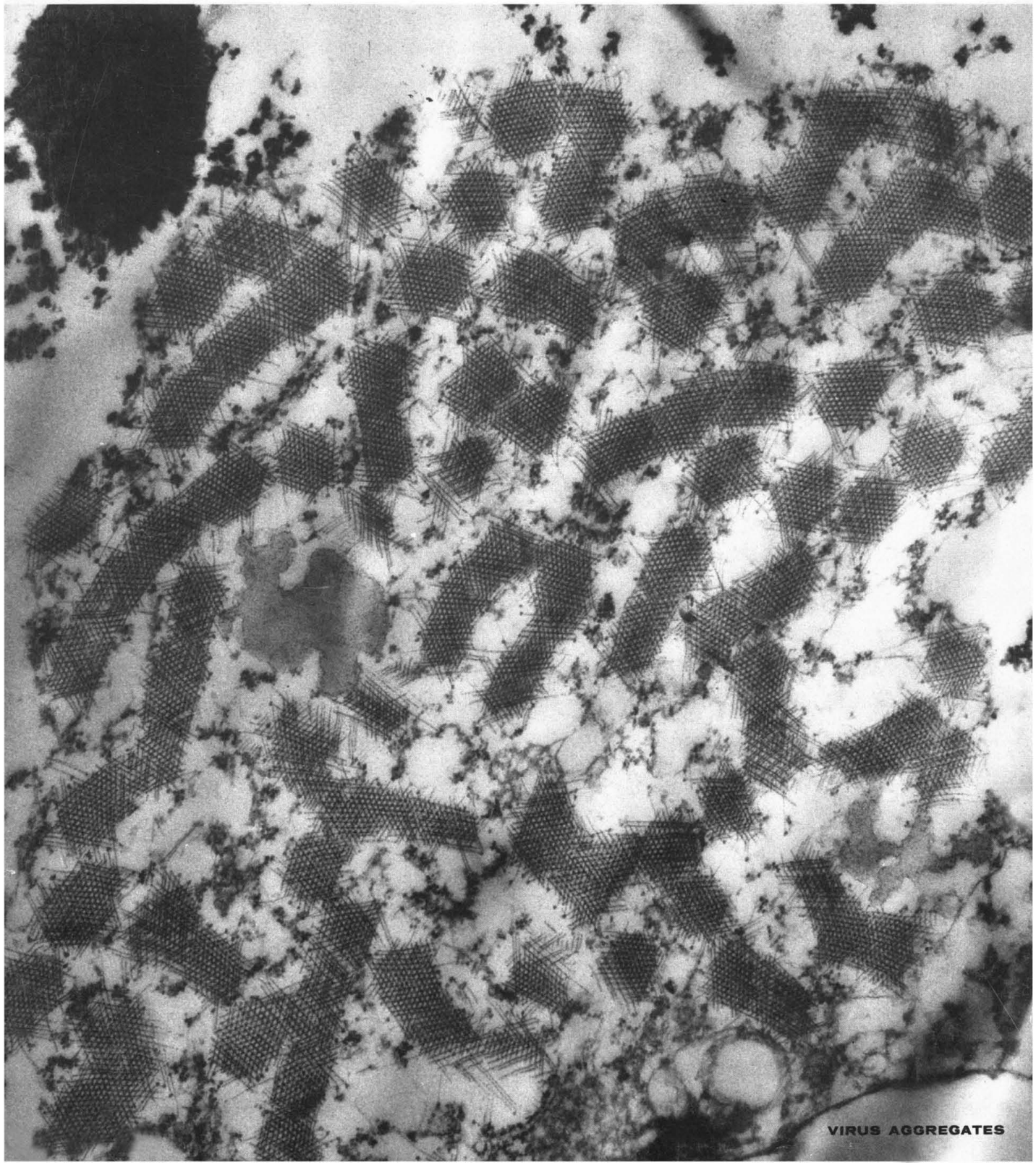
SCIENCE

14 April 1967
Vol. 156, No. 3772

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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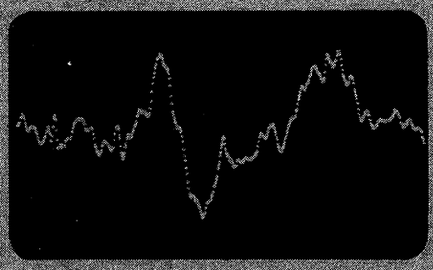

You can now take a single waveform one millisecond long . . . . measure it in 1024 one microsecond increments with five-bit accuracy . . . . and store it in a fast memory . . . . all in 1.024 milliseconds! No other commercially available device can digitize and store this much data this fast.

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The High Speed Digitizer memory stores the results of each fast waveform measurement. After each waveform measurement the Digitizer automatically reads out the recorded data at a rate of 50 microseconds per point to a Fabri-Tek signal averager. The averager may be used as a data storage and readout device for single waveform measurements. When repetitive signals are measured, the readout from the Digitizer is algebraically added into the signal averager memory. The averager then functions as an accumulator as well as a display and readout device. When a repetitive fast signal obscured by noise is measured, the averager accumulates and averages the data to reduce the noise in addition to providing display and readout.

During the readout to the averager the Digitizer is not measuring the signal, but this "dead time" is not critical since it occurs after each signal. System efficiency for repetitive signals is essentially 100% in cases where the signal occurs at a rate of 15 times per second or less. Where fewer than 1024 data points per signal are needed, lossless operation occurs at correspondingly faster repetition rates.

The ability to distinguish small differences in signal amplitude is called "resolution." Five-bit resolution would sometimes be too low except for the fact that, after several measurements, the presence of noise on the input signal tends to improve signal resolution. For cases where the input signal noise is absent, a controlled systematic "noise" is introduced in the High Speed Digitizer. This controlled systematic "noise" is introduced at fixed intervals, in fixed steps, to continuously improve vertical statistical accuracy. This accuracy increases as a function of the number of measurements taken; for example, if at least 32 measurements have been made, the vertical resolution is one part in 1024.

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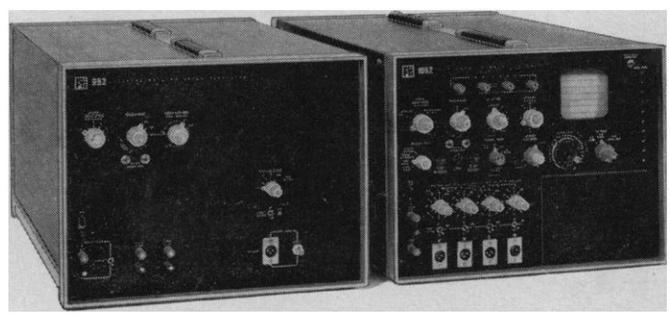
FT-952 High Speed Digitizer



FT-1052 Signal Averager System

14 April 1967
Vol. 156, No. 3772

SCIENCE

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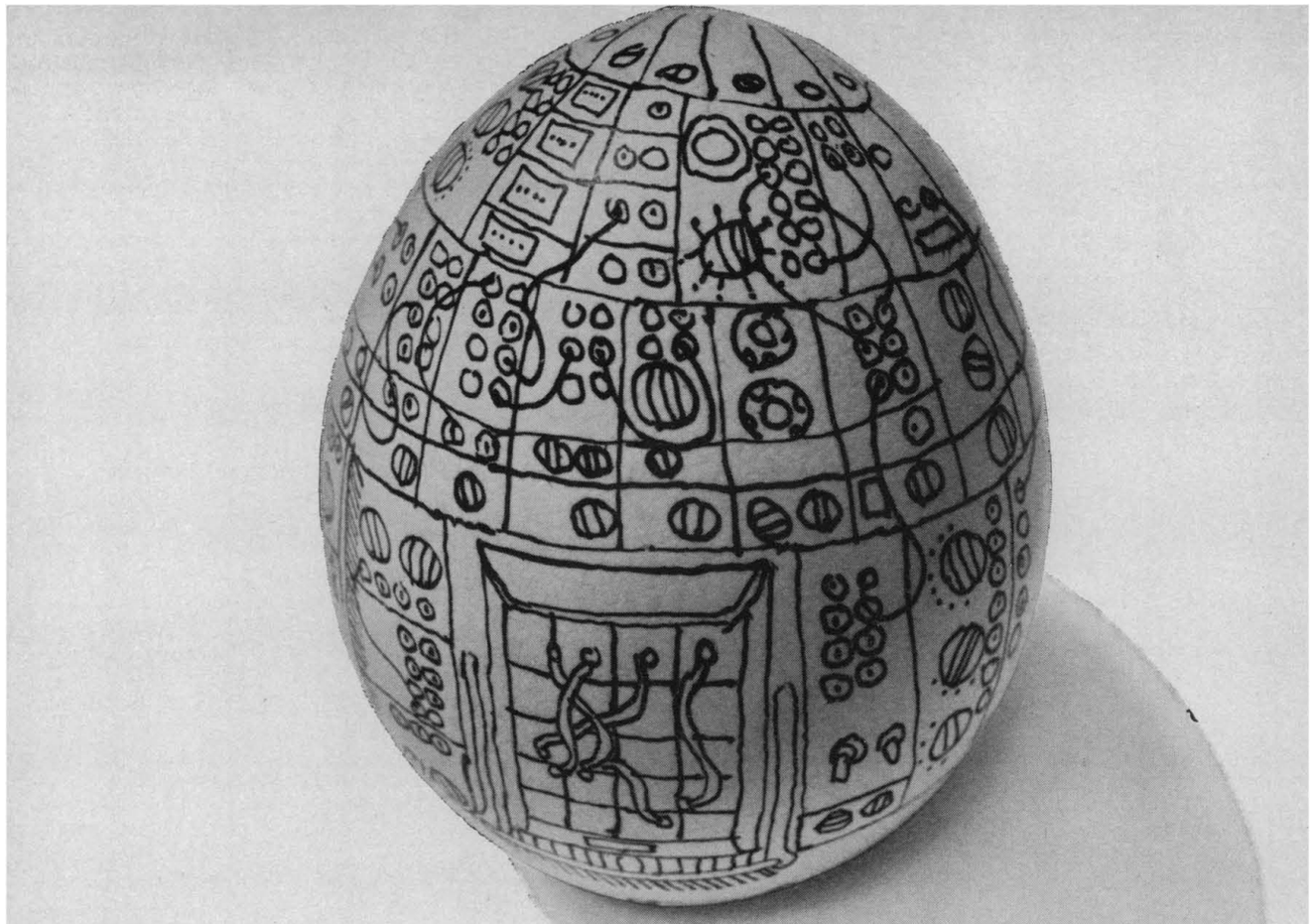
COVER

Tobacco leaf infected with aucuba mosaic virus. The three-way, cross-hatched figures are sections of aggregates formed by layers of rod-like virus particles placed one over another at angles of 60 degrees (about × 49,000; osmium tetroxide fixation). See page 262. [H. E. Warmke, Plant Virus Laboratory, University of Florida, Gainesville]



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But the beauty of The 1200 is its simplicity. Even the fledgling researcher with only a rudimentary knowledge of electronics can solo with but an hour or two of practice. None of this 5-days-of-school business with The 1200.

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We said earlier that The 1200 is customer-oriented. If so, shouldn't it include built-in defenses against human error? It does. No matter how sleepy or sloppy a researcher might be, he will find The 1200 remarkably tolerant of his carelessness. He can connect just about anything to anything else within the System (for any length of time) and still do no electrical damage to the modules.

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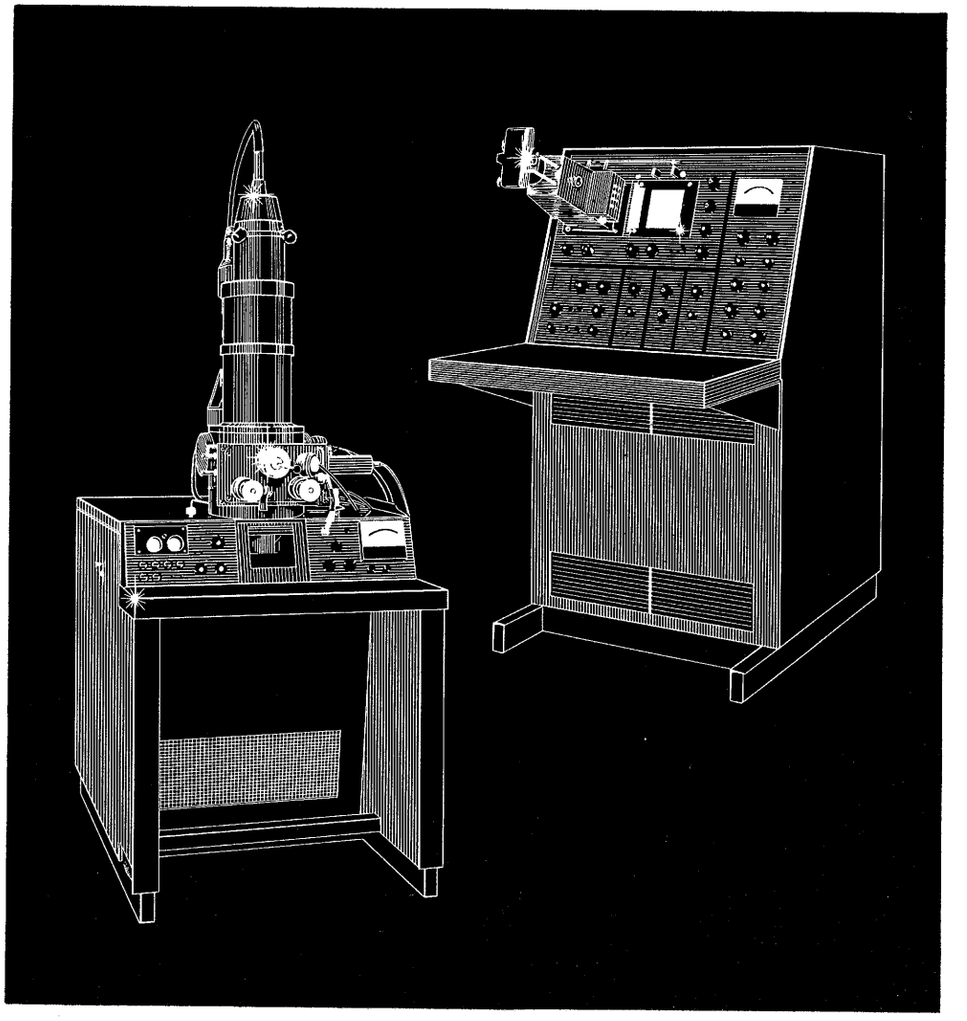

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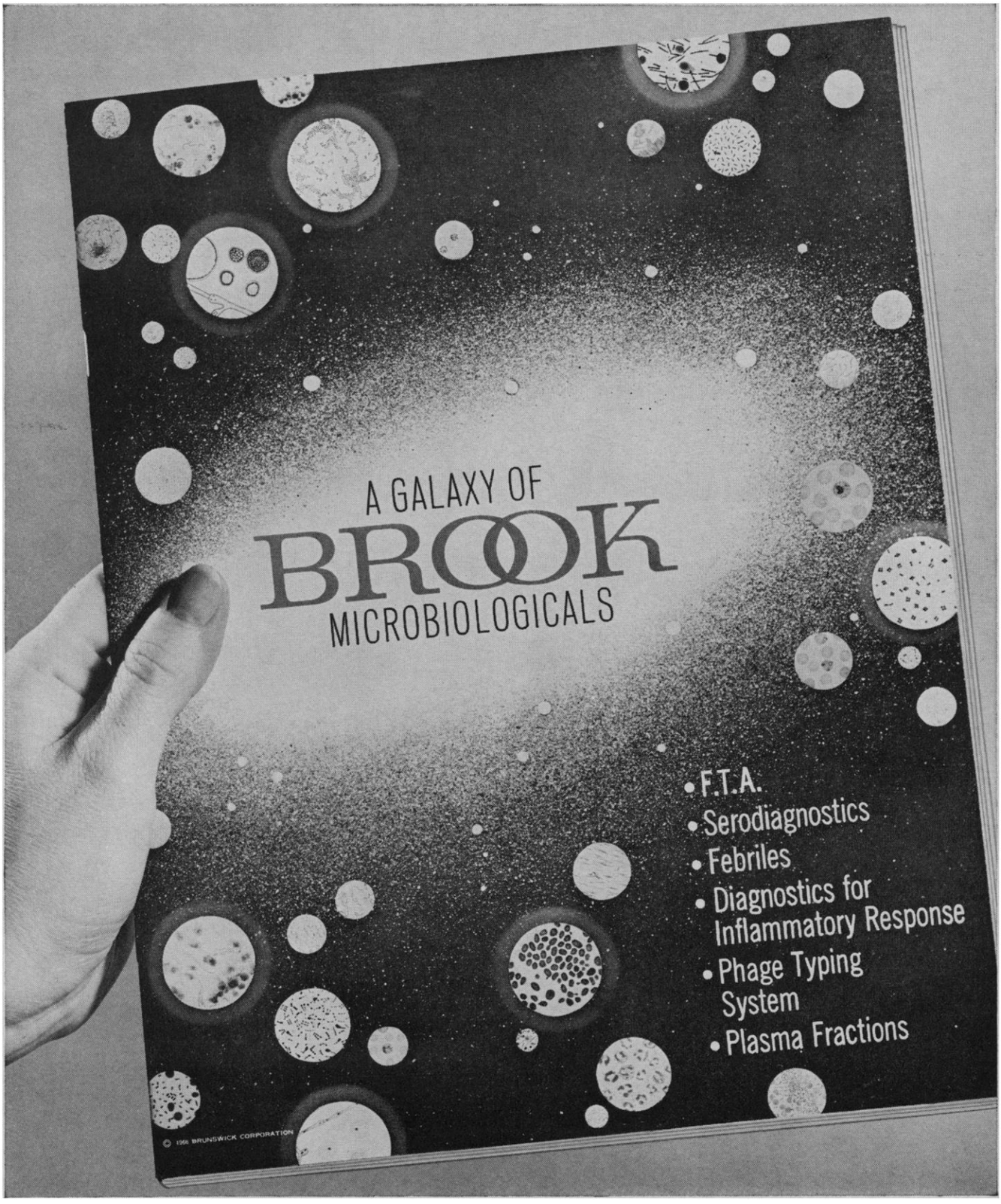

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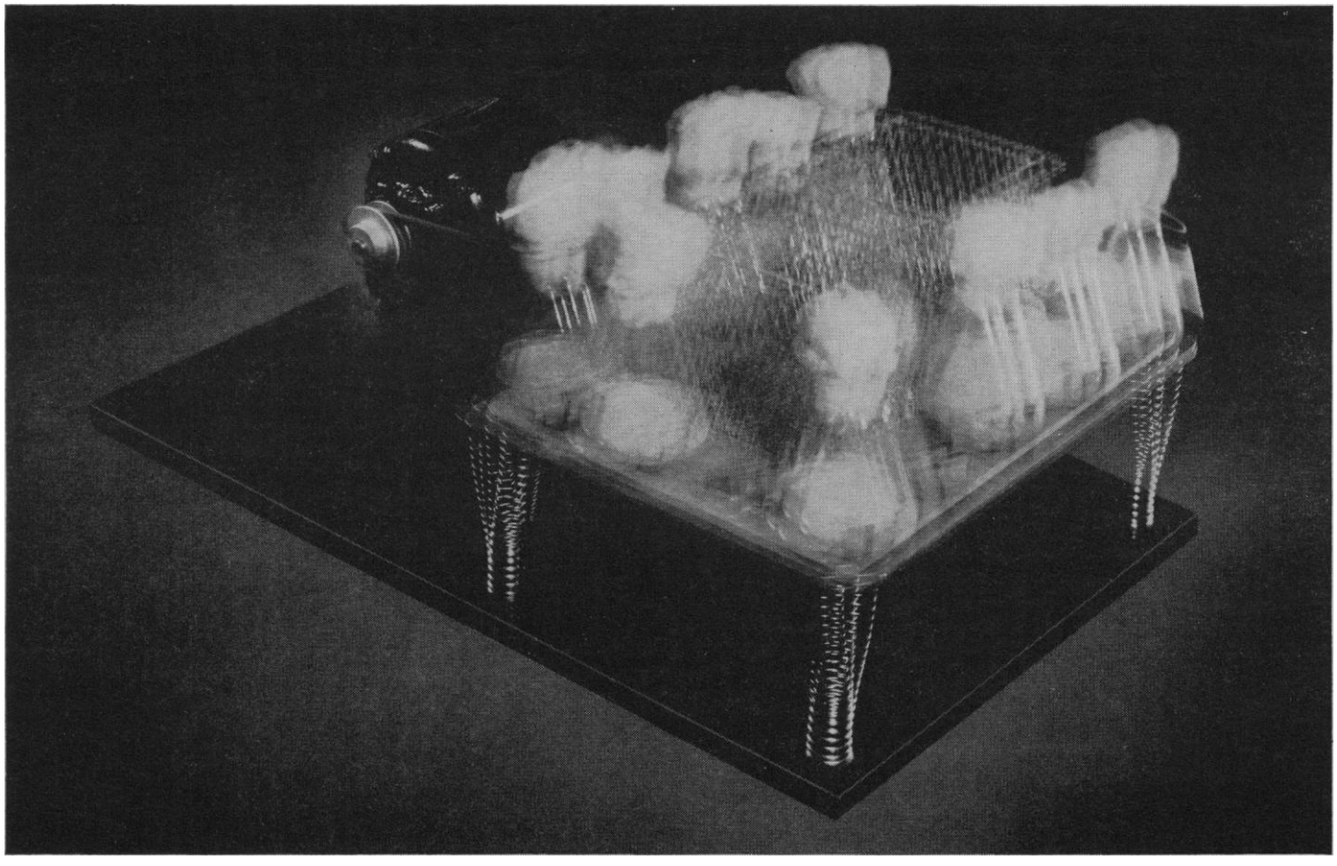

