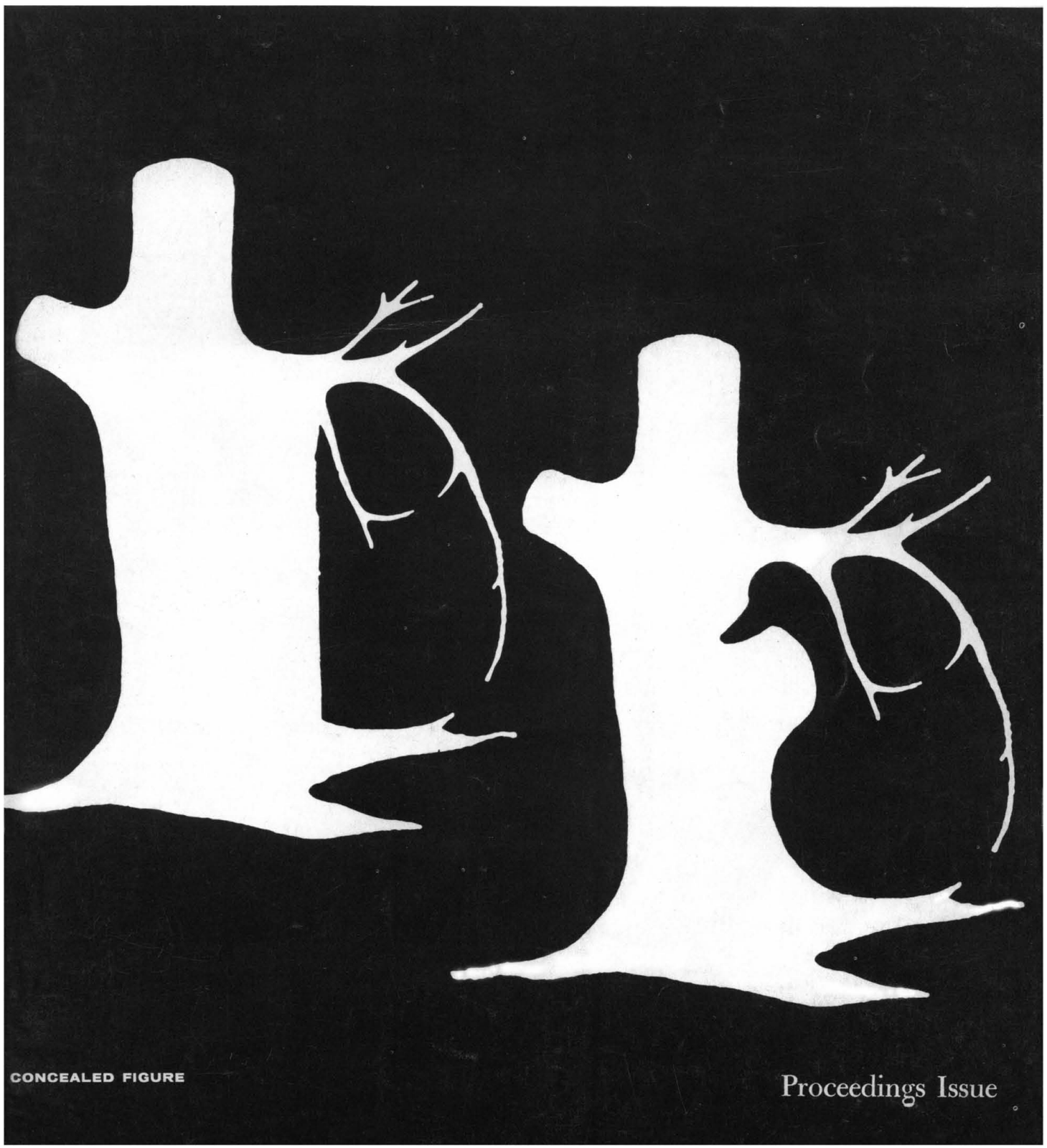
SCIENCE

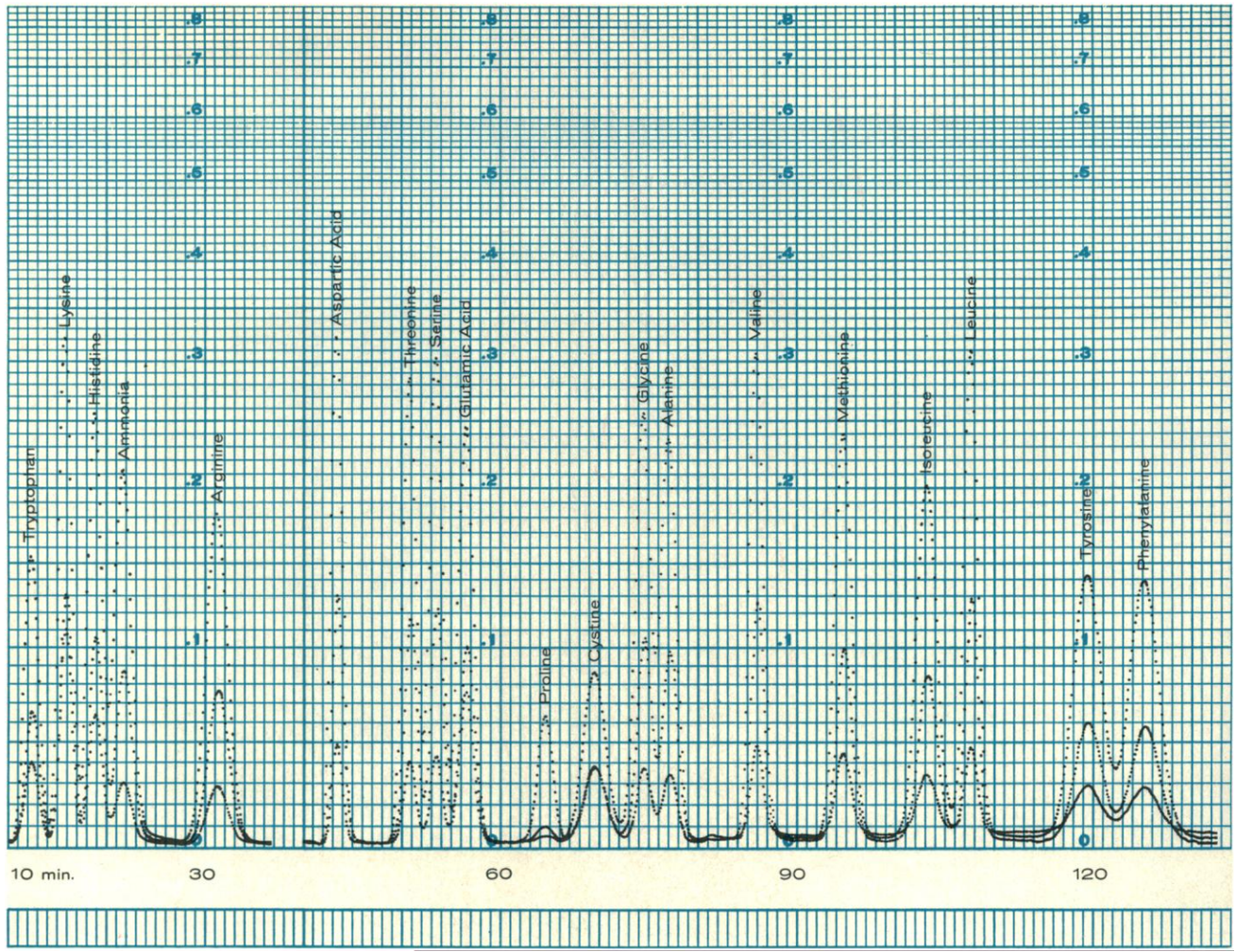
18 February 1966
Vol. 151, No. 3712

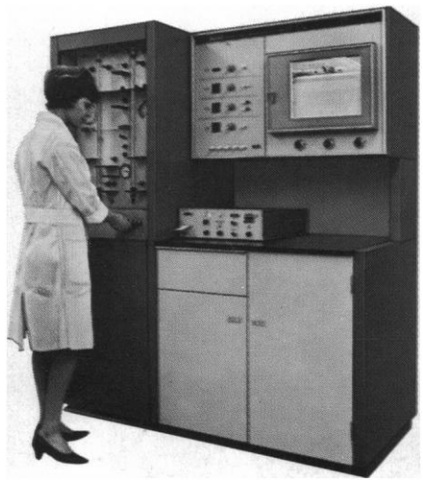
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



CONCEALED FIGURE

Proceedings Issue





This is no ordinary amino acid analysis

It is precise, needed only 0.075 micromole of sample, and was completed in just over 2 hours.

This special kind of speed and precision is reserved for those who use Beckman instrumentation: Model 120 Amino Acid Analyzer, Custom Spherical Resins, and our new 2-hour hydrolyzate procedure.

Can any 120 owner run five such superb hydrolyzate analyses a day? Model 120C Analyzers are all set—just a buffer change; older 120 Analyzers may need modification—which our nationwide Field Service force will be happy to make for you.

We have another important suggestion: the analyses come off so fast you may want to consider a Beckman Model 125 Digital Integrator to keep up. It integrates each peak and offers you a printed ticket at the end of the analysis.

We'd also like to suggest that you continue to buy only Beckman amino acid instrumentation—that way you'll also be able to take advantage of tomorrow's out-of-the-ordinary analyses.

For more information on the 120C Analyzer, the new 2-hour hydrolyzate procedure, and the Model 125 Digital Integrator, write for Data File 120-5.

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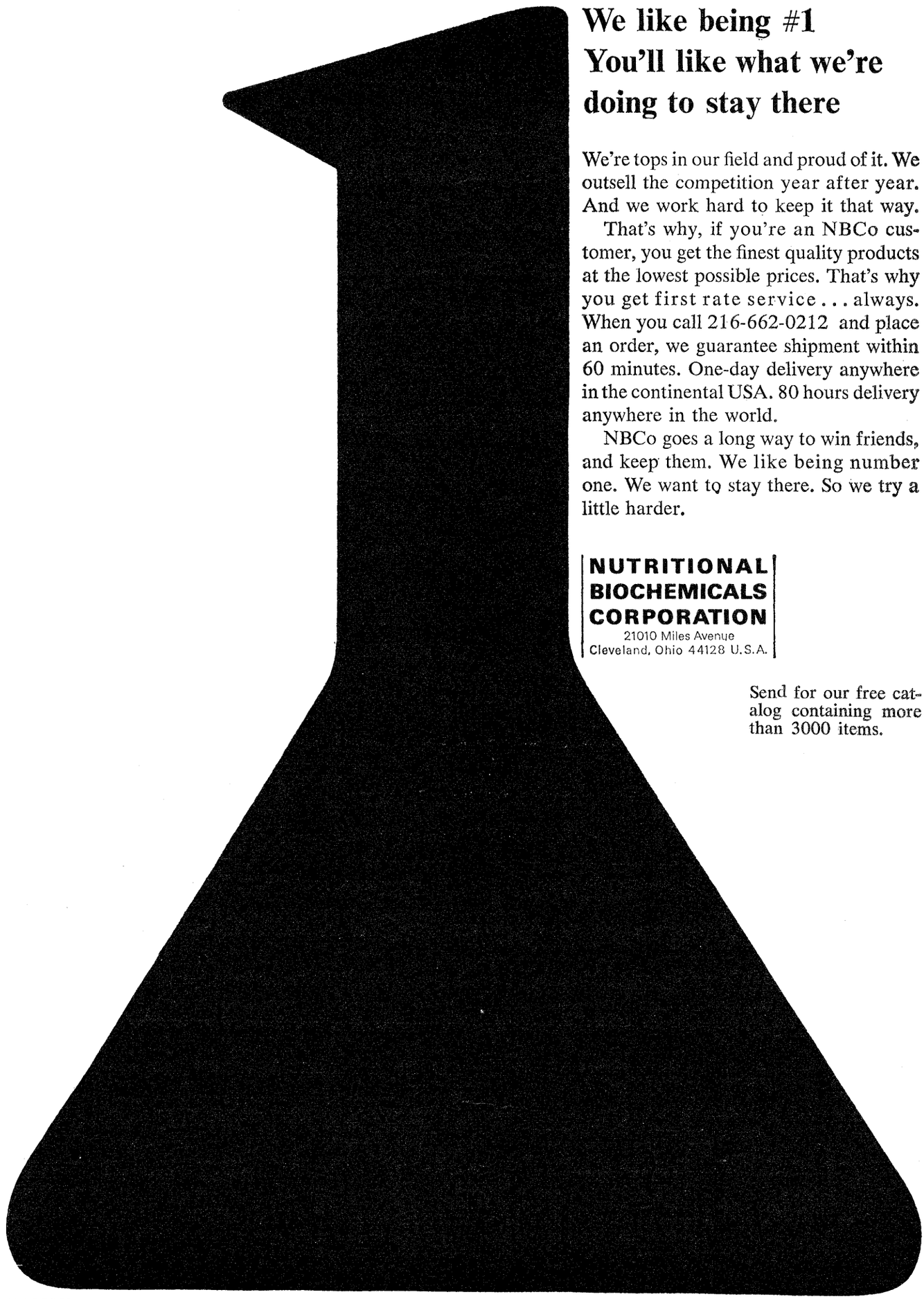

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18 February 1966
Vol. 151, No. 3712

SCIENCE

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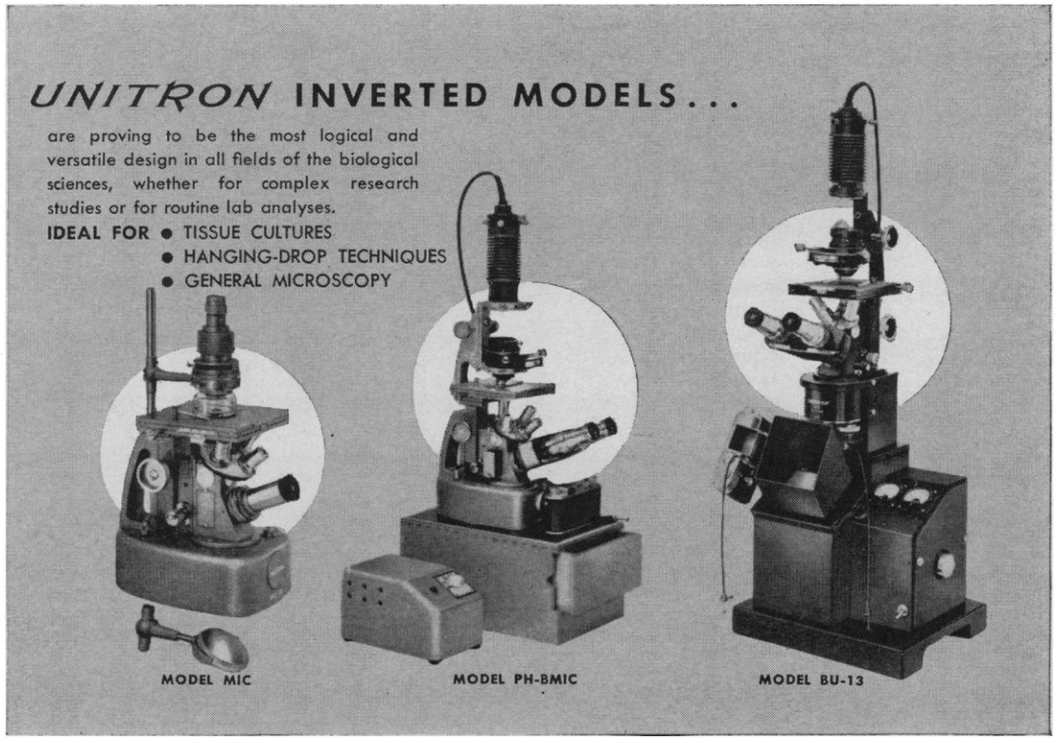
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Experimental stimulus. A background duck, concealed by the tree in the right figure, is not present in the control figure on the left. The concealed form was unperceived by viewers during experiments, but nevertheless did influence the content of subsequent imagery. See page 837. [Adapted from drawing by David Elkind, University of Denver]

THE BIO-LOGICAL BUY IN MICROSCOPES



INVERTED LABORATORY AND RESEARCH MODELS

Brightfield Laboratory Models:

MONOCULAR MODEL MIC. Four brightfield objectives 5X, 10X, 40X, 100X (oil); eyepieces 5X, 10X, 15X; ample height adjustment of condenser-illuminator for even large culture bottles; built-in base transformer. **$409.**

BINOCULAR MODEL BMIC. Binocular version of Model MIC, with camera mechanism. **$609.**

Brightfield Research Models:

MONOCULAR MODEL BR-MIC. Five brightfield objectives 5X, 10X, 20X, 40X, 100X (oil); eyepieces 5X, 10X, 15X; rack and pinion condenser mechanism with individual centering adjustments for condenser and illuminator; elevating compartment provides handy storage for accessories. **$545.**

BINOCULAR MODEL BR-BMIC. Binocular version of Model BR-MIC, with camera mechanism. **$745.**

Phase Research Models:

MONOCULAR MODEL PH-MIC. Eight phase objectives 10X, 20X, 40X, 100X (oil) in both bright and dark-medium contrast; eyepieces 5X, 10X, 15X; high intensity Koehler-type illuminator; five-choice intensity transformer; phase turret condenser with aperture for brightfield; elevating base. **$812.**

BINOCULAR MODEL PH-BMIC. Binocular version of Model PH-MIC plus built-in camera mechanism. **$1012.**

Prices include optics, cabinets, filters, special slides, petri dishes, and basic accessories. The built-in camera mechanism is standard with binocular models and available as an accessory for monoculars. Accommodates 35mm. camera back or Polaroid Land Camera Attachment. Both available at extra cost.

CAMERA-MICROSCOPES

The all-purpose microscope for visual examination, screen viewing and photomicrography. Built-in 3¼" X 4¼" camera with four flat field photo-eyepieces on revolving turret. Accessory attachments for 35mm., Polaroid, and movie cameras. Low-power (5X–40X) accessories available. Needs only 9" x 12" table space.

Brightfield Research Models:

MONOCULAR MODEL U-12. Same objectives and visual eyepieces as Model BR-MIC. **$1195.**

BINOCULAR MODEL BU-12. Binocular version of Model U-12. **$1379.**

Phase Research Models:

MONOCULAR MODEL U-13. Same phase objectives, turret condenser, and visual eyepieces as Model PH-MIC. **$1390.**

BINOCULAR MODEL BU-13. Binocular version of Model U-13. **$1580.**

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accommodates slides, wet mounts, special glassware, warming chambers and micro-manipulators ● unobstructed stage for easy access ● built-in, correct intensity illumination ● glare-free coated optics ● special petri dishes for observation of cultures even by highest power oil immersion objective ● graduated mechanical stage ● accessory camera attachments ● long working distance 40X objective and other accessories also available

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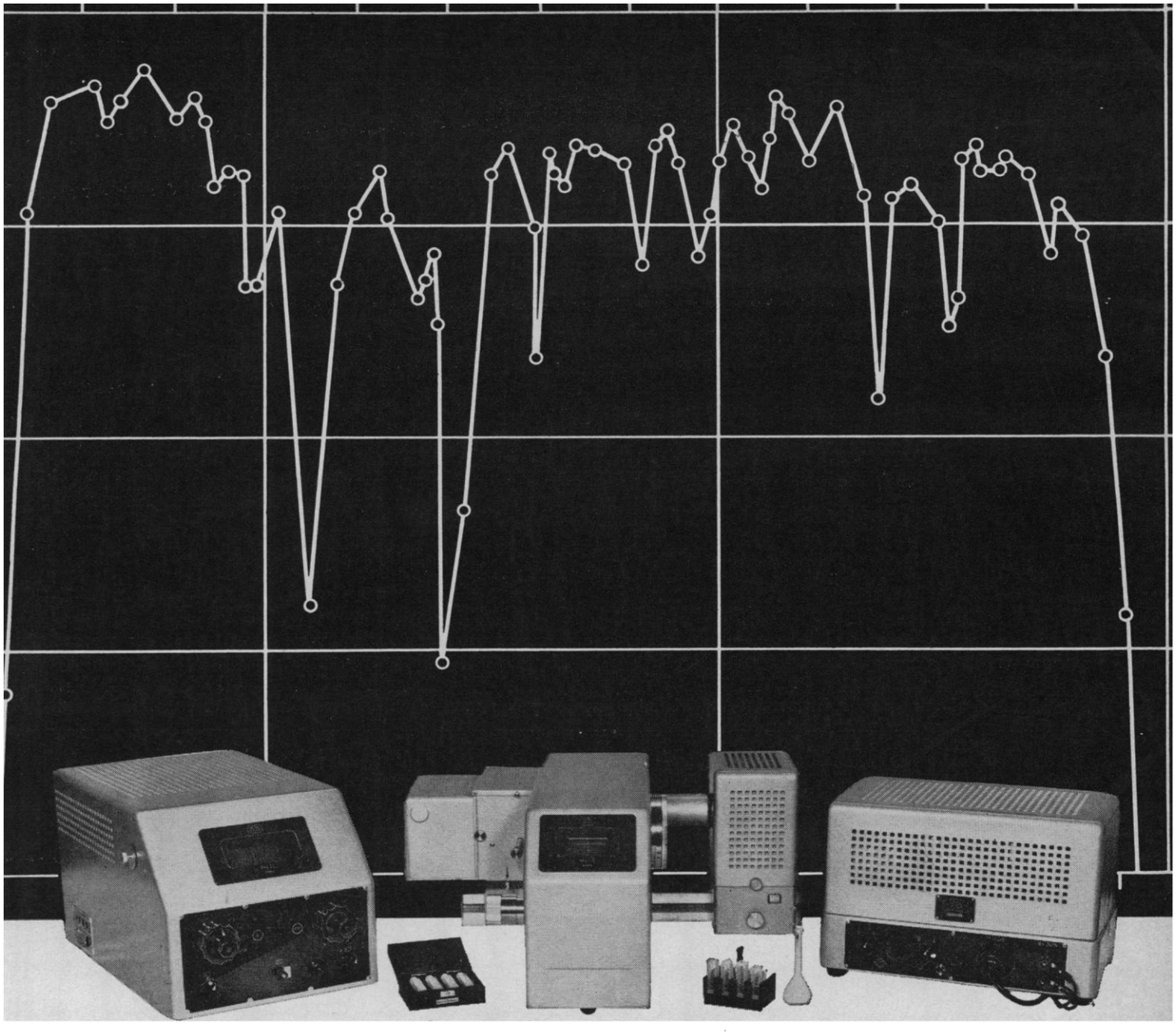

The Carl Zeiss Spectrophotometer PMQ II

For ultraviolet, visible and near infrared measurements from 185 mμ to 2500 mμ. Outstanding features include:

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  Adjustable 3-step damping device.
  Connections provided for 5 or 10mV recorder.
- Deuterium and tungsten light sources combined in one housing.
- Line-operated stabilized power supply.
- Supplementary attachments: Automatic 100-point (zero density) adjustment device; motor drive for wavelength scale; TE-converter; accessories for reflectance, chromatogram, fluorescence and flame measurements; heatable, low-temperature and microcell holders; stirring and titration devices.

