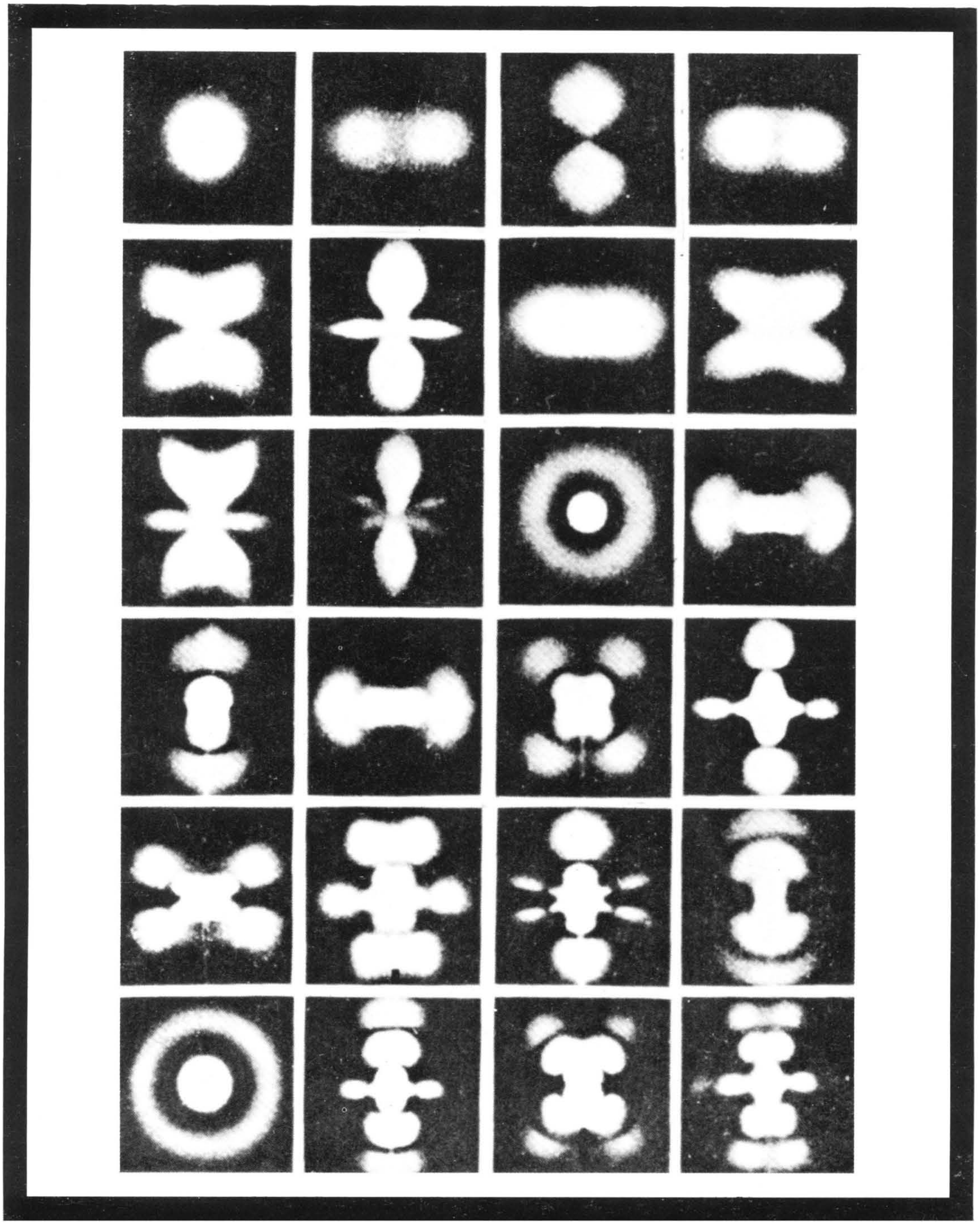
SCIENCE

22 May 1970

Vol. 168, No. 3934

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Amino Acid Analysis

BREAKTHROUGH

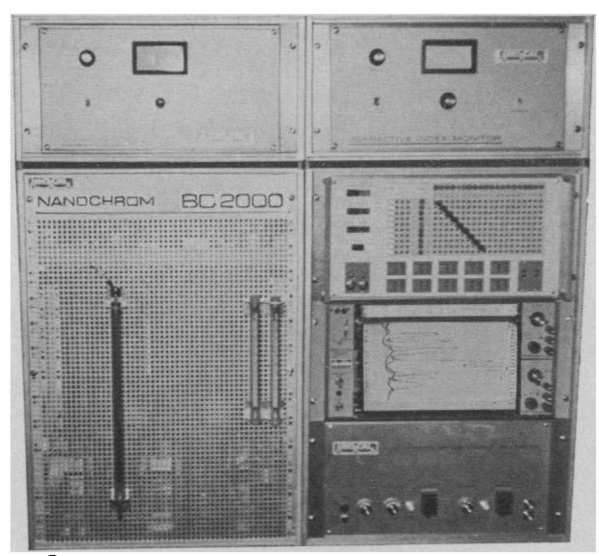
Bio-Cal's BC-2000 is a completely new concept in liquid chromatography. Look at the advantages the NANOCHROM gives you over other amino acid analyzers:

NANOCHROM

1. **NO PULSATING PUMPS.** The Nanochrom uses a pressure driven fluid system.
2. **2500 PSI WORKING PRESSURES.** The Nanochrom operates at pressures that would destroy other analyzers.
3. **LESS THAN 3 GRAMS OF RESIN** are needed to fill the Nanochrom's 0.15 x 30 cm stainless steel column.
4. **10 ml OF BUFFER** for a complete protein hydrolysate analysis. The Nanochrom is a true micro system.
5. **LESS THAN ONE HOUR** for a complete protein hydrolysate. This is the **standard** Nanochrom system, not a special accelerated method.
6. **0.1 NANOMOLES WITHOUT SCALE EXPANSION** is standard sensitivity on the Nanochrom. And the baseline is stable at all detection levels because of the new pressure-driven fluid system and the new photometer.

Other Liquid Analyzers

1. Use pulsating pumps that ultimately affect the baseline.
2. Pressure limits on other analyzers are between 500 and 800 psi. Above this limit components fail.
3. Other analyzers require from 35 to 75 grams of resin to fill their low pressure glass columns.
4. Other analyzers use anything from 120 ml to 300 ml of buffer to analyze a protein hydrolysate.
5. Standard systems on other analyzers usually require two hours or more. Accelerated systems push components to the limit.



BIO CAL Instrument Co.

2400 Wright Avenue/Richmond, California 94804/(415) 237-4944

If you are buying an analyzer—even if you have started the paperwork—call us at (415) 237-4944. The Nanochrom will obsolete the analyzer you are buying. Let us give you the details.

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22 May 1970
Vol. 168, No. 3934

SCIENCE

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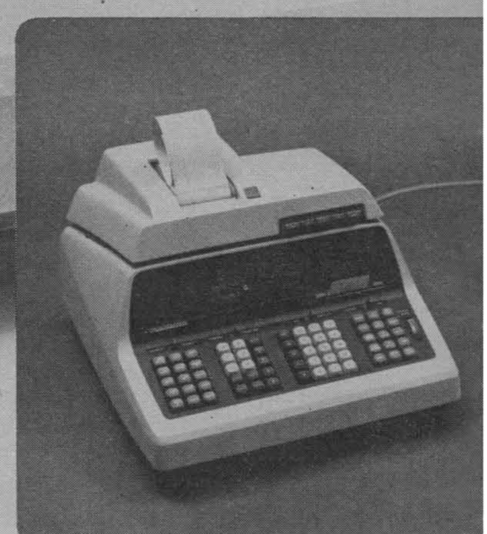
COVER

Patterns of electron wave functions of different quantum states in the Coulomb field. See page 923. [V. F. Weisskopf, Massachusetts Institute of Technology]

Dynamic range 10^{-98} to 10^{99}, nearly 200 decades. Observation of math operations on 3 displayed registers. Up to 32 more registers for data storage.

Complex and vector arithmetic simplified with coordinate transformation keys, rectangular-to-polar and vice-versa, in milliseconds.

Trig functions covering all quadrants and any size angle in degrees or radians.



Introducing the HP 9100B to give you a choice of basic calculators. Provides additional internal memory and programming capability.

Program from the keyboard. Record and store up to 392-step programs on credit-card size magnetic cards for repeated use.

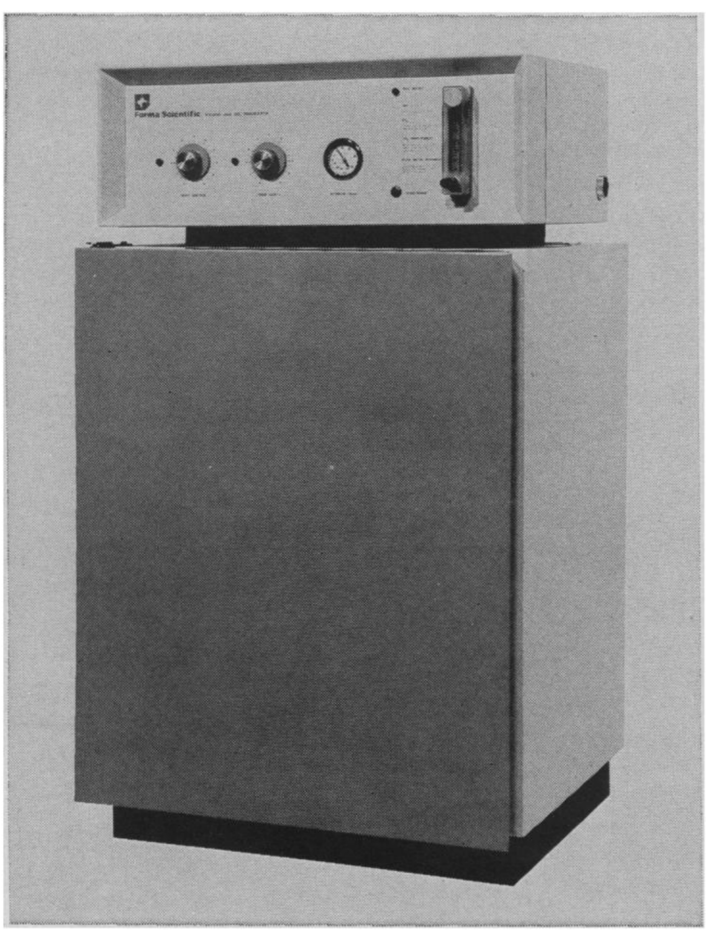
Branching and looping flexibility provided by "IF" keys expands programming capability. Single-key direct sub-routine call.

Edit programs easily. Single-step through programs to check and de-bug. Address an individual step and make corrections without re-entering the entire program.

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-í-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.

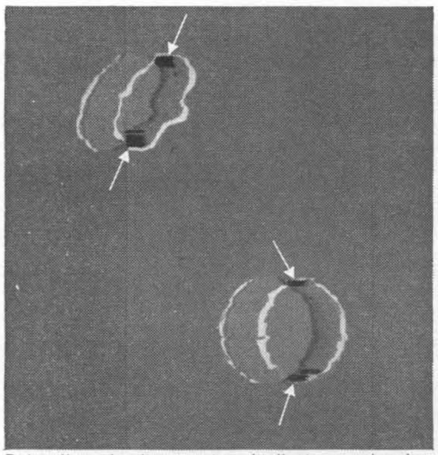
We also increased shelf capacity. With special no-tip shelves. And a stainless steel interior. The exterior is finished in tangerine and cream colored baked enamel.

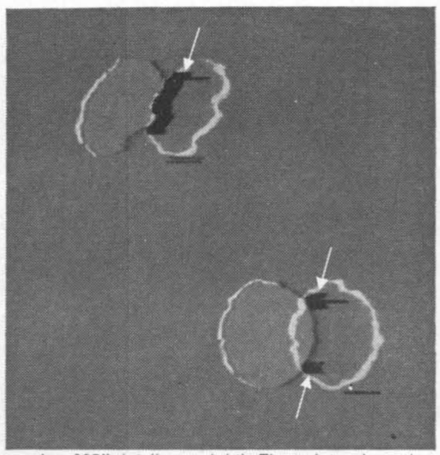
This remarkable incubator is also available in a double-door unit. Choose from four models. Write for Bulletin WJ-100.

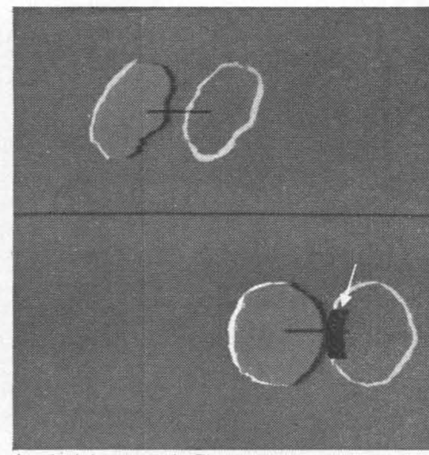
Forma Scientific, Box 649, Marietta, Ohio 45750.

Forma Scientific

How Western Electric spots dots with TV.







Delay line circuitry creates duplicate, overlapping "ghost" images for pencil mark (upper left) and regular .025" dot (lower right). The points where the images cross can be made to produce black areas (marked by arrows). The ghosts are moved right or left, and the positions of the black areas tested

How would you use automation for drilling holes when every hole has to be in a precise spot, but every spot isn't exactly where you expect it to be?

That became a critical problem for Western Electric when we started using a polyethylene with very superior electrical properties as the base laminate in printed circuit boards. Unfortunately this material showed a tendency to shrink when the circuit pattern was etched in the copper on the board—not enough to affect its electrical properties, but enough to dislocate the dots which indicated where holes were to be drilled for placing components. The shrinkage was unpredictable but could move a dot by as much as 1/32"—more than its own diameter.

