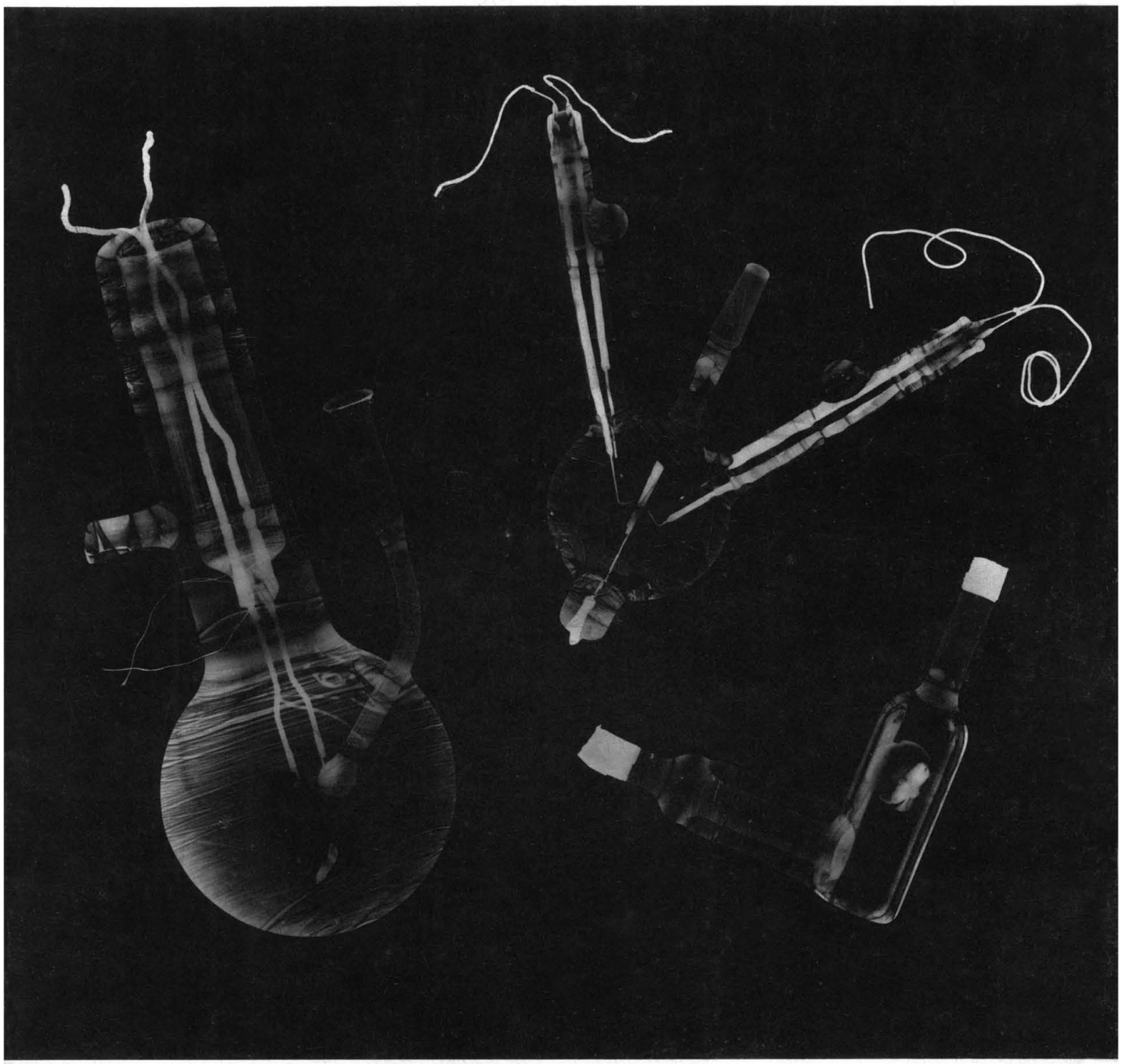
SCIENCE

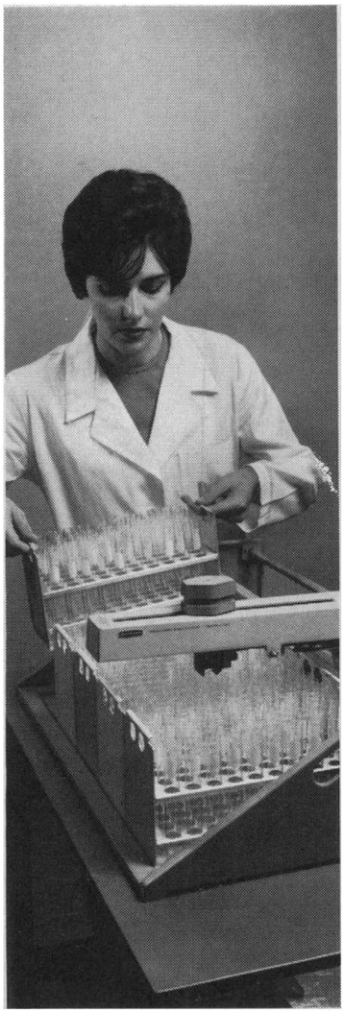
26 March 1965
Vol. 147, No. 3665

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



ULTRAHIGH VACUUM COMPONENTS

Index Issue

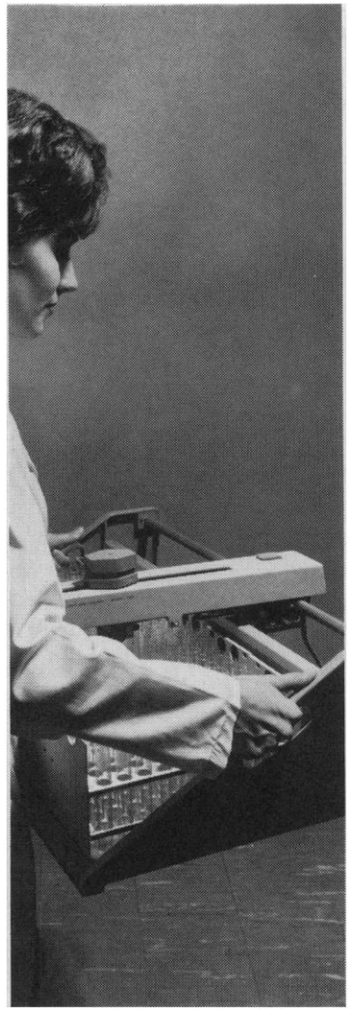


collect confidently

Whatever method of fraction collection you use (time, drop or volumetric), the delivery head of the Beckman 132 Fraction Collector will shut off automatically between tubes—to keep from spilling even a drop of valuable sample. Drip-proof delivery also makes it practical to fill tubes (there are 250 of them) in logical order, from front to back, row by row, for easier identification.

control remotely

The electronic control of this Fraction Collector (an expensive part of any collector) is a separate entity. You can keep it safely out of the way—to avoid damage by accidental spillage when tubes are handled. Equally important, the collector can be cooled completely while the control unit is kept outside the cooling area.



carry handily

Having the control unit separate also allows this Fraction Collector to be carried easily—it has convenient grip-slots on either side.

cool completely

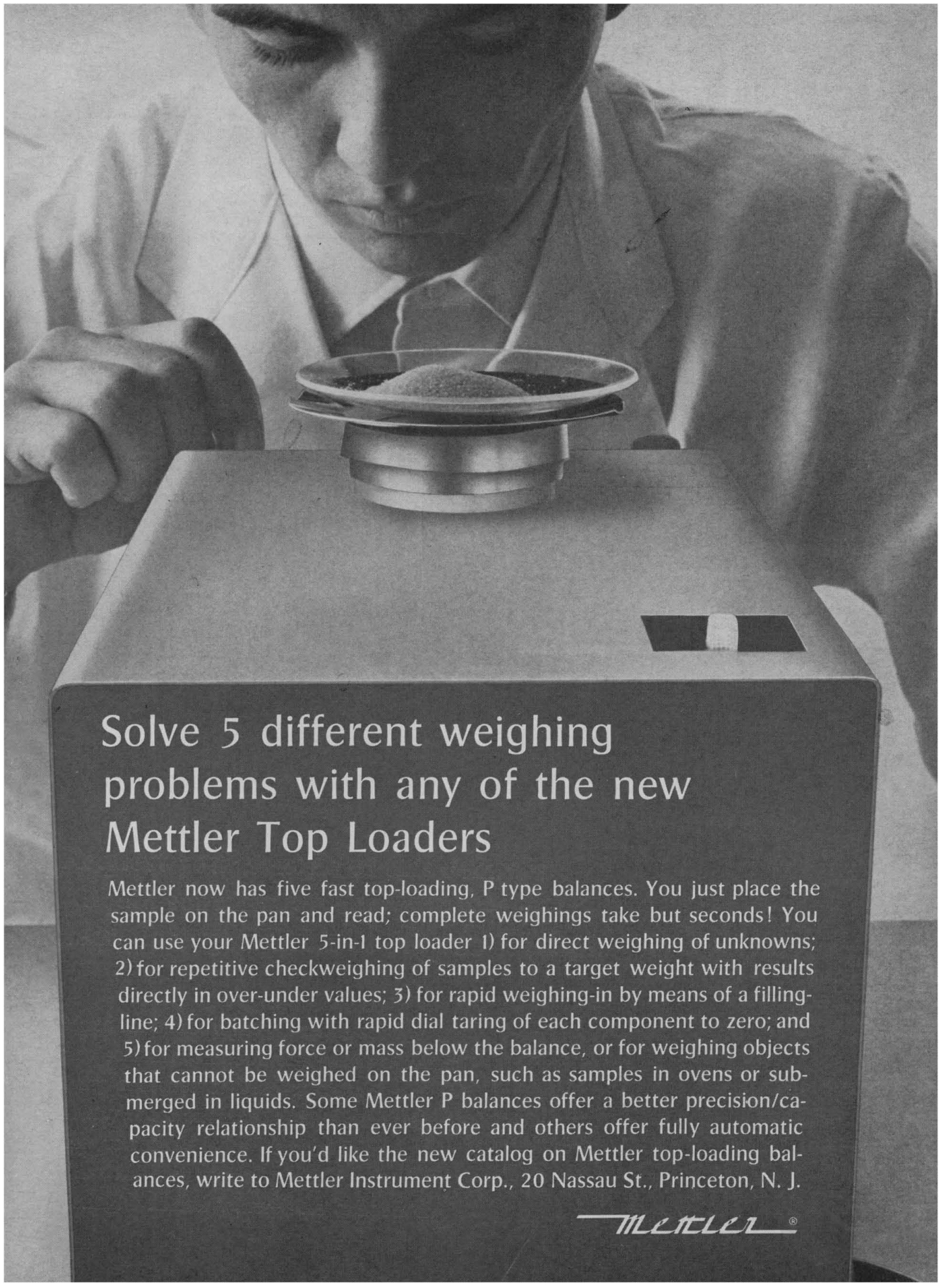
This Fraction Collector has a companion Mobile Refrigeration Unit to save you cold room space. The unit holds fractions at 4° C, and cools an external column. Caster-mounted and easy to move, it permits refrigerated chromatographic analyses to be conveniently made anywhere in the laboratory. For more information about the refrigeration unit and the most advanced of Fraction Collectors, write for Data File 132-5.

it could only be the Fraction Collector from **Beckman** INSTRUMENTS, INC.

SPINCO DIVISION

PALO ALTO, CALIFORNIA • 94304

INTERNATIONAL SUBSIDIARIES: GENEVA, SWITZERLAND; MUNICH, GERMANY; GLENROTHES, SCOTLAND; PARIS, FRANCE; TOKYO, JAPAN; CAPETOWN, SOUTH AFRICA



Solve 5 different weighing problems with any of the new Mettler Top Loaders

Mettler now has five fast top-loading, P type balances. You just place the sample on the pan and read; complete weighings take but seconds! You can use your Mettler 5-in-1 top loader 1) for direct weighing of unknowns; 2) for repetitive checkweighing of samples to a target weight with results directly in over-under values; 3) for rapid weighing-in by means of a filling-line; 4) for batching with rapid dial taring of each component to zero; and 5) for measuring force or mass below the balance, or for weighing objects that cannot be weighed on the pan, such as samples in ovens or submerged in liquids. Some Mettler P balances offer a better precision/capacity relationship than ever before and others offer fully automatic convenience. If you'd like the new catalog on Mettler top-loading balances, write to Mettler Instrument Corp., 20 Nassau St., Princeton, N. J.

Mettler®

26 March 1965
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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Components of a laboratory ultra-high vacuum system used to study chemical reactions between simple gases and atomically clean metal or semiconductor surfaces. (Left to right) Reaction bulb for preparing these surfaces, a bakeable thermistor pressure gage, and a glass valve. See page 1529. [Walter B. Halstead, General Electric Research Laboratory]

Let's explore two questions you might have about SYSTEM/360 as a scientific computer.

QUESTION #1:

Isn't SYSTEM/360 basically a commercial machine that must be adapted to work on scientific or mathematical data processing problems... and doesn't it come with a lot of features scientific workers don't need?

QUESTION #2:

Don't scientists and engineers have special needs that the all-purpose SYSTEM/360 does not meet?

THE FACTS:

SYSTEM/360 is a binary machine—a *word* machine—well suited to scientific computing.

Many of its special features are tailored to your needs.

SYSTEM/360 is an all-purpose machine because it adapts to many special purposes. Everything about it, machines, programming, system organization, is modular.

You are free to select or reject its many optional features.

SYSTEM/360 has the speed you need. It gives you a choice of speeds.

It works like a word machine for fast computing . . . or a character machine for fast compiling.

It handles big problems without segmentation because it has the giant memories you need—modular memories. You choose the right size for your application.

SYSTEM/360 has the interrupt, program relocation and automatic checking and protection features you need to process information reliably in real time... to time-share processors, memory or files.

Two new models are specially designed for time-sharing applications.

This system lets you use either of two precisions in fixed point and floating point arithmetic . . . and variable field length in decimal arithmetic.

It lets you quickly and easily expand your system . . . or reduce its size and complexity when your needs change.

All these abilities interact to make SYSTEM/360 the most powerful and versatile scientific problem-solving tool we ever created.

That makes it difficult to describe the system a feature at a time.

But we'll try. Right now.

Speed isn't everything—but we have it

Solid Logic Technology—our name for the advanced microcircuits used in SYSTEM/360—is the most practical combination of speed and performance available today.

But we designed SYSTEM/360 so that new technologies can be incorporated without changing the way you use the system.

In fact, IBM engineers have already developed advanced circuits with switching speeds as fast as one and one-half nanoseconds.

Our fastest processor accesses a full 64-bit double word in half a microsecond. Interleaved memory on this processor gives you even faster effective access time.

SYSTEM/360 has the raw speed you need, whether you're inverting a large matrix, designing by iterative methods or applying heuristic techniques.

But raw memory speed doesn't buy you much all by itself.

Today, registers operate faster than memory. So we designed SYSTEM/360 with a full set of register-to-register instructions to reduce the number of times the system must move data out of memory. Even in a relatively simple polynomial evaluation, such as:

$$Y = A+X(B+X(C+X(D+X(E))))$$

an ordinary computer would be moving the value, X, out of memory repeatedly. In SYSTEM/360, you'd move X out of memory only once and solve the problem faster.

SYSTEM/360 contains sixteen 32-bit general registers. You use these registers for binary arithmetic as well as for indexing and address arithmetic. (In SYSTEM/360, you can address over sixteen-million 8-bit bytes using only 16 addressing bits per instruction.)

The system also includes four 64-bit floating-point registers. These registers can handle either 32-bit or 64-bit floating point operands.

Data channels also help speed problem-solving. They are, in effect, small computers that relieve the main processor of time-consuming I/O operations and allow computing and I/O operations to go on at the same time.

The selector channels handle up to 256 high-speed input/output devices, like tape drives. Each channel can handle one device at a time. Data rates range from 250,000 to 1.2 million 8-bit bytes per second.

The multiplexor channel permits up to 256 low-speed devices—such as data communications terminals for remote computing—to time-share the data path to the central processor. All 256 can be operating simultaneously.

You need new kinds of memory—and you get them

It took real ingenuity to shoe-horn large programs into the limited memory space in past computers.

We've fixed that in SYSTEM/360.

In main memory, you can get from 1,024 to 131,072 64-bit words, depending on the model.

And you can add up to a million words of directly addressable, 8-microsecond core memory to the largest models of the system. Through interleaving, you cut effective speed to as little as one microsecond. This bulk memory can be addressed as an extension of main memory or as an I/O device with practically zero access time.

This large memory helps you speed solution of big problems.

You no longer have to segment large application programs and arrays. You can solve partial differential equations without bouncing data back and forth, to and from I/O gear.

You can create new algorithms and use old ones that weren't feasible on previous systems. You now can consider the use of "bordering" techniques in matrix inversion and alternating direction implicit schemes for partial differential equations.

In numerical analysis, you have had to spend an exorbitant amount of time devising sophisticated methods to make up for the lack of adequate data storage space. For example, you previously had to combine relatively sparse tables of values with high-order approximations to estimate intermediate points. Now, with SYSTEM/360, you can use dense tables and linear approximations to save processing time.

On-line, magnetic tapes give you data rates up to 340,000 bytes per second. Interchangeable direct-access disk files can store over 8 million words of data or programs.

You can get even greater auxiliary storage in the new IBM Data Cell Drive.