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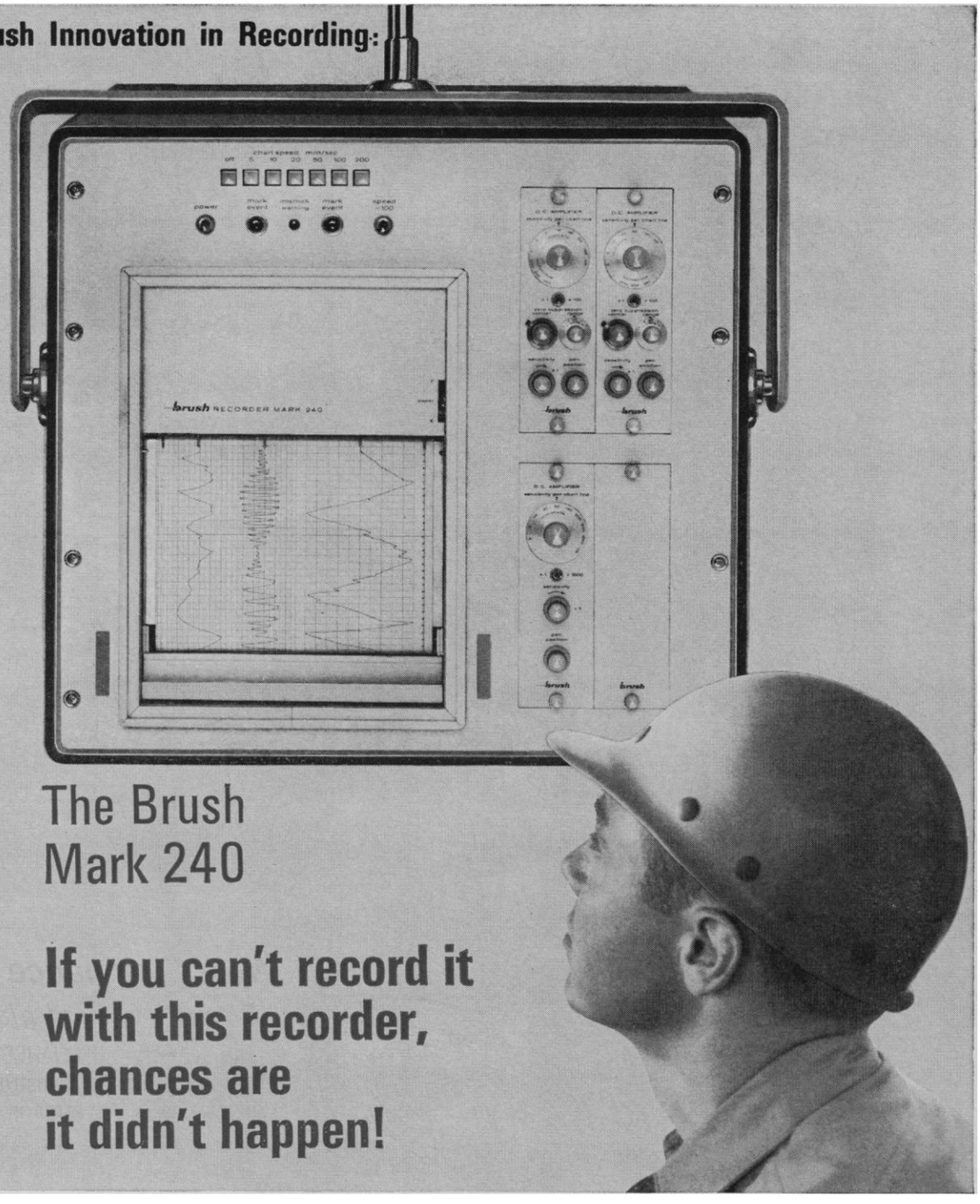
Another Brush Innovation in Recording:



The Brush Mark 240

If you can't record it with this recorder, chances are it didn't happen!

What we've done is this:

We took our famous Mark 200 Recorder and made a 'compact' version for general purpose and medical requirements. Performance? The new 240 will do everything the Mark 200 will do. And as Aerospace people will tell you, that's plenty: System linearity better than ½%. Pressurized fluid writing system assures incredibly crisp traces on low cost chart paper. Presentation is true rectilinear and there's push-button choice of 12 chart speeds.

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If your kind of recording calls for the utmost in resolution, precision and recording flexibility, ask your Brush representative for complete details about the new Brush Mark 240. There's nothing else like it . . . anywhere! Brush Instruments Division, Clevite Corporation, 37th & Perkins, Cleveland, Ohio 44114. *Just out! Three information-packed booklets on strain recording, temperature recording and techniques of low-level recording. Write us today for your copies. They're yours for the asking!* *see photo

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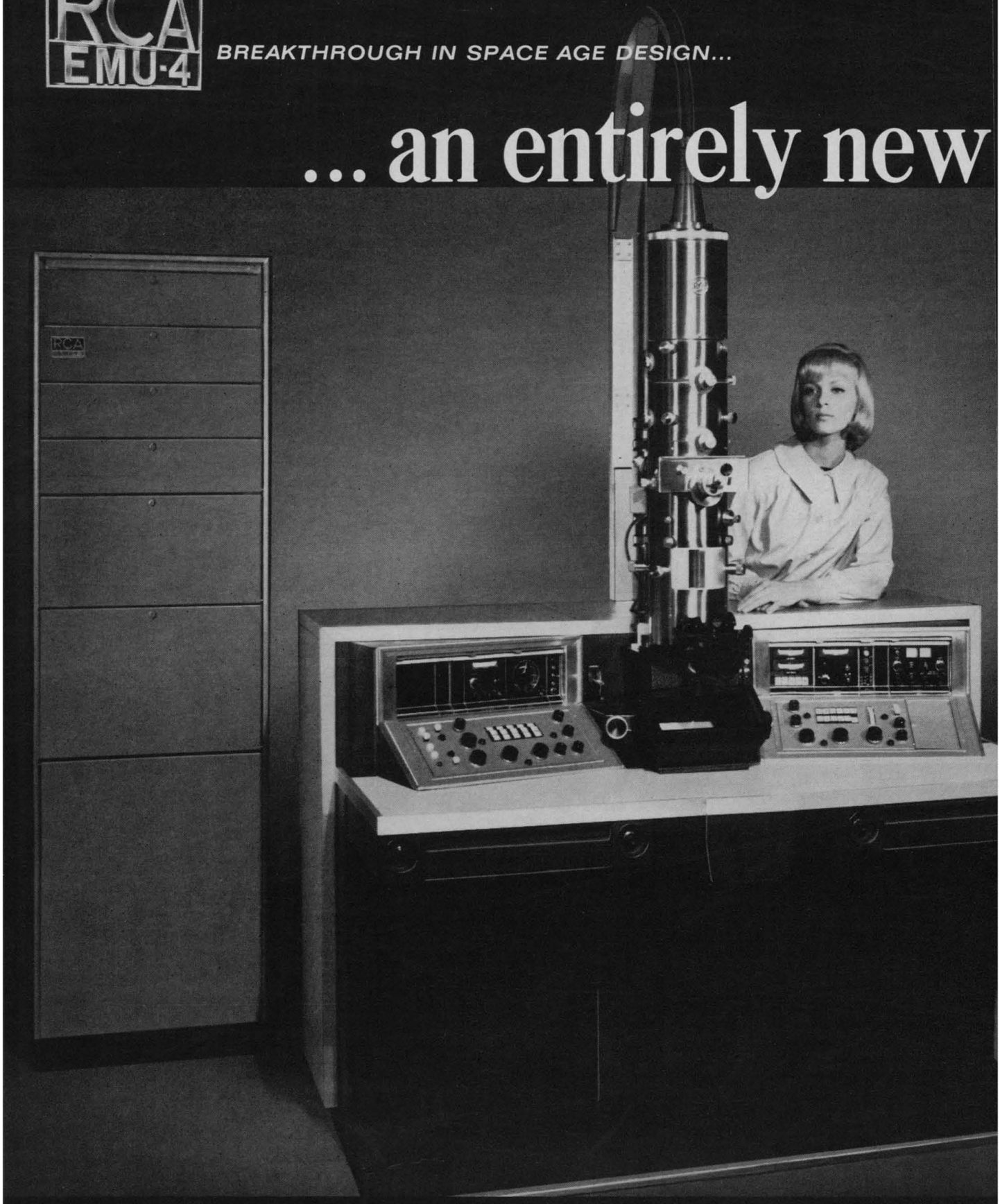
brush INSTRUMENTS DIVISION

RCA EMU-4

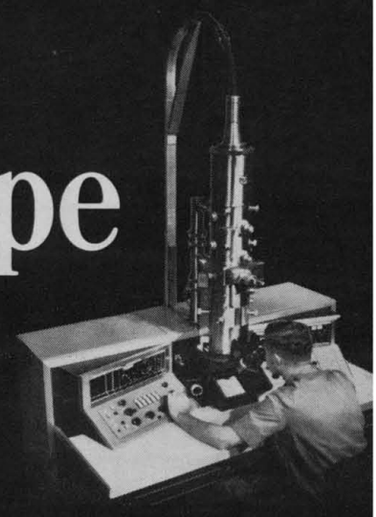
BREAKTHROUGH IN SPACE AGE DESIGN...

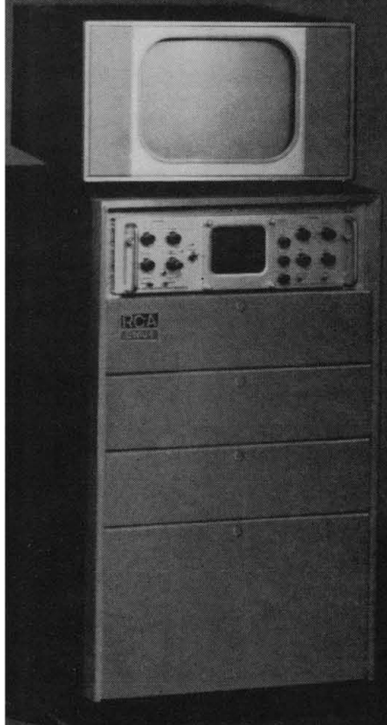
... an entirely new



Complete EMU-4 Electron Microscope System. Includes television image intensification. Rack at left stores the mechanical fore pump and power supplies.

Electron Microscope
FROM RCA





The EMU-4 is not just an up-dated model but a radically new design incorporating the best in space age solid state electronics, modular design, and vacuum technology. Here's a system which provides highest total performance, operational simplicity and long-term reliability.

SPACE AGE ELECTRONICS. Self-adjusting transistor circuits and use of high-voltage silicon rectifiers and temperature-compensated zener diodes assure highest reliability and simplicity of control.

AUTOMATED VACUUM SYSTEM. Fast pumping speed with new air lock permits instrument to be operational 20 seconds after specimen change. Plates can be removed without breaking column vacuum. Only 20 sec. required for shutdown.

WIDE MAGNIFICATION RANGE. Continuously variable and step control over a range of 140 to 1, 1400 to 200,000X. Down to 500 to 70,000X, with the use of an optional low-magnification pole piece.

TV IMAGE INTENSIFICATION SYSTEM. (Optional) Greatly increases versatility of the EMU-4 as a research tool and for training purposes. The first electron microscope specifically designed to work with true TV image intensification.

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These and many other outstanding features of the EMU-4 will assure the microscopist highest production of top quality micrographs. To further increase the versatility of this instrument, a full line of accessories is available. Nation-wide service can be provided. For further information write RCA Scientific Instruments, Building 15-5, Camden, N.J. In Canada: RCA Victor Company Limited, Montreal.

Modular Design. EMU-4 is the first electron microscope constructed of standard transistorized modules. Modules speed servicing and make it easy to integrate new functions into the system.

New Highly Versatile Photographic Facilities. Capacity for six 2" x 10" plates for a total of 30 or 36 exposures; or eighteen 3¼" x 4" plates. Air lock permits removing cassette without breaking vacuum.

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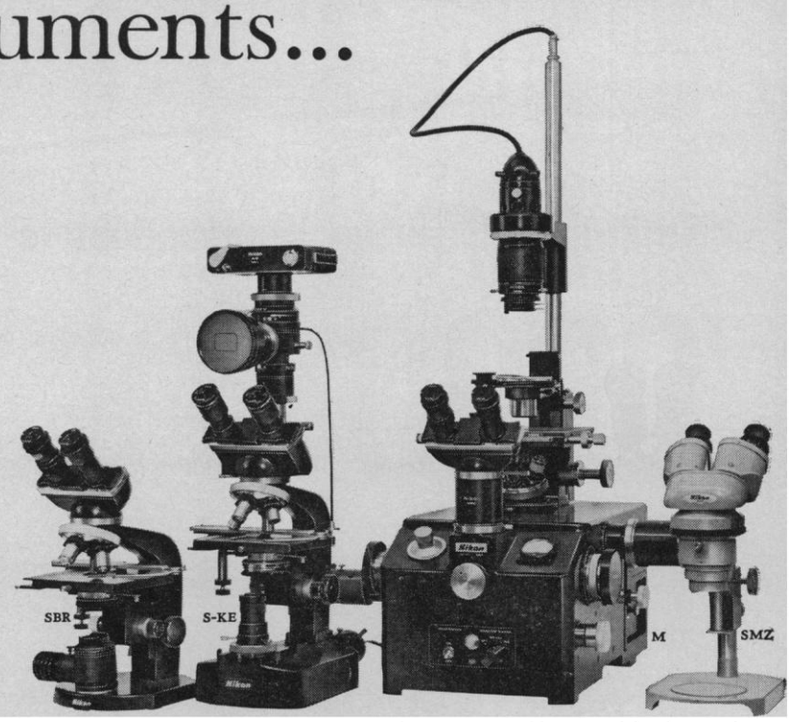
NIKON MICROSCOPES

There is hardly a technique in subvisible investigation which does not derive some noticeable benefit from the optical quality of these instruments...



Model SBR Laboratory Microscope – The most widely used of the Nikon S series. A veritable workhorse for routine applications, yet easily adaptable to special requirements. Ready interchangeability of eyepiece body tubes, stages, condensers, oculars, objectives, etc., and a wide-variety of attachments and accessories, provide astonishing versatility.

Model M Inverted Microscope—A highly sophisticated instrument designed to meet the exacting requirements in biological, medical and industrial research. Ideally suited for transmitted-light and reflected-light microscopy, time-lapse cinemicrography in tissue-culture studies, and other specialized applications. Accepts same interchangeable accessories and attachments as Series S and S-Ke.

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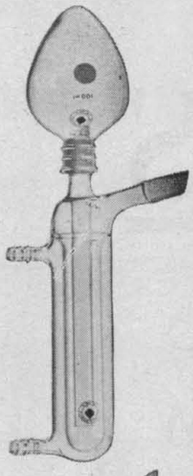
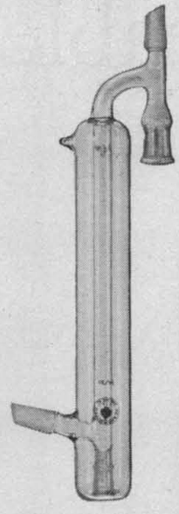
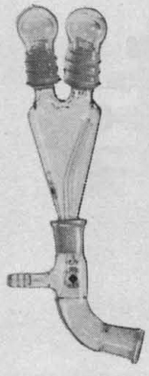
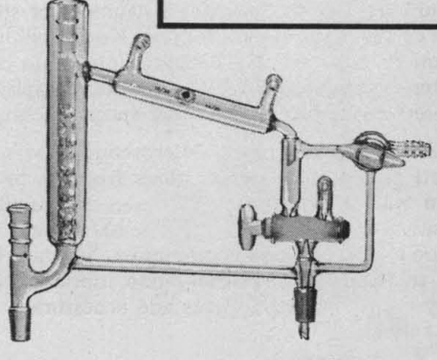
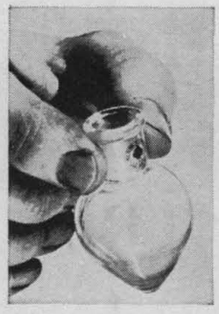








Think  Micro!

The reasons for thinking micro or semi-micro are: space saving, lower initial cost, savings on chemicals *and Ace Mini-Lab, the first and original laboratory in miniature!*

Ace Mini-Lab, introduced in 1950, is the first especially designed line of miniature glassware. Our chemists and designers are perfectionists. Each Mini-Lab apparatus was tested until it performed most efficiently.

Result? Success! Today, Mini-Lab is enthusiastically accepted in laboratories, schools, everywhere!

Ace Mini-Lab, the most complete line of miniature glassware, comes in ⅋ 14/20, 19/22 and ⅋ 18/9 joints; a full line of components permits endless variations.

Another first! You can get Mini-Lab as self-heating glassware: Ace INSTATHERM! Mini-Lab also comes in student kits with PolyGard interior! Stop thinking—do! *Send for new Mini-Lab and Instatherm brochures.*

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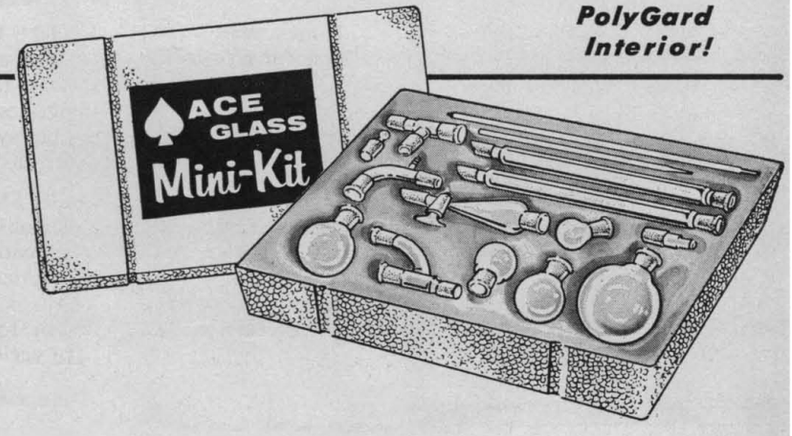


Bone once defied direct radiocarbon dating.

Not anymore.

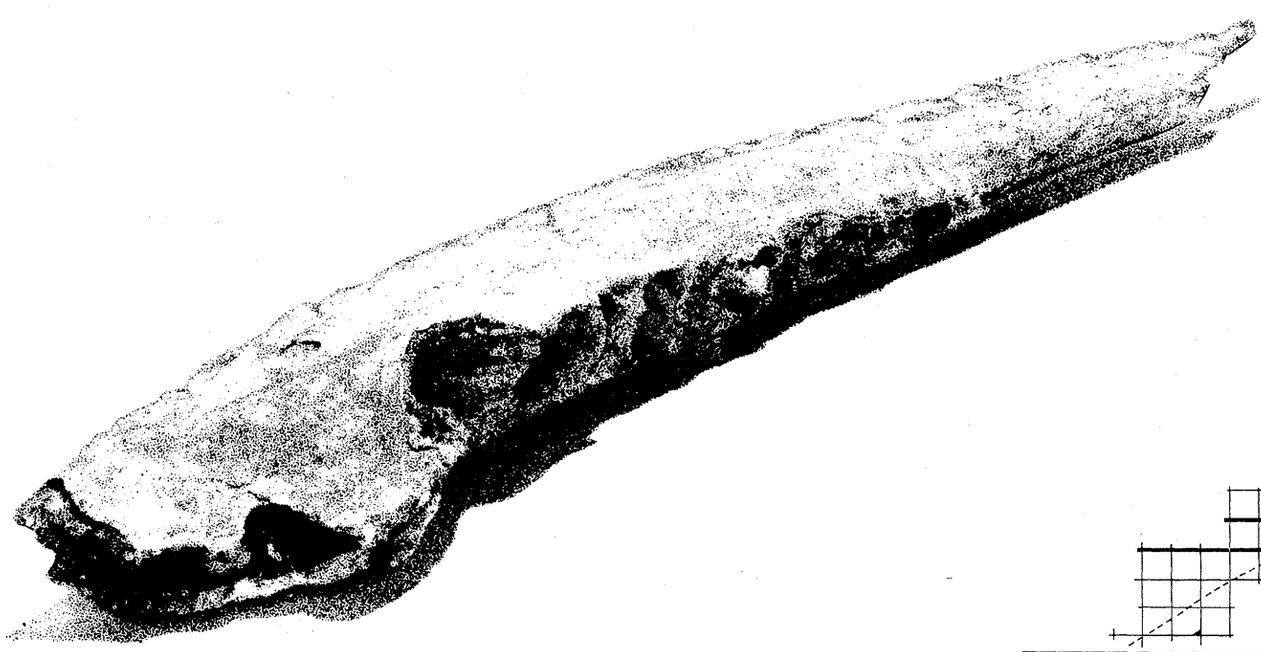
Until recently, radiocarbon dating of archaeological bone samples was based primarily on the dating of associated charcoal or associated organic articles. Now, direct dating of bone is fully practical.

Direct age determination of bone is based on the measurement of the contained bone protein, collagen. Fractionation or other natural mechanisms do not occur with collagen to give a false age.

Direct bone dating is best used to determine the relative ages of bones found in the same general locality, because environmental conditions can effect the rate of collagen decrease in a sample. The oldest samples that have been thus far dated by the collagen method are 9000 years old.

Isotopes, Inc., can date your bone samples by the collagen method. The collagen method costs no more than normal radiocarbon dating. Our prices per evaluation range from $160 to $120 depending on the number of samples submitted to our laboratory during the year. Your results will be reported within three to four weeks after receipt of samples. Complete C^{13}/C^{12} isotopic analysis is available for just an additional $25 to $15 fee, depending once again on the number of samples during the year.

For complete details on our age determination services, and a price list call Bob Adkins at 201-NO4-7070 or write Isotopes, Inc., 124 Woodland Avenue, Westwood, New Jersey 07675.



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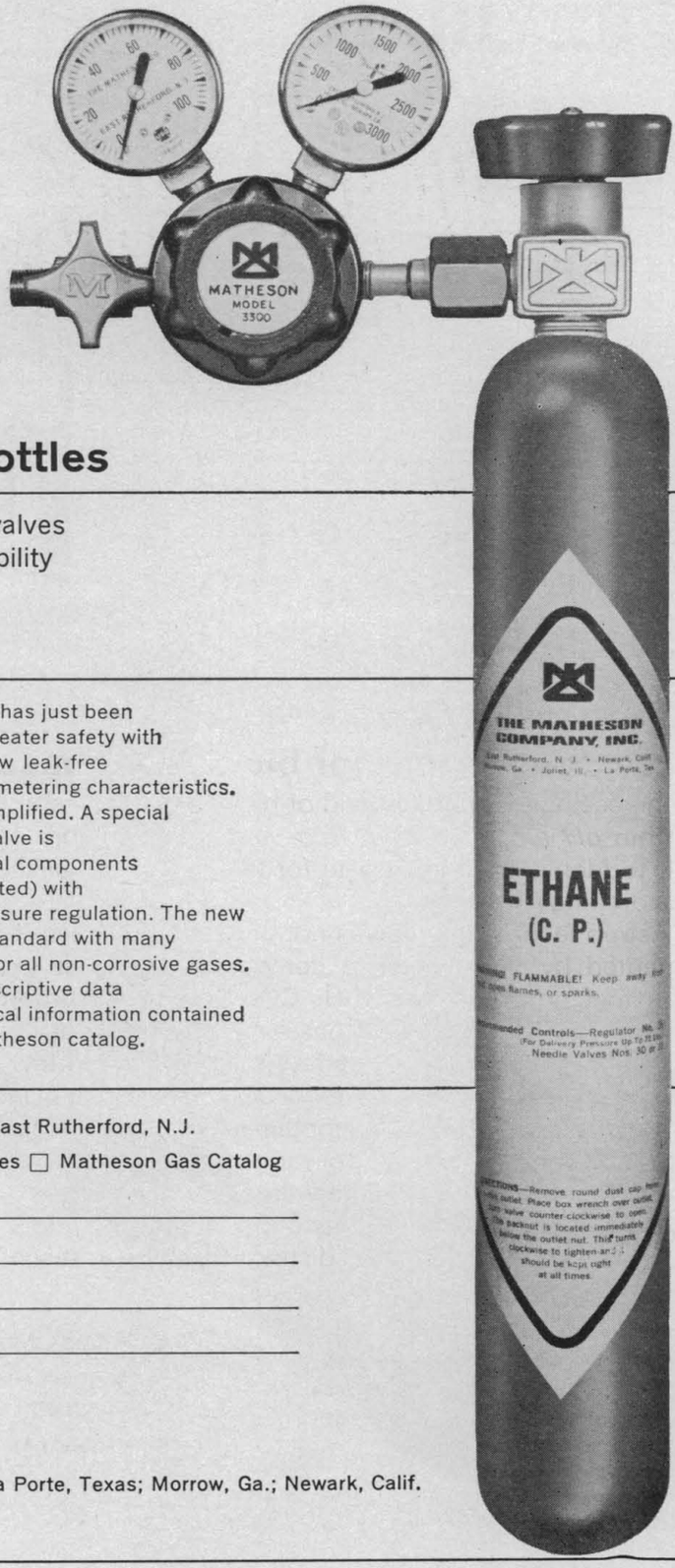

New, Improved Matheson Lecture Bottles

Exclusive, equipped with packless valves
Exclusive, dual threads for compatibility with new, also existing equipment
Exclusive, new controls available

The Lecture Bottle, originated by Matheson, has just been redesigned to provide easier handling and greater safety with non-corrosive gases. It is equipped with a new leak-free packless valve, handwheel control, for good metering characteristics. No wrenches are required and hook-up is simplified. A special valve that connects directly to the cylinder valve is available for ultra-fine metering. Other special components include a metal diaphragm regulator (illustrated) with balanced poppet for greater accuracy in pressure regulation. The new Lecture Bottle and packless valve are now standard with many Matheson gases and will soon be standard for all non-corrosive gases. Write to your nearest Matheson plant for descriptive data on our Lecture Bottle innovation. The technical information contained makes an important supplement to your Matheson catalog.

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by RADIOMETER

A complete system for blood acid-base measurements

In the increasingly important field of blood acid-base status, no reliable diagnosis can be made from *pH alone, or from Pco_2 alone*—respiratory and metabolic disturbances are difficult to identify and segregate for therapy unless *all* the parameters of the acid-base balance are known.

The Astrup technique involves not only an ultra-micro blood sampling method—but as instrumented by Radiometer, a complete system for exposing and evaluating *all* the separate and critical factors: pH, CO_2 tension, Bicarbonates, Buffer Base, Total CO_2, and a figure of excess acid or base in the system for chemical therapy. The AME-1 is field proven, and requires only a few moments and a few drops of blood for a complete determination—including, with extra accessories, the measurement of oxygen tension.

