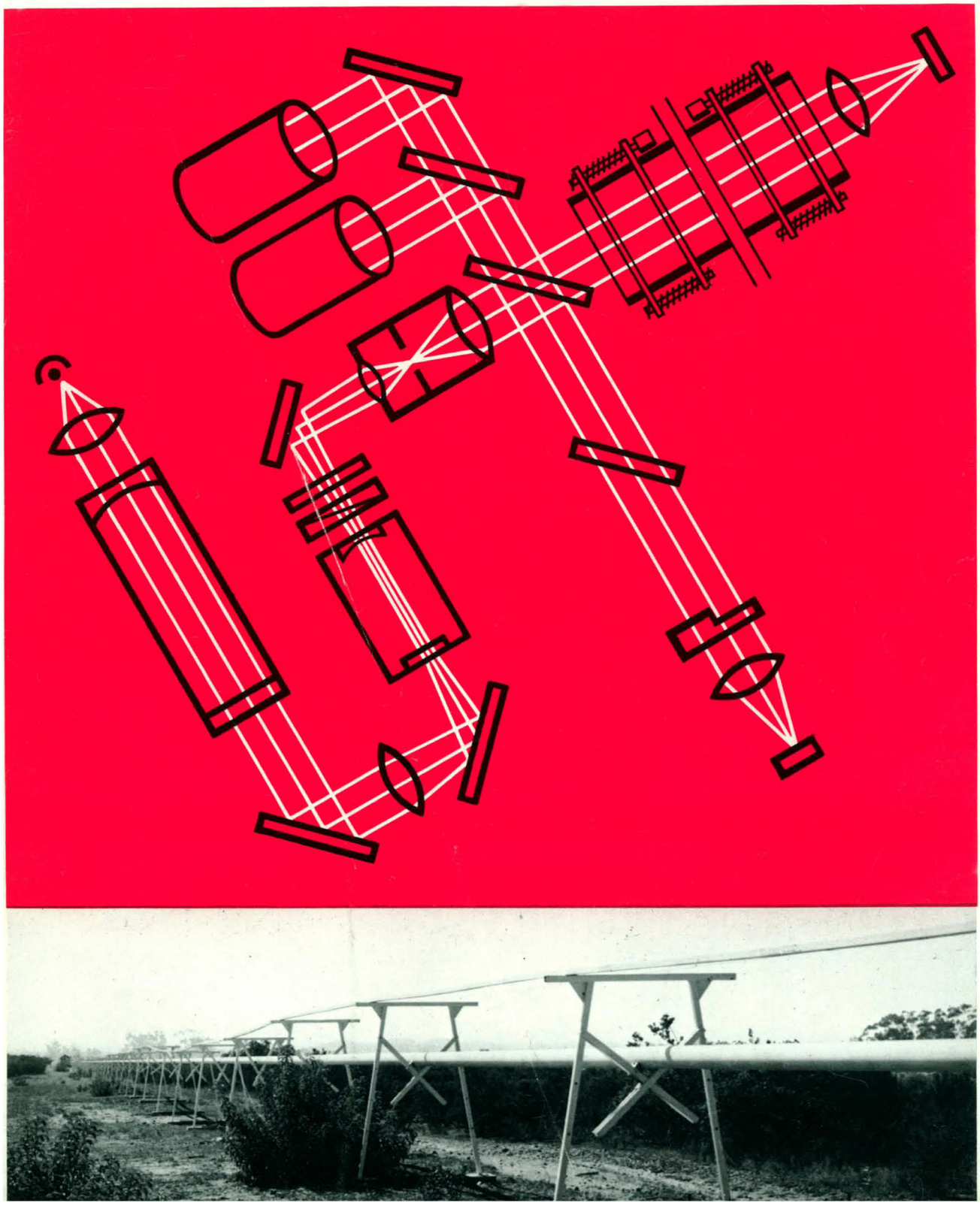
SCIENCE

16 October 1970

Vol. 170, No. 3955

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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This Model 101 electron microscope provides consistent performance whether you produce ten or ten thousand plates a year.

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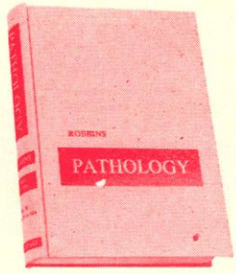

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This standard text, designed specifically for students and clinicians, is the most widely used in its field. It provides in-depth study of pathogenesis, dynamics, phases, alterations, and variations of disease, and correlates them with clinical medicine. New chapters cover *Genetics and Disease* and *Diseases of the Aging.*

1462 pp. 1061 figs. Two-vol. set $25., single $20.50. June, 1967.

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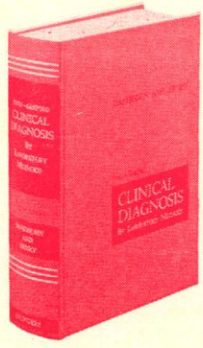
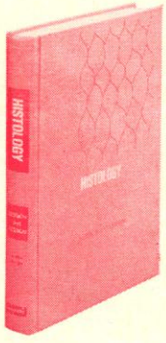
CLINICAL DIAGNOSIS BY LABORATORY METHODS *14th Edition*



The 14th edition of this classic text provides the student with the latest concepts and techniques in laboratory science, as outlined by the editors and 27 contributors. Additions include a chapter on cytogenetics, data on radioactive isotopes, and new material on blood and urine.

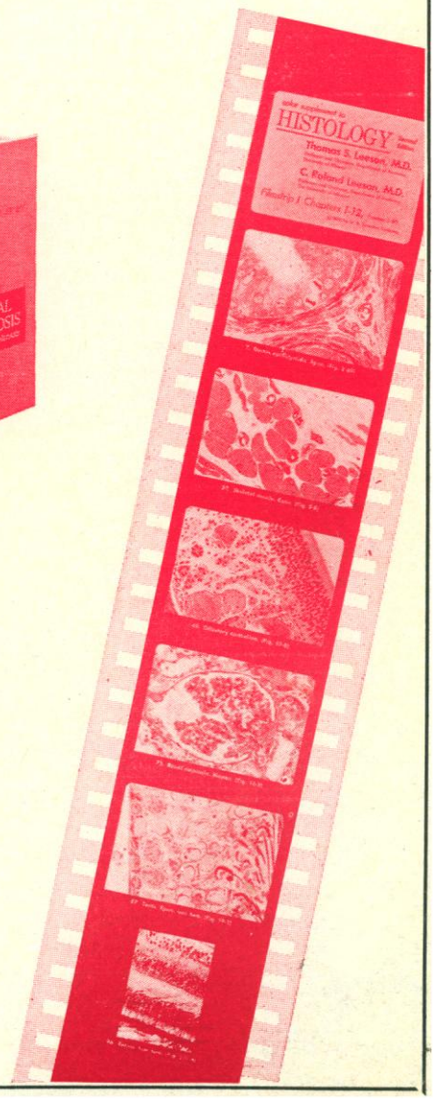
1308 pp. 698 figs., 94 color. $24. Jan., 1969.



Leeson & Leeson: **HISTOLOGY** *2nd Edition*

This text is a storehouse of essential histological information, offering a firm understanding of the three major aspects of microanatomy—cell biology, basic tissues, and systematic histology of the organ systems. This edition includes many new illustrations of Epon sections, transmission electron micrographs, and scanning micrographs. Two 35 mm. text-keyed filmstrips featuring 100 full-color photomicrographs are also available.

525 pp. 470 figs. $11. Jan., 1970. Films, $15.



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COVER

(Top) Schematic of the optical configuration of the Laser Strain Meter. (Bottom) Eight-hundred-meter, evacuated tube installed at Elliott Physical Observatory, San Diego, California. See page 296 [Robert Winsett, University of California, San Diego]

Philips announce a new electron microscope

The Philips EM 201 is a high resolution electron microscope designed for routine investigations rather than advanced experimental work. It derives from experience gained from engineering techniques that have made the Philips EM 300 the world's most advanced and most successful microscope. The EM 201 is intended for day to day use where high reliability, high stability and ease of operation are more important than extreme resolution. It sets a new standard for electron microscopes – it is the first of a new class of instruments with far higher resolution than the conventional middle range models but without the extreme versatility and resolution of the EM 300.

9 AU resolution

The EM 201 has a guaranteed point to point resolution of nine ångstrom units and can attain seven ångstroms in favourable circumstances. The resolving power of any microscope is set by its objective lens, and however advanced the design no magnetic lens obtains its theoretical limits in practise. Philips have pioneered in the EM 300 a degree of practical engineering which gives the objective lens sufficient mechanical and electrical stability to guarantee a high resolving power under normal operating conditions without the need for special alignments. This unique expertise is now available for the first time in a regular price instrument. – the EM 201.

Easy to operate

Advances in electronic and mechanical design make the EM 201 simple to use. Complicated start-up procedures have been completely eliminated. Camera handling is simplified by motorised film and plate transport devices which operate as soon as the exposure is completed.

When changing the magnification the objective lens current is varied automatically to keep a roughly focussed image on the screen. All electrical controls are on two panels at the operators fingertips. Magnification is variable from 1500x to 200 000x in 14 steps and is presented on a digital readout to make exposure logging easier.

Clean vacuum

A completely automatic fail-safe vacuum system uses a stainless steel diffusion pump filled with polyphenyl ether backed by a two stage rotary pump. A water cooled baffle valve minimises back-streaming from the pump but the greatest contribution to a clean vacuum is made by using a thinwalled stainless steel tube around the beam path, so that all magnetic circuits apart from the objective less pole-pieces are outside vacuum. Most dynamic O-rings are replaced by metal bellow seals. This means that the EM 201 can maintain an exceptionally clean vacuum.

Advanced operational facilities

☐ The EM 201 is equipped for selected area electron diffraction with a selection magnification of 14000x and two fixed camera lengths. It also provides 200x magnification for rapid scanning of the specimen.

☐ Photographic recording is handled by a 35 mm, a 70 mm and a plate camera giving a total of 106 exposures in vacuo.

☐ Various TV and image intensifier systems can also be fitted.

☐ The unique Goniometer stage and the wide range of specimen holders developed for the EM 300 can also be used in the EM 201.

Unique condenser system

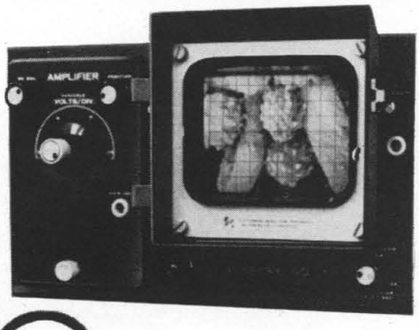
Philips have developed a special minilens illumination system for the EM 201 based on a totally new condenser lens which is small enough to fit in the upper bore of the objective lens. It can demagnify the beam to a 6 μm spot.

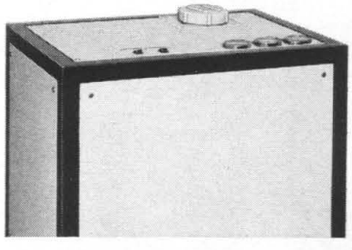
Simplified alignment

The EM 201's condenser and the intermediate and projector lens are permanently aligned and should never be touched. The objective never needs adjustment unless the column is dismantled and the gun is aligned electromagnetically on two straightforward criteria.

A new service for microscopists

The modern electron optics lab does not depend on microscopes alone; peripheral equipment is increasingly needed to exploit the technology of electron beams to the full. In order to meet this need Philips have inaugurated a special Electron Optics Division at Eindhoven, to handle all Philips Electron Microscopes, to provide specially designed or adapted equipment, and to supply associated apparatus.





☐ The initial range include an instrument to provide scanning microscopy on the EM 300, the Edwards E12E Vacuum Coating Unit and the ZEM 1A closed circuit water cooler.

☐ Future plans for Electron Optics Division include the adaptation of the Imanco image analysing computer for electron microscopes and the provision of a virtually complete range of apparatus for the electron optics lab from one source.

Eliminate Water Worries

Cooling water for electron microscopes can be a problem, especially in difficult climates. If local water is expensive or scarce, contaminated or naturally too hot, the Zephyr ZEM 1A closed circuit cooling unit can be used. Specially designed for Philips electron microscopes, it regulates water temperature, pressure and flow rate automatically. The entire installation is protected against damage by high pressure surges or frost. If the internal supply of water fails the ZEM 1A switches automatically to a standby supply.

Solve coating problems

Vacuum coating units have become indispensable in the preparation of specimens for electron microscopes and Philips can supply the Edwards E12E unit for this purpose. The E12E has reduced pump-down time, all stainless chamber and pump and a liquid nitrogen trap. In addition to a full range of chamber fittings, various electron bombarding sources and a new freeze etching device are available.

Convert to scanning

Philips have developed a special attachment for the EM 300 which makes it a scanning electron microscope. Called the EM 300 SEM Attachment, it is designed to operate with the Goniometer stage and its holders for rotating, heating, cooling or stressing the specimen. It works in transmission or reflection so thick specimens can be used and has two detectors for the primary electron backscatter. Resolutions of 250 AU have been demonstrated and frame and line rates can be controlled from 0.2 to 50 seconds. The resulting image is displayed on two 5 inch display tubes. Magnification is variable from

1000x to 1000 000x. Once the attachment is installed the microscope can easily be converted for transmission microscopy.

If you would like a full technical briefing on any Philips Electron Optics product or simply a brochure, please write to

Philips Electronic Instruments,
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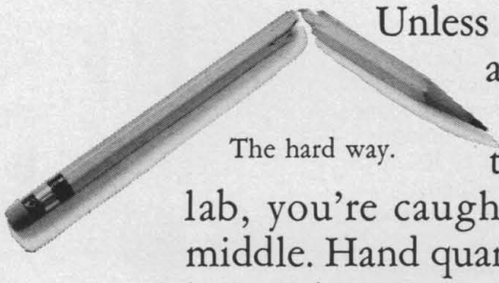

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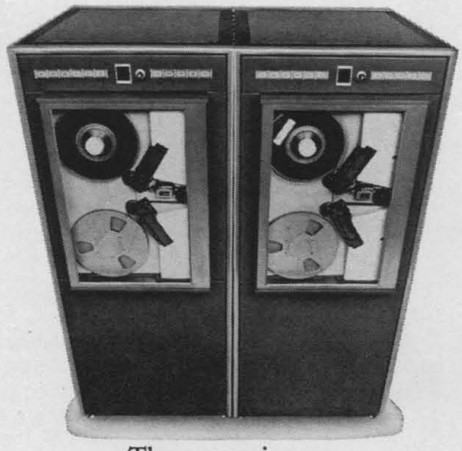

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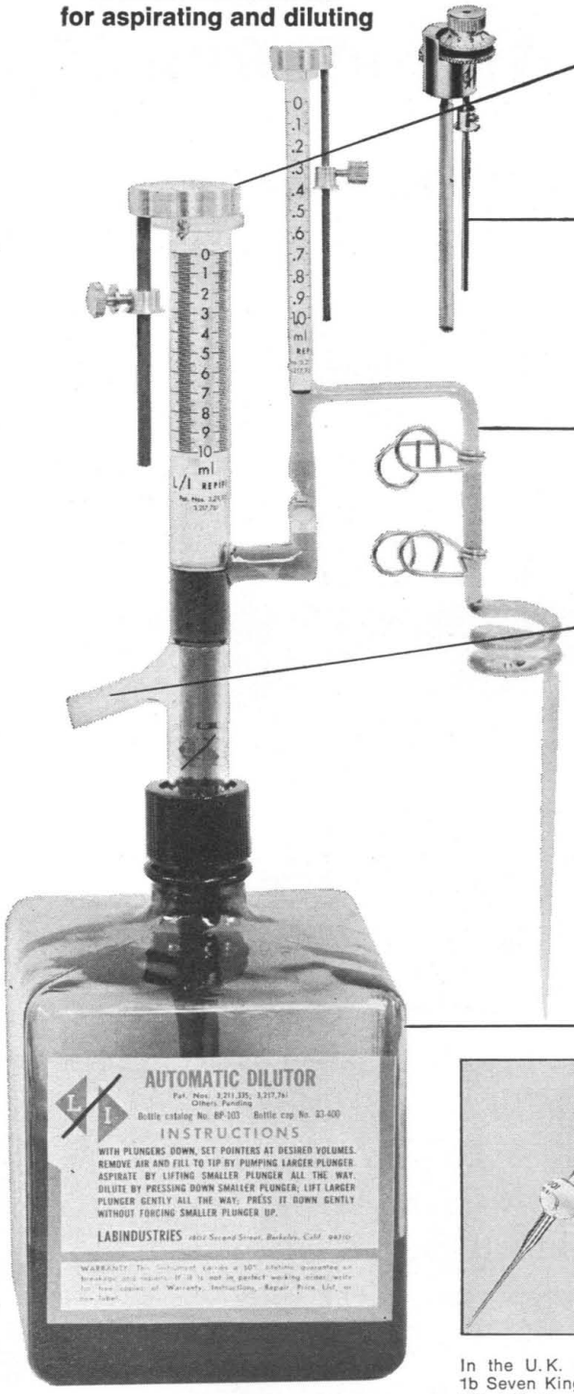

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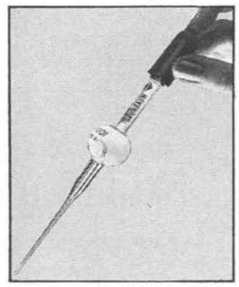

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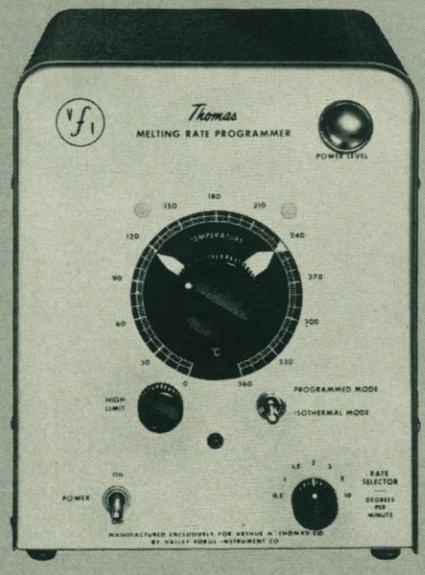

For automatically controlling rate of temperature rise in Thomas-Hoover Melting Point Apparatus. Ensures compliance with U.S.P. specifications for melting point determination on pharmaceutical products. Increases accuracy of m.p. determinations by eliminating subjective operator error in establishing and maintaining constant melting rate.

Frees analyst for other duties by making it unnecessary for him to remain at the instrument during bath warm-up. Assures inter-shift and inter-plant uniformity in technique and results. Usable with all Thomas-Hoover units now in service.

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Range 0 to 360°C.
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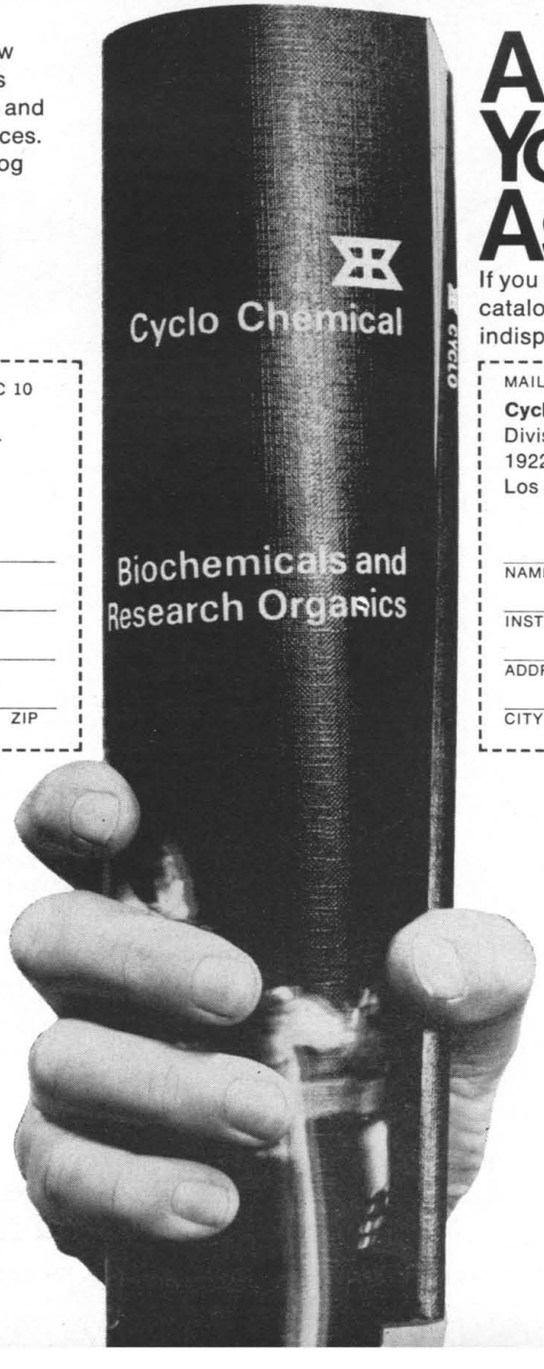

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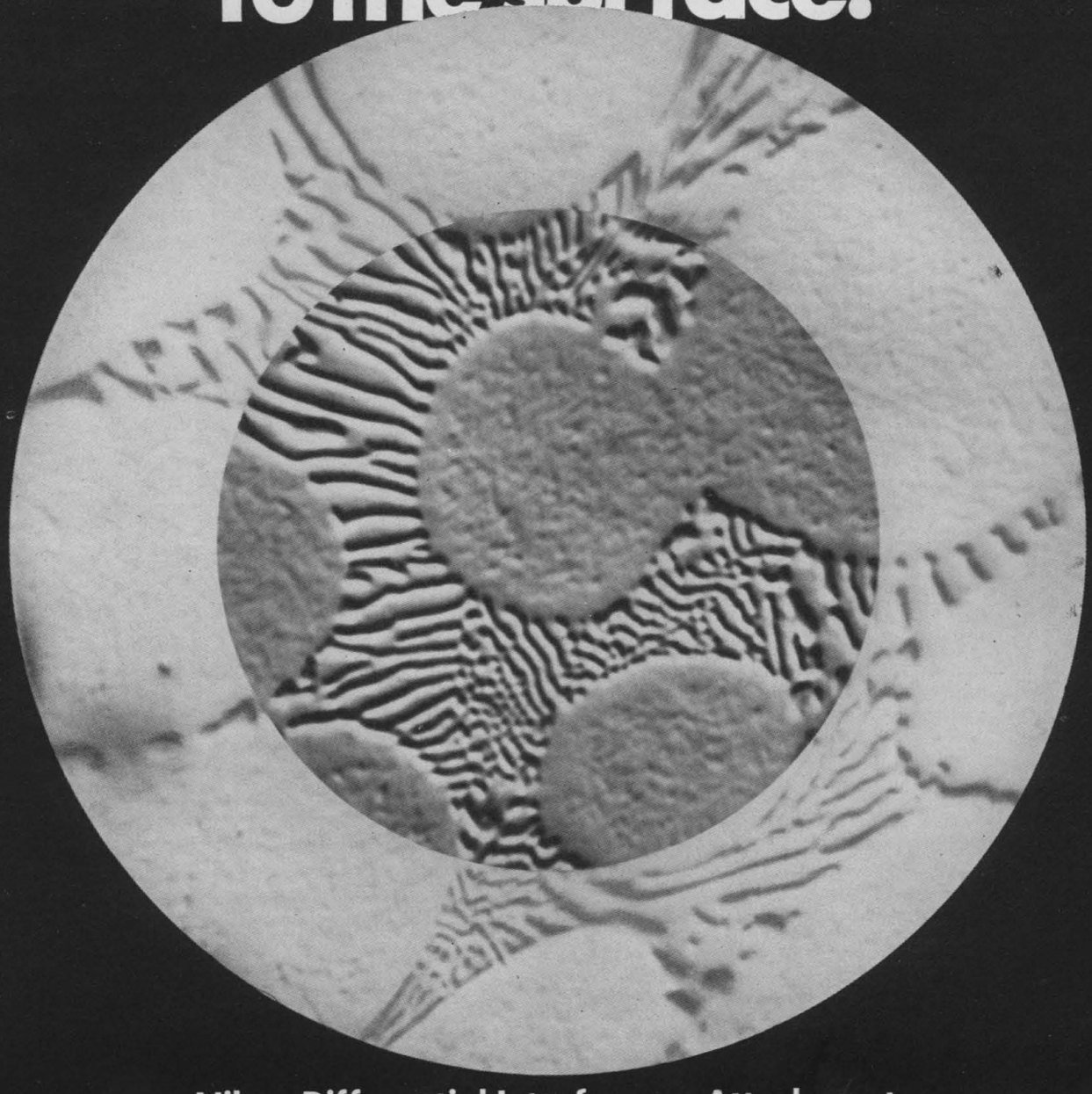

Nikon Differential Interference Attachment

Photographs courtesy of Dr. Robert Hoffman and Dr. Leo Gross of Waldermar Medical Research Foundation.