You can attach up to eight drives, each with ten interchangeable data cells. This gives you direct access to more than 24 billion bits, in milliseconds. This equipment is especially useful in storing graphic information in digital form—medical X-rays, for example, or bubble chamber photographs or engineering drawings.

Every SYSTEM/360 is a special-purpose computer

All features of SYSTEM/360 adapt to suit your needs . . . and then adapt again, easily, when your needs change.

The standard instructions—basic processing and logical operations—let you handle bits, bytes (8-bit characters) or words (16, 32 or 64 bits) depending on your needs. Instructions are two, four or six bytes long. The standard set plus floating-point instructions form the scientific set.

The floating-point field contains a sign bit, seven characteristic (exponent) bits and either 24 or 56 fraction bits (the decision on precision is up to you).

We use the hexadecimal number system for floating point. This gives a characteristic range several orders of magnitude higher than binary with the same number of bits. It also makes it possible to represent numbers closer to zero.

Instructions in the standard set simplify conversion from any character code to any other. They will be useful in processing input from laboratory and test stand instruments . . . from data communications terminals . . . and other external sources, as well as in number-base conversions.

Character-oriented instructions speed compiling and list processing. Direct control instructions synchronize CPU's in multiprocessor systems.

We also have designed the programming systems to save you time and to adapt to your problems.

Operating SYSTEM/360, our supervisory control program, calls in compilers, utility programs and sub-routines as needed to process your job. Two levels of Operating SYSTEM/360—with modular features that you can use or leave out—let you tailor the system to your needs.

Programs prepared for use on any SYSTEM/360 can be recompiled for use on other models, including the specialized time-sharing models.

You can write your programs in any of four major programming languages: FORTRAN IV . . . Assembler Language . . . COBOL . . . or the more powerful new programming language.

Other features include automatic storage protection and program relocation for multiprogrammed systems . . . a powerful five-level interrupt system . . . a new film recorder, scanner and display unit for all forms of graphic data processing—from experiment monitoring to computer-aided design.

The point is that the particular kind of SYSTEM/360 you get is up to you and your needs.

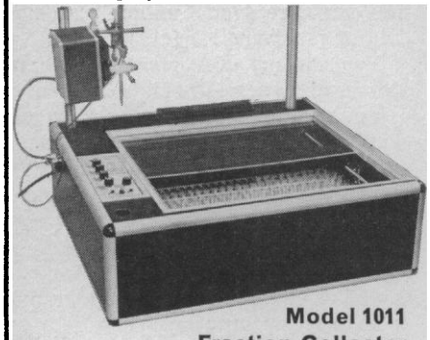
With this modular system, we can give you the one special-purpose scientific system your problems require.

IBM®

VANGUARD

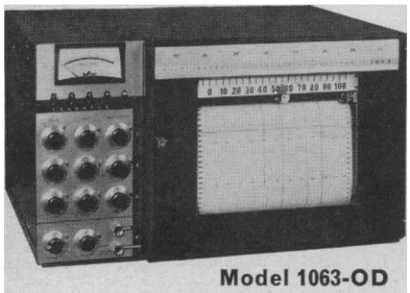
Precision Instruments for Research

When equipping your laboratory, be sure to investigate Vanguard quality, performance, and service. You will find in Vanguard instruments greater compactness, versatility, ease of operation and simplicity of design. Please give our representatives an opportunity to explain in detail the benefits and innovations that will help you speed your experiments with highly accurate information.



Model 1011
Fraction Collector

Time, drop, or volumetric operation. Time range 0-100 minutes in increments of 1/10 minute. Drop range 0-1000 drops in each tube. 400 standard test tube capacity. 8 removable stainless steel trays. Glass dust cover. 2 digital indicators. Available with Model 1012 Refrigeration unit.

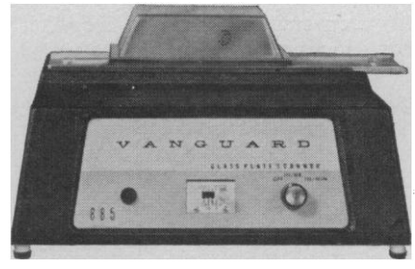


Model 1063-OD
Automatic Multi-Channel Ultra-Violet Analyzer

Presents recording at three different wave lengths. Provides a recording of the ratio of the optical density of the effluent at two of these wave lengths. Space-saving design. Completely transistorized. Detection system completely self-contained and light shielded.

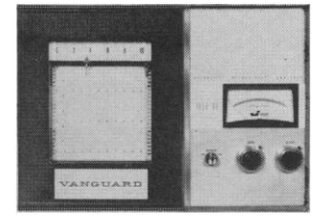
Model 880D
Dual Channel Low Background Autoscanner

Each channel has independent range and time constant selectors. Recorder provides two 5″ charts on one 10″ strip. Can examine simultaneously intense and weak areas of radioactivity. Completely transistorized. Better than 2% accuracy on all ranges. Adaptable to direct digital quantitation.



Model 885 Glass Plate Scanner for Thin Layer Chromatography

Extends the range and operates in conjunction with the Autoscanner. Assays TLC glass plates with greater accuracy and sensitivity. Sits on top of Model 880. Provides 2 pi window-less detection for tritium, carbon-14, sulphur-35 and other beta-emitting radioisotopes.



Model 1056-OD Automatic Ultra-Violet Analyzer

Provides chart recording of the optical density of the effluent from a chromatographic column. A plane diffraction grating monochromator enables the operator to select any wave length from 200 millimicrons into the visible spectrum. Completely transistorized. Detection system self-contained and light shielded.

Model 1000
Volumetric Fraction Collector

Completely self-contained and transistorized. Compact design. Model 1000 for volumetric control. Model 1010 for time-drop control.

Write for complete detailed specifications. Representatives available to explain and demonstrate Vanguard instruments.

VANGUARD INSTRUMENT CORPORATION
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This is a system. Not to be confused with a camera.

"The system" does what cameras never dreamed of. Because "the system" is just that. A system. A unique and complete system of interchangeable components that gives you greater precision, greater versatility than anything called "camera".

Hasselblad 500 C with 150 mm lens, focusing handle, light meter knob.

Take interchangeable lenses, for instance. "The system" has six. 50, 80, 120, 150, 250, and 500 mm. All Zeiss. All with Synchro-Compur shutter, automatic and manual diaphragm and coupled EVS system. All with resolving powers that permit greater enlargements than any other lenses made.

Eye-level pentaprism (left), magnifying hood (right.)

And take film backs. Ever see a "camera" that lets you switch from black and white to color mid-roll? We think not. But that's "the system" for you. A choice of 4 separate and interchangeable magazines. 3 for roll film. Each in a different format. 1 for cut film. And viewfinders. "Cameras" have them, right? One. "The system"—five. Eye-level prisms, sports viewfinders, magnifying hoods—the works. And sunshades. And filters. And proxars. And extension tubes. Exposure meters. Microscope adaptors. You name it.

Now you might ask "why the system?" Why an interchangeable everything? We did. We asked Timothy Galfas. His answer: "Versatility. 'The system' lets me do what I want, when I want. I don't find myself wishing for something extra. Or scraping to make do. I know that it will be optically right. You might say that 'the system' is versatile enough to act as an extension of myself. I can't ask for more than that."

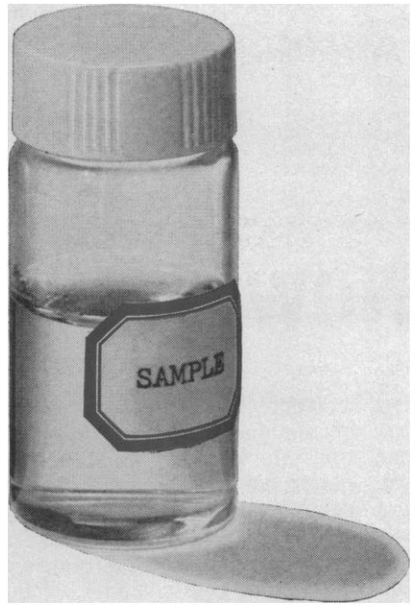
Left to right: Zeiss 150 mm; 250 mm; 80 mm; and film magazine.

Now you know what we mean by "the system". And you know why we cringe when people confuse us with our more limited look-alikes. Let there be no confusion. "Cameras" take pictures, "the system" takes pictures, the resemblance stops there. Write for literature to your dealer or to Paillard Incorporated, 1900 Lower Road, Linden, N. J.

Timothy Galfas, noted New York editorial and fashion photographer, with "the system."

HASSELBLAD

Try it with our compliments.



Request your sample of this remarkable new liquid scintillation counting solvent at the Nuclear-Chicago exhibit at the Federation Meeting.

We have developed an entirely new tissue-dissolving reagent for liquid scintillation counting. It has a higher dissolving capacity and greater freedom from quenching than any other chemical offered to date. If you would like to receive a free sample to try out in your own work, visit our booth at the Federation Meeting. Naturally, there's no obligation.

Please write for your free sample if you won't be at the Meeting.

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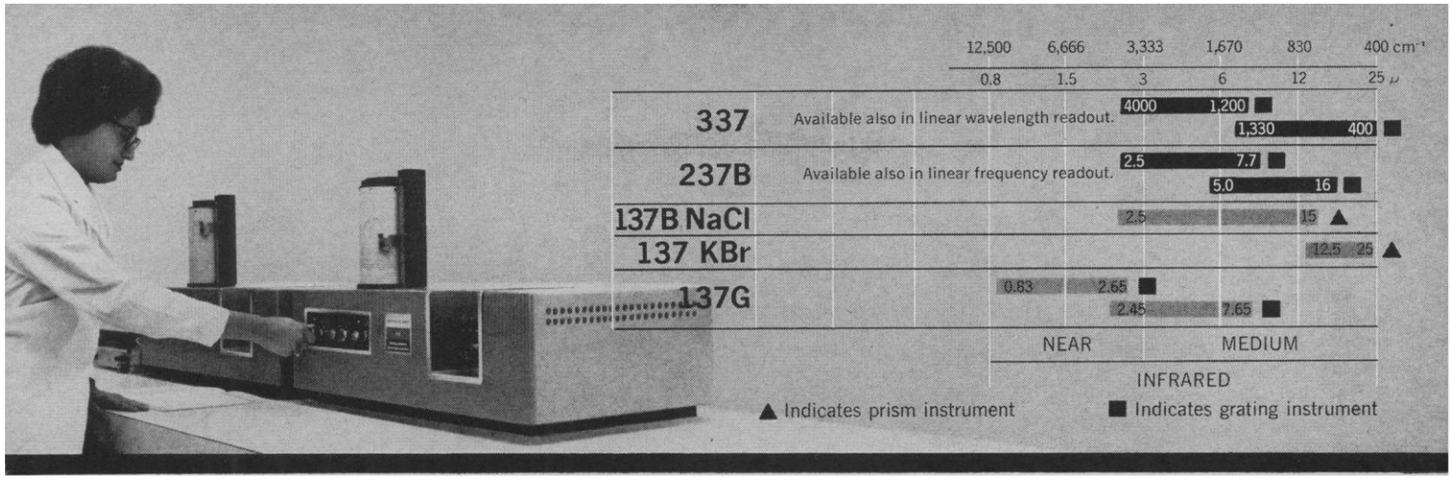


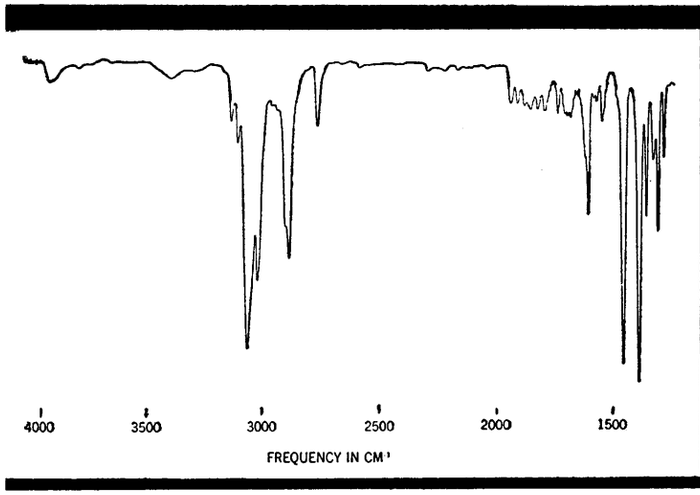
TWO NEW LOW-COST SPECTROPHOTOMETERS USE VARIABLE SLIT PROGRAMMING TO PROVIDE A WIDE RANGE OF RESOLUTION AND ENERGY SCHEDULES

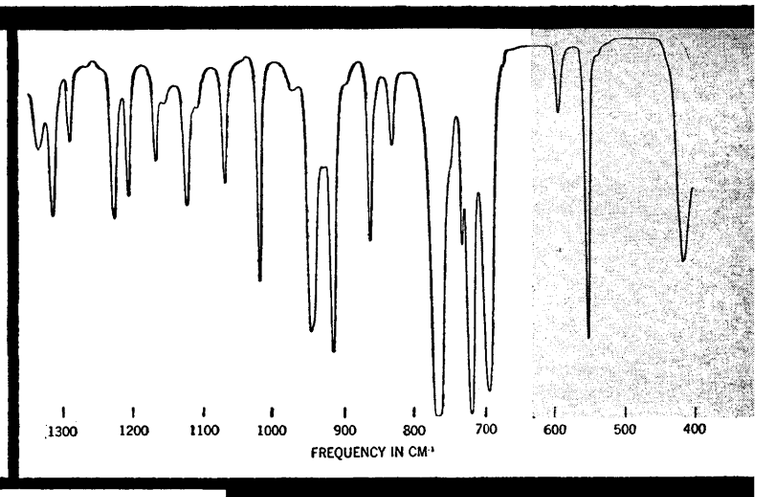
Perkin-Elmer's new low-cost infrared spectrophotometers, the Models 237B and 337, share outstanding new capabilities:

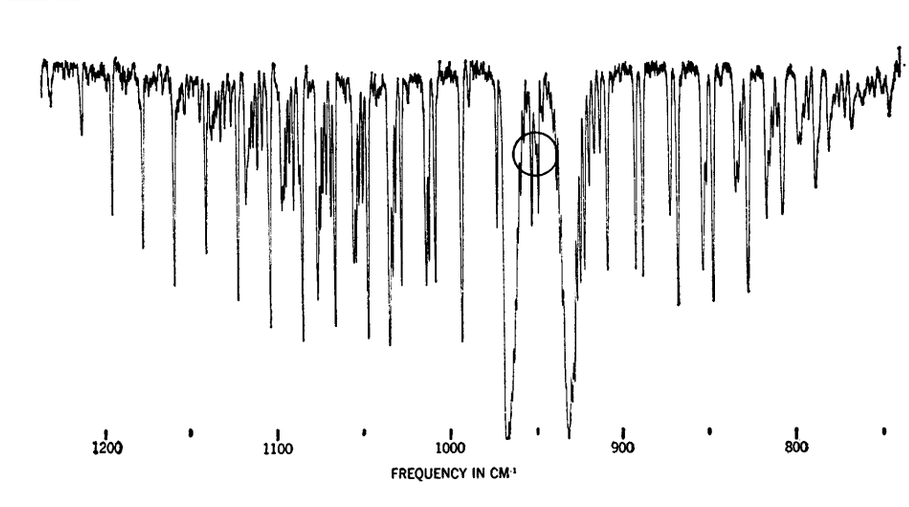
- three-minute scan option for reliable fast surveys;
- variable slit programming, to optimize spectral slit widths under varying requirements of sample, speed and resolution;
- external recorder attachment provisions, for abscissa expansion or compression, as required;
- dual-grating monochromator, for resolution better than that of many instruments costing twice as much.

The Model 237B covers the range from 4000 to 625 cm^{-1}, with a version available in linear wavelength. It is ideal if you normally operate in this fundamental region. The Model 337, also available in either linear frequency, or linear wavelength, scans from 4000 to 400 cm^{-1}. Both instruments cover their individual ranges in two serial scans, on convenient 8½" x 11" charts.

No matter what your choice, either the Model 237B or the Model 337 will provide all the performance you want at the lowest price available. For more information, write Instrument Marketing Division, Perkin-Elmer Corporation, 723 Main Avenue, Norwalk, Conn.







