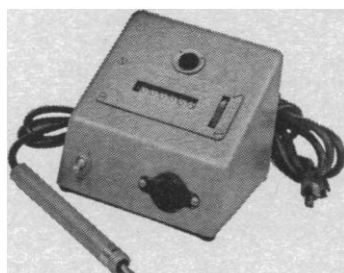


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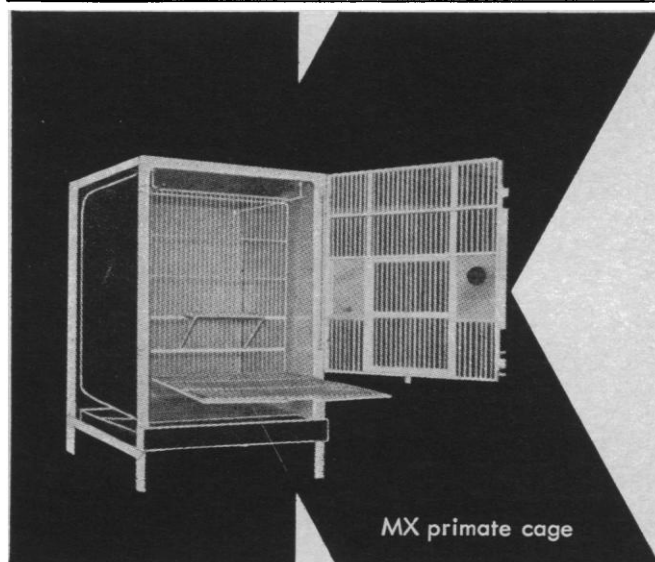
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**Chemical Zoology.** Vol. 2, Porifera, Coelenterata, and Platyhelminthes. Marcel Florkin and Bradley T. Scheer, Eds. Academic Press, New York, 1968. xx + 639 pp., illus. \$29.

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**The Chemistry of the Rarer Platinum Metals (Os, Ru, Ir and Rh).** W. P. Griffith. Interscience (Wiley), New York, 1967. x + 491 pp., illus. \$16. Interscience Monographs on Chemistry.

**Chemistry Simplified.** Vol. 1. William E. Caldwell. Barnes and Noble, New York, 1968. vi + 110 pp. Paper, \$2.25. Barnes and Noble Keynotes, No. 707.

**Clinical Diabetes Mellitus.** John Malins. Eyre and Spottiswoode, London, 1968 (distributed in the U.S. by Barnes and Noble, New York). xxiv + 502 pp., illus. \$19.

**Cohomology Operations and Applications in Homotopy Theory.** Robert E. Mosher and Martin C. Tangora. Harper and Row, New York, 1968. x + 214 pp., illus. \$12.95. Harper's Series in Modern Mathematics.

**Colloque sur le Dévonien Inférieur et ses Limites.** Rennes, September 1964. Bureau de Recherches Géologiques et Minières, Paris, 1967. 458 pp., illus. Paper, 180 F. Mémoires du Bureau de Recherches Géologiques et Minières, No. 33.

**The Commonwealth of Learning.** Henry Steele Commager. Harper and Row, New York, 1968. x + 277 pp. \$6.95.

**Communication Theory.** A. V. Balakrishnan. With contributions by J. W. Carlyle, C. W. Helstrom, W. L. Root, and G. Slomon. McGraw-Hill, New York, 1968. xii + 347 pp., illus. \$15.75. Inter-University Electronics Series, vol. 6.

**Comparative Odontology.** Bernhard Peyer. Translated from the German and edited by Rainer Zangerl. University of Chicago Press, Chicago, 1968. xvi + 347 pp., illus. \$12.50.

**Computational Handbook of Statistics.** James L. Bruning and B. L. Kintz. Scott, Foresman, Glenview, Ill., 1968. xiv + 269 pp., illus. \$4.95.

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**Dendritic Cells of Human Skin.** Dendritic Cells in Epidermis and Their Related Cells in Dermis. Cytology, Physiology and Pathology with Particular Reference to Melanin. G. Niebauer. Karger, Basel, 1968 (distributed in the U.S. by Phiebig, White Plains, N.Y.). xiii + 144 pp., illus. \$8.90. Experimental Biology and Medicine, vol. 2.

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**The Digital Logic Handbook.** Flip Chip Modules, 1968 edition. Digital Equipment Corp., Maynard, Mass., 1968. x + 486 pp., illus. Paper, distributed free of charge.