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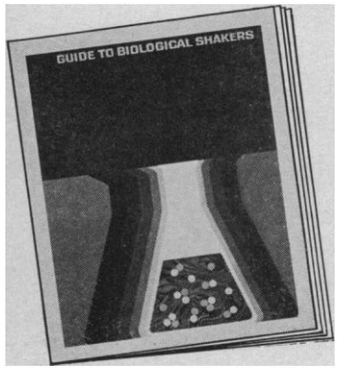

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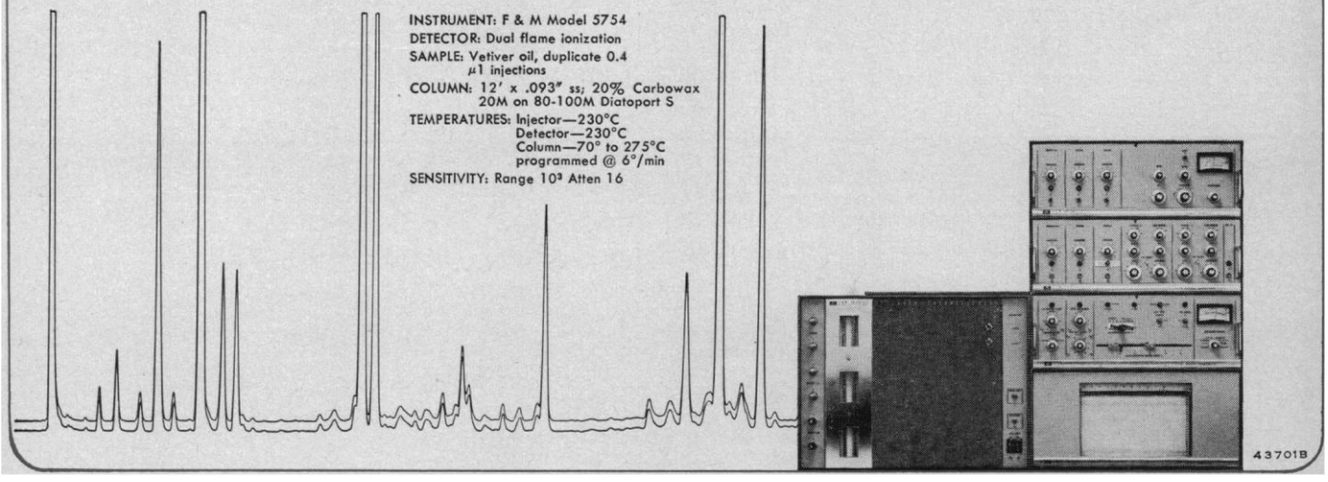

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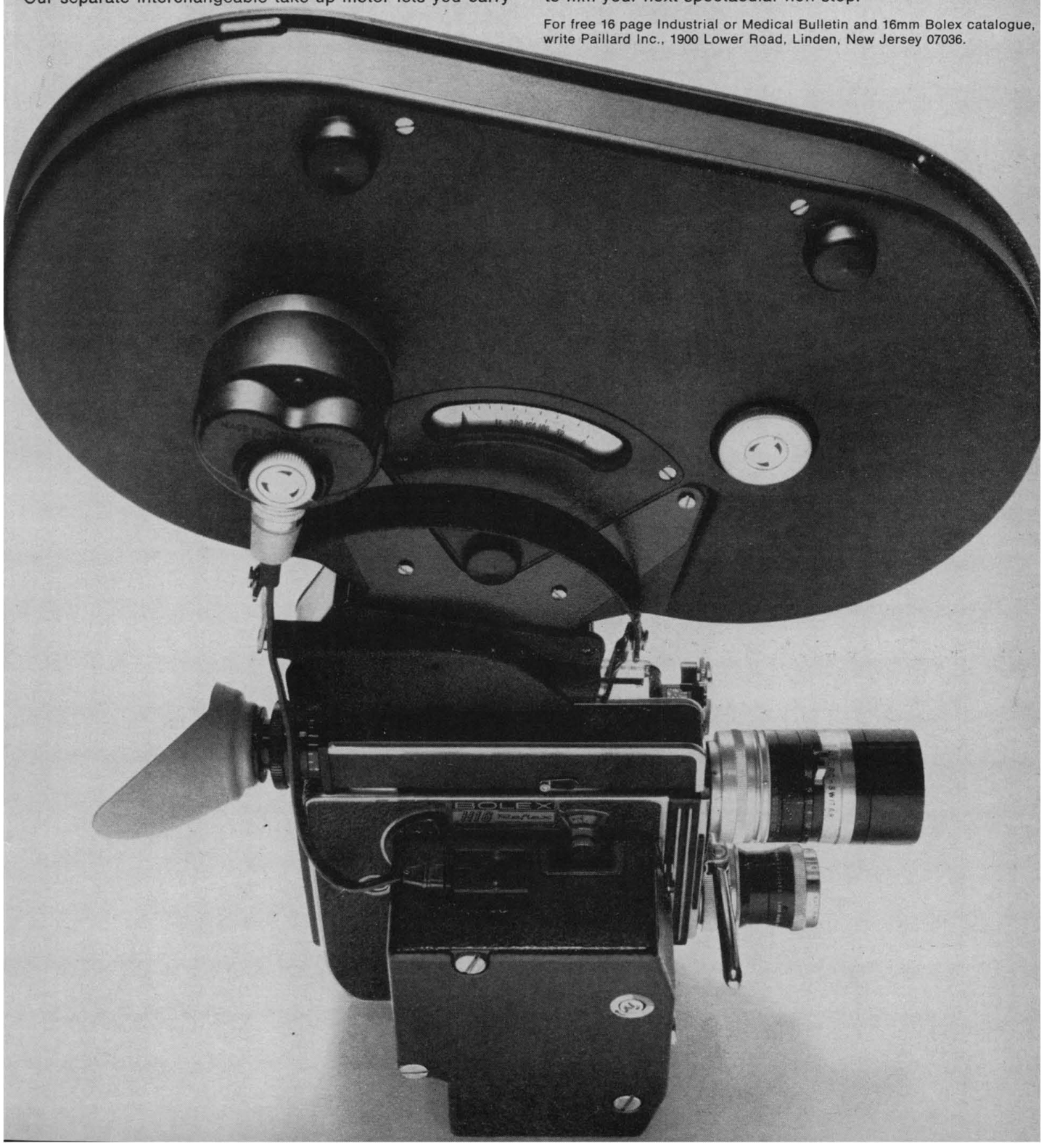

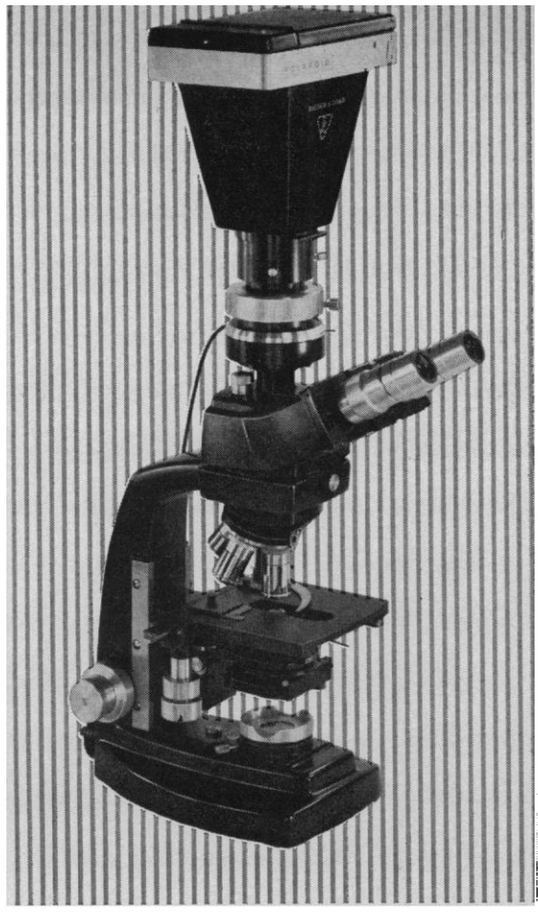

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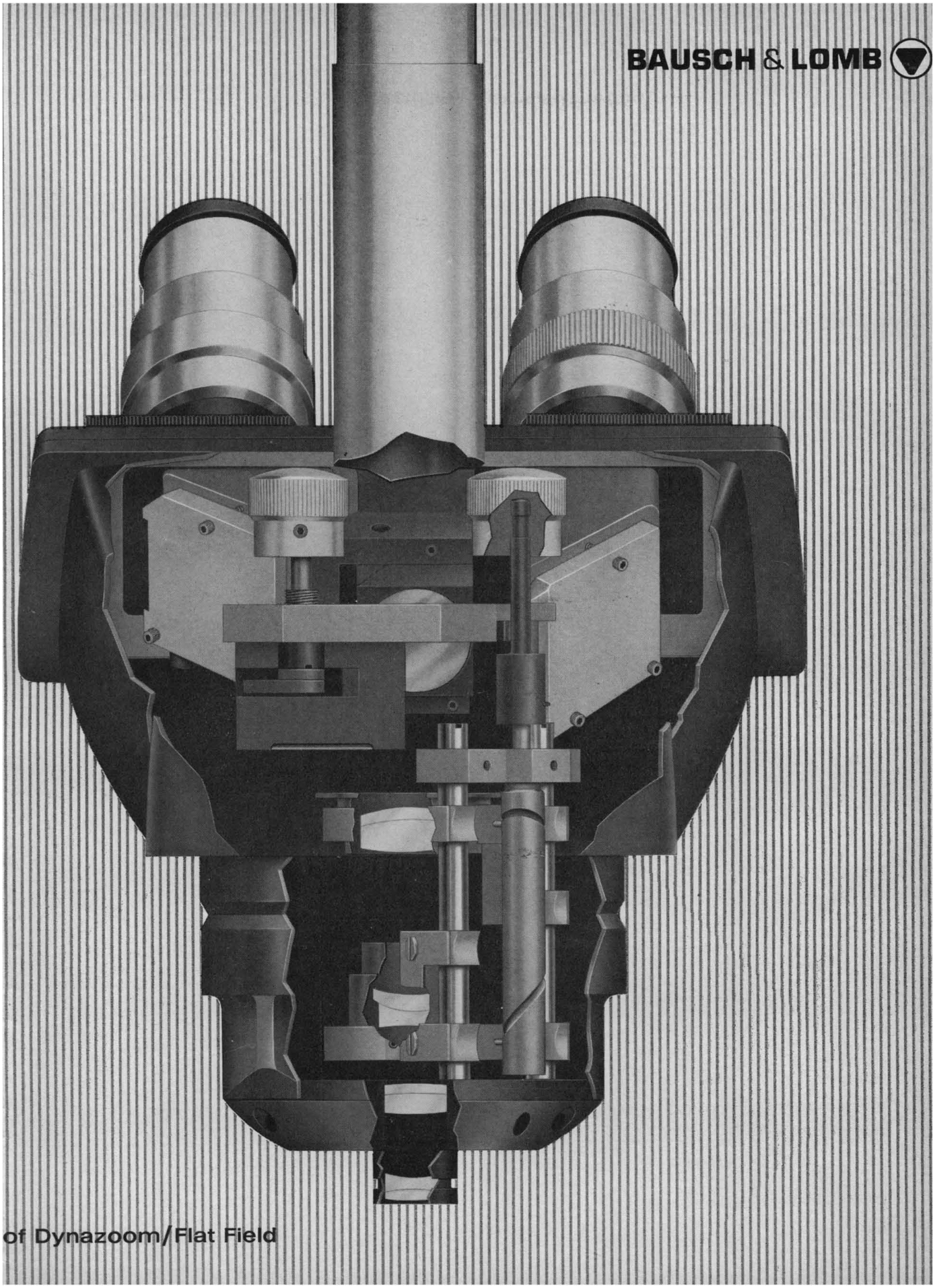

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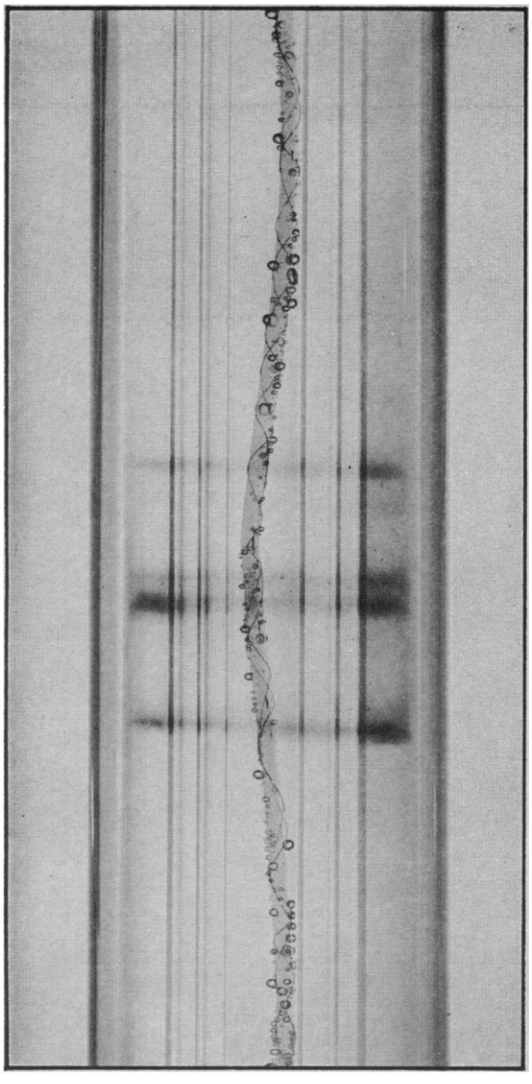

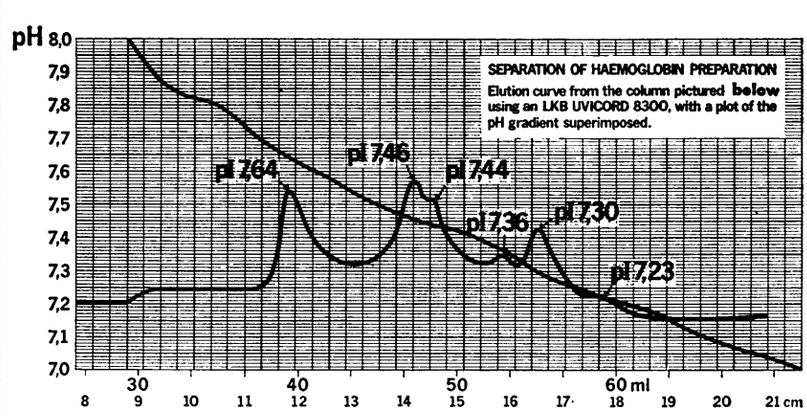

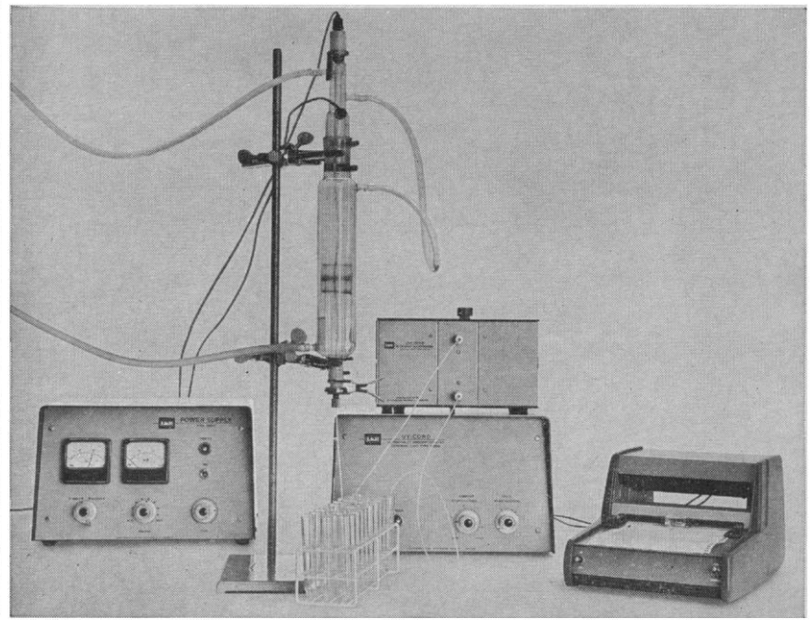

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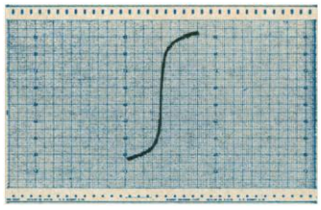
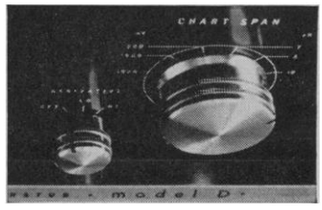
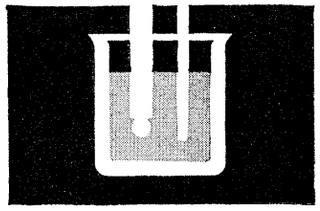


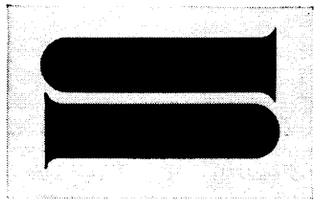
that has to be remarkably accurate (mv or pH accuracy = 0.25%; burette and volume accuracy = 0.1%) and precise (with a 240-mm chart span readable to as little as 0.002 ml and to 0.01 pH units when the 10-ml burette is used),



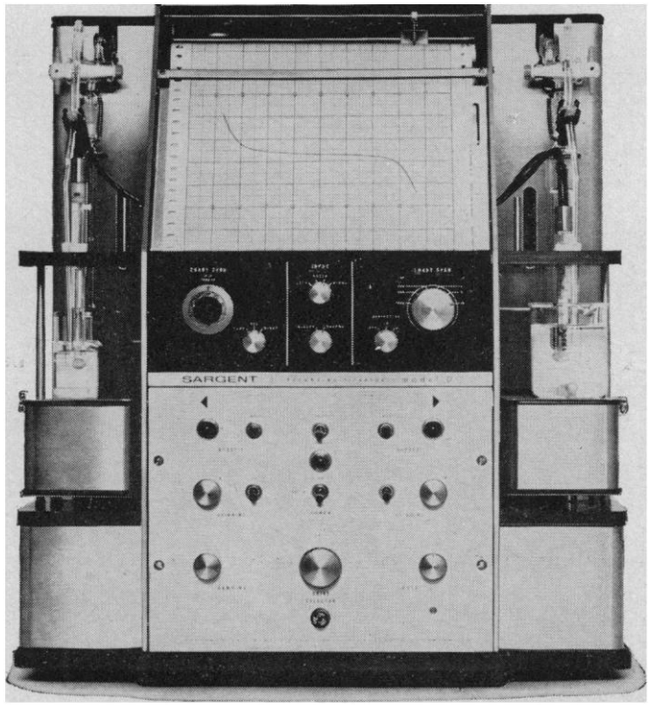
and that is designed for automatic operation (convenient, front-panel settings for chart span, titrant delivery rate, stirring rate, burette rapid flush-and-fill) with built-in titrant deceleration as endpoint is approached,



and that is versatile (accommodating any electrode, for aqueous or nonaqueous media, for semi-micro, micro, or macro work) to perform all potentiometric titrations, including those carried to predetermined endpoints, or indicated by the first derivative of the titration curve,



then the automatic recording titrator for you is the Model D (designed and manufactured by E. H. Sargent & Co.). It has two independent titrating stations and costs $2850, less electrodes. To see the Model D at work in your lab, call your Sargent man for a demonstration at your convenience. EH-S-2137



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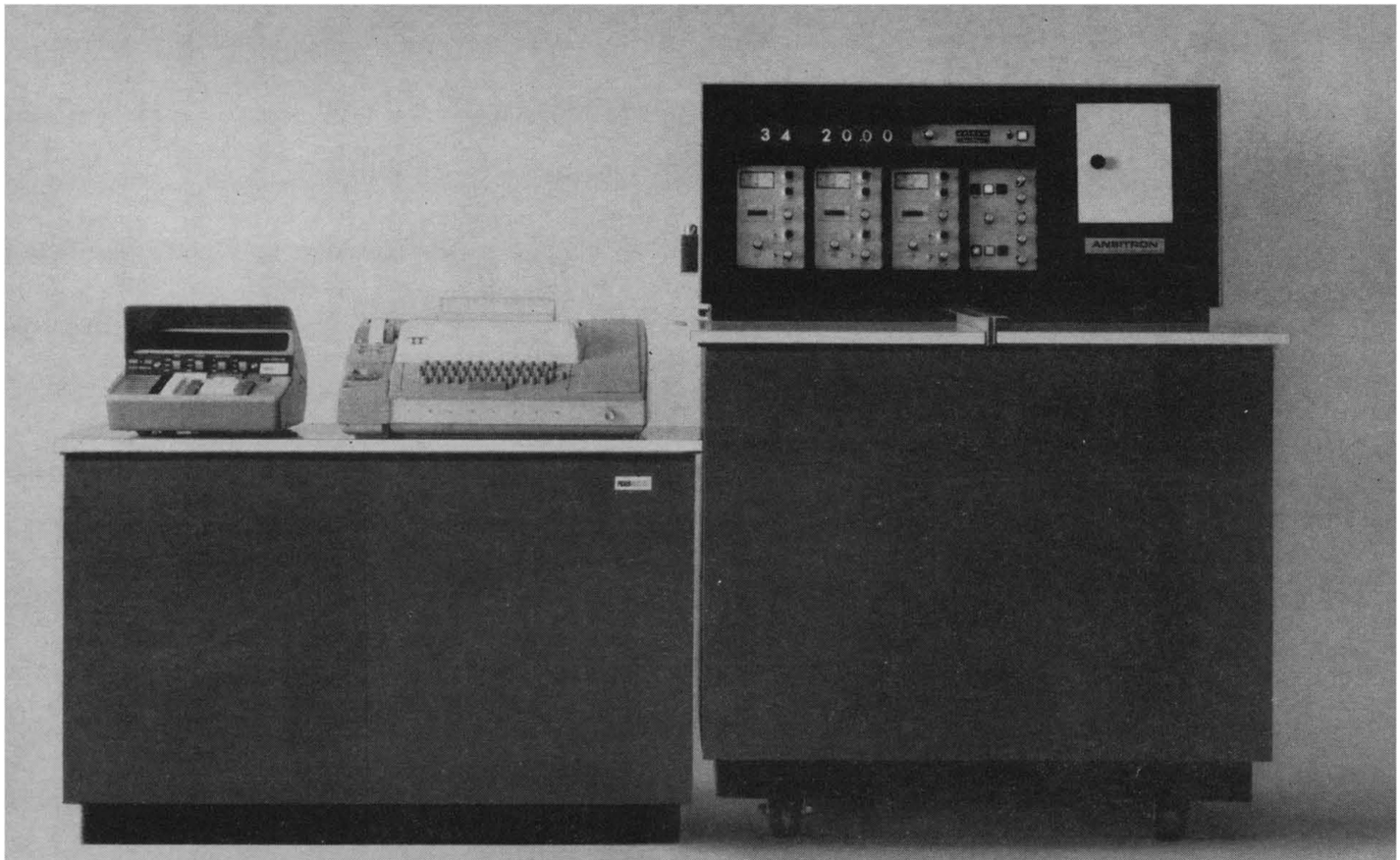

Our introduction of this new computerized liquid scintillation system further complicates your purchase decision.