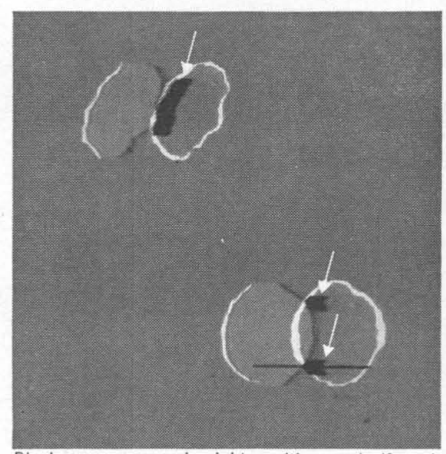
What that meant was that we could not use a conventional tape-controlled drilling machine, which put the drill in precisely the same spot every time. We needed a machine that could, in effect, "see" a dot, no matter where it was, tell it apart from an accidental marking of about the same size and shape, and put a drill right through it.

Engineers at our Greensboro, N.C., Works made such a machine. It consists of a TV camera hooked up to circuitry which removes the grays from the picture, turning it into a series of true on-or-off digital pulses; and logic circuitry which can respond to such pulses and activate a mechanism which moves the board around.

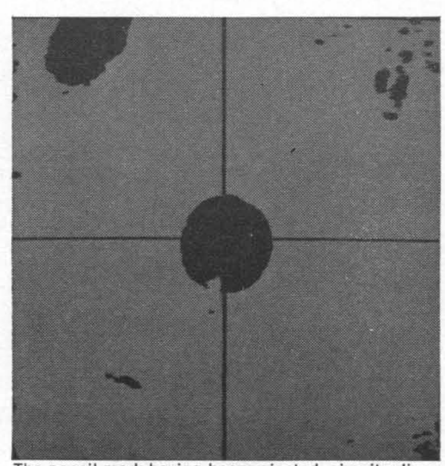
Once the dot has been roughly centered beneath the camera, delay line circuitry creates a second image which is first superimposed on the original, then moved by successive stages to the right. The points where the two images meet—i.e., where the two circles cross—will be in certain positions if and only if the original dot is a perfect circle of the proper size. Logic circuitry tests these positions, and if they are not exactly right, it won't drill and the circuitry sets itself to search for another dot. If they are, it lines the dot up, moves the camera aside, moves the drill into position, and there you are.

A simple, fast, economical, and very, very precise solution to a vexing problem. The kind of solution that helps us keep the quality of the equipment we make for the Bell System high, and the costs low.

Western Electric

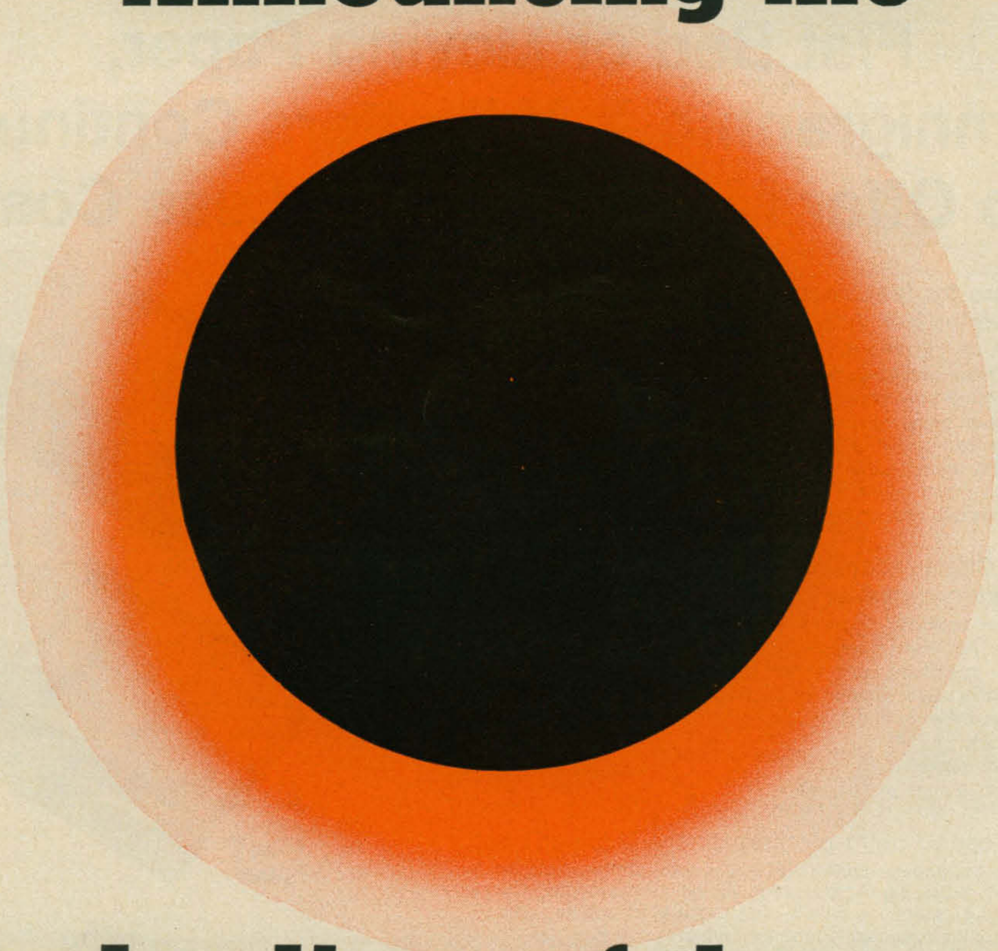


Black areas appear in right positions only if marking is a circle of the proper size.

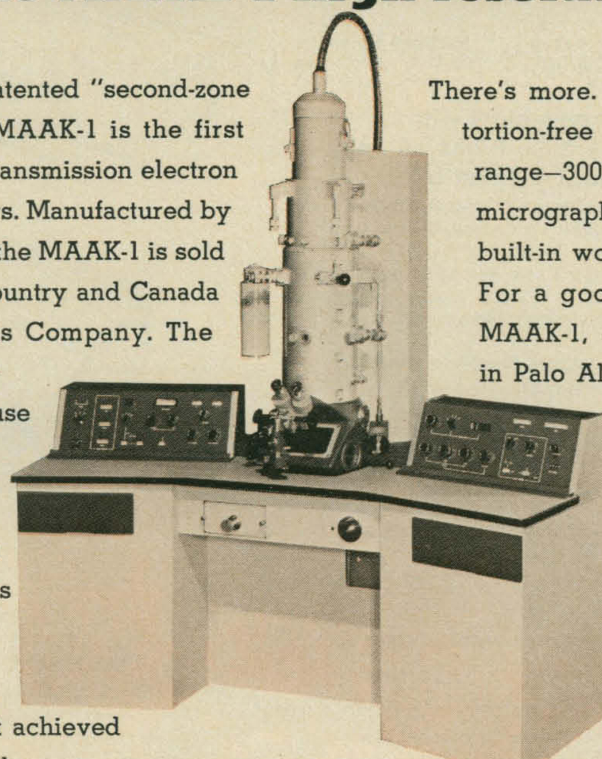


The pencil mark having been rejected, circuitry lines up acceptable dot for drilling.

Announcing the



2nd eclipse of the year!
(The MAAK-1 high resolution TEM.)



Featuring a unique, patented "second-zone objective lens," the MAAK-1 is the first new development in transmission electron microscopes in 10 years. Manufactured by Akashi, Ltd., of Japan, the MAAK-1 is sold and serviced in this country and Canada by Materials Analysis Company. The MAAK-1 eclipses conventional TEM's because its second-zone lens provides:

- <u>twice</u> the resolution of other lens designs (given the same specimen).
- <u>highest contrast</u> yet achieved for thin section work.

There's more. The MAAK-1 gives you bright, distortion-free images over its **entire** magnification range—300X to 500,000X. Further, you'll get sharp micrographs every time because the MAAK-1's built-in wobbler assures proper focusing.

For a good look (without pinholes) at the MAAK-1, contact MAC. Demonstrations given in Palo Alto.

Materials Analysis Company,
1060 E. Meadow Circle,
Palo Alto, CA 94303.
Phone (415) 326-6556.

MAC MATERIALS ANALYSIS COMPANY

H A Heath Tecna Company

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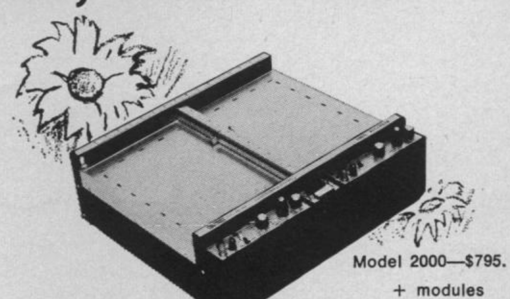
Flat Bed or Moving Paper, Omnigraphic™ X-Y Plotters Continue to Offer More Features, Less Cost



Model 2000—$795.
+ modules

Feature for feature, model for model— a superior X-Y with unmatched flexibility:

- ☐ Both 8½" x 11" and 11" x 17" charts
- ☐ A choice of 12 interchangeable modules from $25. to $420.
- ☐ English/Metric scaling switch
- ☐ Vacuum paper hold down
- ☐ 20 in/sec. speed
- ☐ ± .2% overall accuracy
- ☐ Electric pen lift
- ☐ Disposable non-drying pens

Model 3000—$710.
+ modules

Strip Chart recording with multi speeds and wide range of input functions:

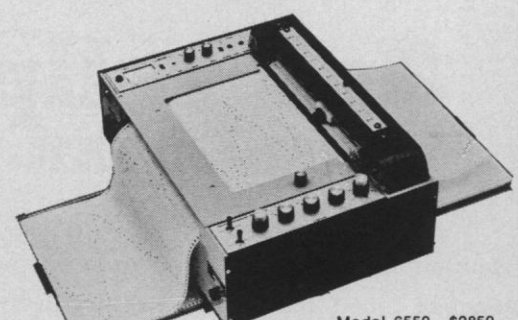
- ☐ Paper size: 10" (25cm) x 100'
- ☐ Nine pushbutton selectable speeds from .05 to 20 in./min.
- ☐ Nine interchangeable Y axis modules
- ☐ Positive paper feed or roll take-up
- ☐ Rack, panel or bench mounting
- ☐ Electric pen lift
- ☐ Event marker
- ☐ All solid state electronics

High speed point plotting for the Nuclear Lab:

Here is the popular OMNIGRAPHIC™ point plotter designed for use with pulse height analyzers, digital oscilloscopes, DVM's, counters or scanners. Simply plug in the 6550 and you get:

- ☐ A plotting speed of 1200 points/minute
- ☐ Four Step resolution from 0.025" to 0.10"
- ☐ High accuracy of ± 0.2% with ± 0.1% repeatability
- ☐ Manually selectable 6 character printer head
- ☐ Z-fold chart paper tears to file size
- ☐ Bi-directional paper movement
- ☐ Plugs into the following Pulse Height Analyzers with only a cable change:

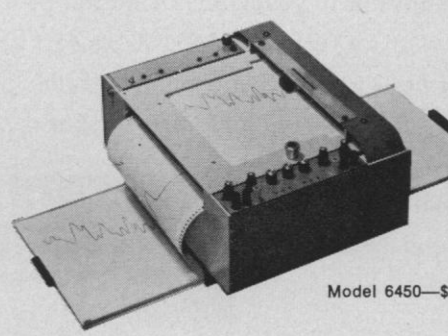
Fabri-Tec **Intertechnique** **Laben** **Northern Scientific**
Nuclear Data **Packard** **RCL-RIDL** **TMC** **Victoreen**



Model 6550—$2850

X-Y Plotting is now more convenient with the Omnigraphic™ 6450 because it has all the advantages of conventional X-Y's, yet offers:

- ☐ Z-fold paper eliminates hand loading of individual charts
- ☐ Automatic index or reversal of chart on command—local or remote.
- ☐ Slewing speed 20 in/sec. on Y (pen) axis and 15 in/sec. on X (paper) axis.
- ☐ 18 calibrated DC voltage ranges (continuously variable between ranges).
- ☐ Input impedence 1 megohm, all ranges fixed and variable
- ☐ Accuracy ± 0.2% of full scale, repeatability ± 0.1%
- ☐ 11" x 17" recording surface
- ☐ Pen control local or remote
- ☐ Front panel switch for automatic English/Metric scaling
- ☐ Ask about 2 pen model 6452



Model 6450—$1950

Send for catalog on the complete line of graphic recorders

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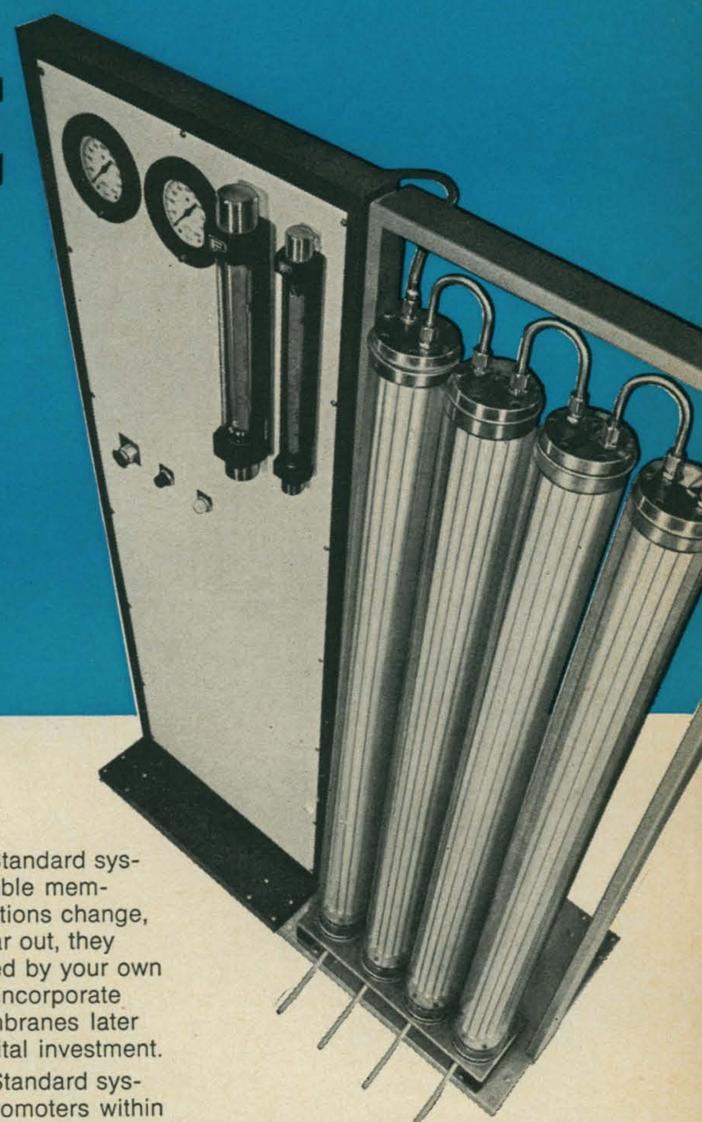
Concentrate... separate without heat

Suspensions as well as solutions.