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Les membranes par B.A. Pethica et M. Cambrai

Les constantes physiques fondamentales par B. M. Taylor, D.N. Langenberg et W.H. Parker

La guerre chimique par N.D. Tam

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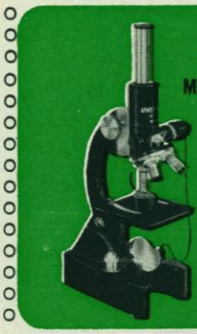

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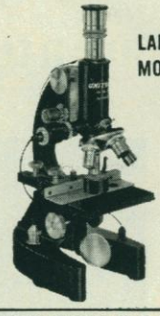

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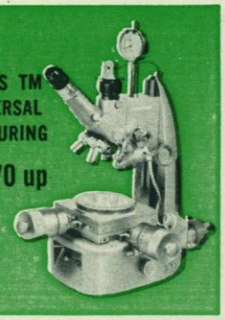

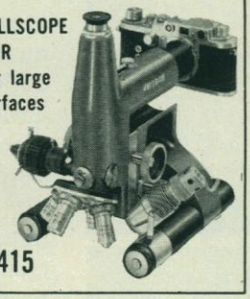

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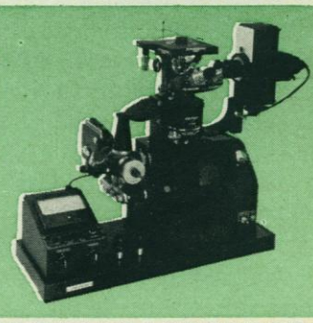
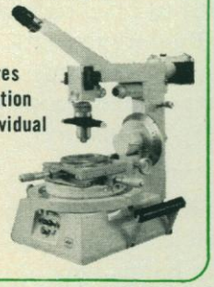


MICROGONIOMETER

Measures orientation of individual grains



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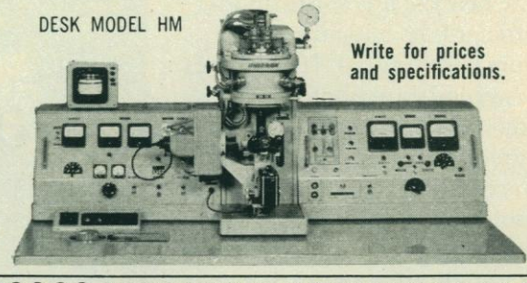

HHS Vacuum Heating Stage for 1500°C. $625

Austenite Grain Size Eyepieces: Turret Type $76 Ke10X $25

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The Cary 16.
The world's best manual spectrophotometer costs $9,000.
Scanning and Kinetics are a touch more.

When you combine its price and performance, there's really nothing quite like the Cary 16 manual spectrophotometer. But that's only part of the story. By adding a few well-chosen, reasonably priced accessories, the 16 becomes a very precise scanning instrument. A few other peripherals make it a kinetics system nobody else can come close to.

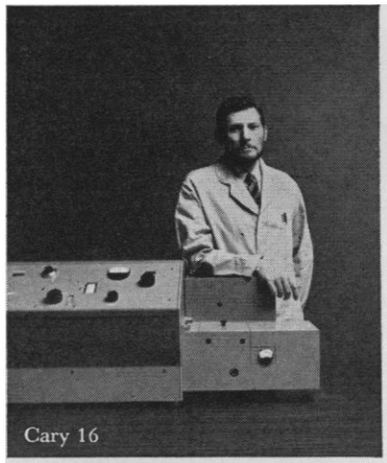
And so, you can end up with three research-quality spectrophotometers without having to buy three research-priced instruments.

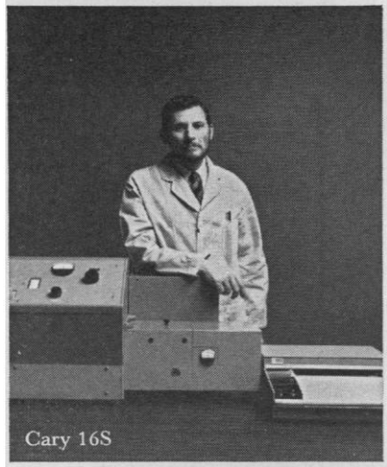
THE BASIC 16

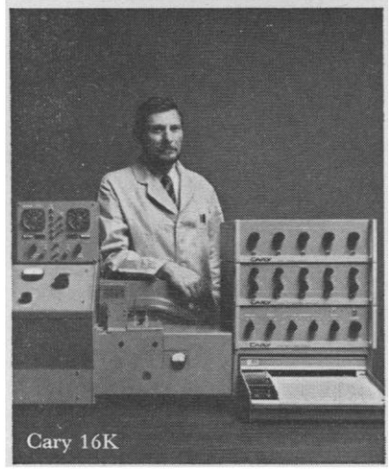
The heart of any spectrophotometer is its optical system. Ours has no equal. It combines a double-beam photometer, a double monochromator and a unique V-beam system of cell space optics. The result is high resolution, extreme photometric accuracy and negligible stray light. But, performance is no good if it's difficult to attain. So, in the manual Cary 16, we've reduced most analyses to a few simple steps.

SCANNING

To the basic 16 add a scan motor, slit servo mechanism, baseline compensator, and log recorder and it's the Cary 16S: a double-beam scanning spectrophotometer which uses a single detector photometric system and offers high accuracy and long term stability.


Cary 16


Cary 16S


Cary 16K

Both essential to recording meaningful spectra.

KINETICS

For automatic kinetics studies, the Cary 16K achieves a level of performance and convenience never before possible with commercially available equipment. Again, starting with the basic Cary 16, you select from a wide range of available kinetics accessories to tailor a system to suit your exact needs. These include a fully automatic five-cell sample changer with dwell and cycling timers, a recorder, an interface with individual scale expansions from 0.1 to 2.0 absorbance full scale, a dual wavelength drive, and a multi-balance accessory to permit individual zeroing of each sample.

HANDY GUIDE

In addition to complete operating specs, we'd like to send you a copy of our handy new *Cary 16 Systems & Accessories Guide*. It explains how you can start with a $9,000 Cary 16 and end up with three research-quality spectrophotometers for a touch more. For your copy, or to arrange a demonstration, write Cary Instruments, a Varian subsidiary, 2724 South Peck Road, Monrovia, Calif. 91016. Ask for data file E006-100.

cary instruments

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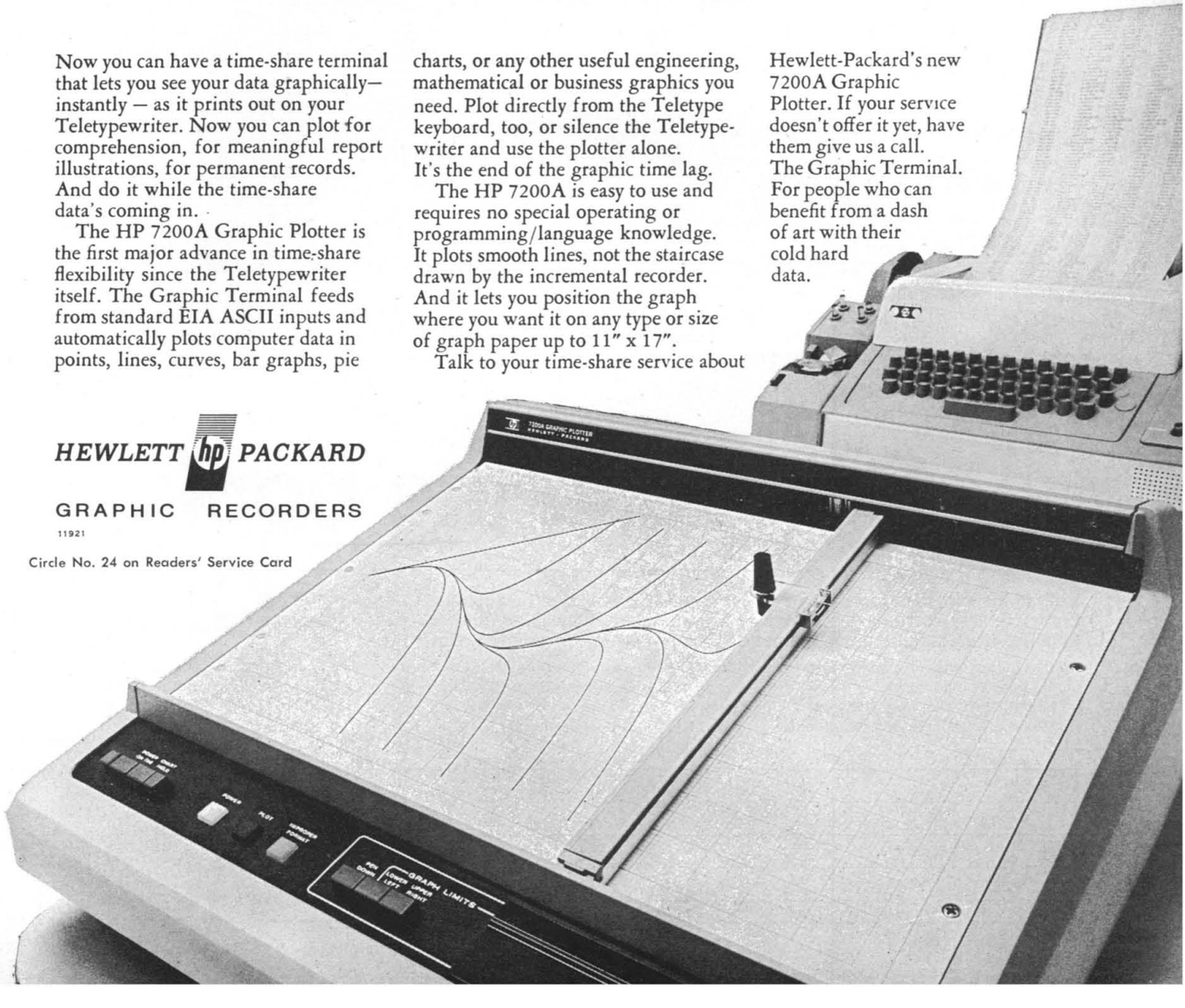
Draw your own conclusions with this new time-share terminal.

Now you can have a time-share terminal that lets you see your data graphically—instantly — as it prints out on your Teletypewriter. Now you can plot for comprehension, for meaningful report illustrations, for permanent records. And do it while the time-share data's coming in.

The HP 7200A Graphic Plotter is the first major advance in time-share flexibility since the Teletypewriter itself. The Graphic Terminal feeds from standard EIA ASCII inputs and automatically plots computer data in points, lines, curves, bar graphs, pie charts, or any other useful engineering, mathematical or business graphics you need. Plot directly from the Teletype keyboard, too, or silence the Teletypewriter and use the plotter alone. It's the end of the graphic time lag.

The HP 7200A is easy to use and requires no special operating or programming/language knowledge. It plots smooth lines, not the staircase drawn by the incremental recorder. And it lets you position the graph where you want it on any type or size of graph paper up to 11" x 17".

Talk to your time-share service about Hewlett-Packard's new 7200A Graphic Plotter. If your service doesn't offer it yet, have them give us a call. The Graphic Terminal. For people who can benefit from a dash of art with their cold hard data.



HEWLETT hp PACKARD

GRAPHIC RECORDERS

11921

Circle No. 24 on Readers' Service Card

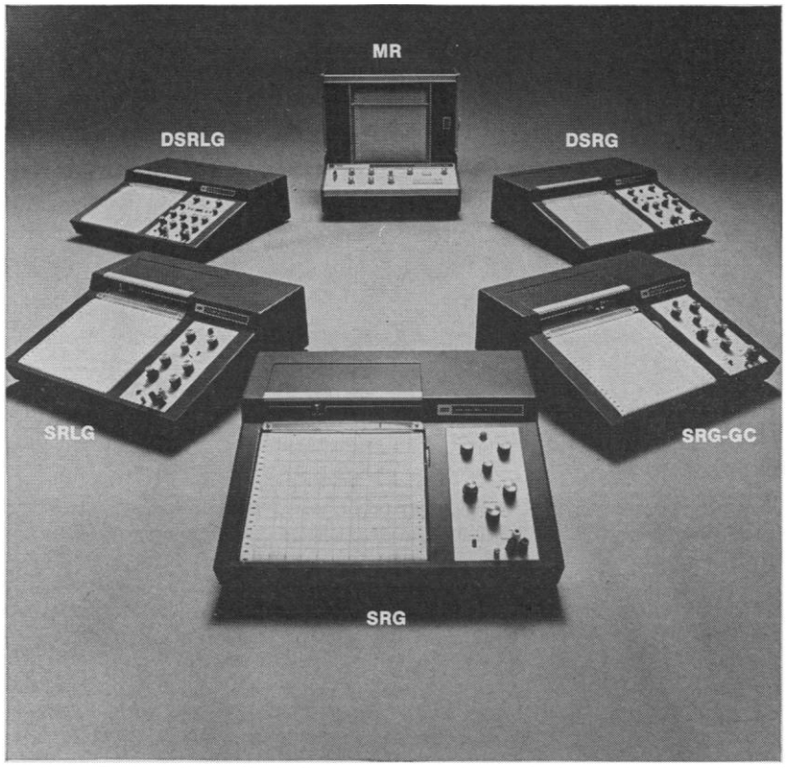
Potentiometric recorders: here's the picture.

Shown here, a portrait of all there is to know about potentiometric recorders. All from Sargent-Welch. And each deserves its own personality profile:

Model SRG: The basic recorder, distinguished by its advanced performance. Seven pre-calibrated spans. Three chart speeds. Guarded circuits and filtered inputs. Accuracy: ±0.25%. Reproducibility: ±0.1%. Full-scale pen response: Less than one second. Basic price: $975.

Model DSRG: The SRG times two. That is, a dual-pen recorder, with two linear channels, for recording two time-related variables, side by side or overlapping, on the same chart. Same matchless performance as the SRG, but only a few inches wider. Think of it as a space- and paper-saver. Basic price: $1675.

Model SRLG: The SRG taken one step further, with the addition of a logarithmic function. Eminently suited, therefore, for recording (say) the log of absorbance with a spectrophotometer. Precision, non-circular gears — which do the job much better than electrical approximations to the log function. Basic price: $1225.



Model DSRLG: Another logical move. Two SRLG's in one dual-pen recorder. Think of what that means if you work with a spectrophotometer, photometer, or densitometer — simultaneous recording of both transmittance *and* absorbance. Or linear/log recording of any two time-synchronized variables. Basic price: $2075.

Model SRG-GC: Something special, for use with a gas chromatograph. Fast response, high AC rejection, floating input, three chart speeds, and continuously variable wide-range spans. Optional integrator for precise measurement of areas under recorded curve. Basic price: $975 (with integrator, $1660).

Model MR: The ultimate recorder? Perhaps. Few can match it for precision, speed, sensitivity, and versatility. Measures and records (vs. time) any variable that can be translated into voltage or current, *or* that can be time-related by synchronous drive. Twelve ranges, twelve speeds. Basic price: $2650.

As we said, a complete picture of a complete line.

Now read the book.

0-214

Still, in all fairness, one picture and these few words don't do justice to our complete line of recorders. So we've prepared a fully illustrated, 30-page catalog. It's yours, without obligation, for returning the coupon. Do it now.

I'd like a copy of your recorder catalog. I'm especially interested in:

- ☐ Model SRG Recorder
- ☐ Model DSRG Dual-Pen Recorder
- ☐ Model SRLG Linear-Log Recorder
- ☐ Model DSRLG Dual-Pen Linear-Log Recorder
- ☐ Model SRG-GC Recorder for Gas Chromatographs
- ☐ Model MR Multi-Range Recorder

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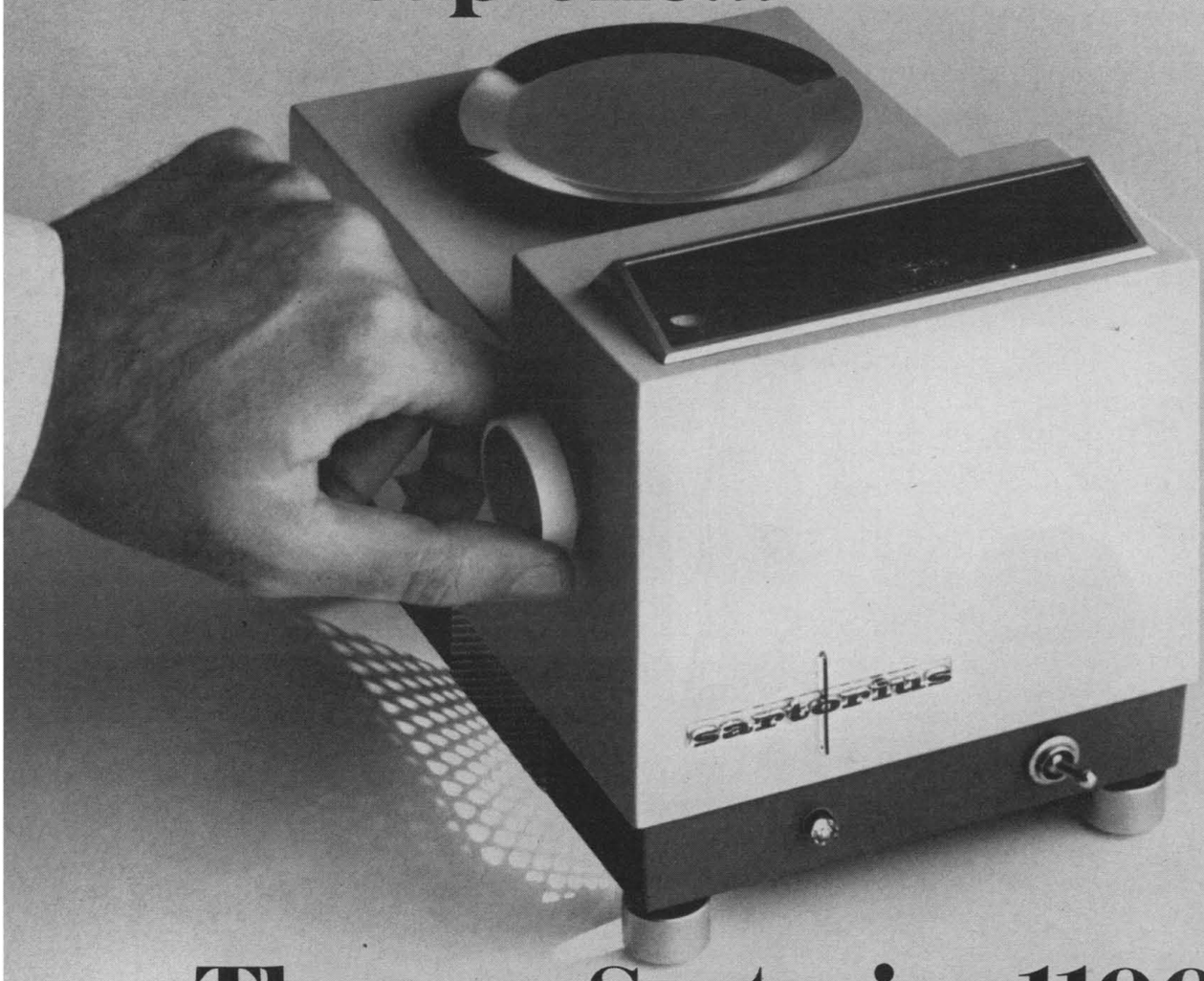
Announcing a scanning electron microscope that puts scanning capability within reach of every laboratory. JSM-S1 from Jeolco. ☐ Jeolco's new S1 scanning electron microscope. Which puts quality, high-volume scanning capability in only 3 x 4 feet of laboratory floor space. ☐ Our unique way of getting right down to the surface of specimens. ☐ At a price you can afford. With TV scan to help you quickly find the area you're looking for. Continuous magnification from 19 to 100,000X with direct display readout in 8 fixed steps. ☐ And guaranteed resolution of 250 angstroms. ☐ With a unique goniometer stage tilting −5 to +45°, 360° continuous rotation. Air locks. 4 x 5″ Polaroid camera. And a fully automatic vacuum system. ☐ With color-coded controls that work like people do. So the JSM-S1 is far simpler to learn and operate. ☐ With completely solid-state modular design that provides high reliability and low maintenance. With a solid-state high-voltage power supply built right into the column. ☐ Which all helps make the Jeolco S1 compact. And simple. ☐ Give it a little room in your lab. ☐ Never will so many owe so much to so little. ☐ For details, please write Jeolco (U.S.A.) Inc., 477 Riverside Avenue, Medford, Massachusetts 02155, Telephone (617) 396-6021.

Jeolco.

Putting the 70's into focus.

Circle No. 19 on Readers' Service Card

For laboratories that don't need an 'expensive' top loader, yet can't use a 'cheap' one...



The new Sartorius 1100. Only $425.

Why pay for an expensive balance your lab may not really need? Why buy slower and cruder equipment that doesn't meet today's standards? Sartorius solves the dilemma with its new Series 1100 top-loaders — the first balances to bridge the gap between modern design and low price.

At only $425, the Series 1100 offers many features usually found only on more expensive, sophisticated weighing instruments. For example: all-digital readout; results in less than 3 seconds; wide-range mechanical taring; fast, easy operation with no weights to handle and not even any dialing of built-in weights. It's a torsion-type balance, and the optical scale covers the entire weighing range.