(But greatly simplifies your life thereafter. Guaranteed.)

This new system (called DiRAC™ to suggest that this is a "disintegration rate computer") marries a liquid scintillation counter to an "in-lab computer"™ to give you *both* data and data processing. Answers, not just numbers. And with a computer to cope with the reduction of complex data, one is encouraged to undertake mathematically involved work. Double labeling, for example. Constant instrument calibration becomes practical. Any of the quench correction techniques now available can be utilized; to their fullest. In general, this system will yield more reliable data. Faster. The DiRAC will actually save one minute of data analysis time per sample – while eliminating the need to send data to a processing center. (Ask for proof.)

The liquid scintillation counter of the DiRAC system – the Ansitron™ II – yields data *worthy* of computer analysis. The performance of this instrument will challenge that of any other competitive unit. And this is the easiest liquid scintillation counter to operate. One example: the availability of "β-set" plug-in discriminators which provide preset control settings for commonly used isotopes and mixtures. (Ask for proof.)

The computer of the DiRAC system is Picker's DAC™ "in-lab computer". And although the marriage of this computer to the liquid scintillation counter gives the practical convenience of an on-line computer, it is done in such a way as to make the "in-lab computer" available for other uses. The DAC and its interface will accept teletype data from any other instrument. Hence you can also marry it to your other devices that now generate data (not answers). Too: the DAC computer is a full-fledged computer and can be used by itself for polynomial computations, statistical analysis, curve-fitting, interpolation, and as an everyday calculator for more mundane computations. (Ask for proof.)

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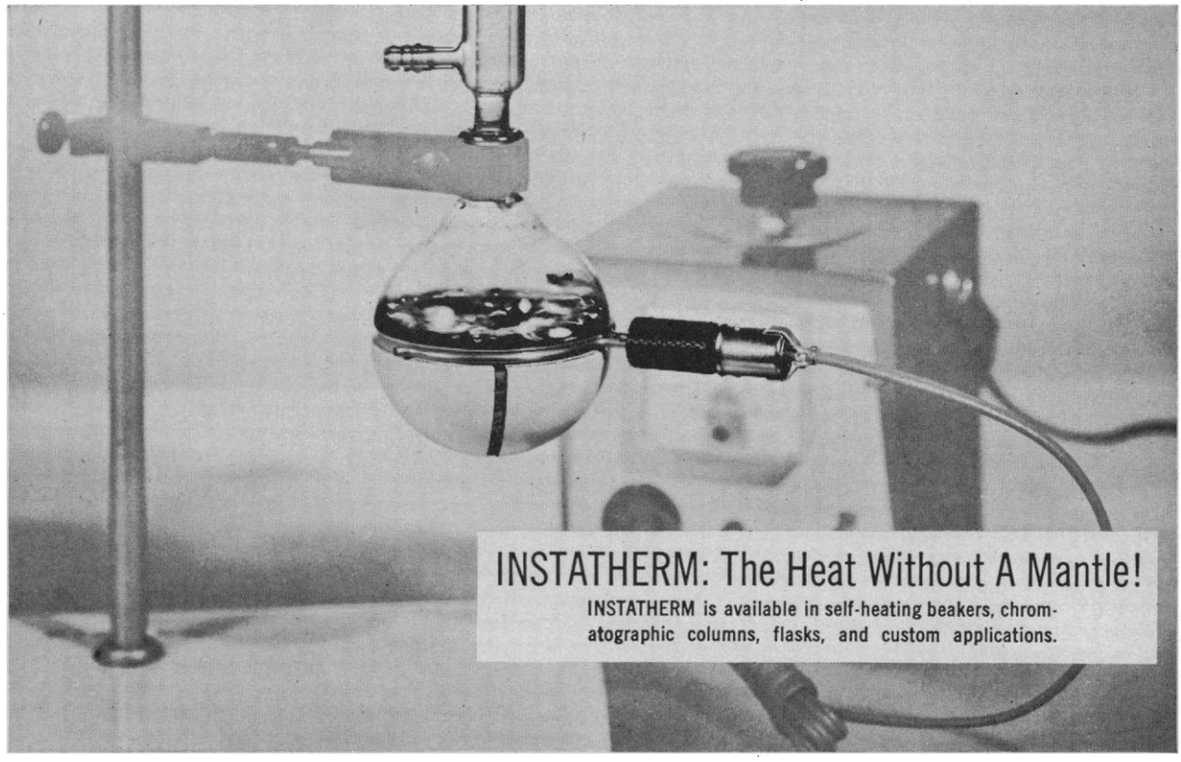

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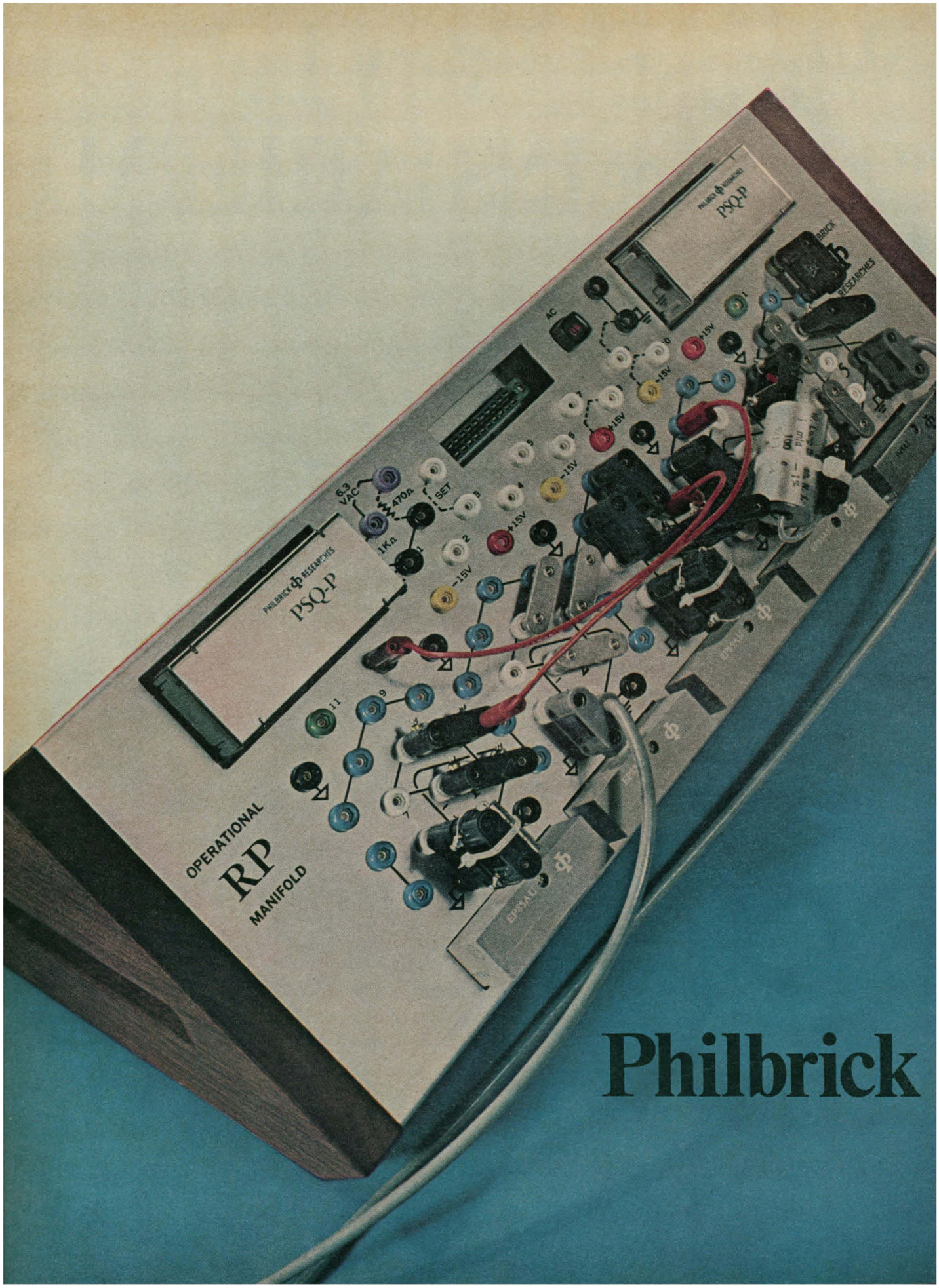
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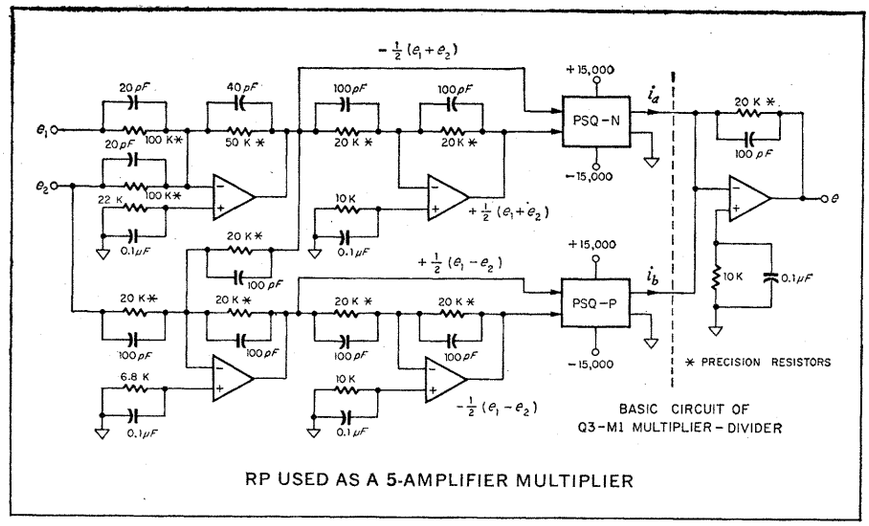
Model RP is an all-in-one analog instrument. With it you can assemble operational amplifier circuits in *minutes* instead of hours or days. It's ideal for experimentation, simulation and instruction in the practical application of solid-state analog circuitry. The RP combines the convenience and freedom of old-fashioned breadboards with a technique that provides logical organization, shielding, grounding, isolation and stabilization to temporary or experimental circuits. Philbrick Operational Manifolds make it easy to build stable operational amplifier circuits that are free of "bugs," "strays" and other parasitic happenings.

The Model RP Operational Manifold has five receptacles for plug-in solid-state operational amplifiers of the Philbrick "EP" type, an integral regulated DC power supply and a jack panel on which circuitry can be assembled conveniently and quickly. In addition, two extra receptacles accommodate a Philbrick Operational Circuit Plug-in — such as a Quadratic, Logarithmic or Sinusoidal Transconductor or a chopper-stabilized high-gain amplifier. An electrically "free-floating" receptacle included on the panel accepts an additional 10-pin plug-in module such as an EP or P-size Operational Amplifier, a Booster Amplifier, an Operational Circuit Plug-in or any arbitrarily selected set of circuit elements preassembled on an OP-O Uncommitted Plug-in unit.

Mounted on the front panel of the RP Operational Manifold are 106 tip jacks, spaced ¾" apart in a pattern of equilateral triangles. They accommodate standard twin-tip plugs and are used for mounting



RP USED AS A 5-AMPLIFIER MULTIPLIER

passive components, shorting bars and as terminations for shielded input and output cables. Jacks are color-coded. Functional interconnections are printed on the panel.

The 5-amplifier multiplier-amplifier circuit diagram shown above is typical of the many analog circuits that can be constructed on the RP Operational Manifold. Virtually all of the 125 circuits described in Philbrick's Applications Manual for Operational Amplifiers can be assembled quickly and easily on the instrument. The RP is not limited to use as a breadboard for experimental circuits. It may also be used for permanent or semi-permanent circuits that must be built to seemingly impossible schedules.

The RP Manifold is sturdily built, attractively packaged and wired to Philbrick's usual high standard of quality. The simple, clear-anodized sheet-aluminum enclosure provides effective shielding and a firm base for the solid mounting of electrical components. It is available in a style for rack-mounting or with hardwood ends for bench use.

Philbrick Model MP Operational Manifolds may be used when a lesser degree of sophistication is required. They contain four Type P plug-in amplifiers and have an interconnection panel with 66 jack tips. The MP provides wide flexibility and a high degree of reliability at relatively low cost.

A complete line of accessory hardware is available for both the RP and MP Operational Manifolds. Uncommitted plug-in component boards are also available.

A 4-color, 6-page brochure contains more detailed information on the Philbrick RP and MP Operational Manifolds. For your copy, phone your nearest Philbrick engineering representative or get in touch with Philbrick Researches, 25-A Allied Drive at Route 128, Dedham, Massachusetts 02026. Phone (617) 329-1600.

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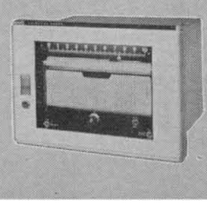

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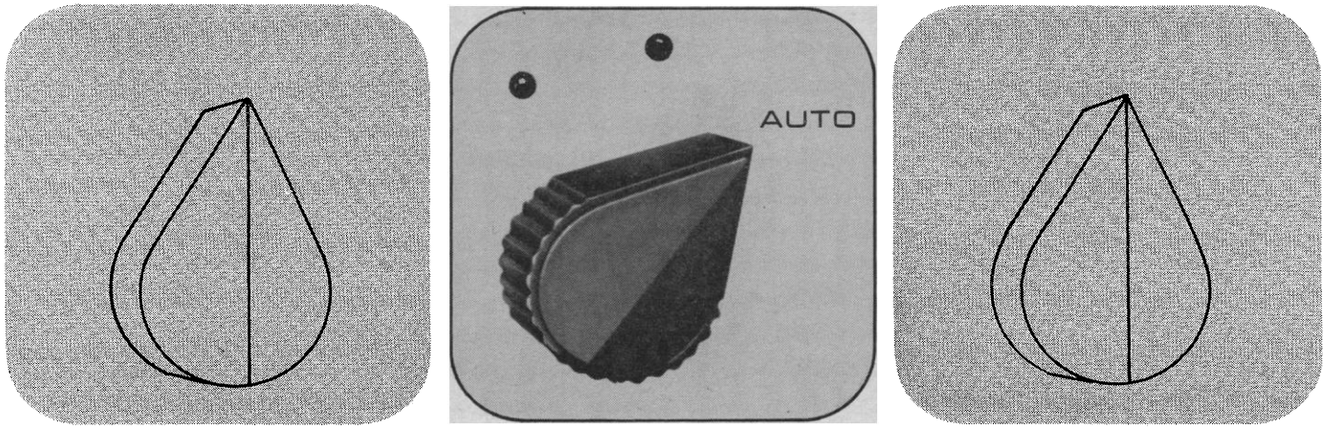


Why are Canalco's UV flow monitors the only ones with automatic scale expansion?

Frankly, we can't imagine why no other manufacturer offers this feature. After all, it's the only way you can have maximum usable sensitivity at all times—even in unattended, overnight operation—with perfect assurance that the recorder's pen won't go off scale and lose vital information.

In addition to automatic 3X expansion, Canalco Wide-Track UV Flow Analyzers also have six other important features that combine to give you extra sensitivity of detection plus reliable, versatile, drift-free performance. Among them are:

■ dual phototube ratio circuitry for accurate linear Transmittance recording, in spite of line voltage or lamp intensity fluctuations. (By the way, linear T recording gives *twice the pen deflection* of linear Absorbance recording at low optical densities, just where you need sensitivity the most. Furthermore, the Wide-Track 3X scale gives direct quantitation; over this chart range, linear T and linear A differ less than 1% T.)

■ both single-cuvette and dual-cuvette models are available. With two cuvettes, you can flatten your baseline out even if solvent absorption changes, as in gradient elutions;

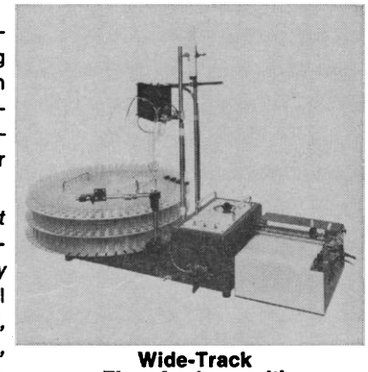
■ you have a choice of *five* optical path lengths, up to 20 millimeters (twice the length, four times the sensitivity our competitors offer);

■ Canalco Wide-Tracks come complete with wide-chart recorder (7½ inches of calibrated grid), including side-of-chart event marking pen to correlate peaks with fraction collector tubes. (Marker pen connection plugs directly into Canalco, Warner-Chilcott and Research Specialties fraction collectors; connection to other makes is also simple.)

■ single-wavelength operation gives optimum sensitivity for both proteins and nucleotides, eliminates filter and source changing;

■ extension cable kits facilitate mounting sensing heads in cold rooms, with recorder conveniently outside. No temperature compensators are required for coldroom use.

Get the full facts about the four models in Canalco's Wide-Track family Write today! See them all *at Booths 112-115, FASEB, East Room, Conrad Hilton, in Chicago, April 16-20, 1967.*



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The AFM consists of two units: **The microscope attachment** contains the photo-image optics, a sensitive cadmium-sulfide light sensor, electronically controlled shutter, and finder-observation system. It fits any standard microscope, and may be used with a variety of standard camera bodies and film backs ranging from 35mm to 4 x 5", including Polaroid.

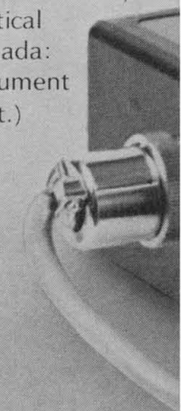
Two interchangeable viewers are supplied: a focusing telescope for high-power microscopy and a ground-glass screen with 7x magnifier for low power work. The latter is useful for group viewing.