American-Standard reverse osmosis systems are proven in extended large-scale operations at pressures to 2000 psi.

If you are processing chemicals, producing enzymes, concentrating juices, coffee, tea or dairy whey, managing specialty water systems, recovering electroplating salts, softening or desalting water, or coping with water pollution, consider the following exclusive advantages of the American-Standard reverse osmosis system:

- Only the American-Standard system can concentrate, separate, purify, or fractionate such a wide range of solutions at ambient or below ambient temperatures with no thermal degradation.
- Only the American-Standard system has a pressure capability of up to 2,000 psi, permitting separation of difficult solutions inseparable in other systems.
- Only the American-Standard system has field-replaceable membranes. As the applications change, or the membranes wear out, they can be quickly changed by your own people. You can also incorporate newly developed membranes later without additional capital investment.
- Only the American-Standard system has turbulence promoters within large diameter tubing. Result: the system can handle fluid flow at low rates while maintaining high flux and rejections . . . and process fluids with a high percentage of solids.

The Basic Engineering Unit

To conduct your own evaluations, American-Standard offers a Basic Engineering Unit for *your* lab with capacities of 50 to 2500 gpd designed to obtain precise engineering data for accurate evaluation of your product. American-Standard Customer Applications Laboratory project engineers will consult with you and confirm your studies.

For literature and/or technical consultation, in strict confidence, write or call today.

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If everyone were easily satisfied,

Zeiss microscopes are made for the microscopist who demands the best. Regardless of what Zeiss microscope you buy, you get the world's finest optics. And you get the ultimate in mechanical precision. Simply to look through the optics and to touch the focusing knobs on any Zeiss instrument is proof enough.

Our Universal Microscope is exactly what its name states—it is universal, and universally accepted for all applications. But we also offer another instrument, the WL, that for many applications is in the same class. Even if you normally find satisfaction hard to come by, you'll find it easily with one of these microscopes. Which one depends upon what you want to do.

The Zeiss WL Microscope
The WL is an outstanding instrument for most transmitted-light applications, including: brightfield, darkfield, phase contrast, Nomarski interference contrast, fluorescence, polarization, microprojection, photomicrography.

A look at just a few of its key features will give you an idea of its excellence:

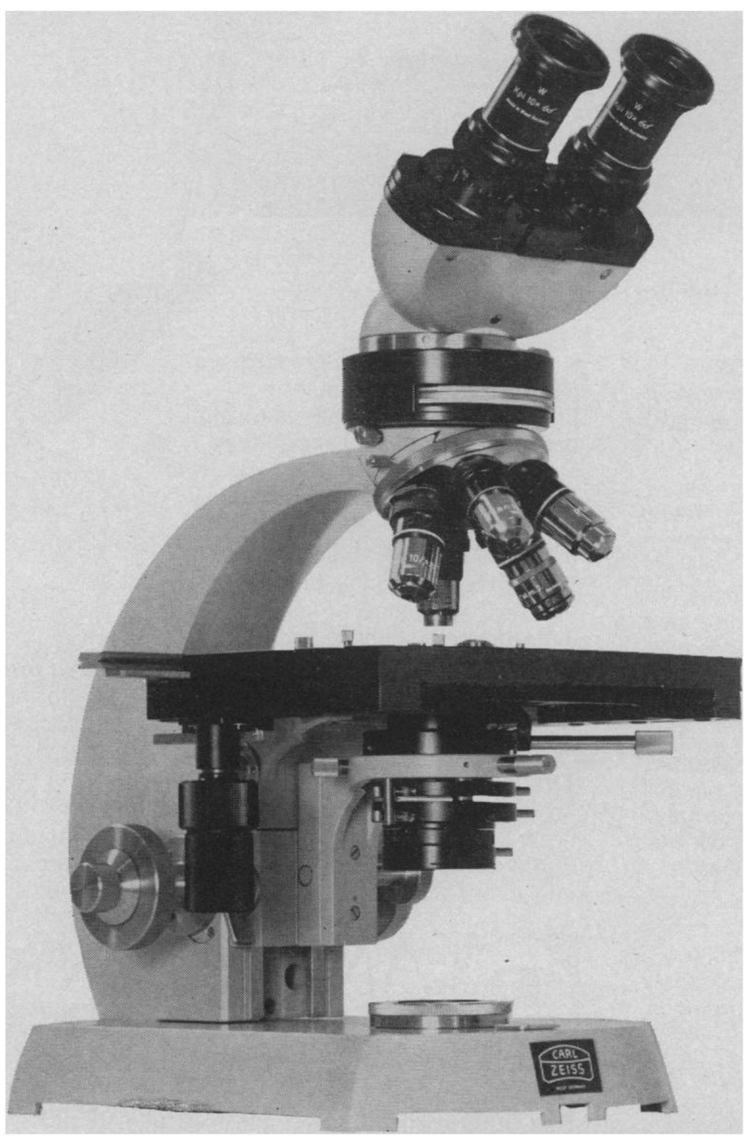
1. Objectives—the most essential component of any microscope. Zeiss objectives are world-famous for their quality. Available for the WL is a complete line of Planapochromats from 4/0.16 to 100/1.3—and *only* Zeiss can offer so many. Complete lines, too, of Neofluars, Planachromats and Achromats. Each, in its class, is the world's best.

2. Brightfield—Phase Contrast—Nomarski Interference Contrast without changing condensers or objectives. And there's no need for a centering telescope either, because the exclusive OPTOVAR Magnification Changer has an auxiliary lens for centering the light ring on the phase ring. The OPTOVAR also lets you easily change magnifications without changing eyepieces.

3. Stages—Rotating and Centering, Mechanical and Gliding, Polarizing—the most versatile, the sturdiest and smoothest made. Even if you exert pressure on these stages, they won't slip .

4. Attachments—There are cameras (35mm, 4 x 5, Polaroid®, motion picture and video), auxiliary binocular and monocular tubes, projection screens, drawing attachments, a refractometer, etc., etc.—just about anything you might ever want.

The Zeiss WL Microscope



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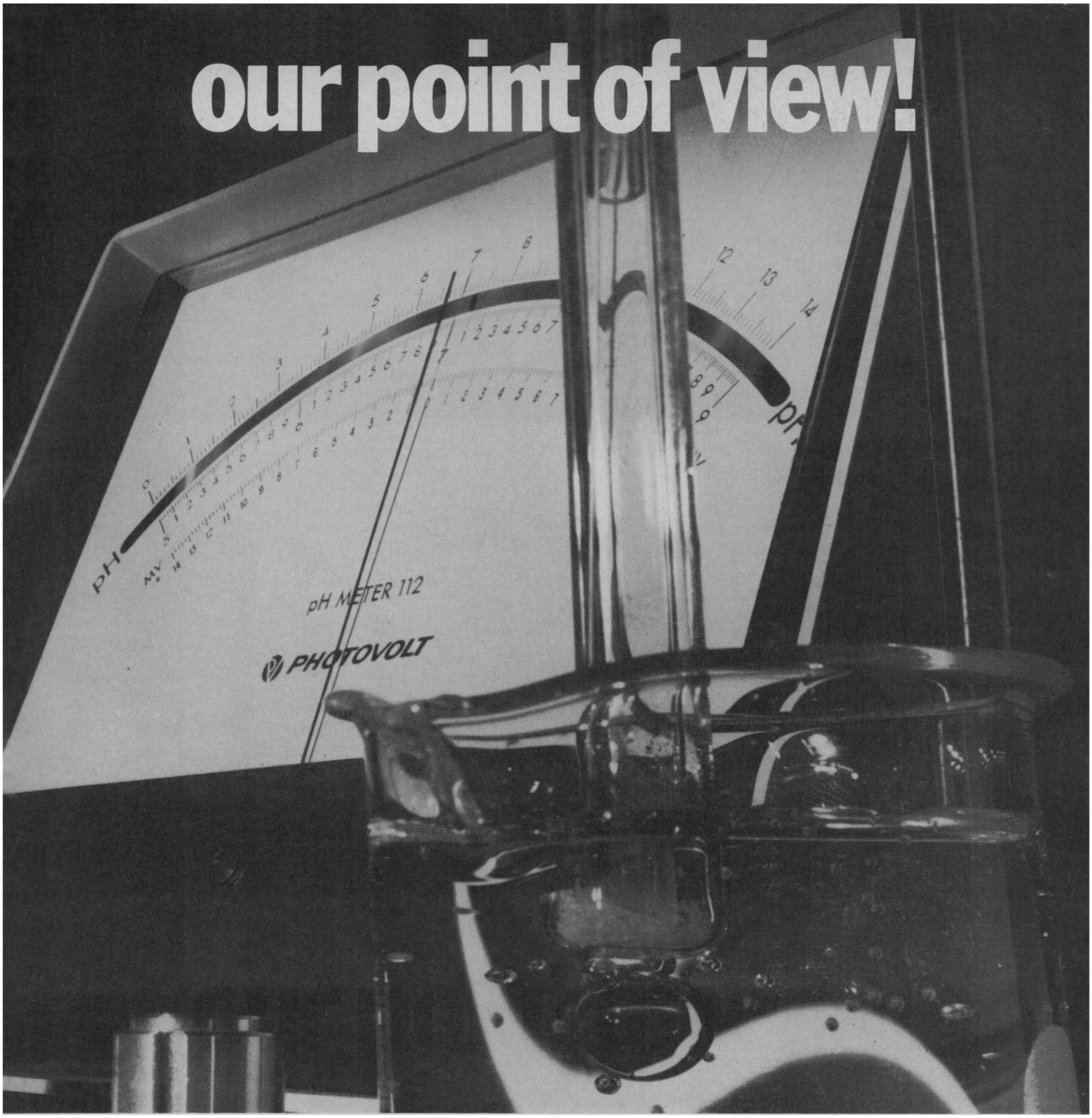
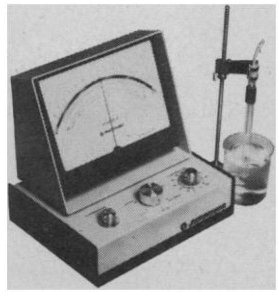


No need to be without an expanded scale pH meter—it's only $40 more.

Photovolt's *Expander IV*, pH meter 112, is $395.00—only $40 more than most laboratory models.

Any range of four pH units can be expanded over the entire scale. This solid state unit is readable and reproducible to within 0.005 pH and accurate to within 0.01 pH. An expanded millivolt range, ± 140 mv, readable to 0.5 mv extends *Expander IV's* ability to all ion selective electrodes.



Expander IV is supplied with a single, fast, high-sensitivity electrode, but it also accepts all others, including ion selective and redox electrodes.

An output is available for Karl Fischer titrations, as well as a 10 mv recorder output.

Our point of view is that there is no longer any reason to be without an expanded scale pH meter. What's your point of view?

PHOTOVOLT CORPORATION *1115 Broadway, New York, N.Y. 10010 • (212) 989-2900*

Circle No. 16 on Readers' Service Card

Now you can have a GC computer installed in your lab for as little as

The new all-HP 3360A System is an on-line real-time dedicated computer packaged for GC and ready for delivery

Until now, the minimum cost of an on-line real-time GC computer system has been $40,000 to $50,000. Beginning with the 1970 Pittsburgh Conference where we introduced the HP Model 3360A GC Data Processing System, the price drops to $18,900 for a single-channel system. The incremental cost for additional simultaneously operating channels, up to a maximum of 8, is just $3900 per channel. The price structure and modular design of the 3360 allow the GC laboratory to have its own dedicated data processing system under local laboratory control.

THE HP CONCEPT

The reason why the 3360 System costs so much less than others evolves directly from HP's unique approach to GC data handling. In the 3360, detector output is digitized and pre-processed at the GC, then transmitted digitally to the computer. The 3360 therefore requires neither an expensive large-scale computer nor a high-speed analog multiplexer.

Each on-line GC is equipped with an HP 3370 or 3371 digital integrator; as many as eight integrators are connected to an HP 2114B digital computer equipped with plug-in digital multiplexer card. Thus you buy only the hardware that you need, and every component—integrator, computer, multiplexer—is designed, installed and warranted by HP.