The unit is completely self-contained for both sampling and measurement, and is mounted in a wheeled cabinet for rapid movement between clinical and research laboratories, or to surgical or after-care wards.

Complete literature, and reprints of pertinent scientific papers are available and, should you wish it, names of the many distinguished and satisfied users in your area.

Write for your copy of the Astrup Method Reference and Data WallChart which details the technique as well as other useful blood acid-base data.

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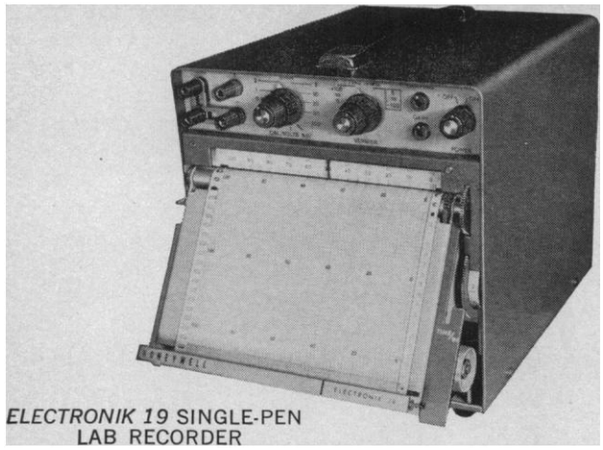
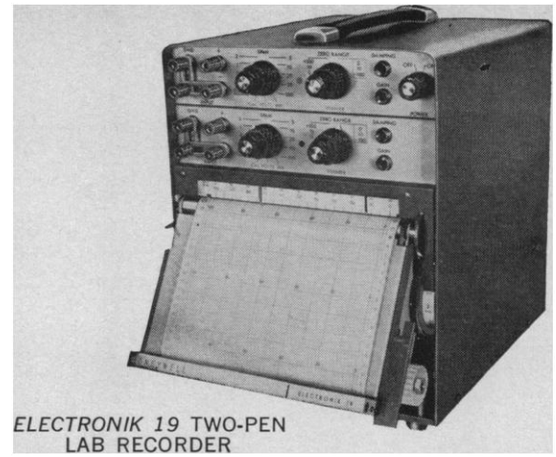


ELECTRONIK 19 SINGLE-PEN LAB RECORDER



ELECTRONIK 19 TWO-PEN LAB RECORDER

What's your application?

Differential Thermal Analysis?
Spectrophotometry?
Chromatography?

Temperature?
Spectrometry?
pH and Conductivity?

Rate of Reaction by Rate of Temperature Rise?
Microvolts-Millivolts-Volts?

The Honeywell ElectroniK 19 Portable Laboratory Recorder is most likely the instrument you need. Why not order one today?

FEATURES

Multi-Range Input: D-C from 100 MICROVOLTS to 100 volts in 19 discrete steps with 1, 2, 5, 10 relationship between steps.

High Accuracy: ±0.25% of span or 1 MICROVOLT, whichever is greater.

Fast Response: Less than 0.5 second full scale. Down less than 1% of full scale for a 5 cps 10% of full scale peak-to-peak sine wave input.

Two-Step or Eleven-Step Zero Positioning: Continuously adjustable zero positioning from +100% to −100% of span in 2 steps, or from +100% to −1000% of span in 11 steps. Rotary switch provides either 2 or 11 calibrated zero positions with continuous vernier adjustments to intermediate positions.

Versatile Chart System: 10 speeds from 1 sec/in to 10 min/in with 1, 2, 5 relationship between steps; chart reroll or positive drive out across table top, and chart platen which tilts to 30° and 45° from vertical.

Simplified Ink System: Disposable ink cartridge, easily replaced and primed without "splash". Manual pen lifter included.

Compact: Single channel recording 8¾-inch wide x 8¾-inch high x 11-inch deep case; two-channel recording in 8¾-inch wide x 10½-inch high x 11-inch deep case.

Light Weight, Portable: Single-pen recorder weighs less than 20 pounds; two-pen recorder, less than 29 pounds. Equipped with comfortable carrying handle.

Easy Connections: Front terminals for input, rear power cord and three-prong plug.

OPTIONS

Auxiliary Switches: For signalling, alarms and control. Price, 1 switch $40/pen, 2 switches $60/pen.

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Power Line Option: 220 or 240 volts instead of 120 volts. Price $15.

Power Frequency: 50 cycle operation instead of 60 cycles. No extra charge.

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Model 19302-11-01 Two-Pen Recorder, ±100% Zero each pen $1995

Model 19301-02-01 Single-Pen Recorder, +100%, −1000% Zero $1200

Model 19302-22-01 Two-Pen Recorder, +100%, −1000% Zero each pen $2195

Note: Prices are net FOB U. S. Factory, All prices and specifications subject to change without notice.

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For more information on Beckman Planchet Counting Systems, contact your local Beckman Sales Engineer or write for Data File LN-166.

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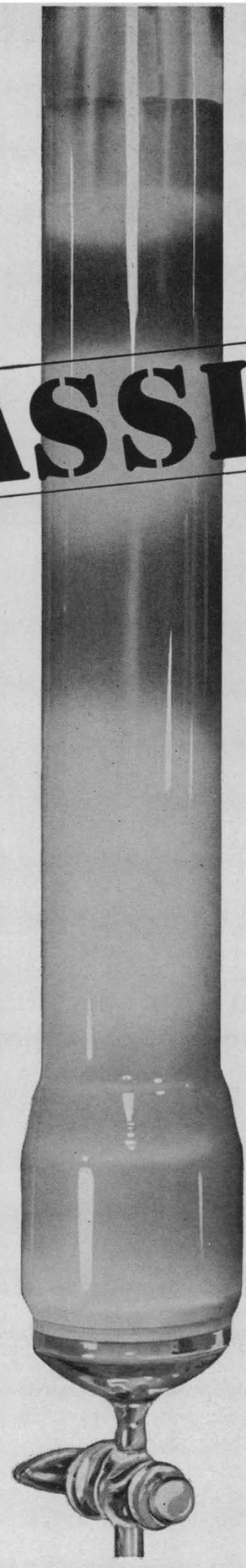

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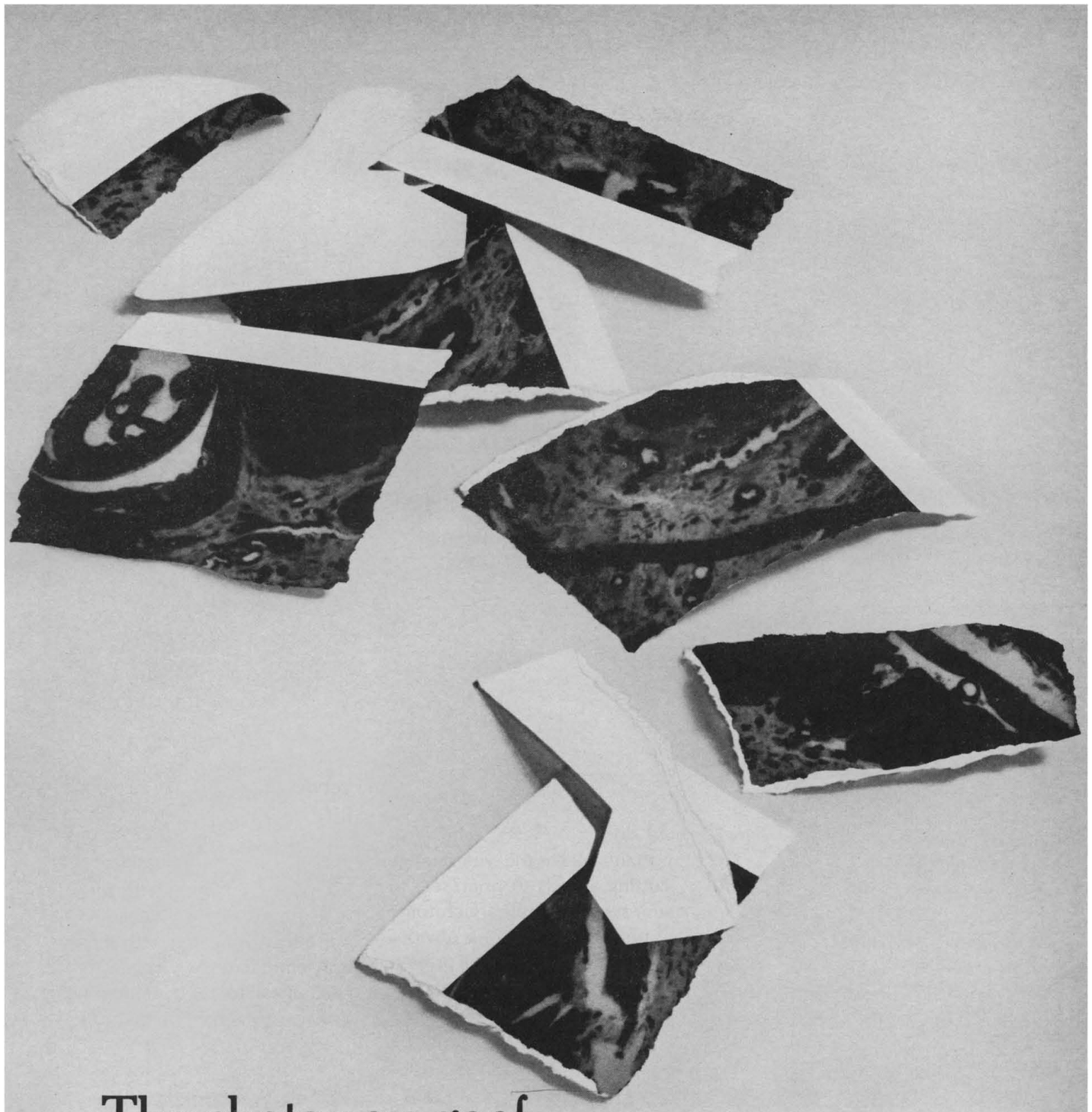

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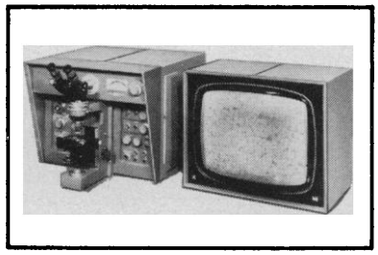
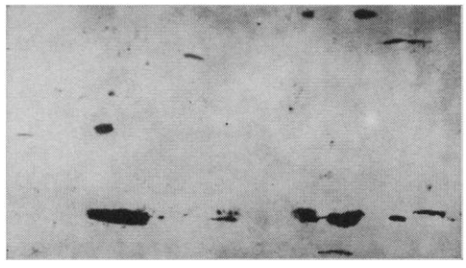
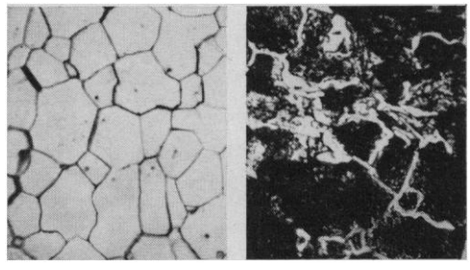
The Quantitative Micro-Image Analyzer has a microscope fitted with beam splitting prism which projects the image simultaneously into a conventional binocular eyepiece for direct viewing and to a television camera which displays it for easy focusing and field selection. The output from the camera is also fed directly into an electronic detector which responds to the changes in output voltage as the scanning spot in the camera tube passes over features in the field, such as grain boundaries, inclusion pores, cells, bacteria, or powder particles. The signals obtained from such areas are also fed immediately into the computer which then presents the desired information on the meter. The screen provides the operator with an instantaneous visual check of setting and instrument operation. Below are examples of this versatile instrument in action. To get more complete details, write for our bulletin QTM-1.





INCLUSIONS IN METAL

For this field of sulphide and silicate inclusions in steel, the Quantitative Micro-Image Analyzer will provide the following information: the number of inclusions present, counting the silicate stringers either as one inclusion or as number of fragments; the number of inclusions in any size range; the area or volume fraction; the average form factor; the average size.

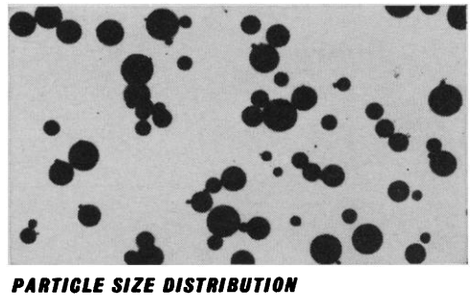


GRAIN SIZE AND FORM FACTOR

The Quantitative Micro-Image Analyzer provides a figure for Mean Linear intercept which is readily converted to A.S.T.M. standards. Shown above is a conventionally prepared mild steel sample etched in 2% nital and a McQuaid-Ehn Test sample. By taking readings along and across the direction of elongation, an average form factor for grains is readily and accurately determined.

VOLUME FRACTION

In just two minutes, the Quantitative Micro-Image Analyzer was able to make readings for 10 different parts of this specimen, measuring the pearlite fraction in this conventionally prepared plain carbon steel sample.



PARTICLE SIZE DISTRIBUTION

The Quantitative Micro-Image Analyzer provided the following information on the acrylic granules shown. There are 9 particles 0-5 microns in size; 21 in the 5-10 range; 37 between 10-20; 20 between 20-40; 3 between 40-80; none above 80 microns.

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Compounds	S.A. C/mM	Price 1 mc	5 mc	25 mc
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Adenosine-GL-H-3	2-5	30.00	100.00	395.00
Adenosine-5'-diphosphate-GL-H-3	0.5-1	95.00	350.00	995.00
Adenosine-5'-monophosphate-GL-H-3	0.5-1	95.00	350.00	995.00
Adenosine-5'-triphosphate-GL-H-3	0.5-1	95.00	350.00	995.00
L-Arginine-HCl-GL-H-3	2-10	70.00	200.00	595.00
Cytidine-GL-H-3	2-10	55.00	100.00	395.00
Deoxyadenosine-GL-H-3	2-5	75.00	280.00	840.00
D-Glucose-1-H-3	0.3-1	30.00	100.00	300.00
Guanosine-GL-H-3	1-5	30.00	100.00	300.00
Guanosine-5'-diphosphate-GL-H-3	0.5-1	95.00	350.00	995.00
Guanosine-5'-monophosphate-GL-H-3	0.5-1	95.00	350.00	995.00
Guanosine-5'-triphosphate-GL-H-3	0.5-1	95.00	350.00	995.00
DL-Histidine-2-H-3	2-5	75.00	100.00	395.00
DL-5-Hydroxytryptophan-GL-H-3	1-5	55.00	95.00	335.00
L-Methionine-GL-H-3	2-10	30.00	100.00	400.00
L-Norepinephrine-GL-H-3	0.5-5	95.00	210.00	675.00
Orotic acid-5-H-3	1-5	35.00	95.00	350.00
L-Proline-GL-H-3	1-10	70.00	95.00	385.00
DL-Serine-GL-H-3	1-5	50.00	95.00	385.00
Serotonin-GL-H-3	2-5	65.00	125.00	395.00
Taurine-GL-H-3	1-5	55.00	95.00	350.00
Thymidine-GL-H-3	1-6	25.00	80.00	295.00
Thymidine-methyl-H-3	6-15	25.00	80.00	295.00
Thymine-methyl-H-3	5-15	25.00	80.00	295.00
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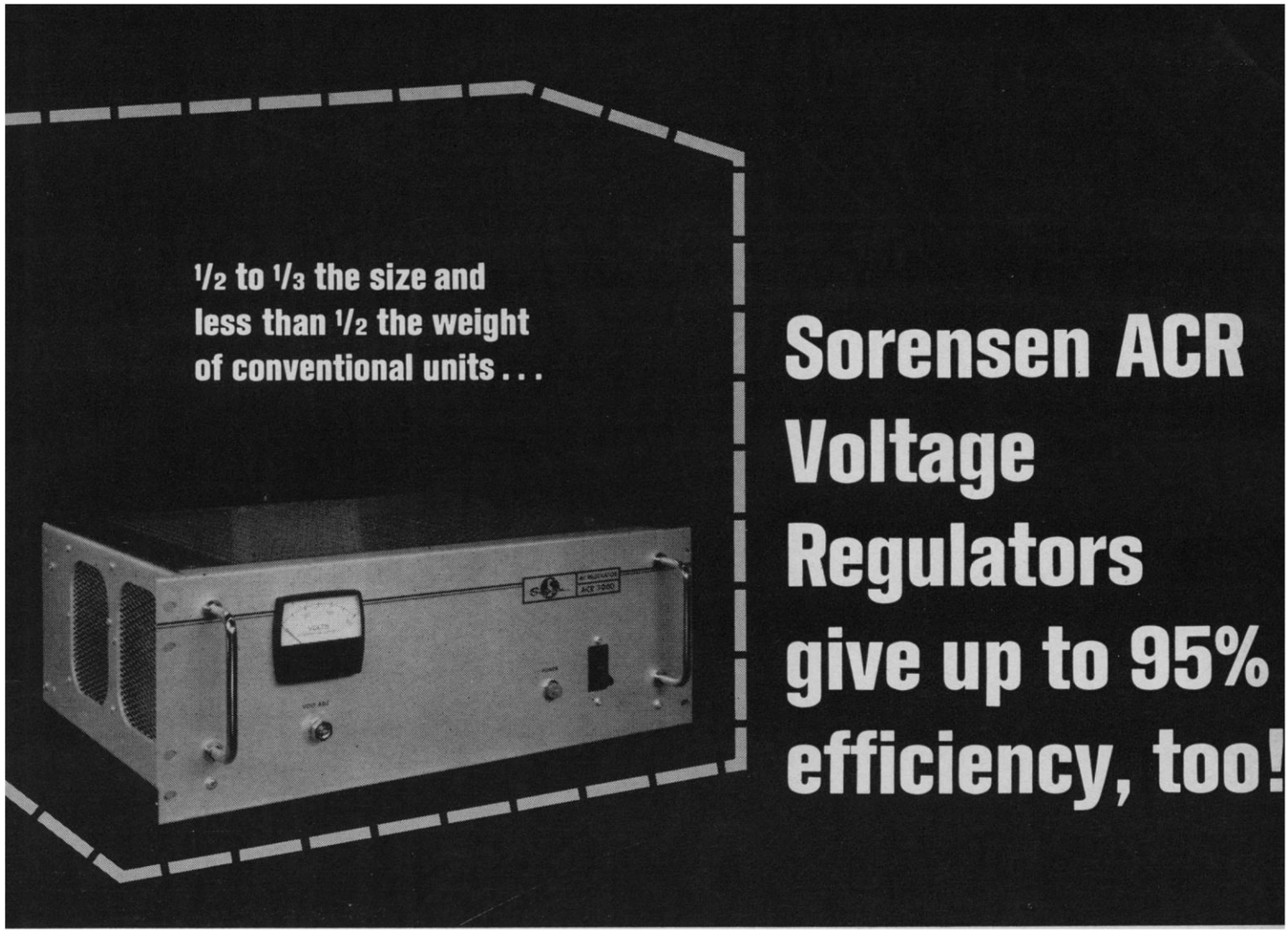

In these new Sorensen silicon controlled rectifier AC regulators, you get the best combination of power, performance, and packaging you've ever seen. The unit is reduced to the size of the transformer and control circuitry. Ideal for motor starting, lamp loads, tube filaments, X-ray applications, etc., ACR Series regulators are designed to control the RMS voltage to a variety of loads requiring precise regulation, fast response time, and low distortion.

1. 8 MODELS AVAILABLE (500, 1000, 2000, 3000, 5000, 7500, 10000, 15000 VA)
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For data on these and other Sorensen power supplies—the DCR Series low voltage (SCR), the QB narrow range and the QRB wide range transistorized units—send for a complete catalog. Write: Sorensen, A Unit of Raytheon Co., Richards Ave., South Norwalk, Conn. 06856.

ACR ELECTRICAL AND MECHANICAL SPECIFICATIONS

MODEL NUMBER	OUTPUT VA RANGE	REGULATION ACCURACY LINE	REGULATION ACCURACY LOAD	EFFICIENCY (FULL VA)	TYPICAL POWER FACTOR	TEMPERATURE AMBIENT (°C)	TEMPERATURE COEFFICIENT (°C)	DIMENSIONS (INCHES) WIDTH	HEIGHT	DEPTH	RACK HEIGHT	PRICE**
ACR 500	0-500	±0.1%	±0.1%	88%	75%	0-50	.03%	15*	5	9	5¼	$ 290
ACR 1000	0-1000	±0.1%	±0.1%	90%	75%	0-50	.03%	19	5¼	11	5¼	340
ACR 2000	0-2000	±0.1%	±0.1%	92%	75%	0-50	.03%	19	5¼	15	5¼	435
ACR 3000	0-3000	±0.1%	±0.1%	95%	75%	0-50	.03%	19	7	15	7	555
ACR 5000	0-5000	±0.15%	±0.15%	95%	75%	0-50	.03%	19	7	20	7	715
ACR 7500	0-7500	±0.15%	±0.15%	95%	75%	0-50	.03%	19	12 7/32	20	12 7/32	850
ACR 10000	0-10000	±0.15%	±0.15%	95%	75%	0-50	.03%	19	12 7/32	20	12 7/32	1,200
ACR 15000	0-15000	±0.15%	±0.15%	95%	75%	0-50	.03%	19	17 15/32	20	17 15/32	1,500

*A 19 inch adapter (rack) panel is available.
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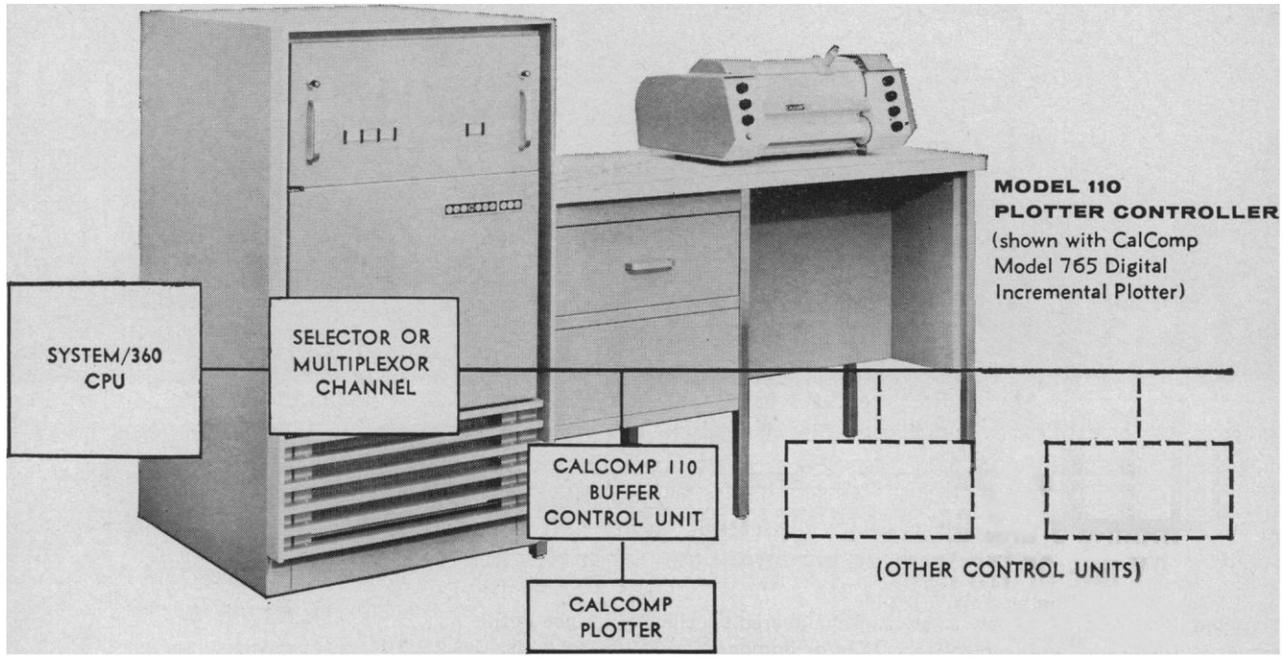

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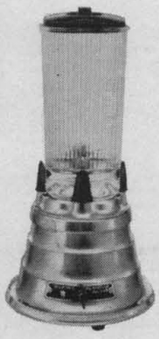

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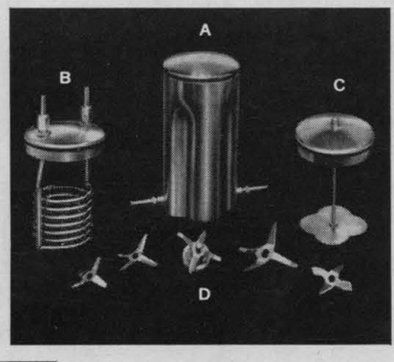

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"The System." Now it has electric drive. So you can create where you used to just crank.