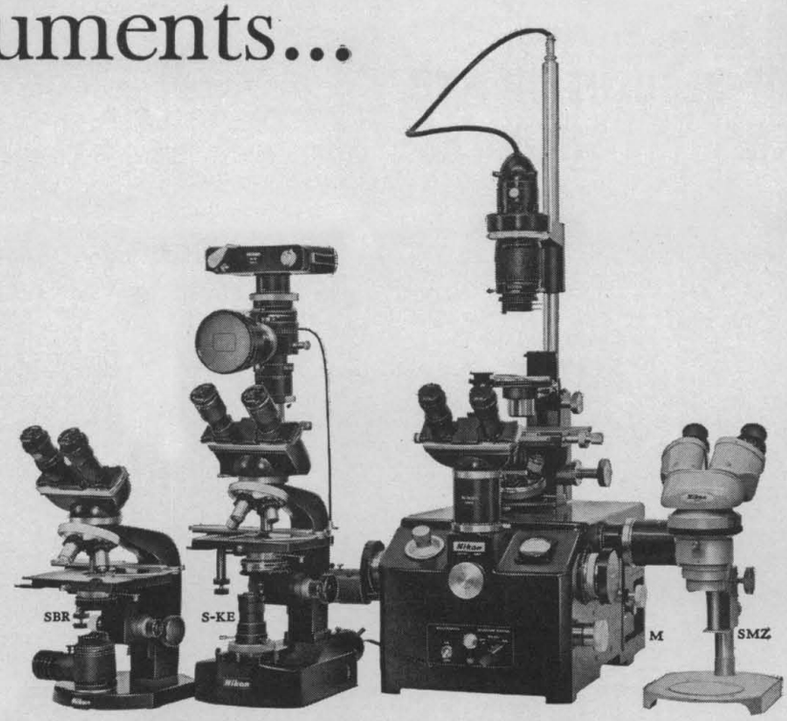
▲ Typical dual scan of indene, run in six minutes in the three-minute scan mode of the Model 337, demonstrates excellent definition possible even at this recording rate. Slit program was 6. Shaded area shows range added by the Model 337 to that of the Model 237B. In this region you gain access to carbon-bromine, carbon-iodine and carbon-chlorine vibrations, out-of-plane aromatic carbon-hydrogen bonds, and data on inorganic and metal-oxygen or metal-nitrogen bonds in complexes. Recent work also points to characteristic vibrations of ketones, aldehydes, acids and esters occurring in the 500 cm^{-1} region.

◀ Ammonia scan from 1200 to 800 cm^{-1} points out one wavenumber resolving power of Model 337, with abscissa expanded on auxiliary recorder.

PERKIN ELMER

NIKON MICROSCOPES

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



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

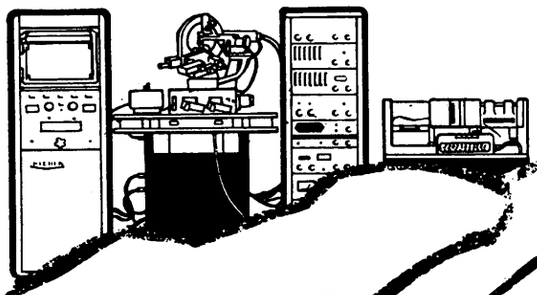
Model M Inverted Microscope—A highly sophisticated instrument designed to meet the exacting requirements in biological, medical and industrial research. Ideally suited for transmitted-light and reflected-light microscopy, time-lapse cinemicrography in tissue-culture studies, and other specialized applications.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

Model S-Ke Research Microscope – Shown with photomicrographic equipment. A professional instrument of special interest to the critical microscopist. Built-in Koehler illumination integrates microscope and light source optics into one compatible system. Ideally suited for photomicrography, phase-contrast, interference-phase, and other special techniques.

Model SMZ Stereoscopic Zoom Microscope – Matched 5:1 zoom objectives provide magnifications from 4x to 120x in combination with interchangeable oculars and auxiliary objective lenses. Working distance and focus remain constant within 5x zoom range of each combination. Substage base and mirror for transmitted-light observation, optional, as are a wide variety of special attachments and accessories.

Nikon Instrument Div. Ehrenreich Photo-Optical Industries, Inc. 623 Stewart Ave., Garden City, N. Y. 11533. Canada: Anglophoto Ltd., Instrument Div. Rexdale, Ont.

***designed for* crystallographers**
***by* crystallographers**



this new

automated system

for single crystal

x-ray diffractometry

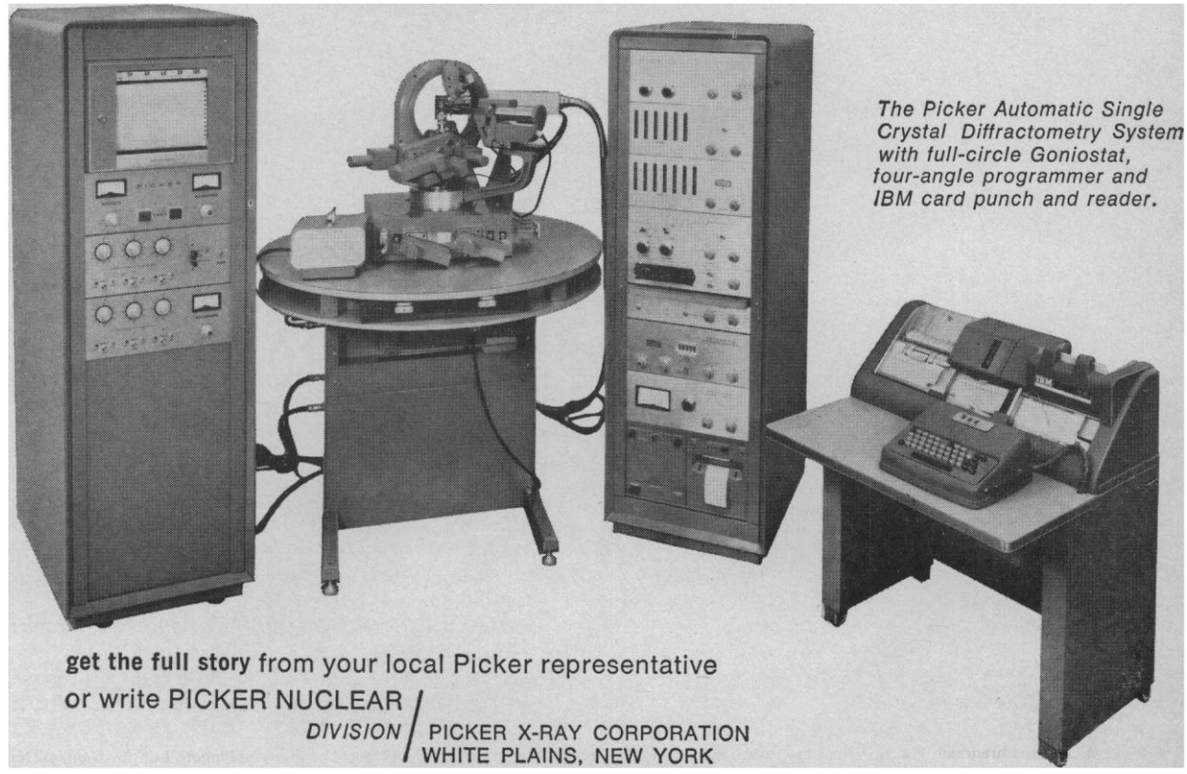
single-handed
single-source
performance
responsibility
because

***all* x-ray, detection,**
and automation
systems
are
built by
sold by
and serviced by

The crystallographer who has long labored under time-consuming manual diffraction procedures can now, by assigning the chores to this new Picker system, lift his gaze to more challenging horizons. There is no longer any need manually to re-orient the crystal for each new reflection: $x\phi\omega\theta$ are automatically set by the four-angle programmer. The full-circle Goniostat with its integral tube mount is precision built to extremely close tolerances, and provides the versatility and reliability so vital in the study of single crystals.

For the utmost reliability of intensity measurements, a new ultra stable direct current X-ray generator is optionally available.

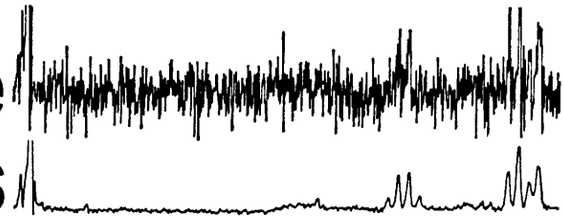
PICKER nuclear



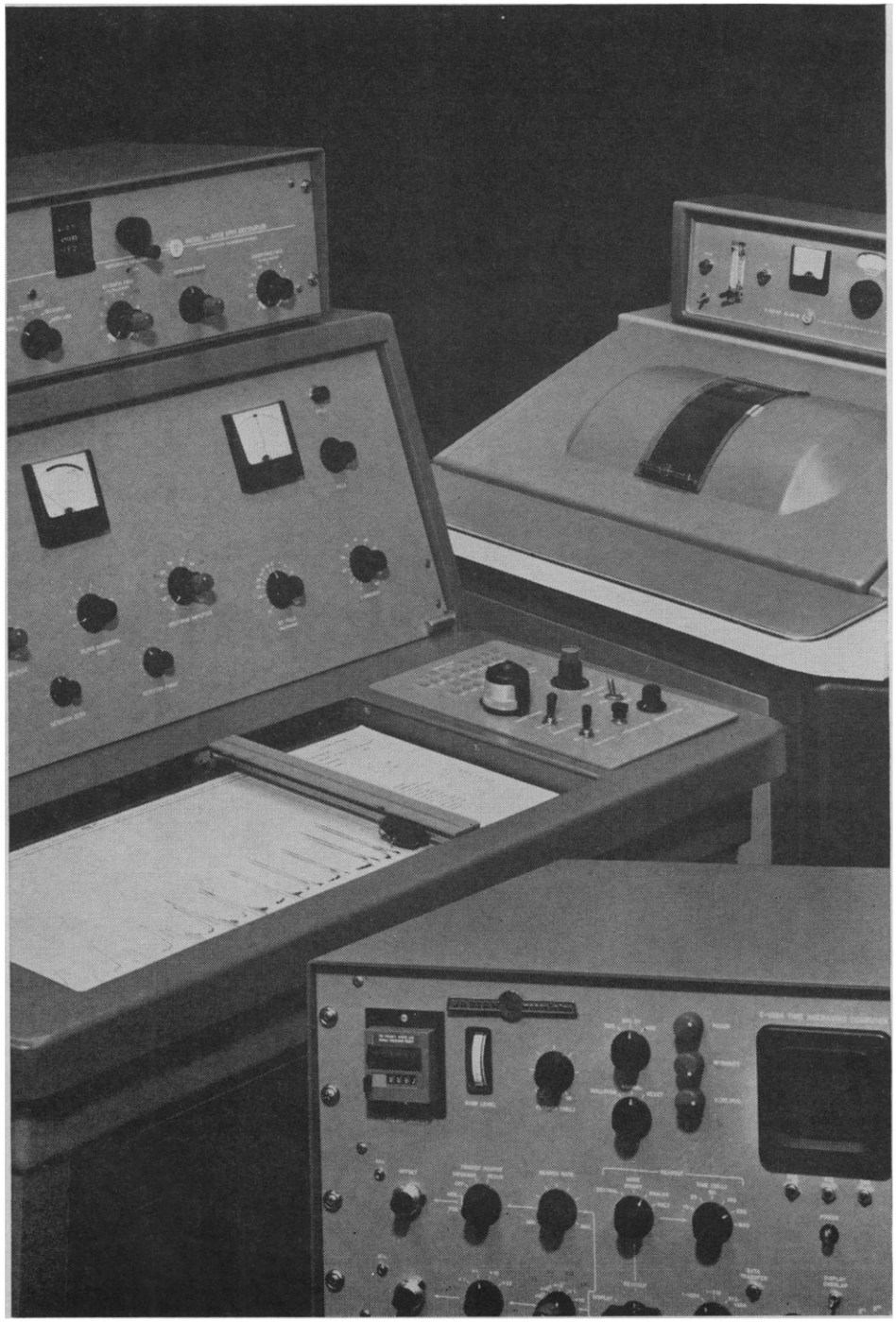
The Picker Automatic Single Crystal Diffractometry System with full-circle Goniostat, four-angle programmer and IBM card punch and reader.

get the full story from your local Picker representative
or write PICKER NUCLEAR
DIVISION / PICKER X-RAY CORPORATION
WHITE PLAINS, NEW YORK

Because becomes



NOW'S THE TIME TO RECONSIDER NMR



☐ That first A-60 spectrum of a 0.10% ethyl benzene solution is so noisy that it is almost worthless. So we reran the sample a hundred times, using an A-60 spectrometer equipped with our new C-1024 time averaging computer. The second spectrum shows the result: a clear, readable, useful signal which has improved the signal-to-noise ratio by a factor of *10*.

☐ Just one example, but we could give you plenty of others. Why couldn't *you* use NMR before? Samples too minute? Working with biological specimens? Solubility-limited compounds? Or what? Anyhow, now's the time to take another look at what our A-60 —coupled with the C-1024— can do for you.

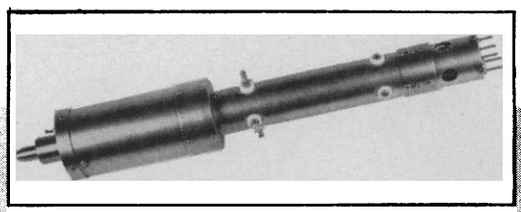
☐ The Varian A-60 offers a fast, non-destructive method of identifying compounds, functional groups, isotopic substitution sites, and components of mixtures. Now, with the time averaging computer accessory, it allows studies which were not previously feasible. Sensitivity is essentially limited only by the time you want to invest. Write our Analytical Instrument Division for details.

☐ P.S. Just in case you haven't heard, we now have spin decoupler and variable temperature accessories for our A-60 Spectrometers. They open up brand new paths to explore. Ask us about them sometime.

VARIAN ASSOCIATES
ANALYTICAL INSTRUMENT DIVISION
PALO ALTO, CALIF. · ZUG, SWITZERLAND

If you have been waiting for a mass spectrometer that:

... scans any of its mass ranges in 50 ms
... is sensitive up to 10^{-15} Torr
... offers unit resolution at mass 500



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Quadrupole is the name of the active element of a great new mass spectrometer system. The basic elements of the Quadrupole are the ionizer, discriminator, and collector. The discriminator, which is the heart of the system, consists of 4 accurately aligned stainless steel rods connected to highly stable D.C. and R.F. voltages. Precise ratios between these voltages, established by an analog computer, allow only ions of specified e/m ratios to pass through to the collector or electron multiplier. All other ions are stopped by the rods. Control electronics and readout from the Jarrell-Ash console provide an absolutely linear record (no peak bunching) of the residual gas spectrum over any of the 3 ranges within 50 milliseconds.

Manufactured by Electronic Associates, Inc.

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The New Jarrell-Ash Quadrupole Mass Spectrometer provides all of these features now

Designed by computer simulation, this compact, rugged, portable analyzer provides significant improvements in sensitivity, resolution and speed. It not only performs to higher order specifications, but also offers a trade-off between sensitivity and resolution. The unit is available in three distinct packages — as a complete mass spectrometer, a combination mass spectrometer/gas chromatograph, or a laboratory residual gas analyzer.

Write for Bulletin 28-100

FEATURES

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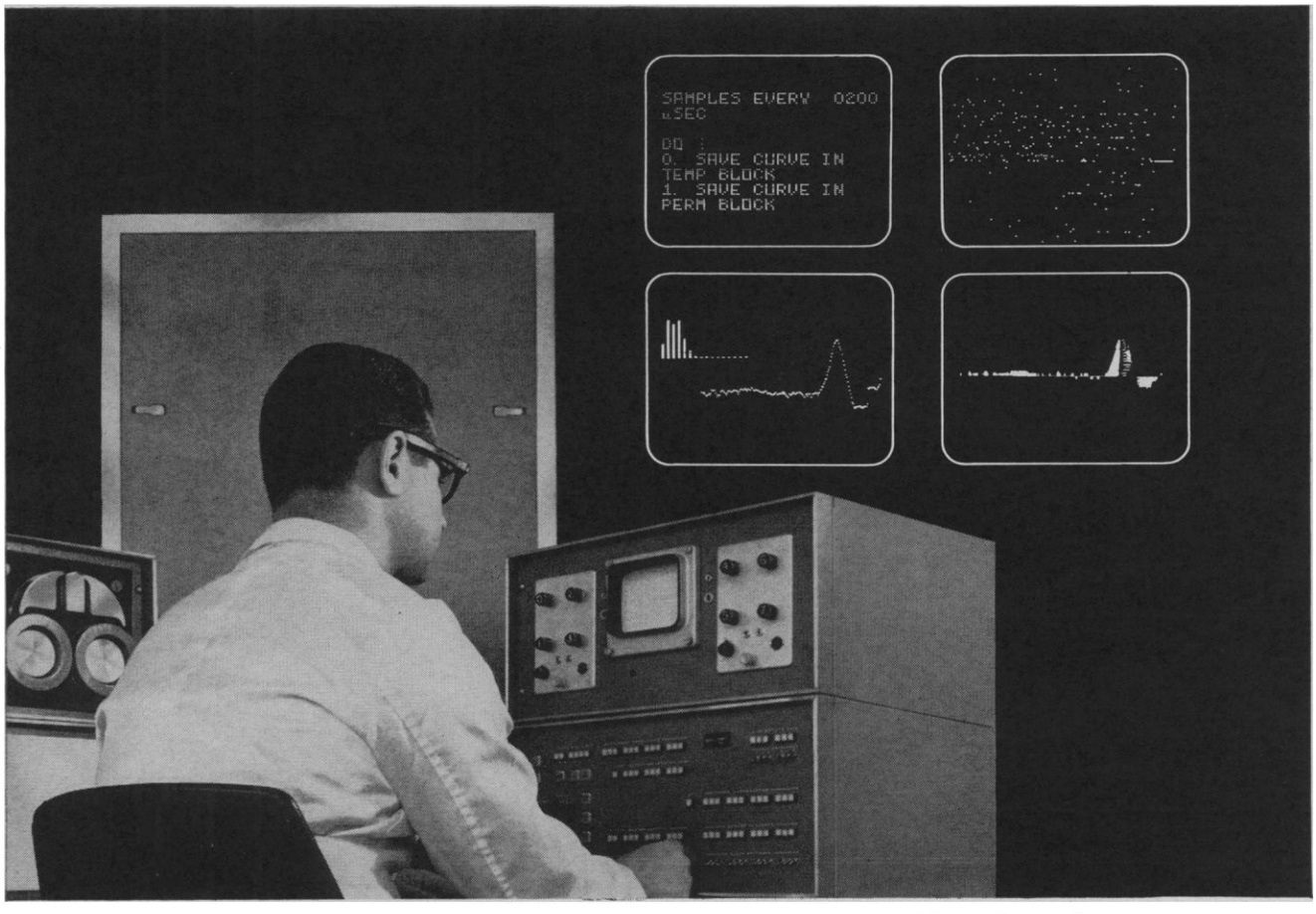

This laboratory instrument computer talks back

LINC (for Laboratory INstrument Computer) is talking, and its language is the language of the biomedicine and psychology researcher.