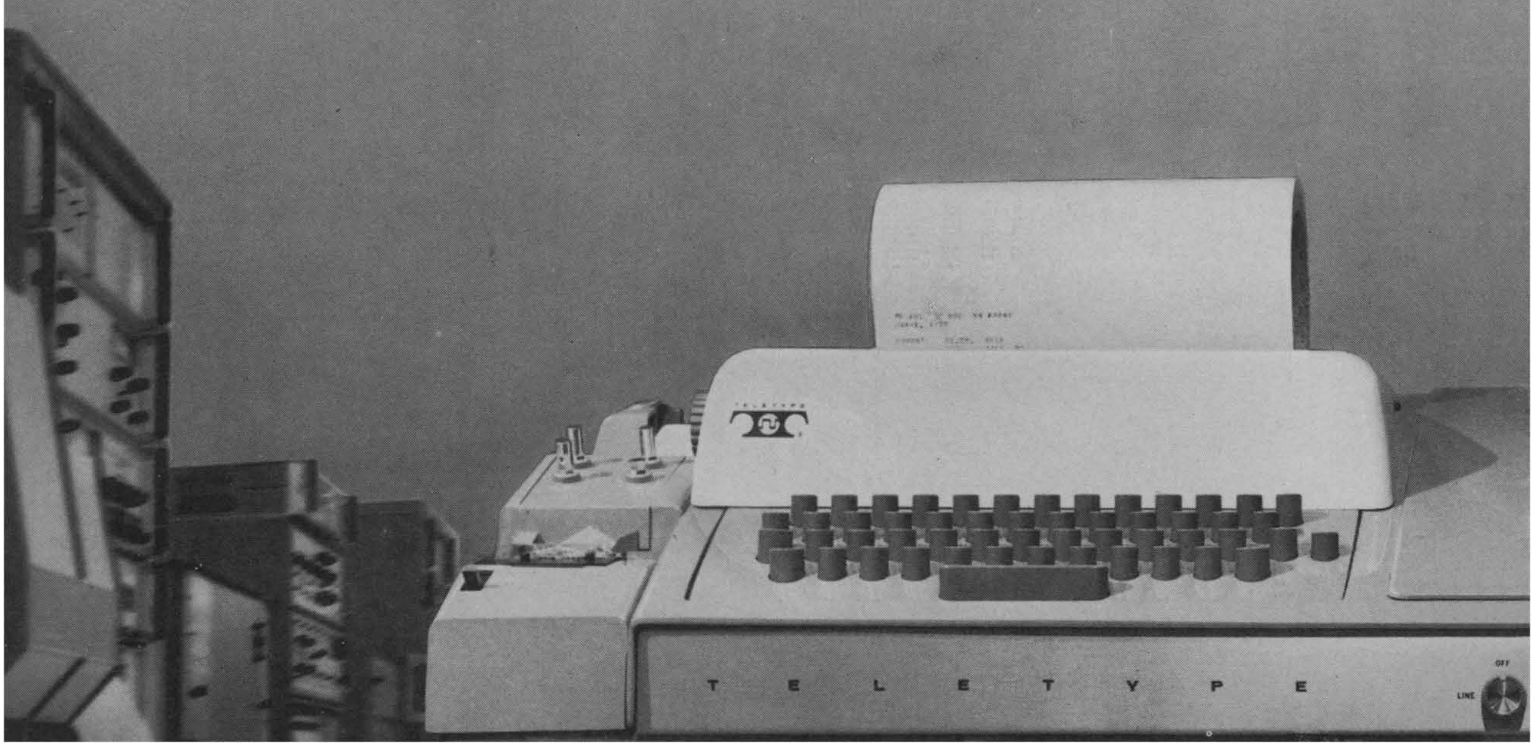
THE HP ADVANTAGES

Compared to GC computer systems based on analog transmission, the 3360 offers more than economy.

Ease of operation. The 3360 dialog is so simple and easy to use that any chromatographer, even one with literally no computer training, can learn to use it easily and quickly. Once in operation, the chromatographer can easily adjust the data processing parameters for each GC in the system, without entering into a dialog with the computer.

Compatibility with any GC. Gas chromatographs of any make and virtually any age can be tied directly to the 3360. In contrast, analog transmission systems require detector signal "clean-up" operations that cost an average of $1000 per GC. Even so, no analog transmission system can approach the 3360's accuracy in trace component analysis because of the 3360's one-microvolt resolution.

Installation economy. The 3360's error-free digital



system
$18,900

transmission allows cabling between GC integrator and computer which needs no shielding, can be extended at least 1000 feet without signal loss or noise pickup, and is extremely inexpensive. As a result, installation is so simple it can usually be completed in a single day.

Dependability. The 3360 enjoys a degree of protection against loss of data unknown in GC computer systems until now. In the event of computer malfunction or failure, the 3360 provides a semi-automatic data processing back-up through the integrator at each GC and thus avoids loss of data.

Performance. With the HP GC computer system, you continue to operate your GC's as you always have except that the computer makes all calculations and prints out a complete analysis report after each run, including identification, % composition and retention time of each component. What better way to find out how well the 3360A System can work for you than to try it in your lab, with your samples? We'd like nothing better than to demonstrate 3360 in this meaningful way. Just fill out the coupon. As soon as we receive it, we'll schedule a demonstration in your lab, with your GC's and your samples. Then you decide if the 3360 is for you. Hewlett-Packard, Route 41, Avondale, Pa. 19311. In Europe: 1217 Meyrin-Geneva.

HEWLETT-PACKARD, Route 41, Avondale, Pa. 19311
(Phone 215-268-2281)

Gentlemen: Please call me to arrange a demonstration of the new HP 3360A System in my laboratory at the earliest possible time. I understand that you will bring the 3360 to my lab, connect it to my GC's and run my samples.

Name ____________ Title ____________

Company ____________ Dept. ____________

Address ____________

City ____________ State ____________ Zip ____________

Phone ____________ Signature ____________

43008

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ANALYTICAL INSTRUMENTS

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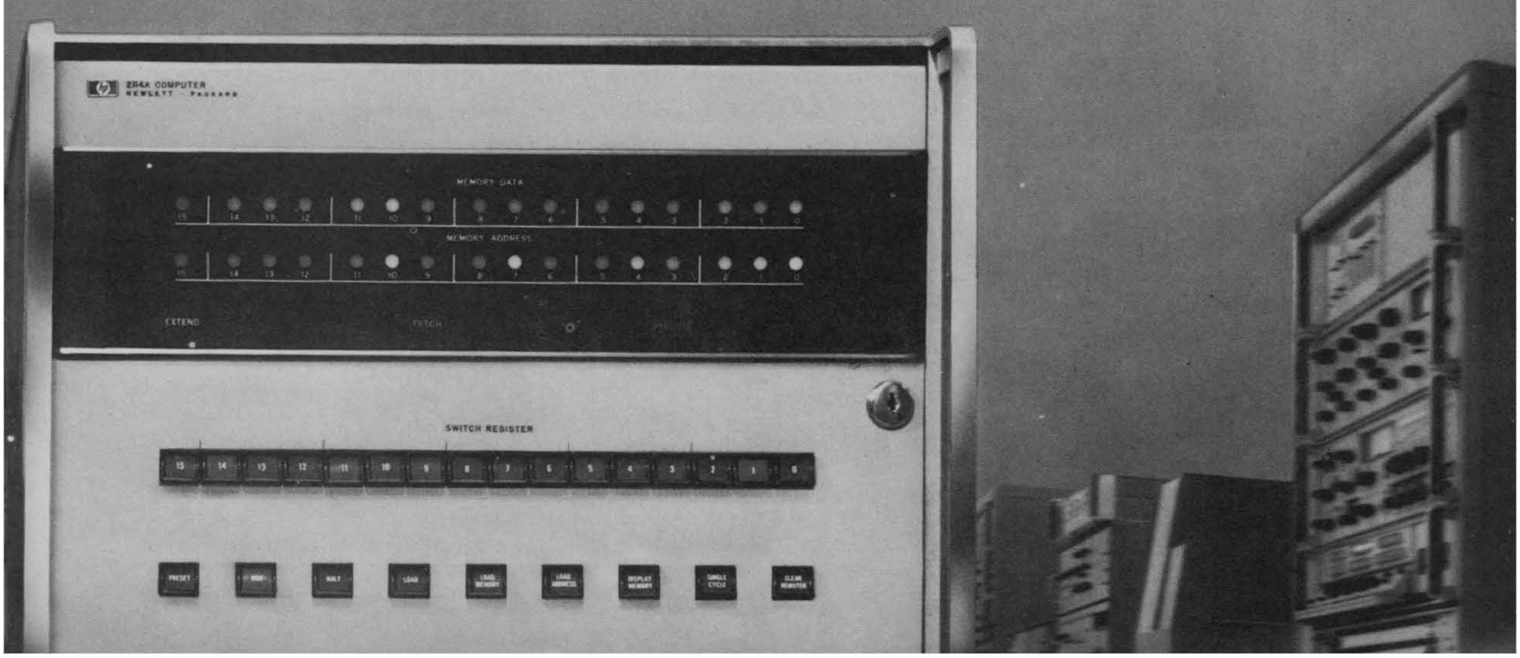
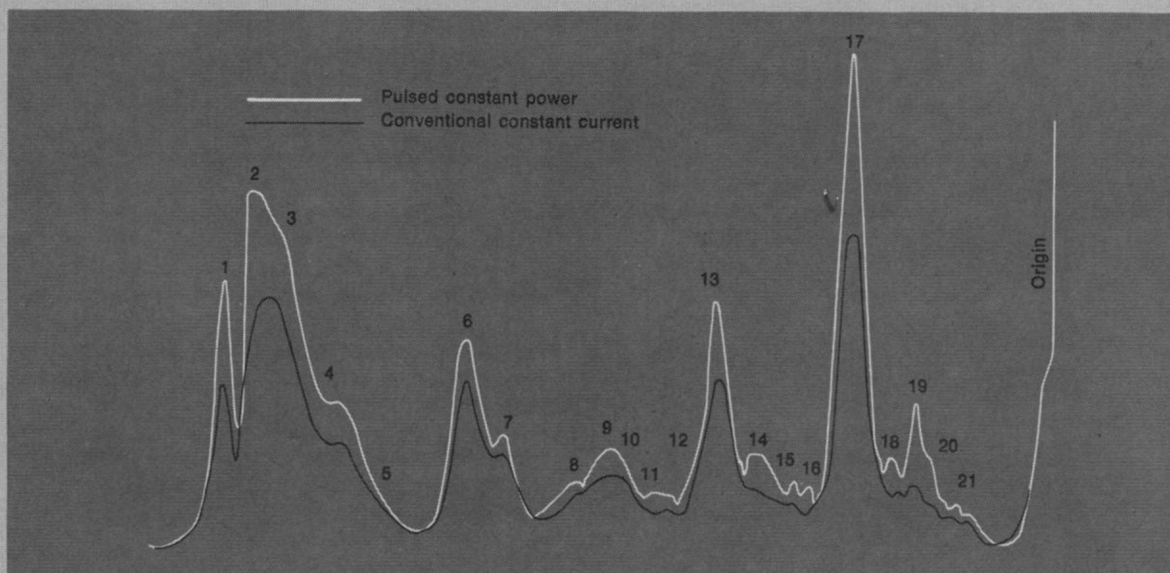


Of course you're having trouble staining electrophoresed enzyme.

Average Power	Total Units of Esterase Activity*	Peak No 1		Peak No. 17	
		Activity*	Width at ½ height	Activity*	Width at ½ height
27 watts, 85ma constant current	187.6 ± 4.1	10.6 ± 0.32	0.50 ± 0.01	31.4 ± 2.3	0.72 ± 0.02
26.5 watts, pulsed constant power	228.9 ± 8.2	14.8 ± 0.51	0.45 ± 0.01	39.4 ± 2.2	0.60 ± 0.01
Improvement with pulsed constant power	+22.5%	+37.5%	+11%	+25.8%	+20%



* Activity expressed as Model 4300 Microdensitometer counts x 10^{-3} for 550μgm mouse plasma. All runs in quadruplicate. Alpha-naphthyl butyrate as substrate. Fast blue RR salt as coupling agent. Reaction time 15 min. at 37°C.

Now look what Ortec pulsed constant power does to help.

The trouble begins before the staining. The very act of conventional electrophoresis destroys a large part of specific enzyme activity. So only that enzyme whose specific activity survives the separation process can react with the stain. You and your densitometer see only the active enzyme on the stained gel.

Now examine these two mouse-plasma esterase zymograms, made from identical 550μgm samples, with all experimental conditions equal except for the power supplies. The black line shows total esterase activity remaining after separation by conventional constant-current d-c polarization. The white line shows activity after Ortec pulsed constant-power electrophoresis. Both zymograms were traced on an Ortec Model 4300 Integrating Densitometer.

The zymograms show that specific activity is approximately 22.5% higher after pulsed constant-power separation than after conventional constant-current separation. Note that total run time was 55 minutes for both, and average power about 27 watts for both. Even without our high-resolution densitometer, the effect of Ortec pulsed constant-power polarization* will be immediately apparent in your lab. The stained gels themselves are easier to evaluate by eye—more bands, sharper bands, indicating enzyme activity that wasn't killed by the power supply. Gels like these give *any* good densitometer more to work with.

The entire illustrated story on Ortec high-resolution electrophoresis is contained in our Bulletin LS-100. You ought to write for a copy. *Life Science Products, Ortec Incorporated, 133 Midland Road, Oak Ridge, Tenn. 37830.* Or phone 615-482-1006. In Europe: Ortec GmbH, 8 München 13, Frankfurter Ring 81, West Germany.