People are always saying, " 'the system' is more versatile than anything called 'camera'." Well, if you thought *that* before, you won't believe "the system" now. You see, now there's the Hasselblad 500EL, the first electric motor-driven 2¼ x 2¼ single lens reflex. And it'll let you do what you've probably never been able to do before. The new 500EL cocks the shutter and advances the film automatically. So you can clickclickclick off a whole series of shots without ever looking up. Or moving a muscle. Without ever losing sight of your subject. Right now you might say "Fine, I want the 500EL. But what am I supposed to do with all the Hasselblad lenses and backs I have? The answer is simple: use the 500EL as an addition to "the system." It will take any lenses, magazines, or viewfinders, and most accessories the 500C will take. What else can the 500EL do? Well,

Hasselblad 500EL with Zeiss 80mm lens.

first of all, you don't have to even be near it when you're clicking off pictures. (There's nothing worse than being tied to your camera when you'd like to be working with your subject.) So by using the 500EL with a special release cord, you can clickclickclick at distances of up to 200 yards. Or by adding the new remote-control Hasselblad radio transmitter, you can clickclickclick from even miles away. And then there's time lapse. By adding a Hasselblad timer to the 500EL you can shoot automatically at intervals anywhere from one second to sixty hours. (With that kind of time-lapse, we dare say there's little you can't do.)

Now you know about the 500EL. But it's only part of the story. The rest has to do with interchangeability. The thing that makes "the system" the system.

In the area of lenses, for example, "the system" doesn't have one or two. The number is six. 50, 80, 120, 150, 250 and 500mm. Each is Zeiss. Each has a Synchro-Compur shutter. Each is completely interchangeable. And film backs. You get a choice of four. Three for roll film, each in a different format. One for cut film. Each interchangeable. So you can go from color to black and white, indoor to outdoor film midroll. Viewfinders, too. "The system" gives you five. (That's four more than most "cameras.") Eye-level prisms, magnifying hoods, the works. All interchangeable. Plus, a truck-full of accessories.

Left to right: Hasselblad 500C with 80mm lens and light meter knob; Hasselblad 500EL with 80mm lens; Zeiss 500mm, 50mm, 150mm, 250mm, and 120mm lenses.

Sure, "the system" was versatile before the 500EL. But now with its addition, we can say, more than ever, "This is a system. Not to be confused with a camera." For information on the 500EL, write: Paillard Incorporated, 1900 Lower Road, Linden, N.J.

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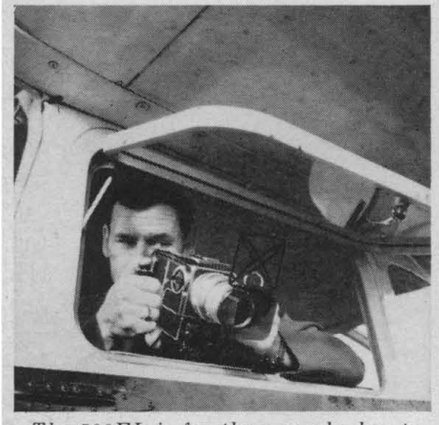
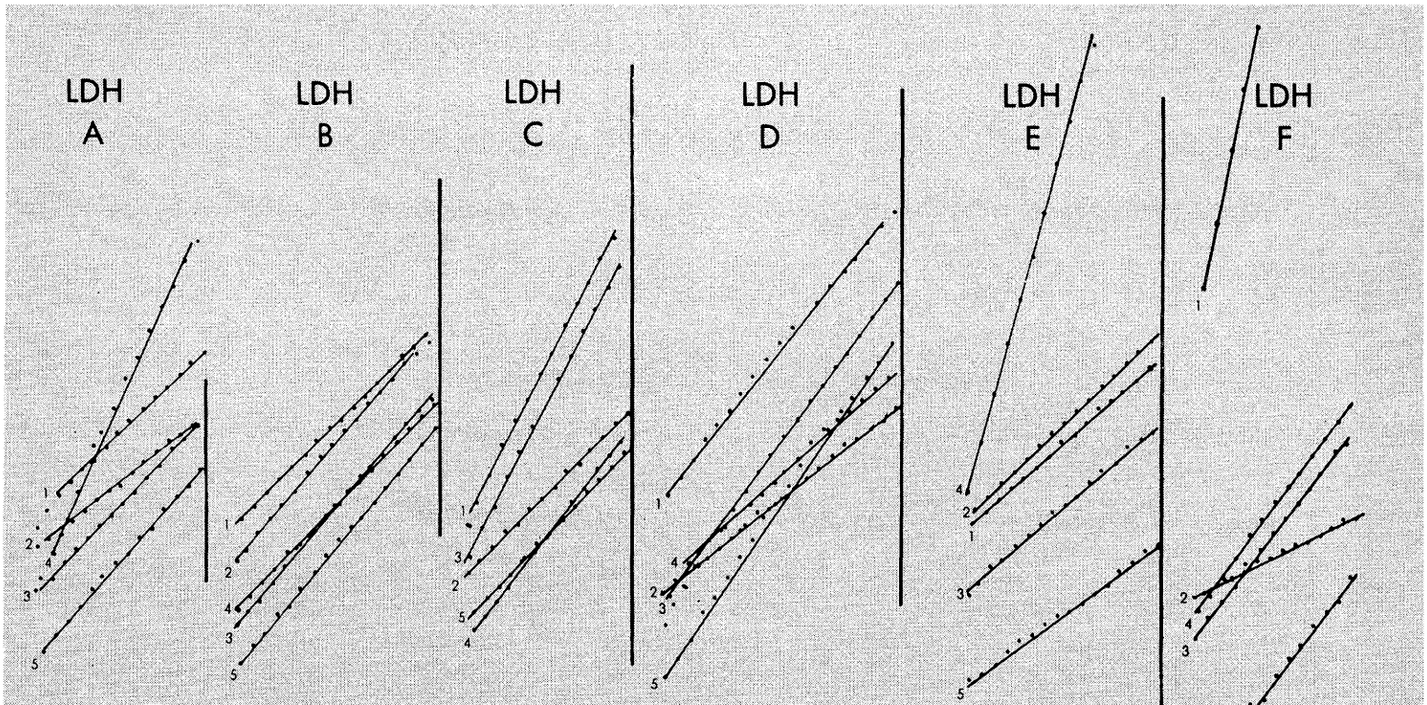


The 500EL is for the guy who has to be in two places at one time. In this case, being a pilot and an aerial photographer simultaneously.



The chart above demonstrates the kinetic spectrophotometric assay of lactic dehydrogenase (LDH). The activity of this enzyme is frequently measured in serum of patients suspected of having had a heart attack. The decreasing absorbance "A" at 340 mμ is recorded against time as LDH catalyzes the reaction.

$$\text{pyruvate} + \text{DPNH} \overset{+\ \text{LDH}}{\rightleftarrows} \text{DPN} + H^+ + \text{lactate}$$

The rate of this reaction (slope of dA/dt during the initial "O" order portion) is a measure of the enzyme's activity. Extreme slopes and/or deviation from linearity are indicative of an LDH abnormality. 30 production runs in 6 groups are recorded on one chart, at 3 minutes/ group.

NEW AUTOMATIC TECHNIQUE REDUCES ENZYME ANALYSIS COSTS

You can do all of your reaction kinetics experiments on this one instrument, and still have a double-beam, scanning UV-Visible Spectrophotometer for bilirubin, barbiturate and salicylate analyses.

The Automatic Multiple Sampling System using Perkin-Elmer's Model 202 Spectrophotometer, saves you vital laboratory analysis time in clinical serum studies. Kinetic reactions may be studied spectrophotometrically, on a production scale of hundreds of analyses per day, at a minimum cost per analysis.

The analysis proceeds at a fixed wavelength of light. The wavelength you select is held constant while the decrease in absorbance of one of the reactants is recorded as a function of time.

Perkin-Elmer's Automatic Multiple Sampling System features...

- A double beam, direct absorbance recording spectrophotometer with analytical accuracy of ± .01 absorbance units;
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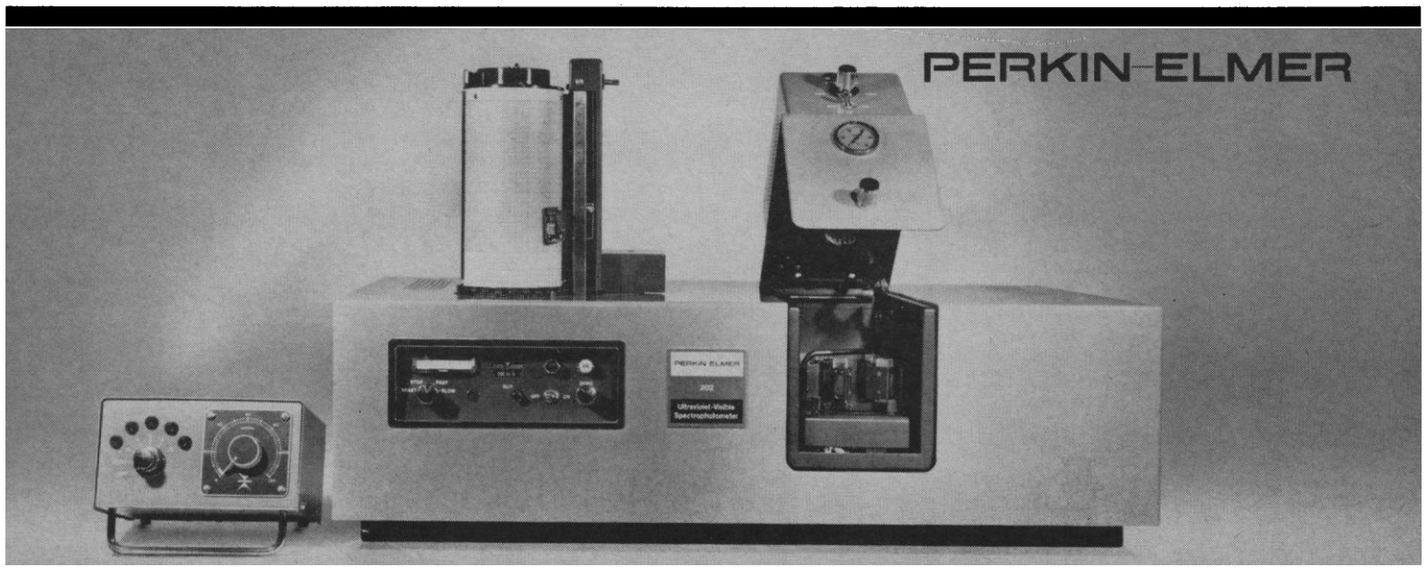

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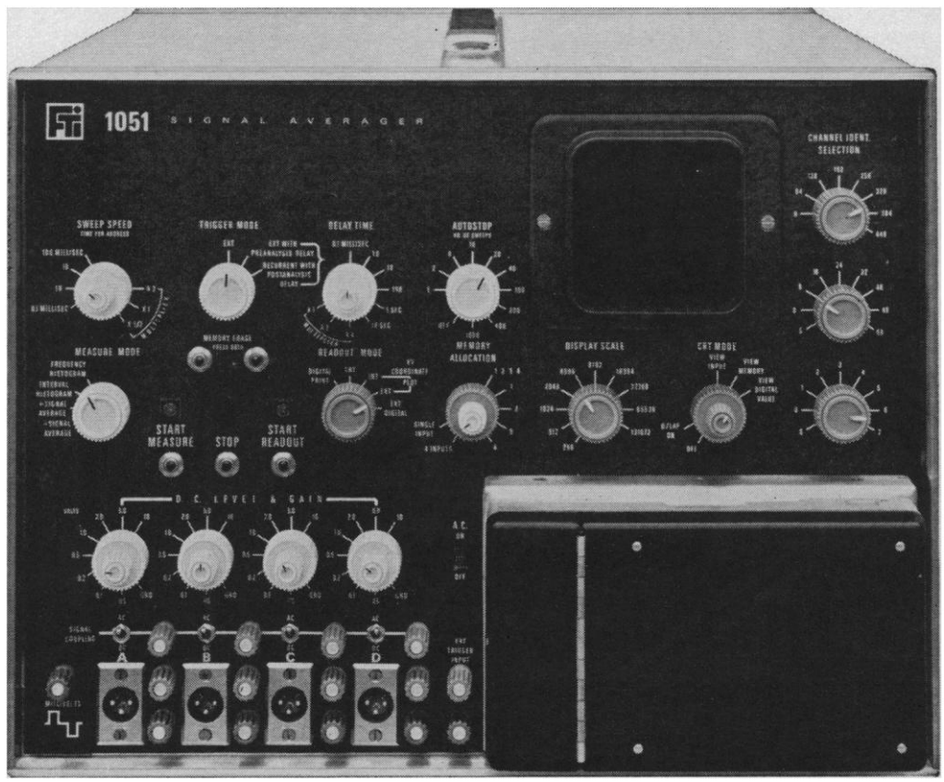

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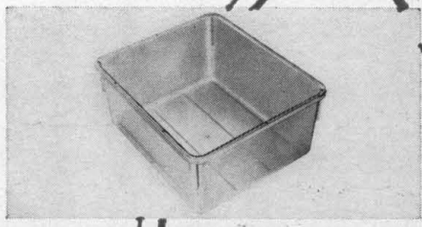

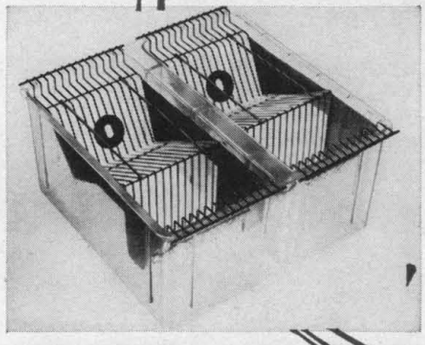

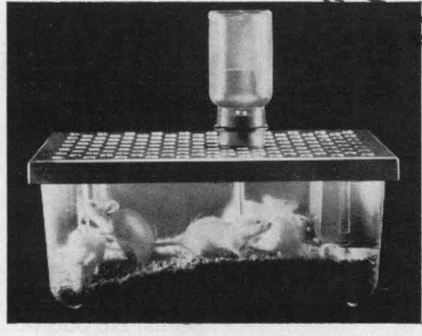

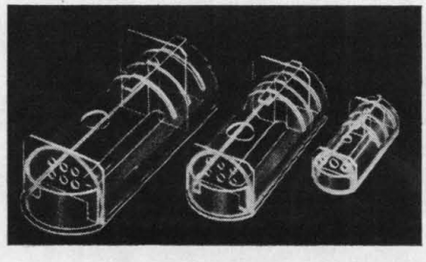

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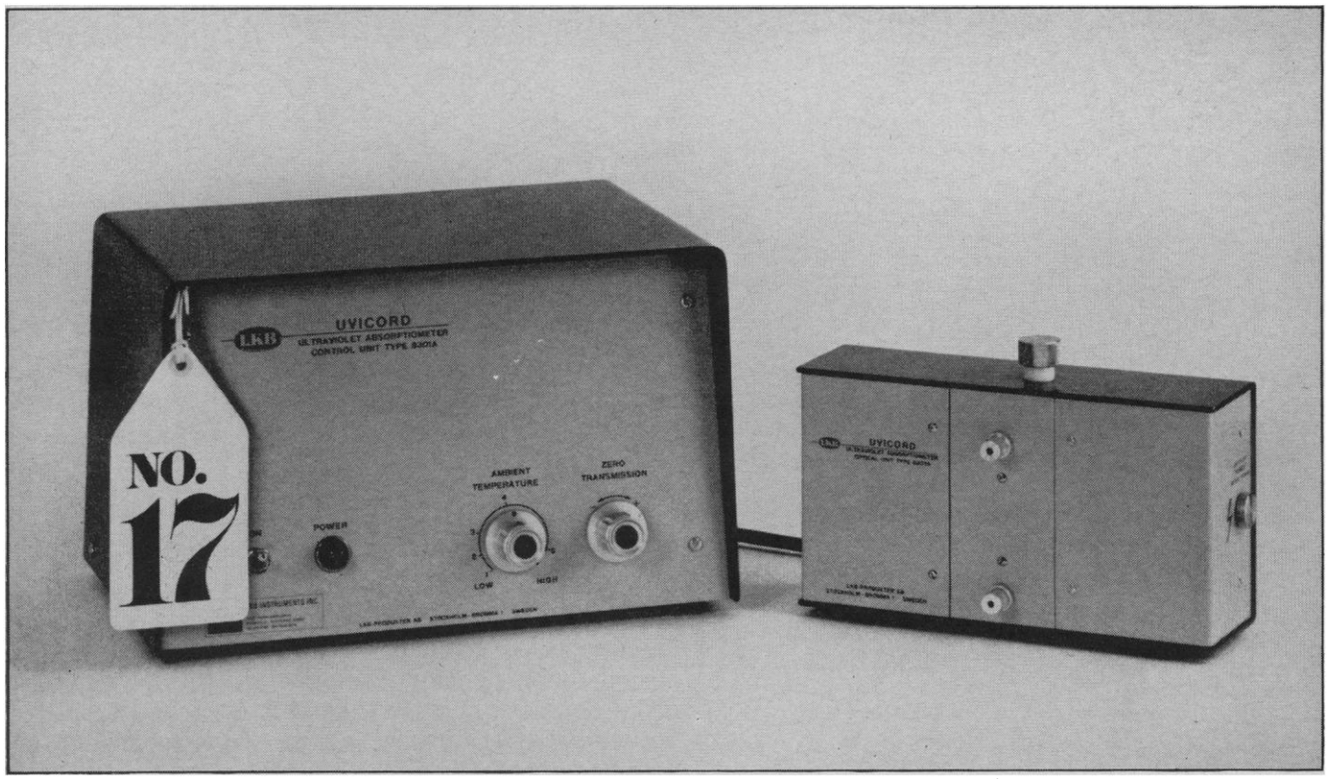

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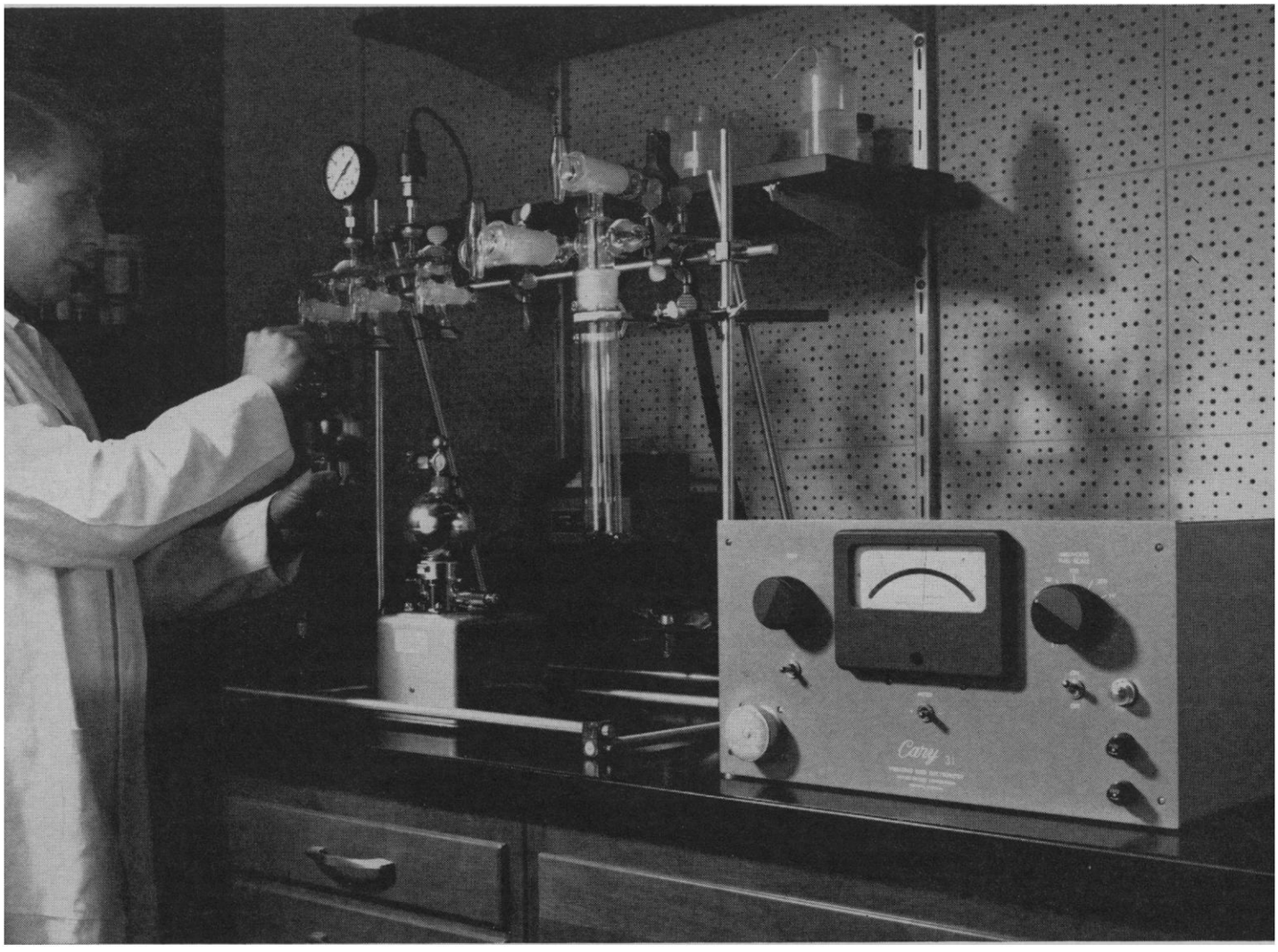

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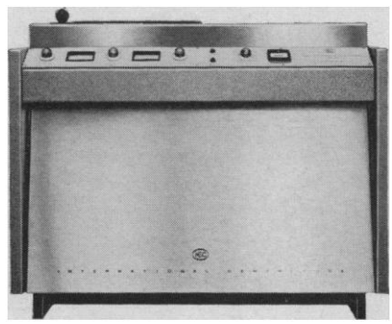

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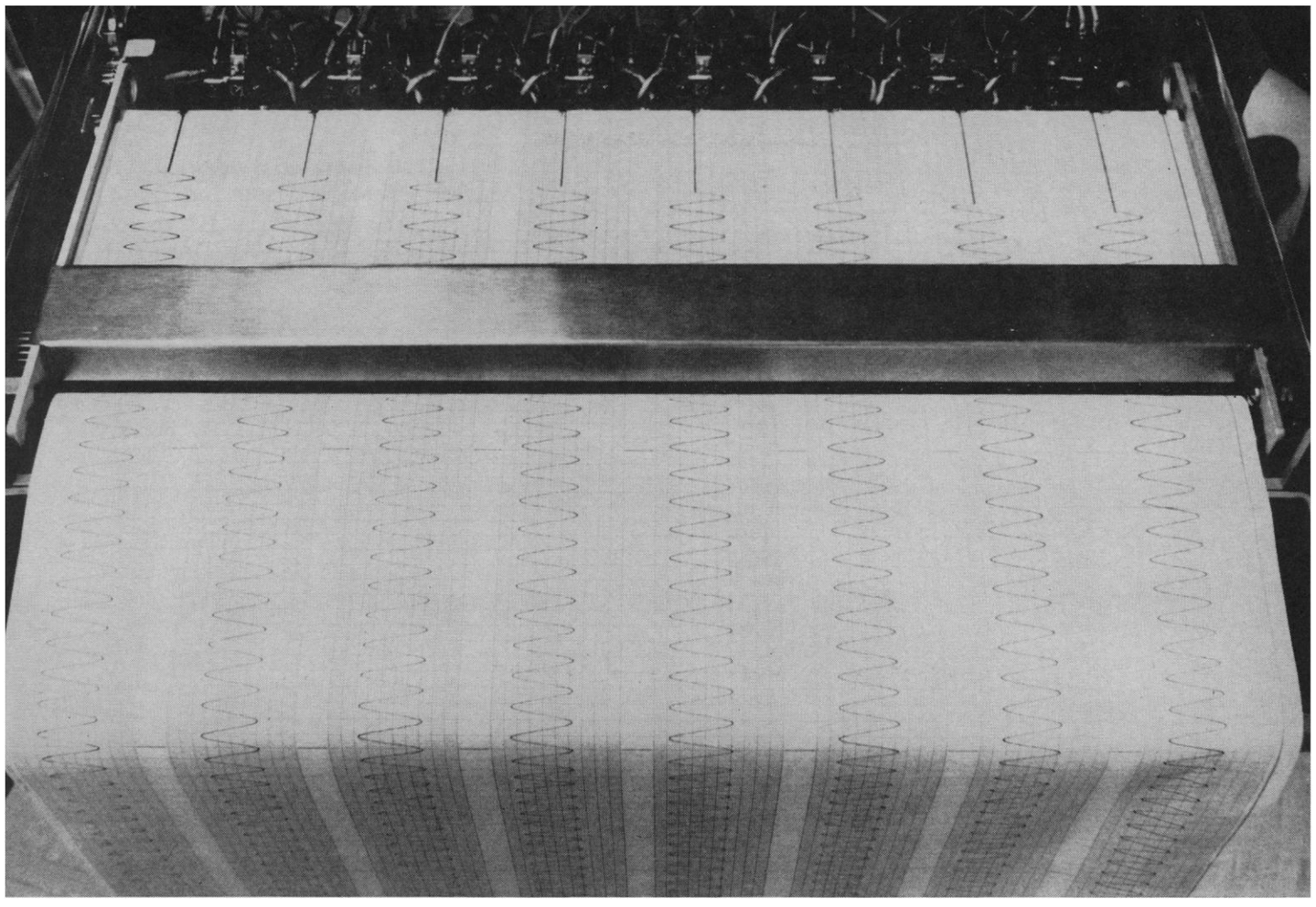