The researcher communicates by typing simple instructions on a typewriter-like keyboard. LINC responds on its built-in display. If LINC needs more instructions before it can proceed on an experiment, it asks for them. For example, how often shall samples of the data be taken? Shall the information be stored in a temporary storage file while the experiment is in progress or does the researcher want a permanent record? Then LINC is ready to go—to control the experiment, to collect and store the data. and to perform the statistical analysis automatically.

LINC generates stimuli, controls stimuli response relationships, and displays responses for on-line monitoring. Experiments can be modified by the LINC as they are performed. LINC stores data for future reference and displays stored data selectively before or after statistical analysis. LINC also calculates distributions, correlations, histograms, performs Fourier analysis and a broad variety of other mathematical analyses automatically. LINC is a powerful tool for constructing mathematical models of physical phenomena.

LINC is prepared to handle each new experiment or modify experiments by means of instructions typed on its keyboard. Commands are executed by means of a prepared set of automatic instructions, called programs. A variety of general-purpose biomedical programs have been written for the LINC. A community of LINC research users share mutually useful information and programs. When modifying or changing experiments, the researcher can spend time on the problem itself rather than in searching for new equipment. New program preparation is simple and straightforward for the researcher—as befits a machine designed to be used without the aid of a computer specialist.

LINC is a completely integrated laboratory computer system. An almost unlimited variety of other laboratory equipment may be directly connected to LINC through plug-in sockets located on the front of one of the cabinets. Data conversion electronics are built-in. The LINC dual-transport magnetic tape unit is extremely versatile. LINC is contained in six separable units, which may be placed as laboratory space or convenience require.

LINC was developed specifically for biomedical research under grants from the National Institutes of Health. Development took place at Massachusetts Institute of Technology and Washington University in St. Louis. Digital Equipment Corporation supplied the major portion of the electronic circuit for the developmental modules and now offers the LINC as a standard product—assembled, tested, warranted for six months, and supported by DEC's service organization. DEC also provides free LINC programming and application instruction.

More than thirty laboratories are now using LINC for specialized research in such fields as cardiovascular physiology, neurophysiology, pharmacology, psychology, genetics, and bio-statistics. Some of these laboratories are working with data from arterial shock waves, EEG alpha waves, single-unit firing of neurons, and audio signals.

These are, of course, only a small sample of the variety of research tasks to which LINC has been or may be applied.

LINC is available for immediate delivery. The cost is low—under $45,000 for the complete system. For full information and the names of LINC users in your area, call any DIGITAL EQUIPMENT CORPORATION office. Or the main office: DIGITAL EQUIPMENT CORPORATION, Maynard, Massachusetts 01754. Telephone 617 897-8821. TWX: 710 347-0212. Telex: 092-027. Cable: DIGITAL MAYNARD.

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G-75	1,000- 50,000	40-120	12-15
G-100	5,000-100,000	40-120	15-20
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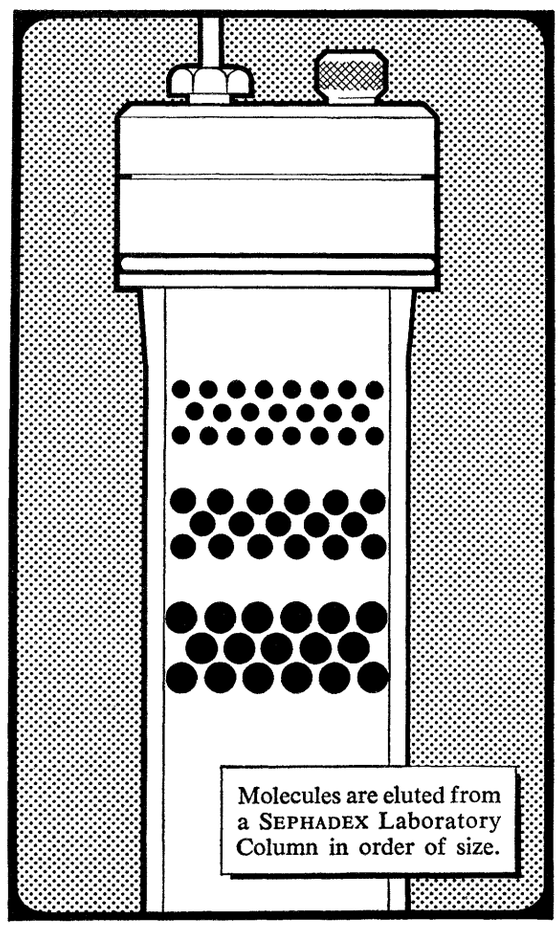

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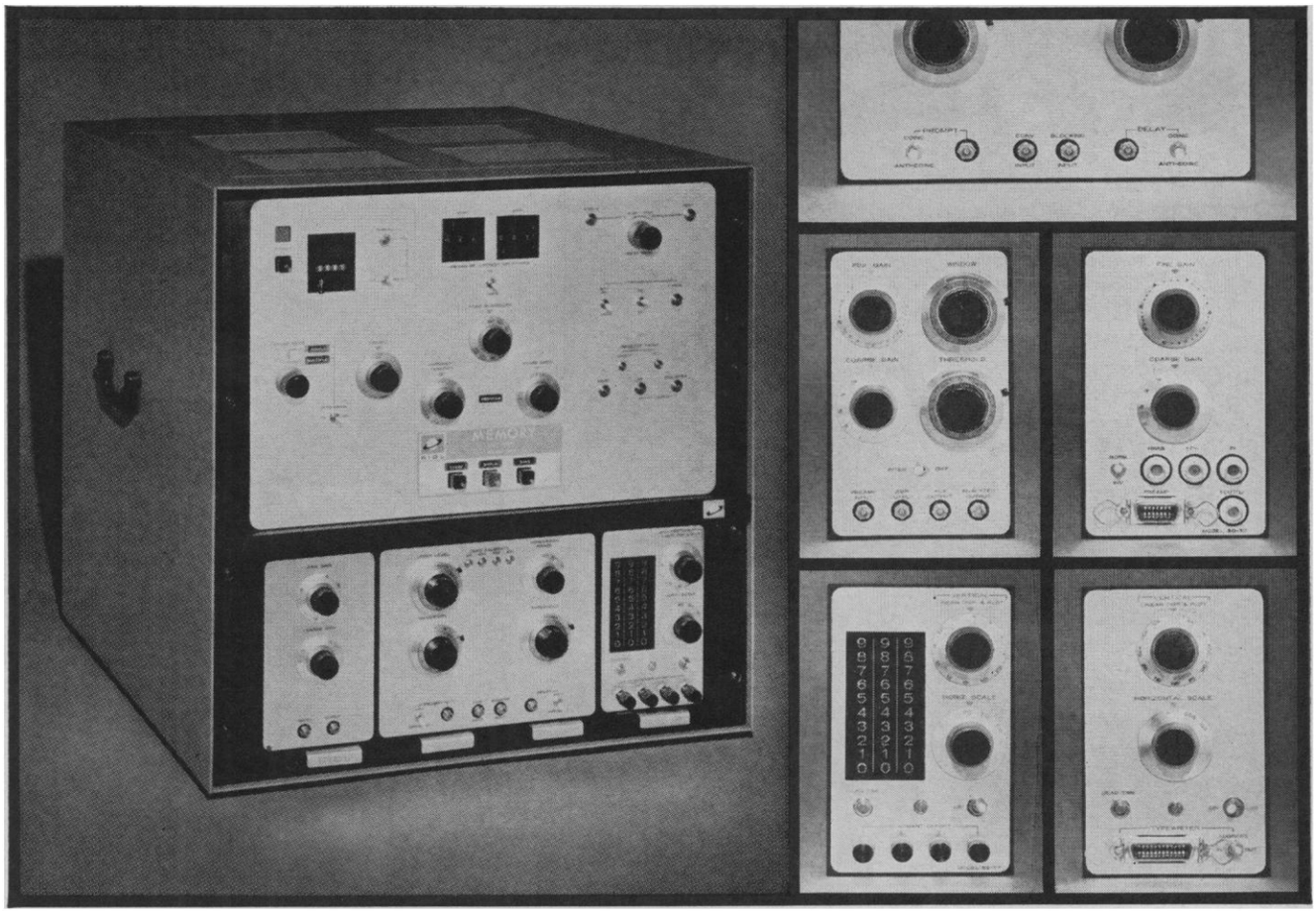

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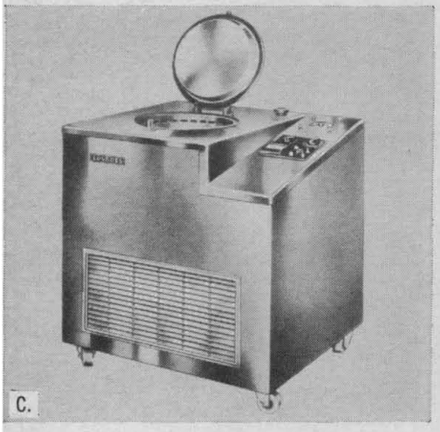
A.


B.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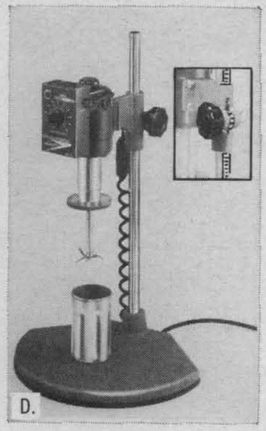
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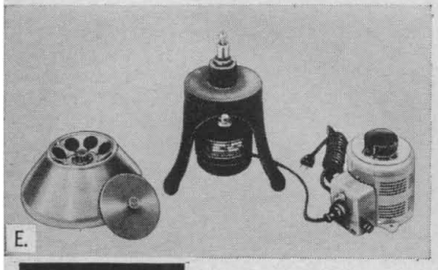
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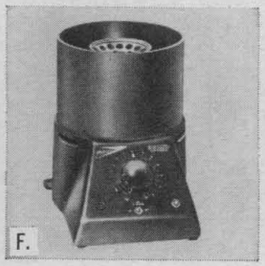
F.

A. Model A "Betafuge", Automatic Superspeed Refrigerated Centrifuge accommodates thirteen interchangeable rotors, including 3300 ml. (6 x 550 ml.) capacity rotor at 14,000 x G; 400 ml. (8 x 50 ml.) rotor at 40,000 x G; temperature control range —20°C to +40°C.

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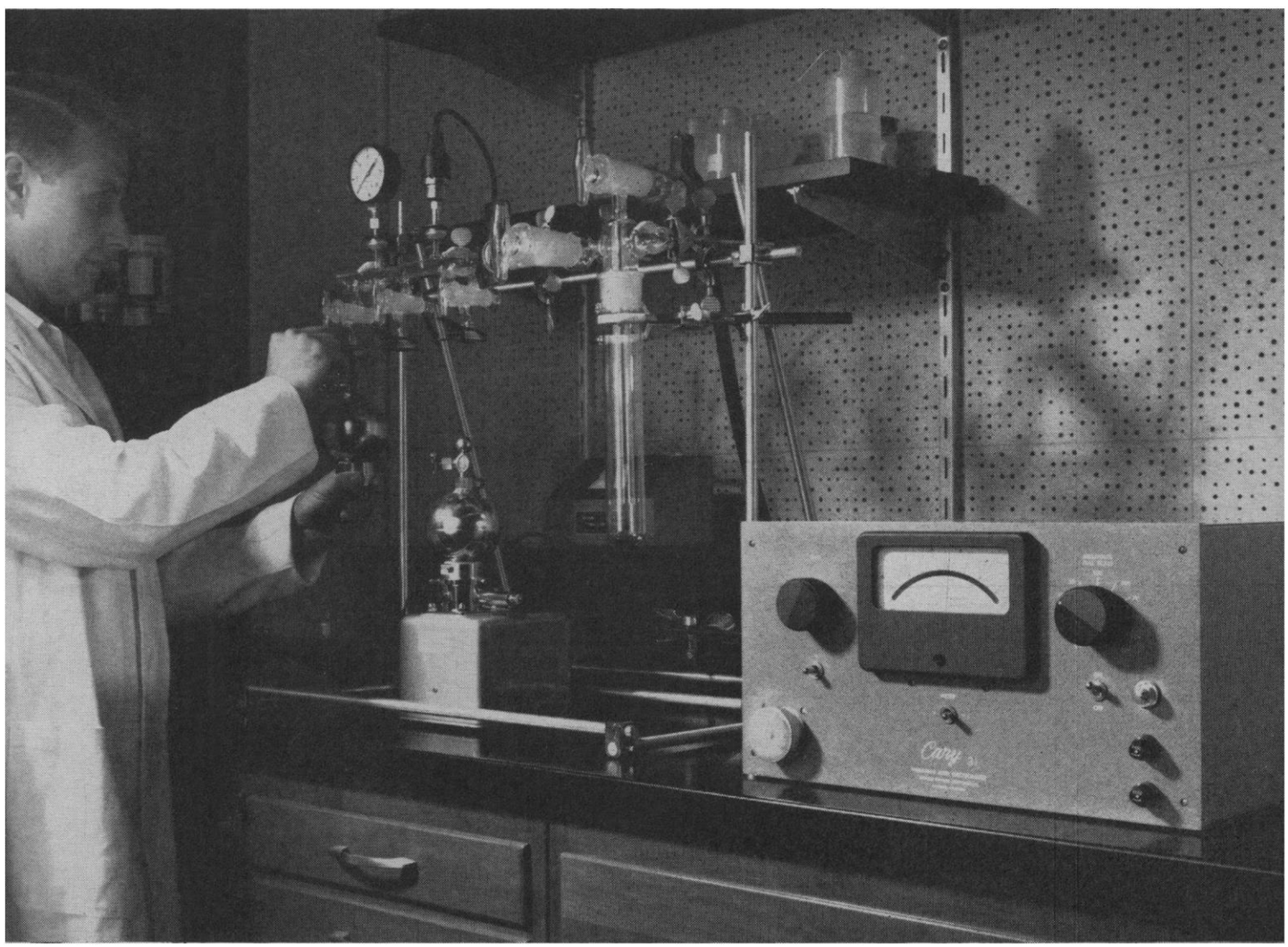
with ion chamber...for precise direct measurement of C^{14} or H^3 in gases



See CARY instruments at FASEB Conference, Atlantic City, April 10-14, 1965. For Model details, request Data File E303-35

Model 31 detects less than 3 dpm C^{14}/cc air with Cary 250-cc ion chamber, provides measurements reproducible to better than 1%, and operates for months with a single calibration. It is ideal for simplifying measurement of either gaseous or combustible non-gaseous radioactive samples. Gaseous samples to 250°C are collected in or passed through the ion chamber for static or continuous flow measurements. Far more precise and sensitive than liquid trapping equipment, a Model 31 with ion chamber costs less than $2,000.

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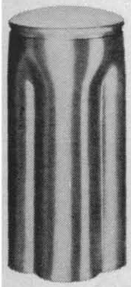

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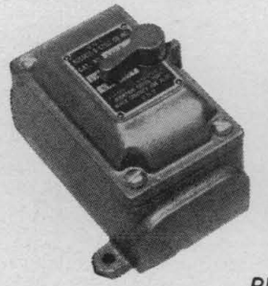

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- May be connected via conduit for remote control of Explosion-Proof Blendor Base. **$29.95**

Please write for full specifications or for answers to any questions you may have.

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*Shown with SS510 Stainless Steel container

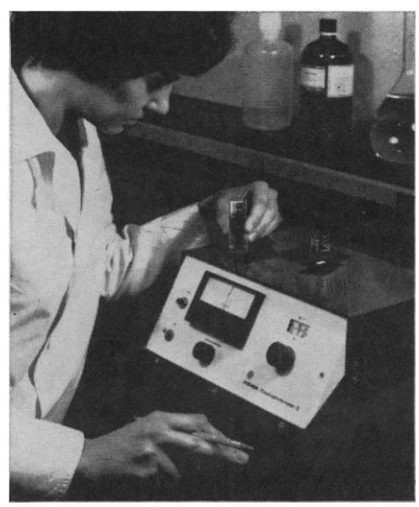
March, 1965

FISHER PRODUCT REPORT

News about instruments, apparatus and reagent chemicals that make your work quicker, surer, safer and easier.

Electrophotometer* II
A favorite colorimeter redesigned for your greater convenience.

That 27-year-old favorite, the Fisher Electrophotometer colorimeter, has been reborn as the Electrophotometer II. It measures transmittance from 10% to 100%T and absorbance from 0 to 1 with reproducibility better than ±0.5%T. To change filters, merely turn the 6-place filter wheel. A new, double-beam photometric system virtually cancels out effects of voltage fluctuations, and a taut-band null meter increases speed yet retains high sensitivity. If you make large numbers of nearly identical measurements, the Flow-Thru accessory lets you read a sample, pump it out, and pour in the next within seconds.