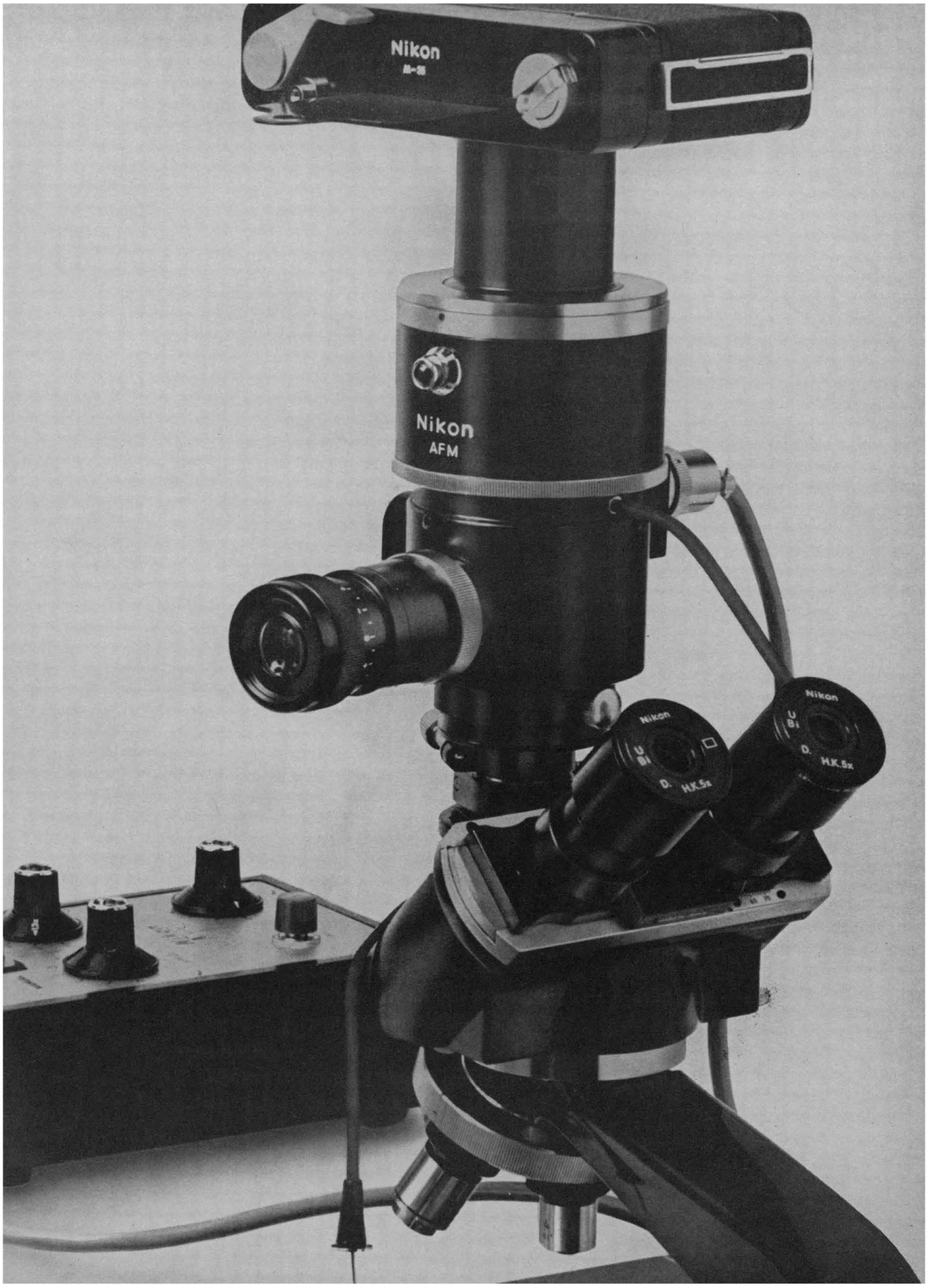
The control unit is a compact, solid-state computer, electrically connected to the microscope attachment. The light sensor in the attachment measures the integrated brightness of the specimen, and transmits this information to the unit. The unit, having first been preset for the ASA film speed rating, translates this information into exposure duration or shutter timing.

A conventional camera cable release, fitted into the microscope attachment, is used to trigger the exposure. The shutter opens and closes automatically, precisely timed for the interval computed by the control unit. The range is from 1/125th second to 10 minutes.

A calibrated, compensation adjustment on the control unit permits increasing or decreasing the programed exposure in 1/3-stop increments where a somewhat different image density is desired. The control unit also permits manually selected exposures from 8 seconds to 1/125th. And it is provided with a standard PC terminal for photomicrography with synchronized electronic flash.

Price of the Nikon Auto-Microflex AFM, less camera back, is $795. For more details and specifications, write. Nikon Inc., Instrument Division, Garden City, N.Y. 11533 Subsidiary of Ehrenreich Photo-Optical Industries, Inc. (In Canada: Anglophoto Ltd. Instrument Division, Rexdale, Ont.)

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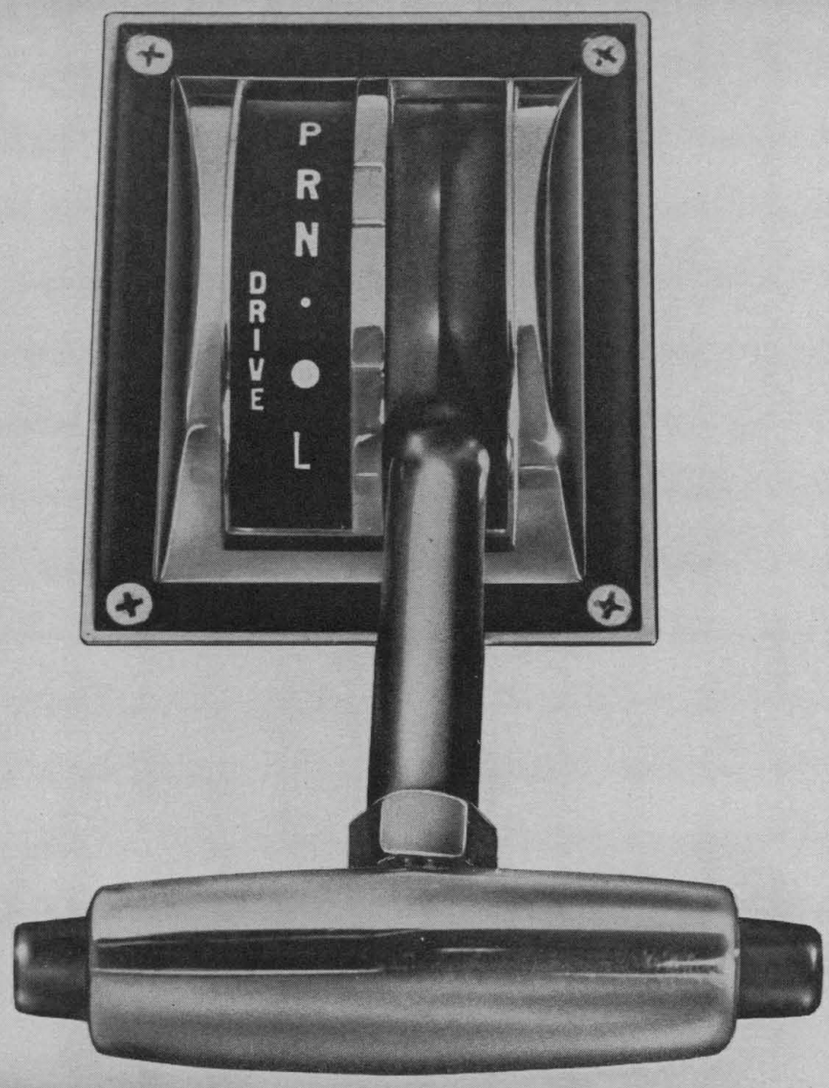
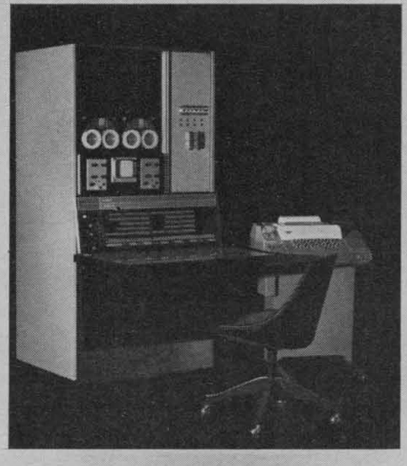


How to drive a LINC-8 computer

To drive a LINC-8, you turn on the ignition key. Then you hit the "Load" switch. The "Do" switch. The "Start" switch. And you're on the air. It takes about five seconds. The display scope is reading "Which Program?". You go to the teletypewriter and you tell it.

Five seconds.

That would be unique if the LINC-8 were just a normal computer. But the LINC-8 is more than a computer. It is a complete laboratory data handling system which includes two computers, built-in A to D converter, oscilloscope display, dual magnetic tape unit for mass storage, relay buffer, buffered input-output lines, teletypewriter and two complete software packages, one with FORTRAN compiler.



If you're a physicist, or biologist, or chemist, or psychologist, or physiologist — the ease of driving a LINC-8 computer has been proved. In process control. In research in hearing, and surgery, and brain studies. In linguistic research. In radioisotope counting and bio-med engineering. In ballistics studies. We'll be glad to give you the names.

Or if you're ready for a test spin around the discipline, see us at the FASEB show, booths 171 and 172. Otherwise, send for a free copy of the "Small Computer Handbook"

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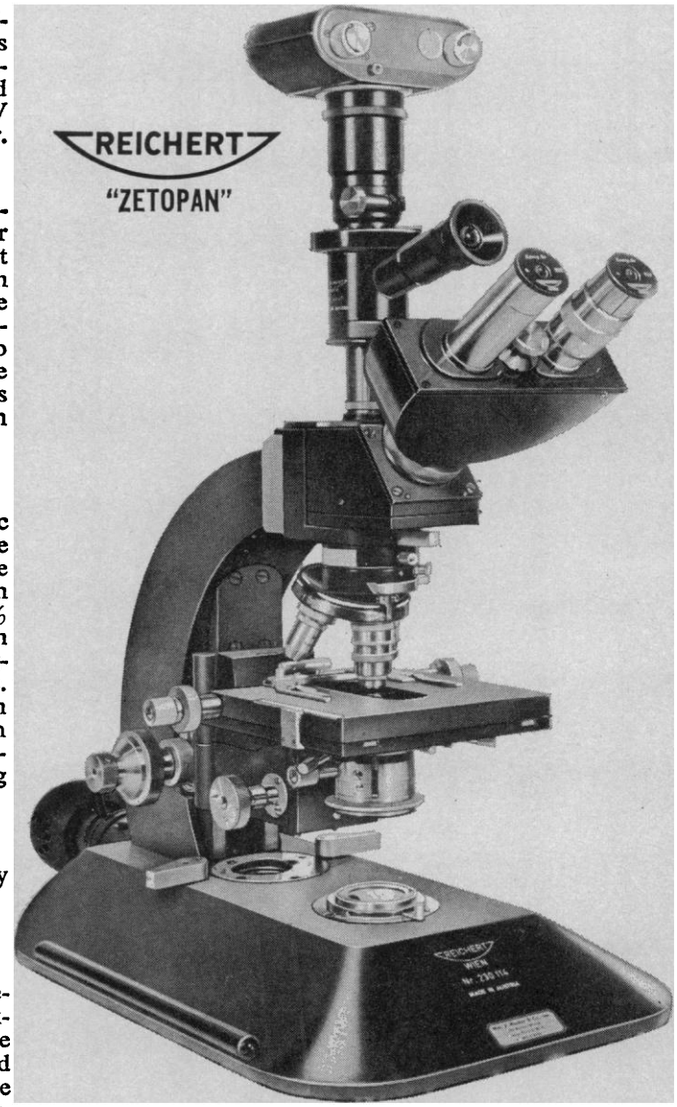

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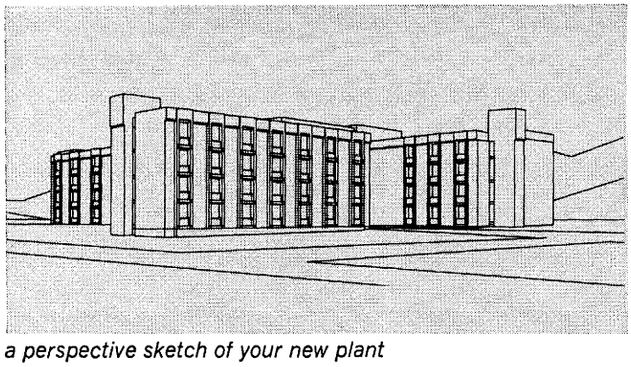
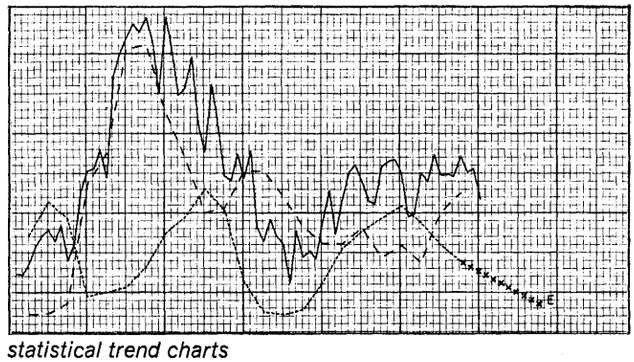
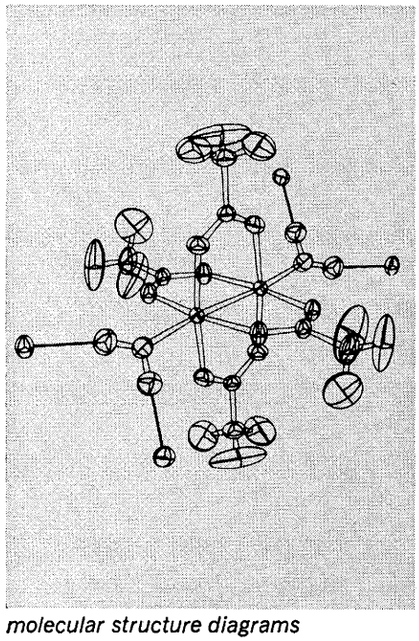


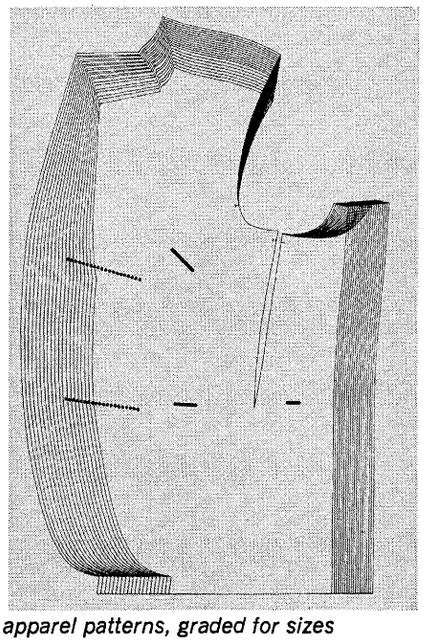
a perspective sketch of your new plant



statistical trend charts



molecular structure diagrams



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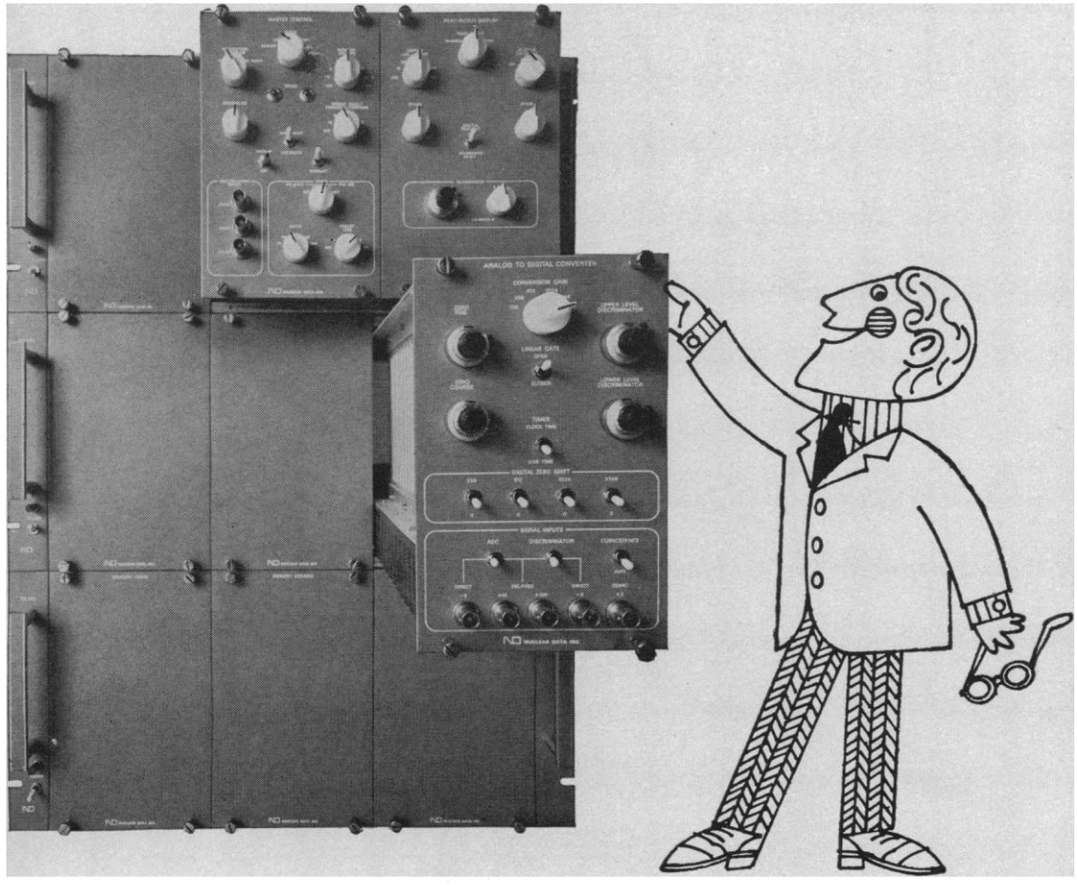

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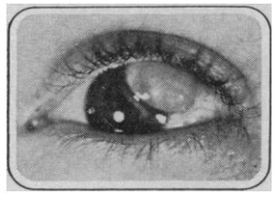
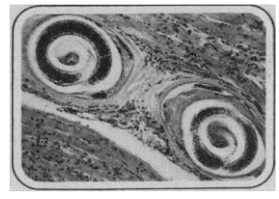
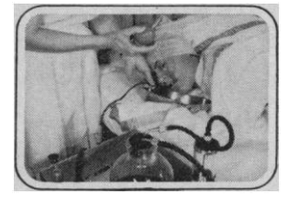
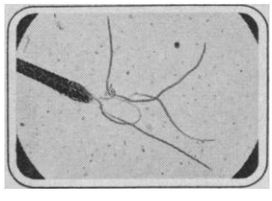

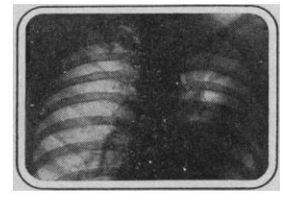
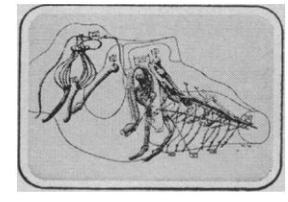

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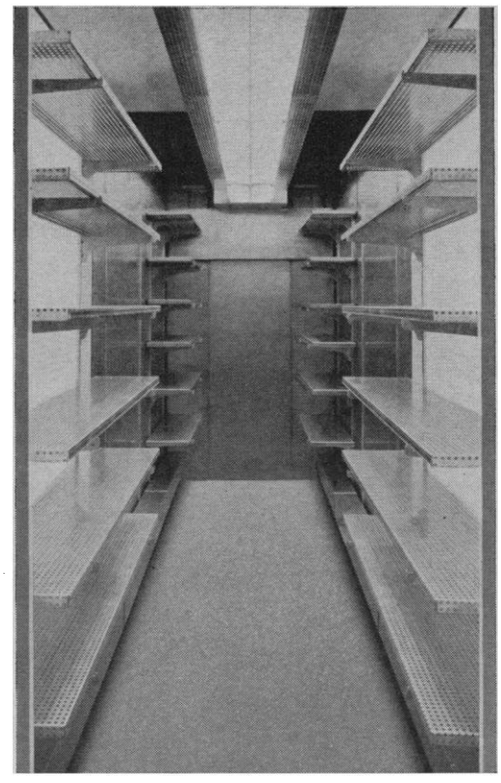

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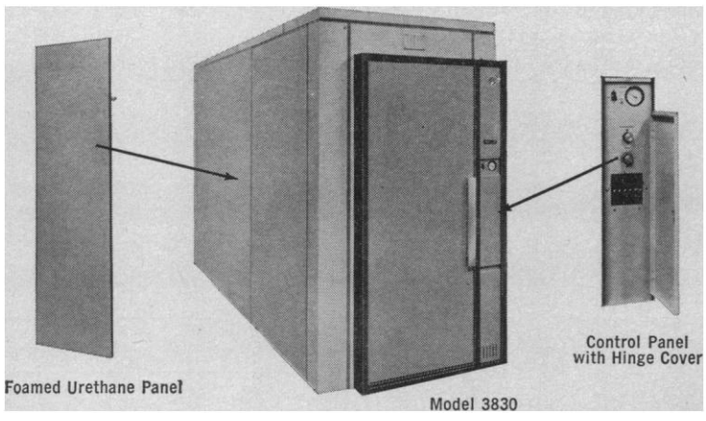