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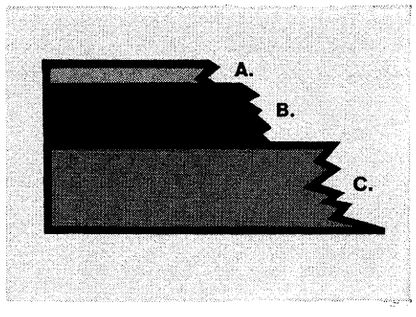

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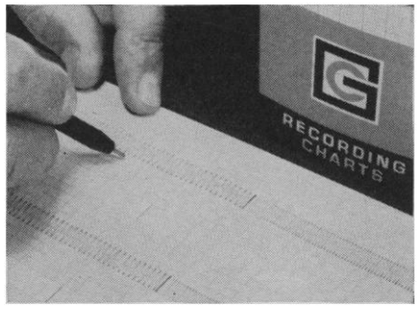

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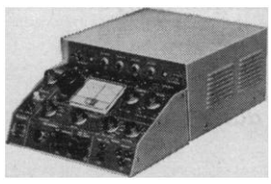

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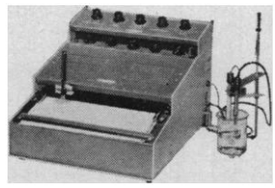

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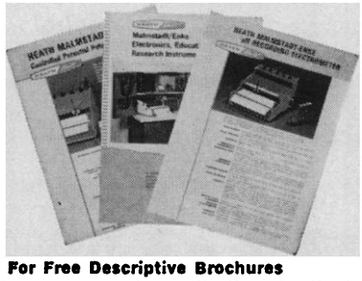

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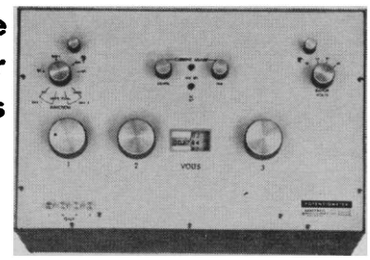

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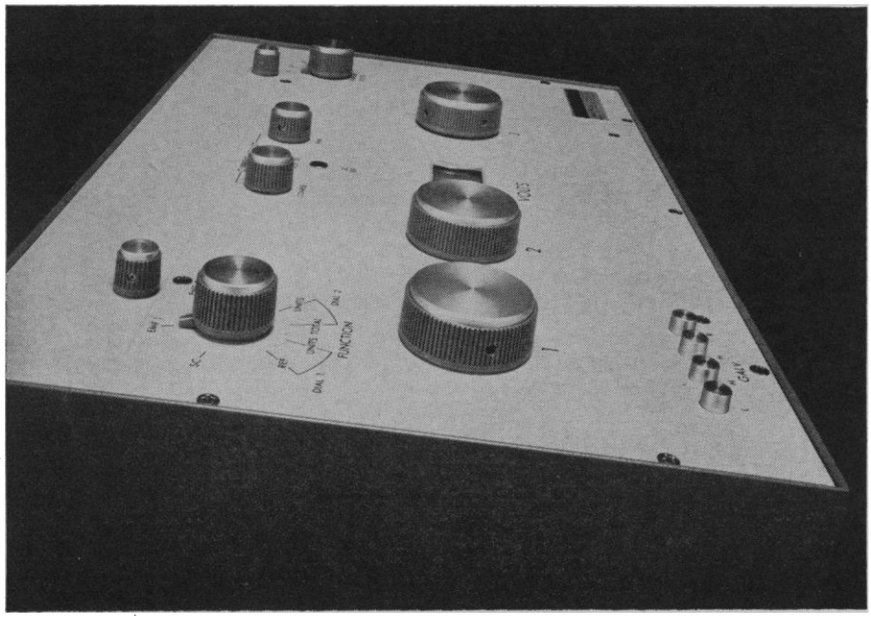

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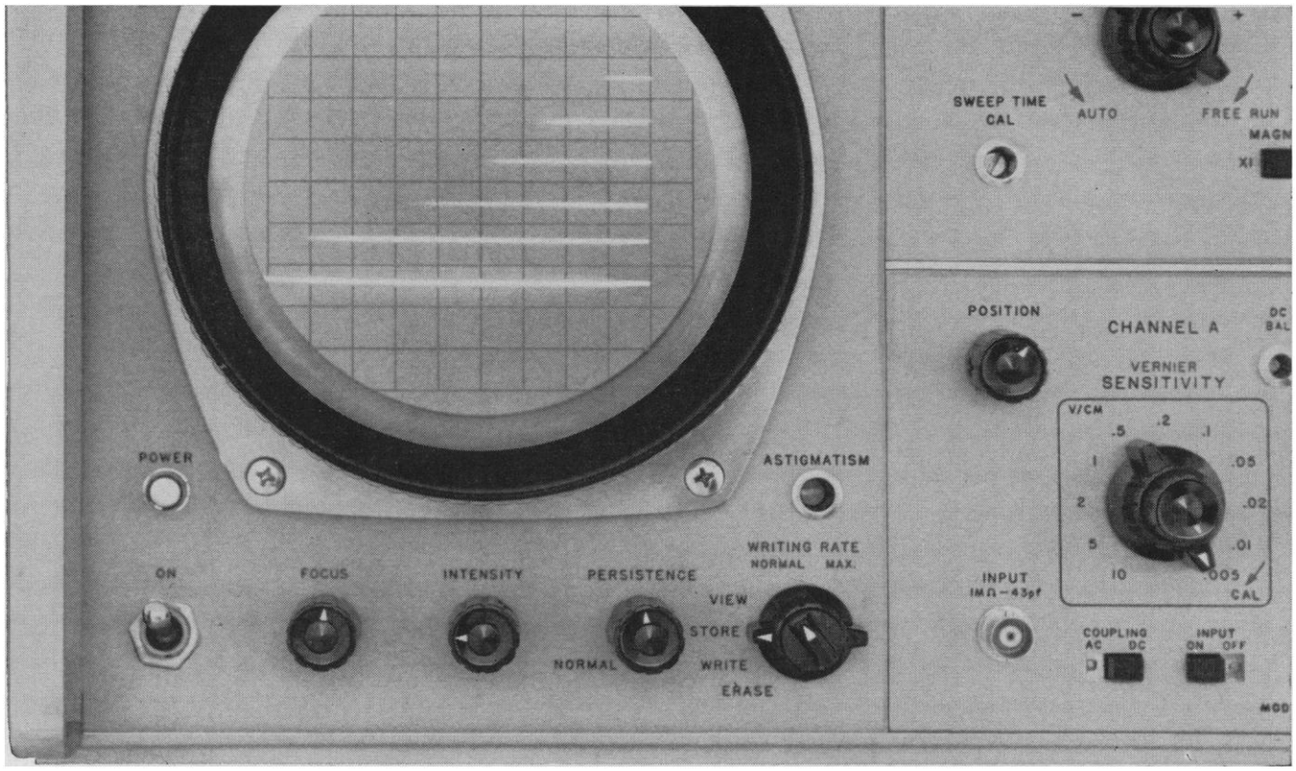

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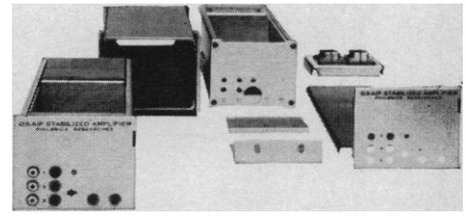

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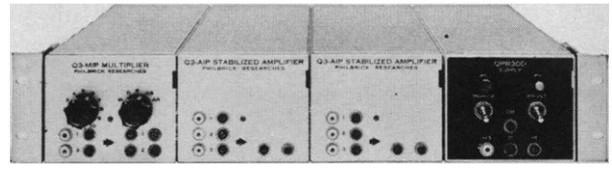

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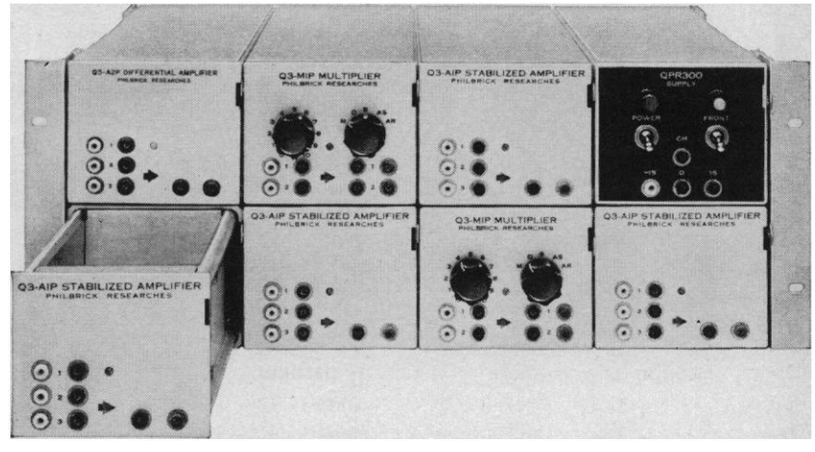

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ELECTRONIC ANALOG COMPUTING EQUIPMENT for MODELLING, MEASURING, MANIPULATING and MUCH ELSE

PHILBRICK

man cites as occurring in Virginia in 1963 can hardly be attributed to the activities of scientists; and even that situation, deplorable as it was, was not quite as Goldman describes it. The fact remains that collection, care, and animal use are three separate endeavors and the faults of one should not be translated to be the faults of all. The fact remains that upon investigation almost every one of the reports of the evils of collection, care, and experimentation described by the "humanitarians" involves either a half-truth, a nonsequitur, or ignorance.

Regardless of the category of "humanitarianism" from which it issues, the constant barrage of attacks, some of them scurrilous, is in the greatest degree anti-intellectual and in the know-nothing tradition. It is not a coincidence that from time to time we find these "humanitarians" embracing other fringe causes. The little old lady in sneakers wears mink, rides a chauffeur-driven Rolls Royce, and supports a Cause. These people probably distrust any intellectual effort in any field. The evidence for their opposition to any animal experimentation rather than their concern for proper treatment may be seen in the provisions of their proposed legislation, which would limit the numbers of animals used in any experiment, limit the species used for any experiment, and limit the experiment itself. A federal official would determine whether an experiment was a repetition of a previous one, and if it were, it would be forbidden. The implication is that experiments are repeated solely to satisfy the sadistic urge of the scientists. . . . It is disconcerting to find Goldman and a very few other trained people being duped into aligning themselves with such groups. . . .

FREDERICK SPERLING
Department of Pharmacology,
Howard University Medical School,
Washington, D.C.

It is true, as Goldman says, that laboratory-animal care and use is imperfect. If there were preponderant evidence that legal restrictions on animal research are more beneficial than otherwise, they should be applied, regardless of the partisan outcries of scientists. But the case against a federal police solution to the problem has nothing to do with the feelings or personal convenience of scientists. Laws and other social remedies should be evaluated pragmatically, like drugs. It is as foolish and dangerous to judge a law by its statement of purpose as it would be to judge a drug in advance of tests, simply on the basis of what it is hoped it may do.

Thirteen states in the United States and a number of municipal governments regulate scientific use of animals more closely than other uses of animals. In addition, all state anticruelty laws apply to scientific use of animals. National laws in several European countries are similar to regulatory proposals now before the U.S. Congress. It is a fact that there is no correlation between the laws governing animal experimentation and the quality of animal care. There are more differences within jurisdictions than between jurisdictions. Factors other than laws—money, cultural development, personalities, manpower, available technology—are the important factors. The scientific community, represented by nearly 1200 organizations and institutions that are members of the National Society for Medical Research, is recommending to Congress the adoption of legislation providing for technological development, manpower development, informational exchange, and the provision of facilities that make the big differences.

What about the problem of moral perversity? Is there nothing that can be done about that? Yes, but not very effectively, it would seem, by annual visits of a federal inspector. Imagine, for a moment, the use of such a preposterous device for the control of crime. I would imagine that government functionaries could inspect the headquarters of the crime syndicate year after year and never find anything wrong. Unpleasant as the task is, disciplinary control of the rare misdeeds of scientists is the duty of other scientists. One has to be in relatively intimate contact in order to discover offenses.

Turning the task over to the federal government is not only irresponsible, it might even be deadly. If Congress votes to encumber and censor scientific study of animals, an incalculable number of our friends, relatives, and descendants will die sooner because discoveries come later. Consider what even a brief delay in an effective new treatment means to the 550,000 Americans who die annually from coronary thrombosis. Consider, for perspective, the *daily* toll of more

than 750 lives lost to cancer in this country alone. Any law complicating the solution of health problems should be required to offer great and certain benefits before being adopted.

RALPH ROHWEDER
National Society for Medical Research, 111 Fourth Street, SE, Rochester, Minnesota

Paleomagnetism and Evolution

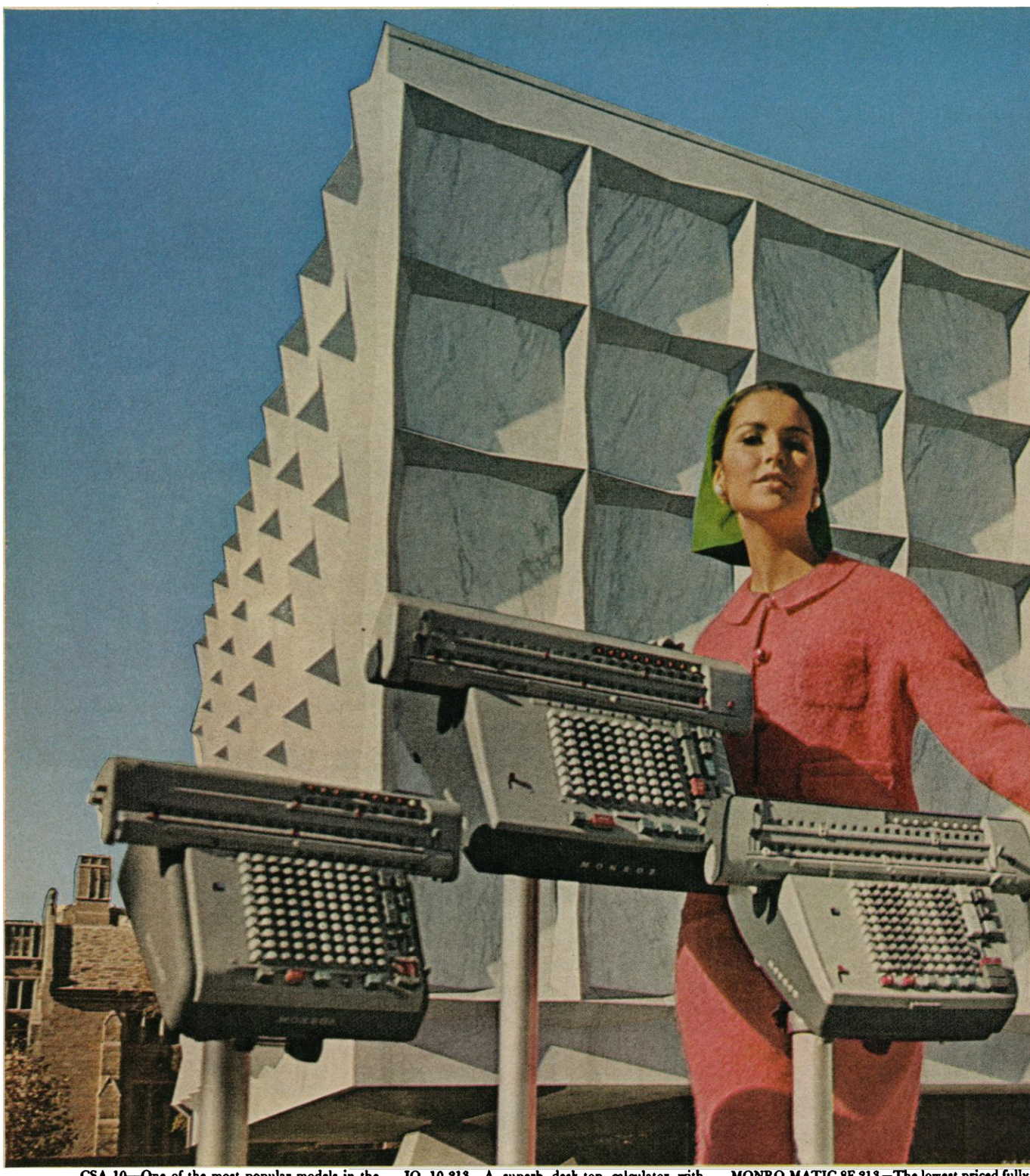
"An obscure Cambridge scientist wrote a book in the 1850's; and, although Darwin shaped no national policy in those ten years, the book altered, for ever since, the way in which educated people look at any question." So wrote T. R. Glover, the Cambridge historian (*The Ancient World*, Cambridge University Press, 1935); but as far as I know, no one has looked at paleomagnetism in an evolutionary kind of way.

The earth began as a homogeneous mass. It is now a highly differentiated mass with nickel-iron core and silicate crust. Of significance for paleomagnetism is the iron core. But since the earth began as a homogeneous mass, there has been an evolutionary process by which the mantle has gradually differentiated from the heavier iron-rich core. With the iron of the earth dispersed, or in local centers, the magnetic qualities of the earth must have been different from the present.

But there is a second component in the magnetic phenomena of our planet —the Van Allen belt. Over a century ago Balfour Stewart put forward the idea of the earth as a dynamo, and forecast the presence of the ionosphere (*Encyclopaedia Britannica*, ninth edition), although the idea was not accepted at the time. The present Van Allen belt could hardly have been there when the earth was formed, and so it also has, apparently, an evolutionary history.

A study of the evolution of the earth as a magnet could throw light on the subject of paleomagnetism. In that the earth is not yet fully differentiated, it may well be that this is a continuing process, and it would be interesting to consider how this continued evolution will affect the magnetic qualities of the earth.

EDMUND D. GILL
National Museum of Victoria, Melbourne, Australia



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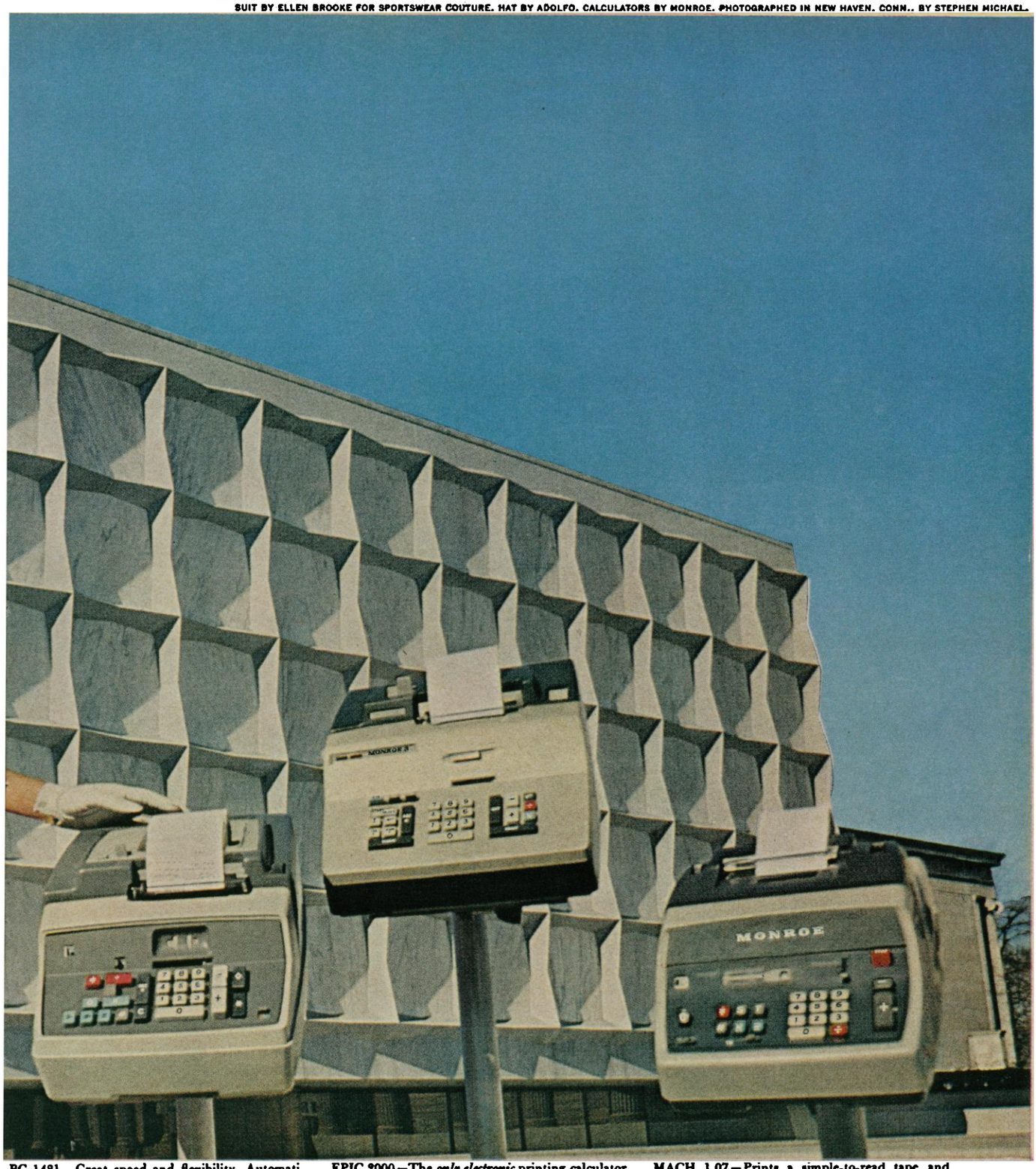

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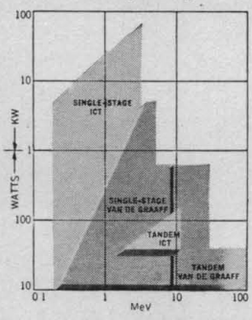
Development of higher energy Van de Graaff particle accelerators which retain high beam precision, stability, and homogeneity, remains a continuing contribution by HVEC to "energy-oriented" research.

To provide even greater freedom of experimentation, HVEC is also anticipating the need for the higher beam intensities required in *power*-oriented research projects. Invented by Dr. R. J. Van de Graaff, the new Insulating Core Transformer (ICT) accelerator now provides high beam currents with all the desirable beam characteristics of Van de Graaff machines. As the graph shows, the high power levels available from the ICT accelerator now make possible a new realm of precision experimentation.



The Insulating Core Transformer

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A number of ICT accelerators and power generation systems are now available.

Single-Stage ICT Accelerators

Two types of single stage ICT accelerators have been developed for research use. The first incorporates an ICT power source coupled to the acceleration assembly through a coaxial cable.

	PROTON ENERGY (KeV)	CURRENT (MAX.) (Analyzed)	TANK HEIGHT Feet	Meters	TANK DIAMETER Feet	Meters
ICT 300	300	15 mA	4'4"	1.32	4	1.2
ICT 500	500	10 mA	5'3"	1.60	4	1.2

The second system utilizes a rigid transmission line to transmit electrical power to the accelerator terminal.

4 MeV ICT	ENERGY (MeV)	CURRENT	DIMENSIONS Length Feet	Meters
Positive Ions	1.5-4	3 mA	26'6"	8.08
Electron Conversion	1.5-3	10 mA	26'6"	8.08
3 MeV ICT Electrons	1.5-3	20 mA	29'	8.84

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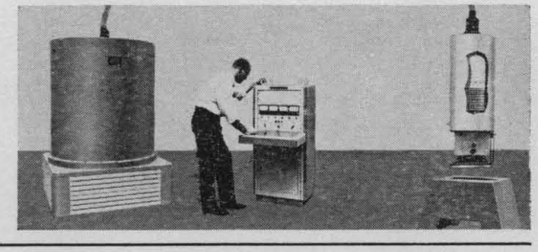
Developed primarily as high-current sources of electrons for industrial processing applications, these systems allow extreme flexibility of operation. Two models are available: 300 kv at 30 mA maximum beam current and 500 kv at 20 mA maximum beam current.