Another accessory converts the instrument for accurate colorimetric titrations. Price of the Electrophotometer II, without accessories, is a cost-conscious $295. Any questions? Our product bulletin has the answers. □

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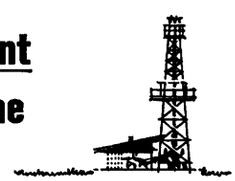

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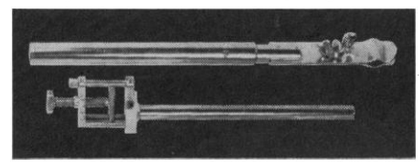

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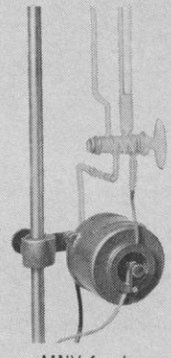

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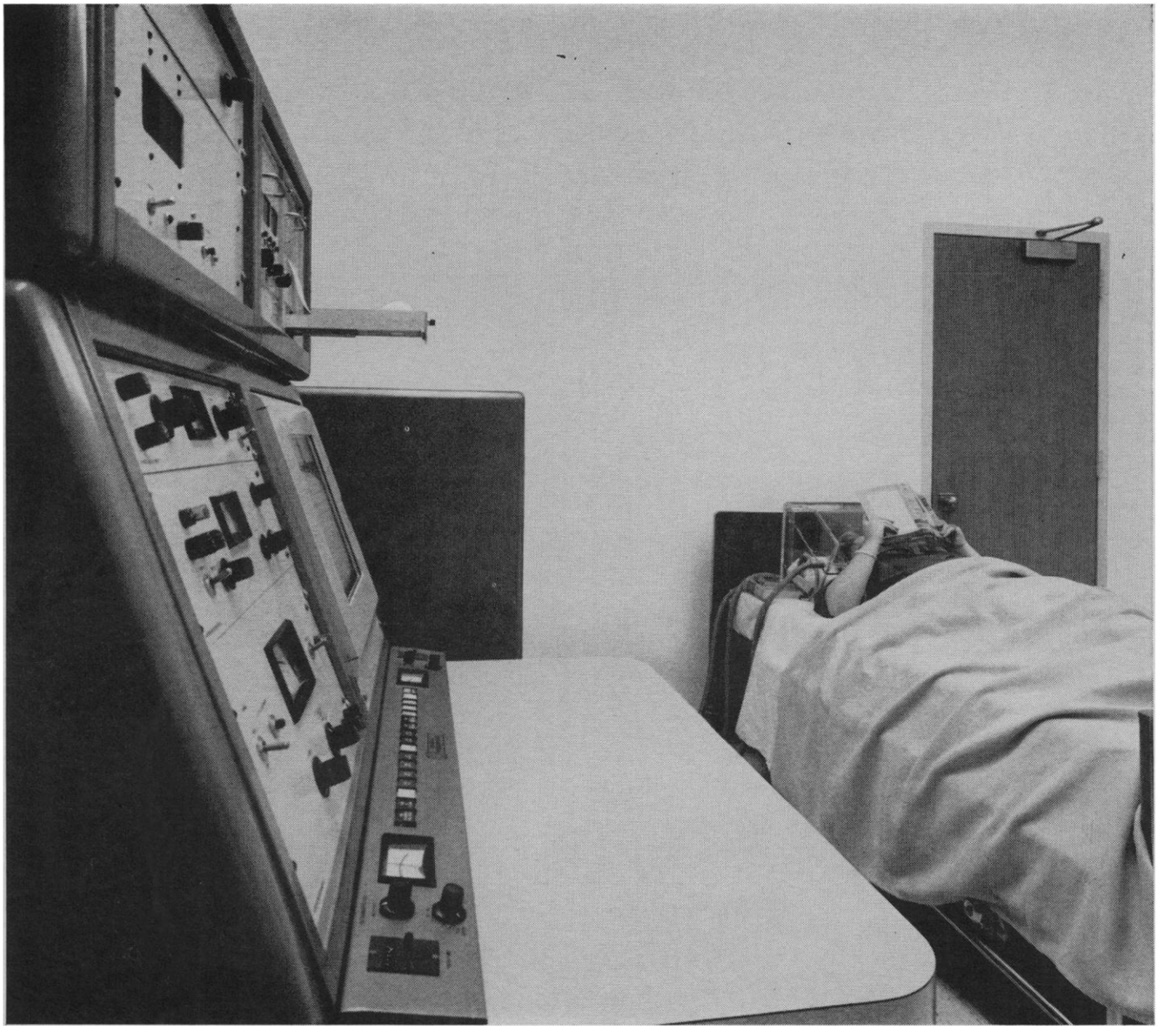

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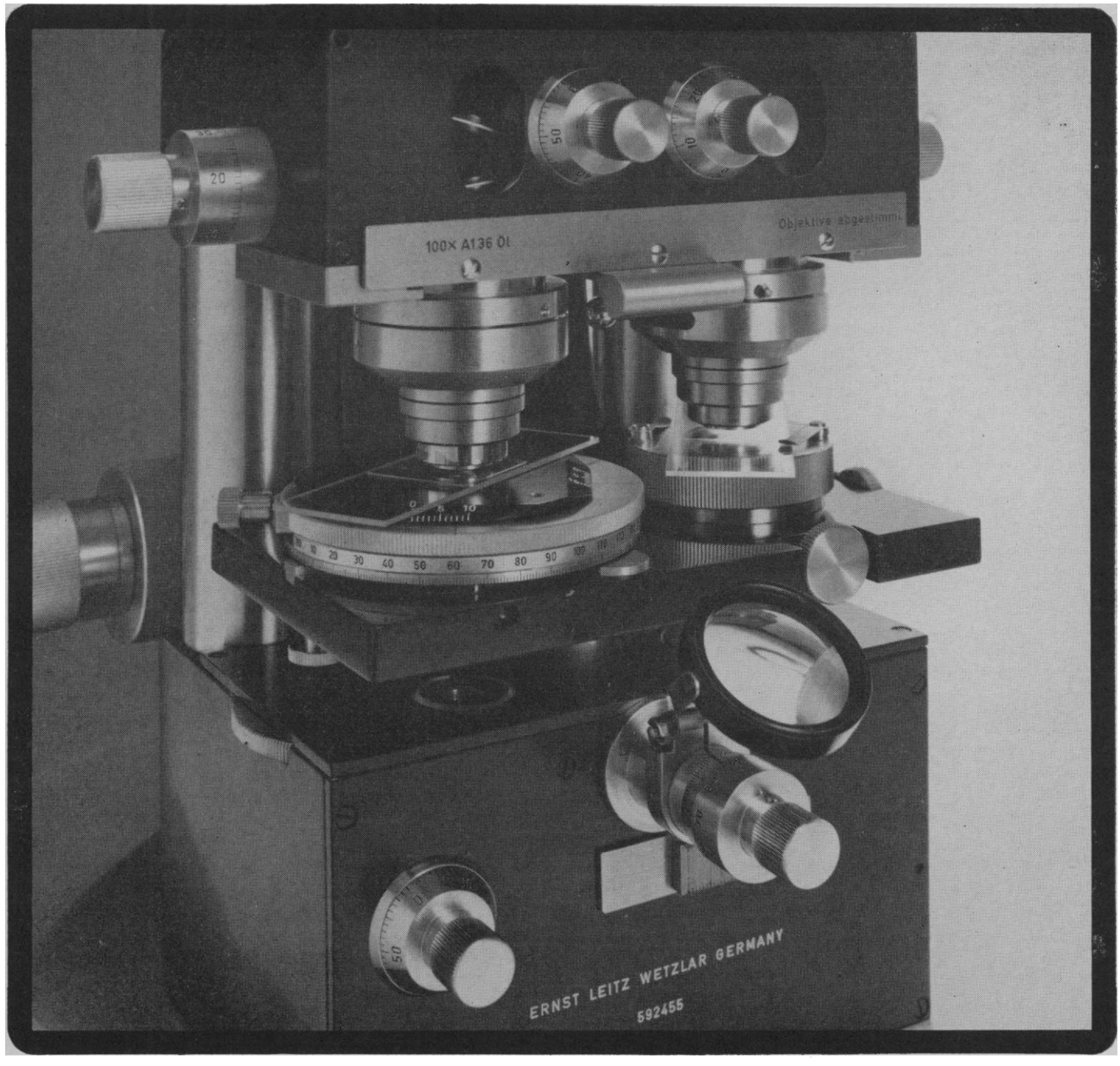

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26 March 1965, Volume 147, Number 3665 **SCIENCE**

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Air Pollution

Air pollution is becoming a serious national problem. Formerly it was a local issue largely connected with industry, but today a principal source of increasing pollution is the ubiquitous automobile.

When motor vehicles burn fuel they produce a number of products in addition to carbon dioxide and water. Important amounts of carbon monoxide and nitrogen oxides are formed. The fuel is not entirely consumed. Part is exhausted unchanged, part appears as hydrocarbons of smaller molecular weight, including reactive olefins.

At a concentration of slightly more than 1000 parts per million carbon monoxide kills quickly. Most people experience dizziness, headache, and other symptoms at approximately 100 ppm. Concentrations as high as 72 ppm have been observed in Los Angeles, and values above 100 ppm have been measured in Detroit. In almost every metropolitan area peak concentrations of carbon monoxide approach the 100-ppm level.

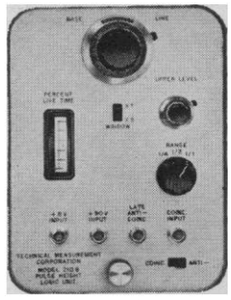
In California efforts have been made to decrease the amounts of carbon monoxide emitted by motor vehicles by use of devices such as catalytic after-burners. At the same time there has been a trend toward higher combustion-chamber temperatures. These efforts result in more complete combustion but also contribute to an increase in the production of oxides of nitrogen. Nitrogen dioxide is a poisonous brown gas. The threshold level for toxic effects is not well known, but it appears to be about 5 ppm. On one occasion a concentration of nitrogen oxides of nearly 4 ppm was observed in Los Angeles.

Automobile exhaust products interact to produce physiological and chemical effects which are greater than the sum of the parts. Synergistic effects of carbon monoxide and nitrogen oxides on respiration have been noted. Light hydrocarbons alone are not very toxic, but in the presence of nitrogen dioxide and sunlight hydrocarbons give rise to noxious substances. Nitrogen dioxide acts as a photoreceptor and is decomposed to nitrogen oxide plus atomic oxygen. This reactive form of oxygen attacks hydrocarbons. The products may react with molecular oxygen to form peroxyl radicals. These in turn react with oxygen to form ozone. The oxidants react further with the original materials as well as with their reaction products. The result is a complex mixture of toxic substances.

As yet there is little evidence of chronic effects from air pollution. However, a large fraction of our population is now being exposed to significant concentrations of a variety of toxic chemicals. These levels are often a substantial fraction of those which produce acute effects. There is a possibility that our people may be sustaining cumulative insidious damage. If genetic injury were involved, the results could be especially serious.

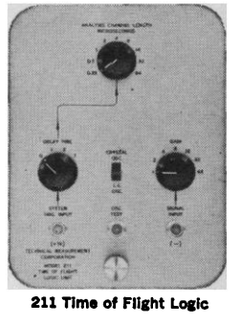
At present we cannot accurately evaluate the hazards of air pollution. The toxicity of even some of the simple important chemicals is not well established. It is clear that there are acute synergistic effects, but these have not been thoroughly examined. Even so basic a problem as establishment of good methods for measuring the concentrations of pollutants has not been completely dealt with.

The automobile and the automotive industry are central to our way of life and to our economy. Can we live with a constantly increasing level of pollution, or will we be forced to take drastic steps to protect the nation's health? At present the federal government is spending about $24 million a year on the study of all aspects of air pollution. Considering the potential seriousness of the problem, this sum seems much too small.—PHILIP H. ABELSON

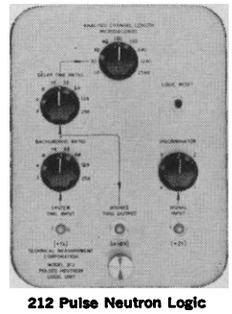


210B Pulse Height Logic

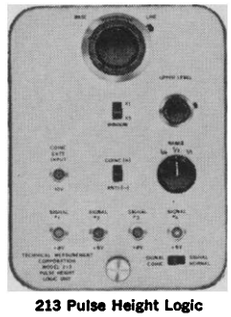
1024-CHANNEL QUICK-CHANGE ARTIST



211 Time of Flight Logic



212 Pulse Neutron Logic

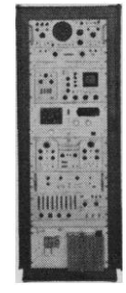


213 Pulse Height Logic

As a single purpose spectrum analyzer, the CN-1024 stands out. But the fact is that it can be quickly changed from pulse height analysis to time-of-flight measurements, pulse neutron studies, multi-parameter analysis, even to a 1024 address Computer of Average Transients — simply by changing the plug-in logic units. With the CAT plug-in, the system will isolate and measure periodic signals masked by random background noise, on-line, in real time and in 1024 addresses at rates up to 31.25 microseconds per address. Plug-ins include units for pulse height analysis, time-of-flight studies, multiscaling, mass spectrometry and coincidence pair spectrometry, and the computer of average transients.

For two parameter measurements the Model 242 input unit, which accepts two logic plug-ins, is used. In this case, the logic units are paired for PHA vs. PHA, PHA vs. TOF, and TOF vs. TOF studies. Additional 242 units may be added to increase the number of parameters.

To further extend the capabilities of the 1024, other data handling units are available. The Model 245 Eight Channel Sorter digitally selects up to eight bands of variable widths, 8 x 128, 4 x 256, 2 x 512 or 1 x 1024. The Display Control Unit, Model 240, provides map or contour display of accumulated data. The Model 220C Data Output Unit drives a paper tape punch or a paper tape printer for readout and also functions as a timer, source trigger and analysis cycle counter, or binary to decimal converter.

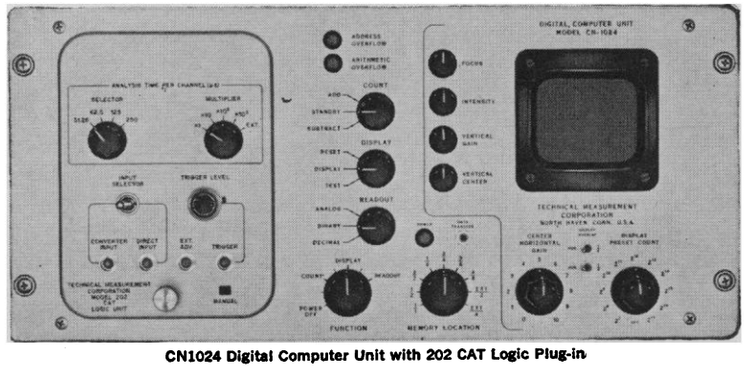


Important analyzer features:

- storage capacity, 2^{17}-1
- memory cycle time, 10 μsec. read and write
- data transfer, half to half or quarter to quarter
- built in Cathode Ray Tube Display.

Other TMC multi-channel analyzers include 100, 256, 400, 1024, 4096 and 16,384 channel systems.

Contact any TMC office for complete information or write Technical Measurement Corporation, 441 Washington Avenue, North Haven, Connecticut.

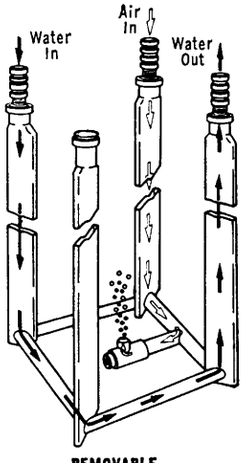


CN1024 Digital Computer Unit with 202 CAT Logic Plug-in

TMC TECHNICAL MEASUREMENT CORPORATION

New Bench-Top Fermentor

Is Small, Compact, Convenient to Use



REMOVABLE BAFFLE ASSEMBLY

A wide range of microbial investigations can now be made with bench-top convenience in the MicroFerm, a compact research fermentor. In the quiet of your own laboratory, you can conduct realistic pilot studies while temperature, agitation, and aeration are carefully controlled.

±0.25°C TEMPERATURE CONTROL

To conserve space and achieve more efficient temperature regulation, the conventional water bath has been eliminated. A new design permits tempered water to flow through hollow baffles* in the fermentor from an integral recirculating system. Temperature is adjustable from 5°C above water-supply temperature to 60°C, by means of a Thermistor controller.

Cultures can be irradiated with fluorescent or neon illumination from a Photosynthetic Light Manifold.

Accommodates 4 interchangeable fermentors: 2, 5, 7½ or 14 liters. Easy to remove. Designed for repeated sterilization in a 20″ autoclave.

*Patent Pending

Send for Catalog MFS/3265

NBS New Brunswick Scientific Co., Inc.
1130 Somerset Street, New Brunswick, New Jersey 08903

level of irradiation are: (i) it allows the survival of microorganisms capable of producing recognizable evidence of spoilage in the product at the end of its storage life; (ii) bacterial spoilage probably will occur if the product is mishandled in storage or shipping; (iii) bacterial spoilage will occur before degradation from other causes which would affect product odor, flavor, and texture; (iv) the cost of irradiation per pound of product would be kept at a minimum.