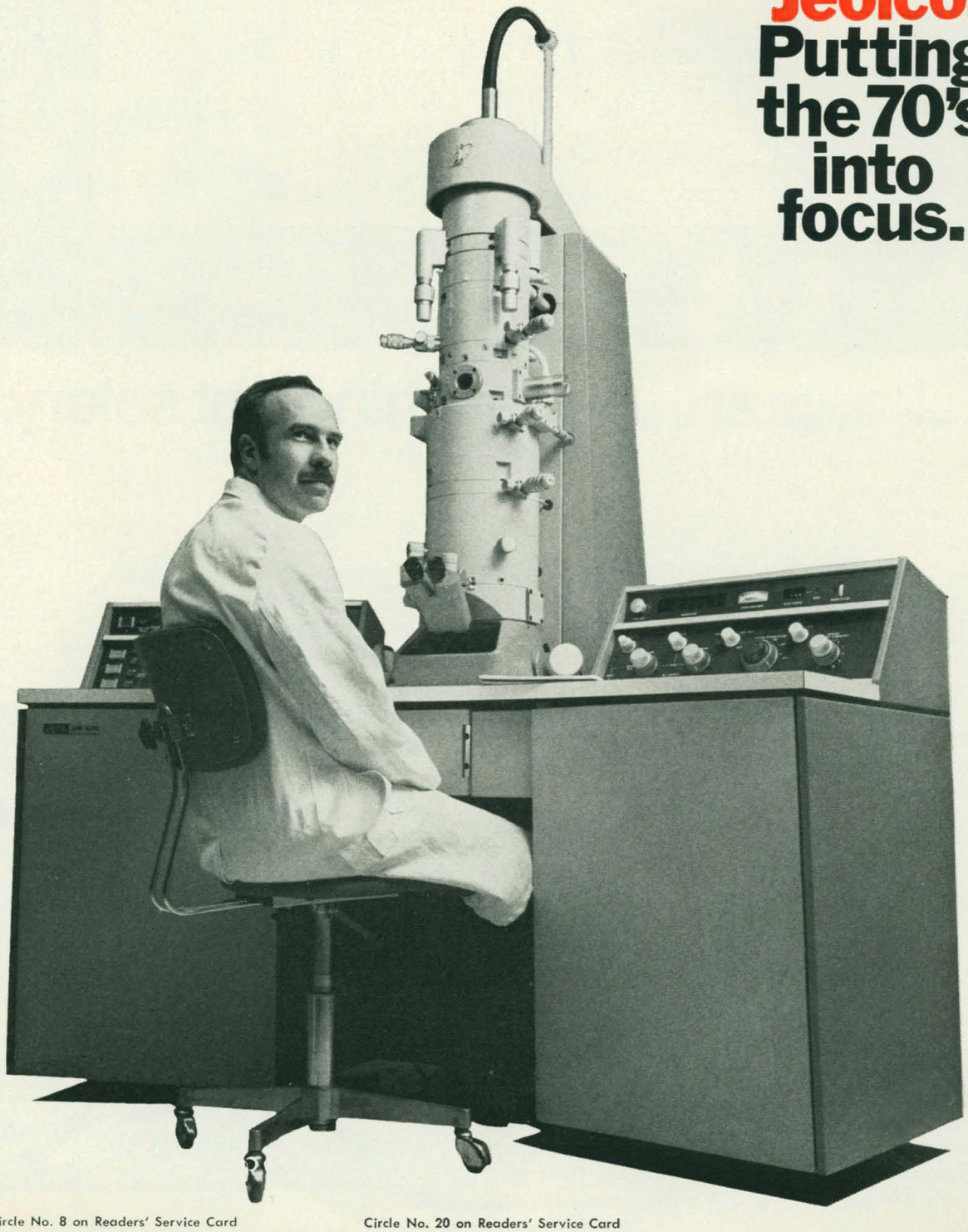
Available in three different capacity/accuracy ratios—1000g/0.1g, 200g/0.015g and 100g/0.01g—these new, reasonably priced balances are ideal for a variety of applications, from student use and research to quality control weighings.

If you're in the market for a new balance for weighing in the range from less than 100 grams up to 1500 grams, you really ought to find out more about the new Series 1100. We'll be happy to send you complete literature and our free 52-page catalog. Just write: Sartorius Division, Brinkmann Instruments, Cantiague Rd., Westbury, N.Y. 11590.

sartorius balances

Jeolco's JEM-100B. Two of the best electron microscopes you'll ever see. ☐ You already know part of our story. Our JEM-100B transmission electron microscope. 2 Å resolution guaranteed. A guarantee already proven in laboratories throughout the world. ☐ And now we've added scanning capability to make the 100B two of the most capable electron microscopes you'll ever use. ☐ So now you can put the third dimension to work on your next project. Or take advantage of the contrast and penetration of scanning transmission microscopy, which provides the image quality with thick sections described at this year's International Electron Microscopy Meeting. ☐ By adding a 200 Å guaranteed secondary electron capability and a 100 Å guaranteed scanning transmission capability to a proven 2 Å transmission microscope, we've produced the most versatile and complete transmission electron microscope available. Best of all, these capabilities are available without continual change of hardware and without sacrifice of basic performance. ☐ To bring these capabilities into view, send for our new brochure. ☐ Jeolco (U.S.A.) Inc., 477 Riverside Ave., Medford, Mass. 02155, Tel. (617) 396-6021.

Jeolco.
Putting the 70's into focus.



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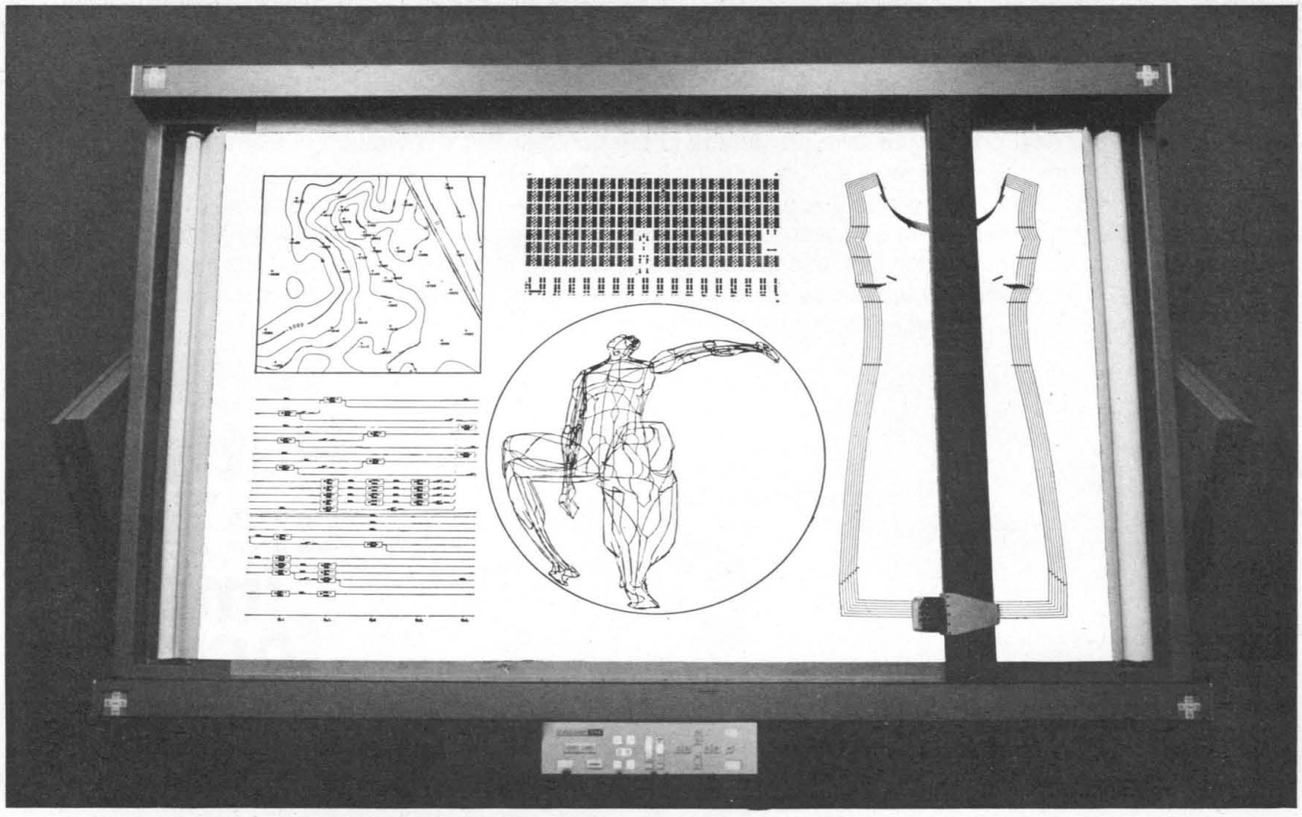

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Being versatile has done a lot to make CalComp's 718 flatbed plotter the world's most popular.

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But if you do, there's our new 728 flatbed plotter. With the same huge 27 square foot drafting area.

But with laser-calibrated accuracy. *Guaranteed.*

Naturally, when you choose from six different CalComp flatbed plotters and 25 separately-defined systems, you pay for only the precision you need. On jobs like these.

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CalComp is the leader in computer graphics. With sales, service and comprehensive software support in 34 cities around the world.

And with the greatest variety of computer-controlled plotters anywhere. Drum plotters, COM plotters, and since 1966, Flatbed plotters.

So call your nearest CalComp man today. And ask him to size up your drafting requirements.

Maybe our versatile 718 flatbed plotter is exactly what you need.

If not, there's our *exact* 728.

CALCOMP

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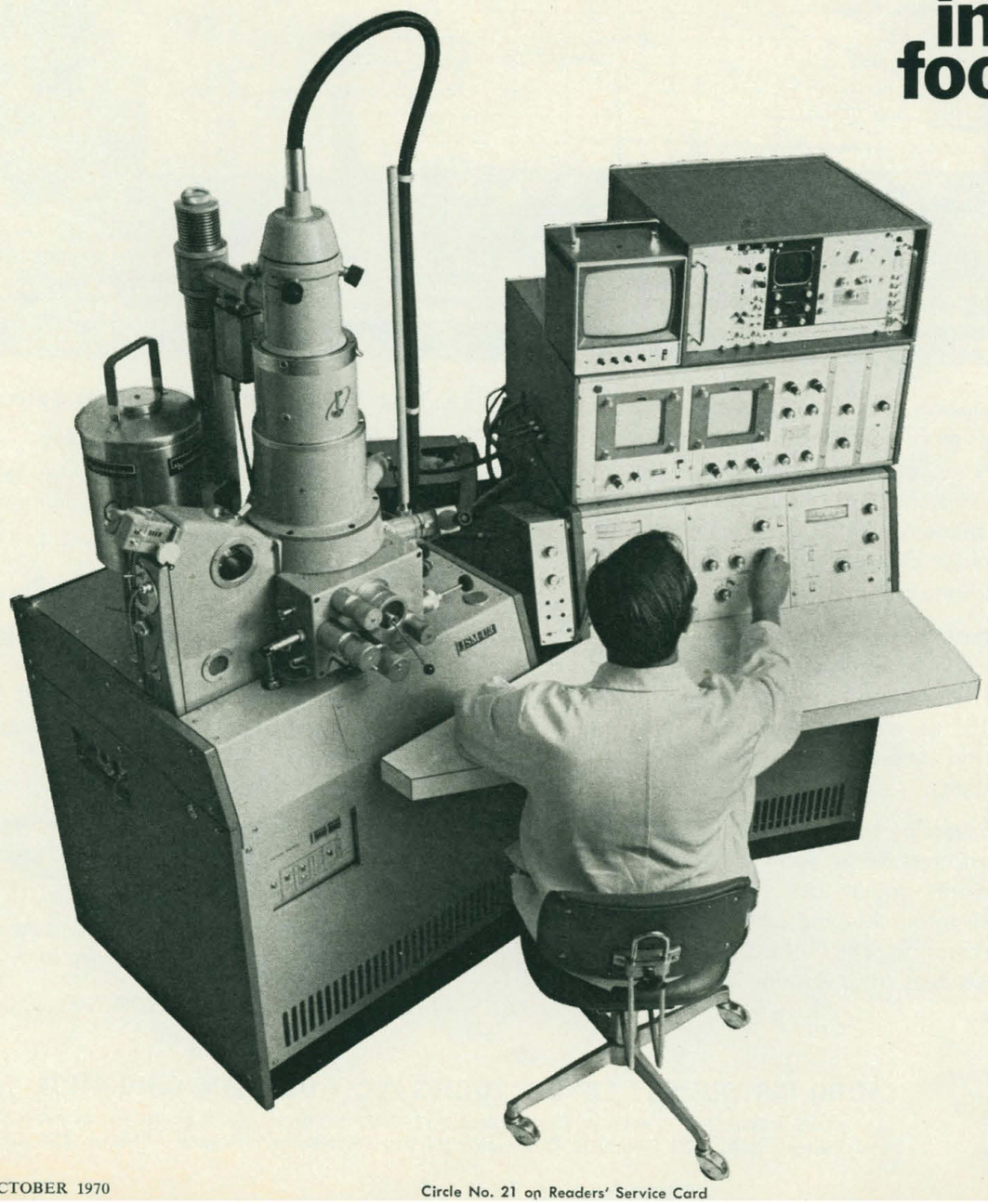
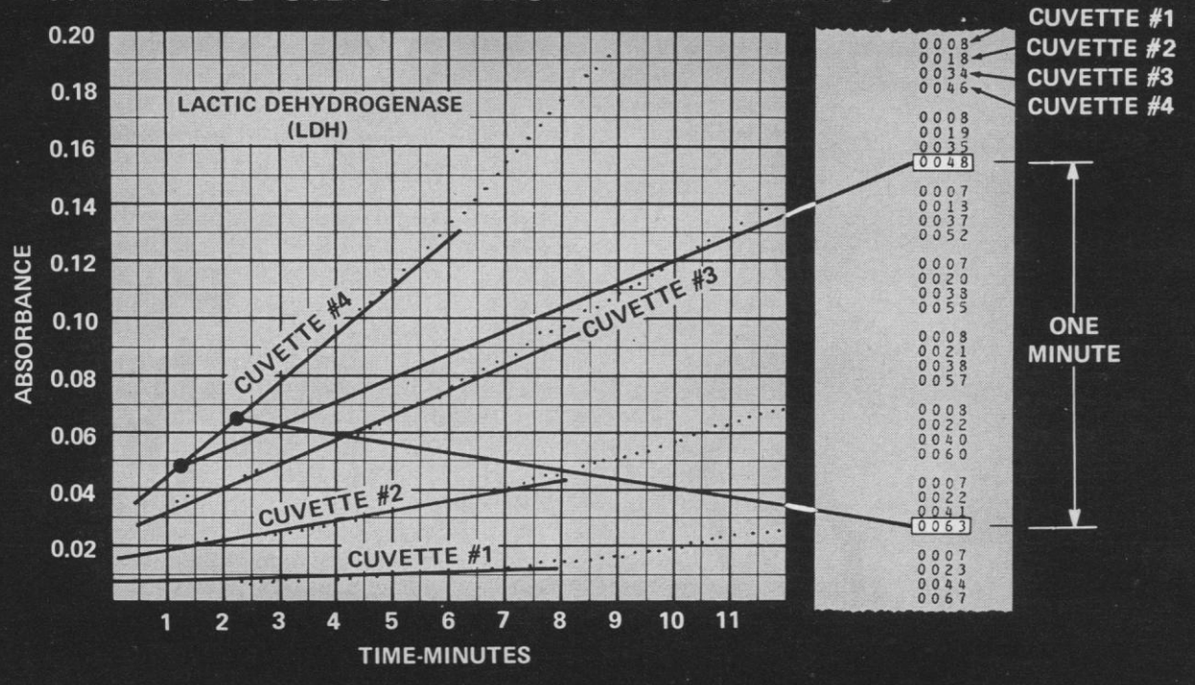
Today. It's still Jeolco accomplishments vs. competition's good intentions. ☐ Everyone knows a full range of accessories makes a good scanning electron microscope an even more valuable investment. ☐ Provided the accessories are really available. ☐ Jeolco's are. ☐ Take our JSM-U3. As you read this ad, 37% of all U3 owners have added our energy dispersive x-ray analyzers. 75% are using our TV scan. 10% are now heating specimens under test to 450° or 1100°C. 10% can apply stress to 10 kg or 200 kg. 25% are using a transmitted electron detector. ☐ And all enjoy the extraordinary reliability, 200 angstrom guaranteed resolution, universal goniometer stage, state-of-the-art 2 lens optical system, and automatic vacuum control that are proven U3 features. ☐ To find out more about the ways Jeolco accessories make your investment more productive, visit one of our demonstration centers and give the JSM-U3 a good workout yourself. Or just watch one of the TV tapes we've prepared on our dynamic accessories. ☐ Either way, you'll discover there's more to Jeolco than promises, promises. ☐ Jeolco delivers. ☐ Jeolco (U.S.A.) Inc., 477 Riverside Ave., Medford, Mass. 02155, Tel. (617) 396-6021.

Jeolco. Putting the 70's into focus.



Simplified Interpretation of Enzyme Rate Data

WITH THE GILFORD DIGITAL ANALYSIS SYSTEM



The chart recording in the figure above was made with a Gilford Automatic Recording Spectrophotometer equipped with the Gilford Automatic Sample Handling System. The tape printout was produced simultaneously on a Gilford Data Lister equipped with a precision Timer. Compare the ease with which the tape printout can be interpreted.

0.001 *A* Resolution. The new Gilford System for digital analysis gives you a printed numerical record of enzyme rate information *directly in absorbance* with a constant resolution of 0.001 *A* — accuracy made possible by the sensitivity, linearity and wide measuring range of the unique Gilford Spectrophotometric System.

Eliminate Chart Interpretation and Analysis. There are no adjustments of chart controls nor any off-scale readings. You get as many data points digitally as with a recorder. And you avoid errors in the transcription and interpretation of data.

Fast, Easy Conversion to Enzyme Concentration. Absorbance printout on an accurately controlled time base permits you to use a convenient enzyme template to quickly and easily convert ΔA data to concentration. The Gilford Enzyme Template contains tables of ΔA/min. vs. IU/liter for many enzymes.

Acquire Your Digital Enzyme Analysis System The Flexible Gilford "Building Block" Way:

If you already have a Gilford Spectrophotometric System*, you simply add the Gilford Absorbance/Concentration Meter and Data Lister with Time Base.

*Model 2000 ... 220, 222 or 222-A ... 240 or 2400.

If you have an Outmoded Spectrophotometer*, you can update it, using your optics. Just add a Gilford Photometer, Automatic Sample Handling System, Digital Absorbance/Concentration Meter and Data Lister/Timer.

* Littrow single-beam type.

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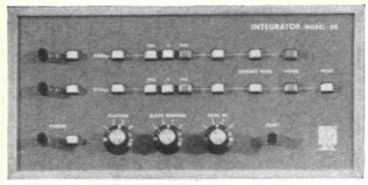

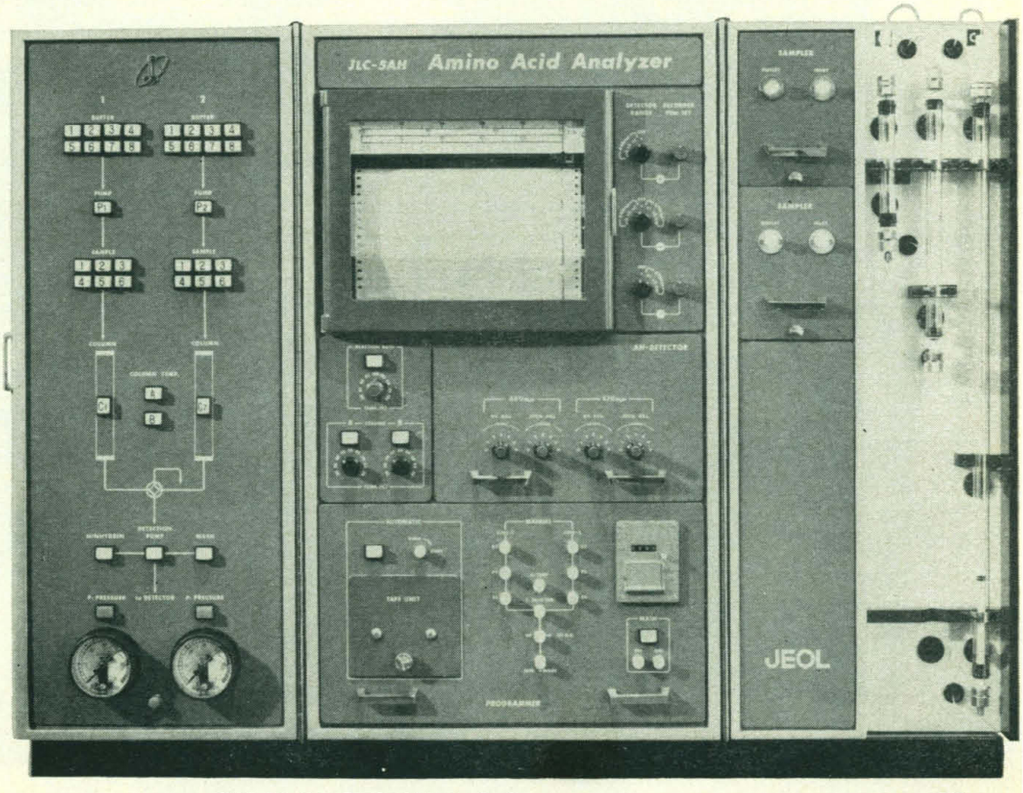

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General Electric introduces the first fully portable, ultra-sensitive nuclear counting system. And, it's under $3,000.

This is the first new nuclear counting system in over ten years. It's the General Electric NUCLE-EYE(TM) Monitor System, an entire nuclear laboratory in a 10 x 14 x 3" case.

With a built-in power supply and carrying handle, the eight-pound GE NUCLE-EYE Monitor goes everywhere your rack of nuclear instruments can't.

But don't think we've sacrificed capability for compactness. Fact is, General Electric's NUCLE-EYE System competes with far costlier systems when it comes to ultra sensitivity. Even low radiation counting is practical because the NUCLE-EYE Monitor features a semi-conductor detection system with high gain.

The heart of this amazing Monitor System is its solid-state "front end." It contains a silicon "avalanche" diode, the world's first solid-state proportional detector. And it also features high speed tunnel diode circuitry.

Detection by the NUCLE-EYE Monitor is extremely fast. In fact, almost as fast as a nuclear particle can create a signal in a solid. The result? Background noise is virtually eliminated. You can count low energy radiations with low background at elevated temperatures or count at the highest rates with no loss of precision.

With General Electric's NUCLE-EYE System, you easily detect nuclear radiation from the softest betas to high energy gamma radiation. Interchangeable heads are available, optimized for beta or gamma radiation.

What applications do we foresee for our exciting new system? Here are just a few:

Nuclear biology and physics

- Ultra soft x-ray and low energy beta research

Circle No. 119 on Readers' Service Card

Medicine and dentistry

- In-vivo probing
- X-ray fluorescence scanning and analysis
- Dental enamel studies
- Bone density scanning with isotopes
- Health physics instrumentation
- Carbon-14 research and experiments
- Opthalmological tumor detection

The portable model (illustrated) is equipped with an x-ray detection head sensitive to energies greater than 1 keV, digital readout, sampling time control and a rechargeable nickel-cadmium battery system. Provisions are made for driving external rate meter, printer, comparator or other data systems.

- Non contamination radiotracing
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For more information, contact Space Technology Products, P. O. Box 8439, Philadelphia, Pa. 19101 Phone: (215) 962-8300

162-48

ACTUAL SIZE

This page contains everything you need to do life sciences GC extraordinarily well.

Our Model 2100 is the best "U" column gas chromatograph ever made. It was designed specifically for life science and bio-medical applications. By people who know what they—and you—are doing.