ORTEC®
AN EG&G COMPANY

*patent pending 4710

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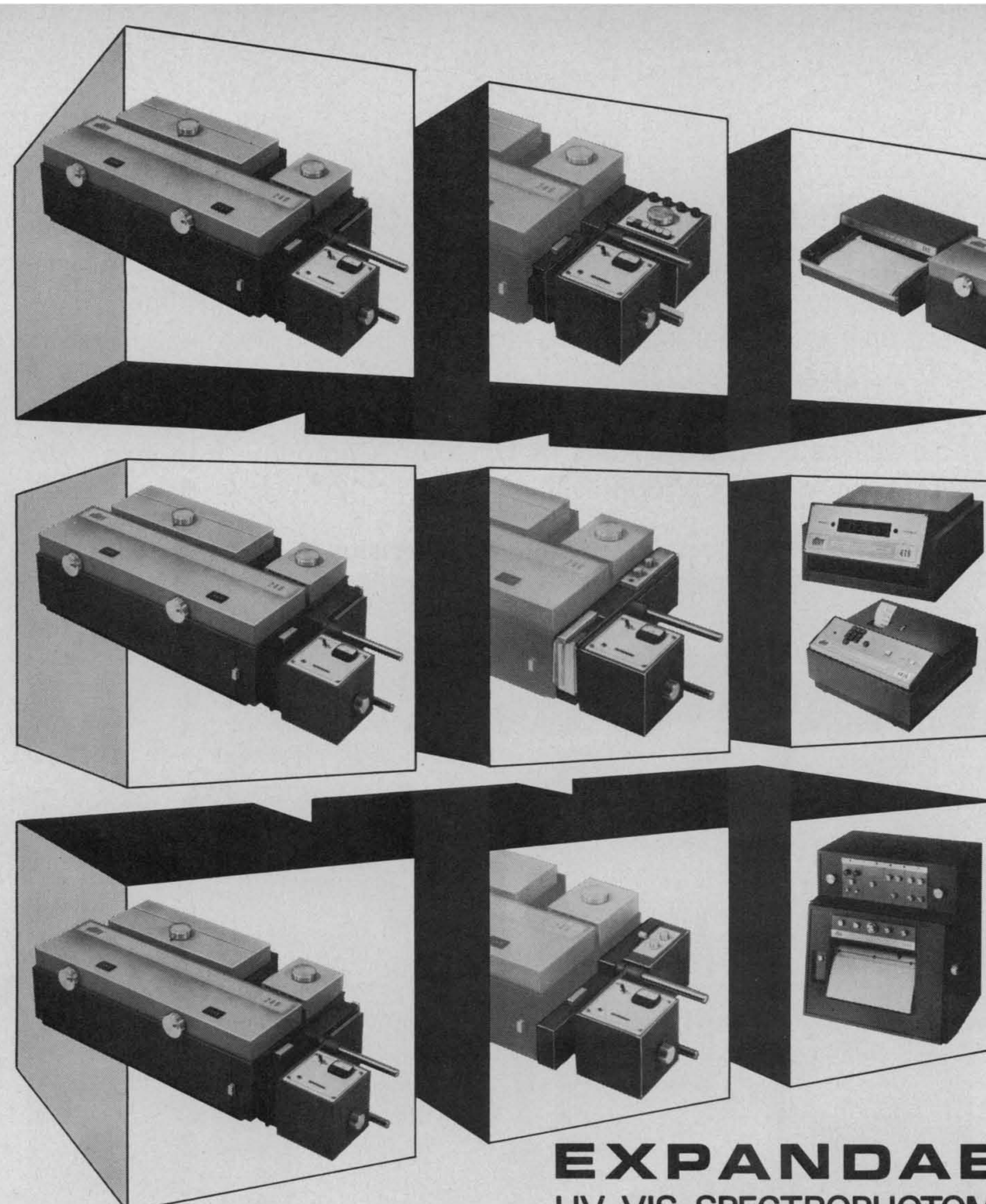


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H
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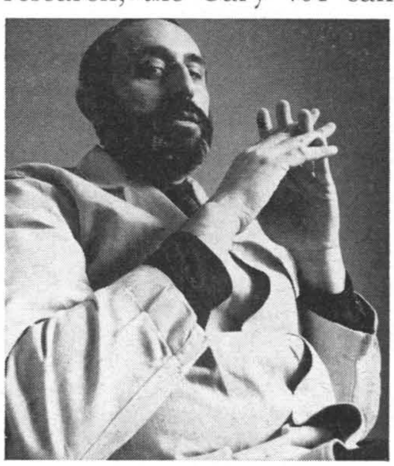
Look into the great outdoors
This is the outdoorsman of Nikon's family. Like most outdoorsmen, it's tough, versatile, reliable and self-sufficient.
You can use it, for instance, to study air and water pollution at the pollution site, to examine fresh microscopic organisms in their natural habitat, blood specimens at the bedside, parasites in the field, or for any other type of microscopy where portability is a factor. Its uses are limited only by your imagination.
Not that the model H can't hold its own in a laboratory. Despite its small size (4⅓"x5½"x2") it has a normal 160mm tube length and a 3-objective revolving nosepiece. The Abbe condenser, iris diaphragm and magnifications up to 1500x all belie the fact that the Model H is pocket-sized and portable. About the only concession we've made to its outdoor function is to recess the controls so they can't be accidentally disturbed. Phase contrast, photomicrography, polarizing microscopy and even closed-circuit TV are among its capabilities.
So if your job is to look into things outdoors, look into an essential traveling companion, the Nikon Model H. Write for our 8-page brochure.
Nikon Model H Microscope
EPI
Nikon Inc., Instrument Division,
Sub. of Ehrenreich Photo-Optical Industries, Inc., Garden City, New York 11530. (In Canada: Anglophoto Ltd., Ont.)

The Cary 401. Our vibrating reed nit-picker.

The Cary 401 vibrating reed electrometer detects currents on the order of 10^{-17} ampere, charges as small as 5×10^{-16} coulomb and potentials down to 2×10^{-5} volts from high impedance sources. Its list of standard features includes solid state circuitry, multiple resistor input switching, remote input shorting, critical damping, measurement of potentials from grounded sources, and master-slave operation. And it can be rack or bench mounted.

If your application is in mass spectrometry, radioactivity, physical measurement or biomedical research, the Cary 401 can tackle just about any problem you've got to solve. For example:



MASS SPECTROMETRY

The 401 provides sensitive, stable ion current measurements in any mass spectrometer system with an optional remote ranging modification available for computer-controlled systems. And, in isotope ratio studies such as uranium 238/235, a pair of our electrometers can determine ion ratios with an accuracy of about 0.02%.

RADIOACTIVITY

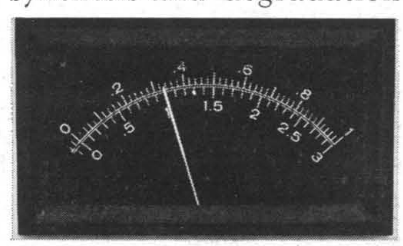
While particularly suited to applications which require drift-free operation, the Cary 401 also measures soft beta radiation such as carbon-14, tritium and sulfur-35. Or assays radioactive labeled chromatographic effluents.

PHYSICAL MEASUREMENTS

With the 401, you can investigate resistance, charging, hysteresis, polarization, absorption and dielectric phenomena. Or study the photoelectric, thermoelectric and electrochemical properties of matter. Semiconductor studies include conductivity, resistivity, impurity and Hall effect measurements. And, because input resistance is greater than 10^{16} ohms, the 401 is ideal for measuring transistor leakage currents, diode reverse currents and MOS FET gate resistances.

BIOMEDICAL RESEARCH

When measuring ion transfer, potentials and resistances across membranes, the 401 gives unmatched performance. Other biomedical applications include in-vivo respiratory analyses of $C^{14}O_2$, intermediary metabolism investigations, polysaccharide synthesis and degradation analyses and gas chromatographic studies of steroid and fatty acid molecular systems.



Range 3 millivolts full scale. 10^{12} ohm input resistor. (Equivalent to 10^{-15} amps.)

Twenty-three years of experience stand behind the Cary 401, the world's best commercially available vibrating reed electrometer. By far. For complete details, write Cary Instruments, a Varian subsidiary, 2724 S. Peck Road, Monrovia, California 91016. Ask for data file **E004-50**

cary instruments

How to put today's instrumentation to work for you.

Resolution so high we're finding new norms to test against

The Philips EM 300 Electron Microscope is capable of reaching a resolution of 2.3A under favorable circumstances.

Columbian Carbon Company for example, has been able to approach this limit in its studies of carbon black particles used in the manufacture of rubber. The photo on the right shows the basic lamellar structure with crystal planes 3.4A. apart.

Knowledge of lattice structures of various carbon blacks is extremely important because of the relationship of ultra structure to performance in rubber matrices.

The scientists at Columbian Carbon have been able to photograph the double sinuous form of the DNA molecule by supporting unstained and unshadowed strands between graphitized carbon black particles. The helical form is easier to see by viewing stereo image pairs.

In the thirteen years that Philips microscopes have been used at Columbian Carbon, more than one half million carbon black micrographs have been made.

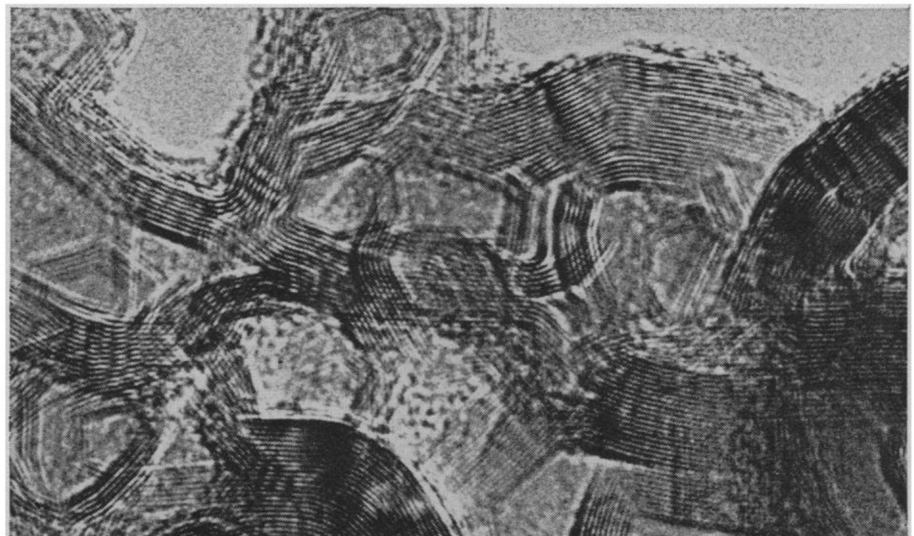
Using several Philips microscopes, Columbian Carbon now has a laboratory that operates at practically production speeds.

General Electric is another company extremely interested in the basic structure of crystalline materials. The micrograph on the right clearly shows the {111} lattice planes of a {112} slice of silicon. The spacing is 3.138A.

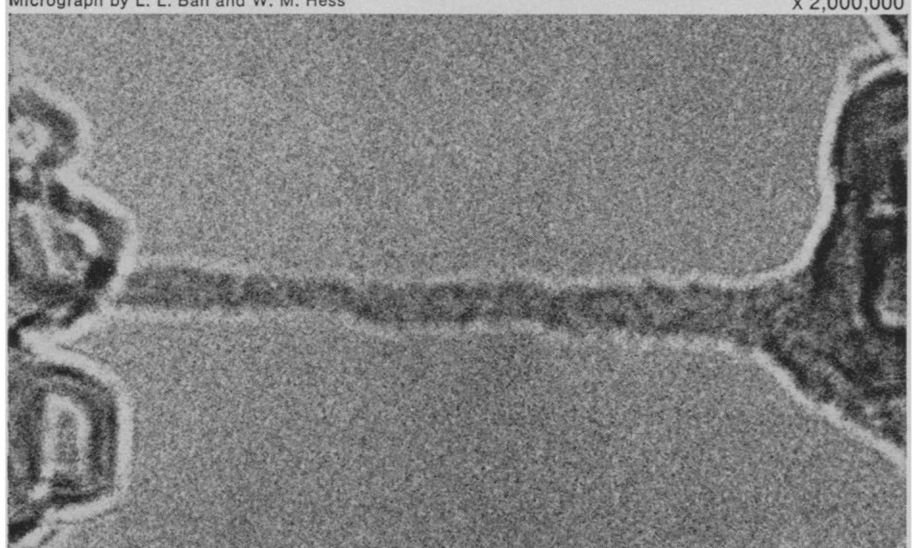
In addition to silicon crystal studies, General Electric researchers have obtained electron micrographs of germanium crystals with resolutions so fine they clearly show lattice defects only one atom wide.

If you have a resolution problem that's challenging, we'd like to hear from you.

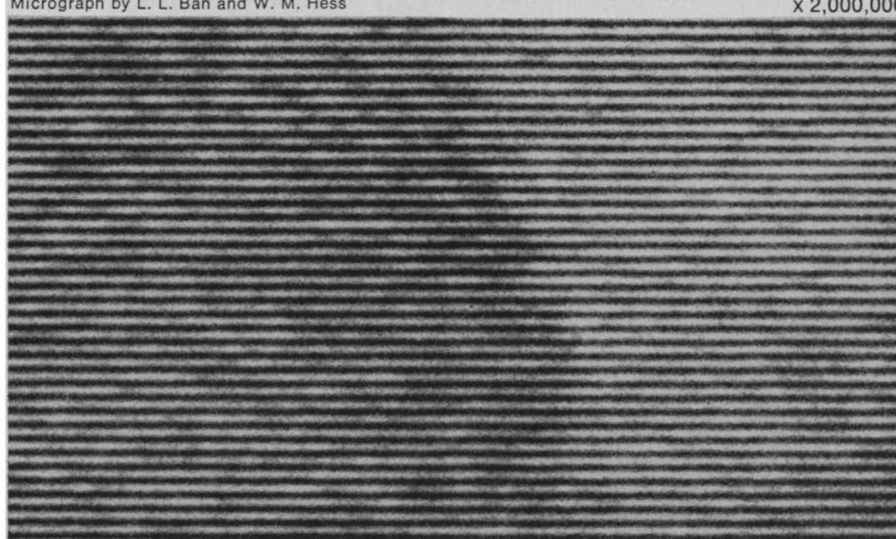
For more information, circle **#1.**



Micrograph by L. L. Ban and W. M. Hess x 2,000,000



Micrograph by L. L. Ban and W. M. Hess x 2,000,000



Micrograph by Dr. V. A. Phillips and J. A. Hugo x 6,000,000

ence Manpower, 1968, National Science Foundation pamphlet 70-5, January 1970).

If the AAAS and scientists in general are committed to the goal of equal opportunity, is not some investigation called for to ascertain why that goal continues to elude us?

BEVERLY L. CHIÑAS
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Effect of the Draft on Graduate Physics Education

On 24 April 1968, Betty Vetter, executive director of the Scientific Manpower Commission, Washington, D.C., gave an address to the American Physical Society entitled "The doomsday machine for physics—the draft." At the time, her prediction that "the new rules will result in the elimination of half of three consecutive classes of entering students (and almost two-thirds in physics)" was considered by many to be exaggerated. It is now apparent that the effect of the draft on graduate physics education at Stanford University is threatening to fulfill her dire prediction.

The Stanford physics department is fortunate in attracting each year an outstanding class of entering graduate students. Out of approximately 400 applicants, an entering class of roughly 30 students is formed. More than 80 percent of the entering students have National Science Foundation or other fellowships and have Graduate Record Examination scores within the top tenth of all physics undergraduate students in the nation.

Of the 29 students who accepted admission to graduate study in our department in the fall of 1968, 5 did not come for reasons related to the draft, 1 did not come for other reasons, 6 left during the first academic year for reasons related to the draft, and 17 returned for the current academic year; of the 17, 13 are vulnerable to the draft.