Dassow also reported a study of the amount and rate of production of trimethylamine, total volatile bases, and volatile acids in irradiated and unirradiated marine products to evaluate their usefulness as objective indices of product quality. Volatile acids were considered to be the best index of quality. The rate of nucleotide degradation and accumulation of hypoxanthine in three species of fish was studied. It was found that these measurements could be made rapidly and showed a good correlation with fish freshness during the first 8 days of storage.

The economic outlook for radiation-preserved foods was discussed by Anthony A. Bertsch (U.S. Department of Commerce), chairman of the U.S. Interdepartmental Committee on Radiation Preservation of Foods. He reported that products and processes which appear most favorable at this point are: (i) sterilization of ham for domestic and foreign markets and of bacon, pork, and beef for foreign markets; (ii) pasteurization of strawberries, poultry, and seafood products for both domestic and foreign markets; (iii) disinfection of liquid eggs; (iv) disinfestation of wheat and wheat products and pork, especially for foreign markets, and of mangoes for domestic markets; (v) the inhibition of sprouting of potatoes, especially for foreign markets; (vi) improvement in the quality of dehydrated vegetables for both domestic and foreign markets.

Howard Hembree (U.S. Army General Equipment Test Activity) reported that in a series of soldier-consumer preference tests, irradiated and nonirradiated pork products, chicken, beef, and seafood items were fed as part of normal meals. Results in general showed that nonirradiated control foods were preferred over their irradiated counterparts. However, irradiated and nonirradiated pork chops and haddock were equally preferred. The results also showed that radiation doses of 0.25 Mrad will prolong the storage,

at 0.5° to 1.7°C, of haddock for 14 days and shrimp for 7 days, without adversely affecting consumer preference.

W. T. L. Neal (Ministry of Agriculture, Fisheries and Food, Great Britain) indicated that the principal interest of European countries is in the use of radiation to pasteurize foods to eliminate salmonella infection. He indicated that there is a potential in Britain for the application of radiation to the processing of imported frozen eggs, frozen horse meat imported for pet foods, coconuts, meat and fish meals, and chicken.

Lloyd L. Kempe (University of Michigan) reported on the unusual problems in studying Type E botulism in connection with the radiation preservation of foods. Citing studies on the heat resistance of Type E spores, he pointed out an apparent anomaly in the temperature at which they are inactivated. He reported on a study using spore suspensions of the Beluga strain in sealed ampules in which the number of spores was reduced by 5 cycles in 3 minutes at 78°C but survivors remained at 60 minutes. These remaining spores produced Type E toxin upon subculture. Kempe said that this indicates the existence of the so-called "tail" on the heat-survivor curves and that the surviving spores are Type E. Studies to confirm this are continuing.

The conference was sponsored jointly by the National Academy of Sciences–National Research Council, the U.S. Atomic Energy Commission, and the U.S. Army Natick Laboratories. Proceedings of the conference will be published by NAS–NRC.

FERDINAND P. MEHRLICH
Food Division, U.S. Army Natick Laboratories, Natick, Massachusetts

Vesalius Commemoration at Brussels

Vesalius was born in 1514 and died in 1564. His activities took him from his native Belgium, through France, Switzerland, Germany, Austria, Italy, Spain, the Holy Land, and the Greek islands. The widespread impact of his work amply justified the international celebration of the fourth centennial of his death which was held in Brussels 19–24 October 1964.

The meeting comprised two programs, one historical and humanistic, and the other concerned with contemporary biology. An elegant facsimile

edition of the *Fabrica* (1543) was published for the occasion, while C. D. O'Malley's biography of Vesalius had appeared shortly before the meeting. The week opened with a ceremonial session in the presence of King Baudouin; there were visits to Vesalius's birthplace and other historical sites, concerts of 16th-century music in the old city hall, and joint lunches and dinners.

The inaugural session of the combined programs was devoted to general addresses in honor of Vesalius and concluded with the formal opening of an exhibition of Vesaliana gathered from all over Belgium and from Switzerland and Spain; this was unquestionably the largest such exhibition ever presented.

The succeeding humanistic sessions were of a more specialized nature, with speakers invited from those European countries with which Vesalius had some relation, and from America, in order to stress the international character of the commemoration. With Heymans (president of the organizing committee) presiding, Belloni (Milan) discussed Vesalius's great-grandfather, Johannes de Vesalia, his medical training at Pavia, his study of the plague in Italy, and his relations with the Duke of Milan, Francesco Sforza. Kellett (Newcastle-upon-Tyne) dealt with influences on Vesalius during his medical studies in Paris (1533–36), and Boeynams (Antwerp) discussed the same theme as it related to Vesalius's further studies in Louvain. O'Malley (University of California, Los Angeles) spoke on the evolution of Vesalius's scientific method during his years in Padua.

A paper by Steudel (Bonn) on Vesalius's contribution to the development of anatomical nomenclature was followed by more general considerations of "The Vesalian man in the world of Copernicus" by Canguilhem (Paris), the evolution of scientific-technical relations by Auger (Paris), and a paper by Florkin (Liege) on "The renaissance of Vesalian studies in the 20th century." There is no question of the increasing interest in Vesalius and the growing recognition of his achievement.

The scientific sessions, in the form of a symposium on "Cell, form and function," represented an effort to view the contemporary scene in biology. Under the title "The cell and its environment," there were presentations by Danielli (Buffalo) and Koch (Lou-

vain), Chapman-Andresen (Copenhagen), Curtis (London), and Kleinzeller (Prague), centered around cell membranes and transport phenomena. Under "Energy production," there were broad discussions by Slater (Amsterdam) and Duysens (Leiden) on respiratory and photosynthetic processes, and by André (Paris) on the structure of mitochondria. Discussion on the "Utilization of energy" was opened by Chantrenne (Brussels) who spoke on "Polyribosomes, agents of protein synthesis." Gibbons (Harvard) then spoke on ciliary movement, and was followed by Huxley (Cambridge) and Mommaerts (UCLA) discussing the structure and function of muscle. Under the general heading "Catabolism," Berthet (Louvain), speaking for himself and DeDuve, discussed "Physiological adaptations of the phenomena of intracellular digestion." Levi-Montalcini (St. Louis) treated "Growth control of nerve cells by a protein factor and its antiserum," and Glucksmann (Cambridge) spoke on "Cell death in normal development."

At a meeting on "Morphogenesis and differentiation," Pasteels (Brussels) discussed the structural aspects of fertilization; Monroy (Palermo) spoke on the activation of protein synthesis in that process, and Curtis (London) discussed the cortical control of embryogenesis. The last special session was devoted to "Genetical aspects of embryonic development," with lectures by Thomas (Brussels) on the control of genetic replication, Sirlin (Edinborough) on nucleolar RNA, and Signoret (Caen) on nuclear transplantations and embryonic differentiation.

The closing session was opened by Brachet (Brussels) with a masterful summary of the entire scientific program. The symposium indeed provoked an active discussion of contemporary currents in biology; one may say that among these are the problems with which Vesalius would occupy himself today, the more so since the emphasis was on embryonic development, often regarded as the next frontier of molecular biology. As a result of the conference all participants were aware of the great scientific tradition perpetuated by Vesalius.

The proceedings of the conference and a catalog of the exhibition will be published.

W. F. H. M. MOMMAERTS
C. D. O'MALLEY
University of California, Los Angeles

Forthcoming Events

March

29–29 Apr. **Genito-Urinary Diseases**, symp., Univ. of Kentucky, Lexington. (N. J. Pisacano, Continuation Medical Education, Univ. of Kentucky, Lexington)

30–31. **Formulation of Pesticides**, symp., London, England. (Assistant Secretary, Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1)

30–1. Non-conventional **Electron Microscopy**, Cambridge, England. (Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

31–2. **Corrosion** by Hot Gases and Combustion Products, symp., European Federation of Corrosion, Frankfurt am Main, Germany. [DECHEMA, 6 Frankfurt (Main) 7, Postfach 7746, Germany]

31–2. **Optical** Soc. of America, Dallas, Tex. (M. E. Warga, 1155 16th St., NW, Washington, D.C. 20036)

31–2. Recent Developments in **Heat Treatment of Food**, 2nd European symp., Frankfurt am Main, Germany. [Gesellschaft Deutscher Chemiker, Dr.rer. nat. Wolfgang Fritsche, 6000 Frankfurt (Main), Postfach 9075, Warrentrappstr. 40-42, Germany]

31–2. **Electron Beam**, 7th annual symp., University Park, Pa. (A. B. El-Kareh, Dept. of Electrical Engineering, Pennsylvania State Univ., University Park)

April

1–3. Association of **Surgeons** of Great Britain and Ireland, annual, London, England. (Joint Secretariat, 47 Lincoln's Inn Fields, London, W.C.2)

1–3. **Dermovenereology**, 7th meeting Univ. of Catania, Italy. (Direzione della Clinica Dermosfilopatica, Piazza S. Agata La Vetere 5, Catania, Sicily, Italy)

1–4. **British Medical** Assoc., annual clinical meeting, Dundee, Scotland. (D. Gullick, BMA, Tavistock Square, London, W.C.1, England)

1–15. **Theoretical Chemistry**, NATO Advanced Study Inst., Frascati, Italy. (C. A. Coulson, Mathematical Inst., 10 Parks Rd., Oxford, England)

2–3. **Alabama** Acad. of Science, Florence State College, Florence. (W. B. DeVall, Forestry Dept., Auburn Univ., Auburn, Ala.)

2–3. **Arkansas** Acad. of Science, Univ. of Arkansas, Fayetteville. (G. E. Templeton, Dept. of Plant Pathology, Univ. of Arkansas, Fayetteville)

2–3. **Chemistry Facilities for the Two-Year College**, Junior College Chemistry Roundtable, conf., Dearborn, Mich. (W. T. Mooney, Jr., El Camino College, Via Torrance, Calif. 90506)

2–3. Alexander Graham Bell Assoc. for the **Deaf**, Southeastern regional meeting, New Orleans, La. (G. W. Fellendorf, 1537 35th St., Washington 20007)

2–3. **Pennsylvania** Acad. of Science, 41st annual, Villanova Univ., Villanova. (G. E. Grube, Lock Haven State College, Lock Haven, Pa.)

2–4. Society for Applied **Anthropology**, annual, Lexington, Ky. (SAA, Rand Hall, Cornell Univ., Ithaca, N.Y.)

2–4. American Soc. for the Study of **Sterility**, San Francisco, Calif. (H. H. Thomas, 944 S. 18th St., Birmingham, Ala.)

2–7. **West African Science** Assoc., 5th biennial conf., Freetown, Sierra Leone. (M. M. Anderson, Geology Dept., Fourah Bay College, Freetown)

4. **Chest Disease**, symp., Arizona Acad. of General Practice. (Cardiopulmonary Section, Tucson Medical Center, P.O. Box 6067, Tucson, Ariz. 85716)

4–7. American College of **Obstetricians and Gynecologists**, annual, San Francisco, Calif. (ACOG, 79 W. Monroe St., Chicago, Ill. 60603)

4–9. Division of **Chemical Literature**, American Chemical Soc., Detroit, Mich. (B. M. Davis, Cabot Corp., Concord Rd., Billerica, Mass.)

4–9. American **Chemical** Soc., spring natl. meeting, Detroit, Mich. (ACS, 1155 16th St., NW, Washington, D.C. 20036)

5–7. **Atomic Energy** Soc. of Japan, annual, Kyoto, Japan. (M. Masamoto, Atomic Energy Soc. of Japan, c/o Japan Atomic Energy Research Inst., 1, 1-chome, Shibatamura-cho, Minato-ku, Tokyo, Japan)

5–7. Hormonal Effects of **Cutaneous Structure and Function**, New York Univ., New York, N.Y. (Office of the Recorder, New York Univ. Post-Graduate Medical School, 550 First Ave., New York 10016)

5–7. **Elementary Particles**, conf., Birmingham, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

5–7. **Fission Product Release and Transport** under Accident Conditions, intern. symp., Oak Ridge, Tenn. (C. J. Barton, Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge 37831)

5–7. Nuclear Engineering: **Neutron Dynamics and Control**, 4th annual symp., Univ. of Arizona, Tucson. (D. L. Hetrick, Dept. of Nuclear Engineering, Univ. of Arizona, Tucson 85721)

5–7. New Dimensions in **Space Technology**, 2nd space congr., Cocoa Beach, Fla. (L. E. Mertens, RCA Missile Test Project, M.U. 741 Bldg. 423, Patrick AFB, Fla.)

5–7. **Structures and Materials**, AIAA 6th natl. conf., Palm Springs, Calif. (J. E. Hove, Materials Sciences Laboratory-F/2323, Aerospace Corp., Box 95805, Los Angeles, Calif.)

5–8. American Acad. of **General Practice**, annual, Seattle, Wash. (M. F. Cahal, AAGP, Volker Blvd. at Brookside, Kansas City, Mo.)

5–8. **High Energy Physics**, symp., Birmingham, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

5–8. **Industrial Health**, American conf., Miami Beach, Fla. (American Industrial Health Conf., 55 East Washington St., Chicago, Ill.)

5–9. American College of **Allergists**, seminar and 21st annual congr., Las Vegas, Nev. (Administrative Office, 2141 14th St., Boulder, Colo.)

5–9. **Clean Air**, congr. and exhibition, Dusseldorf, Germany. (Nordwestdeutsche Ausstelungs-und Messe-Gesellschaft mbH, Nowea 5, Dusseldorf, Messegelande, Germany)

5–9. Phenomena in the Neighborhood of **Critical Points**, Washington, D.C. (M. S. Green, Statistical Physics Section, Natl.

Bureau of Standards, Washington, D.C. 20234)

5–10. **Nuclear Developments**, 1st intern. congr., Brighton, England. (J. B. Pinkerton, Inst. of Nuclear Engineers, 147 Victoria St., London, S.W.1, England)

5–12. **Large Telescopes**, symp., Pasadena and San José, Calif. (I. S. Bowen, c/o Mt. Wilson Observatory, 813 Santa Barbara St., Pasadena)

5–24. **World Meteorological Organization**, Regional Assoc. VI (Europe), 4th session, Paris, France. (WMO, 41 Avenue Giuseppe Motta, Geneva, Switzerland)

6–8. **Biomathematics and Computer Science** in the Life Sciences, 3rd annual symp., Houston, Tex. (Office of the Dean, Div. of Continuing Education, Univ. of Texas Graduate School of Biomedical Sciences, 102 Jesse Jones Library Bldg., Texas Medical Center, Houston 77025)

6–9. Royal **Aeronautical** Soc., conf., Nottingham, England. (H. Umpleby, Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1, England)

6–9. **Automatic Control**, conv., Nottingham, England. (H. Umpleby, Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1, England)

7–9. American Assoc. for **Cancer Research**, 56th annual, Philadelphia, Pa. (AACR, 7701 Burholme Ave., Fox Chase, Philadelphia 19111)

7–9. The **Chemical** Soc., anniversary meetings, Glasgow, Scotland. (CS, Burlington House, London, W.1, England)

7–9. **Nucleation Phenomena**, intern. symp., Cleveland, Ohio. (A. G. Walton, Dept. of Chemistry, Case Inst. of Technology, University Circle, Cleveland 6)

7–9. **Pesticides**, U.S.–Japan Cooperative Science program, Honolulu, Hawaii. (Office of Intern. Science Activities, Natl. Science Foundation, Washington, D.C.)

7–9. **Stress Analysis**, conf., Bristol, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

7–16. **Instrumentation for Hydraulic Research**, U.S.–Japan Cooperative Science Program seminar, Tokyo, Japan. (Office of Intern. Science Activities, Natl. Science Foundation, Washington, D.C.)

8–9. **Histochemical** Soc., 16th annual, Philadelphia, Pa. (S. S. Spicer, Natl. Inst. of Health, Bethesda, Md. 20014)

8–9. **Microbiological Deterioration in the Tropics**, symp., London, England. (Secretary, Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1, England)

8–9. British Inst. of **Radiology**, annual congr., London, England. (BIR, 32 Welbeck St., London, W.1)

8–9. **X-ray Analysis**, Conf., Inst. of Physics and the Physical Soc., Edinburgh, Scotland. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

8–10. North Pacific Soc. of **Neurology and Psychiatry**, Portland, Ore. (W. W. Thompson, 3300 S.W. Dosch Rd., Portland)

8–10. American **Radium** Soc., New Orleans, La. (J. L. Pool, 444 E. 68 St., New York 10021)

8–14. American Soc. for **Biological Chemists**, annual, Atlantic City, N.J. (K.

Bloch, Harvard Univ., Cambridge 38, Mass.)

9–10. American Soc. for **Artificial Internal Organs**, Atlantic City, N.J. (B. K. Kusserow, Dept. of Pathology, Univ. of Vermont College of Medicine, Burlington)

9–10. American Assoc. of **University Professors**, Washington, D.C. (W. P. Fidler, AAUP, 1785 Massachusetts Ave., NW, Washington, D.C.)