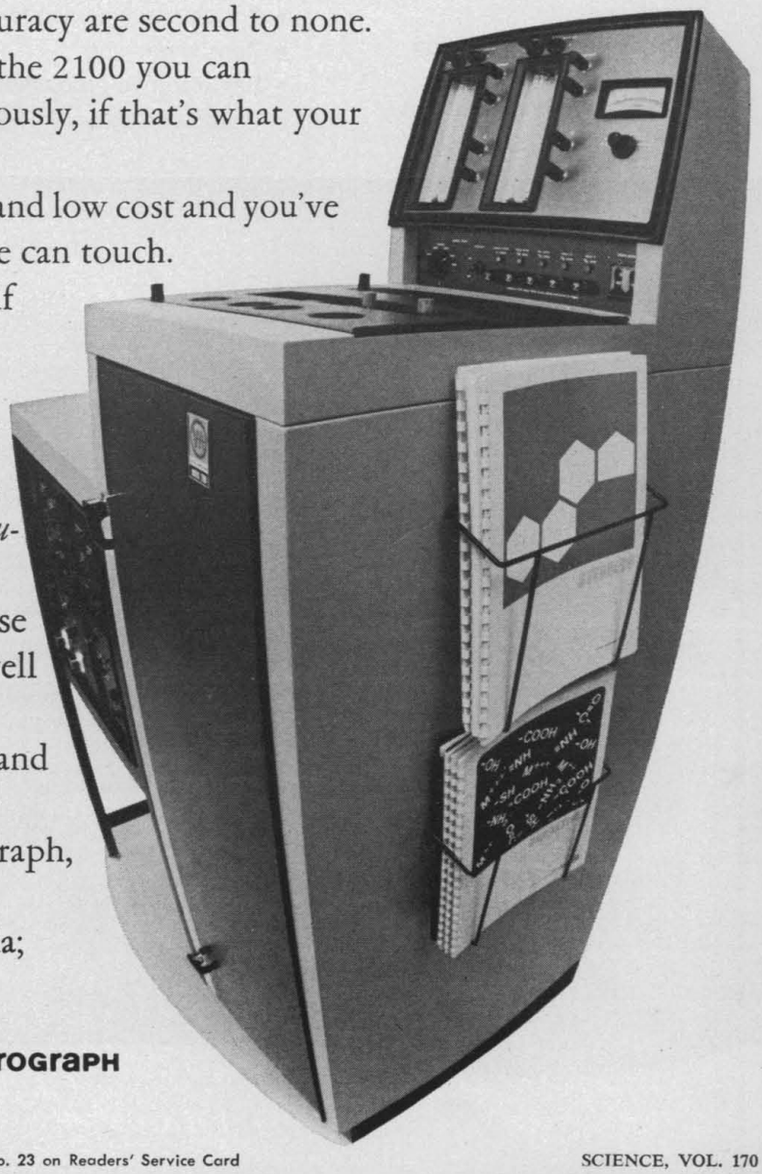
The 2100 is an all-glass system with on-column injection so that you can analyze even the most labile compounds with complete confidence. You get virtually no dead volume and precision and accuracy are second to none.

Then there's versatility. With the 2100 you can operate up to four columns simultaneously, if that's what your workload calls for.

Add fast, personalized service and low cost and you've got a life sciences GC that nobody else can touch.

But our instrument is only half the story. The other half is a series of unique life sciences GC methodology books. Each a procedural "cook book" in itself. Our titles include: *Fatty Acids, Steroids, Lipids, Carbohydrates, Pharmaceuticals & Drugs* and *Alcoholic Beverages.*

You can have any or all of these fine books with our compliments as well as a detailed product bulletin on the Model 2100. Simply write your name and the books you want on your company letterhead and mail it to Varian Aerograph, Walnut Creek, California 94598; Tokyo, Japan; Malton, Ontario, Canada; Crows Nest, N.S.W., Australia; or Zug, Switzerland.



varian aerograph

Free: Two New Encyclopedias.

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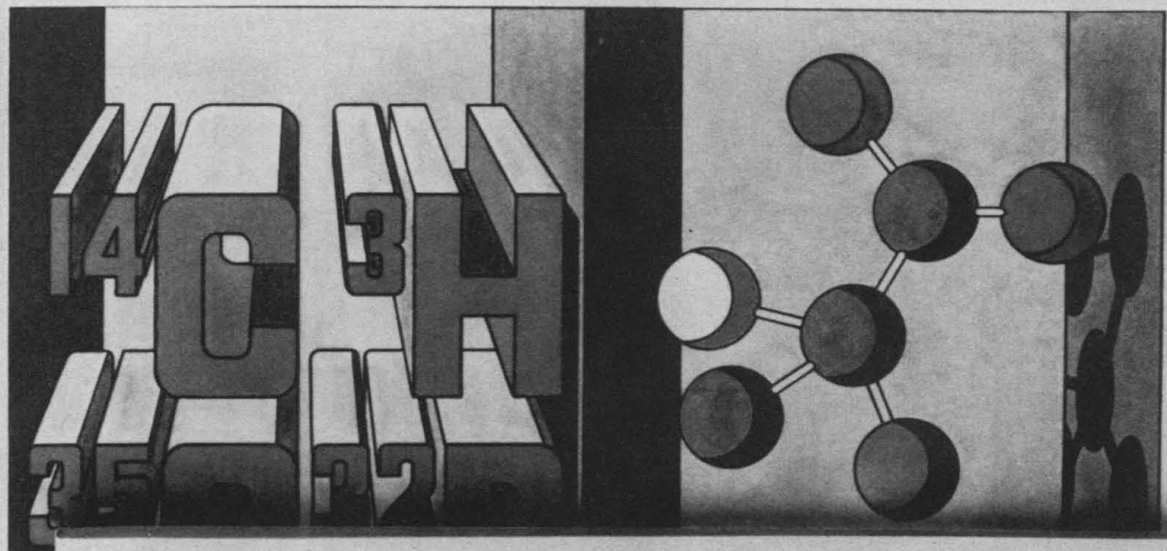
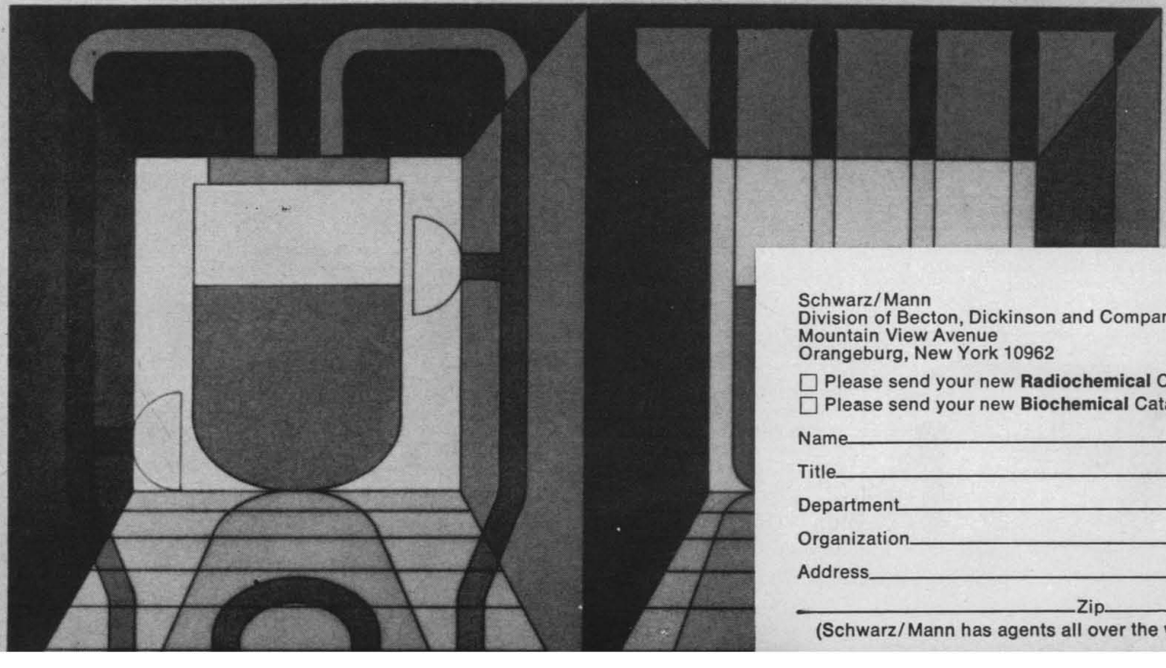


Schwarz/Mann Biochemical Catalog 1970/71



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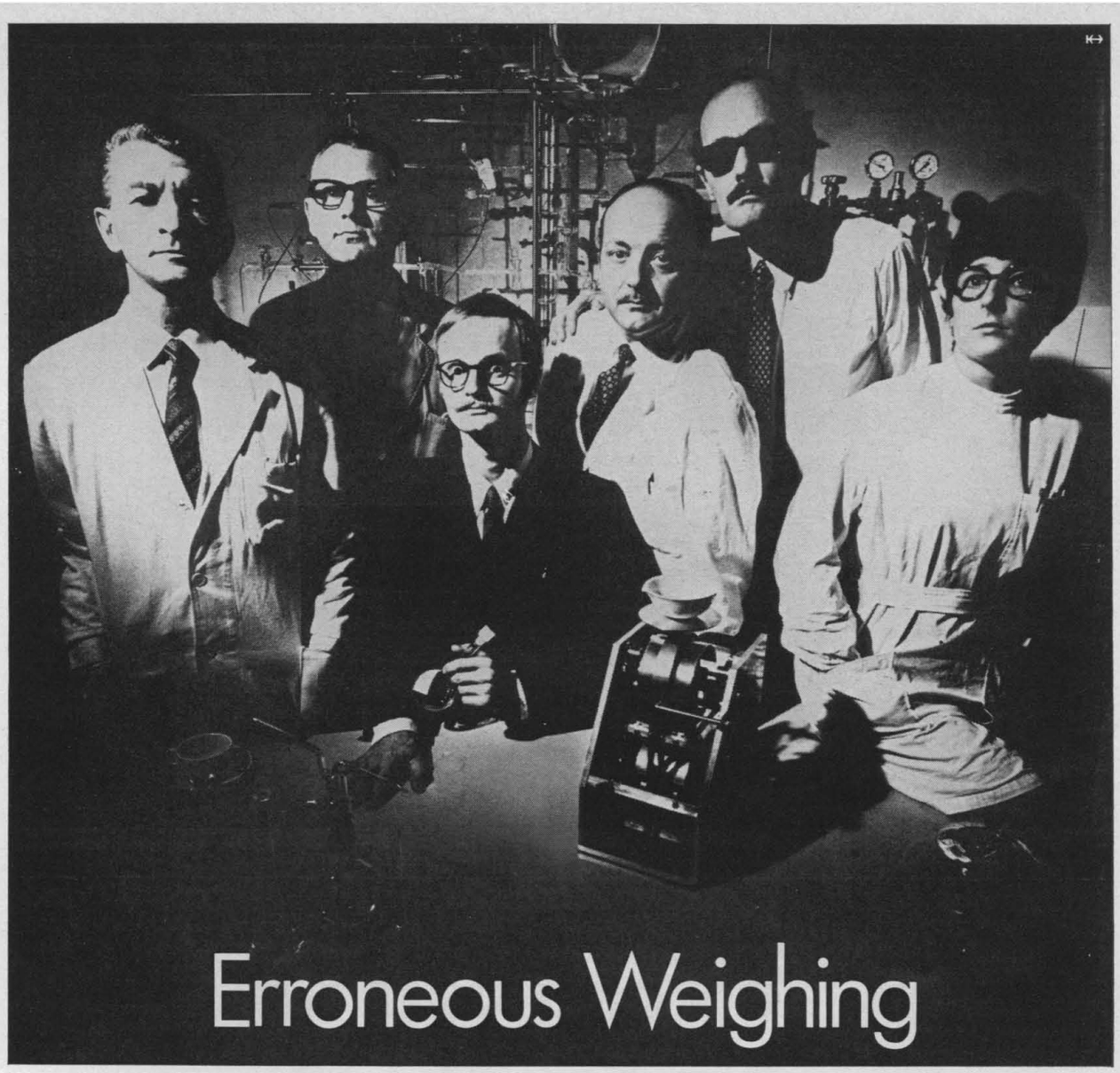


Erroneous Weighing

Erroneous weighing always happens when the milligram is taken lightly.

During the 6000 years that the old two-pan balance was around, errors like these were common. But for the last 25 years, we at Mettler have been waging an all-out crusade against such weighing errors.

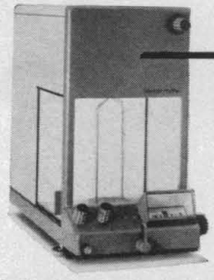
Our strategy has been to construct Mettler balances in such a way that it is extremely difficult to weigh incorrectly.

Take the Mettler H10Tw, for instance. It is impossible to interpret the digital readout incorrectly. You can't make mistakes in arithmetic because you don't use arithmetic. The sample weight indication and the tare weight indication are separate. And weighing-in correctly is easy and enjoyable with the filling guide.

At Mettler we have also been waging a war against wasted time. The arrangement and position of the ring weights in our balances save time by reducing the pendulum effect. The Mettler air damping system also annuls the time required for the optical scale to come to rest. With automatic preweighing across the entire weighing range, you don't waste precious time in a trial-and-error search for the correct weight control. The wide optical scale range makes it unnecessary to use a lot of separate weights. Add to this the rapid taring feature. This lets you bring the optical scale back to zero with lightning speed And so on.

Every year there are a few tens of thousands more Mettler balances and a few tens of thousands less inaccurate and unreliable weighing results around. After a while, inaccurate balances will be an extinct species.

Until that moment arrives, we will continue with our crusade for the scrupulously correct milligram.



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The new Stat-Pac, latest addition to the 9100 software, contains 100 *applied* statistical programs that you use for decision-making in every field, from business to scientific research. Areas covered are general statistics, distribution functions, test statistics, curve fitting, harmonic analysis, sampling theory, analysis of variance, operations research, and reliability and quality control. These programs are formated and ready for entry into your 9100. For instantaneous entry, store often-used programs on the exclusive magnetic card. Since many of these programs include the HP 9125A X-Y Plotter, you will be free from tedious (and inefficient) hand plotting of graphs and charts.

How's this for a vital statistic? Users tell us that the System 9100 is solving 58% of their problems for $1.11 per computing hour. Lease, rent, and purchase options available. For further information, or to arrange a "hands-on" demonstration at your desk, write: Hewlett-Packard, P.O. Box 301, Loveland, Colorado 80537 In Europe: Hewlett-Packard, 1217 Meyrin-Geneva, Switzerland.

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HP CALCULATOR SYSTEM 9100

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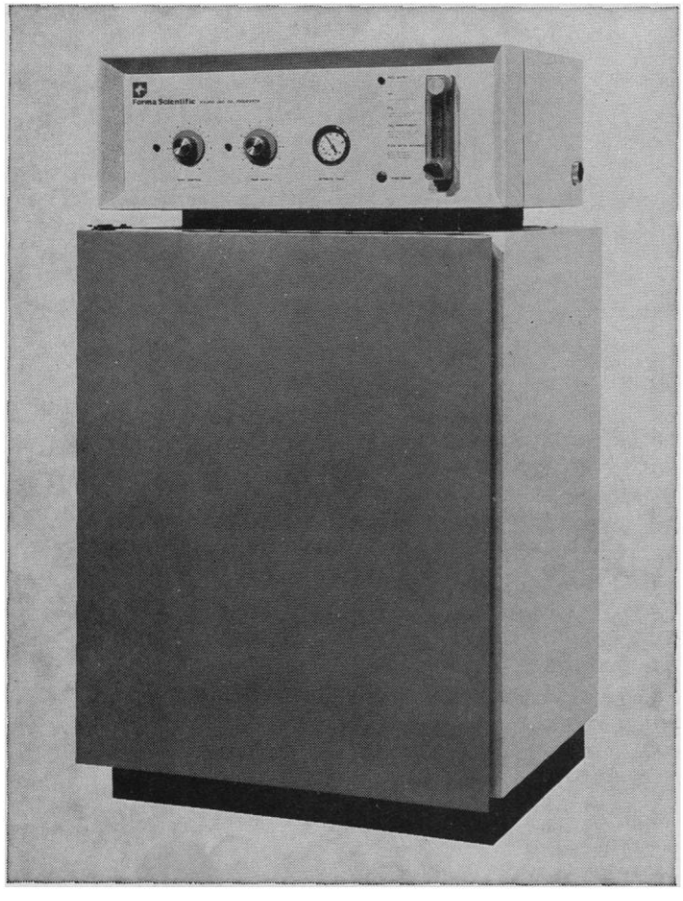
Inside are optimum conditions for your tissue cultures.

You'll discover there is more to our new single-door, water-jacketed incubator than meets your eye. Including an exciting price—available from $895.00.

The incubating chamber is designed especially for tissue culturing procedures. There, the precise CO_2 tension is maintained by our exclusive Un-i-trol system. Air, of constant pressure and flow, is provided by the built-in supply. While a built-in water reservoir maintains the ideal elevated relative humidity.



A controlled, stable water mass in five jacketed walls creates exceptional temperature stability and uniformity.

After door openings, independent "Kwik-Purge" elements rapidly reestablish the pre-selected CO_2 tension. A full-view inner glass door closes against a tight-sealing silicone gasket, and the outer door closes softly to avoid shocking cultures.

We also increased shelf capacity. With special no-tip shelves. And a stainless steel interior. The exterior is finished in tangerine and cream colored baked enamel.

This remarkable incubator is also available in a double-door unit. Choose from four models. Write for Bulletin WJ-100.

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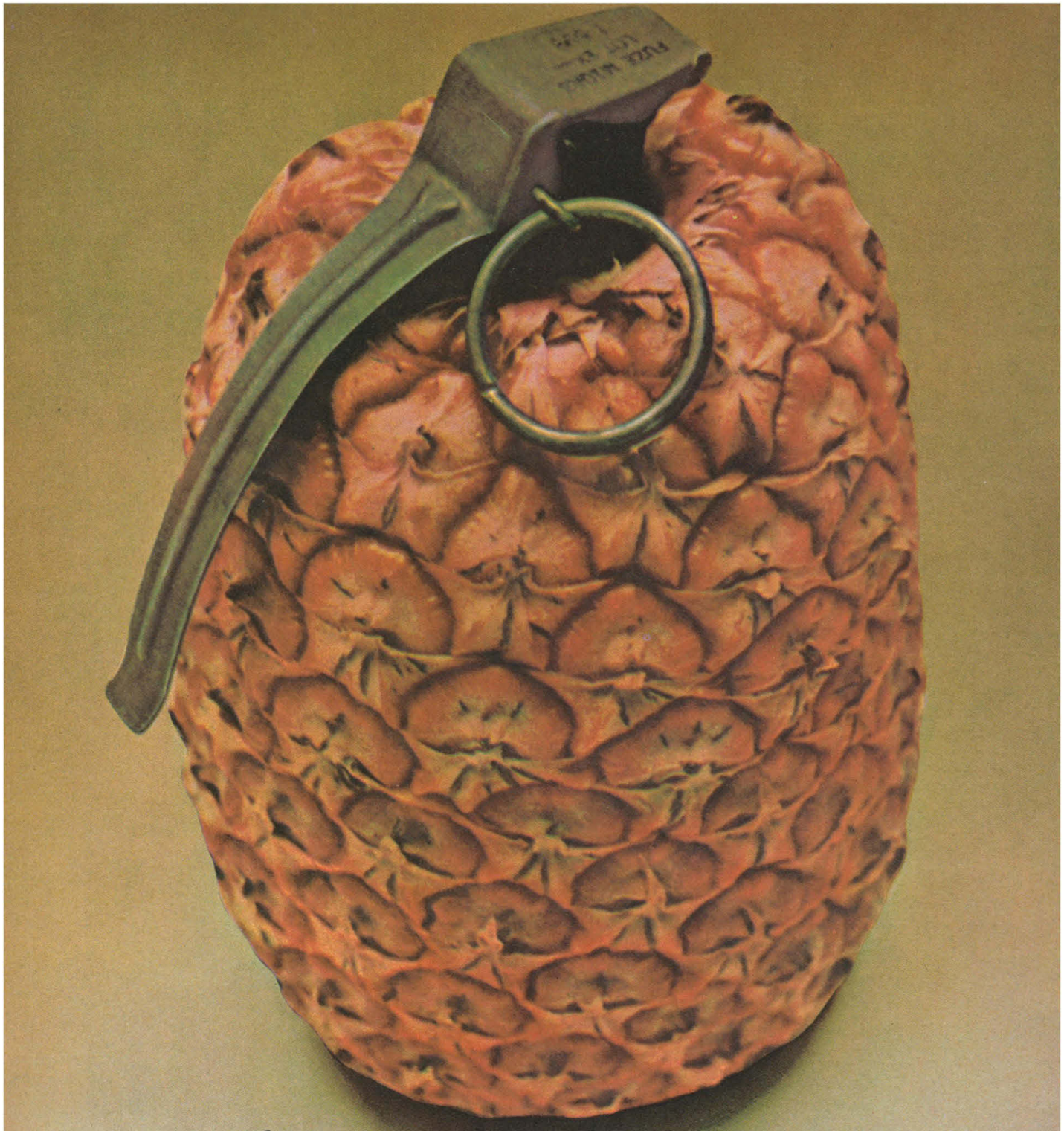

A different kind of weapon

Once known only as a golden fruit, the pineapple has also given its name to the deadly "pineapple." Now this fruit whose name was used for the grenade of war is rapidly becoming a versatile source of articles of peace.

One of these promising products of the pineapple plant is a protein-splitting enzyme called bromelain. It has already proved its worth as a meat tenderizer . . . as an anti-gellant that keeps gelatine drinks free-flowing . . . as an ingredient in a variety of pharmaceutical products . . . in chill-proofing beer.

How will this plant protease continue to meet its high promise in the field of new products? As a digestive aid? As a miracle cleanser? As a cure for the common cold?

How can your company use bromelain? Dole will supply technical supporting data and research samples if you think there may be an application in your business. Just write. We'll send you all the facts. Or, if you are ready to try your idea on a larger scale, bromelain is also available in commercial quantities.

You may find the kind of explosion you're looking for by releasing the potential in bromelain.