**Discovery of the Elements.** Mary Elvira Weeks. Completely revised and new material added by Henry M. Leicester. Illustrations collected by F. B. Dains. Journal of Chemical Education, Easton, Pa., ed. 7, 1968. x + 896 pp. \$12.50.

**The Eccentric Ark.** The Curious World of Frank Buckland. G. H. O. Burgess. Horizon Press, New York, 1968. xii + 242 pp., illus. \$6.50.

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**Elements of Mathematics.** Bruce E. Meserve and Max A. Sobel. Prentice-Hall, Englewood Cliffs, N.J., 1968. xii + 303 pp., illus. \$7.95.

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**Elements of Zoology.** Paul B. Weisz. McGraw-Hill, New York, 1968. xvi + 486 pp., illus. \$8.95.

**Elsevier's Dictionary of Pharmaceutical Science and Techniques.** In Five Languages: English, French, Italian, Spanish, German. Vol. 1, Pharmaceutical Technology. Compiled and arranged on an English alphabetical basis by A. Sliosberg. Elsevier, New York, 1968. xii + 686 pp. \$30.

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**Engineering Plasticity.** Papers for a conference, Cambridge, England, March 1968. J. Heyman and F. A. Leckie, Eds. Cambridge University Press, Cambridge, Mass., 1968. viii + 706 pp., illus. \$22.50.

**Die Erhöhung der Fruchtbarkeit der Sandboden.** Vorträge der Internationalen Koordinierenden Arbeitstagung in Budapest, 1965. M. Kozak, S. Egerszegi, F. Hepp, and I. Lang, Eds. Akademiai Kiado, Budapest, 1967. 446 pp., illus.

**Ethics, Politics, and Social Research.** Gideon Sjöberg, Ed. Schenkman, Cambridge, Mass., 1967. xviii + 358 pp. \$8.95.

**Experimental Magnetochemistry.** Non-metallic Magnetic Materials. Michael M. Schieber. North-Holland, Amsterdam; Interscience (Wiley), New York, 1967. xxiv + 572 pp., illus. \$28. Monographs on Selected Topics in Solid State Physics, vol. 8.

**Experimental Organic Chemistry.** Ralph L. Dannley and James D. Crum. Macmillan, New York; Collier-Macmillan, London, 1968. x + 341 pp., illus. \$7.25.

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**Fluorescent Antibody Methods.** Morris Goldman. Academic Press, New York, 1968. xviii + 303 pp., illus. \$13.50.

**Functions of the Adrenal Cortex.** Vol. 1. Kenneth W. McKerns, Ed. Appleton-Century-Crofts, New York, 1968. xvi + 643 pp., illus. \$21. Biochemical Endocrinology Series.

**Fundamental Aspects of Fiber Reinforced Plastic Composites.** R. T. Schwartz and H. S. Schwartz, Eds. Interscience (Wiley), New York, 1968. xiv + 284 pp., illus. \$12.75. Polymer Engineering and Technology Series.

**Galilée.** Aspects de sa vie et de son oeuvre. Maurice Clavelin *et al.*, Eds. Presses Universitaires de France, Paris, 1968. x + 382 pp., illus. Paper, 24 F. Centre International de Synthèse: Histoire des Sciences.

**Gemini.** A Personal Account of Man's Venture into Space. Virgil "Gus" Grissom. Macmillan, New York; Collier-Macmillan, London, 1968. xii + 212 pp., illus. \$5.95.

**Geology Simplified.** Richard M. Pearl. Barnes and Noble, New York, 1968. vi + 89 pp., illus. Paper, \$2.25. Barnes and Noble Keynotes, No. 712.