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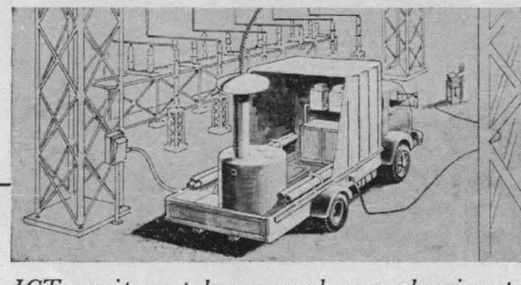

ICT equipment has crossed many barriers to dc operation at high particle energies and currents. There is no indication that a ceiling exists to further advances of similar importance.

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18 February 1966, Volume 151, Number 3712

SCIENCE

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The Tea Leaves or the Record?

Our scientific leadership has been less than brilliant both in justifying public support of basic research and in managing the funds made available. Federal support of basic research was initiated because citizens developed a profound respect for a great record of scientific accomplishments. Nevertheless, scientists, in talking to politicians, have taken the line, "You never know what will come out of scientific research." Then, instead of talking of recent accomplishments, the spokesmen speak of Newton or Faraday.

Despite professing inability to judge significance of research work in advance, a granting agency such as the National Science Foundation tries to do just that in passing on research proposals. In deciding whom to support, considerable emphasis is placed on the content of the research proposal. Knowing this, some scientists are willing to make extravagant promises. All of us can have hopes, and it is just as easy to have high hopes as lesser ones. Panelists are not stupid or easily taken in, but often the proposal is the principal piece of information at their disposal. In considering grants, much more weight should be given to past scientific achievements of the individual than to his merchandising abilities. Men who have produced are likely to continue to do so; those who have promised much and delivered little will continue to promise. The scientist's past stewardship of federal funds should be examined. Although expenditures are audited, there is at present little follow-up on the scientific results.

In evaluating grant proposals we should focus on the man—his accomplishments and the trends in his accomplishments. If he is young and just beginning, we should rely on the judgment of his professors. As his professional development proceeds, more and more weight should be given to achievement. The principle of looking at the record for guidance has relevance beyond the individual proposals. Valuable judgments about whole fields of science can be made by looking at the record.

However, instead of giving predominant weight to trends in productivity of fields of research, the NSF has made allocations for grants for the various sciences largely on the basis of so-called "proposal pressure." The NSF has assumed that the scientific community will generate proposals for grant support in proportions representative of the needs and opportunities of the various fields.

After recommendations have been made on the grant proposals by panelists, the bookkeepers total the sums involved. If the physicists approve of grants calling for $120 million and the chemists approve of grants involving $80 million, proposal pressure in physics is considered to be greater than proposal pressure in chemistry. Accordingly, the physicists are given more money.

A little consideration will make it evident that the mechanism of proposal pressure can easily be distorted. Panelists early become aware that the more they recommend the more their science gets. In the past some NSF staff members have been active and successful in encouraging grant proposals for their particular discipline. This led to high proposal pressure in some fields and not in others, and to distortions in the support of science.

The NSF can function as a balance wheel only if it develops a better approach to the advocacy and management of basic research. Such an effort will necessarily involve continuing analysis of trends and accomplishments in scientific research. Increased support for NSF will be available if the foundation makes a convincing demonstration that basic research is continuing to be productive in creating important new insights. In judging individuals, areas of science, and organizations, a look at the record is superior to a look at the tea leaves, and a lot more convincing.—PHILIP H. ABELSON

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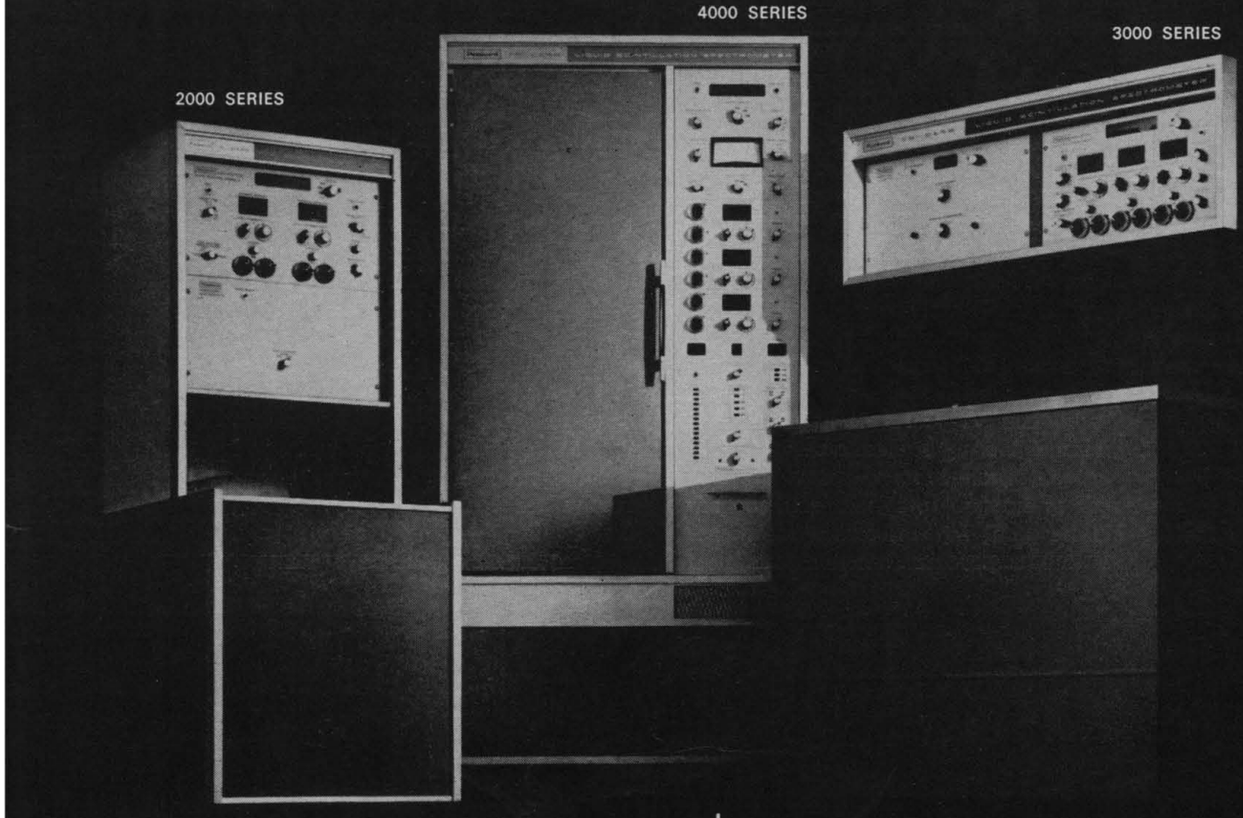

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with special training in the teaching of modern science and mathematics, works closely with a committee of Turkish scientists. The teaching materials for science and mathematics consist of special adaptations of new U.S. materials. These adaptations have been made on the campus by Turkish and American scientists and science teachers working together. Summer training courses for groups of Turkish high school science and mathematics teachers are also conducted at the school, and plans are being made to extend the influence of the school in a number of ways with the ultimate aim being to help improve the teaching of science and mathematics in the country in general.

Jack S. Goldstein (Brandeis University) discussed the progress being made in the African elementary school science project administered by Educational Services Incorporated, with support from a number of sources including the United States Agency for International Development (AID), the Ford Foundation, and the Louis and Pauline Cowan Foundation. In particular, Goldstein described the summer workshop which he directed in Entebbe, Uganda, in 1965, attended by selected representatives of the primary schools of the Tropical African Countries. The three objectives of the workshop were: (i) to develop primary school science units, (ii) to exchange information about primary school science activities from the countries represented, and (iii) to develop a corps of people from each country who would be equipped to staff school science resource centers in each of the countries. Goldstein noted the eagerness and ability of the African students and teachers and the tremendous problems which must be overcome in each of the countries.

Claude A. Welch (Michigan State University) related observations on science education made during a visit to Japan in the summer of 1965 in connection with the U.S.-Japan Cooperative Science Program. Welch described Japanese progress in translating and adapting biology teaching materials developed in the United States by the Biological Sciences Study Committee. He also discussed the network of science teaching centers which have been established in Japan where a wide range of activities, from the preparation of science teaching materials to the supplemental training of science teachers,

take place. Of special interest was the rapidity with which the Japanese are adapting their programs of science education to the needs of the time.

Eric M. Rogers (Princeton University) discussed United Kingdom efforts to improve science teaching through the work of the Nuffield Foundation. Rogers presented an analysis of the present state of science education in the United Kingdom and of reforms which must be made. The various projects of the Nuffield Foundation in this respect were described. Rogers pointed out that the basic change which must come about is the point of view from which the study of science must be approached—from the traditional attitude that the study of science is aimed toward learning to the view that science is studied for understanding.

HOWARD F. FONCANNON,
National Science Foundation

Piaget's Research and Its Implications for Science Education

This symposium was a joint session of Section Q and the National Association for Research in Science Teaching (27 December 1965).

"A preliminary report on the performance of 5th and 6th graders on a directed learning task: the pendulum," was presented by Maurice Belanger. Another paper, "Interrelations of the acquisition of some Piaget-type tasks requiring proportional thinking," was presented by Ronald Raven. The paper by Belanger is just a small section of a monograph which he is in the process of writing. Therefore some of his conclusions were still tentative. However, it was interesting to learn there is such a thing as "boy physics" as well as "girl physics"; that girls seem to have greater rigidity to change than boys; that boys, rather than girls, are much more receptive to data collected by experimentation. These represent just a few of the inferences which Belanger has been able to make from his studies. Raven found from his research that maturation plays an important role in the ability to use proportional thinking.

Interrelations of the acquisition of some Piaget-type tasks requiring proportional thinking in primary school children was one of the subjects covered during this symposium on Piaget research. Inhelder and Piaget have shown that there is a gradual evolu-

tion in the process of proportional thinking. His paper reports the results of an investigation of children's thinking within the first and second proportion schema. In the first stage, the child is able to see the relationship between the changes of one variable and the proportionate changes of the final results. Thus, he can predict that an increase in the height of an inclined plane will produce an increase in the speed of an object moving down the plane. During the second stage, the child comprehends that an increase in one variable can be compensated for by reducing or increasing another variable. For example, we can hold the speed of a car constant by increasing the angle of an inclined plane even though we have placed the car lower on the plane.

The purpose of this experiment was to determine what the effects of two different rules were on the ability of the child to manipulate the variables governing the speed of objects down the inclined plane. In the first experiment, six-, seven-, and eight-year-old children used the rule that the speed of an object down the plane was directly proportional to the height of the object on the plane and the angle of the plane. Weight was not a factor in determining the speed of the object. In the second part of the experiment, children of the same age group were using the rule that the speed of the object down the inclined plane was directly proportional to the weight, height of the object on the plane, and the angle of the plane. The car was adjusted so that an increase in weight would make it go faster contrary to "accepted" laws of physics.

Six- and seven-year-old children had more difficulty excluding the weight as a variable than did the eight-year-old children. Even though the first rule involved only two variables, the children scored consistently higher on problems dealing with the rule involving three variables. It is to be noted that all the children had previously been operating by a rule that lighter things go faster. The second experiment made them operate by an opposite rule that heavier things go faster. In spite of the unusual nature of the latter rule, the children still preferred to operate by it rather than exclude weight as a factor determining the speed of objects down the plane. It would appear that children have formed a strong relationship between weight and speed. The results of the experiment show

that the rules governing the relationship are not altogether perceptual in that the children were able to successfully use a rule that contradicted their perceptual experiences, that is, heavier things go faster. However, the weight-speed relationship was not easily extinguished until the third grade although the rules governing this relationship were easily changed at the first and second grade levels.

Measurement of Quality in Education

During this symposium (29 December), all participants generally accepted Allan M. Cartter's opening comments that "quality" is an elusive term and that we are living in an age of public accountability. Using chemistry as an example, Cartter described a "subjective opinion study" of graduate departments of 106 major universities, involving ratings of graduate programs in 30 subject fields. The judgments of department chairmen, senior scholars, and junior scholars were tabulated independently and collectively for these groups. Judgments and subsequent rankings were made on the scholastic stature of the faculty of each graduate department and the general effectiveness of each doctoral program.

William Firman reported on a study conducted in New York state which involved ability and basic skills achievement measures of 70,000 pupils in 100 school systems. Analysis of the results of students tested at these grade levels (4, 7, and 10), with type of system, general ability level as indicated by I.Q., and socio-economic levels has led to a "mosaic of strengths and weaknesses" for each system and sets of achievement expectancy norms. Two general conclusions reported were that "good" schools tend to recruit teachers on a nationwide basis and have more faculty members with masters degrees; and, second, that holding power is positively related to the availability of special services.

Henry S. Dyer reported on pilot work which has led to the development of a plan to evaluate educational programs in Pennsylvania. Citing the act of the Pennsylvania legislature which calls for the development of this type of program, Dyer pointed out that the pilot work demonstrated that dialogue between laymen and school people on educational matters is possible. The plan calls for the involvement

of the public right down to the tests ultimately devised for use. It would yield expected outputs for schools of different types based on predictor variables over which the school system has control. The five salient features of the plan are (i) direct public involvement, (ii) continuous review, (iii) breadth of purposes, (iv) a cumulative program of research, and (v) encouragement of vital diversity.

Ralph W. Tyler discussed the work of the Exploratory Committee on Assessing the Progress of Education. He pointed to the value of descriptive type information provided during the depression by the reports of the National Youth Commision, and national measures in the fields of health and business; he noted that we do not have such information about the progress of education. He said a national assessment would differ from a national testing program in many ways. Each student would complete only a portion of the exercises and only a sample of students would be involved. There would be no scores or reports on individual students, teachers, or school systems. Rather, descriptive reports would be made on 192 populations based on four age levels (9, 13, 17, adult), four regions, two socio-economic levels, three types of communities (large city, suburban, rural-small town, and sex. Tyler cited the involvement of scholars, teachers, and public-spirited laymen in the deliberations of the committee and in initial steps toward instrument development.

Curriculum Development for Elementary School Science

This symposium was a joint session of Section Q, the National Association for Research in Science Teaching, and the American Educational Research Association (30 December 1965).

Joseph Lipson reported on how the Learning Research and Development Center of the University of Pittsburgh has for the past two years been engaged in the preparation of individualized science lessons for the elementary school. The individualized program depends on diagnostic pretesting and achievement post-testing of the abilities of the students so that no student is asked to learn objectives which he has already mastered and so that each student is assured of mastery of the objectives of the lessons he has had. In order to have an effective co-

ordinated program of lesson writing, materials development, test development, and program evaluation, the entire sequence is keyed to statements of what the student is expected to be able to do after each lesson or group of lessons. Lessons in which the student is asked to transfer his knowledge to new problems, discuss a problem with other students, or explore a new environment are built into the lesson stream.

Turning from the technical and pedagogic problems of lesson preparation for individualized instruction, we have concerned ourselves with forming a basis for deciding what should be taught in the elementary school science program, how the objectives should be taught, and the criteria of performance which the children should be expected to meet.

The lessons currently in use are based upon the AAAS process lessons and the lessons of the Science Curriculum Improvement Study of the University of California at Berkeley. It is proposed that the next step in curriculum development might go beyond the process objectives which enable the student to organize information and events over broad areas of science and general experience. The lessons of the SCIS (Science Curriculum Improvement Study) are in the domain which we have in mind. These lessons teach highly general basic concepts using experiences which are familiar to the student and which can be brought into the elementary school laboratory. Our proposal is that this program, integrating process goals and developing concepts of wide application and generality, be extended and at each point in the program we select those concepts which will most contribute to future learning and comprehension in science.

Concept learning in the elementary school has a special meaning in our lesson plan. By concept formation is meant that the student can identify a class of objects or events when shown a sample of objects or events (for example, when shown three triangles the student should be able to say that they are all triangles), and that the student can distinguish instances and non-instances of the concept (for example, which of the following figures are not triangles). This type of learning is emphasized because it is evident that children can gain command over many hundreds of concepts and that these concepts are resistant to forgetting.

Laboratory experiences are used as the basis for concept formation because of the observed persistence which children show in manipulative exercises; because we avoid many of the learning problems which arise when we attempt to teach scientific ideas with purely graphic or verbal means; because of the opportunity for self-initiated exploration which the laboratory materials provide; and because the properties to be observed cannot be fully displayed except in the laboratory setting.

Vocabulary plays an important role in the curriculum in order that the students can use a verbal sequence in applying the concepts to future problems; so that the instructor or the instructional materials can call forth the concept by the appropriate word; and so that at some point new principles can be taught by verbally indicating the relationship between previously mastered concepts. By building concepts upon verifiable, repeatable experiences we can ensure that the individual citizen can make a reasonable interpretation of events which have a scientific context. If properly chosen, the concepts will show a minimum interference of early learning with future learning.

In order to illustrate the steps which must be taken to implement the suggested program, a scheme of course design will be suggested; current experimental work in individualized education will be described insofar as it pertains to the theme of the talk. In particular, a comparison of grade school children and college freshmen will be reported.

Lawrence Lowery tested the reliability of a unit prepared by the Elementary School Science Project, and measured children's attitudes toward science, the nature of science, and the scientist. The tests consist of three parts which use the projective technique—Word Association Test, an Apperception Test, and a Sentence Completion Test. Reliability of the test was determined in two ways: (i) scoring between types, and (ii) the ranking of the same individuals 8 weeks later with no science being taught in the interim.

The reliability is greater than .90. The validity was established through an interface showing where students scored consistently through the three projective tests. Note the validity was never lower than .80 for the sub-tests. The weakness presented is that, al-

though these tests proved out, they are not to be used separately since all three are necessary before one may draw conclusions.

The final session of Section Q's program consisted of contributed papers (30 December). Paul Wittey (Northwestern University) summarized 15 annual studies of television-viewing habits of children and youth. Favorite programs and total viewing time were reported. Gains in vocabulary, changes in reading habits, relation to succession in school, and undesirable outcomes were among conclusions discussed. Philip H. DuBois reported on the statistical procedures by which statistical controls may be substituted for experimental controls in educational situations. The method involves (i) development of a hypothesis relating gain in proficiency to measurable traits; (ii) measurement of pertinent variables, including initial and final level of proficiency; and (iii) estimation of the relation between the primary variable and gain. Melvin P. Robbins (University of British Columbia) reported on a study which tested the Delacato conception for certain cognitive abilities in children. His study fails to support the Delacato hypothesis. R. J. Tritschler (IBM) reviewed the many problems faced by librarians in cataloging and retrieving printed materials. The potential solution through the use of computers was presented.

FREDERIC B. DUTTON,
Secretary

National Association of Biology Teachers (Q8)

Four sessions comprised the core of the NABT program. In the session, "Specific techniques in biology," Nicholas Eigsti (Ball State University) used yellow-green soybeans to show how genetic ratios can be taught as an open-ended experiment. Darwin Thorpe (Compton, California, College) showed how he used 35-mm slides to make vertebrate dissections more efficient. To show evolution, Marion S. Baran (Riverside-Brookfield High School, Illinois) explained how he innovated with plastic refrigeration containers to raise *Drosophila*. One of the problems with electrophoresis is its high cost. Sister Mary Ivo (Chicago Archdiocese) showed how she utilized simple and inexpensive equipment.

Another session, "BSCS and re-

search participation program," had Paul Geisert (Oak Park and River Forest, Illinois, High School) demonstrating his "think box," a skull into which students are encouraged to place questions. M. Cassandra Hickey (Medford, Massachusetts, High School) talked about her guide sheets which she used to help her students understand better the BSCS Yellow Version. In Oregon at Twality Junior High School, Arthur Biederman used his students as part of a NSF research participation ground squirrel study. And Gladys Kleinman (Rutgers University) explained her inquiry-oriented methods course to train nonscience oriented elementary teachers.

In a session, "Teacher training and resource use in biology," Tom Mertins and Jerry Nisbet (Ball State University) explained that their NSF summer institute stressed cytology, genetics, and biochemistry to fill the void of most secondary teachers. Kenneth Bandelier (New Haven, Indiana, High School) reported on his research which showed that teachers seldom made use of community resources. The necessity of keeping records of an organization, which can be made available for research, was stressed by Myrl Lichtenwalter (Wells High School, Chicago.)

In the last session, Alfred Novak (Stephens College) proposed a model college program for training future biology teachers, and Charles Ostrander (Merced, California, College) showed his device for obtaining immediate evaluation of student response to prepared questions. And finally, John Cunningham (Florida State University) explained how biological examples can be used to build science concepts in elementary students.

One of the most interesting and well-attended sessions was an "how-to-do-it" session where 20 teachers simultaneously demonstrated their pet ideas.

The highlight of the sessions was the NABT luncheon; Ralph Gerard (University of California, Irvine) talked on brains and learning.

HARRY K. WONG,
Program Chairman

Education (Q)

National Science Teachers Association (Q9)

The NSTA and the Central Association of Science and Mathematics Teachers (Q5) (CASMT) coopera-

tively planned sessions that were concerned with the rapidly changing patterns of science education at all levels, from the primary grades through college.

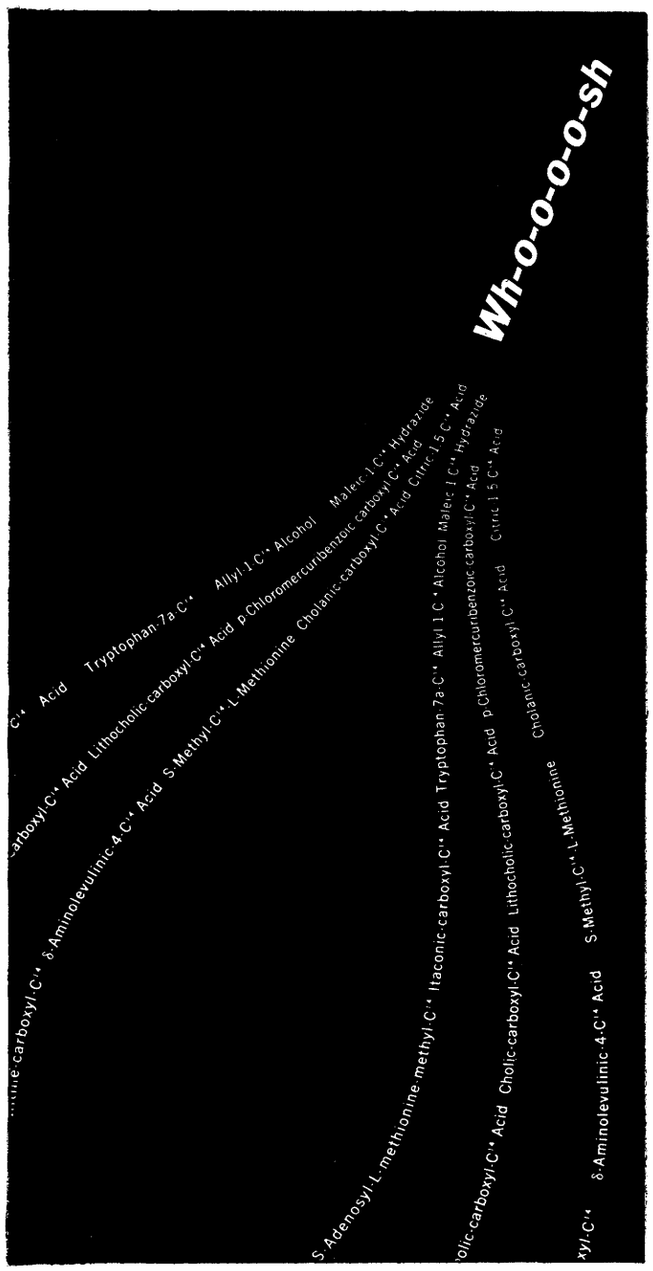
Sessions on science in the elementary school emphasized the great need for involving individual students in the process of science to achieve effective learning and for more open-ended experiments to help children understand the nature of science. One lecture presented methods for using closed circuit TV for observing and evaluating teaching techniques.

We should give more attention to the preparation of teachers and helping them keep up to date in science. The most important thing that a teacher should develop in college is a sound philosophy—of science, of science teaching, and of life in general. This philosophy is not usually what is taught in formal classes, but what is learned in the many classroom and life situations on the campus.