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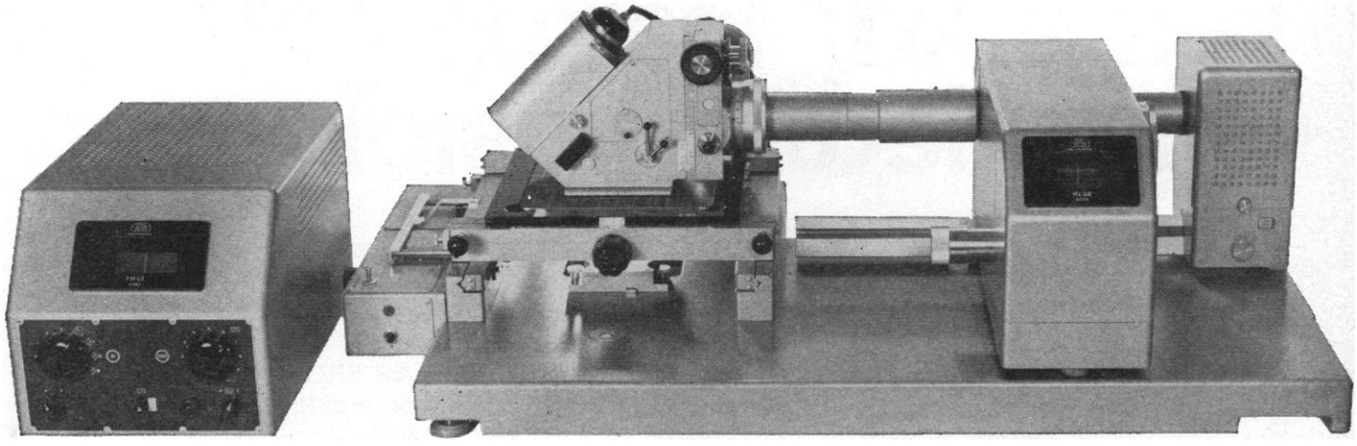
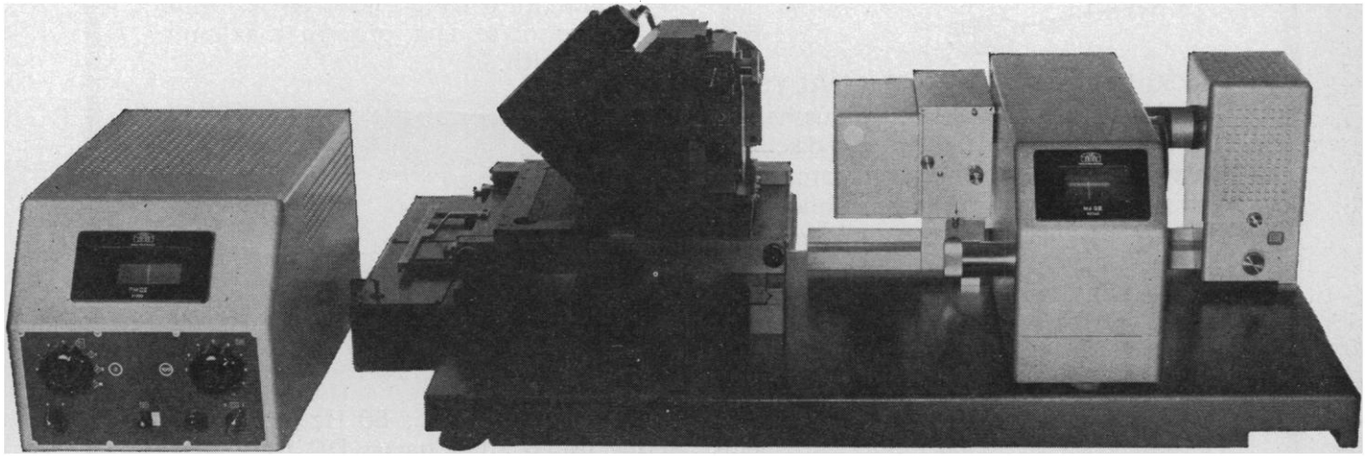


look for the extra value you get from the Zeiss Chromatogram Spectrophotometer for TLC...



...it can be converted easily to the universal PMQ II Spectrophotometer by the addition of units costing only $726. 2 instruments for just a little more than the price of 1.

Just because funds are hard to come by is no reason not to have the best. And the Zeiss TLC Spectrophotometer *is* the best. It offers accuracy and sensitivity significantly better than you can find elsewhere. A demonstration will prove it, and we'll be glad to arrange one for you. But right now we'd like to emphasize its versatility—the versatility that gives it extra value in these cost-conscious times.

First, over a wavelength range of 200-2500 nm, this spectrophotometer measures chromatographic separations by transmission, reflectance or fluorescence. And not only can it accommodate larger TLC plates than any other instrument, but also paper chromatograms, electrophoresis strips and film negatives. Provision is also made to measure gel discs and slabs, and to attach the recorder of your choice.

Moreover, because it operates by direct examination in the UV range, it eliminates the need for staining. Resolution is infinitely high. And you have a choice of continuously variable round and rectangular apertures.

But that only begins the story of its versatility. Chapter 2 starts with our picture caption—please read it. With that slight extra investment, you'll reward yourself with the world's most reliable and accurate universal spectrophotometer, and have two great instruments for little more than the price of one. The arithmetic is simple, and it all adds up in your favor.

For complete data, or to arrange a demonstration, write Carl Zeiss, Inc., 444 Fifth Avenue, New York, N.Y. 10018.

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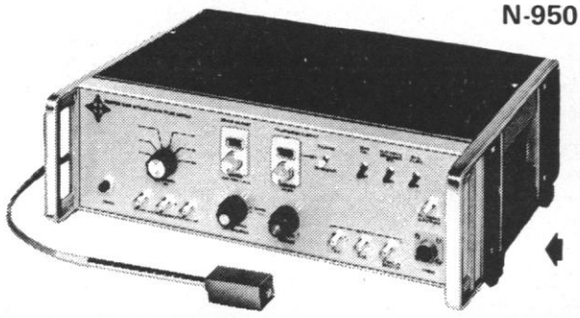
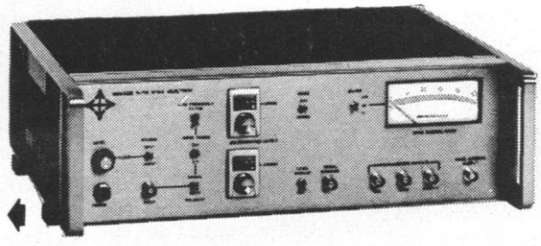


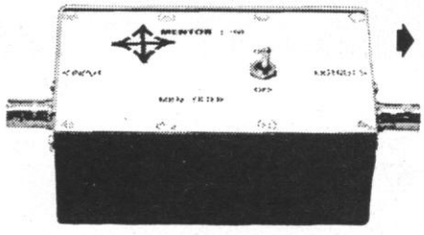
N-950 INTRACELLULAR PROBE SYSTEM

The N-950 Intracellular Probe System is used with a single barrelled micropipette to perform intracellular electrical measurements. The instrument allows simultaneous cell stimulation and measurement of membrane impedance and potential. Electrode mounts directly on guarded probe to reduce noise and provide maximum bandwidth.

N-750 NEURONAL SPIKE ANALYSER

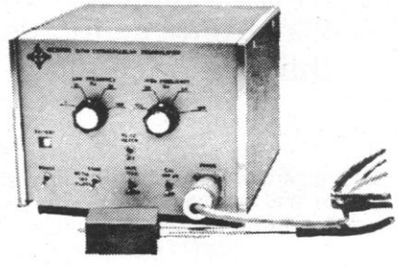
The Model N-750 is an enormous help in the analysis of extracellular unit discharge patterns. A window discriminator sorts spikes of differing amplitudes while a timing section measures the time interval between spikes. Inter-spike interval is displayed continuously on the panel meter, and is available as an analog signal for plotting on a chart recorder.





F-60 FILTER

Model F-60 Filter eliminates 60 Hz noise problems. Active notch filter passes DC to 1 MHz, with 40 db rejection of 60 Hz line frequency pickup. This completely self-contained filter is compatible with all recording systems.



N-740 EXTRACELLULAR PREAMPLIFIER

Designed specifically for extracellular recording with glass or metal microelectrodes, the N-740 has a probe preamplifier for direct electrode mounting. Low noise combined with high gain and selectable active filters, make the N-740 the ideal microelectrode amplifier.

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What would you ask for in a complete Photomicrographic and Photomacrographic Lab?

1. The first thing you'd ask for would be an easily operated 4 x 5 camera system. You'd want it to be completely automatic —exposure, film counting, frame-imprinting, everything—so that all you have to do to take a picture is focus and push a button. You might need, too, a fully automatic 35mm camera that's easily and rapidly interchangeable. You'd definitely want utmost stability—the kind that the Zeiss Ultraphot III, with its sliding mirror system (rather than bulky bellows) and its strong shock mounting, gives you. You'd want to use Polaroid® and have a projection head available, and, for metallographic work, special disks for grain size determinations. You might also need a Micro-Hardness Tester and a movie camera. So you'd make sure there was provision for all these.

2. You'd insist on the highest quality optics—in other words, Zeiss optics. And you'd want them to be *completely* interchangeable with those on any other Zeiss microscope you may have or plan to add. So you'd have available to you the world's widest line of Planapochromats, Planachromats, Plan-Neofluars, Neofluars, Ultrafluars, Achromats, Epi-plans, and Pol objectives for transmitted and reflected light—not to mention the unequaled Luminars and Epi-Luminars for photomacrography. You'd want, in short, capability for 4 x 5 and 35mm photography at continuous magnifications from 2.5X to the limits of light microscopy, through the finest flat-field optics ever made.

3. You'd require a choice of light sources—CSI, Mercury, Xenon, Quartz Iodide, and Tungsten. And you'd find it very convenient that the Ultraphot holds three at the same time so you can switch from one to the other, or combine Mercury and Tungsten for phase-fluorescence, all by a simple flip of a lever.

4. You'd expect it to be a simple matter to exchange stages so that you can switch from reflected to transmitted light, or vice-versa, in a matter of seconds. You'd want the same easy exchangeability, too, of eyepieces and condensers.

5. You'd want a specially designed instrument table, with ample working space, drawers with fittings for all accessories, and a built-in power supply.

6. You'd make sure everything was built into a sturdy and compact stand. And "everything" means "everything": filters, ASA selector for speeds from 2.5 to 8,000, exposure readout window, push-button for exposure, photo-multiplier, beam splitter (so that the light can be directed 100% to the camera, or 100% to the eyepieces, or ⅓ to the eyepieces and ⅔ to the 4 x 5 camera, or 100% to the 35mm camera with its own focusing eyepiece.)

You'd ask for Ultraphot III.

That's what Zeiss calls it, and it does everything but develop the film. And, if you use Polaroid® film, it does that too. For all light-microscope techniques—brightfield, darkfield, fluorescence, polarization, phase contrast, Nomarski interference contrast and quantitative interference microscopy (Jamin—Lebedeff)—in both reflected and transmitted light—photomicrography and photomacrography—the Ultraphot III is the supreme instrument. Write Carl Zeiss, Inc., 444 Fifth Avenue, New York, New York 10018.

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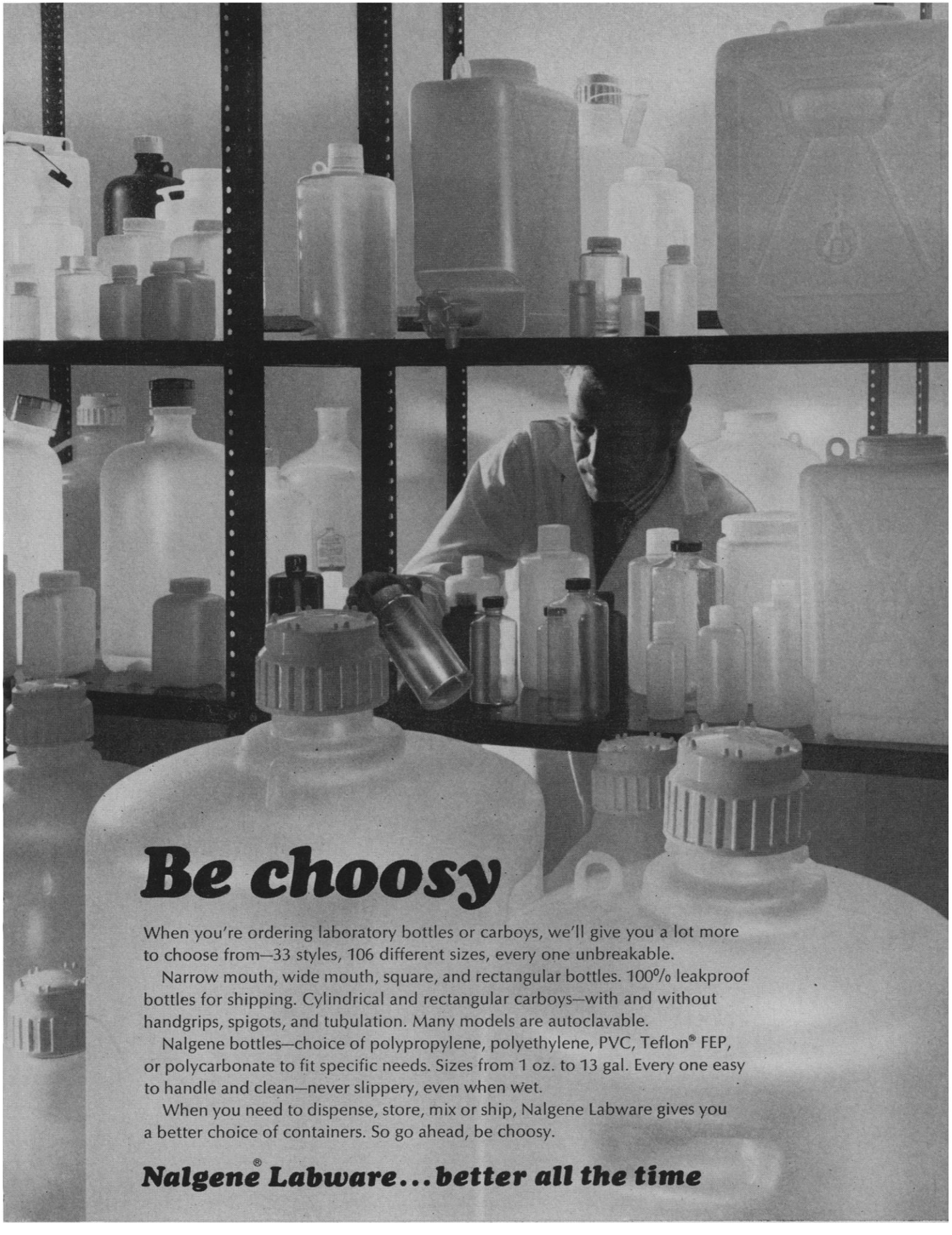

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And the Brush 260 is about as accurate as you can get. We *guarantee* 99½ % linearity. So when you're looking at the chart of a Brush 260, what you see, is fact. We owe it all to a foolproof position feedback system that enforces pen position all the way across the chart. There are no springs, no strings. Or any of the other tricky mechanisms that you'll suffer with in other recorders.

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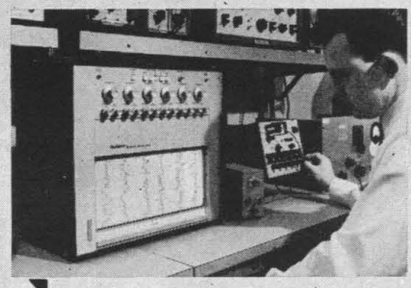
More facts. Less fuss, bother and cost.

Ask your Brush representative for a demonstration. Or write for Brush 260 Bulletin 942-2: Brush Division, Gould Inc., 3631 Perkins Avenue, Cleveland, Ohio 44114.



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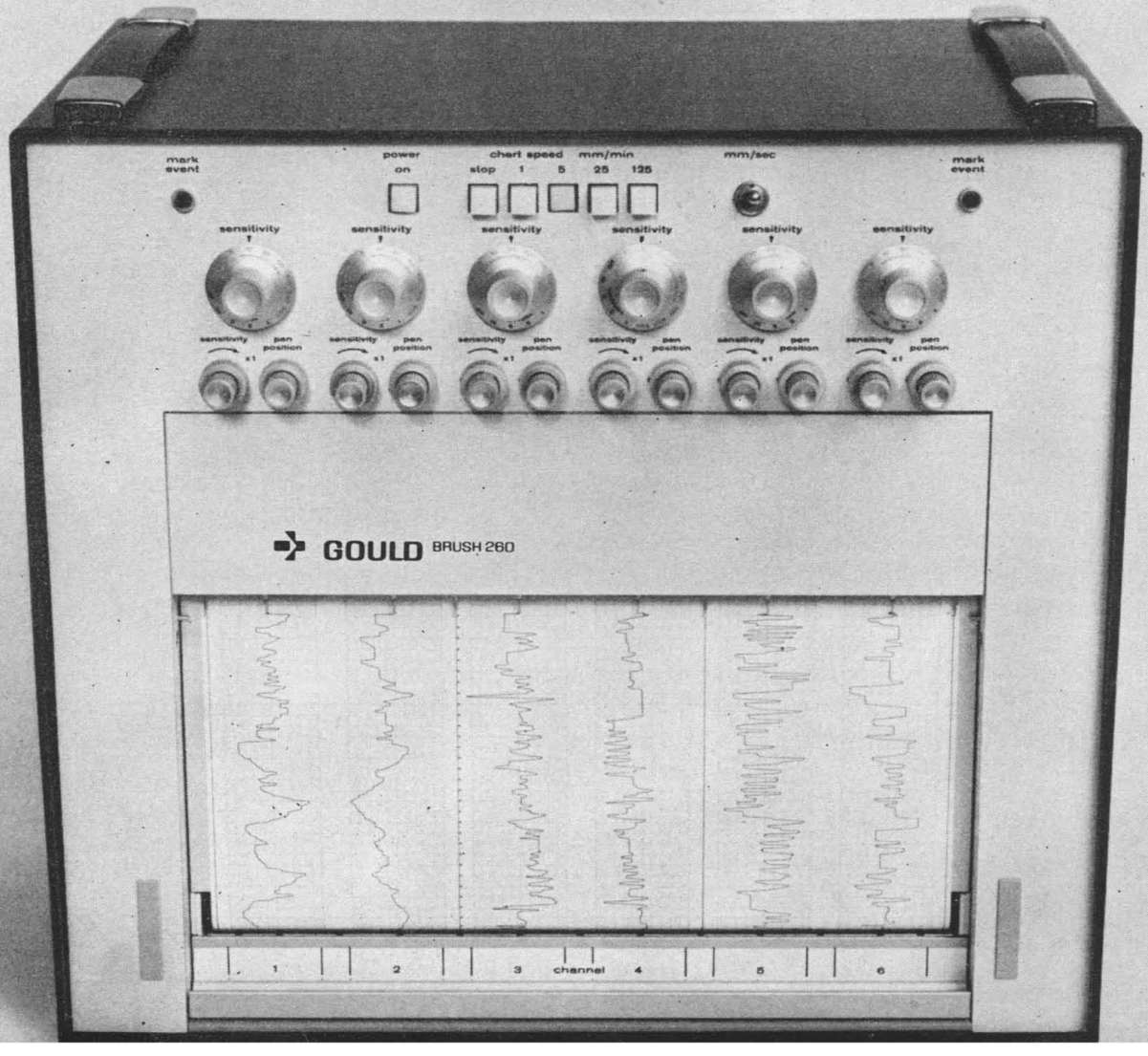

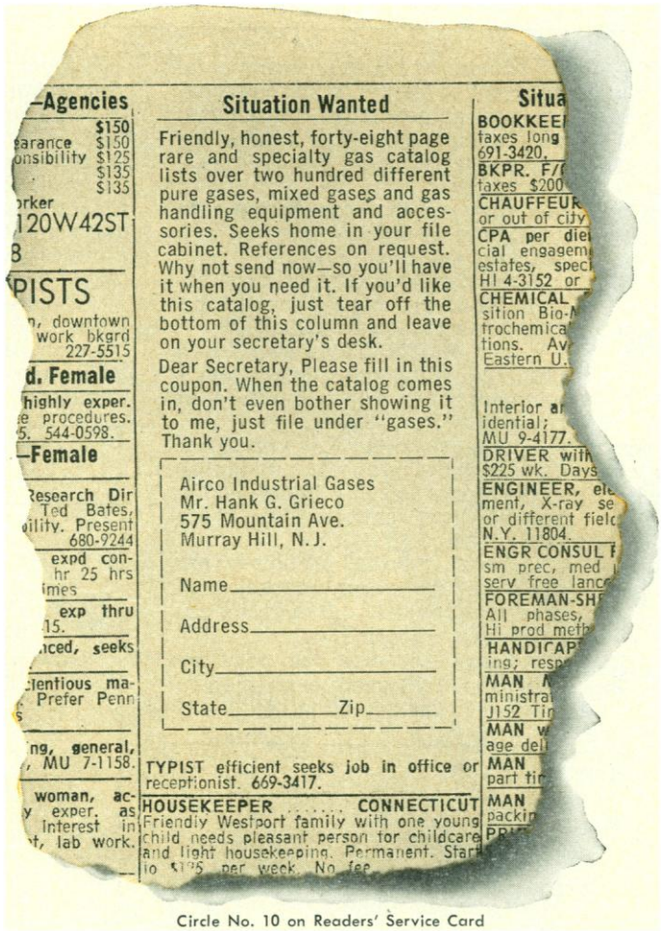

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Combine conventional double-beam performance with highly versatile double-wavelength capabilities and you have the Model 356. Problems usually considered too difficult to solve by UV analysis are done easily and reliably by the Model 356. This *different kind* of instrument will solve your analytical problems better than any other instrument if you're:

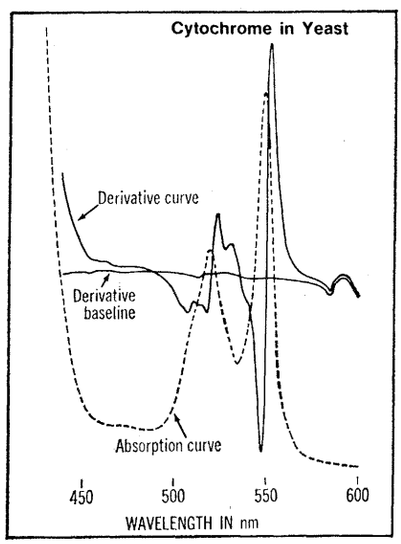
a biochemist or biophysicist and your samples are highly *turbid;* or

a plant physiologist and your samples are plant leaves; or

a physiologist whose samples are microtomed tissue sections; or

a textile or paper chemist who must measure dyes or inks on paper or textiles; or

an analytical chemist who must make measurements on overlapped absorption bands; or



CYTOCHROMES IN YEAST — This absorption spectrum of a yeast cell suspension clearly shows the absorption bands of the various cytochromes. To compensate for high turbidity, 8 sheets of filter paper were required in the reference beam. The sampling geometry and the sensitivity of the Model 356 are such that the transmitted light has been measured through fifteen sheets of Whatman® No. 2 filter paper at 600 mμ with 1 mμ bandpass.

concerned with environmental pollution problems requiring measurement of pesticides, herbicides, polynuclear aromatics and other types of organic and inorganic pollutants; or

required to measure the rate of change of *two components* in a reaction cell *simultaneously;* or

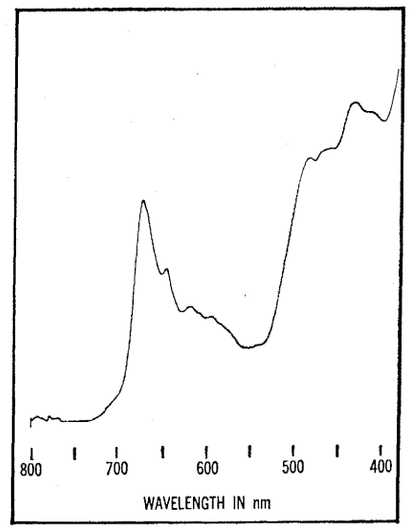
measuring the rates of reactions that produce absorbance changes as small as 0.006A/hr.

The Model 356 solves such problems when other spectrophotometers can't for a number of reasons.

Analyses of turbid samples are done with the large photomultiplier of the Model 356 only *3mm* from the sample—light scattering losses are minimized.

Band overlap problems are minimized by direct recording of the *first derivative curve* of the absorption spectrum.

Trace analyses are done by using the *100X* scale expansion to achieve lower detection limits.



LEAVES — This is the absorption spectrum of a lettuce leaf at liquid nitrogen temperature. Note the shoulder at approximately 700 mμ. This may arise from a component referred to as P700 and is quite difficult to detect *in vivo.*

Simultaneous measurement of concentration changes of two components in a single reaction cell can be done by using the *Double-Wavelength* mode.