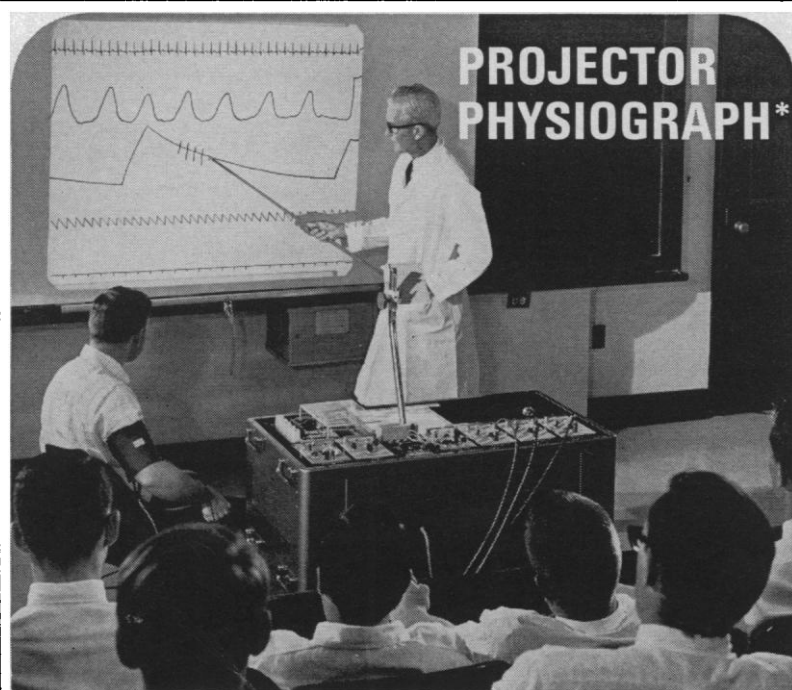
**German Miniature Electronic Components and Assemblies Data 1967-68.** G. W. A. Dummer, J. Mackenzie Robertson, and Paul Dietrich, Eds. Pergamon, New York, 1968. vi + 988 pp., illus. \$37.

**God, the Atom, and the Universe.** James Reid. Zondervan, Grand Rapids, Mich., 1968. 240 pp., illus. \$4.95.

**Group Counseling and Psychotherapy with Adolescents.** Beryce W. MacLennan and Naomi Felsenfeld. Columbia University Press, New York, 1968. x + 198 pp. \$6.

**Gynäkologische Cytologie.** P. Stoll, J. Jaeger, and G. Dallenbach-Hellweg. Springer-Verlag, New York, 1968. xii + 307 pp., illus. \$22.

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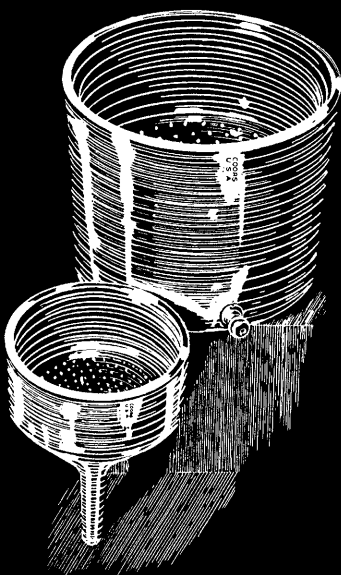
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**Handbook for Automatic Computation.** F. L. Bauer, A. S. Householder, F. W. J. Olver, H. Rutishauser, K. Samelson, and E. Stiefel, Eds. Vol. 1, part b, Translation of ALGOL 60. A. A. Grau, U. Hill, and H. Langmaack. Springer-Verlag, New York, 1967. x + 397 pp., illus. \$16. Die Grundlehren der mathematischen Wissenschaften, vol. 137.

**The Heart of the Earth.** O. M. Phillips. Freeman, Cooper, San Francisco, 1968. 236 pp., illus. \$4.50.

**Henry E. Sigerist.** Autobiographical Writings. Selected and translated by Nora Sigerist Beeson. McGill University Press, Montreal, 1966. xiv + 247 pp. \$5.75.

**High Energy Astrophysics.** Vols. 1 and 2. Lectures delivered at Les Houches during the 1966 session of the Summer School of Theoretical Physics, with a grant from NATO. C. DeWitt, E. Schatzman, and P. Véron, Eds. Gordon and Breach, New York, 1967. Vol. 1, xiv + 250 pp., illus., \$12.50; vol. 2, xii + 332 pp., illus., \$12.50.

**High-Energy Nuclear Reactions in Astrophysics.** A Collection of Articles. B. S. P. Shen, Ed. Benjamin, New York, 1967. x + 281 pp., illus. \$9.75.

**The Higher Learning in America.** A Re-assessment. Paul Woodring. McGraw-Hill, New York, 1968. xviii + 236 pp. \$6.95.

**Homosexuality.** D. J. West. Aldine, Chicago, 1968. 305 pp. \$5.95.

**Hormone in Genese und Therapie des Mammarcarcinoms.** Panel discussion, Berlin and Jena, Sept.-Oct. 1965. H. Gummel and H. Kraatz, Eds. Akademie-Verlag, Berlin, 1967. vi + 135 pp., illus.