The session on science in the junior high school dealt specifically with achieving balance in teaching the physical sciences. One speaker showed how the earth and space sciences can serve as a unifying theme for teaching science. There is a lack of adequate emphasis on the laboratory in junior high school and a need for providing more adequate facilities and equipment.

Problems of teaching science in the junior college were also discussed. There is a need for more interplay between administrators and professors in 4-year colleges and their counterparts in the junior colleges. In some colleges an alarming trend away from emphasizing scientific literacy for general education is indicated through the decreased emphasis on science for general education and the increased emphasis on the separate disciplines.

There is an encouraging improvement in the academic quality of junior college teachers, often placing them on equal intellectual footing with the professors in the 4-year college. The junior college science staff is making commendable efforts to solve the problems of the wide range of ability levels among students and relieving the pressures of rapidly increasing enrollments. Although professors in junior colleges are giving an increasing amount of attention to research, teaching is their primary function and interest. This, together with the fact that the best teachers are teaching introductory as well as more advanced courses, creates a fa-



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vorable situation for providing students with a sound introduction to science.

Several groups met to discuss specific topics related to science teaching in junior college. A report of these discussion groups is available on request from NSTA, 1201 Sixteenth Street, NW, Washington, D.C. 20036.

One of the problems facing teachers and administrators is that of effecting changes in teaching techniques and content in the classroom. In-service education and new techniques for evaluation provide excellent opportunity for accelerating these changes. One speaker discussed the role of education in our society and the potential assistance for change available at all levels of instruction through federal funds. In the future it is probable that increasing attention will be given to implementing changes and encouraging schools at every level to improve their instructional programs.

ALBERT F. EISS,
Associate Executive Secretary

Information and Communication (T)

Current Issues in Communication of Science II: The Scientific Meeting and Related Publications

The panel on Scientific Meetings (27 December 1965) observed that there are many purposes for scientific meetings; among the most constructive uses by scientists are: Reporting and learning about new research developments; surveying the state of the art of an area; personal contact, both professional and social; and building interdisciplinary bridges. These purposes are accomplished to varying degrees by the many types of meetings now offered.

However a great deal of both direct financial outlay and valuable time is now consumed by meetings. This has reached the point where the value of present meeting activities is being questioned with increasing seriousness. There is not any good method of evaluation and it is rather widely assumed or estimated that the return on total expenditure is small. The planning and sponsorship of meetings is moving from the scientific and professional societies toward the federal government and trade associations.

More clarity of objectives is needed in planning most meetings as is more care in setting structure in accordance

with objectives. In addition, the structure of systems of meetings sponsored by major societies and other organizations ought to be examined with objectives in mind. More carefully documented study of meetings with these matters in mind should prove valuable and the cost of such studies certainly should be returned manifoldly by the reduced expenditures and increased yield of value from meetings.

RICHARD KENYON,
Program Chairman

State of the Art and the Prospects for Data Gathering, Storage, Transformation, and Retrieval

The field of information transfer is in a phase of transition. In the session, 29 December 1965, on "Data gathering, storage, transformation, and retrieval," Walter M. Carlson (Department of Defense) presented recent findings that show local and informal transfer (face-to-face and telephone communication, personal and office files, and others) predominate markedly in frequency of use over formal transfer involving national or regional libraries, bibliographic services, document-retrieval systems, and journals. Carl F. J. Overhage (M.I.T.) then outlined the program of research (Information Transfer Experiments) recommended by last summer's Planning Conference to improve informal transfer and introduce into formal transfer some of the convenience and quick responsiveness that have heretofore characterized informal but not formal transfer. The Intrex program calls for a melding of the concepts of library and multiple-access (for example "time-sharing") computer and, in accordance with Carlson's philosophy, an emphasis on the needs and points of view of the users of information. In the final talk, J. C. R. Licklider (IBM) focused attention upon the prospects for "on-line information networks" in which systems similar to Intrex in various parts of the country (or of the world) will be interconnected through telecommunication channels. He adduced support for the ideas that the technological bases (storage, transmission, processing, display, and so forth) for such systems are rapidly coming into being and that much of the research and development during the next few years aimed at a "national information system" should be directed toward on-line networks in which "content" as well as document-retrieval (that

is, "bibliographic-control") information exists, and is used, in computer-processible form. Discussion ranged over a broad field—browsing in a semiautomated information system, "negotiating" retrieval specifications through conversational man-computer interaction; cost of storing the contents of the Berkeley library in computer-processible form; an experimental on-line information network for universities.

J. C. R. LICKLIDER,
Program Arranger

Society of Technical Writers and Publishers (T2)

During a panel discussion, "Strengthening the scientist's communicative skills" (30 December 1965), H. C. McDaniel (Westinghouse Electric Corporation, Pittsburgh) noted that the course this country will pursue for the next few years will be determined largely by the rate of technological advancement, and that the private citizen must be kept informed so that he can make intelligent decisions. Scientists possess at least two vocabularies—the common English vocabulary, and the specialized technical and scientific vocabulary. In communicating research results, the audience determines word choice. It is not enough to use only words the reader can understand; these must also be words he cannot misunderstand. Manuscripts should be free of bias, particularly if this relates to conclusions. The more objective the analysis, the more useful the results.

In examining "the valued decision" within the framework of today's complex society, Harold Hornby (Ames Laboratory, National Aeronautics and Space Administrations, Sunnyvale) analyzed factors such as criteria for value judgments, evaluation of alternative approaches, mechanisms for assuring objectivity, and today's planning vis-à-vis tomorrow's anticipated requirements. It was shown how these criteria relate to the universality of science and to the strengthening of the concept of total education.

Improved methods of scientific reporting were considered by Carl M. Johnson (U.S. Navy Electronics Laboratory, San Diego). Noting that much time, effort, and money have gone into the retrieval of scientific literature, Johnson suggested that at least equally important should be improvement of the material being retrieved, so that it can be quickly comprehended by the read-

er and readily found in the document center. The QRC (quick reader comprehension) reporting technique was cited as an example of an effective information retrieval method now being used successfully at the Navy Electronics Laboratory and elsewhere.

Supervision as the key to effective communication was discussed by James W. Souther (University of Washington, Seattle). It was pointed out that the supervisor—the university professor guiding the work of graduate students, or the scientist-supervisor in industry or government directing the work of scientists—exerts a powerful influence on scientific writing. No longer can we afford supervisors who do not meet their responsibilities with respect to strengthening the communicative skills of those who work for them. If science supervisors are to exert a positive influence, they must understand the kinds of problems science writers must solve, must identify the informational needs and the reading habits of the anticipated audience, and must establish procedures for effectively directing the writing of scientists.

The panel was cosponsored by AAAS (Section T) and the Society of Technical Writers and Publishers. Gunther Marx (IIT Research Institute, Chicago) arranged the session and presided at the meeting.

GUNTHER MARX,
Program Chairman

Statistics (U)

Section U sponsored or cosponsored 28 sessions at the 1965 AAAS meetings in Berkeley. The largest group of meetings (18) were the December sessions of the Fifth Berkeley Symposium on Mathematical Statistics and Probability.

The address at the vice-presidential session was given by Oscar Kempthorne on "The classical problem of inference —goodness of fit." Arrangements for this address were made after it was learned that Dr. Fry would not be able to attend. Neyman, first chairman of Section U and organizer of the Berkeley Symposium, presided.

The 18 sessions of the Berkeley symposium included 65 papers on subjects such as weather modification, information processing and cognition, medical diagnosis by computer, astronomy, demography, genetics, and other topics. The earlier meetings of the Berkeley Symposium were held in June and additional sessions were held in January

1966. The papers will be published by the University of California; papers on weather modification and discussions will form a separate volume.

A major problem in the epidemiology of mental disorder is that no single set of statistics can be taken as truly representing either incidence or prevalence. At a session arranged for the Population Association by Everett Lee (University of Pennsylvania) results obtained from various sources were critically examined. Enough agreement as to some of the most important differentials appears to establish important elements in this area.

A session, "Experiments on operating information systems," arranged by Ezra Glaser (National Institute of Health) discussed the actual problems encountered at the Patent Office and elsewhere in developing search systems and other information procedures.

Other sessions cosponsored by Section U included the symposium on Measuring Quality in Education (with Section Q and others), Computers and Universities (with Section P and others), a session on Statistical Methods of Bioassay arranged for the Biometric Society (ENAR) by Douglas Robson (Cornell) and two sessions arranged by the Biometric Society (WNAR). The Section also cosponsored the two sessions arranged by the Society of Systematic Zoology on "Biological data retrieval and computer analysis."

MORRIS ULLMAN,
Secretary

Biometric Society, Eastern North American Region (U3)

The session on bioassay placed emphasis on the use of prior information in the statistical design and analysis of routine assays. Variances among previous slope and intercept estimates for the Standard Preparation provided the basis for deciding the number of doses of Standard and Test Preparations to include in a parallel-line assay. A numerical illustration comparing variances of potency estimates based on a single dose of Test Preparation and 0, 1, or 2 doses of a Standard antibiotic showed that for a fixed total number of observations the 1-point assay, using prior estimates of both slope and intercept for the Standard, was less accurate than the 2- and 3-point assays. The problem of nonparallelism between Standard and Test dosage-response curves was examined and formulas were presented for confidence interval estimates of dose-specific potency values. In quantral response assays where the probit slope $(1/\sigma)$ is known a priori, the LD_{50} can be estimated homoscedastically by an "up and down method" in which animals are tested singly in sequence at dose levels which change by $c\sigma$ units in each trial. If an animal does not respond then the dose is increased for the next animal—otherwise the dose is decreased. The experiment is terminated after a fixed number of trials following the first change in direction of dosage increment. The LD_{50} is then estimated by the maximum likelihood method. For $c = 1$, errors of $\pm 2\sigma/3$ in setting the dose increment value were shown to have a negligible effect with respect to variance and bias of the LD_{50} estimate.

D. S. ROBSON,
Program Chairman

Science in General (X)

Sigma Delta Epsilon (X3)

A luncheon for all women in science was held in the Women's Faculty Club of the University of California in Berkeley on 28 December 1965. Mary L. Willard (Pennsylvania State University; past president and national honorary member of Sigma Delta Epsilon) was the speaker. She gave a very interesting talk on criminalistics and called on members of the audience to act as visual aids to illustrate her stories.

The annual dinner and Grand Chapter meeting was held on 29 December 1965. National honorary membership was conferred on four members of the Fraternity; Helen Dyer and Mary E. Maver, in absentia; Mary Rogick, posthumously; and Anna Rachel Whiting, in person. Whiting, at present a consultant to the Oak Ridge National Laboratories, Biology Division, gave a brief talk on her studies on the genetics of *Habrobracon* wasps through the use of x-ray irradiation at various stages of the wasps' development. She plans now to study the effect of weightlessness on the genetics of this species by sending wasps into space on a Gemini flight.

Eleanor Alexander Jackson, one of the recipients of the 1965 grants-in-aid, reported on her attempts to cultivate *M. leprae* on media used for the growth of *M. tuberculosis*. She has been able to grow the organism from freshly excised leproma nodules sent to her from Brazil and to produce lepromalike lesions with them in newborn rats.

At the business meeting money was appropriated for three additional grants-in-aid for 1966, a check for $200 was contributed to UNESCO to help finance science education in Nigeria, and the Miles College project was extended for the new fiscal year. Amendments to the constitution and bylaws were adopted to implement the change in fiscal year. The possibility of creating a new office, that of business manager for the fraternity was discussed and the present treasurer appointed to fill the office until it can be properly established at the next meeting of the Grand Chapter. Finally, national officers were elected and installed to take office 1 July 1966, the beginning of the new fiscal year, present officers will function until 30 June 1966.

HARRIET M. BOYD,
National Secretary

Forthcoming Events

March

1–2. **Dairy Engineering**, natl. conf., Michigan State Univ., East Lansing. (C. W. Hall, Agricultural Engineering Dept., Michigan State Univ., East Lansing)

1–3. **Space Maintenance** and Extra-Vehicular Activities, natl. conf., Orlando, Fla. (M. B. Goldman, Mail No. 302, Martin Co., Baltimore, Md. 21203)

1–10. **Industrial Development** in the Arab Countries, regional symp., Kuwait. (Intern. Agency Liaison Branch, Office of the Director General, Food and Agriculture Organization, Via delle terme di Caracalla, Rome, Italy)

2–4. **Air Pollution** Medical Research, AMA conf., Los Angeles, Calif. (Dept. of Environmental Health, American Medical Assoc., 535 N. Dearborn St., Chicago, Ill. 60610)

2–4. **Plasmadynamics**, conf., Monterey, Calif. (American Inst. of Aeronautics and Astronautics, 1290 Sixth Ave., New York 10019)

2–4. **Scintillation and Semiconductor Counters**, 10th symp., Washington, D.C. (W. A. Higinbotham, Brookhaven Natl. Laboratory, Upton, L.I., N.Y.)

3–4. Louisiana Soc. for **Electron Microscopy**, 3rd annual symp., New Orleans. (W. R. Goynes, Southern Regional Research Laboratory, Box 19687, New Orleans)

3–5. **Pb-Zn-Barite-Fluorite** Symp., New York, N.Y. (C. H. Behre, Jr., Behre Dolbear & Co., 11 Broadway, New York 10004)

3–5. Central **Surgical** Assoc., Chicago, Ill. (C. E. Lischer, 457 N. Kingshighway, St. Louis 8, Mo.)

4–5. **Cineradiology**, 5th symp., Rochester, N.Y. (R. Gramiak, Div. of Diagnostic Radiology, Univ. of Rochester Medical Center, Rochester 14620)

4–6. American Assoc. of **Pathologists and Bacteriologists**, 63rd annual mtg., Cleveland, Ohio. (P. Fitzgerald, Downstate Medical Center, 450 Clarkson Ave., Brooklyn 3, N.Y.)

5–10. International Acad. of **Proctology**, 18th annual conv., Miami Beach, Fla. (A. F. Cantor, 147-41 Sanford Ave., Flushing, N.Y. 11355)

6–11. American Soc. of **Photogrammetry**, Washington, D.C. (C. E. Palmer, 5917 Brookview Dr., Brookland Estates, Alexandria, Va.)

7–9. Fundamental **Cancer Research**, 20th annual symp., Univ. of Texas, Houston. (M. Mandel, Dept. of Biology, M. D. Anderson Hospital and Tumor Inst., Univ. of Texas, Houston 77025)

7–9. **Electric Propulsion**, 5th conf., American Inst. of Aeronautics and Astronautics, San Diego, Calif. (A. T. Forrester, Electro-Optical Systems, Inc., 300 N. Halstead St., Pasadena, Calif. 91107)

7–9. **Space**, 3rd congr., Cocoa Beach, Fla. (R. M. Barnes, PAA-Guided Missiles Range Div., Bldg. 423, MU 111, Patrick Air Force Base, Fla.)

7–11. American Soc. for **Metals**, western metal and tool exposition and conf., Los Angeles, Calif. (The Society, Metals Park, Ohio)

7–11. Society of **Plastics Engineers**, 22nd

annual technical conf., Montreal, P.Q., Canada. (G. L. Bata, Union Carbide Canada, Ltd., P.O. Box 700, Pointe-aux-Trembles, P.Q.)

7–12. Inter-American **Nuclear Energy** Commission, 6th mtg., Washington, D.C. (J. D. Perkinson, Jr., Pan American Union, Washington 20006)

8–3. World **Meteorological** Organization, commission for synoptic meteorology, 4th session, Wiesbaden, Germany. (WMO, 41, avenue Giuseppe Motta, Geneva, Switzerland)

9–11. **Ethics in Medical Progress**, Ciba Foundation symp., London, England. (Ciba Foundation, 41 Portland Pl., London W.1)

9–13. Teaching Machines and **Programmed Instruction**, intern. symp., Nürtingen, Germany. (Arbeitsgemeinschaft Programmierte Instruktion, Inst. für Kybernetik, Pädagogische Hochschule Berlin, Malteserstr. 74-100, 1 Berlin 46)

10–11. **Heat Transfer** to Non-Newtonian Fluids, 12th annual heat transfer conf., Oklahoma State Univ., Stillwater. (J. D. Parker, Dept. of Mechanical Engineering, Oklahoma State Univ., Stillwater 74075)

11–13. National Council of **Teachers of Mathematics**, San Diego, Calif. (J. D. Gates, 1201 16th St., NW, Washington, D.C. 20036)

11–13. National **Wildlife** Federation, annual mtg., Pittsburgh, Pa. (T. L. Kimball, 1412 16th St., NW, Washington, D.C. 20036)

12–13. **Linguistics**, 11th natl. conf., Linguistic Circle of New York, N.Y. (L. Pap, State Univ. College, New Paltz, N.Y. 12561)

14–16. Society of **Toxicology**, annual scientific mtg., Williamsburg, Va. (C. S. Weil, Mellon Inst., 4400 Fifth Ave., Pittsburgh, Pa. 15213)

14–16. **Wildlife and Natural Resources**, 31st North American conf., Pittsburgh, Pa. (C. R. Gutermuth, Wildlife Management Inst., Wire Bldg., Washington, D.C.)

14–20. **Obstetrics and Gynecology**, 8th Australian congr., Hobart. (J. F. Correy, 173 Macquaire St., Hobart)

14–6 May. Extraordinary Administrative **Aeronautical Radio** Conf., 2nd session, Geneva, Switzerland. (Intern. Telecommunication Union, Place des Nations, Geneva)

15–16. **Flame Resistant Polymers**, conf., London, England. (Secretary, Plastics Inst., 6 Mandeville Pl., London, W.1)

15–18. **Optical Soc.** of America, spring mtg., Washington, D.C. (M. E. Warga, 1155 16th St., NW, Washington, D.C. 20006)

17–19. **Isobaric Spin in Nuclear Physics**, intern. conf., Florida State Univ., Tallahassee. (D. Robson, Dept. of Physics, Florida State Univ., Tallahassee)

18–19. **Rural Health**, conf., Colorado Springs, Colo. (B. L. Bible, 535 N. Dearborn St., Chicago, Ill. 60610)

18–20. American **Psychosomatic** Soc. annual mtg., Chicago, Ill. (W. A. Greene, The Society, 265 Nassau Rd., Roosevelt, N.Y. 11575)

20–23. **Solar Energy** Soc., 2nd annual mtg., Boston, Mass. (F. Edlin, Arizona State Univ., Tempe 85281)

21–24. **Aerospace Instrumentation**, 4th intern. symp., College of Aeronautics,

Cranfield, England. (E. K. Merewether, ISA Aerospace Industry Div., 4515 Canoga Ave., Woodland Hills, Calif.)

21–25. Institute of **Electrical and Electronics Engineers**, intern. conv., New York, N.Y. (IEEE, 345 E. 47 St., New York)

22–23. **Biomagnetics**, 3rd intern. symp., Univ. of Illinois, Chicago. (M. F. Barnothy, Univ. of Illinois, 833 S. Wood St., Chicago)

22–23. Modern Concepts of **Cardiovascular Diseases**. conf. and workshop, Reno, Nev. (G. T. Smith, Laboratory of Patho-Physiology, Univ. of Nevada. Reno 89507)

22–24. Measurement and Applications of **Neutron Cross Sections**, conf., Washington, D.C. (W. W. Havens, Dept. of Physics, Columbia Univ., 538 W. 120 St., New York 10027)

22–31. American **Chemical** Soc., spring mtg., Pittsburgh, Pa. (ACS, 1155 16th St., NW, Washington, D.C.)

23–25. Institute of **Mathematical Statistics**, Purdue Univ., Lafayette, Ind. (G. E. Nicholson, Jr., Univ. of North Carolina, Chapel Hill).

23–25. Modern Methods of **Weather Forecasting and Analysis**. Chicago, Ill. (J. R. Fulks, U.S. Weather Bureau, 5730 S. Woodlawn Ave., Chicago)

24–26. **Biomathematics and Computer Science** in the Life Sciences, symp., Houston, Tex. (Dean, Div. of Continuing Education, Univ. of Texas Graduate School of Biomedical Sciences, Texas Medical Center, Houston 77025)

24–26. Pediatric and Adolescent **Gynecology**, conf., New York Acad. of Sciences, New York. (W. R. Lang, Jefferson Medical College of Philadelphia, 1025 Walnut St., Philadelphia, Pa.)

24–26. **Pollution and Marine Ecology**, conf., Galveston, Tex. (S. M. Ray, Texas A&M Univ. Marine Laboratory, Galveston 77550)

24–27. International Assoc. for **Dental Research**, 44th general mtg., Miami, Fla. (G. H. Rovelstad, U.S. Navy Dental School, Natl. Naval Medical Center, Bethesda, Md. 20014)

25–26. National Assoc. of **Biology Teachers**, western regional conv., Los Angeles, Calif. (The Association, Professional Building, Great Falls, Mont.)

26–2. **Stress Analysis**, 3rd intern. conf., Berlin, Germany. (H. Kotthaus, Verein Deutscher Ingenieure, Prinz-Georg Str. 77/79, 4 Düsseldorf 10)

26–27. Arizona **Chest Disease** Symp., Tucson. (E. A. Oppenheimer, P.O. Box 6067, Tucson 85716)

27–30. American Assoc. of **Dental Schools**, Miami Beach, Fla. (R. Sullens, 840 N. Lake Shore Dr., Chicago, Ill.)

28–30. **Great Lakes Research**, 9th conf., Chicago, Ill. (B. M. McCormac, IIT Research Inst., 10 W. 35 St., Chicago 60616)

28–31. Collegium Intern. **Neuro-Psychopharmacologicum**, 5th biennial mtg., Washington, D.C. (M. K. Taylor, 3636 16th St., NW, Washington 20010)

29–31. **Airborne Infection**, 2nd intern. conf., Illinois Inst. of Technology, Chicago. (E. K. Wolfe, U.S. Army Biological Laboratories, Fort Detrick, Frederick, Md.)

29–31. **Applied Meteorology**, 6th natl. conf., Los Angeles, Calif. (B. N. Charles, Booz-Allen Applied Research, 6151 W. Century Blvd., Los Angeles 90045)

29–31. **Chemical** Soc., anniversary mtgs., Oxford, England. (General Secretary, Burlington House, London W.1)

29–31. **Surface-Active Substances**, intern. conf., Berlin, East Germany. (Inst. für Fettchemie, Deutsche Akademie der Wissenschaften zu Berlin, Rudower Chaussee 5, 1199 Berlin-Adlershof)

29–31. **Symbolic and Algebraic Manipulation**, symp., Assoc. for Computing Machinery, Washington, D.C. (J. E. Sammet, I.B.M. Corp., 545 Technology Sq., Cambridge, Mass. 02139)

29–1. American Assoc. for **Contamination Control**, 5th annual technical mtg., Houston, Tex. (W. T. Maloney, The Association, 6 Beacon St., Boston, Mass. 02108)

29–1. Ultraviolet and X-ray **Spectroscopy of Laboratory and Astrophysical Plasma**, conf., Abingdon, England. (Inst. of Physics and the Physics Soc., 47 Belgrave Sq., London, S.W.1, England)

30. **Oral Cancer**, 4th symp., St. Francis Hospital, Poughkeepsie, N.Y. (M. A. Engelman, 1 E. Academy St., Wappingers Falls, N.Y.)

30–1. **Magnetohydrodynamics**, 7th symp., Princeton, N.J. (R. G. Jahn, Guggenheim Laboratories, Forrestal Research Center, Princeton, N.J. 08540)

31–2. Michigan **Acad. of Science, Arts, and Letters**, Wayne State Univ., Detroit. (E. A. Wunsch, Dept. of English, Univ. of Michigan, Ann Arbor)

April

1–2. Alabama **Acad. of Science**, Birmingham-Southern College, Birmingham. (W. B. DeVall, Dept. of Forestry, Auburn Univ., Auburn, Ala.)

1–2. Arkansas **Acad. of Science**, Little Rock. (G. E. Templeton, Univ. of Arkansas, Fayetteville)

1–5. National **Science Teachers** Assoc., New York, N.Y. (R. H. Carleton, 1201 16th St., NW, Washington, D.C. 20036)

1–7. American Acad. of **General Practice**, Boston, Mass. (M. F. Cahal, Volker Blvd. at Brookside, Kansas City 12, Mo.)

4–6. **Atomic Energy** Soc. of Japan, annual mtg., Tokyo. (M. Masamoto, Japan Atomic Energy Research Inst., 1-1, Shibatamura-cho, Minato-ku, Tokyo)

4–6. **Exobiology**, conf., Ames Research Center, Moffett Field, Calif. (Letters and Science Extension, Univ. of California, Berkeley 94720)

4–6. American Assoc. of **Physical Anthropologists**, Berkeley, Calif. (F. E. Johnston, Dept. of Anthropology, Univ. of Pennsylvania, Philadelphia 19104)

4–7. Federation of European **Biochemical** Soc., 3rd mtg., Warsaw, Poland. (T. Klopotowski, Polish Biochemical Soc., Freta 16, Warsaw)

4–7. Advances in **Water Quality Improvement**, conf., Univ. of Texas, Austin. (Special Lecture Series, Engineering Laboratories Bldg. 305, Univ. of Texas, Austin 78712)

4–8. International **Biological Program**, 2nd general assembly, Paris, France. (F. W. G. Baker, 2 via Sebenico, Rome, Italy)

4–10. **Psychology**, 10th inter-American congr., Lima, Peru. (Intern. Soc. of Psychology, 2104 Meadowbrook Dr., Austin, Tex.)