Kinetics of slow reactions or reactions at *high dilution* are made using the low noise *100X* scale expansion and the *Double-Wavelength* mode.

For full details, write for our Model 356 brochure to: Instrument Division, Perkin-Elmer Corporation, 723 Main Avenue, Norwalk, Connecticut 06852.

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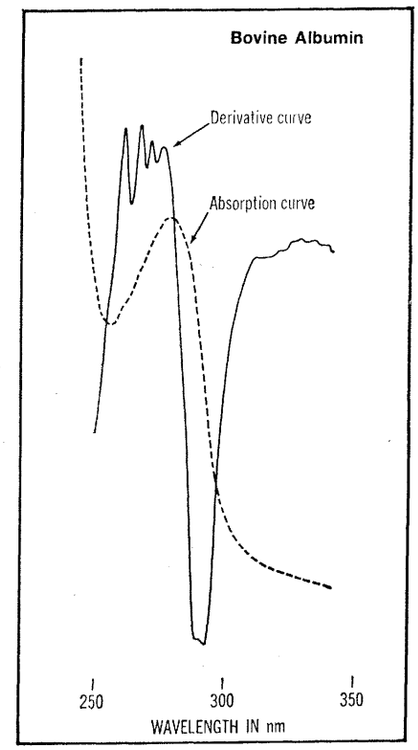

MILK — These curves illustrate the relationship between the absorption spectrum of a milk sample containing added bovine albumin, and its first derivative curve. The presence of bands hidden in the absorption spectrum is clearly shown in the first derivative curve.

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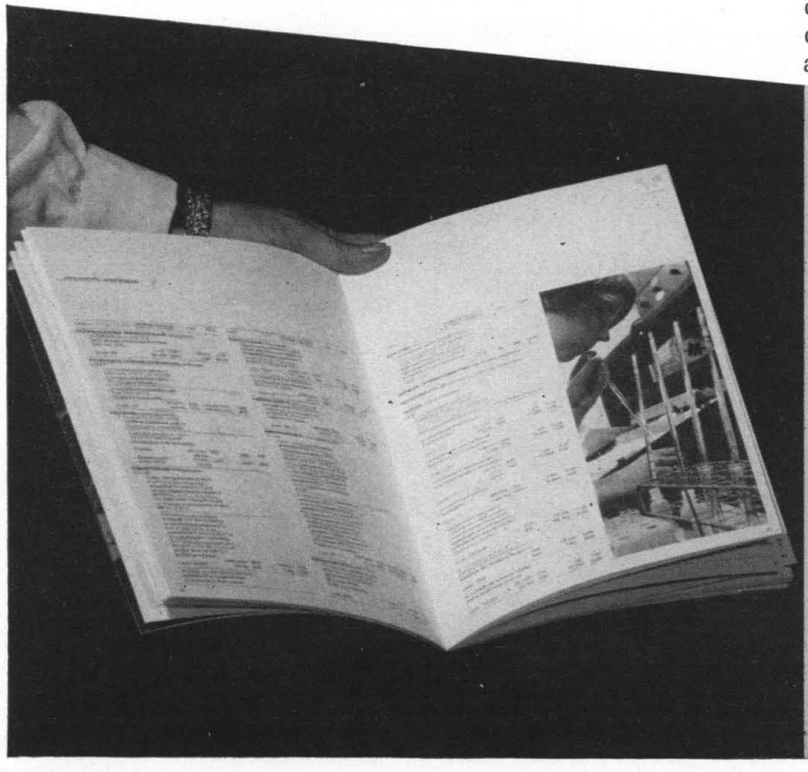

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☐ Product literature on Worthington enzyme reagents for the clinical laboratory

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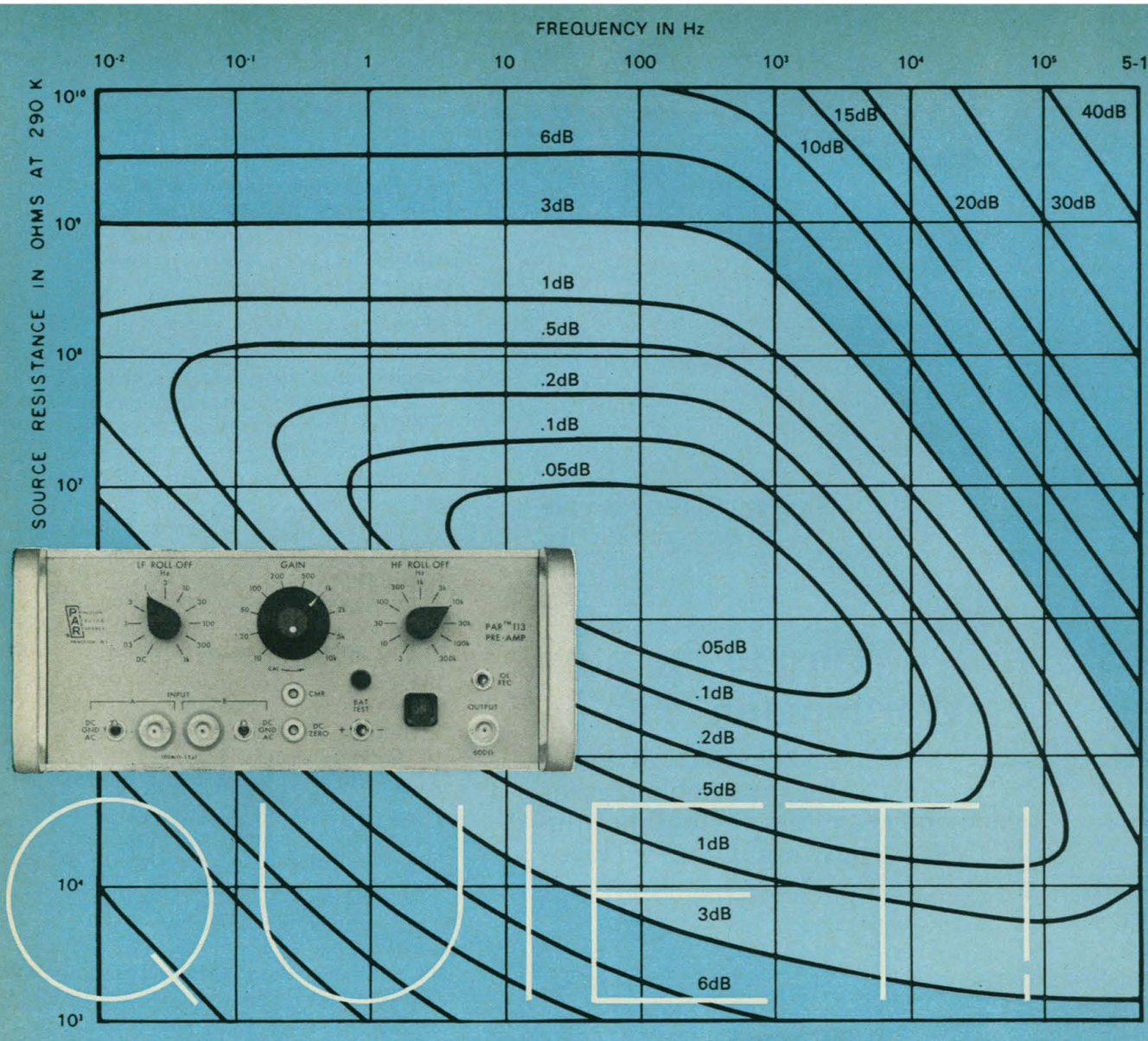

How quiet? At 10 Hz, with a 2 megohm source resistance, our new Model 113 Low-Noise Preamplifier has a noise figure of less than 0.3 dB. Or at 1 kHz, with a 1 megohm source resistance, its noise figure is only 0.2 dB maximum. Shorted input noise from dc to 100 kHz is typically 1 μV referred to the input.

Model 113 also offers:

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Ask us to demonstrate our quiet new $795 Model 113 Preamplifier for you now. Then you'll see why we're making so much noise about it. Contact your local PAR representative or write Princeton Applied Research Corporation, Box 565, Princeton, New Jersey 08540. Telephone: (609) 924-6835.

PAR

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make sense to hold women solely responsible? If the privilege has to be granted, or if the right for a child can be claimed, does it not make sense to take advantage of the semen depot readily available in sterilized men, samples of which can even be checked for their biological value by numbers, morphology, and biochemistry? Artificial insemination is highly successful, as long as the mother's genital tract can function unimpaired. How successful the procedure will be to gain eggs by laparotomy, to fertilize them in vitro, and transfer them to the mother's uterus in time, nobody knows. And even if successful, cost and procedures involved are highly in favor of artificial insemination to an unimpaired female.

If it is true that mankind is entering the age of equal rights and responsibility for both sexes, it is inconceivable to put burdens on one sex or the other as long as alternatives exist. The widely discussed and proposed punitive actions any elected government or society can impose on those breaking newly established laws or moral codes should leave the choice of the method open to responsible parents, but should give them all possible advice and tell them of the other side of any method involved. Any method with the assurance of reasonable safety and true reversibility should have priority.

WOLFGANG JÖCHLE
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Los Altos Hills, California 94022

Garrett Hardin is to be commended for recognizing that appeals to conscience are self-defeating as a means of population control, and that the concept of a right to have children is responsible for our inability to control our population . . . [but he] seems to discount the value of economic pressure exerted through the tax structure. It is true that under a system of tax incentives "noncooperators" will outbreed "cooperators." But this is less important than might be thought, since parents of large families will, through their taxes, be defraying the government's cost of caring for and educating their children. What is important is the overall effect, which will be a reduced birthrate.

Not only is taxation less obnoxious to a libertarian than compulsory sterilization, since it influences the individual's freedom of choice rather than superseding it, but it is also more flexible. The versatility of tax law as a policy

instrument can be seen from many ingenious ways in which powerful and greedy persons have redesigned it for their own benefit. It can equally be written to serve social needs.

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. . . If parenthood is only a privilege, then choice in general is only a privilege, and if choice is to be the special advantage of government bureaucrats and Garrett Hardins, pulpy bipeds may continue to roam the earth, but there is little hope for the continued existence of a free, thinking, striving, rational mankind.

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. . . Hardin could benefit the world much more if he would concern himself with the quality of parenthood. Problems of crime, moral dissent, and lack of convictions to help society could be corrected, in my mind, through better home life and by better-qualified parents. Divorce and unhappy homes to me are critical problems in terms of human suffering and welfare. Should not the criteria of training people to be better parents and to care properly for their children be more important than whether they have one, two, or three children? In fact, in my association it has often been the parents of larger families that seem to concentrate more heavily on caring for the children and instilling in them a sense of responsibility to society . . . parenthood is not a question of right or privilege, but a problem of responsibility.

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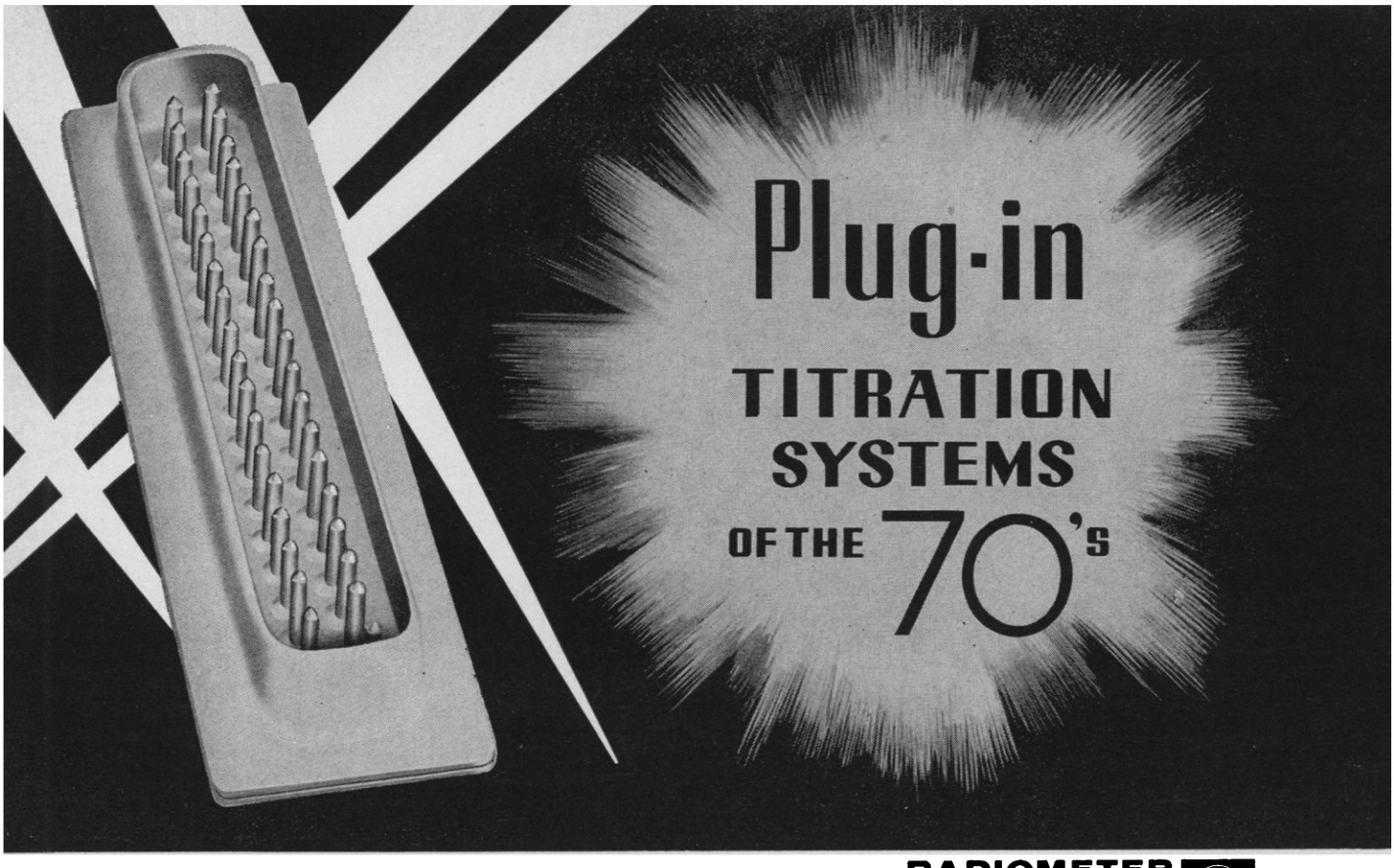
We will not achieve population control overnight. Progress will be made in stages, and I agree with Berkhout that abortion should first be made freely and instantly available to any woman who wants it. Contraception, never perfect, always leaves open the possibility of an "accident"; freely available abortion eliminates both the tragedy and the excuse. Since 1963, I have been heavily engaged in writing and speaking in favor of elective abortion.

Cash rewards for nonreproduction are also a fine idea. I believe R. B. Cowles was the first to propose a non-baby bonus, in 1959. It would not be



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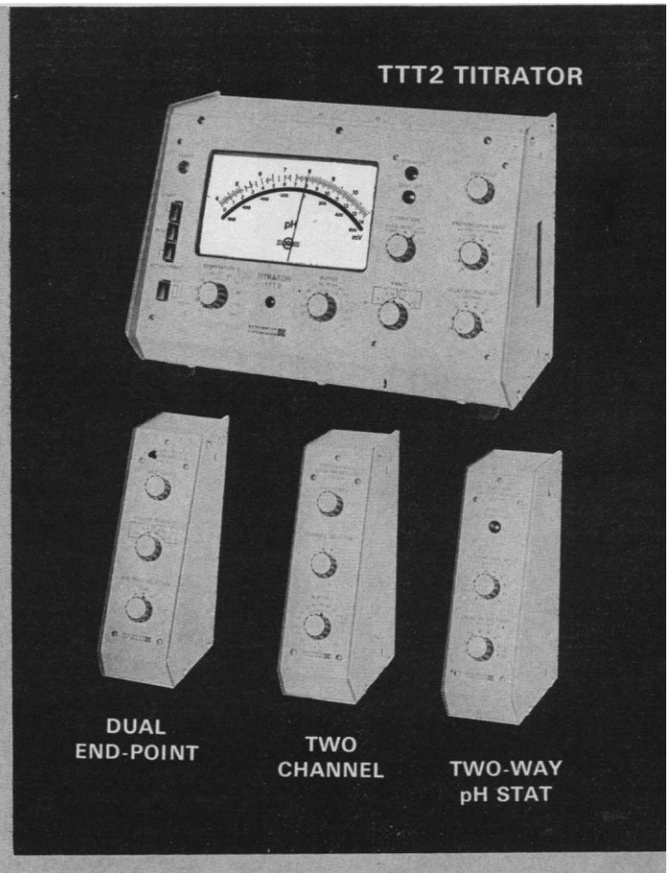

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necessary to continue it until the climacteric, as Webb implies: probably to age 25 would be far enough. Young women are dangerously fertile for both physiological and psychological reasons; they often seek to solve their psychiatric problems by conceiving. By the time they are 25 they have a better understanding of the costs of motherhood, and are less tempted by this "solution."

Tax penalties for excessive reproduction may help, but they have several shortcomings. (i) They cannot have much effect on people who pay no taxes anyway. McClenon rather surprisingly assumes that parents of large families are necessarily taxpayers. (ii) Insofar as taxes hurt the parents this hurt may be passed on to the children, whom the community does not want to harm. (iii) Highly "philoprogenitive" parents will be less affected by such measures, and will produce more of their own kind, thus instituting an unwanted selective system, as Charles Galton Darwin pointed out in 1959.

Positive control is distasteful to everyone, including me. But I think we will someday have to accept it as the price for other changes already made. Two centuries ago there was no need for the state to interfere with family breeding because the community allowed surplus children to starve. [See, for instance, Linnaeus' account of the acceptance of such starvation in K. Hagberg's *Carl Linnaeus* (Dutton, New York, 1953), p. 118.] The family was responsible for making the correct breeding decision. Now, welfare economics has freed the family of much of the responsibility, while leaving it the full power of breeding. Power without responsibility produces an unstable system, always.

Twenty years ago I was sterilized after my wife and I had produced what we regarded as our *n*th child. I watched the doctor perform the vasectomy; I found nothing horrifying in the operation. I have since recommended sterilization to thousands of people. Rational couples usually settle for male sterilization as the cheaper and simpler of the two possibilities. I think this is usually the best *individual* decision.

Population control would probably be least irksome if it involved two steps: (i) a directive to have no more than n children, control to be achieved by whatever means individual couples preferred; coupled with (ii) positive community action after $n + 1$ children have been born to prevent the appearance of $n + 2$ *et al.* Our experience with Prohibition has taught us that positive control is not feasible unless the *vast* majority is convinced of its necessity; when this stage is reached the recalcitrant minority that would have to be sterilized would be small.

If community control ever comes—and it may not—it will be far easier to build the controlling mechanisms around the female than the male. The reasons for this conclusion escaped many of my critics, so let me spell them out.

Whether control is exerted by sterilization or by punitive taxation is of secondary importance. The point is, we want to make it difficult or impossible for a person or a couple to produce more than their share of children. Suppose we decide that it is the couple's joint responsibility, that each child counts against their quota. How should we deal with the following cases?

1) Mary and John get divorced, after having two children. Mary takes the children. Both remarry, their new partners having had no children previously. Suppose Mary's new husband wants a child "of his own"—can he have one? If so, Mary must exceed *her* quota. What if John's new wife wants to be a mother—is she forbidden to do so because John has twice fathered children? If she promised to conceive extramaritally, would that make it all right?

2) A young woman has intercourse with several men in one month and becomes pregnant. She doesn't know who the father is, and "paternity tests," which can only exclude some of the candidates, do not tell us. Should each of the nonexcluded men be charged with one child? Or only a fraction of a child?

3) Five men and three women join in a group marriage. If a quota is to be assigned to the group, what is it? $3 \times 2 = 6$? $5 \times 2 = 10$? $[(5 + 3) \div 2] \times 2 = 8$?

We haven't even considered the complications introduced by extramarital affairs, and the legal consequences of condonation. I'm afraid there are more patterns of marriage and sex than are dreamt of in Doris Day's philosophy. The law ignores this variety at its peril.

The chain of legal evidence that establishes maternity is really quite good. The evidence for paternity is always shaky, and putting a policeman under every bed really wouldn't help. "It's a wise father that knows his own child," said Shakespeare, and the science of immunology hasn't helped much.

To achieve community control of breeding, would it "be just as effective," as Webb says, "to sterilize all men as to sterilize all women"? *By definition*, yes; but there has been no proposal to sterilize *all* of either sex. If only some are sterilized, and those only after they have had children, the effectiveness of the two alternatives is not the same.

Debaters tend to forget that we are not a perfectly monogamous people. Extramarital intercourse is not rare; and divorce and remarriage create what has been called "serial polygamy." For these reasons the sterilization of x men can be expected to be less effective in reducing births than the sterilization of x women.

My statement that women "want more children than the community needs" was based on the evidence assembled by Kingsley Davis [*Science* **158**, 730 (1967)]. But it must be admitted that "wants" are not permanent facts of life like chemical valence and specific chromosome numbers. We may be able to modify wants; we should seek to do so.

I do not think my identifying women as the intrinsically responsible sex in reproduction is the result of "blatant but possibly unconscious male supremacism," as Butler put it. Once women have at their command a perfect system of birth control (contraception plus elective abortion as a backstop), they will have almost complete power over the reproductive process. A woman who wants a child can easily find a man to furnish spermatozoa.

When women can completely avoid having children they do not want, men become powerless to "have children" by a unilateral decision. The sexes are not equal.

Power and responsibility need to go together; there really is no defensible reason why women should reject responsibility once they possess—and realize they possess—power.

GARRETT HARDIN

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Wasting Waste

In "Waste-water treatment: The tide is turning" (31 July, p. 457), Robert Holcomb comments on the problems of disposing of the sludge produced by sewage treatment plants. He writes that the "sale [of sludge] as fertilizer or soil conditioner . . . will probably decrease

as disposal by incineration increases." If true, this is very sad, for the land in this country is in need of the organic material which the sludge would provide, while the air is abundantly full of the pollution caused by incineration.

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. . . Perhaps my ignorance makes me unduly alarmed, but can we really afford to continue to destroy the potential soil-conditioning and fertilizing components of sewage? What do the ecologists say—are we wasting waste?

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Vigor of Northern Hardwoods

In his article "Effects of pollution on the structure and physiology of ecosystems" (24 Apr., p. 429), G. M. Woodwell mentions that nutrient losses from cutting all trees on a watershed "will cause a large reduction in the potential of the site supporting living systems as complex as that destroyed—until nutrients accumulate again." I hope readers of this portion of Woodwell's article are not misled into believing that total tree removal per se (or "clearcutting" as referred to by foresters) will consistently bring about a deleterious change in the terrestial plant community (*1*).

When a mature stand of timber is clearcut, an almost identical living system as that removed can be regenerated immediately (*2*). Silvicultural studies at the Barlett Experimental Forest in New Hampshire show that northern hardwoods renew themselves when the mature stand is completely removed in small blocks, patches, or strips. In fact, species composition and tree quality of the regenerated stand in many cases are better than that found in the natural ecosystem.

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SCIENCE

"Pieces of the Action"

*Pieces of the Action** was written by Vannevar Bush, who at 80 draws on wide experience gained while successfully tackling problems at least as rough as those we face today. Bush was this nation's scientific leader during World War II. Never before or since have science and technology been so effectively employed to meet national purposes. The book draws on memories of events spread over the past 60 years. It surveys the present scene but gives particular attention to events that occurred during World War II. Bush does not systematically outline the key elements of his successful leadership, but a reading of the book provides clues and some lessons applicable to today or tomorrow.