**How to Qualify as a "Biologist" in the Universities of Europe.** Jean Leclercq. Council for Cultural Co-operation of the Council of Europe, Strasbourg, 1967. 240 pp.

**Human Growth.** Body Composition, Cell Growth, Energy, and Intelligence. Donald B. Cheek, with the assistance of collaborating investigators. Lea and Febiger, Philadelphia, 1968. xxx + 781 pp., illus. \$25.

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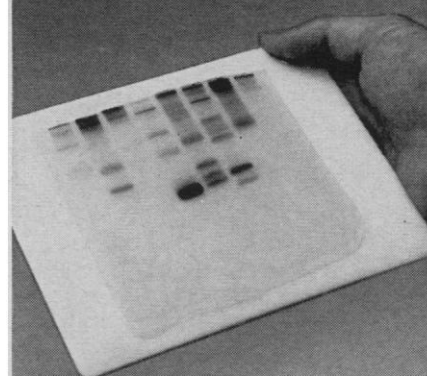
**Hydrogen—The Carrier of Life.** An Approach to Atomic Biology. Mieczyslaw Taube. Translated from the Polish edition (Warsaw, 1965) by B. Jankowski. Nuclear Energy Information Center, Warsaw, 1967. 144 pp., illus. Review Report No. 25.

**Hypnosis.** Anatol Milechnin. Translated from the Spanish edition (Buenos Aires, 1961) by Galina Solovey. Wright, Bristol, 1967 (distributed in the U.S. by Williams and Wilkins, Baltimore). xii + 255 pp. \$10.

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SCIENCE, VOL. 161

**inary Zoology.** Subjects: Trematoda and Trematode Diseases, part 7, Supergenera and Genera R-S. Mildred A. Doss, with the assistance of Katharine Forsyth Roach, Marion M. Farr, and Virginia L. Breen. U.S. Department of Agriculture, Washington, D.C., 1968 (available from Superintendent of Documents, Washington, D.C.). vi + 214 pp. Paper, 60¢.

**Industrial Organic Chemistry.** John K. Stille. Prentice-Hall, Englewood Cliffs, N.J., 1968. xvi + 128 pp., illus. Cloth, \$5.95; paper, \$2.50. Foundations of Modern Organic Chemistry Series.

**Industrial Waste Disposal.** R. D. Ross, Ed. Reinhold, New York, 1968. xii + 340 pp., illus. \$16.

**Infectious Diseases.** Carl C. Dauer, Robert F. Korn, and Leonard M. Schuman. Harvard University Press, Cambridge, Mass., 1968. xx + 262 pp., illus. \$5. American Public Health Association, Vital and Health Statistics Monographs.

**Intellectuals Today.** Problems in a Changing Society. T. R. Fyvel. Schocken, New York, 1968. 240 pp. \$6.95.

**Internationale Vortragstagung über Grenzflächenaktive Stoffe.** In two parts. Originalbeiträge der Tagung in Berlin, March 1966. xxiv + 953 pp., illus. Akademie-Verlag, Berlin, 1967. Abhandlungen der Detuschen Akademie der Wissenschaften zu Berlin, No. 3.

**Introduction to Algebra for College Students.** William A. Rutledge and Simon Green. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1968. x + 310 pp., illus. \$7.50.

**Introduction to Ground-Water Hydrology.** Ralph C. Heath and Frank W. Trainor. Wiley, New York, 1968. xii + 284 pp., illus. \$9.95.

**Introduction to Mechanics of Solids.** Egor P. Popov. Prentice-Hall, Englewood Cliffs, N.J., 1968. xx + 571 pp., illus. \$11.50.

**Introduction to Statistics.** Frank W. Carlborg. Scott, Foresman, Glenview, Ill., 1968. x + 293 pp., illus. \$8.50.

**An Introduction to the Meaning and Structure of Physics.** Leon N. Cooper. Harper and Row, New York, 1968. xiv + 745 pp., illus. \$13.95.

**Introduction to the Study of Human Behavior.** Harry Kaufmann. Saunders, Philadelphia, 1968. viii + 162 pp. Paper, \$2.50.