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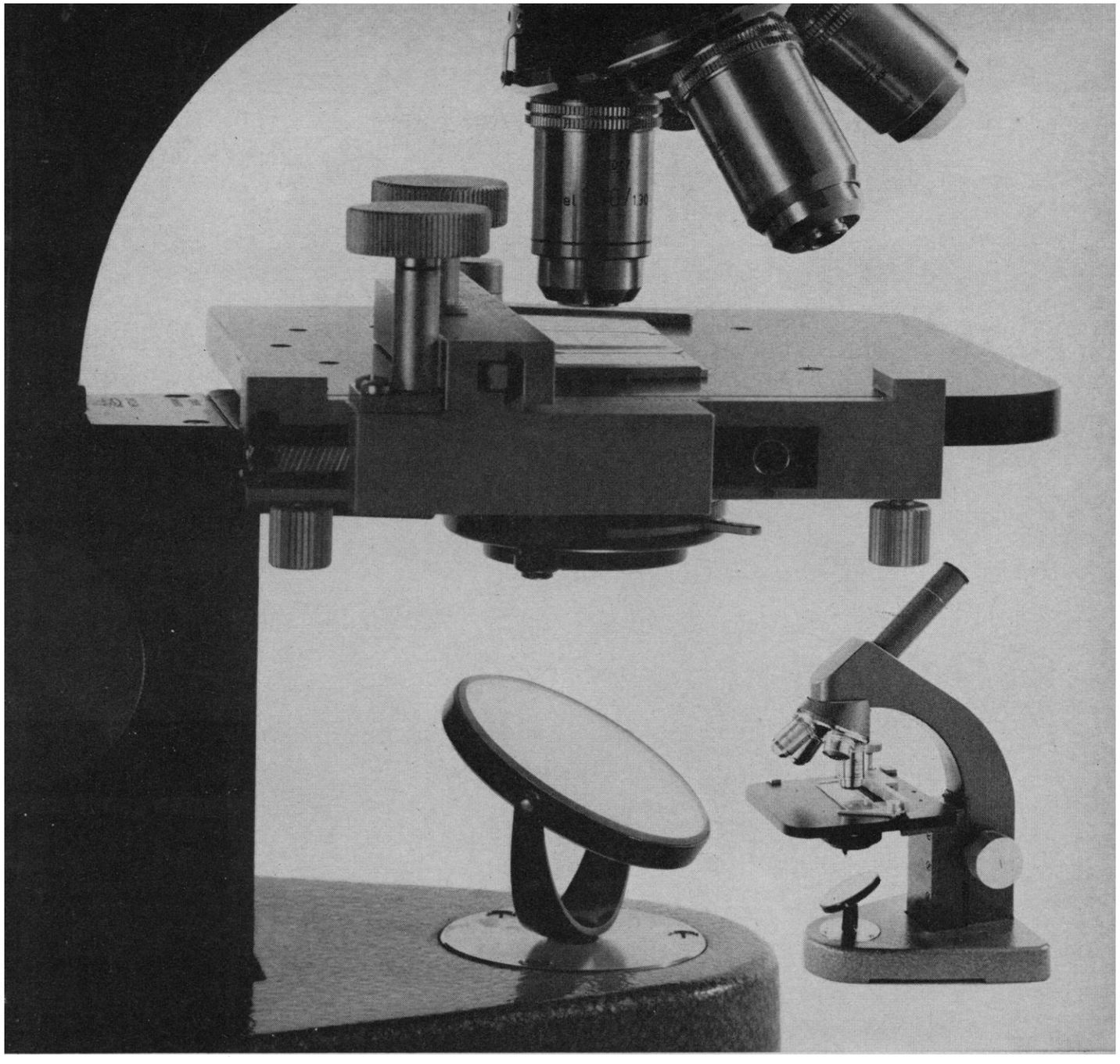

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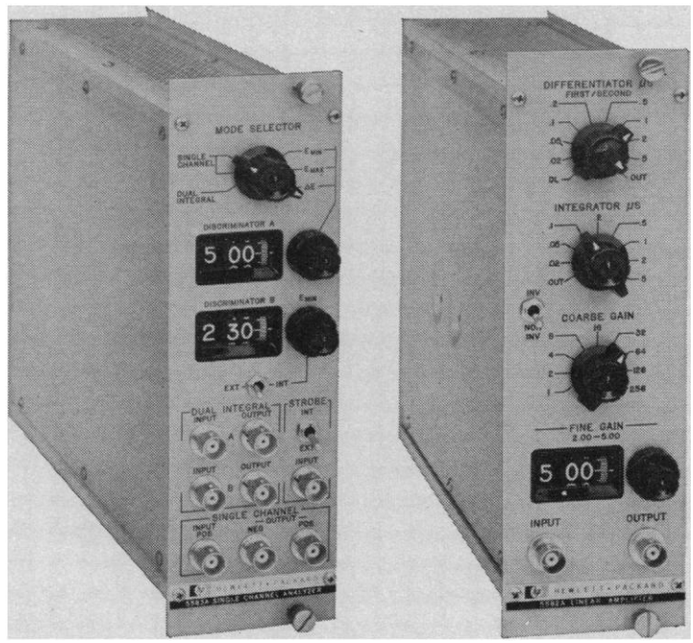

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For information on Hewlett-Packard nuclear instrumentation, call your Hewlett-Packard field engineer. Or write to Jim Sheldon, Hewlett-Packard, Palo Alto, Calif. 94304. Europe: 54 Route des Acacias, Geneva.

Model 5583A
Single Channel Analyzer

Single channel and dual integral operation for maximum versatility
Input 50 mV to 10 V
200 nsec multiple pulse resolution
Internal, external strobed and/or gated operation
Price, $550

Model 5582A Linear Amplifier

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Crossover walk $< \pm 0.5$ nsec
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Embarrassing questions to ask our salesmen about the β/γ Liquimat® liquid scintillation counter.

Prior to beginning the actual questioning, you might consider initiating the discussion with the following preamble or something akin to it:

"Before you discourse on the many virtues of your instrument, let me tell you what is important to *me* the customer in choosing a liquid scintillation counter. First of all, please understand that I don't really care about the instrument *per se.* I'm only interested in this: reliable data, day-in, day-out, easily gotten. To that end, I'll ask two kinds of questions: about the instrument and its capabilities; and about your company and the local "people" support it's prepared to give me. Accordingly, please always speak to me in terms of my needs, not in esoteric engineering terms—I don't have an E.E. degree and I'd consider it a favor if you remember this. We begin."

Question 1: Does the β/γ Liquimat qualify as a modern, up-to-date, "state-of-the-art" instrument? For example, does it have three independent channels, automatic external standardization, high E^2/B, 200 sample capacity, CPM computation, and can it also be manually controlled?

Question 2: You call this the β/γ Liquimat—do I assume correctly that I can do both beta and gamma counting with this *single* instrument? Without buying anything else? Is the β/γ Liquimat the only liquid scintillation counter that has an *integrated* gamma counter? What am I actually paying to get this gamma capability?

Question 3: What does the warranty cover? Do you also guarantee to check back with me and the instrument periodically—*without my asking for it*—to see whether the instrument is functioning properly and I'm happy with it?

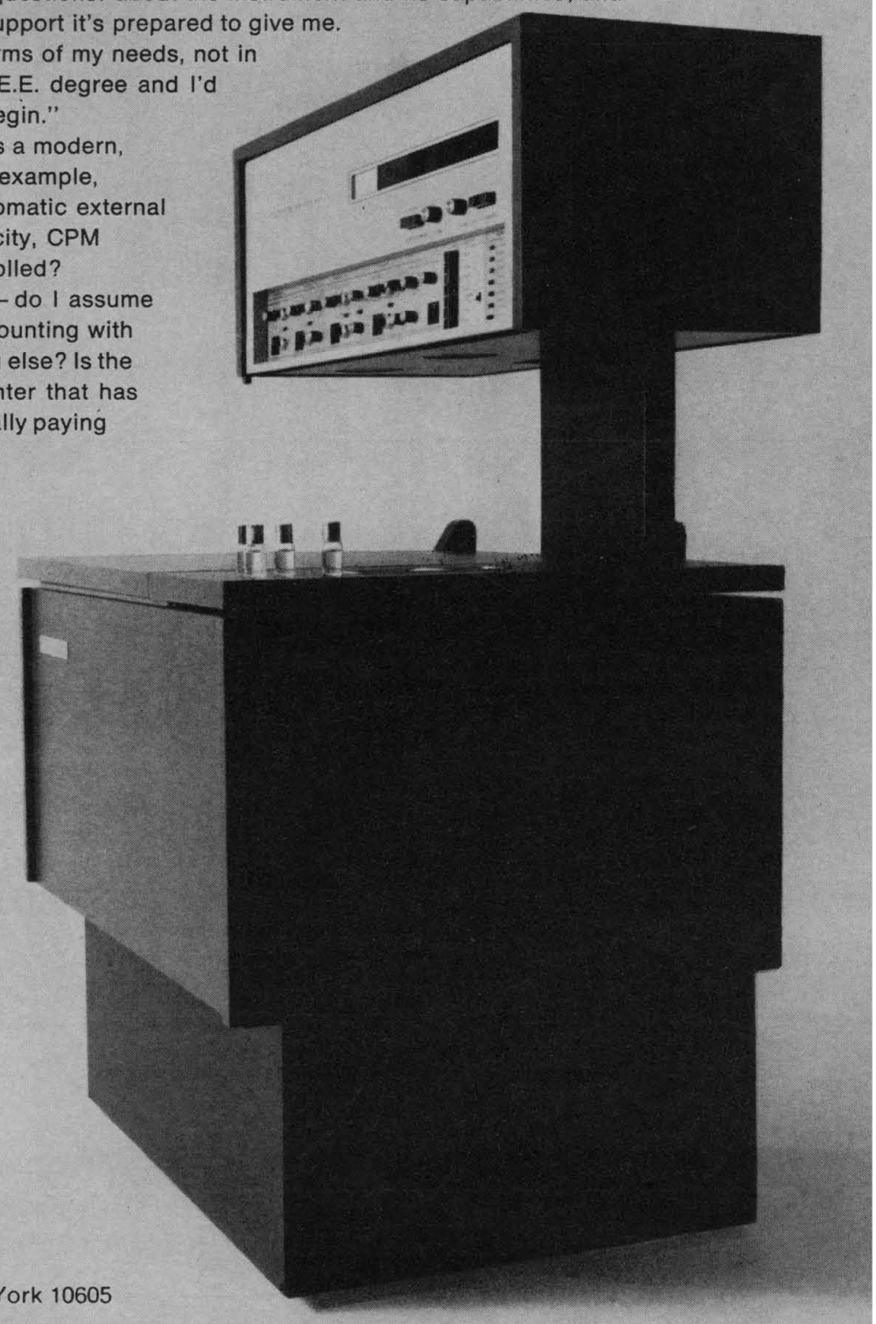
Question 4: Other than yourself, what *other* Picker Nuclear sales or service people can I rely on in this area?

Question 5: What is the price of the β/γ Liquimat? And exactly what do I get for this?

Question 6: Finally, what else can you tell me about the β/γ Liquimat that's relevant to my real needs as a researcher: an instrument that is current, data I can trust, operation that is simple, an instrument that keeps working, and service people committed to keeping it that way?

Want to try these on a salesman? Ask to see one.

Want detailed written information on the β/γ Liquimat? Ask for file 101 S.



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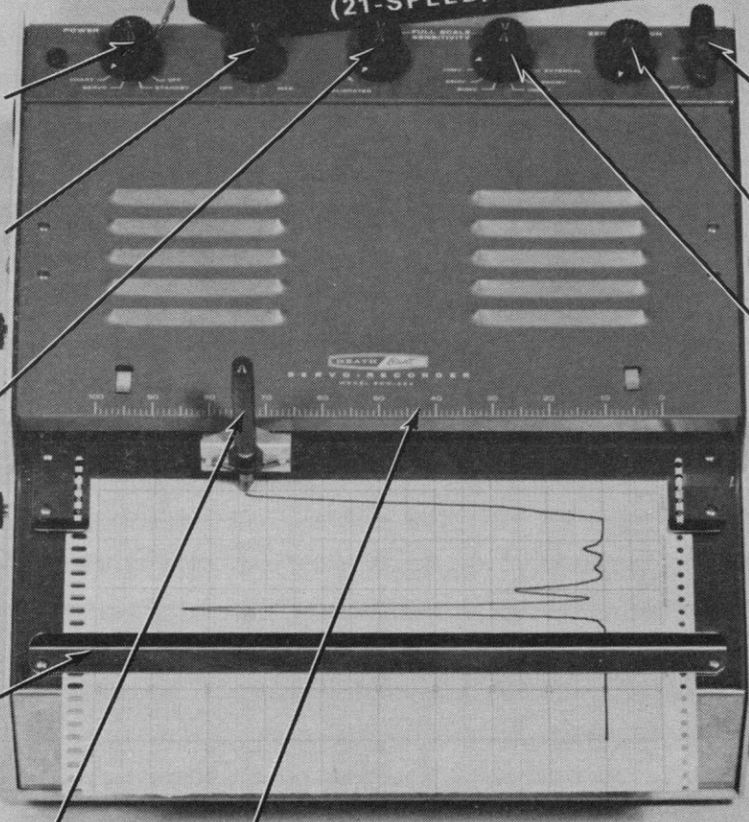
(21-SPEED, $289)



Multi-function Power Switch . . . snaps to "OFF," "STAND-BY" (chopper drive & reference cell remain "off"), "SERVO" (pen & pointer are "live" — instrument reads input signals), and "CHART" (chart paper is in motion and pen is "live").

Damping Control . . . adjusts the pen response to transients and fast-rise or impulse-type signals . . . essentially functions as a noise filter (applicable in photo tube readout).

Range Vernier . . . for variable sensitivity from each calibrated range switch position. In full counter-clockwise position, recorder is "CALIBRATED". Rotating control to full clockwise increases sensitivity from each calibrated range by a factor of 3 approximately.

Calibrate Control . . . permits quick recalibration if necessary (using the Heath EUA-20-12 pH Millivolt Test Unit, the Heath EUW-16A Voltage Reference Source, or another standard).

Paper Tear-off Guide.

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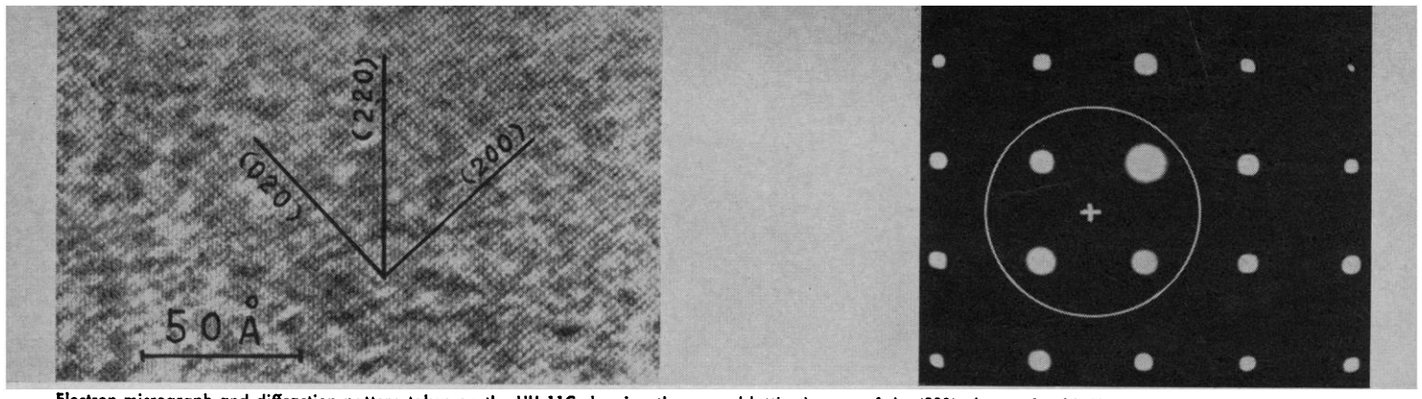

Electron micrograph and diffraction pattern taken on the HU-11C showing the crossed lattice images of the (200) planes of gold. The (020) and (200) planes = 2.04 Angstroms. The (220) plane = 1.44 Angstroms. All important factors such as contamination, stage drift, astigmatism and aberrations must be negligible to achieve this ultra-high resolution. The HU-11C was operated at an accelerating voltage of 100 KV and an electron optical magnification of 270,000 X. The illumination was tilted until the three reflections showed nearly equal intensity in the diffraction pattern; then the micrograph was taken.

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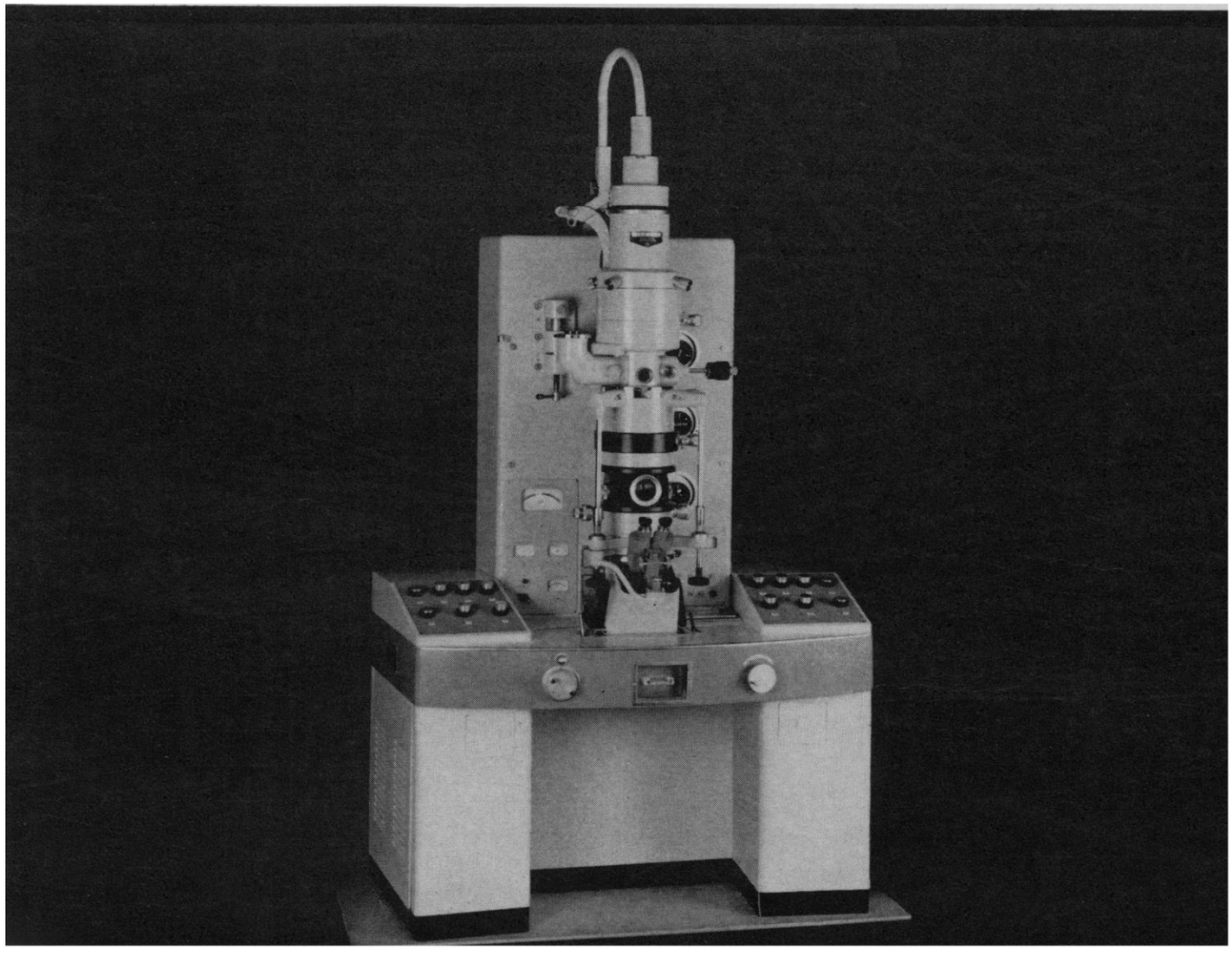

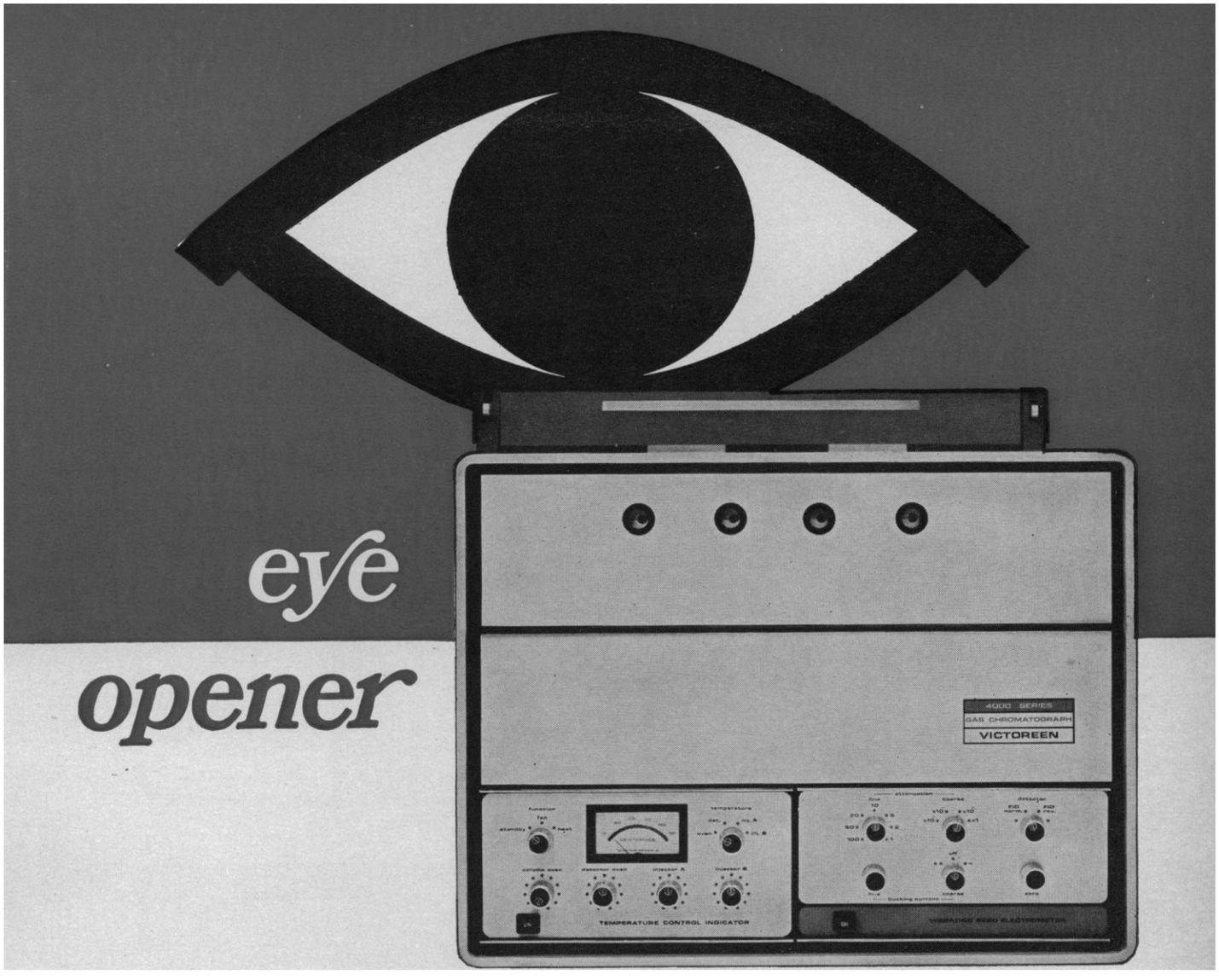

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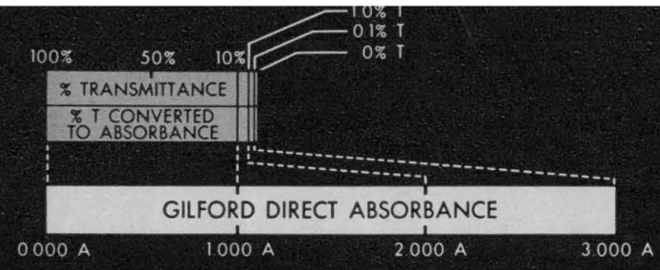