In order to explore whether our experience has been duplicated elsewhere, we sent inquiries to the top 21 departments in this country whose graduate faculties were voted as "distinguished" or "strong" in the 1966 *Assessment of Quality of Graduate Education* by A. M. Cartter (American Council of Education, Washington, D.C.). Ten replies were received. Table 1 shows that many of them had experiences similar to ours; that is, of the students who accepted offers of admission for the fall of 1968, between 11 and 38 percent did not come or have since left for draft-related reasons.

Our experience has shown that uncertainty with respect to draft status has an extremely detrimental effect on our students. Graduate study in physics, and, no doubt, in other professional fields, requires an absorption and concentration on the subject matter which is probably unique as far as occupations are concerned. Under these circumstances many of our graduate students cannot bear the pressure of a I-A classification, even for 1 year. They tend to join other activities in which their military status is defined with greater certainty.

Judging by the classifications of the new class of students who entered in the fall of 1969, most of the 13 students vulnerable to the draft will receive I-A classifications during the present academic year. Furthermore, under the present lottery system one may expect that at least half will be

Table 1. Summary of draft experience of students entering graduate work in physics in the fall of 1968.

	ACE rank	Students (No.)				
		Accepted admission	Did not come or left		Remaining in 1969	Did not come or left for known draft reasons (%)
			Draft reason	Other reasons		
Berkeley	1	65	20	6	39	31
Harvard	3	22	6	1	15	27
Princeton	4	32	11	1	20	34
Stanford	5	29	11	1	17	38
Illinois	8	88	17			19
Yale	11	21	7	4	10	33
Michigan	13	44	9	14	21	20
Rochester	13	28	3	4	21	11
Maryland	16	90	14			16
Hopkins	19	15	5	0	10	33
Carnegie-Mellon	21	22	6	5	11	27

drafted. Therefore we can predict that of the class which accepted admission for the fall of 1968, less than half, perhaps as few as one-third, will be left in the fall of 1970.

We realize that the present method of draft selection is in a transitional period as far as graduate students are concerned, since in the future mainly 19-year-olds will be affected. Nevertheless, the transitional period will be of approximately 4 years duration. If no special consideration is given to graduate students during this period, the effect on our graduate program will be disastrous.

The situation is actually worse than predicted by Mrs. Vetter who suggested that after 2 years of military service most graduate students would return to graduate study. It appears, though, that a large percentage of students are actually leaving the field of physics as a result of a I-A classification and that they will not return to our department at a later date. This statement is based on interviews with students who have left our graduate program over the years for nonacademic reasons. Over the years, also, there has been no equivalent flow of graduate students from other fields into our department, so that the loss of graduate students is not balanced off.

The recently announced postponement of induction of graduate students until the end of the academic year does not affect the long-range predictions made here. Although the postponement will allow many students to obtain their Master's degrees, it does not avoid a I-A classification and the period of uncertainty which causes students to leave graduate study in physics.

In assessing the effect of the actual and the further predicted decrease in graduate enrollment on our department it should be noted that graduate students are heavily engaged in our teaching and research programs. Specifically, one-third of our students teach and more than 95 percent are involved in some research project. Obviously, a large decrease of graduate enrollment caused by the draft will have a very damaging effect on our department. The blame for this unhappy situation clearly lies with the legislative and executive branches of our government. Unless drastic changes in the draft laws are made, our government is guilty of eroding the educational and research programs of some of the finest physics departments in the country.

A volunteer army, recommended by the President, would clearly provide one solution to the problems outlined above. Failing that, we propose that during a transitional period of approximately 4 years, deferments be extended to graduate students. This would allow a man to finish his training before he starts military service. Such a man is much more likely to return to physics than one whose study is interrupted, thus helping to assure an adequate supply of highly trained physicists for the needs of our country.

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Mind Assault

Stanley Milgram's "The experience of living in cities" (13 Mar., p. 1461) provides evidence on the quality of life in the city. He reports that McKenna and Morgenthau devised an experiment in which telephone callers misrepresented themselves as long-distance callers "who had, through error, been connected with the respondent by the operator." The callers then proceeded to diddle the subjects by representing themselves as persons in need of information. When that dialogue was established, the subjects were then put to a greater test when the caller asked, on some pretext, that the respondent "please hold on." The caller would put the phone down for almost a minute, and then would ask further questions, in the cases where the respondent had continued to make himself available. "Scores were assigned the subjects on the basis of how helpful they had been."

Henry Thoreau observed in *On the Duty of Civil Disobedience*, "It is not so important that many should be as good as you, as that there should be absolute goodness somewhere; for that will leaven the whole lump." From that I draw the uneasy conclusion that the small leavening of absolute duplicity which McKenna unloads onto the lump of troubled city life may do more to increase those troubles than to alleviate them. The informed citizen of our city will henceforth consider the dangers of mind assault as well as body assault when he wonders whether he should open his door, or heed the phone call of a stranger. . . .

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22 May 1970, Volume 168, Number 3934 **SCIENCE**

The Wrong Top Priority

At the moment, American conservatives and liberals, government and people, all consider the elimination of pollution *the* domestic problem which deserves first priority. Public opinion polls show that Americans ranked fighting pollution next to fighting crime; fighting pollution ranked higher than any other needs, including those of improving schools and expanding medical services. A very high 56 percent favored allotting more money to the purification of our air and water, while an extremely low 3 percent favored less expenditure in this area. The President clearly indicated his concern in his message to Congress on 10 February: "The time has come when we can no longer wait to repair the damage already done, and to establish new criteria to guide us in the future." Furthermore, he added that pollution "may well become the major concern of the American people in the decade of the '70's."

This new commitment has many features of a fad: a rapid swell of enthusiasm (most of the ecology action groups are less than 6 months old), fanned by the mass media (the number of activists at Columbia University tripled after the *New York Times* reported that pollution was The Cause of the Year). And the commitment is rather shallow. Few citizens seem aware of the costs they will have to bear as taxpayers, consumers, and automobile and home owners. For example, the increase in fuel costs for landlords is estimated to run between 15 and 20 percent. Another typical feature of this past fad is the preponderance of advocates who feel that the advancement of their project would achieve a whole spectrum of good things, ranging from revival of the Judeo-Christian tradition to improvement of the "quality of life."

To arouse the public and Congress, the newly found environmental dangers are being vastly exaggerated; we really are not all about to be asphyxiated by carbon monoxide. Nor is it true that, unless we *act now*, "air pollution will screen out the sun and make big cities uninhabitable; [that] the fragile biosphere we all live in is becoming poisonous and may cease to support life; [that] plagues threaten" [editorial, *Life* (6 March 1970)]. The time frequently set for this "end of the world" is "within 10 to 15 years." Even if a presently threatened species—say, Louisiana's brown pelicans—were to disappear, it is still ridiculous to expect that the whole ecology would be thrown so out of equilibrium that our economy or society would collapse.

The complicated problems that pollution control poses can be handled only in part through a crash program. Public and legislative commitment ought to be built up for a long pull. But even if one day water and air again are as pure as they were before man polluted them, many other environmental problems—from ugly cities to overcrowding—will still be with us.

Now we should continue to give top priority to "unfashionable" *human* problems. Fighting hunger, malnutrition, and rats should be given priority over saving wildlife, and improving our schools over constructing waste disposal systems. If we must turn to "environment," first attention should be given to the 57,000 Americans who will *lose their lives* on the roads in 1970.

More deeply, we must face the fact that our society and policy are still organized as if our real top priority was the production of consumer goods and their consumption. Unless we learn to turn much more of our resources, manpower, organizational skills, and attention to public issues, none of the annual fads will cause a significant, lasting reduction in *any* of our domestic problems.—AMITAI ETZIONI, *chairman, Department of Sociology, Columbia University, New York, New York*

Fondation Curie, 26 rue d'Ulm, F-75-Paris 5ᵉ, France)

29–1. **Drug Metabolism in Man**, New York, N.Y. (E. S. Vesell, Pennsylvania State Univ. College of Medicine, Hershey, Pa.)

29–1. American Soc. of **Heating, Refrigerating and Air Conditioning**, Kansas City, Mo. (J. T. Szabo, 345 E. 47 St., New York 10017)

29–1. Society for **Industrial and Applied Mathematics**, Denver, Colo. (N. Bleistein, Dept. of Mathematics, Univ. of Denver, Denver 80210)

29–1. **Marine Technology** Soc., 6th annual conf., Washington, D.C. (D. L. McKernan, 130 M St., NW, Washington, D.C. 20036)

29–1. **Water Quality Management Data and Instrumentation**, Madison, Wis. (I. Grossman, New York State Dept. of Health, 84 Holland Ave., Albany 12208)

29–3. International Conf. of **Operational Research** Soc. and Inst. of **Management Sciences**, London, England. (Mrs. M. Kinnaird, Operational Research Soc. Ltd., 62–64 Cannon St., London E.C.4)

30–3. American **Dental** Soc. of Europe, Dublin, Eire. (D. Derrick, 140 Park Lane, London W.1, England)

July

1–3. Institute of **Management Sciences**, London, England. (S. W. Hess, Wharton School, Univ. of Pennsylvania, Philadelphia 19104)

1–3. Institute of **Navigation**, 25th annual, Colorado Springs, Colo. (R. E. Freeman, Suite 832, 815 15th St., NW, Washington, D.C. 20005)

1–4. Canadian **Dental** Assoc., Winnipeg, Man. (J. P. Beattie, 435 Academy Rd., Winnipeg 9)

1–6. National **Education** Assoc., San Francisco, Calif. (S. M. Lambert, NEA, 1201 16th St., NW, Washington, D.C. 20036)

2–3. American Inst. of **Aeronautics and Astronautics** and **Canadian Aeronautics and Space** Inst. joint meeting, Toronto, Ont., Canada. (H. C. Luttman, 77 Metcalfe St., Ottawa 4, Ont.)

5–9. **Agricultural Pesticide** Soc., Ottawa, Ont., Canada. (W. H. Minshall, Research Inst., Canada Agriculture, University Sub Post Office, London, Ont.)

5–9. Canadian Soc. of **Agronomy**, Ottawa, Ont. (R. Loiselle, Ottawa Research Sta., Central Experimental Farm, Ottawa)

5–9. Canadian Soc. of **Soil Science**, Ottawa, Ont. (A. R. Mack, Soil Research Inst., Central Experimental Farm, Ottawa)

6–10. **Microwave Spectroscopy** Conf., Bangor, England. (Meetings Officer, Inst. of Physics and The Physical Soc., 47 Belgrave Sq. London S.W.1, England)

6–10. Urban **Water Resources Management** Conf., Henniker, N.H. (K. R. Wright, Wright Water Engineers, Denver, Colo.)

6–11. Symposium on Applications of **Holography**, Besancon, France. (J. Ch. Vienot, Laboratoire de Physique Générale et Optique, Faculté des Sciences, Univ. de Besancon, 25 Besancon)

6–12. Society of **Nuclear Medicine**, Washington, D.C. (M. Glos, 211 E. 43 St., New York 10017)

7–9. Conference on **Scanning Electron Microscopy in Materials Science**, Newcastle upon Tyne, England. (E. H. Boult, School of Chemistry, The University, Newscastle upon Tyne)

7–9. Conference on **Modern Welding Techniques**, New York, N.Y. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

7–10. **Catalytic Oxidation Principles and Processes**, intern. symp., London, England. (J. F. Gibson, Chemical Soc., Burlington House, London)

7–10. International Conf. on the **Chemistry and Physics of Organic Scintillators** and **Liquid Scintillation Counting**, San Francisco, Calif. (C. T. Peng, School of Pharmacy, Univ. of California, San Francisco 94122)

7–10. Symposium on **Stock and Recruitment**, Aarhus, Denmark. (L. R. Day, Intern. Commission for Northwest Atlantic Fisheries, P.O. Box 638, Dartmouth, Nova Scotia, Canada)

8–10. American Soc. of **Agricultural Engineers**, 63rd annual, Minneapolis, Minn. (J. L. Butt, P.O. Box 229, St. Joseph, Mich. 49085)

8–10. Symposium on **Non-Aqueous Electrochemistry**, Paris, France. (J. Badoz-Lambling, Laboratoire de Chimie Analytique, 10 rue Vauquelin, Paris 5)

8–10. Western **Resources** Conf., Denver, Colo. (J. J. Schanz, Jr., Denver Research Inst., Univ. of Denver, Denver 80210)

8–11. World Congress of **Digestive Endoscopy**, 2nd, Copenhagen, Denmark. (S. Stoichita, 29 ree Pitar Mos, Bucharest, Rumania)

9–10. Texas **Water Pollution Control** Assoc., 9th conf., Houston, Tex. (H. N. Myrick, Dept. of Civil Engineering, Univ. of Houston, Houston 77004)

12–16. **Powder Metallurgy**, 3rd intern. conf., New York, N.Y. (P. K. Johnson, Metal Powder Industries Federation, 201 E. 42 St., New York 10017)

12–18. International Soc. of **Gastroenterology**, 4th world congr., Copenhagen, Denmark. (M. Andreassen, Univ. Kirurgiske Klinik C., Rigshospitalet, Copenhagen)

12–18. **Photochemistry**, 3rd intern. symp., St. Moritz, Switzerland. (D. Bryce-Smith, Dept. of Chemistry, Univ. of Reading, Reading, England)

12–18. International Soc. of **Urology**, 15th congr., Tokyo, Japan. (T. Ichiawa, 1 Toyamacho, Shinju Ku, Tokyo)

13–15. American Assoc. of **Physicists in Medicine**, Washington, D.C. (J. A. Hancock, Jr., Box 2546, Malcolm Grow USAF Hospital, Andrews Air Force Base, Washington, D.C. 20331)

13–17. American Soc. of **Civil Engineers**, Boston, Mass. (W. H. Wisely, ASCE, 345 E. 47 St., New York 10017)

13–17. **Engineering Foundation Research** Conf., Henniker, N.H. (F. P. Huddle, Reference Service, Library of Congress, Washington, D.C.)

13–17. National Policy for **Materials**, Henniker, N.H. (F. P. Huddle, Library of Congress, Washington, D.C.)