**Introductory Calculus.** A. Wayne Roberts. Academic Press, New York, 1968. xiv + 527 pp., illus. \$8.75.

**Journal of Anatomy.** Index to the First 100 Years, 1866-1966. Compiled by Doreen Blake and Ruth E. M. Bowden. Cambridge University Press, Cambridge, Mass., 1968. xiv + 450 pp. \$37.50.

**The June Bug.** A Study of Hysterical Contagion. Alan C. Kerckhoff and Kurt W. Back. Appleton-Century-Crofts, New York, 1968. x + 239 pp. Paper, \$2.95.

**Das Kallikrein-Kinin-System und Seine Inhibitoren.** Emil K. Frey, Heinrich Kraut, and Eugen Werle. Enke, Stuttgart, ed. 2, 1968. xii + 290 pp., illus. DM 65.

**Die Klinischen Eponyme.** Medizinische Eigennamenbegriffe in Klinik und Praxis. Bernfried Leiber and Theodor Olbert, with the collaboration of H. Najjoks, G. Naumann, A. Obel, and G. Schiebe. Urban and Schwarzenberg, Munich, 1968. xii + 456 pp., illus. DM 59.

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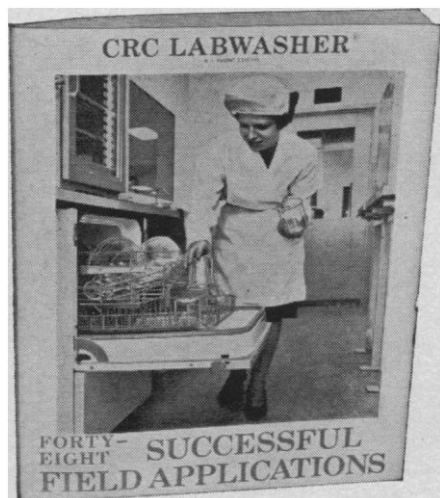
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**Language and Symbolic Systems.** Yuen Ren Chao. Cambridge University Press, New York, 1968. xvi + 240 pp., illus. Cloth, \$5; paper, \$1.95.

**Laser Technology and Applications.** Samuel L. Marshall, Ed. McGraw-Hill, New York, 1968. x + 294 pp., illus. \$14.

**Lattice Defects and Their Interactions.** R. R. Hasiguti, Ed. Gordon and Breach, New York, 1967. viii + 1144 pp., illus. \$35; to libraries, \$68; 20 percent discount if prepaid.

**LDH Isoenzymen bij Nieraandoeningen Experimentele en Klinische Studie.** With Summaries in French and English. S. Ringoir. Uitgaven, Brussels, 1967. 363 pp., illus.

**Lectures in Theoretical Physics.** Wesley E. Brittin, Asim O. Barut, and Marcel Guenin, Eds. Vol. 9A, Mathematical Methods of Theoretical Physics (x + 400 pp., illus.); vol. 9B, High Energy and Particle Physics (xii + 436 pp., illus.); vol. 9C, Kinetic Theory (xii + 791 pp., illus.). Cloth, \$19.50 per volume; paper, \$8.95 per volume. Gordon and Breach, New York, 1967.

**Libel and Academic Freedom.** A Lawsuit Against Political Extremists. Arnold M. Rose. University of Minnesota Press, Minneapolis, 1968. xii + 287 pp., illus. \$7.95.

**El Libro del Cancer: Descubrimiento, Contagio, Curacion.** Ligdano Chávez. Mundial, Managua, Nicaragua, 1967. 264 pp.

**Linear Algebra.** R. R. Stoll and E. T. Wong. Academic Press, New York, 1968. x + 326 pp., illus. \$8.50.

**Mitochondrial Structure and Compartmentation.** Proceedings of the Round Table Discussion, Polignano a Mare, Italy, May 1966. E. Quagliariello, S. Papa, E. C. Slater, and J. M. Tager, Eds. Adriatica, Bari, Italy, 1967. 473 pp., illus.

**Mound Builders of Ancient America.** The Archaeology of a Myth. Robert Silverberg. New York Graphic Society, Greenwich, Conn., 1968. xiv + 369 pp., illus. \$8.95.

**Nebulae and Interstellar Matter.** Barbara M. Middlehurst and Lawrence H. Aller, Eds. University of Chicago Press, Chicago, 1968. xxii + 835 pp., illus. \$27.50.

**Neurophysiological Basis of Normal and Abnormal Motor Activities.** Proceedings of the 3rd symposium of the Parkinson's Disease Information and Research Center of Columbia University, New York, Nov. 1966. Melvin D. Yahr and Dominick P. Purpura, Eds. Raven Press, Hewlett, N.Y., 1967. xii + 451 pp., illus. \$25.