NEW BOOKS

(Continued from page 814)

edition (Moscow, 1960) by D. M. G. Wishart. Pergamon, New York, 1965. Illus. $5.50.

Encyclopedia of Polymer Science and Technology: Plastics, Resins, Rubbers, Fibers. vol. 3, *Casting to Cohesive-Energy Density*. Herman F. Mark, Norman G. Gaylord, and Norbert M. Bikales, Eds. Interscience (Wiley), New York, 1965. 876 pp. Illus. $50.

Essentials of Earth History: An Introduction to Historical Geology. William Lee Stokes. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1966. 480 pp. Illus. $8.95.

Estimation Theory. Ralph Deutsch. Prentice-Hall, Englewood Cliffs, N.J., 1965. 285 pp. Illus. $13.

Extractive Metallurgy: Principles and Application. W. H. Dennis. Philosophical Library, New York, 1965. 381 pp. Illus. $15.

Extrusion Casting. Vladimir M. Plyatskii. Translated from the Russian edition (Moscow, 1964) by R. E. Hammond. Adolph Wald, Translation Ed. Primary Sources, New York, 1965. 320 pp. Illus. $22.50.

Failure-Tolerant Computer Design. William H. Pierce. Academic Press, New York, 1965. 256 pp. Illus. $8.50.

Ferromagnetism and Ferromagnetic Domains. D. J. Craik and R. S. Tebble. North-Holland, Amsterdam; Interscience (Wiley), New York, 1965. 349 pp. Illus. $14. Volume 4 of the Series of Monographs on Selected Topics in Solid State Physics, edited by E. P. Wohlfarth.

The Fundamentals of Mathematical Analysis. vol. 2. G. M. Fikhtengol'ts. Translated from the Russian edition (Moscow, 1960) by Ann Swinfen. Ian N. Sneddon, Translation Ed. Pergamon, New York, 1965. 540 pp. Illus. $9.50.

Fundamentals of Physics. Henry Semat. Holt, Rinehart, and Winston, New York, ed. 4, 1966. 765 pp. Illus. $9.95.

Gasdynamics of Combustion. K. I. Shchelkin and Ya. K. Troshin. Translated from the Russian by Boris W. Kuvshinoff and Lester Holtschlag. Mono Book Corp., Baltimore, 1965. 234 pp. Illus. $11.50.

The Geology of Scotland. Gordon Y. Craig, Ed. Archon Books, Hamden, Conn., 1965. 572 pp. Illus. $20. Chapters were contributed by G. Y. Craig, P. McL. D. Duff, E. H. Francis, T. N. George, A. Hallam, M. R. W. Johnson, E. L. P. Mercy, J. B. Sissons, F. H. Stewart, E. K. Walton, C. D. Waterston, and Janet Watson.

Geology of the Himalayas. Augusto Gansser. Interscience (Wiley), New York, 1964. 305 pp. Illus. Maps.

The Growth of Crystals from the Melt. J. C. Brice. North-Holland, Amsterdam; Interscience (Wiley), New York, 1965. 202 pp. Illus. $8.50. A volume in the Series of Monographs on Selected Topics in Solid State Physics, edited by E. P. Wohlfarth.

The Hydrocyclone. D. Bradley. Pergamon, New York, 1966. 346 pp. Illus. $20. Monographs in Chemical Engineering. Volume 4 of the International Series of

Industrial Stroboscopy. Gilbert Kivenson. Hayden, New York, 1965. 292 pp. Illus. $9.95.

Integral Transforms and Operational Calculus. V. A. Ditkin and A. P. Prudnikov. Translated from the Russian edition (Moscow, 1961) by D. E. Brown. Ian N. Sneddon, Translation Ed. Pergamon, New York, 1965. 541 pp. Illus. $15.50. International Series of Monographs in Pure and Applied Mathematics, vol. 78.

Interpretive Spectroscopy. Stanley K. Freeman, Ed. Reinhold, New York, 1965. 301 pp. Illus. $17.50. Five papers: "Ultraviolet absorption spectroscopy" by W. F. Forbes; "Infrared absorption spectroscopy" by Maurizio Gianturco; "Far infrared spectroscopy" by James E. Stewart; "Mass spectrometry" by Henry A. Bondarovich and Stanley K. Freeman; and "Proton nuclear magnetic resonance spectroscopy" by Ajay K. Bose.

Introduction a l'Optique Corpusculaire. Noël J. Félici. Gauthier-Villars, Paris, 1965. 136 pp. Illus. Paper, F. 33. La Physique dans l'Industrie et au Laboratoire, edited by M. Louis Weil.

An Introduction to Chemical Industry. John Manning. Pergamon, New York, 1965. 282 pp. Illus. Paper. $3.95. Commonwealth and International Library of Science.

Introduction to Electronic Analogue Computers. C. A. A. Wass and K. C. Garner. Pergamon, New York, ed. 2, 1965. 312 pp. Illus. $8.50. International Series of Monographs in Electronics and Instrumentation, vol. 6.

Introduction to General Topology. Sze-Tsen Hu. Holden-Day, San Francisco, 1966. 240 pp. Illus. $8.50. A volume in the Holden-Day Series in Mathematics, edited by Earl A. Coddington and Andrew M. Gleason.

Investigations in the Field of Organolead Chemistry. L. C. Willemsens and G. J. M. van der Kerk. International Lead Zinc Research Organization, New York, 1965. 145 pp. Illus. Paper.

Lie Groups for Physicists. Robert Hermann. Benjamin, New York, 1966. 203 pp. Illus. $12.50. Mathematical Physics Monograph Series, edited by A. S. Wightman.

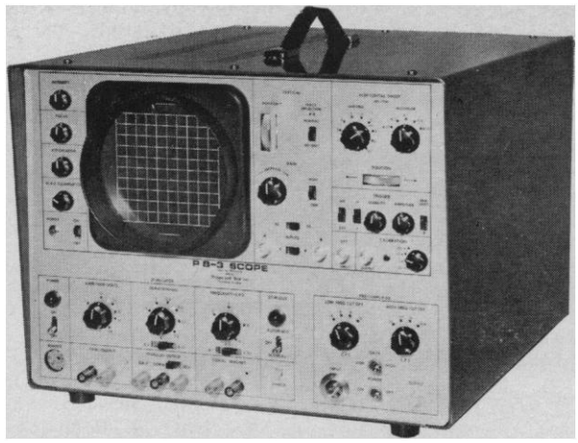
Linear Analysis of Electronic Circuits. Glenn M. Glasford. Addison-Wesley, Reading, Mass., 1966. 592 pp. Illus. $15. Addison-Wesley Series in Electrical Engineering.

Mathematical Analysis: A Special Course. G. Ye. Shilov. Translated from the Russian edition (Moscow, 1961) by J. D. Davis. D. A. R. Wallace, Translation Ed. Pergamon, New York, 1965. 497 pp. Illus. $13. Volume 77 of the International Series of Monographs in Pure and Applied Mathematics.

Methods of Thermodynamics. Howard Reiss. Blaisdell (Ginn), New York, 1965. 237 pp. Illus. $8.50. A Blaisdell Book in the Pure and Applied Sciences.

Mineral Studies. E. Wm. Heinrich, Ed. Mineralogical Soc. of America, Washington, D.C., 1965. 305 pp. Illus. Paper, $3.25. Twenty-one papers. The volume is dedicated to Paul Francis Kerr on the occasion of his retirement.

Molecular Symmetry: An Introduction to Group Theory and Its Uses in Chemistry. David S. Schonland. Van Nostrand,



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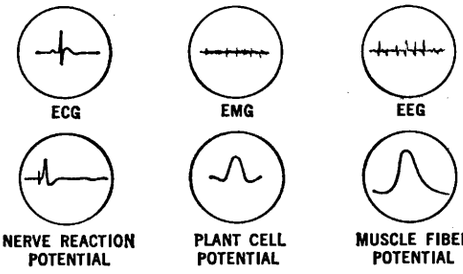

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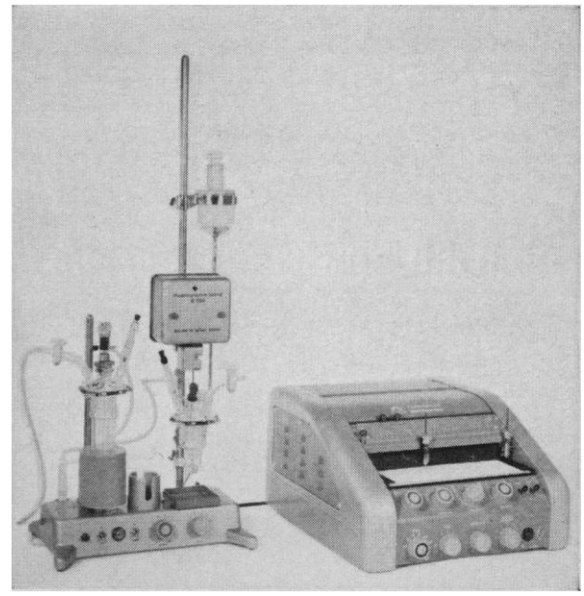

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Princeton, N.J., 1965. 310 pp. Illus. $12.

Multiplet Structure of Atoms and Molecules. Richard Stevenson. Saunders, Philadelphia, 1965. 200 pp. Illus. $5.75. Studies in Physics and Chemistry Series.

Newer Redox Titrants. A. Berka, J. Vulterin, and J. Zyka. Translated by H. Weisz. Pergamon, New York, 1965. 255 pp. Illus. $10.

Nonclassical Ions. Reprints and commentary. Paul D. Bartlett. Benjamin, New York, 1965. 573 pp. Illus. Paper, $6.95; cloth, $12. This volume, which is published in the Frontiers in Chemistry Series, edited by Ronald Breslow and Martin Karplus, contains 75 papers, reprinted from various journals, and published during the years 1937 to 1964.

Non-Linear Transformations of Stochastic Processes. P. I. Kuznetsov, R. L. Stratonovich, and V. I. Tikhonov, Eds. Translated by O. M. Blunn. J. Wise and D. C. Cooper, Tranlsation Eds. Pergamon, New York, 1965. 496 pp. Illus. $20. Thirty-nine papers: Some Problems of the Theory of Stochastic Processes (7 papers); The Effect of Noise on Certain Non-Linear Elements (8 papers); The Effect of Fluctuations on Oscillator Operation (12 papers); Random Function Excursions (6 papers); and Optimum Filtration (6 papers).

Numerical Mathematics. Jerome C. R. Li. Edwards, Ann Arbor, Mich., 1966. 657 pp. Illus. $10.

Open Channel Flow. F. M. Henderson. Macmillan, New York, 1966. 544 pp. Illus. $14.95. Macmillan Series in Civil Engineering, edited by Gene Nordby.

Petrogenesis of Metamorphic Rocks. Helmut G. F. Winkler. Translated from the German by N. D. Chatterjee and E. Froese. Springer-Verlag, New York, 1965. 220 pp. Illus. Paper, $4.95.

Physical Acoustics: Principles and Methods. vol. 3, pt. B, *Lattice Dynamics*. Warren P. Mason, Ed. Academic Press, New York, 1965. 356 pp. Illus. $12. Seven papers: "Use of sound velocity measurements in determining the Debye temperature of solids" by George A. Alers; "Determination and some uses of isotropic elastic constants of polycrystalline aggregates using single-crystal data" by O. L. Anderson; "The effect of light on the mechanical properties of alkali halide crystals" by Robert B. Gordon; "Magnetoelastic interactions in ferromagnetic insulators" by R. C. LeCraw and R. L. Comstock; "Effect of thermal and phonon processes on ultrasonic attenuation" by P. G. Klemens; "Effect of impurities and phonon processes on the ultrasonic attenuation of germanium, crystal quartz, and silicon" by Warren P. Mason; and "Attenuation of elastic waves in the earth" by L. Knopoff.

Plastic Analysis and Design. vol. 1, *Beams and Frames*. C. E. Massonnet and M. A. Save. Translated from the French. Blaisdell (Ginn), New York, 1965. 393 pp. Illus. $10.50.

Potential Scattering. V. DeAlfaro and T. Regge. North-Holland, Amsterdam; Interscience (Wiley), New York, 1965. 215 pp. Illus. $8.

Preparations of Metals for Painting. Samuel Spring. Reinhold, New York, 1965. 326 pp. Illus. $12.

Principles of Electrodynamics. Aleksey

N. Matveyev. Translated from the Russian. Leon F. Landovitz, Translation Ed. Reinhold, New York, 1966. 429 pp. Illus. $12.50.

Problems in Undergraduate Physics. vol. 2, *Electricity and Magnetism*. S. P. Strelkov, I. A. El'tsin, and S. E. Khaikin. Translated from the third Russian edition (Moscow, 1964) by D. E. Brown. D. ter Haar, Translation Ed. Pergamon, New York, 1965. 212 pp. Illus. $5.50.

Problems in Undergraduate Physics. vol. 4, *Molecular Physics, Thermodynamics, Atomic and Nuclear Physics*. V. L. Ginzburg, L. M. Levin, M. S. Rabinovich, and D. V. Sivukhin. Translated from the revised Russian edition (Moscow, 1960) by D. E. Brown. D. ter Haar, Translation Ed. Pergamon, New York, 1965. 244 pp. Illus. $5.50.

Programming, Games, and Transportation Networks. Claude Berge and A. Ghouila-Houri. Translated from the French edition (Paris, 1962) by Maxine Merrington and C. Ramanujacharyulu. Methuen, London; Wiley, New York, 1965. 270 pp. Illus. $8.75.

Radiative Contributions to Energy and Momentum Transport in a Gas. Douglas H. Sampson. Interscience (Wiley), New York, 1965. 194 pp. Illus. $8.50. Interscience Tracts on Physics and Astronomy, vol. 26, edited by R. E. Marshak.

Rolling Mills. A. I. Tselikov and V. V. Smirnov. Translated from the Russian edition by M. H. T. Alford. W. J. McG. Tegart, Translation Ed. Pergamon, New York, 1965. 415 pp. Illus. $25.

Semiconductor Surfaces. A. Many, Y. Goldstein, and N. B. Grover. North-Holland, Amsterdam; Interscience (Wiley), New York, 1965. 512 pp. Illus. $17.50.

Sound Control and Thermal Insulation of Buildings. Paul Dunham Close. Reinhold, New York, 1966. 510 pp. Illus. $17.

Space Communications Techniques. Richard F. Filipowsky and Eugen I. Muehldorf. Prentice-Hall, Englewood Cliffs, N.J., 1965. 351 pp. Illus. $11.95. Space Technology Series, edited by C. W. Besserer and Floyd E. Nixon.

Structural and Tectonic Principles. Peter C. Badgley. Harper and Row, New York, 1965. 541 pp. Illus. $13.95.

The Structure of Small Molecules. W. J. Orville-Thomas. Elsevier, New York, 1966. 199 pp. Illus. $9.50. Principles of Modern Chemistry: A Guide to Advanced Study Series, vol. 1, edited by W. F. Forbes and W. J. Orville-Thomas.

Symbolic Logic and the Real Number System: An Introduction to the Foundations of Number Systems. A. H. Lightstone. Harper and Row, New York, 1965. 237 pp. Illus. $7.50. Harper's Series in Modern Mathematics, edited by I. N. Herstein and Gian-Carlo Rota.

Tables of Generalized Airy Functions for the Asymptotic Solution of the Differential Equations $^{\circ}(py')' + (q^{+er})y=f$. L. N. Nosova and S. A. Tumarkin. Translated from the Russian edition (Moscow, 1961) by D. E. Brown. Pergamon, New York, 1965. 123 pp. Illus. $5.

The Theory of Stochastic Processes. D. R. Cox and H. D. Miller. Wiley, New York, 1965. 408 pp. Illus. $11.50.

Traité de Tectonique. Jean Goguel. Masson, Paris, ed. 2, 1965. 463 pp. Illus. F. 68.

(Continued from page 808)

$6000 to $11,000, depending on previous training. (H. S. Kaplan, Stanford University School of Medicine, Palo Alto, California 94304)

Meeting Notes

The 2nd international **biophysics** congress will be held in Vienna, 5–9 September, sponsored by the International Organization for Pure and Applied Biophysics. Contributed papers on all areas of biophysics will be considered for presentation. Abstracts deadline: *15 May*. (Secretariat, Mrs. E. Weidenhaus, Vienna Academie of Medicine, Alserstrasse 4, Vienna 9)

The American Meteorological Society will sponsor a conference on **marine meteorology**, 7–10 September, in Virginia Beach, Virginia. Papers are invited on exchange processes between atmosphere and oceans, weather systems over the oceans, oceanic physical influences, and applications of meteorology to operations in ocean areas. Abstracts: 200 words; deadline: *15 March*. (J. R. Stinson, U.S. Navy Weather Research Facility, Naval Air Station, Norfolk, Virginia 23511)

A conference on **coherence and quantum optics** is scheduled at the University of Rochester, New York, 22–24 June. Emphasis will be on statistical properties of electromagnetic fields and the interactions of fields under conditions where coherence effects play a role. The sponsors are the University, the Air Force Office of Scientific Research, and the Air Force Cambridge Research Laboratory. Abstracts: 1000 words; deadline: *10 March*. (E. Wolf, Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627)

Papers are invited on fundamental and practical **applications of x-ray analysis** for a conference scheduled for 10–12 August in Denver. The sponsor is the metallurgy division of Denver Research Institute. Abstracts: 200 to 400 words, in duplicate; deadline: *11 April*. Final manuscripts, in duplicate, and the author's consent to publish in the copyrighted proceedings of the conference, are required by 11 July. (Metallurgy Division, Denver Research Institute University of Denver, Colorado)

The Air Force Systems Command aerospace medical division and research and technology division will sponsor a symposium on **bionics** 3–5 May in Dayton, Ohio. Main emphasis will be on areas related to cybernetics; topics to be discussed include biological control and information-processing systems, artificial intelligence, pattern recognition, self-organizing and learning systems, and automata theory. (H. L. Oestreicher, Aerospace Medical Research Laboratories, Wright-Patterson Air Force Base, Ohio 45433)

A symposium on **underwater physiology** will be presented 23–25 March in Washington. The program includes reports on studies of man, animals, tissues, cells, and the effects of gases under conditions encountered at depths of more than 250 feet. (K. W. Hannah, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington, D.C. 20418)

An international conference on **lens design** with large computers will be held 5–8 July in Rochester, New York. The meeting will provide opportunity to evaluate and compare the performances of various programs for large computers and to synthesize information offered by these programs concerning the physics of optical systems. Although emphasis will be on optical design with large computers, papers about work done with small machines and simple programs will also be welcome. (Institute of Optics, University of Rochester, Rochester, New York 14627)

The 1966 **Laurentian Hormone** conference is scheduled for 28 August to 2 September in Mont Tremblant, Quebec. The program will include sessions on thyroid physiology, steroid hormones, peptide hormones, insulin and the pancreas, and hormones and metabolism. Participation will be limited. Deadline for applications: *20 April*. (J. Sanford, 222 Maple Avenue, Shrewsbury, Massachusetts 01545)

North Dakota State University, Fargo, will present a research conference on the **biological sciences**, 31 March to 1 April. The meeting will be cosponsored by AIBS. Topics to be covered will include the probability of life in outer space, protein nutrition, environmental research problems, radiation biology, and bionics. (K. L. Larson, Department of Agronomy, North Dakota State University, Fargo)

Publications

The Engineering Manpower Commission has published the results of a survey of **engineering students** who graduated from college in 1965. The information was gleaned from questionnaires, completed by the placement directors of 186 engineering schools, regarding some 20,000 graduates. The survey indicates that the demand for new engineering graduates is high; some 87 percent had definite educational, job, or military commitments by graduation. About one of every four for whom information was available is going to graduate school; and salaries for those who accepted jobs averages $634 a month, 3½ percent higher than for 1964 graduates. (*The Placement of Engineering Graduates 1965*. Engineering Manpower Commission of Engineers Joint Council, Department P, 345 East 47th Street, New York 10017. $1)

A base map of the **Atlantic Continental Shelf and Slope** has been published by the U.S. Geological Survey to help geologists record data from submerged lands. It incorporates more than 1.8 million soundings showing the topography of the ocean floor from Nova Scotia to Florida at a scale of 1 inch to 16 miles. The map was compiled from U.S. and Canadian data, supplemented with data collected by a team aboard the research vessel *Gosnold* during several cruises. The map is divided into three sheets which can be joined to form a single map. (*Map Showing Relation of Land and Submarine Topography*; miscellaneous map I-451. U.S.G.S., Washington, D.C. 20242; $1.50 set)

A recent NSF publication discusses the numbers of **scientists and engineers who immigrated** to the United States during fiscal years 1962 and 1963. The report says that the majority came from the United Kingdom, Canada, and Germany, and that 7000 of 10,000 were engineers. The report also includes information on the migration of scientists and engineers prior to their immigration to the U.S. Data are based on special tabulations prepared for NSF by the Immigration and Naturalization Service. (*Scientists and Engineers from Abroad, Fiscal Years 1962 and 1963, Reviews of Data on Science Resources, Vol. 1, Number 5*. Superintendent of Documents, Government Printing Office, Washington, D.C. 20402; 5 cents)

Scientists in the News

Atomic Energy Commission chairman **Glenn T. Seaborg** has been awarded the 1966 Gibbs medal of the Chicago section of the American Chemical Society. The award was given to Seaborg for his outstanding contributions to pure and applied chemistry and for contributions to scientific and academic administration and to government service.

The new Home Secretary of the National Academy of Sciences is **Merle A. Tuve**, director of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington.

South Dakota State University appointed **Duane Acker** dean of the college of agriculture and biological sciences, effective 1 February. He was associate dean of agriculture at Kansas State University.

Edmund S. Nasset, professor emeritus of physiology at the University of Rochester, has become visiting professor of physiology at George Washington University medical school, Washington. The appointment will last through August.

Ralph E. Knutti, who retired last July as director of the National Heart Institute, has been appointed executive officer of Universities Associated for Research and Education in Pathology, an organization formed recently to encourage cooperation in that field among universities and other scientific institutions. The association's headquarters is 9650 Rockville Pike, Bethesda, Maryland.

Peyton Rous of New York City, a pioneer American researcher in the field of cancer, was named the main recipient of Germany's highest medical award—the Paul Ehrlich and Ludwig Darmstaedter prize. Rous, 86, a member emeritus of The Rockefeller University in New York, will receive the award in ceremonies in Frankfurt in March.

John A. Saxton, director of the United Kingdom Scientific Mission and scientific counsellor at the British Embassy in Washington, will return to England this spring to become director of the Radio and Space Research Station of the Science Research Council, in Slough.

Piet C. Gugelot, director of the Institute for Nuclear Physics, Amsterdam, Netherlands, has been named scientific director of NASA's Space Radiation Effects Laboratory, Newport News, Virginia, effective 1 January. Virginia Associated Research Center operates the laboratory under contract with NASA Langley Research Center.

Victor H. Weisskopf has returned to his position as Institute professor of physics at MIT, after a 5 years' leave of absence during which he was director general and scientific director of the European Organization for Nuclear Research (CERN), Geneva, Switzerland. He will be succeeded at CERN by **Bernard Gregory** of France, who has been a directorate member for research.

Robert C. Seamans, Jr. has been appointed as deputy administrator of NASA. He will retain his position as associate administrator for an indefinite period.

Recent Deaths

Saul Adler, 71; head of the parasitology department of Hebrew University, Jerusalem; 25 January.

Dirk Brouwer, 63; Munson professor of natural philosophy and astronomy at Yale University and director of the Yale Observatory; 31 January.

Harold C. M. Case, 75; retired professor and head of the department of agricultural economics at the University of Illinois; 3 January.

Israel L. Chaikoff, 63; professor of physiology and formerly co-chairman of the department, University of California, Berkeley; 25 January.

Ellsworth C. Dougherty, 44; lecturer in comparative nutrition and a specialist at the agricultural experiment station at the University of California, Berkeley; 21 December.

George Wicker Elderkin, 86; professor emeritus of art and archeology at Princeton University; 19 December.

Clarence B. Hilberry; president emeritus of Wayne State University; 10 January.

G. Albert Hill, 73; former professor of chemistry at Wesleyan University; 28 December.

Robert Hodes, 51; professor of physiology at Mount Sinai medical school; 27 January.

Albert W. Hull, 85; retired assistant director of the General Electric Research Laboratory; 22 January.