9–11. Southwestern **Psychological** Assoc., annual, Oklahoma City, Okla. (O. Parsons, Dept. of Psychiatry, Neurology, and Psychology, Oklahoma Medical Center, Oklahoma City)

9–13. Mediterranean Cooperation for **Solar Energy**, Istanbul, Turkey. (M. Perrot, c/o Faculte des Sciences, Pl. Victor Hugo, Marseilles, France)

9–14. Federation of American Societies for **Experimental Biology**, 46th annual, Atlantic City, N.J. (Mrs. T. C. Heatwole, FASEB, 9650 Wisconsin Ave., Washington, D.C. 20014)

10. **New Mexico** Acad. of Sciences, Socorro. (K. S. Bergstresser, 739 42nd St., Los Alamos, N.M.)

10–12. **Aerospace Electronics**, natl. conf., Dayton, Ohio. (Inst. of Electrical and Electronics Engineers, Dayton Office, 1414 E. 3 St., Dayton)

10–14. American Soc. for **Experimental Pathology**, Atlantic City, N.J. (H. D. Moon, Univ. of California School of Medicine, San Francisco 94122)

10–14. American Inst. of **Nutrition**, annual, Atlantic City, N.J. (O. Mickelsen, Dept. of Foods and Nutrition, Michigan State Univ., East Lansing)

10–14. American **Physiological** Soc., Atlantic City, N.J. (R. G. Daggs, 9650 Wisconsin Ave., Washington, D.C.)

10–16. American Assoc. of **Immunologists**, Atlantic City, N.J. (B. H. Waksman, Massachusetts General Hospital, Boston 14)

11–15. **Calcified Tissues**, 3rd European symp., Davos, Switzerland. (H. Fleisch, Laboratorium für Experimentelle Chirurgie, Schweizerisches Forschungsinstitut, Davos)

12–13. **Inorganic Single Crystals**, symp., London, England. (Asst. Secretary, Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1)

12–13. **Seismological** Soc. of America, annual, St. Louis, Mo. (C. Kisslinger, Dept. of Geophysics and Geophysical Engineering, St. Louis Univ., 3621 Olive St., St. Louis 63108)

12–14. **Atomic Spectra and Radiation Processes**, conf., Oxford, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

12–14. **Ballistocardiography and Cardiovascular Dynamics**, 1st world congr., Amsterdam, Netherlands. (A. A. Knoop, Physiological Laboratory, Free Univ., Valeriusplein 11, Amsterdam)

12–15. American **College Personnel** Assoc., Minneapolis, Minn. (A. H. Hitchcock, 1605 New Hampshire Ave., NW, Washington, D.C. 20009)

13–14. Kinetics of **Proton Transfer Processes**, Faraday Soc., Univ. of Newcastle-upon-Tyne, England. (FS, 6 Gray's Inn Square, London, W.C.1, England)

13–14. **Thermal Analysis**, symp., Lon-

don, England. (B. R. Currell, Dept. of Chemistry, Mathematics, Biology, and Geology, Northern Polytechnic, Holloway Rd., London, N.7)

13–15. **Telemetering**, natl. conf., Houston, Tex. (R. W. Towle, Advanced Technology Laboratories, 369 Winsman Ave., Mountain View, Calif.)

13–17. American Soc. of **Parasitologists**, 40th annual, Atlanta, Ga. (F. J. Kruidenier, Dept. of Zoology, Univ. of Illinois, Urbana)

13–17. **Rehabilitation**, Pan Pacific conf., Tokyo, Japan. (Intern. Soc. for Rehabilitation of the Disabled, 701 First Ave., New York 10017)

14. **Programmed Instruction in Medical Education**, symp., Newark, N.J. (A. Krosnick, Div. of Chronic Illness Control, New Jersey State Dept. of Health, Box 1540, Trenton 25)

14–16. **Water Resources and Pollution Control**, 14th, Raleigh, N.C. (C. M. Weiss, Box 899, Chapel Hill, N.C.)

15–16. **Heat Transfer** at Cryogenic Temperatures, Oklahoma State Univ., Stillwater. (J. D. Parker, Dept. of Mechanical Engineering, Oklahoma State Univ., Stillwater 74075)

15–16. **Programming and Control**, intern. conf., U.S. Air Force Academy, Colorado Springs, Colo. (O. J. Manci, G. B. Dantzig Operations Research Center, Univ. of California, Berkeley)

15–17. American **Ethnological** Soc., Lexington, Ky. (N. F. S. Woodbury, Office of Anthropology, U.S. Natl. Museum, Washington, D.C.)

15–17. Southern Soc. for **Philosophy and Psychology**, Atlanta, Ga. (E. A. Alluisi, Psychology Dept., Univ. of Texas, Austin 78712)

16–17. **Montana** Acad. of Sciences, Montana State College, Bozeman. (L. H. Harvey, Dept. of Botany and Microbiology, Montana State Univ., Missoula)

16–18. Association of **Southeastern Biologists**, annual, Charlottesville, Va. (J. N. Dent, Room 270, Gilmer Hall, McCormick Rd., Charlottesville 22903)

18–22. Association of American **Geographers**, annual, Columbus, Ohio. (E. Taafee, Dept. of Geography, Ohio State Univ., Columbus)

18–24. **Tsunami Run-up**, U.S.–Japan Cooperative Science Program mtg., Sapporo, Japan. (Office of Intern. Science Activities, Natl. Science Foundation, Washington, D.C.)

19–21. Nondestructive Evaluation of **Aerospace and Weapons System Components and Materials** (unclassified), San Antonio, Tex. (J. R. Barton, Southwest Research Inst., 8500 Culebra Rd., San Antonio 6)

19–21. **Biomedical Sciences Instrumentation**, 3rd natl. symp., Instrument Soc. of America, Dallas, Tex. (D. R. Stearn, ISA, 530 William Penn Place, Pittsburgh, Pa. 15219)

19–21. Mechanics, Physics, and Chemistry of **Solid Propellants**, Purdue Univ., Lafayette, Ind. (A. C. Eringen, School of Aeronautics, Astronautics and Engineering Sciences, Purdue Univ., Lafayette)

19–22. Modern Trends in **Activation Analysis**, intern. conf., Texas A&M Univ., College Station. (R. E. Wainerdi, Texas A&M Univ., College Station)

19–22. American **Geophysical** Union, annual, Washington, D.C. (W. E. Smith, AGU, 1145 19th St., NW, Washington, D.C. 20036)

19–22. **Nuclear Magnetic Resonance**, 2nd annual workshop, Washington, D.C. (A. J. Rosen, Dept. of Chemistry, Georgetown Univ., Washington, D.C.)

20–22. **Frequency Control**, 19th annual symp., Atlantic City, N.J. (Director, U.S. Army Electronics Laboratories, Headquarters, U.S. Army Electronics Command, Attn: AMSEL-RD-PF, Fort Monmouth, N.J. 07703)

20–22. **Great Plains**, symp., North Dakota State Univ., Fargo. (S. W. Russell, North Dakota State Univ., Fargo)

20–22. **Physics of Solids at High Pressures**, 1st intern. conf., Tucson, Ariz. (C. T. Tomizuka, Dept. of Physics, Univ. of Arizona, Tucson 85721)

20–22. Photochemical Aspects of **Air Pollution**, symp., Cincinnati, Ohio. (A. P. Altshuller, Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 45226)

20–22. **System Theory**, symp., Polytechnic Inst. of Brooklyn, Brooklyn, N.Y. (J. Fox, Polytechnic Inst. of Brooklyn, 333 Jay St., Brooklyn 1)

20–23. American Assoc. of **Anatomists**, annual, Miami, Fla. (R. T. Woodburne, Dept. of Anatomy, Univ. of Michigan, Ann Arbor 48104)

20–23. American **Meteorological** Soc., spring meeting, Washington, D.C. (K. C. Spengler, 45 Beacon St., Boston 8, Mass.)

20–23. U.S. Natl. Committee, Intern. **Scientific Radio Union**/Inst. of **Electrical and Electronics Engineers**, spring meeting, Washington, D.C. (A. T. Waterman, Stanford Electronics Laboratories, Stanford Univ., Stanford, Calif.)

21. **Oral Cancer**, 3rd annual symp., Poughkeepsie, N.Y. (M. A. Engelman, 1 East Academy St., Wappingers Falls, N.Y. 12590)

21–22. **Mathematical Geodesy**, symp., Turin, Italy. (A. Marussi, Univ. of Trieste, Trieste, Italy)

21–23. American Inst. of **Chemists**, 42nd annual, Richmond, Va. (R. E. Anderson, Albemarle Paper Manufacturing Co., Richmond 23217)

21–23. **Cognitive Processes and Clinical Psychology**, 3rd symp., Univ. of Colorado, Boulder. (R. Jessor, Dept. of Psychology, Univ. of Colorado, Boulder)

21–23. **Combustion** Inst., western states section, spring meeting, Hollywood, Calif. (A. S. Gordon, Forrestal Research Center, Princeton Univ., Princeton, N.J.)

21–23. Instititute of **Environmental Sciences**, 11th annual, Chicago, Ill. (IES, 34 Main St., Mount Prospect, Ill. 60057)

21–23. Engineering Aspects of **Magnetohydrodynamics**, 6th symp., Pittsburgh, Pa. (E. Reshotko, Div. of Electrical Engineering, Case Inst. of Technology, Cleveland, Ohio 44106)

21–23. Support for **Manned Flight**, conf., Dayton, Ohio. (G. L. Schwarz, Headquarters, AF Logistics Command (MCO), Wright-Patterson Air Force Base, Ohio)

21–23. **Marine Sciences Instrumentation**, 3rd natl. symp., Instrument Soc. of America, Univ. of Miami, Miami, Fla. (H. A. Cook, Airpax Electronics, Inc., P.O. Box 8488, Fort Lauderdale, Fla.)

21–23. **Nonlinear Magnetics**, 3rd intern. conf. (INTERMAG), Washington, D.C. (E. W. Pugh, I.B.M. Components Div., Dept. 231, Bldg. 703-2, Poughkeepsie, N.Y. 12602)

21–23. **Ophthalmological** Soc. of the United Kingdom, annual, London, England. (Joint Secretariat, 47 Lincoln's Inn Fields, London, W.C.2)

21–23. **Optimization Techniques**, symp., Pittsburgh, Pa. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y.)

21–23. **Pulse Radiolysis**, symp., Manchester, England. (M. Ebert, Paterson Laboratories, Christie Hospital and Holt Radium Inst., Withington, Manchester 20, England)

21–24. Federation of European **Biochemical** Societies, Vienna, Austria. (The Secretariat, Alserstr. 4, Vienna 9)

21–24. British **Paediatric** Assoc., Scarborough, England. (E. W. Hart, Hospital for Sick Children, Great Ormond St., London, W.C.1, England)

21–2. **Industrial Chemistry**, 26th intern. congr., Paris, France. (Soc. of Industrial Chemistry, 28 rue St. Dominique, Paris 7)

22–23. **Nondestructive Testing** of Materials, intern. conf., Vienna, Austria. (Firma Gebr. Böhler & Co., A.G., Kapfenberg, Austria)

22–23. Chemistry of **Polymerization Processes**, symp., London, England. (W. R. Moore, Dept. of Chemical Technology, Bradford Inst. of Technology, Bradford 7, Yorkshire, England)

22–24. Eastern **Psychological** Assoc., 36th annual, Atlantic City, N.J. (M. A. Iverson, Queens College, Flushing, N.Y. 11367)

22–24. Role of the **Solvent in Chemical Kinetics**, E. A. Moelwyn-Hughes symp., Univ. of Arkansas, Fayetteville. (A. Fry, Dept. of Chemistry, Univ. of Arkansas, Fayetteville 72701)

22–24. **Wildflower Pilgrimage**, 15th annual, Great Smoky Mountains Natl. Park. (E. E. C. Clebsch, Dept. of Botany, Univ. of Tennessee, Knoxville)

23–24. **Georgia** Acad. of Science, Oglethorpe Univ., Atlanta. (J. T. May, School of Forestry, Univ. of Georgia, Athens)

23–24. **Information Retrieval**, 2nd annual natl. colloquium, Univ. of Pennsylvania, Philadelphia. (Inst. for Scientific Information, 325 Chestnut St., Philadelphia 19106)

23–24. **Iowa** Acad. of Science, Univ. of Dubuque, Dubuque. (G. W. Peglar, Dept. of Mathematics, Iowa State Univ., Ames)

23–24. **Mississippi** Acad. of Sciences, Biloxi. (C. Q. Sheely, Mississippi State Univ., State College)

23–24. **Ohio** Acad. of Science, annual, Ohio Univ., Athens. (J. H. Melvin, 505 King Ave., Columbus, Ohio 43201)

23–24. **Parasitism**, colloquium, Oregon State Univ., Corvallis. (J. E. McCauley, Dept. of Oceanography, Oregon State Univ., Corvallis 97331)

23–24. **Population** Assoc. of America, annual, Chicago, Ill. (A. J. Coale, PAA, Office of Population Research, 5 Ivy Lane, Princeton, N.J.)

23–24. **South Dakota** Acad. of Science, Black Hills State College, Spearfish. (T.

Van Bruggen, Botany Dept., Univ. of South Dakota, Vermillion)

23–24. **West Virginia** Acad. of Science, Fairmont State College, Fairmont. (J. B. Hickman, 8 Mineral Industries Bldg., West Virginia Univ., Morgantown)

25–26. **Pi Gamma Mu,** natl. social science honor soc., St. Paul, Minn. (E. B. Urquhart, 1719 Ames St., Winfield, Kan.)

25–28. American **Oil Chemists** Soc., Houston, Tex. (C. W. Hoerr, Durkee Foods, 2333 Logan Blvd., Chicago, Ill.)

25–28. Southeastern **Psychiatric** Assoc., annual, Southern Pines, N.C. (H. Brackin, Jr., 1918 Church Ave., Nashville 3, Tenn.)

25–29. American Assoc. of **Cereal Chemists,** Kansas City, Mo. (E. J. Bass, Intern. Milling Co., Inc., 1423 S. 4th St., Minneapolis, Minn. 55404)

25–29. American Soc. for **Microbiology,** annual, Atlantic City, N.J. (R. W. Sarber, ASM, 115 Huron View Blvd., Ann Arbor, Mich.)

25–29. International College of **Surgeons,** North American Federation, Las Vegas, Nev. (Secretariat, 1516 Lake Shore Dr., Chicago, Ill. 60610)

26–27. European Days of **Chemical Engineering,** Paris, France. (Societé de Chimie Industrielle, 28, rue St. Dominique, Paris 7)

26–27. **Electroanesthesia,** 2nd symp., Univ. of Tennessee, Knoxville. (C. E. Short, UT-AEC Agricultural Research Laboratory, 1299 Bethel Valley Rd., Oak Ridge, Tenn.)

26–27. **Environmental Health Problems,** 2nd AMA congr., Chicago, Ill. (Dept. of Environmental Health, AMA, 535 North Dearborn St., Chicago, Ill. 60610)

26–28. **Error in Digital Computation,** symp., Madison, Wis. (L. B. Rall, U.S. Army Mathematics Research Center, Univ. of Wisconsin, Madison 53706)

26–29. **Aerospace Medical** Assoc., 36th annual, New York, N.Y. (Gen. J. M. Talbot, Headquarters USAF, AFMSPA, Washington, D.C. 20333)

26–29. Mechanisms and Therapy of **Cardiac Arrythmias,** 14th Hahnemann symp., Philadelphia, Pa. (L. Dreifus, Dept. of Medicine, Hahnemann Medical College and Hospital, Philadelphia)

26–29. Society of **Economic Paleontologists and Mineralogists,** New Orleans, La. (D. M. Curtis, Shell Oil Co., Box 127, Metairie, La.)

26–29. American Assoc. of **Petroleum Geologists,** 39th annual, New Orleans, La. (G. Atwater, 424 Whitney Bldg., New Orleans)

26–29. American **Physical** Soc., Washington, D.C. (K. K. Darrow, APS, Columbia Univ., New York 10027)

26–1. **Geodetic Uses of Satellites,** conf., Athens, Greece. (Intern. Organizations Staff, Bureau of Intern. Commerce, U.S. Dept. of Commerce, Washington, D.C.)

28–30. **Hypnosis and Psychosomatic Medicine,** intern. congr., Paris, France. (H. C. Harding, 2050 NW Lovejoy, Portland 9, Ore.)

28–30. National Soc. for **Prevention of Blindness,** Houston, Tex. (J. W. Ferree, 16 E. 40 St., New York 10016)

28–1. **Biometric** Soc., Florida State Univ., Tallahassee. (E. L. LeClerg, 6804 40th Ave., University Park, Hyattsville, Md.

NEW BOOKS

(Continued from page 1568)

troduction to Mathieu, Lamé, and allied functions. F. M. Arscott. Pergamon, London; Macmillan, New York, 1964. 291 pp. Illus. $9.50.

Les Périodotites Serpentinisées en France. Groupe 1, *Péridotites Intracristallines*. pt. 4, *Massif Central Médian: Bassin du Haut-Allier*. F. H. Forestier. Éditions B.R.G.M., Paris, 1964. 291 pp. Illus. Map.

Perturbation Methods in Fluid Mechanics. Milton Van Dyke. Academic Press, New York, 1964. 239 pp. Illus. $7.

Photoelectric Effects in Semiconductors. Solomon Meerovich Ryvkin. Translated from the Russian edition (Leningrad, 1963) by A. Tybulewicz. Consultants Bureau, New York, 1964. 417 pp. Illus. $22.50.