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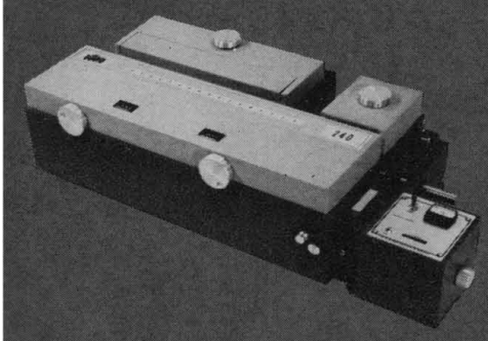

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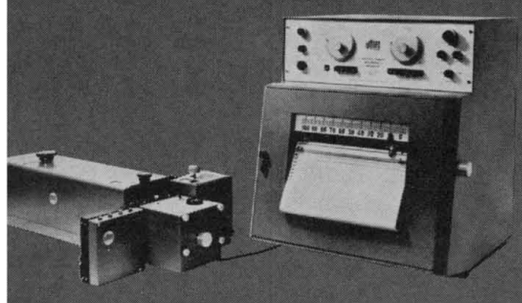

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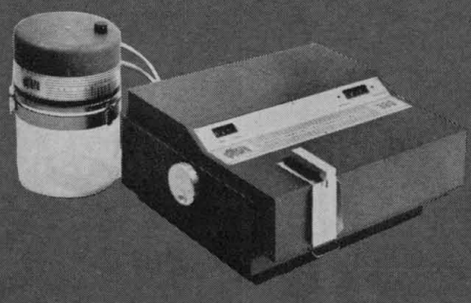

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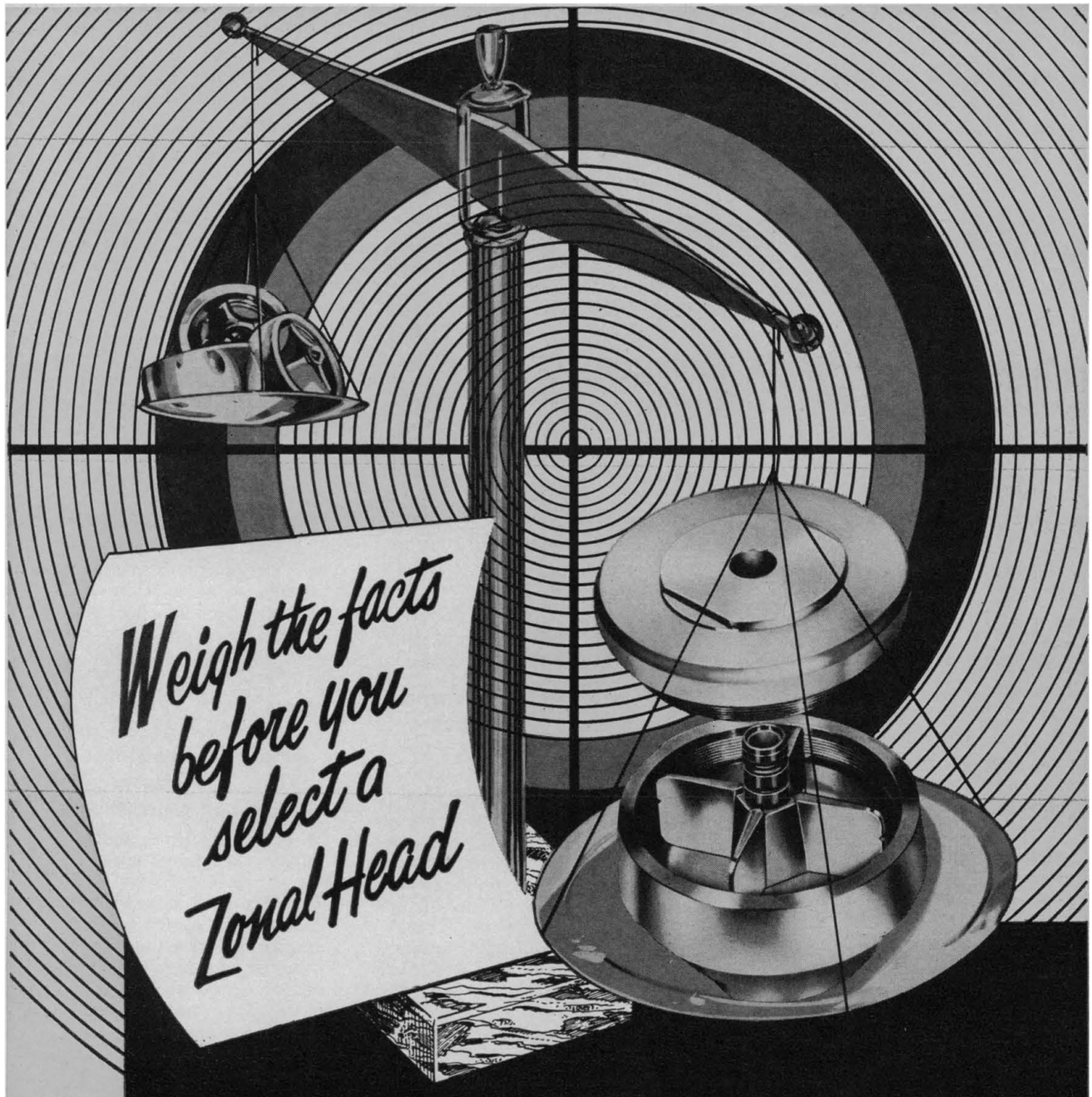

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event, the present government policy of doing everything possible to restrict free discussion of chemical and biological weapons should be modified so as to permit full public examination of the question, limited only by the dictates of necessary military security. Hopefully, the petition might assist in advancing this aim.

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Incaparina Gains Acceptance

In Carter's article, "World food supply: problems and prospects" (News and Comment, 6 Jan., p. 56), he referred to Incaparina, the low-cost protein-rich food supplement developed by the Institute for Nutrition for Central America and Panama (INCAP) as one example of the use of oil seed protein in a product designed to meet the needs of the developing countries. However, I believe that some clarification with respect to the commercial application of Incaparina is in order. While it is true that Incaparina is in various stages of product development in several Latin American countries, it is currently in full-scale commercial distribution in only Colombia and Guatemala. We do not believe that the current commercial sales of the product in either of these countries should be classified as "not particularly encouraging."

Carter did note, of course, that the Guatemalan experience is a notable exception. The 1966 sales in the two countries exceeded 4.6 million pounds (2.1 million kilograms) for a 40 percent increase over the previous year. This performance has been achieved without either large-scale governmental purchases of the product or any other form of subsidy. In Guatemala Incaparina has been sufficiently well accepted by consumers to have been in a paying position for the producer for over 2½ years. Sales volumes in Colombia are now reaching the "break-even" point and full commercial success is anticipated there. It is too early to forecast the results of consumer acceptability and market tests now underway in El Salvador, Honduras, Nicaragua, Costa Rica, Panama, Brazil, and Venezuela.

RICHARD L. SHAW
Institute for Nutrition for Central America and Panama, Carretera Roosevelt Zona 11, Guatemala, C. A.

Microbial Ecology

I strongly disagree with Pramer's review (3 Feb., p. 551) of Brock's *Principles of Microbial Ecology*. When I read the book in manuscript, I was delighted to note that it was *not* a compendium, but rather "a book of principles," to use the author's own words. The finished volume reaffirms this opinion. Brock has managed to wield the scissors with discrimination, and the result is a very readable, thought-provoking book which does bring forth many of the problems and principles of microbial ecology.

Contrary to Pramer's comments, the author clearly defines his intended audience in the preface, and the very elementary chapter on the microbial environment is a good starting point for many potential readers who may have had their training in the usual soils curriculum. I do not find an inconsistency between the statements that "the interior of an experimental animal is usually sterile" and that "microorganisms are frequently present in huge quantities, especially on the skin and in the intestinal tract," for the interior of an animal is usually considered to exclude the skin and the gastrointestinal tract. In short, I believe that Brock is to be commended for writing an informative, often profound, first volume in a new field in such a manner that the charm of the author's expression has not been deadened by dreary details of superfluous, uncritically chosen examples from the literature.

WARREN S. SILVER
Department of Bacteriology, University of Florida, Gainesville 32601

. . . I found, in contrast with Pramer, that Brock's book was thoughtfully assembled, provocative, and, in those areas which I was able to judge, reasonably accurate. . . . The reviewer writes that "There is little new information that the book can impart to a college student who has completed courses in introductory chemistry and microbiology. . . ." Whether or not this is so is moot. But what is important is not just "new information" but the incorporation of that information into the warp and woof of the total fabric of science. Not to realize this is to miss the whole point of the book.

MARTIN DWORKIN
Department of Microbiology, University of Minnesota Medical School, Minnapolis 55455

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How To Write a Thesis

On Selection of a Research Project. Be sure to select a topic which has been thoroughly explored by previous graduate students in your department, so that characteristics of your organism will be well known and basic procedures fully established. Also, you can borrow reagents, ideas, and perhaps data from your colleagues. Select a very limited, circumscribed, orthodox aspect of this topic for your investigation—preferably one where you don't have to believe the results of your work, certainly not one in which you will become emotionally involved. Don't attempt to discover anything new—you can do that later on a higher salary—concentrate simply on obtaining data, quickly and in quantity.

Experimental Approach. Set up experiments which will give meaningful results regardless of whether data are positive or negative; once you set up a procedure, never, never alter it or you will have to explain how and why and what difference it made. Restrict your study to a single variable so that you don't have to concern yourself with complicating factors and there will be no necessity for a comprehensive discussion. Avoid experiments which must be presented in the form of figures or graphs and, by all means, exclude photographs. If all data can be summarized in typewritten tables you will save yourself time, money, and frustration. (It's even better if you don't need tables!)

The Literature Review. If you've followed the advice above, your review will have been written for you by a former student and all you need to do is paraphrase it slightly and bring it up to date. If you should work on a topic which hasn't been reviewed recently, depend exclusively on *Chemical and Biological Abstracts* for information for your own review. Thus you will avoid the problem of trying to track down journals which were hidden away at the bindery all the time; you'll also save yourself many hours of reading and trying to organize experimental details which only make those lovely, sweeping generalizations more difficult. It goes without saying that you should have made sure there is no significant amount of foreign-language literature on the subject. Remember to document thoroughly every statement you make. It really doesn't matter that the idea is now out of date or that the author

turned out to be an idiot—just so it's been published. One thing you don't have to worry about is punctuation; trust your committee to put in any commas you have omitted and to delete most of those you have used; it salves their consciences for failing to understand or not caring about what you have to say.

General Principles. Be sure that the organization of your thesis follows established, accepted, orthodox, conventional, recognized, approved, hallowed precedents. Whenever questions of form arise it is safest to check with the graduate school, though this may require a lot of hiking. Never, never do anything new, even to improve clarity of presentation, unless you can cite an established, accepted, orthodox, conventional, recognized, approved, hallowed precedent. Always keep in mind the basic purpose of the thesis: to satisfy the graduate school. Unequivocal presentation of data is far more important than unequivocal data. But most important of all is that the margins are correct.

A. W. JAMES

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Canisius College, Buffalo, New York

Performance of Retarded Children

Zigler and his co-workers have amassed considerable and impressive evidence demonstrating that a large portion of what has been described as "rigidity" on the part of the mental retardate may be due to such motivating factors as social deprivation ("Familial mental retardation: a continuing dilemma," 20 Jan., p. 292). However, we feel that he has minimized certain other motivating factors which influence the behavior of the noninstitutionalized retardate. Specifically, we refer to the feelings of inadequacy which are inevitably generated as a result of the noninstitutionalized retardate's daily experiences with the normal child. Indeed, in this sense, the noninstitutionalized retardate probably is under more environmental pressure than his institutionalized counterpart.

In an unpublished study (*1*) we have compared the performances of normal children and institutionalized and noninstitutionalized retardates under various rewards. The noninstitutionalized retardate was found to perform for a significantly longer period of time and at a faster rate than either of the other two groups under "social" reinforcement (presence of the examiner and verbal encouragement). Thus, we feel that "success deprivation" may be as important an influence on the behavior of noninstitutionalized retardates as social deprivation is on the behavior of institutionalized retardates.

J. ROBERT NOONAN
JOHN R. BARRY

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University of Georgia, Athens 30601

Reference

1. J. R. Noonan and J. R. Barry, *J. Educ. Res.*, in press.

Attention Research in 1896

Hess and Polt in two papers published in *Science* [**132**, 349 (1960); **143**, 1190 (1964)] have demonstrated an effect of cognitive variables on the size of the pupillary opening. Great interest has been generated by their findings that interesting visual stimuli and mental arithmetic produce pupillary dilatation. The availability of a subtle indicator of attention holds promise in a number of fields ranging from psychophysics to personality.

Recently, while surveying literature on early work on attention, I came across an anticipation of cognitive pupillometry in a paper by Heinrich, *Zeitschrift für Psychologie und Physiologie der Sinnesorgane* **9**, 343 (1896). He measured pupillary diameter with an ophthalmograph while the subject tried to identify a letter on a card which was fixated centrally and at varying angles into the peripheral field. Pupillary diameter tended to increase with peripheral vision; this is attributed to the greater attentive effort required for peripheral vision. Heinrich also anticipated the work of Hess and Polt on the effect of mental arithmetic on pupillary size. He found that difficult mental multiplication was accompanied by a marked increase in pupil diameter, 39 percent in the case of one subject and 100 percent for another subject. Heinrich made use of the data to refute Helmholtz's contention that attention need not be correlated with changes in the sense organ.

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14 April 1967, Volume 156, Number 3772 **SCIENCE**

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

The Office of Science and Technology

Five years ago the United States and the U.S.S.R. were involved in an intense cold war. There seemed urgent need for efficient use of resources for research and development.

In this atmosphere the Office of Science and Technology was formally established. Among other functions, the director of OST was to advise and assist the President "with respect to major policies . . ." and with "review, integration, and coordination of major federal activities in science and technology. . . ." More than two-thirds of all research and development work in this country is federally financed. Thus the director of OST and his staff of 18, together with the President's Science Advisory Committee and some part-time consultants, were expected to mastermind most R & D in this country.

After 5 years the structure of the science advisory apparatus remains unchanged. However, the circumstances are different. Concern over the Russian peril has faded and has been replaced largely by concern over domestic issues, such as urban problems, and Vietnam. There is another President, and another Science Adviser, and their styles are not those of their predecessors.

Perhaps the greatest change is in the approach of Congress toward problems involving science and technology. This in turn reflects altered public attitudes. When the big problems were top-secret, the public did not expect wide participation by Congress. However, contemporary issues such as air and water pollution are matters on which the people expect participation by and action from their representatives. Another prod has come from the widespread belief that federal R & D funds are a key to economic progress. Whatever the causes, Congress today effectively participates and often leads in science policy making.

The prospects are that Congress will seize an even larger role. Congress controls the purse. It also provides effective means of shaping and weighing public opinion, through congressional hearings. When the issues are simple and dramatic, the President can dominate the scene. When the issues are many and complex, Congress can take the lead, as it did on pollution. An important aspect of hearings is the public record that results. These documents are valuable sources of technical information, and they often influence members of Congress.

During the past 2½ years Congress has availed itself of a new mechanism, the Science Policy Research Division of the Legislative Reference Service of the Library of Congress. In the last fiscal year, 33 committees or subcommittees of Congress sought assistance from the Division, and 168 representatives and 54 senators called on the Division for help. The Division has prepared a series of excellent reports. The latest of these* is a rich source of information concerning OST. Within the limitations of his opportunities, the director, Donald Hornig, has done a good job. However, in comparison with the scholarly record compiled by Congress and its Library staff, or in comparison with the output of ideas in the publications of the National Academy of Sciences, OST and the White House science apparatus have not been very productive. Such a performance would have been merely regrettable under the circumstances of 5 years ago. Today, this deficiency is costly of prestige and could lead to a back seat in science policy making.

—PHILIP H. ABELSON

*The report is available from The Military Operations Subcommittee, House of Representatives, B 373 Rayburn Building, Washington, D.C. 20025.

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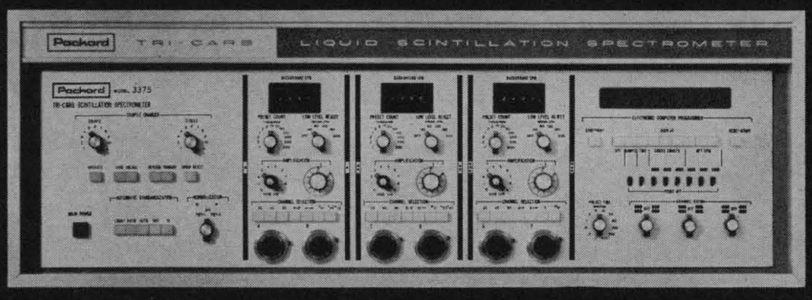

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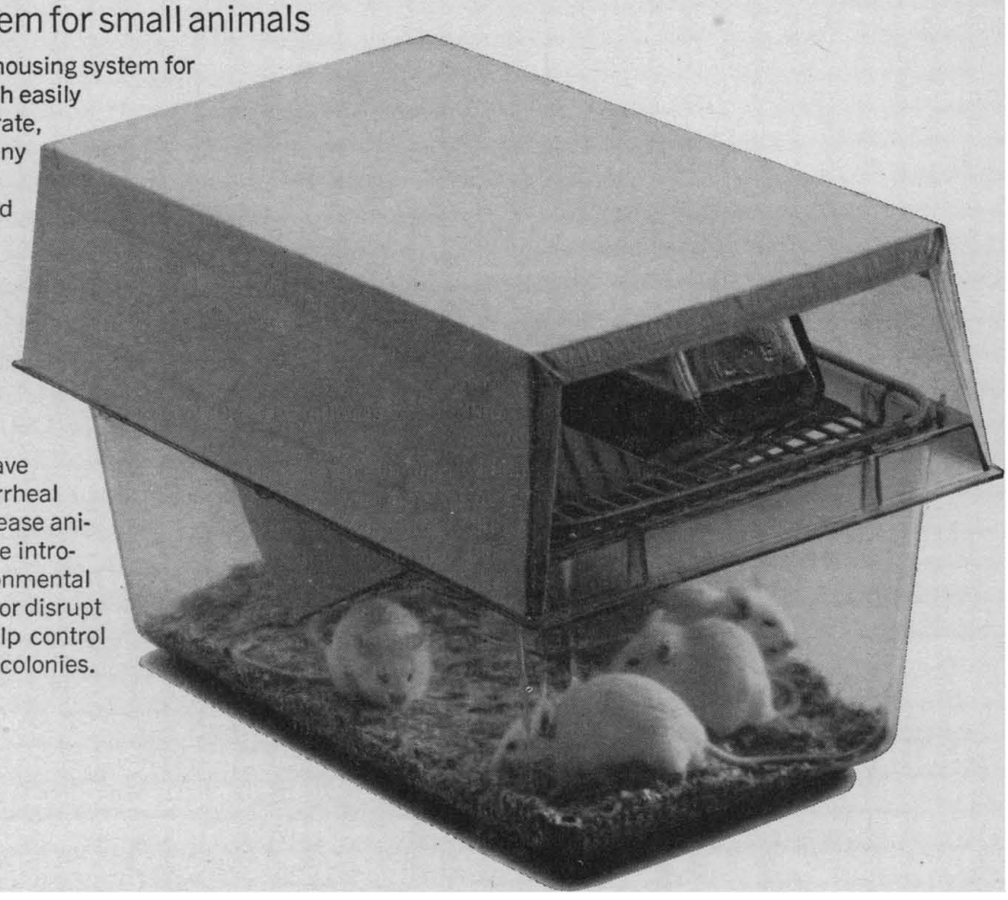

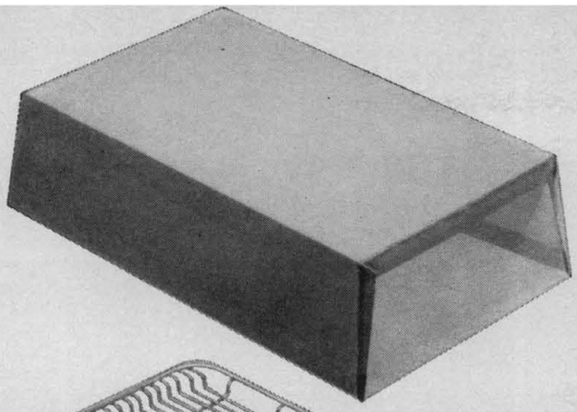

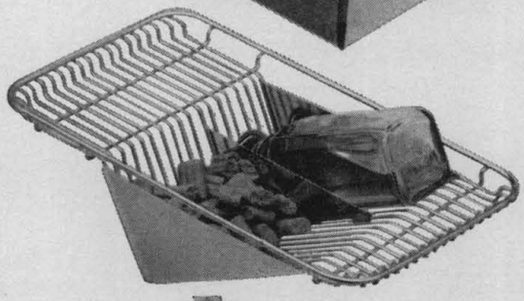

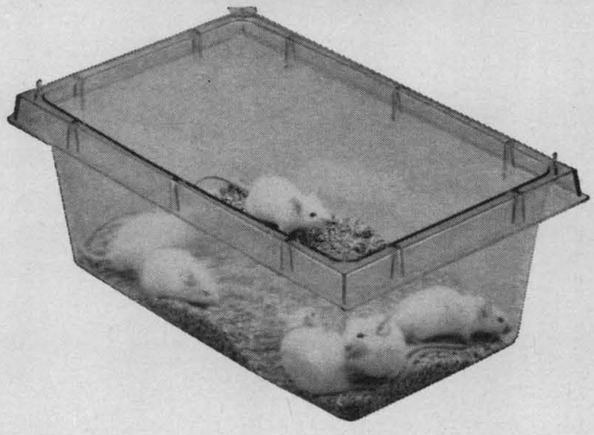

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up studies on such cases of poisoning have been performed. Among other common poisons of significance at all age levels, Done cited carbon monoxide, barbiturates, tranquilizers and sedatives, glutethimide, and psychedelic substances. Thus, in addition to accidental poisonings, we must consider suicidal and environmental poisonings as well as the growing problem of intentional abuse of drugs and solvents.