13–17. **Transportation and Engineering**, Boston, Mass. (W. H. Wisely, American Soc. of Civil Engineers, 345 E. 47 St., New York 10017)

14–16. **Electromagnetic Compatibility**, intern. symp., Anaheim, Calif. (J. C. Senn, P.O. Box 1970, Anaheim 92803)

15–23. **World Water Balance**, intern.

symp., Reading, England. (R. L. Nace, U.S. Geological Survey, Water Resources Div., Washington, D.C. 20242)

16–19. American Soc. of **Extra-Corporeal Technology,** 8th intern. conf., New Orleans, La. (E. C. Berger, 287 E. Sixth St., St. Paul, Minn. 55101)

16–20. American **Malacological** Union, 36th annual, Key West, Fla. (A. Solem, Field Museum of Natural History, Chicago, Ill. 60605)

17–18. Rocky Mountain **Cancer** Conf., Denver, Colo. (D. G. Derry, Colorado Medical Soc., 1809 E. 18th Ave., Denver 80218)

19–24. American Assoc. of **Clinical Chemists,** 22nd natl., Buffalo, N.Y. (D. A. Pragay, P.O. Box 38, Buffalo 14215)

20–22. American Inst. of **Aeronautics and Astronautics,** Detroit, Mich. (W. I. Marble, 2 Pennsylvania Plaza, New York 10001)

20–22. Society of **Automotive Engineers,** Detroit, Mich. (W. I. Marble, 2 Pennsylvania Plaza, New York 10001)

20–22. Conference on the **Fatigue Problem,** Boston, Mass. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

20–22. Society of Mechanical Engineers **Reliability and Maintainability** Conf., Detroit, Mich. (W. I. Marble, 2 Pennsylvania Plaza, New York 10001)

20–24. Association for the Study of **Animal Behavior,** Birmingham, England. (S. Dimond, Dept. of Psychology, University College, Cardiff, Wales)

20–24. Symposium on **Coastal Geodesy,** Munich, Germany. (G. W. Lennon, Inst. of Coastal Oceanography and Tides, Bidston Observatory, Birkenhead, Cheshire, England)

20–24. **Reactions in Solution,** intern. conf., Kent, England. (G. R. Martin, Chemical Lab., Univ. of Kent at Canterbury, Canterbury, Kent)

20–24. **Urban Systems Engineering,** Henniker, N.H. (M. Wachs, Univ. of Illinois, Chicago)

21–23. Society for **Experimental Biology,** Dublin, Ireland. (A. P. M. Lockwood, Dept. of Oceanography, Univ. of Southampton, Southampton, England)

21–23. National Symp. on Data and Instrumentation for **Water Quality Management,** Madison, Wis. (I. Grossman, New York State Dept. of Health, Div. of Pure Waters, Albany 12208)

21–24. Conference on **Atomic Physics,** 2nd intern., Oxford, England. (E. K. Woodgate, Dept. of Physics, Clarendon Lab., Parks Rd., Oxford)

21–24. **Computer Science** Symp., 2nd annual, Bangkok, Thailand. (L. Padunchewit, Computer Science Lab., Chulalongkorn Univ., Bangkok)

22–24. **Electronic Probe Analysis,** 5th natl. conf., New York, N.Y. (P. Lublin, Gen. Telephone & Electronics Lab., Bayside, N.Y. 11630)

22–24. An **Equipment Manuals** Symp., Los Angeles, Calif. (R. Post, Dept. of the Army, Materiel Command, Washington, D.C. 20315)

24–26. **Linguistic** Soc. of America, Columbus, Ohio. (T. A. Sebeck, Patton House, Indiana Univ., Bloomington 47401)

25–1. Institute on **Religion in an Age of Science,** Star Island (Portsmouth), N.H.

(Mrs. E. R. Goodenough, 89 Irving St., Cambridge, Mass. 02138)

26–1. **Water Pollution Research,** 5th intern. conf., San Francisco, Calif. (J. Parkhurst, California Host Corp., Room 635, Davis Hall, Univ. of California, Berkeley 94720)

27–31. Instrument Soc. of America, Research Conf. on **Instrumentation Science**, 29th, Geneva, N.Y. (N. E. Huston, Univ. of Wisconsin, Madison 53706)

28–30. Conference on **Nondestructive Evaluation**, Philadelphia, Pa. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

29–31. International Symp. on **Biomechanics**, San Diego, Calif. (Y. C. Fung, 5022 Basic Science Bldg., Univ. of California, San Diego 92037)

29–31. **Acoustical Holography**, 3rd intern. symp., Newport Beach, Calif. (H. E. Calkins, Douglas Advanced Research Labs., McDonnell Douglas Corp., Huntington Beach, Calif. 92647)

29–1. **Reticuloendothelial** Soc., 4th intern., Freiburg, Germany. (K. Flemming, 7799 Heiligenberg, Postfach 3, West Germany)

30–1. **Equine Nutrition,** 2nd symp., Ithaca, N.Y. (H. F. Hintz, Dept. of Large Animal Medicine, Cornell Univ., Ithaca 14850)

August

2–5. American Soc. of **Animal Science**, University Park, Pa. (G. P. Lofgreen, Imperial Valley Field Station, 1004 E. Holton Rd., El Centro, Calif. 92243)

2–5. **Primitology,** 3rd intern. congr. Zurich, Switzerland. (J. Biegert, Anthropological Inst., Univ. of Zurich, CH 8001, Zurich)

2–6. National **Medical** Assoc., Atlanta, Ga. (E. C. Walden, 4200 Edmonson Ave., Baltimore, Md. 21229)

2–7. Society for **Industrial Microbiology**, Kingston, R.I. (V. S. Kenny, Gagliardi Research Corp., P.O. Box 390, East Greenwich, R.I. 02818)

3–4. American Soc. of **Safety Engineers**, San Diego, Calif. (A. C. Blackman, The Society, 850 Busse Highway, Park Ridge, Ill. 60068)

3–7. Future Implications of **Biomedical Technologies** Conf., Deerfield, Mass. (C. Williams, National Science Foundation, Washington, D.C.)

3–7. American College of **Chest Physicians**, 11th intern. congr. on Diseases of the Chest, Lausanne, Switzerland. (M. Kornfield, 112 E. Chestnut St., Chicago, Ill. 60611)

5–7. **Engineering in Medicine**—Bioceramics Conf., Henniker, N.H. (C. W. Hall, Southwest Research Inst., San Antonio, Tex.)

3–7. **Molecular Biology and Pathology**, 3rd conf., Saratoga Springs, N.Y. (K. T. Lee, Dept. of Pathology, Albany Medical College, Albany, N.Y. 12208)

4–6. **Stress Corrosion Cracking** Conf., Philadelphia, Pa. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

5–7. Association of American **Feed Control** Officials, Louisville, Ky. (B. Poundstone, Kentucky Agricultural Experiment Sta., Univ. of Kentucky, Lexington 40506)

5–7. Applications of **X-Ray Analysis,** 19th conf., Denver, Colo. (J. B. Newkirk, Dept. of Metallurgy, Univ. of Denver, Denver 80210)

5–12. International Council on **Health, Physical Education and Recreation,** Sydney, Australia. (A. Willee, Dept. of Physical Education, Univ. of Melbourne, Melbourne, Australia)

6–15. **Antarctic Geology and Solid Earth Geophysics,** intern. symp., Oslo, Norway. (L. DeGoes, Natl. Acad. of Sciences, 2101 Constitution Ave., NW, Washington, D.C. 20418)

9–12. **Soil Conservation** Soc. of America, Toronto, Ont., Canada. (H. W. Pritchard, 7515 NE Ankeny Rd., Ankeny, Iowa 50021)

9–13. **Biocommunications** 70 Conf., Houston, Tex. (H. R. Smith, Medical Illustration, Room 414E, Baylor College of Medicine, Houston 77025)

9–14. **Food Science and Technology,** 3rd intern. congr., Washington, D.C. (C. L. Willey, Inst. of Food Technologists, 221 N. LaSalle St., Chicago, Ill. 60601)

9–15. **Microbiology,** 10th intern. congr., Mexico City, Mexico. (L. F. Bojalil, Apartado Postal P.O. Box 60-603, Mexico 18, D.F. Mexico)

10–13. Society of **Automotive Engineers,** Los Angeles, Calif. (W. Marble, 2 Pennsylvania Plaza, New York 10001)

10–14. Continuing **Engineering Education,** Andover, N.H. (W. M. Mueller, American Soc. for Metals, Metals Park, Ohio)

10–14. Environmental Aspects of **Nuclear Power Stations** Symp., New York, N.Y. (J. H. Kane, Div. for Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

10–14. **Particulate Matter Systems** Conf., Deerfield, Mass. (D. W. Fuerstenau, Univ. of California, Berkeley)

11–13. **Photovoltaic** Specialists Conf., Seattle, Wash. (J. Loferski, Div. of Engineering, Brown Univ., Providence, R.I.)

16–18. American Acad. of **Physical Medicine and Rehabilitation,** New York, N.Y. (C. C. Herold, 30 N. Michigan Ave., Chicago, Ill. 60602)

16–21. World **Medical** Assoc., 24th general assembly, Oslo, Norway. (A. E. Romnaldez, 10 Columbus Circle, New York 10019)

16–27. **Wool Research,** 4th intern. conf., Berkeley, Calif. (H. Lundgren, U.S. Dept. of Agriculture, 800 Buchanan St., Albany, Calif. 94710)

17–19. **Alaska Science** Conf., 21st annual, College. (Hannelore, c/o Dept. of Civil Engineering, Univ. of Alaska, College 99701)

17–19. American **Peptide** Symp., 2nd, Cleveland, Ohio. (R. R. Smeby, Cleveland Clinic Foundation, 2020 E. 93 St., Cleveland)

17–19. **Trace Analysis with an Emphasis on Pollution and Environment Factors,** Edmonton, Alta., Canada. (J. A. Plamdeck, Dept. of Chemistry, Univ. of Alberta, Edmonton)

17–20. International Conf. on **Ephemeroptera,** Tallahassee, Fla. (W. L. Peters, P.O. Box 111, Florida A & M Univ., Tallahassee 32307)

17–21. New England Assoc. of **Chemistry Teachers,** 32nd summer conf., Manchester, N.H. (H. B. Bjornson, 95 Falls Ave., Medford, Mass. 02155)

17–21. **Computers in Undergraduate Science Education,** Chicago, Ill. (R. Blum, Dept. of Physics and Astronomy, Univ. of Maryland, College Park 20742)

17–21. National **Metric Study** Conf., Deerfield, Mass. (R. P. Trowbridge, c/o Engineering Foundation, 345 E. 47 St., New York 10017)

17–21. International Assoc. of **Milk, Food and Environmental Sanitarians,** Cedar Rapids, Iowa. (H. L. Thomasson, P.O. Box 437, Shelbyville, Ind. 46178)

17–21. Symposium on **Recovery of Uranium from the Ores and Other Sources,** Rio de Janeiro, Brazil. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

17–22. **Anatomical** Congr., 9th intern., Leningrad, U.S.S.R. (W. Bargmann, Dept. of Anatomy, Univ. of Kiel, Kiel, Germany)

17–22. **Carbohydrate Chemistry,** 5th intern. symp., Paris, France. (F. Percheron, 4, Ave. de l'Observatoire, 75, Paris 6e)

18–21. **Chemical Engineering** Conf., Melbourne, Australia. (P. D. O'Connor, Australian Acad. of Science, Gordon St., Canberra City, A.C.T., 2601)

18–21. **Detonation,** 5th intern. symp., Pasadena, Calif. (S. J. Jacobs, U.S. Naval Ordnance Lab., Silver Spring, Md. 20910)

18–27. International **Astronomical** Union, 14th general assembly, Brighton, England. (L. Perak, General Secretary, Astronomical Inst., Czechoslovak Acad. of Science, Prague 2)

19–20. **Water Quality,** 5th annual intern. symp., Washington, D.C. (David X. Manners Co., 237 East Rocks Rd., Norwalk, Conn. 06851)

19–26. Institute of **Mathematical Statistics,** Hanover, West Germany. (L. Katz, Statistical Lab., Michigan State Univ., East Lansing 48823)

20–21. American **Astronautical** Soc., Santa Barbara, Calif. (T. Mitchell, Univ. of California, Santa Barbara)

20–22. Therapy of **Advanced Cancer,** 9th natl. conf., Madison, Wis. (R. J. Samp, University Hospitals, 1300 University Ave., Madison 53706)

21–23. **Soil Geomorphology** Field Conf., Tucson, Ariz. (J. W. Hawley, Soil Science Soc. of America, P.O. Box 3129, University Park, N.M. 88001)

23. **Botanical** Soc. of America, Bloomington, Ind. (B. F. Palser, Dept. of Botany, Rutgers Univ., New Brunswick, N.J. 08903)

23–26. Association of American **Geographers,** San Francisco, Calif. (J. W. Nystrom, 1146 16th St., Washington, D.C. 20036)

23–27. **Phycological** Soc. of America, Bloomington, Ind. (P. L. Walne, Dept. of Botany, Univ. of Tennessee, Knoxville 37916)

23–28. American Soc. of **Agronomy,** Tucson, Ariz. (M. Stelly, 677 S. Segoe Rd., Madison, Wis. 53711)

23–28. International **Diabetes** Federation Symp. and Conf., 7th, Buenos Aires, Argentina. (V. G. Foglia, Paraguay 2155, 7° piso, Buenos Aires)

23–28. International **Law** Assoc. Conf,

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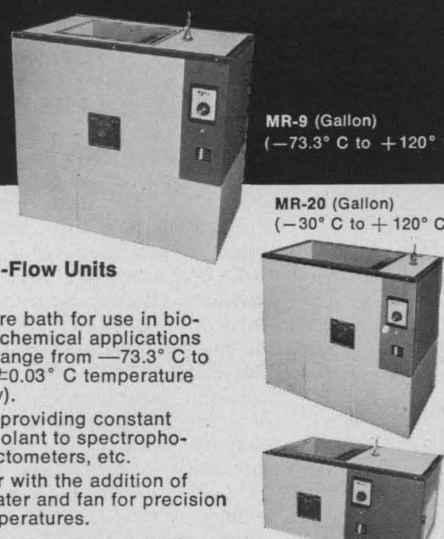