In part, Bush's genius lay in organization. During the late 1930's he and a small group of associates could foresee the coming war, and they realized that, if science and technology were to be used effectively, a new organization partaking of the powers of the White House would be required. Bush at that time was president of the Carnegie Institution of Washington and chairman of the National Advisory Committee for Aeronautics. He had access to President Roosevelt and especially to Harry Hopkins, the President's special adviser. Bush had established an excellent working relationship with Harry Hopkins and was ready with a plan of action at the time of the fall of France, in 1940. Very quickly the National Defense Research Committee was authorized and began its remarkably successful work. Bush retained primary responsibility for important external contacts, such as those with Congress and the military, although he delegated responsibility for the scientific and engineering efforts. He saw to it that decisions were made rapidly and that there was excellent two-way communication throughout the organization. Once ideas crystallized they were quickly implemented in prototypes, and these were speedily tested. Getting the military to adopt new devices or methods was sometimes difficult. However, though Bush is naturally combative, he was careful not to use improperly his special relationship to the White House. In his description of incidents where his qualities of leadership were involved, Bush makes his actions seem logical and obvious. It really wasn't all easy. Some excellent judgment and self-discipline were required. For example, Roosevelt sometimes demanded opinions on subjects with which Bush was not entirely conversant. Bush would give an immediate answer but would subsequently consult expert opinion on the matter. If he learned that his answer had not been entirely sound, he would so inform the White House.

Throughout the book one has the impression of listening to an interesting conversationalist, and an optimistic one. In fact, he says, "we take ourselves too seriously these days. Something sad appears to have happened to our sense of humor. It is true that our outlook is grim; we face many tough problems. We have to tackle them with determination, and we will do a better job at it if we do not let them get us down—pitch us into gloom and frantic despair . . . Life can be gay even as it is grim."

We have come to recognize that our future is inextricably dependent on our management of science and technology. Talk of doom and disaster are in the air because many people fear that neither individuals nor society as a whole have the gumption to live comfortably with, and to manage, the changing technological problems. It is therefore refreshing to read a book dealing with science and technology that is optimistic in tone while not dodging the troublesome issues.—PHILIP H. ABELSON

* V. Bush, *Pieces of the Action* (Morrow, New York, 1970).

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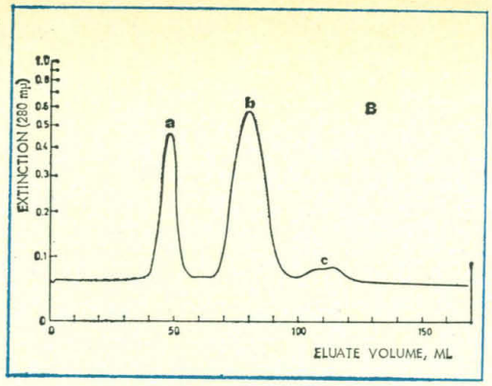

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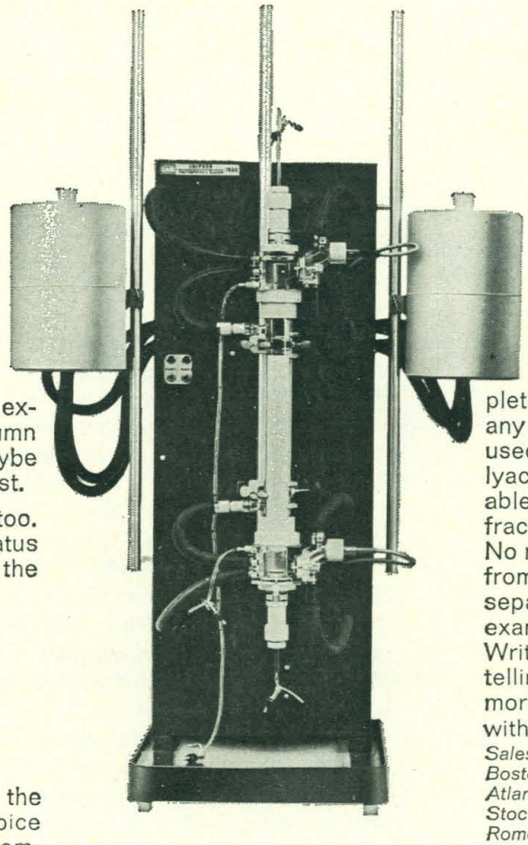

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controversies on nutrition and metabolism that involved Magendie, Liebig, Dumas, Claude Bernard, and others in the second quarter of the 19th century. A. J. Ihde outlined his extensive studies on the history of nutrition. Stanley Becker presented the early history of vitamin A, including the intense rivalry between E. V. McCollum and the team of T. B. Osborne and L. B. Mendel. R. E. Kohler considered the series of crucial biochemical discoveries which occurred in the last decade of the 19th century and led to the rapid development of biochemistry in our own time: The separation of the zymase system from the yeast cell, demonstrating that fermentation could proceed outside of the living cell, was probably the most crucial event of a whole network of discoveries. John Parascandola reported on his studies on the work of Lawrence J. Henderson, an influential biochemist, physiologist, sociologist, and philosopher of science.

There was much discussion of the opportunities and needs for gathering and preserving the documents that will be essential to future historians of science. Charles Weiner described the research in the history of modern physics being conducted by the American Institute of Physics. The extensive collections of the Niels Bohr Library include, in addition to published material, the correspondence and other unpublished documents deposited by physicists, autobiographies from a considerable number of physicists, a film library, and about 10,000 photographs. Weiner emphasized the importance of coupling research efforts with the collection of documents and the value of holding small, carefully prepared conferences which bring together scientists, historians, and others. Whitfield Bell of the American Philosophical Society agreed that it is generally best for individuals, especially in universities, to deposit their unpublished papers in the archives of their own institutions, provided that these materials are given proper care. When such arrangements are not possible, he indicated that the American Philosophical Society is prepared to receive material from biochemists and molecular biologists for deposit and care in its archives. If these documents are to prove genuinely useful, archives must be well organized and the material must be properly filed and cataloged. Controls on the use of papers must be carefully considered and specified; the library may see fit to impose its own restrictions, even if the

donor of the material does not specify them himself.

Those present at the conference agreed on the importance of urging leaders in biochemistry and molecular biology to preserve such material from their own files. It was recommended that a statement emphasizing the importance of preservation be sent out in the near future to a selected list of leading scientists in the field. Also, it would be highly desirable to issue a newsletter, perhaps once or twice a year, reporting on the location of such material and on other information useful for scholars. Both the American Institute of Physics and the American Philosophical Society publish such a newsletter. Saul Benison urged the compilation of lists of biographical and autobiographical articles that have already appeared. Everett Mendelsohn pointed out that the *Journal of the History of Biology* could publish at least some of the information for a newsletter among its "Notes." J. S. Fruton spoke of the possible role of the American Society of Biological Chemists in promoting these developments. It was agreed that action should be taken on several of these proposals in the near future and that the American Academy and its Committee should endeavor to implement them.

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Nucleic Acid Structure Function Relations

At a United States–Japan Science Cooperation Seminar in Tokyo, 20–24 April 1970, 7 American scientists and 14 Japanese scientists exchanged details of recent progress in their experiments to determine structure and function relations in nucleic acids. Some 15 additional Japanese research workers attended the discussions as observers. The National Science Foundation of the United States and the Japan Society for Promotion of Science cosponsored this conference at which both new knowledge and elegant research techniques were exchanged.

T. Tsuboi and K. Imahori of Tokyo described how infrared spectroscopy and circular dichroism can be calibrated with model polynucleotides and pure natural ribonucleic acids. The techniques are complementary in revealing

base pair content and helix content of transfer RNA (tRNA), purified fragments of tRNA, and native and denatured RNA's. R. Bock reported the progress in x-ray diffraction studies of six tRNA species crystallized at the University of Wisconsin. Three-dimensional Patterson projections are availfor two species of tRNA, and unit cell dimensions were reported for several other species. Tsuboi reported the crystallization of formylmethionine (fMet) acceptor tRNA from *Escherichia coli*.

Two of the world's leading groups for purification of tRNA were represented by D. Novelli of Oak Ridge and S. Nishimura of Tokyo. Novelli described the strategy and procedures that have made possible the isolation of gram quantities of five species of *E. coli* tRNA. Nishimura described a program that has produced pure samples of *E. coli* tRNA for 11 different amino acid acceptor activities. He reported a series of discoveries of minor bases made possible by this purification.

Ukita presented evidence that one of these newly discovered bases, a 2-thiouridine derivative, causes a codon-reading pattern different from those predicted by the "wobble" hypothesis. It causes glutamyl-$tRNA_{III}$ to recognize only the code word GAA, whereas the only previous report of a tRNA able to read only a single code word was restricted to certain code words ending in the base G. Another new codon recognition pattern was reported by S. Nishimura for tRNA's containing uridine-5-oxyacetic acid in their anticodon. Serine tRNA containing this nucleoside reads the three code words: UCU, UCG, and UCA. Thus, depending on the state of modification of uridine in the anticodon, a given tRNA may read one, two, or three different code words.

H. Ishikura presented a preliminary model for the sequence of this *E. coli* serine acceptor tRNA and pointed out that, in spite of many differences elsewhere, the dihydrouracil-containing loop of serine tRNA is common to samples isolated from yeast, *E. coli*, and rat liver. However, T. Seno presented strong evidence that the dihydrouracil-containing loop was not essential for recognition of $tRNA^{Met}$ by methionyl tRNA synthetase or by methionyl tRNA formylase. He was able to remove the dihydrouracil loop by carefully controlled nuclease digestion with only slight reduction of amino acid acceptor function in the tRNA.

D. Söll of Yale elaborated details on the specificity of the aminoacyl-tRNA synthetases. It is known that a single synthetase is capable of recognizing the several tRNA species in *E. coli* which accept that particular amino acid. He showed that K_m (Michaelis constant) was identical for four different separable serine tRNA species even though they read different codons and have substantial composition differences. Six separable leucine tRNA's are all charged by one single enzyme.

An assembly of experts on tRNA genetics and RNA sequencing had much that was new to discuss and share with those attending the meeting. M. L. Gefter (Columbia), J. E. Dahlberg (Wisconsin), and J. Abelson (San Diego) demonstrated the technique of oligonucleotide mapping, as pioneered in Sanger's laboratory. The experiments were both instructive and successful, even though begun the day after the group arrived in the Japanese laboratory. In addition to teaching the mapping technique, they each described important new concepts of RNA sequence related to RNA function. Gefter showed how the tRNA gene introduced into phage ø80 was a useful tool for obtaining tRNA defective in the modifications that convert adenosine to methylthioisopentenyladenosine. He summarized evidence relating mutant changes to function in the ø80-Su^{+III}–induced tyrosine tRNA. Abelson discussed the leucine tRNA induced by phage T4 and reported on efforts to develop this system into a tool for the study of tRNA structure and function as related to both protein synthesis and metabolic regulation in the phage-infected cell. Dahlberg outlined the strategy and results of sequencing large RNA molecules. The results suggest special structures at the beginnings of RNA messages not unlike the loops found in tRNA.

H. Ozeki and K. Shimura (Kyoto) had good reason to note the experimental details of tRNA sequencing methodology. They have used elegant genetic strategies to obtain a set of interesting mutants of tyrosine suppressor tRNA. One of these mutants gives evidence that the tRNA has mutated so that it is enzymically recognized as a glutamate acceptor instead of a tyrosine acceptor. We are now anxiously awaiting news that will relate a structural change in tRNA to this dramatic functional change.

The great utility of pure tRNA species to serve as substrates for nucleotide methylases was illustrated by Y. Kuchino of Kyushu University. He

purified from animal tissue a G-specific methylase which methylates only one unique locus in *E. coli* $tRNA^{fMet}$.

High-molecular-weight RNA received much attention at the conference. Ando and Takagi brought the audience up to date on the function and specificity of nucleases they have isolated. One nuclease in T4 phage–infected *E. coli* was shown to be essential for repair of photochemical damage. K. Miura summarized his work on the organization of RNA in viruses from the silkworm, human respiratory tissue, and the rice plant. These double-stranded RNA viruses contain, respectively, 10, 10, and 12 discrete pieces of RNA. The 5′ termini of these chains were masked from phosphomonoesterase digestion until the RNA double strands were denatured. Some progress on the separation and characterization of these discrete RNA pieces was described.

J. Krakow of Berkeley and M. Takanami of Kyoto presented new findings on the nature and role of protein factors which influence the initiation and termination of RNA synthesis from DNA templates. Krakow's use of acrylamide-gel electrophoretic separations of RNA polymerase and its control factors made possible a description of the cyclic process of initiation, propagation, and termination of synthesis as influenced by "sigma" factor. Because he was able to subdivide the cycle, he could pinpoint the action of antibiotics such as rifampicin and streptolydigin. Sigma factor is not released upon formation of the first internucleotide bond. However, synthesis of a nascent RNA chain of less than 40 nucleotides was sufficient to displace the sigma factor from a complex of deoxyadenylate-thymidylate and enzyme. Takanami's experiments demonstrated that "rho" factor causes guanosine triphosphate–initiated messages from ø80 DNA to terminate at characteristic places, whereas in the absence of rho the messages synthesized terminate at other places and are severalfold larger. *Escherichia coli* RNA polymerase is stable until sigma factor is separated from the enzyme. In the presence of sigma factor, 90 percent of the new chains started with pppApPyr while only 50 percent had this initiation sequence when sigma factor was withheld.

After the conference, the U.S. participants arranged individual visits to the universities of Chiba, Sendai, Nagoya, Kyoto, and Osaka. At these we learned of detailed progress and aspirations in research and graduate training.

The Japanese workers share our concern for finding balanced solutions to academic evolution and reform. The ability to conduct meaningful basic science research in a well-planned and painstakingly equipped facility may be sacrificed by oversights in hastily adopted solutions in the name of reform. Some Japanese "reformed" universities are now learning of problems that were unforeseen or ignored and are seeking ways that a liberated, equalized student-faculty community can attack nontrivial scientific problems which depend on multiyear development of skills and facilities by a group dedicated to a common goal.

The conference was an efficient and productive mechanism for exchange of current research concepts and techniques. It also produced or strengthened at least four United States–Japan collaborative research efforts. Our information channels are now quite adequate in the literature because of the use of European and U.S. journals by Japanese scientists and the continued improvement of the *Japanese Journal of Biochemistry*. The exchange of professional scientists for extended periods of study needs much better balance. Any well-qualified U.S. scientist who trains himself in the language and arranges to study in one of the several excellent research centers in Japan deserves encouragement and support by our foundations and professional societies. The U.S. science community and our whole society have much to learn from such an exchange.

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Bioresources of Shallow Water Environments

A national symposium on hydrobiology was conducted under the sponsorship of the American Water Resources Association in Miami Beach, Florida, during 24–27 June 1970. The theme of the symposium was directed to shallow waters that supply vast amounts of harvestable materials. The objectives of the meeting were especially pertinent inasmuch as the biological aspects of water resources are becoming increasingly important as greater demands are placed on total water resources by national and international economies.

The first day of technical sessions emphasized the use and potential of bio-

resources through harvesting, conservation, and development. Early in the discussions the importance of shallow water environments (fresh water, estuarine, and marine) was established. Over 90 percent of the world fish catch is taken from shallow marine waters, which constitute only 7.6 percent of the ocean's surface. One-half of all marine fisheries are in the near-coastal regions, which are dependent upon estuaries for their sustained stability.

Other general discussions during the first day included such topics as the economic importance of freshwater algae and aquatic invertebrates as new sources of drugs and biologically active agents. The distribution of coastal biota as related to commercial and recreational fishery resources was also discussed. Other speakers discussed engineering aspects in protection of the aquatic environment and the need for the conservation of marine species and areas. A change in political attitudes was listed as a necessary first step toward conservation and development.

During the second day aquatic bioresources were considered in relation to their environment. A general concept conveyed by ten of the twelve speakers was that changes in environmental quality produced by the cultural activities of man were the greatest threat to bioresources. In an excellent paper on eutrophication, several cases were indicated in which the aging of a body of water had actually been reversed when pollution had been diverted or eliminated. One of the most controversial papers de-emphasized the presence of phosphorus and nitrogen as a principal agent in eutrophication and indicted carbon dioxide as a causative factor in promoting growth of algal blooms.

The measurement and detection of bioresources were considered during the third day of the symposium. Methods of remote sensing were introduced by informative papers on aerial photographic methods and infrared and multispectral techniques. The practical application and accuracy of these methods were illustrated by five other speakers. New procedures in bioresources study were described during the afternoon.

The production of harvestable materials from the oceans and fresh waters has tripled in the past two decades, and the present production can be substantially increased without exceeding sustainable yield and without including possible production from aquaculture. The potential increase in ocean productivity will result largely from utilization of presently unexploited and underexploited species and areas and in international cooperation for the prevention of overexploitation.

Even though it is generally agreed that the "seas" can furnish vastly more food and materials for humans than is presently being taken, there are limits to production as there are limits to shallow-water environments. A definite threat exists to aquatic bioresources in the impact of the ever-expanding human population on the delicate ecological balance. The maintenance and improvement of environmental quality is a must for the continuation of increased aquatic production.

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Note

1. The proceedings of the symposium will be available from the American Water Resources Association, P.O. Box 434, Urbana, Illinois 61801.

Forthcoming Events

November

11–13. **Geological** Soc. of America, 83rd annual, Milwaukee, Wis. (L. M. Cline, GSA, P.O. Box 1719, Boulder, Colo. 80302)

11–14. **Seismological** Soc. of America, Milwaukee, Wis. (D. Tocher, P.O. Box 826, Berkeley, Calif. 94701)

12–15. American **Heart** Assoc., 43rd annual scientific sessions, Atlantic City, N.J. (AHA, 44 E. 23 St., New York 10010)

15–19. **Engineering in Medicine and Biology**, 23rd conf., Washington, D.C. (R. Johns, 522 Traylor Bldg., Johns Hopkins School of Medicine, Baltimore, Md. 21205)

15–19. American **Nuclear** Soc., Washington, D.C. (J. Stouky, NUS Corp., 2351 Research Blvd., Rockville, Md. 20850)

16–17. American **Petroleum** Inst., 50th annual, New York, N.Y. (H. A. Fondu, 1271 Avenue of the Americas, New York 10020)

16–18. **Chemical Marketing Research** Assoc., San Francisco, Calif. (C. W. Slade, Jr., Chemical Marketing Research Assoc., 100 Church St., New York 10007)

16–19. Society of **Vertebrate Paleontology**, Toronto, Ont., Canada. (J. H. Ostrom, Yale Peabody Museum, 170 Whitney Ave., New Haven, Conn. 06520)

17–19. Fall Joint **Computer** Conf., 7th annual, Houston, Tex. (B. Pollard, RCA–NPL, 200 Forest St., Marlboro, Mass. 01752)

17–20. **Magnetism and Magnetic Materials**, 16th annual conf., Miami Beach, Fla. (H. C. Wolfe, American Inst. of Physics, 335 E. 45 St., New York 10017)

17–22. Pan American **Medical** Assoc., 45th, Hollywood Beach, Fla. (J. Eller, 745 Fifth Avenue, New York 10022)

18–20. Eastern **Analytical** Symp., New York, N.Y. (D. A. Pragay, P.O. Box 38, Buffalo, N.Y. 14215)

18–20. **Brain Chemistry and Mental Disease**, 4th annual intern. symp., Houston, Tex. (B. T. Ho, TRIMS, 1300 Moursund Ave., Houston 77025)

18–20. National Assoc. for **Mental Health**, Los Angeles, Calif. (NAMH, 10 Columbus Circle, New York 10019)

18–20. **Hamster Pathology**, Boston, Mass. (F. Homburger, Bio-Research Inst., Inc., 9 Commercial Ave., Cambridge, Mass. 02141)

18–20. National Assoc. of **Police Labs.** and the Bureau of **Narcotics and Dangerous Drugs**, New York, N.Y. (Lt. F. Fernez, Suffolk County Police Dept. Lab., Veteran's Highway, Hauppauge, N.Y. 11787)

19–20. American Assoc. for **Automotive Medicine**, Ann Arbor, Mich. (J. L. Weygandt, 716 Monroe St., Sheboygan Falls, Wis. 53085)

19–20. **Biomedical Materials**, London, England. (Meetings Officer, Inst. of Physics and The Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

19–20. **Cancer** Conf., Houston, Tex. (F. Goff, M. D. Anderson Hospital, Univ. of Texas, Houston)

19–20. Conflicts in **Water Resources Planning**, What are the Remedies?, Austin, Tex. (S. Ferguson, Center for Research in Water Resources, Balcones Research Center, Route 4, Box 189, Austin 78757)

19–22. American **Anthropological** Assoc., San Diego, Calif. (E. J. Lehman, Executive Director, AAA, 1703 New Hampshire Ave., NW, Washington, D.C. 20009)

19–22. Society for **Psycho-physiological** Research, New Orleans, La. (L. H. Miller, Louisiana State Univ. Medical Center, 1542 Tulane Ave., New Orleans 70112)

20–21. Tennessee Acad. of **Science**, Memphis, Tenn. (J. D. Caponetti, Dept. of Botany, Univ. of Tennessee, Knoxville 37916)

20–23. American **Speech and Hearing** Assoc., New York, N.Y. (K. O. Johnson, ASHA, 9030 Old Georgetown Rd., Washington, D.C. 20014)

21–24. Association of Schools of **Allied Health Professions**, 3rd annual, Chicago, Ill. (J. Von Bargen, Suite 300, 1 Dupont Circle, NW, Washington, D.C. 20036)

23–25. American Physical Soc., Div. of **Fluid Dynamics**, 23rd, Charlottesville, Va. (Y. H. Pao, Boeing Scientific Research Labs., P.O. Box 3981, Seattle, Wash. 98124)

25–28. International Symp. on **Chemotherapy of Tuberculosis**, 2nd, Buenos Aires, Argentina. (J. L. Marchese, Sanchez de Bustamante Str., 2144, Buenos Aires)

26–28. Central Assoc. of **Science and Mathematics Teachers**, Chicago, Ill. (D. R. Winslow, P.O. Box 246, Bloomington, Ind. 47401)

26–29. National Council for **Geographic Education**, Detroit, Mich. (L. Mitchell, NCGE, 111 W. Washington St., Chicago, Ill. 60602)

27–29. **Abortion, Family Planning and Sex Education**, 5th annual intern. symp., Boston, Mass. (H. Ratner, Natl. Commission on Human Life, Reproduction and Rhythm, P.O. Box 31, Oak Park, Ill. 60303)

29–30. International **Exchange of Technology**, Research Triangle Park, N.C. (G. R. Herbert, Research Triangle Inst., P.O. Box 12194, Research Triangle Park 27709)

29–2. American **Medical** Assoc. (clinical conv.), Boston, Mass. (E. B. Howard, AMA, 535 N. Dearborn St., Chicago, Ill. 60610)

29–3. American Inst. of **Chemical Engineers**, Chicago, Ill. (F. J. Van Antwerpen, AICE, 345 E. 47 St., New York 10017)

29–3. Association of **Military Surgeons** of the United States, Washington, D.C. (F. E. Wilson, AMSUS, 8502 Connecticut Ave., Chevy Chase, Md. 20015)

29–4. American Soc. of **Mechanical Engineers**, New York, N.Y. (A. B. Conlin, Jr., Technical Dept., ASME, 345 E. 47 St., New York 10017)

29–4. **Radiological** Soc. of North America, Chicago, Ill. (M. D. Frazer, RSNA, Inc., 713 E. Genesee St., Syracuse, N.Y. 13210)

30–2. Conference on the **Fatigue Problem**, Detroit, Mich. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio)

30–3. **Entomological** Soc. of America, Miami Beach, Fla. (W. P. Murdoch, 4603 Calvert Rd., College Park, Md. 20740)

30–4. **Engineering Materials and Design**, intern. exhibition and trade fair, London, England. (Industrial and Trade Fairs, Ltd., Commonwealth House, New Oxford St., London, W.C.1, England)

December

1–3. **Problems of Electroplating,** 3rd symp., Budapest, Hungary. (Scientific Soc. of Mechanical Engineers, Szabadsag Ter. 17, Budapest)

1–6. **Radiological** Soc. of North America, Chicago, Ill. (M. D. Frazier, 713 E. Genesee St., Syracuse, N.Y. 13210)

1–7. International **Hospital** Federation, 2nd, San Jose, Costa Rica. (J. Gonzalez, Pan American Office, 1 Farragut Sq., South, Washington, D.C. 20006)

1–8. International Symp. on the Results of **Research on Representative and Experimental Basins**, Wellington, New Zealand. (L. A. Heindl, Royal Soc. of New Zealand, P.O. Box 196, Wellington)

2–3. **Materials/Process Selection**, Phase II, Cleveland, Ohio. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

2–4. **Vehicular Technology**, 21st conf., Washington, D.C. (P. M. Kelly, Kelly Scientific Corp., 3900 Wisconsin Ave., NW, Washington, D.C. 20016)

2–9. Management of **Emotional Problems in the Older Person**, New York, N.Y.