A number of panelists talked about the role of oxygen poisoning and of cerebral anoxia and asphyxia. Sokoloff (NIMH) postulated a possible correlation between rate of cerebral blood flow and sensitivity to anoxia. He noted that in the middle of the first decade of life the brain may account for as much as 50 percent of the total basal oxygen consumption of the body. Lowden (Hospital for Sick Children, Toronto) reported the experimental finding that asphyxia in cats produced a fall in the sialic acid content of cerebral gangliosides; he related the observation that the concentration of this acid in the gangliosides of patients dying from cyanosis was also sharply reduced. Behrman (University of Oregon Medical School) discussed basic concepts of placental transport as they relate to the administering of a particular drug to pregnant women, and the pathophysiology of the development of fetal anoxia. Rubinstein (Stanford University School of Medicine) essayed an analysis of the pathogenesis and mechanism of neonatal anoxia, drawing attention to the age-dependent differences in histologic responses to anoxia of the human brain.

In an examination of model systems of chemically induced mental retardation, the role of vitamin D was discussed by Wiltse (University of California School of Medicine, Los Angeles). Lowe (University of Florida, College of Medicine), who is chairman of the Committee on Nutrition of the American Academy of Pediatrics, reviewed this Committee's investigations into the vitamin D problem. The Committee found that the daily requirement of this vitamin can be fully met by a ration of 400 units per day. Lowe touched upon the complex problems inherent in any attempt by government agencies, such as the Food and Drug Administration, to impose limits on the permissible use of food additives or drugs without arousing unwarranted public apprehension about the dangers involved.

Other model systems of brain dam-

age caused by exogenous agents were the heavy metals, notably lead, mercury, and thallium. Harrison (Baltimore City Hospital) appraised the problem of lead poisoning and its possible mechanisms; he described measures being taken in Baltimore and other cities to control this environmental problem. He stressed that lead poisoning is most commonly seen in children from slum areas, who have easy access to lead contained in paint on walls and other surfaces. As many as 5 percent of children from such slum areas were found to have significant blood levels of lead. Harrison raised the question of possible chronic brain damage from continuous, low-level exposure to lead, thus resulting in subclinical blood lead levels. Preventive steps must include changes in the physical environment; cases of frank poisoning can be effectively treated with chelating agents. Kurland (Mayo Clinic) described an example of industrial water pollution which led to an outbreak of a disease resembling cerebral palsy among children in Minamata, Japan. The disease was caused by organic mercury compounds that were discharged into the bay as waste from a vinyl chloride-producing plant. The compound was subsequently ingested with the water by fish fed to the victims. (Brief mention was also made of thallotoxicosis.)

Comments by Eeckels (University of Lovanium, Republic of Congo) illuminated the perspective from which mental retardation is viewed in some of the underdeveloped countries. In such countries the phenomenon is commonly due to states of deficiency rather than to intake of exogenous agents. Mentally retarded children do not pose a serious problem simply because the environment is too harsh to allow them to live very long.

A highlight of the conference was an address by James L. Goddard (commissioner of the Food and Drug Administration). He canvassed the broad responsibilities of his agency in the realm of consumer protection, reviewed experience to date in the fields of drug, food additive, and pesticide regulation, and sketched future plans and projects.

In remarks concluding the conference, Goldstein (Stanford University School of Medicine) reformulated the major problems raised; cited the difficulty of screening drugs with potential neurotoxicity in animals; and underscored the need for vastly intensified

efforts aimed at full clarification and prevention of cases of brain damage due to exogenous chemical agents. Protection of the public is the primary goal.

In their final recommendations the participants made the following points:

1) There is a strong need for continued and greatly expanded basic research relating to the developing nervous system.

2) Another paramount need is for the development of more effective monitoring systems for the collection and dissemination of data on drugs and toxic agents. The group welcomed the initiative of the FDA in embarking on a comprehensive review of drug efficacy, which should be immensely helpful in facilitating the evaluation of drug effects.

3) Long-term, follow-up studies should be undertaken of patients known to have been intoxicated, and surveillance of intoxicated patients should be maintained so that possible latent effects leading to manifestations of brain damage may be detected.

4) Massive efforts should be instituted to gather data to determine whether a relationship exists between the incidence of damage to the central nervous system and changes in environment and continued exposure to drugs and other agents. There was strong emphasis on the need for planning and study to devise appropriate, effective, methodological approaches in order to attain these objectives.

The meeting was held under the sponsorship of the National Institute of Neurological Diseases and Blindness. Detailed proceedings of the conference will be published by the Institute.

GUY M. MCKHANN
Stanford University School of Medicine, Palo Alto, California 94304
SUMNER J. YAFFE
State University of New York at Buffalo, School of Medicine, Buffalo

Forthcoming Events

April

20–22. **Biological Energy Conversion,** conf., NASA Ames Research Center, Moffett Field, Calif. (Letters and Science Extension, Univ. of California, 2223 Fulton St., Berkeley)

20–22. **Ohio Acad. of Science,** 76th annual mtg., Dayton, Ohio. (J. H. Melvin, Executive Officer, The Academy, 505 King Ave., Columbus, Ohio 43221)

21–24. American **Oil Chemists'** Soc.,

Memphis, Tenn. (C. H. Hauber, Executive Secretary, 35 E. Wacker Dr., Chicago, Ill.)

23–27. American Soc. of **Mechanical Engineers**, Chicago, Ill. (Meetings Manager, The Society, 345 E. 47 St., New York 10017)

27–28. **Care of Animals for Medical Research**, symp., Kingston, Ont., Canada. (D. B. Jennings, Dept. of Physiology, Queen's University, Kingston)

27–29. **Southwestern Psychological** Assoc., 14th annual, Houston, Tex. (Mrs. C. Cleland, Southwestern Psychological Assoc., 2104 Meadowbrook Dr., Austin, Tex. 78703)

27–29. **Wildflower Pilgrimage**, 17th annual, Great Smoky Mountains Natl. Park. (Dept. of Botany, Univ. of Tennessee, Knoxville 37916)

28–29. **Biology Colloquium**, 28th annual mtg., Corvallis, Ore. (W. P. Lowry, 1967 Biology Colloquium, Dept. of Statistics, Oregon State Univ., Corvallis)

28–29. Physics of **Superconducting Devices**, symp., Univ. of Virginia, Charlottesville. (B. S. Deaver, Jr., Organizing Committee, Dept. of Physics, Univ. of Virginia, Charlottesville 22903)

28–30. **Wisconsin Acad.** of **Sciences**, Arts and Letters, annual mtg., Wisconsin State Univ., Oshkosh. (J. Thompson, Birge Hall, Univ. of Wisconsin, Madison 53706)

29. American Soc. for **Clinical Nutrition**, annual mtg., Atlantic City, N.J. (A. B. Eisenstein, 818 S. Meramec Ave., St. Louis, Mo. 63105)

29–4. American **Ceramic Soc.**, 69th annual mtg., New York, N.Y. (Technical, Secretary, The Society, 4055 N. High St., Columbus 14, Ohio)

30–3. **Underwater Technology** Conf., American Soc. of Mechanical Engineers, Hampton, Va. (Meetings Manager, The Society, 345 E. 47 St., New York 10017)

30–5. International **College** of **Surgeons**, congr., Bal Harbor, Fla. (S. E. Henwood, 1516 Lake Shore Dr., Chicago, Ill. 60610)

May

1–2. **Adhesion** (Cold Welding) **of Materials in Space Environments**, natl. symp., American Soc. for Testing and Materials, Toronto, Ont., Canada. (The Society, 1916 Race St., Philadelphia, Pa. 19103)

1–2. Association for **Research in Ophthalmology**, Clearwater Beach, Fla. (H. E. Kaufman, Dept. of Ophthalmology, Univ. of Florida College of Medicine, Gainesville 32601)

1–2. Colloquium on the **Pupil**, Univ. of Pennsylvania, Philadelphia. (A. Laties, Room 188, Old Medical School Bldg., Univ. of Pennsylvania School of Medicine, Philadelphia 19104)

1–2. Rocky Mountain **Bioengineering** Symp., Univ. of Colorado Medical Center, Denver. (RMBS, P.O. Box 59, USAF Academy, Colo. 80840)

1–2. 1967 **Rural Electrification** Conf., Cedar Rapids, Iowa. Office of Technical Activities Board, (Inst. of Electrical and Electronics Engineers, 345 E. 47 St., New York 10017)

1–3. American **Astronautical** Soc., 13th annual mtg., Dallas, Tex. (R. Gilmer, Varo, Inc., 800 Garland Ave., Garland, Tex.)

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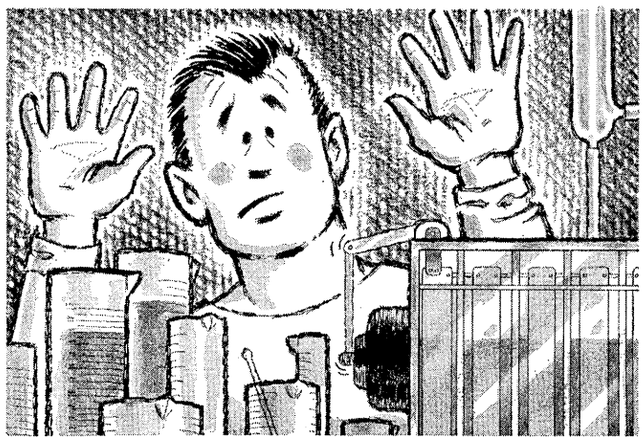

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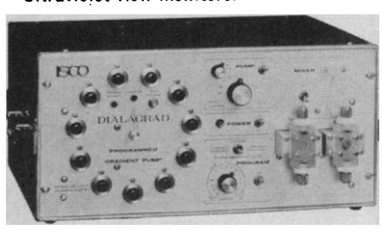

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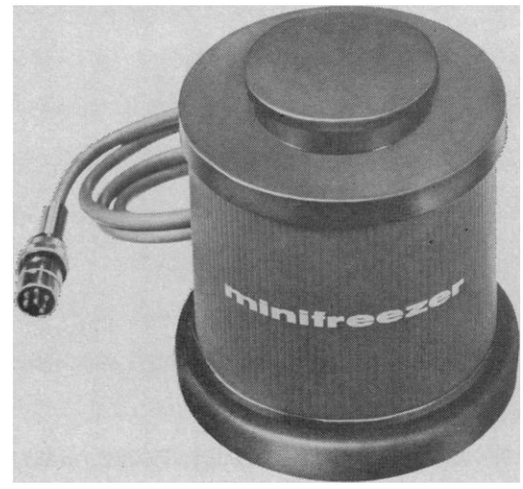
WHAT IS THE SHAPE OF COLD?



The answer depends on your needs and not on an attempt to dimensionalize sensation. That is, do you want it small, medium or large? Minifreezer solves the small requirement. An island of cold in a tiny container, Minifreezer is a controlled temperature chamber that can be used anywhere to save time, effort, money and space.

Consider the advantages of having a self-contained freezer that will take the temperature as low as —55°C and yet is about the size of a standard thermos bottle. No trips to a big freezer — quick freezing of samples where they are gathered — environmental testing — storage — you name it. Capacities range from 80 ml to 1500 ml and you can control the temperature set point directly.

If the dimension of cold for your needs runs around the size of a cocktail shaker, you ought to see the Minifreezer. Catalogs on request. Cocktails, if you are brave enough to ask for a demonstration.

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1–3. **Geology and Technology of Gulf Coast Salt**, symp., Louisiana State Univ., Baton Rouge. (D. H. Kupfer, Dept. of Geology, Louisiana State Univ., Baton Rouge 70803)

1–3. **Markov Processes and Potential Theory**, spring symp., Madison, Wis. (J. Chover, Mathematics Research Center, Univ. of Wisconsin, Madison 53706)

1–4. American Soc. of **Lubrication Engineers**, 22nd annual, Toronto, Ont., Canada. (The Society, 838 Busse Hwy., Park Ridge, Ill. 60068)

1–4. **Pulp Bleaching** Conf., 4th intern., Toronto, Ont., Canada. (Canadian Pulp & Paper Assoc., Technical Section, 2280 Sun Life Bldg., Montreal 2, P.Q.)

1–5. American **Industrial Hygiene** Assoc., conf., Chicago, Ill. (The Association, 14125 Prevost, Detroit, Mich. 48227)

2–4. Purdue **Industrial Waste** Conf., Lafayette, Ind. (D. E. Bloodgood, Purdue Univ. of School of Civil Engineering, Lafayette 47907)

2–5. Biological Effects of **Pesticides**, conf. New York Acad. of Sciences, New York, N.Y. (Executive Director, The Academy, 2 E. 63 St., New York 10021)

2–5. **Pulp and Paper** Industry Tech. Conf., Houston, Tex. (W. S. Hines, Westinghouse Electric Corp., Box 4808, Atlanta, Ga. 30302)

2–5. Use of **Subhuman Primates in Drug Evaulation**, symp., Southwest Foundation for Research and Education, San Antonio, Tex. (L. R. Smith, Jr., The Foundation, P.O. Box 2296, San Antonio 78206)

3–5. **Human Factors in Electronics**, 8th annual symp., Institute of Electrical and Electronic Engineers, Palo Alto, Calif. (R. J. Randle, Biotechnology Div., Ames Research Center, Moffett Field, Calif.)

3–6. **Rare Earth Research** Conf., 6th, Gatlinburg, Tenn. (W. C. Koehler, Solid State Div., Oak Ridge Natl. Lab., Oak Ridge, Tenn. 37831)

3–7. Fifteenth Colloquium, **Protides** of **Biological Fluids**, Brugge, Belgium. (The Colloquium, P.O. Box 71, Brugge 1)

4–5. **Fiber** Soc., Asheville, N.C. (The Society, Textile Research Inst., P.O. Box 625, Princeton, N.J.)

4–5. **Salt-Water Encroachment** of **Aquifers**, symp., Louisiana State Univ., Baton Rouge. (E. J. Dantin, Louisiana Water Resources Research Inst., Louisiana State Univ., Baton Rouge 70803)

4–6. Society for **American Archaeology**, Ann Arbor, Mich. (E. M. Davis, Dept. of Anthropology, Univ. of Texas, Austin 78712)

4–7. Association of **Clinical Scientists**, Orlando, Fla. (R. P. MacFate, 300 N. State St., Apartment 5322, Chicago, Ill. 60610)

5–7. American Acad. of **Psychoanalysis**, Detroit, Mich. (M. Carroll, The Academy, 125 E. 65 St., New York 10021)

5–7. Society of **Biological Psychiatry**, scientific conv., Detroit, Mich. (The Society, 2010 Wilshire Blvd., Los Angeles, Calif. 90057)

6. Central States **Entomological** Soc., 42nd annual, Univ. of Missouri, Columbia. (R. B. Mills, Dept. of Entomology, Kansas State Univ., Manhattan 66504)

6–8. World **Dredging** Conf., New York, N.Y. (M. Richardson, P.O. Box 88, Palos Verdes Estates, Calif. 90274)

7–11. Third Pan American **Cancer Cytology** Congr., New York, N.Y. (J. E. Ayre, The Congress, 115 E. 69 St., New York 10021)

7–12. **Electrochemical Soc. Sets**, spring mtg., Dallas, Tex. (The Society, 30 E. 42 St., New York 10017)

7–12. **Petroleum** Symp., Banff, Alta., Canada. (Director, Dept. of Extension, Univ. of Alberta, Edmonton, Alta.)

8–10. American **Oil Chemists'** Soc., 58th annual, New Orleans, La. (The Society, 35 E. Wacker Dr., Chicago, Ill. 60600)

8–10. **Static Electrification**, 2nd conf., Inst. of Physics and Physical Soc., London, England. (Meetings Officer, The Society, 47 Belgrave Sq., London, S.W.1)

8–10. International Conf. of **Mechanics of Composite Materials**, Philadelphia, Pa. (T. Ryan, Space Sciences Lab., General Electric Co., P.O. Box 8555, Philadelphia 19101)

8–10. Symposium on **Origin and Distribution of the Elements**, Paris, France. (E. Ingerson, Dept. of Geology, Univ. of Texas, Austin 78712)

8–11. G-MTT 1967 Intern. **Microwave** Symp., Boston, Mass. (Inst. of Electrical and Electronics Engineers, 345 E. 47 St., New York 10017)

8–11. **Molecular Association in Biology**, intern. symp., Paris, France. (B. Pullman, Director, Institut de Biologie Physico-Chimique, 12, rue Pierre Curie, Paris 5°)

8–12. American Soc. of **Civil Engineers**, Seattle, Wash. (W. H. Wisely, The Society, 345 E. 47 St., New York 10017)

8–12. **Color Measurement** Seminar, Clemson Univ., Clemson, S.C. (H. J. Keegan, School of Industrial Management and Textile Science, Clemson Univ., Clemson 29631)

8–13. **Nuclear Activation Techniques** in **Life Sciences**, symp., Intern. Atomic Energy Agency, Amsterdam, Netherlands. (J. H. Kane, Conferences Branch, Div. of Technical Information, Atomic Energy Commission, Washington, D.C. 20545)

9–11. **Electron, Ion and Laser Beam** Technology, 9th annual symp., Institute of Electrical and Electronics Engineers, Berkeley, Calif. (C. Susskind, Electrical Engineering, Univ. of California, Berkeley 94720)

9–11. **Packaging Industry** Technical Conf., New York, N.Y. (Office of Technical Activities Board, Inst. of Electrical and Electronics Engineers, 345 E. 47 St., New York 10017)

11–12. Canadian **Operational Research** Soc., 9th annual conf., Ottowa, Ont., Canada. (Chairman, The Society, Box 120, R.R. No. 1 Ottawa, Ont.)