**A Neuropsychiatric and Genetical Investigation of Acute Intermittent Porphria.** Lennart Wettenberg. Svenska, Norstedts, Sweden, 1967. 87 pp., illus.

**Particle Size Measurement.** Terence Allen. Chapman and Hall, London, 1968 (distributed in the U.S. by Barnes and Noble, New York). xvi + 248 pp., illus. \$8.

**Permanence/Durability of the Book.** Strength and Other Characteristics of Book Papers, 1800-1899. Barrow Research Laboratory, Richmond, Va., 1967. 116 pp.

**Physical Methods in Advanced Inorganic Chemistry.** H. A. O. Hill and P. Day, Eds. Interscience (Wiley), New York, 1968. xii + 627 pp., illus. \$16.50.

**Physical Science.** Donald S. Allen and Richard J. Ordway. Van Nostrand, Princeton, N.J., ed. 2, 1968. xii + 872 pp., illus. \$10.95.

**Physico-chemical Aspects of Drug Action.** Vol. 7. Proceedings of the 3rd International Pharmacological Meeting, São Paulo, July 1966. E. J. Ariëns, Ed. Pergamon, New York, 1968. x + 386 pp., illus. \$14.

**Physics.** Principles and Insights. Ira M. Freeman. McGraw-Hill, New York, 1968. x + 729 pp., illus. \$10.75.

**Physics 1.** Elisha R. Huggins. Benjamin, New York, 1968. xvi + 624 pp., illus. \$10.95.

**Physics of Electronic Conduction in Solids.** Frank J. Blatt. McGraw-Hill, New York, 1968. xiv + 446 pp., illus. \$14.50.

**The Physics of Large Deformation of Crystalline Solids.** James F. Bell. Springer-Verlag, New York, 1968. x + 253 pp., illus. \$12. Springer Tracts in Natural Philosophy, vol. 14.

**Physiology.** Laboratory Manual. W. W. Tuttle, Byron A. Schottelius, and John D. Thomson. Mosby, St. Louis, ed. 2, 1968. x + 257 pp., illus. Paper, \$4.95.

**The Poisoned Ivy.** William Surface. Coward-McCann, New York, 1968. 223 pp. \$5.

**Polderlands.** Paul Wagret. Translated from the French edition (Paris, 1959). Methuen, London, 1968 (distributed in the U.S. by Barnes and Noble, New York). xvi + 288 pp., illus. \$10.

**Proceedings of the First International Conference on Forensic Activation Analysis.** San Diego, Calif., Sept. 1966. V. P. Guinn, Ed. Gulf General Atomic, San Diego, 1967. x + 314 pp., illus. Paper, \$7.

**Précis de Physique Theorique Moderne.** Vol. 2, Physique quantique théorique; 1, Mécanique quantique fondamentale (Mécanique ondulatoire et matricielle). Théo Kahan. Presses Universitaires de France, Paris, 1968. xii + 711 pp., illus. Paper, 70 F.

**A Programmed Introduction to Microbiology.** Stewart M. Brooks. Mosby, St. Louis, Mo. 1968. viii + 100 pp., illus., spiral binding. \$4.25.

**Protides of the Biological Fluids.** Proceedings of the 15th colloquium, Bruges, Sept. 1967. H. Peeters, Ed. Elsevier, New York, 1968. xii + 626 pp., illus. \$34.50.

**Psychiatry and Art.** Proceedings of the 4th International Colloquium of Psychopathology of Expression, Washington, D.C., April 1966. Irene Jakab, Ed. Karger, Basel, 1968 (distributed in the U.S. by Phiebig, White Plains, N.Y.). xii + 211 pp., illus. Paper, \$14.20.

**Psychiatry in the Communist World.** Ari Kiev, Ed. Science House, New York, 1968. x + 276 pp. \$10.

**Psychological Functioning in the Normal Aging and Senile Aged.** Report of an international colloquium, Semmering, Austria, June 1966. Sheila S. Chown and K. F. Riegel, Eds. Karger, Basel, 1968 (distributed in the U.S. by Phiebig, White Plains, N.Y.). x + 153 pp., illus. \$7.90.

**Quantitative Chemical Analysis.** Gilbert H. Ayres. Harper and Row, New