Physicochemical Investigations of Sedimentary Iron and Manganese Ores and Associated Rocks (Oxidation-reduction and acid-alkaline properties of sedimentary ore complexes). E. I. Sokolova. Translated from the Russian edition (Moscow, 1962) by David Shochet. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1964. 226 pp. Illus. $7.

Theory of Crystal Dislocations. A. H. Cottrell. Gordon and Breach, New York, 1964. 101 pp. Illus. Paper, $2.50; cloth, $4.50.

Thermal Methods of Analysis. Wesley W. Wendlandt. Interscience (Wiley), New York, 1964. 434 pp. Illus. $16.50.

Three-Dimensional Problems of the Theory of Elasticity. A. (I.) Lur'e. Translated from the Russian edition (Moscow, 1955) by D. B. McVean. J. R. M. Radok, Ed. Interscience (Wiley), New York, 1964. 505 pp. Illus. $16.

Turbulent Boundary Layers in Compressible Gases. S. S. Kutateladze and A. I. Leont'ev. Translated from the Russian edition (1962) by D. B. Spalding. Academic Press, New York, 1964. 192 pp. Illus. $8.50.

Ultrasonic Cutting. L. D. Rozenberg, V. F. Kazantsev, L. O. Makarov, and D. F. Yakhimovich. Translated from the Russian edition (Moscow, 1962) by J. E. S. Bradley. Consultants Bureau, New York, 1964. 154 pp. Illus. $17.50.

Ultrasound: Physical, Chemical, and Biological Effects. Isaak Efimovich El'piner. Translated from the Russian edition (Moscow, 1963) by F. L. Sinclair. Consultants Bureau, New York, 1964. 379 pp. Illus. $22.50.

Unsaturated Nitro Compounds. V. V. Perekalin. Translated from the Russian edition (Leningrad, 1961) by L. Mandel. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1964. 342 pp. Illus. $15.25.

General

The Addict and the Law. Alfred R. Lindesmith. Indiana Univ. Press, Bloomington, 1965. 351 pp. Illus. $7.50.

Archeological Investigations in the Parita and Santa Maria Zones of Panama (Bureau of American Ethnology, *Bulletin*, No. 193). John Ladd. Smithsonian Institution, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 303 pp. Illus. $2.50.

Archeology of the Yakutat Bay Area, Alaska (Bureau of American Ethnology, *Bulletin*, No. 192). Frederica de Laguna, Francis A. Riddell, Donald F. McGeein, Kenneth S. Lane, and J. Arthur Freed. With a chapter by Carolyn Osborne. Smithsonian Institution, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 257 pp. Illus. Maps. $3.25.

Art and Geometry: A Study in Space Intuitions. William M. Ivins, Jr. Dover, New York, 1964 (reprint of the 1964 edition). 123 pp. Paper, $1.

Astronomy. Samuel Rapport and Helen Wright, Eds. New York Univ. Press, New York, 1964. 368 pp. Illus. $4.95. Twenty three topics arranged in the following sections: The Founders of Modern Astronomy; Tools and Techniques; The Solar System; The Sun and Other Stars: and Galaxies, Cosmology, and Relativity.

The Atomic Adventure: Its Political and Technical Aspects. Bertrand Goldschmidt. Translated from the French edition (1962) by Peter Beer. Pergamon, London; Macmillan, New York, 1964. 271 pp. Paper, $3.75.

Australian Bird Songs. Carl Weismann and Allen Keast. Jacaranda Press, Brisbane, Australia, 1964. 20 pp. Illus. 27s. 6d. A 45-r.p.m. record of the bird songs is included.

Beyond the Edge of Certainty. Robert G. Colodny, Ed. Prentice-Hall, Englewood Cliffs, N.J., 1965. 297 pp. Illus. $8.75. Essays in contemporary science and philosophy by Norwood Russell Hanson, Brian Ellis, Hilary Putnam, David Hawkins, Philip Morrison, Paul K. Feyerabend, and Nicholas Rescher.

Bibliography of the History of Medicine of the United States and Canada, 1939–1960. Genevieve Miller, Ed. Johns Hopkins Press, Baltimore, Md., 1964. 446 pp. $10.

Billion Dollar Battle. The story behind the "impossible" 727 product. Harold Mansfield. McKay, New York, 1965. 192 pp. Illus. $4.95.

Biographical Encyclopedia of Philosophy. Henry Thomas. Doubleday, Garden City, N.Y., 1965. 287 pp. $5.50.

Biographical Memoirs of Fellows of the Royal Society. vol. 10. Royal Society, London, 1964. 394 pp. Illus. $6.

Biography of an Atom. J. Bronowski and Millicent E. Selsam. Harper and Row, New York, 1965. 43 pp. Illus. $2.95 (juvenile book).

Bone, Tooth, and Horn Tools of Palaeolithic Man. An account of the osteodontokeratic discoveries in Pin Hole Cave, Derbyshire. James W. Kitching. Manchester Univ. Press, Manchester, England; Humanities Press, New York, 1964. 69 pp. Illus. Plates. $4.50.

The Breath of Life. Donald E. Carr. Norton, New York, 1965. 175 pp. $3.95.

Canine Behavior. M. W. Fox. Thomas, Springfield, Ill., 1964. 151 pp. Illus. $6.75.

Carnegie Institution of Washington Year Book 1963–1964. vol. 63. Carnegie Institution, Washington, D.C., 1964. 673 pp. Illus. $1.50. Reports on current research from all departments of the Institution, covering the period 1 July 1963 to 30 June 1964.

Case Studies in Anatomy. Ernest Lachman. Oxford Univ. Press, New York, 1965. 250 pp. Illus. Paper, $2.95.

Catalogue of Data in World Data Center A: Oceanography. Suppl. No. 1, Data received during the period, 1 January to 30 June 1964. World Data Center A: Oceanography, Washington, D.C., 1964. Unpaged.

Circulation and Respiration: The Evolution of an Idea. Mark Graubard. Harcourt, Brace, and World, New York, 1964. 288 pp. Illus. Paper, $2.95.

The Clock We Live On. Isaac Asimov. Abelard-Schuman, New York, ed. 2, 1965. 172 pp. Illus. $3.50 (juvenile book).

The Computer Age: And Its Potential for Management. Gilbert Burck and the editors of *Fortune*. Harper and Row, New York, 1965. 160 pp. Illus. $3.95.

Contemporary Physics. David Park. Harcourt, Brace, and World, New York, 1964. 185 pp. Illus. Paper, $2.45.

Current Research and Development in Scientific Documentation. vol. 13. Compiled by the Office of Science Information Service, National Science Foundation. Natl. Science Foundation, Washington, D.C., 1964. 508 pp. Paper, $1.75 (order from Superintendent of Documents, Washington, D.C.). Reports on research activities in scientific documentation and closely related fields.

Dances of Anáhuac. The choreography and music of precortesian dances. Samuel Martí and Gertrude Prokosch Kurath. Aldine, Chicago, 1964. 271 pp. Illus. $10.

Darwin's Biological Work: Some Aspects Reconsidered. P. R. Bell, J. Challinor, J. B. S. Haldane, P. Marler, H. L. K. Whitehouse, and J. S. Wilkie. Wiley, New York, 1964 (reprint of the 1959 edition). 357 pp. Illus. Paper, $2.25.

The Development of Modern Chemistry. Aaron J. Ihde. Harper and Row, New York, 1964. 862 pp. Illus. $13.50.

Rudolf Diesel: Pioneer of the Age of Power. W. Robert Nitske and Charles Morrow Wilson. Univ. of Oklahoma Press, Norman, 1965. 328 pp. Illus. $5.95.

Digest of Literature on Dielectrics. vol. 27. Prepared by the Committee on Digest of Literature of the Conference on Electrical Insulation, Division of Engineering and Industrial Research. Natl. Acad. Sciences–Natl. Research Council, Washington, D.C., 1964. 263 pp. Paper, $15.

A Directory of Information Resources in the United States: Physical Sciences, Biological Sciences, Engineering. Natl. Referral Center for Science and Technology, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 356 pp. Paper, $2.25.

The Discovery of Radioactivity and Transmutation. Alfred Romer, Ed. Dover, New York, 1964. 247 pp. Illus. Paper, $1.65. A collection of essays by Henri Becquerel, Sir William Crookes, P. Curie, S. Curie, A. Laborde, William Ramsey, E. Rutherford, and Frederick Soddy.

Education of Vision. Gyorgy Kepes, Ed. Braziller, New York, 1965. 241 pp. Illus. $12.50. The contributors are Rudolf Arnheim, Wolfgang Metzger, Anton Ehrenzweig, Gerald Holton, Will Burtin, William J. J. Gordon, Johannes Itten, Tomás Maldonado, Paul Rand, Mirko Basaldella, Julian Beinart, Bartlett H. Hayes, Jr., Robert Preusser, and Robert Jay Wolff.

Everyday Miracle. Gustav Eckstein. Harper and Row, New York, 1965. 160 pp. Illus. $3.50 (juvenile book).

Explaining the Atom. Selig Hecht. With revisions and additional material by Eugene Rabinowitch. Viking Press, New York, ed. 2, 1964. 255 pp. Illus. Paper, $1.45.

The Fabric of Geology. Claude C. Albritton, Jr., Ed. Freeman, Cooper, Stanford, Calif., 1964 (© 1963). 384 pp. Illus. $8. Sixteen papers contributed by Charles A. Anderson, Frederick Betz, Jr., W. H. Bradley, James Gilluly, Arthur F. Hagner, J. M. Harrison, Mason L. Hill, David B. Kitts, Walter B. Langbein, Robert F. Legget, Luna B. Leopold, J. Hoover Mackin, Donald B. McIntyre, V. E. McKelvey, George Gaylord Simpson, and A. O. Woodford.

The Flight of Thunderbolts. Sir Basil Schonland. Oxford Univ. Press, New York, ed. 2, 1964. 192 pp. Illus. $4.80. The Gregynog Lectures, delivered in 1960 at the University College of Aberystwyth, are included.

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Foundations of Engineering. Cornell College of Engineering Lectures, Spring 1963. Philip Sporn. Pergamon, London; Macmillan, New York, 1964. 149 pp. $3.75.

Galileo Galilei: A Biography and Inquiry into His Philosophy of Science. Ludovico Geymonat. Translated from the Italian edition (1957) by Stillman Drake. McGraw-Hill, New York, 1964. 272 pp. $6.50.

Halftone Printing. Proceedings, Seventh International Conference of Printing Research Institutes (London), June 1963. W. H. Banks, Ed. Pergamon, London; Macmillan, New York, 1964. 435 pp. Illus. $15. 27 papers.

A Handbook on Evolution. Gavin de Beer. British Museum (Natural History), London, ed. 3, 1964. 142 pp. Illus. Paper, 5s.

Heredity and Evolution in Human Populations. L. C. Dunn. Atheneum, New York, ed. 2, 1965. 165 pp. Illus. Paper, $1.95.

A History of Science: Hellenistic Science and Culture in the Last Three Centuries B.C. George Sarton. Wiley, New York, 1965. 576 pp. Illus. Paper, $2.65 (reprint of 1959 edition).

The Human Brain: Its Capacities and Functions. Isaac Asimov. New American Library, New York, 1965. 377 pp. Illus. Paper, 75¢.

Human Engineering Guide for Equipment Designers. Wesley E. Woodson and Donald W. Conover. Univ. of California Press, Berkeley, ed. 2, 1964. Unpaged. Illus. $10.

Hydrospace. Martin Caidin. Dutton, New York, 1964. 320 pp. Illus. $5.95.

The Image and Appearance of the Human Body: Studies in the Constructive Energies of the Psyche. Paul Schilder. Wiley, New York, 1964 (reprint of 1950 edition). 353 pp. Paper, $1.65.

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and Monographs in Organic Chemistry: For the Period 1961–1962. Compiled and edited by Norman Kharasch and Walter Wolf. Pergamon, London; Macmillan, New York, 1964. 272 pp. $10.

Infinity: An Essay in Metaphysics. José A. Benardete. Oxford Univ. Press, New York. 1964. 299 pp. $7.20.

Insight and Responsibility. Lectures on the ethical implications of psychoanalytic insight. Erik H. Erickson. Norton, New York, 1964. 256 pp. Illus. $5.

Institute in Technical and Industrial Communications. *Proceedings*, July 1964. Herman M. Weisman, Ed. Colorado State Univ., Fort Collins, 1965. 136 pp. Illus. Paper, $6. The contributors are Shirleigh Silverman and Charles DeVore; C. O. Neidt; Harold F. Osborne; Herbert B. Michaelson; H. N. Hubbs; George T. Vardaman; Melvin S. Day; Waldo T. Boyd; Israel Light; Roy Davison; Roy C. Nelson; William E. DeSmith; John B. Haney; A. M. I. Fiskin; Arthur Dreyer; Julius Frome; J. W. Perry; Herman M. Weisman; and B. M. Oliver.

Internal Factors in Evolution. Lancelot Law Whyte. Braziller, New York, 1965. 128 pp. $4.

An Introduction to Patents for Inventors and Engineers. C. D. Tuska. Dover, New York, 1965 [reprint of *Patent Notes for Engineers* (1956)]. 204 pp. Illus. Paper, $1.50.

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Issaquena: An Archaeological Phase in the Yazoo Basin of the Lower Mississippi Valley (*Memoirs*, No. 18). Robert E. Greengo. Soc. American Archaeology, Salt Lake City, Utah, 1964. 148 pp. Illus. Paper.

Kepler's Dream. John Lear. Translated by Patricia Frueh Kirkwood. Univ. of California Press, Berkeley, 1965. 190 pp. $5.

The Land and Wildlife of North America. Peter Farb and the editors of *Life*. Time Inc., New York, 1964. 200 pp. Illus. $3.95.

The Language of Nature: An Essay in the Philosophy of Science. David Hawkins. Freeman, San Francisco, 1964. 384 pp. Illus. $7.50.

Legumes in Human Nutrition. W. R. Aykroyd and Joyce Doughty. Food and Agriculture Organization of the United Nations, Rome, 1964 (order from Columbia Univ. Press, New York). 150 pp. Paper, $3.

Life in Deserts. J. L. Cloudsley-Thompson and M. J. Chadwick. Dufour, Philadelphia, 1964. 236 pp. Illus. $8.95.

Man and the World of Science. Harry A. Kuljian. Barnes, New York; Yoseloff, London, 1964. 142 pp. Illus. $6.50.

Mathematics and Logic in History and in Contemporary Thought. Ettore Carruccio. Translated by Isabel Quigley. Aldine, Chicago, 1965. 398 pp. Illus. $8.75.

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Translated from the French (1913) by John W. Bolduc. Dover, New York, 1963. 125 pp. Paper, $1.25.

Mathematics in Western Culture. Morris Kline. Oxford Univ. Press, New York, 1964 (reprint of 1953 edition). 512 pp. Illus. Plates. Paper, $2.25.

The Lifeline of America. Development of the food industry. Edward C. Hampe, Jr., and Merle Wittenberg. McGraw-Hill, New York, 1964. 400 pp. Illus. $6.95.

The Lives of Desert Animals in Joshua Tree National Monument. Alden H. Miller and Robert C. Stebbins. Univ. of California Press, Berkeley, 1964. 459 pp. Illus. $10.

The Magic of Molecules. Herbert W. Franke. Translated from the German by H. F. Brookes. Abelard-Schuman, New York, 1964. 275 pp. Illus. $6.

Magnetic Materials Digest. The literature of 1963. A. H. Morrish, R. J. Rosen, and S. M. Rubens. Lads, Philadelphia, 1964. 268 pp. Illus.

Medical School Admission Requirements: U.S.A. and Canada. Compiled by E. Shepley Nourse. Assoc. of American Medical Colleges, Evanston, Ill., ed. 15, 1964. 263 pp. Paper, $4.

Meet the Reptiles. C. H. Keeling. Watts, New York, 1965. 158 pp. Illus. $3.95 (juvenile book).

Modern Science A and B for Second Year. F. T. Barrell. Jacaranda Press, Brisbane, Australia, 1965. 296 pp. Illus. Textbook for grade 9.

The Mysterious Senses of Animals. Vitus B. Dröscher. Translated from the German edition (Oldenburg, 1962) by Eveleen Huggard. Dutton, New York, 1965. 255 pp. Illus. $5.95.

National Advisory Committee on Research in the Geological Sciences. A report. Geological Survey of Canada, Ottawa, 1965. 199 pp. Paper, 50¢. The 14th annual report of the committee, giving a review of the period 1 September 1963 to 31 August 1964, subcommittee reports, research grants awarded in 1964 and 1965, and current research in the geological sciences in Canada 1963 and 1964.

Native Vegetation of Nebraska. J. E. Weaver. Univ. of Nebraska Press, Lincoln, 1965. 191 pp. Illus. $4.75.

The Nature and Art of Motion. Gyorgy Kepes, Ed. Braziller, New York, 1965. 207 pp. Illus. $12.50. The contributors are Gyorgy Kepes, Gerald Holton, James S. Ackerman, Gillo Dorfles, Hans Wallach, James J. Gibson, Stanley W. Hayter, George Rickey, Katharine Kuh, Karl Gerstner, Hans Richter, Robert Gessner, Gordon B. Washburn, and Donald Appleyard.

Orchids of the Western Great Lakes Region. Frederick W. Case, Jr. Cranbrook Inst. of Science, Bloomfield Hills, Mich., 1964. 159 pp. Illus. $7.

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