12–13. Association of University **Radiologists**, annual mtg., Philadelphia, Pa. (S. Rogoff, Dept. of Radiology, Univ. of Rochester Medical School, Rochester, N.Y. 14620)

12–13. **North Carolina Acad.** of **Science**, Duke Univ., Durham. (J. A. Yarbrough, Meredith College, Raleigh, N.C. 27602)

12–13. Northern and Southern societies for **Electron Microscopy**, joint mtg., Anaheim, Calif. (R. F. Bils, Hancock Foun-

dation, Univ. of Southern California, Los Angeles 90007)

14–19. Institute of **Food Technologists**, 27th annual, Minneapolis, Minn. (The Institute, 221 N. LaSalle St., Chicago, Ill. 60601)

14–19. Society of **Photographic Scientists and Engineers**, annual conf., Chicago, Ill. (W. S. Dempsey, Itek Corp., 1735 Eye St., NW, Washington, D.C. 20006)

15. **Biomacromolecules**, symp., New York Soc. of Electron Microscopists and New York Univ. School of Medicine, New York, N.Y. (S. S. Breese, Jr., Plum Island Animal Disease Lab., Box 848, Greenport, Long Island, N.Y. 11944)

15–17. **Aerospace Electronics** Conf., 19th annual conf., Dayton, Ohio. (Inst. of Electrical and Electronics Engineers, Dayton Office, 1414 E. 3 St., Dayton 3)

15–17. **Diagnosis** and **Treatment** of **Deposited Radionuclides**, intern. symp., Richland, Wash. (T. Bauman, The Symposium, P.O. Box 999, Richland 99352)

15–17. **Chemical** and **Petroleum** Instrumentation Symp., 8th natl., Instrument Soc. of America, St. Louis, Mo. (S. A. Young, Honeywell, Inc., 2146 Hampton St., St. Louis 63139)

15–17. **Biomedical Sciences** Instrumentation Symp., 5th natl., Instrument Soc. of America, Albuquerque, N.M. (The Society, 530 William Penn Pl., Pittsburgh, Pa. 15219)

15–17. **Radioecology**, 2nd natl. symp., Univ. of Michigan, Ann Arbor. (F. C. Evans, Dept. of Zoology, Univ. of Michigan, Ann Arbor)

15–17. **Technical Literature Abstracting** and **Indexing**, 3rd annual institute, Washington, D.C. (Director, Center for Technology and Administration, American Univ., 2000 G St., NW, Washington, D.C. 20006)

15–18. Mid-America Symp. on **Spectroscopy**, 18th annual, Chicago, Ill. (W. K. Baer, Nalco Chemical Co., 6216 W. 66 Place, Chicago 60038)

15–18. Society of **Plastics Engineers**, 25th annual technical conf., Detroit, Mich. (R. D. Forger, The Society, 65 Prospect St., Stamford, Conn. 06902)

15–19. Society of **Photographic Scientists** and **Engineers**, annual conf., Chicago, Ill. (R. J. Mazor, Nugent-Williams Studies, Inc., 120 N. Pulaski Rd., Chicago)

15–20. **Space Technology** and **Science**, 7th intern. symp., Tokyo, Japan. (S. Nozawa, ISTS-Tokyo, 1967, Japanese Rocket Soc., Yomiuri Newspaper Bldg., 1, 3-chome, Ginza-Nishi, Chuo-ku, Tokyo)

15–26. Workshop in **Heat Transfer Computer Programs**, Univ. of California, Los Angeles. (Engineering Extension, Room 6266, Boelter Hall, Univ. of California, Los Angeles 90024)

16–18. National **Telemetering** Conf., San Francisco, Calif. (L. Winner, 152 W. 42 St., New York 10036)

16–19. Society for **Experimental Stress Analysis**, Ottawa, Ont., Canada. (B. E. Rossi, The Society, 21 Bridge Sq., Westport, Conn. 06882)

16–20. **Solid Inorganic Phosphates**, intern. colloquium, Toulouse, France. (Secretariat du Colloque International sur les Phosphates Mineraux Solids, Dept. de Chimie Inorganique, Faculté des Sciences,

38, rue des Trente-Six Ponts, 31-Toulouse)

17–22. **Fresh Water from the Sea**, 2nd European symp., Athens, Greece. (A. A. Delyannis, P.O. Box 1199, Athens-Omonia)

18. **Washington Acad. of Sciences**, mtg., Washington, D.C. (R. P. Farrow, Natl. Canners Assoc., 1133 20th St., NW, Washington, D.C. 20036)

18–19. Midwest Symp. on **Circuit Theory**, Purdue Univ., West Lafayette, Ind. (B. J. Leon, School of Electrical Engineering, Purdue Univ., West Lafayette 47907)

18–19. Southern **Textile Research** Conf., Hilton Head Island, S.C. (A. L. Smith, Chatham Manufacturing Co., Elkin, N.C. 28621)

20–24. Recent and Ancient **Deltaic Deposits**, seminar, Louisiana State Univ., Baton Rouge. (J. M. Coleman, Coastal Studies Inst., Dept. of Geology, Louisiana State Univ., Baton Rouge 70803)

21–24. American Inst. of **Chemical Engineers**, mtg., Salt Lake City, Utah. (F. J. Van Antwerpen, The Institute, 345 E. 47 St., New York 10017)

21–26. **Nondestructive Testing**, 5th intern. conf., Montreal, P.Q., Canada. (Conf. on Nondestructive Testing, P.O. Box 95, Verdun 19, P.Q.)

22–24. Conference on **Frequency Generation and Control for Radio Systems**, London, England. (J. L. Regan, Inst. of Electrical Engineers, Savoy Pl., London, W.C.2)

22–25. Institute of **Electrical** and **Electronics Engineers**, joint technical conf., Cleveland, Ohio. (Office of Technical Activities Board, The Institute, 345 E. 47 St., New York 10017)

22–25. New Aids for **Management Decision Making**, Washington, D.C. (Director, Center for Technology and Administration, American Univ., 2000 G St., NW, Washington, D.C.)

22–25. **URSI–IEEE**, spring mtg., Ottawa, Ont., Canada. (R. S. Rettle, Natl. Research Council, Ottawa 2)

22–26. **Drug Metabolism**, 2nd workshop, George Washington Univ., Washington, D.C. (Dept. of Pharmacology, School of Medicine, George Washington Univ., 1337 H St., NW, Washington, D.C. 20005)

22–26. **Radiosterilization of Medical Products**, symp., Intern. Atomic Energy Agency, Budapest, Hungary. (J. H. Kane, Conferences Branch, Div. of Technical Information, Atomic Energy Commission, Washington, D.C. 20545)

23–25. National **Tuberculosis** Assoc. and American **Thoracic** Soc., annual mtg., Pittsburgh, Pa. (NTA, 1740 Broadway, New York 10019)

23–31. **Water for Peace**, intern. conf., Washington, D.C. (R. C. Hagan, Dept. of State, Room 1318, 2201 C St., NW, Washington, D.C.)

24–26. Fourteenth Canadian **High Polymer** Forum, Laval Univ., Quebec City. (J. F. Henderson, Research and Development Div. Polymer Corp. Ltd., Sarnia, Ont., Canada)

24–27. **Teratology** Soc., 7th annual mtg., Estes Park, Colo. (M. D. Runner, Inst. for Developmental Biology, Univ. of Colorado, Boulder 80302)

NEW BOOKS

(Continued from page 232)

Academic Press, New York, 1966. 398 pp. Illus. $16. Five papers.

Amines and Schizophrenia. Harold E. Himwich, Seymour S. Kety, and John R. Smythies, Eds. Pergamon, New York, 1967. 300 pp. Illus. $11.50. Eighteen papers.

Analyses of Concept Learning. Herbert J. Klausmeier and Chester W. Harris, Eds. Academic Press, New York, 1966. 286 pp. Illus. $8.50. Sixteen papers presented at a conference (Madison, Wis.), October 1965.

Animal Tissue Techniques. Gretchen L. Humason. Freeman, San Francisco, ed. 2, 1967. 585 pp. Illus. $9.

Antibiotics: Advances in Research, Production and Clinical Use. Proceedings of the Congress on Antibiotics (Prague), June 1964. Miloš Herold and Zdeněk Gabriel, Eds. Czechslovak Medical Press, Prague; Butterworth, Washington, D.C., 1966. 778 pp. Illus. $21. There are 163 papers.

Applications of Undergraduate Mathematics in Engineering. Ben Noble. Macmillan, New York, 1967. 384 pp. Illus. $9.

Arid Lands: A Geographical Appraisal. E. S. Hills, Ed. Methuen, London; Barnes and Noble, New York, 1967. 479 pp. Illus. $13.50. Twenty papers.

An Atomistic Approach to the Nature and Properties of Materials. Joseph A. Pask, Ed. Wiley, New York, 1967. 491 pp. Illus. $19.95. University of California Engineering and Physical Sciences Extension Series.

The Bacterial Lipids. Jean Asselineau. Based on a translation of the French edition (Paris, 1962). Hermann, Paris; Holden-Day, San Francisco, Calif., 1967. 372 pp. Illus. $11.50.

A Biological and Psychological Background to Education. C. G. Ivan Hussell and Alice F. Laing. Pergamon, New York, 1967, 237 pp. Illus. Paper, $5.25. Commonwealth and International Library.

Biological Foundations of Language. Eric H. Lenneberg. Wiley, New York, 1967. 507 pp. Illus. $14.95.

Biological Science. William T. Keeton. Norton, New York, 1967. 971 pp. Illus. $9.50.

La Biologie des Chiroptères. André Brosset. Masson, Paris, 1966. 248 pp. Illus. F. 50.

Biology of the Invertebrates. Cleveland P. Hickman. Mosby, St. Louis, 1967. 685 pp. Illus. $10.

Botanical Latin: History, Grammar, Syntax, Terminology and Vocabulary. William T. Stearn. Hafner, New York, 1966. 580 pp. Illus. $16.75.

Breakthroughs in Chemistry. Peter Wolff. New American Library, New York, 1967. 336 pp. Illus. Paper, 75¢.

Calvin's Geneva. E. William Monter. Wiley, New York, 1967. 266 pp. Illus. Paper, $2.95; cloth, $5.95.

Cells and Tissues in Culture: Methods, Biology and Physiology. vol. 3. E. N. Willmer, Ed. Academic Press, New York, 1966. 842 pp. Illus. $29. Eleven papers.

The Character of Physical Law. Rich-

ard Feynman. M.I.T. Press, Cambridge, Mass., 1967. 173 pp. Illus. Paper, $2.45. Reprint, 1965 edition.

The Chemistry of Non-Aqueous Solvents. vol. 1, *Principles and Techniques*. J. J. Lagowski, Ed. Academic Press, New York, 1966. 415 pp. Illus. $16.50. Seven papers.

Chinese Society under Communism: A Reader. William T. Liu, Ed. Wiley, New York, 1967. 510 pp. $8.50. Forty-two papers.

Circuit Design for Audio, AM/FM, and TV. William A. Stover, Ed. McGraw-Hill, New York, 1967. 364 pp. Illus. $14.50.

Classical Mechanics. J. W. Leech. Methuen, London; Barnes and Noble, New York, 1967. 163 pp. Illus. Paper, $1.50; cloth, $2.75.

Clinical Pharmacology. vol. 2. L. Lasagna, Ed. Pergamon, New York, 1966. 321 pp. Illus. $9.50. Fourteen papers.

Computer Calculations for Multicomponent Vapor-Liquid Equilibria. J. M. Prausnitz, C. A. Eckert, R. V. Orye, and J. P. O'Connell. Prentice-Hall, Englewood Cliffs, N.J., 1967. 250 pp. Illus. $12.50.

Concepts in Biochemistry: A Programmed Text. William K. Stephenson. Wiley, New York, 1967. 260 pp. Illus. Paper, $2.95.

Contracting for Atoms. Harold Orlans. Brookings Institution, Washington, D.C., 1967. 260 pp. $6.

Control Systems Functions and Programming Approaches. vol. A, *Theory*. Dimitris N. Chorafas. Academic Press, New York, 1966. 421 pp. Illus. $16.

Captain James Cook: Genius Afloat. Daniel J. Carrison. Watts, New York, 1967. 202 pp. Illus. $2.95.

Coordinate Indexing. John C. Costello, Jr. Graduate School of Library Service, Rutgers State Univ., New Brunswick, N.J., 1966. 218 pp. Illus. Paper, $5. Rutgers Series on Systems for the Intellectual Organization of Information.

The Criminal Mind: A Study of Communication Between the Criminal Law and Psychiatry. Philip Q. Roche. Wiley, New York, 1967. 311 pp. Paper, $1.65. Reprint, 1958 edition.

Current Topics in Developmental Biology. vol. 1. A. A. Moscona and Alberto Monroy, Eds. Academic Press, New York, 1966. 317 pp. Illus. $12.50. Nine papers.

Data Relative to Sesquiterpenoids. G. Ourisson, S. Munavalli, and C. Ehret. Pergamon, New York, 1966. 108 pp. Illus. $13.50. International Tables of Selected Constants, No. 15. In English and French.

The Deer and the Tiger: A Study of Wildlife in India. George B. Schaller. Univ. of Chicago Press, Chicago, 1967. 386 pp. Illus. $10.

A Diary in the Strict Sense of the Term. Bronislaw Malinowski. Translated from the Polish by Norbert Guterman. Harcourt, Brace and World, New York, 1967. 337 pp. $6.95.

Dictionary of Electrotechnology (German-English). Eduard Höhn. Chapman and Hall, London; Barnes and Noble, New York, 1967. 719 pp. $22.50.

A Draft Synopsis of the Orders, Families and Genera of Recent Fishes and Fish-like Vertebrates. J. R. Norman. British Museum (Natural History), London, 1966. 653 pp. £10.

Dynamical Theories of Brownian Motion. Edward Nelson. Princeton Univ. Press, Princeton, N.J., 1967. 146 pp. Illus. Paper, $2.25.

Echinodermes de l'Ordovicien du Maroc. Jean Chauvel. Éditions du Centre National de la Recherche Scientifique, Paris, 1966. 152 pp. Illus. Plates. F. 35.

Electrodynamics of Plasmas. R. Jancel and Th. Kahan. Wiley, New York, 1966. 649 pp. Illus. $19.60.

Electron Dynamics of Diode Regions. Charles K. Birdsall and William B. Bridges. Academic Press, New York, 1966. 286 pp. Illus. $10. Electrical Science Series.

Electron Spin Resonance: A Comprehensive Treatise on Experimental Techniques. Charles P. Poole, Jr. Interscience (Wiley), New York, 1967. 950 pp. Illus. $29.75.

Elementary Statistics: A Workbook. K. Hope. Pergamon, New York, 1967. 113 pp. Illus. Paper, $4.

Eléménts de Mécanique Quantique. J. Barriol. Masson, Paris, 1966. 385 pp. Illus. F. 78.

Elements of Pulse Circuits. F. J. M. Farley. Methuen, London; Barnes and Noble, New York, 1967. 169 pp. Illus. Paper, $1.95; cloth, $3.75.

Embryologie. Charles Houillon. Hermann, Paris, 1967. 184 pp. Illus. Paper, F. 27.

Engineering in the Practice of Medicine. Bernard L. Segal and David G. Kilpatrick, Eds. Williams and Wilkins, Baltimore, 1967. 500 pp. Illus. $20. Forty papers.

English Translation of Selected East European Papers in Nematology. B. M. Zuckerman, M. W. Brzeski, and K. H. Deubert. Univ. of Massachusetts Cranberry Experiment Station, East Wareham, 1967. 100 pp. Illus. $2.50.

Extra Pharmacopoeia (Martindale). R. G. Todd, Ed. Pharmaceutical Press. London, ed. 25, 1967 (order from Rittenhouse Book Store, Philadelphia, Pa.). 1834 pp. $27.

Fascinating Problems in Organic Reaction Mechanisms. Subramania Ranganathan. Holden-Day, San Francisco, 1967. 96 pp. Illus. $4.50.

Faune Ichthyologique du London Clay. Edgard Casier. British Museum (Natural History), London, 1966. Text, 510 pp.; Atlas, unpaged. Illus. Plates. £30 set.

Fishes of the Atlantic Coast of Canada. A. H. Leim and W. B. Scott. Fisheries Research Board of Canada, Ottawa, 1966. 493 pp. Illus. $8.50.

Fractional Solidification. vol. 1. Morris Zief and William R. Wilcox, Eds. Dekker, New York, 1967. 730 pp. Illus. $28.75. Twenty-six papers.

Frequency Independent Antennas. Victor H. Rumsey. Academic Press, New York, 1966. 160 pp. Illus. $7.50. Electrical Science Series.

The Functional Organization of the Compound Eye. Proceedings of the international symposium (Stockholm), October 1965. Sponsored by European Office of Aerospace Research, Ministry of Education, Swedish Medical Research Council, Swedish Natural Science Research Council, and Karolinska Institutet. C. G. Bernhard, Ed. Pergamon, New York, 1966. 605 pp. Illus. $19.50. Thirty-five papers.

Fundamentals of Applied Probability Theory. Alvin W. Drake. McGraw-Hill, New York, 1967. 299 pp. Illus. $9.75.

General Zoology. Gairdner B. Moment. Houghton Mifflin, Boston, ed. 2, 1967. 735 pp. Illus. $8.95.

Genetics. Robert C. King. Oxford Univ. Press, New York, ed. 2, 1967. 466 pp. Illus. $9.50.

Genetics Is Easy. Philip Goldstein. Lantern Press, New York, ed. 4, 1967. 307 pp. Illus. $6.

Genetics of Man. Paul Amos Moody. Norton, New York, 1967. 454 pp. Illus. $7.50.

Geography as Human Ecology: Methodology by Example. S. R. Eyre and G. R. J. Jones, Eds. St. Martin's Press, New York, 1966. 320 pp. Illus. $9. Eleven papers.

Helicopters and Autogiros. Charles Gablehouse. Lippincott, Philadelphia, New York, 1967. 272 pp. Illus. $4.95.

History of Rocketry and Space Travel. Wernher von Braun and Frederick I. Ordway III. Crowell, New York, 1967. 256 pp. Illus. $14.95.

Human Blood Groups and Inheritance. Sylvia D. Lawler and L. J. Lawler. Harvard Univ. Press, Cambridge, Mass., ed. 2, 1966. 112 pp. Illus. $2.50.

The Human Dimension: Experiences in Policy Research. Hadley Cantril. Rutgers Univ. Press, New Brunswick, N.J., 1967. 216 pp. Illus. $7.50.

Hydrology and Water Resources Development. A symposium (Ankara, Turkey), February 1966. Luise Lackland Shields, Ed. Central Treaty Organization, Ankara, Turkey, 1966. 484 pp. Illus. Paper. Twenty-nine papers.

Hypersonic Flow Theory. vol. 1, *Inviscid Flows*. Wallace D. Hayes and Ronald F. Probstein. Academic Press, New York, ed. 2, 1966. 620 pp. Illus. $16.50.

Ideals of Differentiable Functions. B. Malgrange. Published for the Tata Institute of Fundamental Research, Bombay. Oxford Univ. Press, New York, 1966. 114 pp. Paper, $6.

An Illustrated Catalogue of the Rothschild Collection of Fleas (Siphonaptera) in the British Museum (Natural History). vol. 4, *Hystrichopsyllidae (Ctenophthalminae, Dinopsyllinae, Doratopsyllinae and Listropsyllinae)*. G. H. E. Hopkins and Miriam Rothschild. British Museum (Natural History), London, 1966. 557 pp. Illus. Plates. £18.

Immunodiffusion und Immunoelektrophorese: Grundlagen, Methoden, und Ergebnisse. Richard Backhausz. Fischer, Jena, East Germany, 1967. 516 pp. Illus. MDN 67.30.

Index to Reviews, Symposia Volumes and Monographs in Organic Chemistry: For the Period 1963–1964. Compiled and edited by Norman Kharasch and Walter Wolf. Pergamon, New York, 1966. 338 pp. $17.50.

Indications for Psychoanalysis. The Place of the Dream in Clinical Psychoanalysis. Herbert F. Waldhorn. Edward D. Joseph, Ed. International Universities Press, New York, 1967. 112 pp. Paper, $3. The Kris Study Group of the New York Psychoanalytic Institute, Monograph 2.

Information. Dennis Flanagan *et al.*, Eds. Freeman, San Francisco, 1966, 228

pp. Illus. Paper, $2.50; cloth, $5. Twelve papers reprinted from *Scientific American*, September 1966.

Instrumentation in Biochemistry. A symposium (London), April 1966. T. W. Goodwin, Ed. Academic Press, New York, 1966. 123 pp. Illus. $5. Six papers.

Vie Intense et Cachée du Sol: Essai de Pédobiologie végétale. Bernard Boullard. Flammarion, Paris, 1967. 309 pp. Illus.

The International Brotherhood of Teamsters: Its Government and Structure. Sam Romer. Wiley, New York, 1967. 172 pp. Paper, $1.45. Reprint, 1962 edition.

International Review of Cytology. vol. 20. G. H. Bourne and J. F. Danielli, Eds. Academic Press, New York, 1966. 396 pp. Illus. $17. Eight papers.

International Review of General and Experimental Zoology. vol. 2. William J. L. Felts and Richard J. Harrison, Eds. Academic Press, New York, 1966. 454 pp. Illus. $18. Six papers.

Intonation, Perception, and Language. Philip Lieberman. M.I.T. Press, Cambridge, Mass., 1967. 224 pp. Illus. $7.50.

An Introduction to Animal Behavior: Ethology's First Century. Peter H. Klopfer and Jack P. Hailman. Prentice-Hall, Englewood Cliffs, N.J., 1967. 313 pp. Illus. $6.75. Prentice-Hall Biological Science Series.

An Introduction to Linear Programming and the Theory of Games. S. Vajda. Methuen, London; Barnes and Noble, New York, 1967. 76 pp. Illus. Paper, $1.50.

Introduction to Quantitative Cytochemistry. George L. Wied, Ed. Academic Press, New York, 1966. 639 pp. Illus. $25. Twenty-eight papers.

Invertebrate Zoology. Paul A. Meglitsch. Oxford Univ. Press, New York, 1967. 983 pp. Illus. $11.

Invitation to Archaeology. James Deetz. Published for the American Museum of Natural History. Natural History Press, Garden City, N.Y., 1967. 160 pp. Illus. $4.50.

W Laboratoriach Fizyków. Stanisław Ignatowicz, Walerian Majewski, Zbigniew Płochocki, and Dominik Rogula, Eds. Pánstwowe Wydawnictwo Naukowe, Warsaw, 1966. 427 pp. Illus.

Laboratory Exercises in General Biology. James W. Mavor and Harold W. Manner. Macmillan, New York, ed. 6, 1967. 329 pp. Illus. $4.95.

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