(H. Gershman, American Inst. for Psychoanalysis, 329 E. 62 St., New York 10021)

3–4. Conference on **Clinical Pharmacology**, Washington, D.C. (L. I. Goldberg, Emory Univ. School of Medicine, Atlanta, Ga.)

4. American Assoc. of **Physicists in Medicine**, Chicago, Ill. (M. Rozenfeld, Argonne Hospital, 950 E. 59 St., Chicago 60637)

4–6. American Acad. of **Psychoanalysis**, New York, N.Y. (J. B. Miller, AAP, 510 E. 86 St., New York 10028)

5–10. American Acad. of **Dermatology**, Chicago, Ill. (F. A. J. Kingery, 2250 Northwest Flanders, Portland, Ore. 97201)

6. American Soc. of **Hospital Pharmacists**, 5th annual, Anaheim, Calif. (W. E. McConnell, Dept. of Education and Training, 4630 Montgomery Ave., Washington, D.C. 20014)

6–8. American Soc. of **Hematology**, San Juan, Puerto Rico. (F. H. Gardner, Presbyterian–Univ. of Pennsylvania Medical Center, Philadelphia 19104)

6–10. Association of **State and Territorial Health Officers**, Washington, D.C. (N. J. Swearingen, 128 C St., NE, Washington, D.C. 20002)

6–11. International **Clean Air** Congr., 2nd, Washington, D.C. (A. Arch, Air Pollution Control Assoc., 4400 Fifth Ave., Pittsburgh, Pa. 15213)

6–11. Pan American Congr. of **Rheumatology**, 5th, Punta del Este, Uruguay. (H. Havranek, Hospital Maciel, Calle 25 de Mayo 174, Montevideo, Uruguay)

7–8. **Myasthenia Gravis**, New York, N.Y. (R. J. Johns, Johns Hopkins Univ. Baltimore, Md.)

7–9. **Adaptive Processes Decision and Control** Symp., Austin, Tex. (D. G. Lainiotis, Electrical Research Center, Univ. of Texas, Austin 78712)

7–9. **Ceramics in Severe Environments**, Raleigh, N.C. (W. W. Kriegel, Engineering Information Office, North Carolina State Univ., Box 5125, Raleigh 27607)

7–9. National **Electronics** Conf. and Exhibition, 26th annual, Chicago, Ill. (R. Klich, Natl. Electronics Conference, Inc., Oakbrook Executive Plaza No. 2, 1211 W. 22 St., Oak Brook, Ill. 60521)

7–9. Southern **Surgical** Assoc., Boca Raton, Fla. (D. C. Sabiston, Duke Univ. Medical Center, Durham, N.C. 27706)

7–10. American **Astronomical** Soc., Tampa, Fla. (H. M. Gurin, 211 Fitz Randolph Rd., Princeton, N.J. 08540)

7–10. American **Geophysical** Union, San Francisco, Calif. (A. F. Spilhaus, Jr., AGU, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

7–11. Elements of **Ferrous Metallurgy**, 4th, Toronto, Canada. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

7–11. Greater New York **Dental** Mtg., 46th annual, New York, N.Y. (H. M. Harrison, Room 106-A, Statler Hilton, New York 10001)

7–12. **Plant Growth Substances**, 7th intern conf., Canberra, Australia. (P. D. O'Connor, Australian Acad. of Science, Gordon St., Canberra City, A.C.T. 2601)

8–10. North Central **Weed Control** Conf. Inc., Lexington, Ky. (E. L. Knake, Agronomy Dept., Univ. of Illinois, Urbana 61801)

8–11. American Soc. of **Agricultural Engineers**, Chicago, Ill. (J. L. Butt, P.O. Box 229, St. Joseph, Mich. 49085)

9–11. Conference on **Application of Simulation**, New York, N.Y. (M. Araten, Celanese Chemical Co., 245 Park Ave., New York 10017)

9–12. American Acad. for **Cerebral Palsy**, Houston, Tex. (G. Solomons, University Hospitals, Iowa City, Iowa 52240)

10. American Acad. of **Optometry**, Miami Beach, Fla. (C. C. Koch, 214–215 Foshay Tower, Minneapolis, Minn. 53402)

10–11. Symposium on **Molecular Mechanism of Drug Action**, Lucknow, India. (C. R. Krishna Murti, Div. of Biochemistry, Central Drug Research Inst., Chattar Manzil Palace, Lucknow)

10–12. American Heart Assoc. Council of **Clinical Cardiology**, 11th, Miami, Fla. (Mrs. J. Baxter, 5080 Biscayne Rd., Miami, Fla. 33137)

10–16. New York State Soc. of **Anesthesiologists** (Postgraduate Assembly), New York, N.Y. (Mrs. E. C. Sinsi, 30 E. 42 St., New York 10017)

11–12. American Federation for **Clinical Research**, New York, N.Y. (R. A. Rifkind, College of Physicians and Surgeons, 630 W. 168 St., New York 10032)

11–15. National Federation of **Catholic Physicians**, Washington, D.C. (H. R. Herzog, 2825 N. Mayfair Rd., Milwaukee, Wis. 53222)

14–15. British **Biophysical** Soc., London, England. (E. M. Bradbury, Biophysics Lab., Physics Dept., College of Technology, Park Rd., Portsmouth, England PO1 2DZ)

14–16. Institute of Electrical and Electronics Engineers, intern. symp. on **Circuit Theory**, Atlanta, Ga. (I. T. Frisch, Network Analysis Corp., Beechwood, Old Tappan Rd., Glen Cove, N.Y., 11542)

14–16. **Flow Properties of Metals**, Chicago, Ill. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

14–18. Texas Symp. on **Relativistic Astrophysics**, 5th, Austin. (L. C. Shepley, Physics Dept., Univ. of Texas, Austin 78712)

14–18. **Solid State Physics**, 6th conf., Reading, England. (Inst. of Physics and the Physical Soc., 47 Belgrade Sq., London S.W.1, England)

17–20. American **Psychoanalytic** Assoc., New York, N.Y. (Mrs. H. Fischer, APA, 1 E. 57 St., New York 10022)

26–29. Society for the **History of Technology**, Chicago, Ill. (M. Kranzberg, Crawford Hall, Case Western Reserve Univ., Cleveland, Ohio 44106)

26–30. Western Soc. of **Naturalists**, Honolulu, Hawaii. (D. H. Montgomery, Dept. of Biological Sciences, California Poly State College, San Luis Obispo 94301)

26–30. Society of **Systematic Zoology**, Chicago, Ill. (G. I. Stage, Dept. of Entomology, Natl. Museum of Natural History, Washington, D.C. 20560)

26–31. American Assoc. for the **Advancement of Science**, 137th annual, Chicago, Ill. (D. W. Thornhill, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

26–31. Society for **General Systems Research**, Chicago, Ill. (R. F. Ericson, 2100 Pennsylvania Ave., NW, Rm 818, Washington, D.C. 20006)

26–31. American **Nature Study** Soc. Chicago, Ill. (Mrs. J. Geisler, Milewood Rd., Verbank, N.Y. 12585)

26–31. American Soc. of **Zoologists**, Chicago, Ill. (G. Sprugel, Jr., Illinois Natural History Survey, 179 Natural Resources Bldg., Urbana 61801)

27. National Assoc. of **Science Writers**, Chicago, Ill. (Mrs. R. Arctander, Box H, Sea Cliff, N.Y. 11579)

27–30. **Archaeological** Inst. of America, 72nd annual, New York, N.Y. (J. S. Ord, AIA, 260 West Broadway, New York 10013)

27–30. **Biometric** Soc., eastern North American regional, Detroit, Mich. (D. G. Gosslee, P.O. Box 713, Oak Ridge, Tenn. 37830)

27–30. **Sigma Delta Epsilon**, Chicago, Ill. (M. A. Myers, 6234 Mary Lane Dr., San Diego, Calif. 92115)

27–30. American **Statistical** Assoc., 130th, Detroit, Mich. (J. W. Lehman, ASA, 806 15th St., NW, Washington, D.C. 20005)

28–30. American **Economic** Assoc., Detroit, Mich. (H. F. Williamson, 629 Noyes St., Evanston, Ill. 60201)

28–30. **History of Science Study**, Chicago, Ill. (J. C. Greene, Dept. of History, Univ. of Connecticut, Storrs 06268)

28–30. **Linguistic** Soc. of America, Washington, D.C. (T. A. Sebeok, Patton House, Indiana Univ., 516 E. Sixth St., Bloomington, Ind. 47401)

28–31. **Metric** Assoc., Chicago, Ill. (L. F. Sokol, 624 N. Drury Lane, Arlington Heights, Ill. 60004)

28–31. American **Physical** Soc., Stanford, Calif. (W. W. Havens, Jr., 335 E. 45 St., New York 10017)

28–31. Symposium on **Upper Mantle Project**, 2nd, Hyderabad, India. (S. Balakrishna, Natl. Geophysical Research Inst., Hyderabad-7)

January

2–21. American **College of Surgeons**, scientific winter cruise, San Juan, Puerto Rico; Caracas, Venezuela; and Panama City (American College of Surgeons, 55 E. Erie St., Chicago, Ill. 60611)

3–8. Symposium on **Hibernation-Hypothermia**, Snowmass (Aspen), Colo. (F. E. South, Space Sciences Research Center, Univ. of Missouri, Columbia 65201)

3–9. Indian **Science** Congr. Assoc., 58th annual, Calcutta. (M. Nagaraj, Dean, Faculty of Science, Bangalore Univ., Bangalore-1, India)

4–7. **Solid State Physics and Applications**, Boca Raton, Fla. (J. S. Blakemore, Physics Dept., Florida Atlantic Univ., Boca Ratón 33432)

5–7. **Solid State Physics**, 8th annual, Manchester, England. (Meetings Officer, Inst. of Physics and The Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

6–9. American **Rheumatism** Assoc., Washington, D.C. (Miss M. M. Walsh, Arthritis Foundation, 1212 Avenue of the Americas, New York 10036)

7–9. National Conf. on **Cancer of the Colon and Rectum**, San Diego, Calif. (R. N. Grant, American Cancer Soc., 219 E. 42 St., New York 10017)

11–15. Society of **Automotive Engineers**, Detroit, Mich. (W. I. Marble, 2 Pennsylvania Pl., New York 10001)

11–15. **Water Resources Engineering,** Phoenix, Ariz. (Executive Secretary, American Soc. of Chemical Engineers, 345 E. 47 Street, New York 10017)

11–22. **Science, Society, and Our World,** Medford, Mass. (K. A. McCarthy, Graduate School of Arts and Sciences, Tufts Univ., Medford 02155)

12–14. Institute of Electrical and Electronics Engineers, **Reliability and Quality Control,** 17th annual symp., Washington, D.C. (Executive Secretary, IEEE, 345 E. 47 St., New York 10017)

12–14. **System Sciences,** intern. conf., Honolulu, Hawaii. (R. Chattopadhyay, Univ. of Hawaii, 2565 The Mall, Honolulu 96822)

12–16. National Soc. of **Professional Engineers,** Memphis, Tenn. (P. H. Robbins, 2029 K St., NW, Washington, D.C. 20006)

12–18. **Marine Biological** Assoc. of India, Cochin. (E. G. Silas, Jyothi Building, Gopala Prabhu Rd., Ernakulam, Cochin, 11)

17. **Human Factors in the Design and Operation of the Highway Transportation System,** 4th annual, Washington, D.C. (B. W. Stephens, Dept. of Transportation, Federal Highway Administration, Office of Research and Development, 35-41.2, Washington, D.C. 20591)

17–21. Pan- American Conf. on **Adolescence,** Buenos Aires, Argentina. (S. C. Feinstein, American Soc. for Adolescent Psychiatry, 741 St. Johns, Highland Park, Ill. 60035)

18–19. **Nucleic Acid-Protein Interaction,** Miami, Fla. (F. Huijing, Dept. of Biochemistry Univ. of Miami School of Medicine, P.O. Box 875, Biscayne Annex, Miami 33152)

18–20. Society of **Thoracic Surgeons,** Dallas, Tex. (W. G. Purcell, 333 N. Michigan Ave., Chicago, Ill. 60610)

18–22. **Highway Research** Board, 50th annual, Washington, D.C. (H. M. Gillespie, Natl. Research Council, 2101 Constitution Ave., NW, Washington, D.C. 20418)

18–22. **Metallographic Interpretation,** Dallas, Tex. (J. A. Fellows, American Society of Metals, Metal Park, Ohio 44073)

18–25. **Pathological Wilting in Plants,** intern. symp., Madras, India (T. S. Sadasivan, Univ. of Madras, Botany Lab., Madras-5)

19–21. **Systems, Networks, and Computers,** intern. conf., Oaxtepec, Mexico. (M. A. Murray-Lasso, Instituto de Ingeneria, Ciudad Universitaria, Mexico 20 DF, Mexico)

21–22. **Nucleic Acid Synthesis in Viral Infection,** Miami, Fla. (F. Huijing, Dept. of Biochemistry, Univ. of Miami School of Medicine, P.O. Box 875, Biscayne Annex, Miami 33152)

21–25. American **Mathematical** Soc., Atlantic City, N.J. (G. L. Walker, P.O. Box 6248, Providence, R.I. 02904)

21–31. North American Conf. on **Fertility and Sterility,** Puerto Vallarta, Mexico. (Mrs. F. Royce, 112-44 69th Ave, Forest Hills, N.Y. 11375)

22. **Bibliographical Soc. of America,** New York, N.Y. (T. R. Adams, John Carter Brown Library, Brown Univ., Providence, R.I. 02912)

BOOKS RECEIVED

(Continued from page 314)

York, 1969. xviii, 300 pp., illus. $7.75. Concepts in Geography, vol. 2.

Anatomies of America. Sociological Perspectives. Philip Ehrensaft and Amitai Etzioni, Eds. Macmillan, New York; Collier-Macmillan, London, 1970. xii, 500 pp. Paper, $9.95.

Animals in Migration. Robert T. Orr. Macmillan, New York; Collier-Macmillan, London, 1970, xvi, 304 pp., illus. $12.50.

Approaching the Benign Environment. The Franklin Lectures in the Sciences and Humanities. First Series. R. Buckminster Fuller, Eric A. Walker, and James R. Killian, Jr. Published for Auburn University by University of Alabama Press, University, 1970. xii, 124 pp. $6.

An Archeological Survey of Southwest Virginia. C. G. Holland. Smithsonian Institution Press, Washington, D.C., 1970 (available from the Superintendent of Documents, Washington, D.C.). xviii, 196 pp., illus. + plates. $4.75. Smithsonian Contributions to Anthropology, No. 12.

The Barabaig. East African Cattle-Herders. George J. Klima. Holt, Rinehart and Winston, New York, 1970. xiv, 112 pp., illus. Paper, $2.25. Case Studies in Cultural Anthropology.

Basic Biology. Alfred M. Elliott and Bruce R. Voeller. Appleton-Century-Crofts, New York, 1970. xii, 660 pp., illus. $8.95.

Basic Mathematics Review. Text and Workbook. James A. Cooley and Ralph Mansfield. xii + 416 pp. Vol. 1, Arithmetic (xii, 178 pp.); vol. 2, Elementary Algebra (xii, pp. 179–416, illus.) Paper, each $3.95. Macmillan, New York; Collier-Macmillan, London, ed. 2, 1970.

Behavior in New Environments. Adaptation of Migrant Populations. Based on a conference, Dorado Beach, Puerto Rico, November 1968. Eugene B. Brody, Ed. Sage, Beverly Hills, Calif., 1970. 480 pp., illus. $12.50.

Beliefs and Values. Karl E. Scheibe. Holt, Rinehart and Winston, New York, 1970. xii, 164 pp. Paper, $2.95. The Person in Psychology Series.

Bibliography of Publications. As of 30 June 1969. Human Resources Research Organization, Alexandria, Va., 1969. viii, 314 pp. Paper.

Bibliography on Smoking and Health. 1969 Cumulation. With English language abstracts of foreign items. National Clearinghouse for Smoking and Health, Health Services and Mental Health Administration, Arlington, Va., 1969 (available from Superintendent of Documents, Washington, D.C.). vi, 322 pp. Paper. Public Health Service Publ. No. 1124, Bibliography Series No. 45.

Bibliography on the Urban Crisis. The Behavioral, Psychological, and Sociological Aspects of the Urban Crisis. Jon K. Meyer. National Institute of Mental Health, Chevy Chase, Md., 1969 (available from the Superintendent of Documents, Washington, D.C.). viii, 452 pp. Paper, $3.75. Public Health Service Publication No. 1948.

Biochemistry of the Phagocytic Process. Localization and the Role of Myeloperoxidase and the Mechanism of the Halogena-

tion Reaction. Julius Schultz, Ed. North-Holland, Amsterdam; Elsevier, New York, 1970. 142 pp., illus. $8.

Biology and the Future of Man. Philip Handler, Ed. Oxford University Press, New York, 1970. xxiv, 936 pp., illus. $12.50.

The Biology of Twinning in Man. M. G. Bulmer. Clarendon (Oxford University Press), New York, 1970. x, 206 pp., illus. $6.40.

A Brief Guide to Sources of Scientific and Technical Information. Saul Herner. Information Resources Press, Washington, D.C., 1969. x, 102 pp. Paper, $4.25.

Cardiovascular Disease. A Matter of Prevention. Kenneth L. Briney. Wadsworth, Belmont, Calif., 1970. xiv, 82 pp., illus. Paper. Basic Concepts in Health Science Series.

Catalogue of the Neotropical Squamata. Part 1, Snakes. James A. Peters and Braulio Orejas-Miranda, with the collaboration of Roberto Donoso-Barros. viii, 348 pp., illus. Part 2, Lizards and Amphisbaenians. James A. Peters and Roberto Donoso-Barros, with the collaboration of Braulio Orejas-Miranda. viii, 296 pp., illus. Paper, $6.75 the set. Smithsonian Institution Press, Washington, D.C., 1970 (available from the Superintendent of Documents, Washington, D.C.).

Century of Mismatch. Simon Ramo. McKay, New York, 1970. xiv, 210 pp. $5.95.

Changing Patterns. An Atypical Autobiography. Macfarlane Burnet. Elsevier, New York, 1969. x, 282 pp. + plates. $8.50.

Chemical Thermodynamics. Principles and Applications. Peter A. Rock. Macmillan, New York; Collier-Macmillan, London, 1969. xvi, 512 pp., illus. $11.95.

Chemicals and Life. Kenneth E. Maxwell. Dickenson, Belmont, Calif., 1970. x, 374 pp., illus. Paper. Dickenson Series in Biology.

Chemistry: A Comprehensive Laboratory Course. B. Richard Siebring, Georgia Strack Moczynski, Arlene Hetzel Constant, and Mary Ellen Schaff. Harper and Row, New York, 1970. viii, 312 pp., illus. Paper, $6.50.

The Chemistry of Matter. James B. Pierce. Houghton Mifflin, Boston, 1970. xvi, 800 pp., illus. $10.50.

Chimie Industrielle. Henri Guérin. Vol. 2, Du Sel au Téflon: Le Chlorure de Sodium et les Industries Dérivées ou Connexes. Presses Universitaires de France, Paris, 1969. 568 pp. + plates. 60 F. Euclide: Introduction aux Etudes Scientifiques.

China at Work. An Illustrated Record of the Primitive Industries of China's Masses, Whose Life Is Toil, and Thus an Account of Chinese Civilization. Rudolf P. Hommel. M.I.T. Press, Cambridge, Mass., 1969. xii, 372 pp., illus. Cloth, $10; paper, $3.95. Reprint of the 1937 edition.

Chronological Analysis of Tsegi Phase Sites in Northeastern Arizona. Jeffrey S. Dean. University of Arizona Press, Tucson, 1969. xiv, 210 pp., illus. Paper, $8.50. Papers of the Laboratory of Tree-Ring Research, No. 3.

Circuits, Signals, and Networks. Cyrus W. Cox and William L. Reuter. Macmillan, New York; Collier-Macmillan, London, 1969. xviii, 590 pp., illus. $12.95.

Clinical Nursing. Pathophysiological and Psychosocial Approaches. Irene L. Beland. Macmillan, New York; Collier-Macmillan, London, ed. 2, 1970. x, 950 pp., illus. $13.95.

College Algebra and Trigonometry. Steven J. Bryant, Jack Karush, Leon Nower, and Daniel Saltz. Goodyear, Pacific Palisades, Calif., 1970. xii, 468 pp., illus. $10.95.

College Zoology. Karl A. Stiles, Robert W. Hegner, and Richard A. Boolootian. Macmillan, New York; Collier-Macmillan, London, ed. 8, 1969. viii, 600 pp., illus. $9.95.

The Computation and Theory of Optimal Control. Peter Dyer and Stephen R. McReynolds. Academic Press, New York, 1970. x, 246 pp., illus. $13.50. Mathematics in Science and Engineering, vol. 65.

Computer Math Experiences. Programs and Exercises for Use in the Computer-Equipped Classroom. Melvin Serisky. Olcott Forward, Hartsdale, N.Y., 1970. 320 pp., illus. Paper, $7.85.

Computer Research in Palynology Demonstrated by Use of Oklahoma University General Information Processing System (GIPSY). Permian Palynology of North America and Some Associated Problems. L. R. Wilson, Jack L. Morrison, and William E. Reid. University of Oklahoma, Norman, 1969. viii, 143 pp. Paper. Information Science Series, Monograph No. 2.

Computing and Computer Science. A First Course with FORTRAN IV. T. D. Sterling and S. V. Pollack. Macmillan, New York; Collier-Macmillan, London, 1970. xvi, 400 pp., illus. $9.95.

Conference on Health Services for Children and Youth. Chapel Hill, N.C., March 1969. American Public Health Association, New York, 1970. viii, 136 pp., illus. Paper, $2. Supplement to April 1970 *Journal of Public Health*, vol. 60, No. 4.

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