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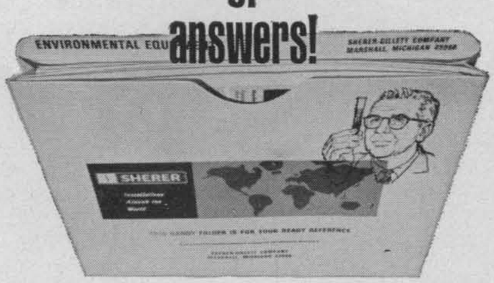

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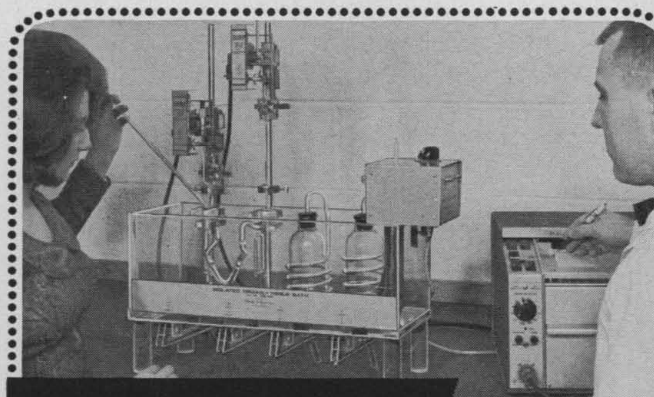

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54th, The Hague, Netherlands. (A. Cronheim, Holland Organizing Centre, 16, Lange Voorhout, The Hague)

23–28. **Liquid Crystal**, 3rd intern. conf., Berlin, Germany. (R. Hosemann, Fritz-Haber Institut der Max-Planck-Gesellschaft, Faradayweg 46.1, Berlin 33)

23–29. **Crop and Soil Science** Meetings, Tucson, Ariz. (M. Stelly, 677 S. Segoe Rd., Madison, Wis. 53711)

23–29. American **Fern** Soc., Bloomington, Ind. (A. M. Evans, Dept. of Botany, Univ. of Tennessee, Knoxville 37916)

23–29. American Soc. of **Plant Physiologists**, Bloomington, Ind. (W. H. Klein, Radiation Lab., Smithsonian Institution, Washington, D.C. 20560)

23–29. American Soc. of **Plant Taxonomists**, Bloomington, Ind. (L. I. Nevling, Jr., Arnold Arboretum and Gray Herbarium, 22 Divinity Ave., Cambridge, Mass. 02138)

23–29. American Soc. of **Zoologists**, Bloomington, Ind. (G. Sprugel, Jr., Illinois Natural History Survey, 179 Natural Resources Bldg., Urbana 61801)

24–26. **Chemical Engineering** Conf., Sydney, Australia. (P. D. O'Connor, Secy., Australian Acad. of Science, Gordon St., Canberra City, A.C.T., 2601)

24–26. **Energy and the Environment**, 24th annual conf., Oak Ridge, Tenn. (W. W. Grigorieff, Special Projects Office, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge 37830)

24–26. **Genetics** Soc. of America, Seattle, Wash. (B. Wallace, Dept. of Genetics, Cornell Univ., Ithaca, N.Y. 14850)

24–26. **Mathematical** Assoc. of Amercia, Laramie, Wyo. (A. B. Willcox, The Association, 1225 Connecticut Ave., NW, Washington, D.C. 20036)

24–26. International Conf. on **Psychosurgery**, Copenhagen, Denmark. (E. R. Hitchcock, Dept. of Surgical Neurology, Royal Infirmary, Edinburgh, Scotland)

24–26. International Conf. on **Radiation Effects in Semiconductors**, Albany, N.Y. (J. W. Corbett, Dept. of Physics, State Univ. of New York at Albany, Albany 12203)

24–27. **Soil Science** Soc. of America, Tucson, Ariz. (J. W. Hawley, The Society, P.O. Box 3129, University Park, N.M.)

24–28. Application of **Environmental R & D to Landfill Disposal for Solid Wastes**, Deerfield, Mass. (E. A. Glysson, Univ. of Michigan, Ann Arbor)

24–28. Quantitative Decision Making for Delivery of **Health Care**, Andover, N.H. (A. Jacobs, Univ. of Rochester, Rochester, N.Y.)

24–29. Congress of Intern. Soc. of **Haematology**, Munich, Germany. (J. L. Tullis, 110 Francis St., Boston, Mass. 02215)

25–28. Symposium on the **Chromosphere-Corona Transition Region**, Boulder, Colo. (J. W. Evans, Director, Sacramento Park Observatory, Sunspot, N.M. 88349)

25–28. Western **Electronic** Show and Convention, Los Angeles, Calif. (R. Howard, WESCON, 3600 Wilshire Blvd., Los Angeles 90005)

25–28. Institute of **Mathematical Statistics**, Laramie, Wyo. (L. Katz, Statistical Lab., Michigan State Univ., East Lansing 48823)

26–29. **Small-Angle X-Ray Scattering**, 2nd intern. conf., Graz, Austria. (O. Kratky, Inst. for Physical Chemistry, Univ. of Graz, Heinrichstrasse 28, A-8010 Graz)

27–30. Society for the Study of **Amphibians and Reptiles**, 13th annual, Kansas City, Mo. (J. L. Vial, Dept. of Biology, Univ. of Missouri, Kansas City 64110)

28–30. International **Mathematical** Union, 6th general assembly, Menton, France. (C. B. Morrey, Jr., Dept. of Mathematics, Univ. of California, Berkeley)

28–30. **Soil Geomorphology** Field Conf., Tucson, Ariz. (J. W. Hawley, Soil Science Soc. of America, P.O. Box 3129, University Park, N.M. 88001)

28–1. American **Quaternary** Assoc., Yellowstone Natl. Park and Bozeman, Mont. (M. Davis, Great Lakes Research Div., Univ. of Michigan, Ann Arbor 48104)

28–2. International **Mineralogical** Assoc., 7th congr., Tokyo, Japan. (C. E. Tilley, Dept. of Mineralogy and Petrology, Univ. of Cambridge, Cambridge, England)

29–3. American **Physiological** Soc., Bloomington, Ind. (H. Hazelrigg, News Bureau, Indiana Univ., 306 N. Union St., Bloomington 47401)

30–2. American Inst. of **Chemical Engineering**, Denver, Colo. (J. Henry, 345 E. 47 St., New York 10017)

30–2. **Electronic Materials** Technical Conf., New York, N.Y. (A. Reisman, I.B.M., P.O. Box 218, Yorktown Heights, N.Y. 10598)

30–2. **Geological** Assoc. of Canada and **Mineralogical** Assoc. of Canada, Winnipeg, Man. (R. F. J. Scoates, Manitoba Mines Branch, 900 Norguay Bldg., Winnipeg)

30–4. Luarentian **Hormone** Conf., Quebec, Canada. (J. Sanford, Laurentian Conf. Office, 222 Maple Ave., Shrewsbury, Mass. 01545)

30–4. **Strength of Metals and Alloys**, 2nd intern. conf., Asilomar, Calif. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

30–5. **History of Medicine**, 22nd intern. congr., Bucharest, Rumania. (B. Dutescu, Strada Rozelar 13, Bucharest)

30–5. **Ornithological** Congr., 15th intern., The Hague, Netherlands. (N. Tinbergen, Dept. of Zoology, Parks Rd., Oxford, England)

31–2. Symposium on **Heteroatom Chemistry**, London, Ont., Canada. (D. H. Hunter, Dept of Chemistry, Univ. of Western Ontario, London)

31–3. American **Sociological** Assoc., Washington, D.C. (E. H. Volkart, 1001 Connecticut Ave., NW, Washington, D.C. 20036)

31–4. Modern Concepts in **Corrosion Engineering**, Andover, N.H. (W. H. Boyd, Battelle Memorial Inst., Columbus, Ohio)

31–4. American Soc. of **Limnology and Oceanography**, Kingston, R.I. (G. H. Lauff, W. W. Kellogg Biological Sta., Michigan State Univ., Hickory Corners 49060)

31–4. **Neuropathology**, 7th intern. congr., Paris, France. (J. Lapresle, Hôpital de la Salpetriere, 47 Bld de l'Hôpital, 75 Paris 13[e])

31–4. Symposium on **Polarisation Phenomena in Nuclear Reactions**, Madison, Wis. (J. Teillar, Laboratoire Joliot-Curie, Faculte des Sciences d'Orsay, Orsay 91, France)

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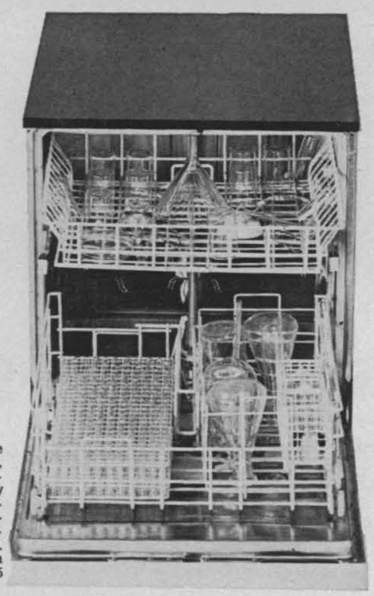

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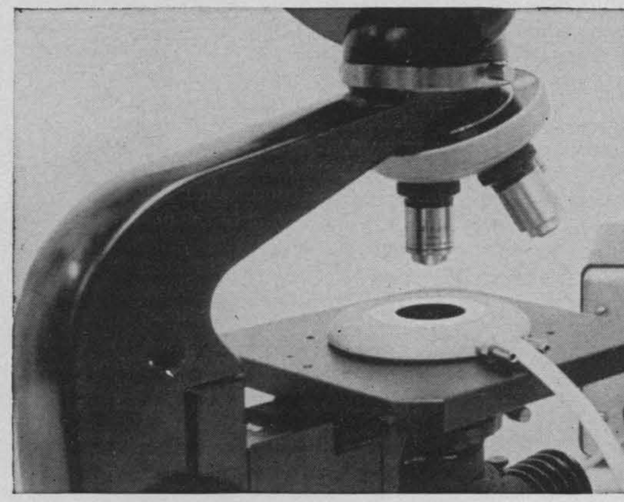

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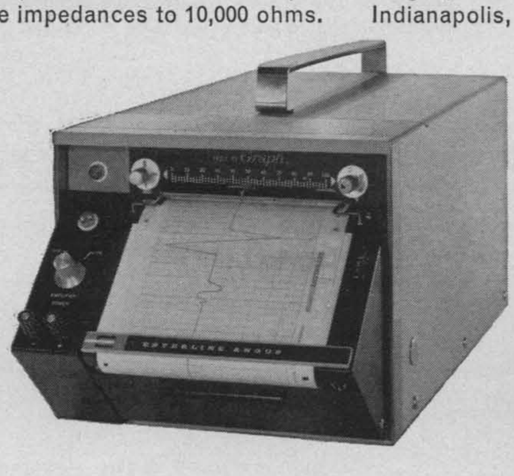

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BOOKS RECEIVED

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east Missouri. Carl F. Tolman and Forbes Robertson. Missouri Geological Survey and Water Resources, Rolla, 1969. vi + 68 pp. + maps. Paper, $2. Report of Investigations No. 44. Contribution to Precambrian Geology No. 1.

Fast Burst Reactors. Proceedings of a meeting, Albuquerque, January 1969. Robert L. Long and Paul D. O'Brien, Technical Coordinators. Div. of Technical Information, U.S. Atomic Energy Commission, Oak Ridge, Tenn., 1969 (available as CONF-690102 from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.). x + 646 pp., illus. Paper, $3. AEC Symposium Series, vol. 15.

Fertilization. Comparative Morphology, Biochemistry, and Immunology. Vol. 2. Charles B. Metz and Alberto Monroy, Eds. Academic Press, New York, 1969. xx + 556 pp., illus. $34.

Fish in Research. A symposium, Vermillion, S.D., November 1968. Otto W. Neuhaus and John E. Halver, Eds. Academic Press, New York, 1969. xii + 312 pp., illus. $8.50.

Fish Physiology. W. S. Hoar and D. J. Randall, Eds. Vol. 3, Reproduction and Growth; Bioluminescence, Pigments, and Poisons. Academic Press, New York, 1969. xvi + 488 pp., illus. $24; by subscription, $20.

Gallium Arsenide Lasers. C. H. Gooch, Ed. Wiley-Interscience, New York, 1969. xii + 340 pp., illus. $14.50.

Genesis of Stratiform Lead-Zinc-Barite-Fluorite Deposits in Carbonate Rocks. (The So-Called Mississippi Valley Type Deposits). A symposium, New York, March 1966. J. S. Brown, Ed. Economic Geology Publishing Company, c/o A. M. Bateman, Yale University, New Haven, Conn., 1967. x + 466 pp., illus. Paper, $6. Economic Geology Monograph 3.

Genetics of Antibiotic-Producing Microorganisms. G. Sermonti. Wiley-Interscience, New York, 1969. xiv + 390 pp., illus. $18. Techniques in Pure and Applied Microbiology.

Gravity Flow of Bulk Solids and Transportation of Solids in Suspension. Alexey J. Stepanoff. Wiley, New York, 1969. x + 198 pp., illus. $9.95. Materials Handling and Packaging Series.

Gum Technology in the Food Industry. Martin Glicksman. Academic Press, New York, 1969. xvi + 592 pp., illus. $27.50. Food Science and Technology, vol. 8.

Histology. Thomas S. Leeson and C. Roland Leeson. Saunders, Philadelphia, ed. 2, 1970. xii + 532 pp., illus. $11. Two supplementary filmstrips, $15.

History and Human Survival. Essays on the Young and Old, Survivors and the Dead, Peace and War, and on Contemporary Psychohistory. Robert Jay Lifton. Random House, New York, 1970. x + 406 pp. $8.95.

The Honest Politician's Guide to Crime Control. Norval Morris and Gordon Hawkins. University of Chicago Press, Chicago, 1970. xii + 276 pp. $5.95.

In Quest of the Unseen. B. J. F. Laubscher. Vantage, New York, 1969. 240 pp. $4.50.