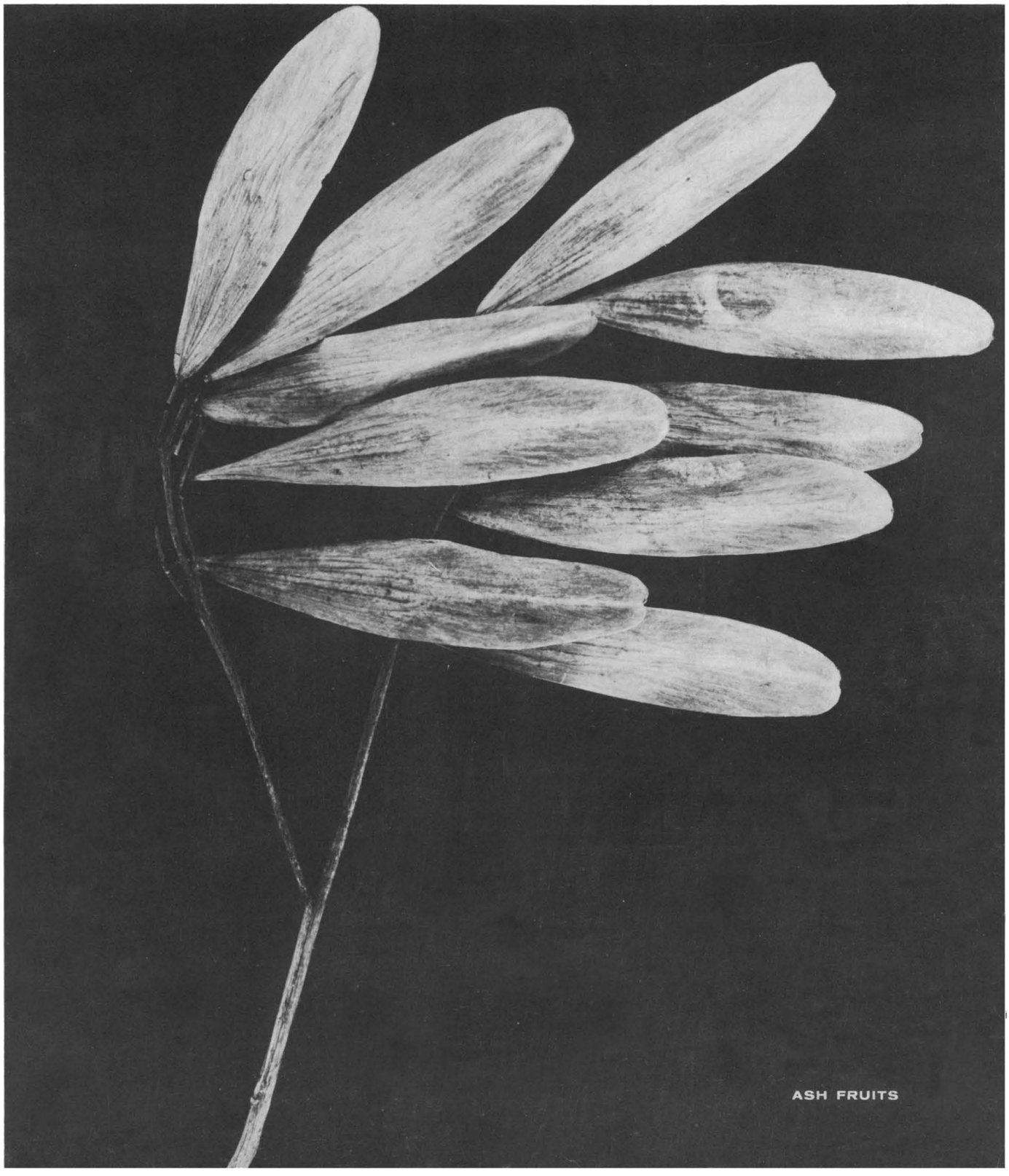
SCIENCE

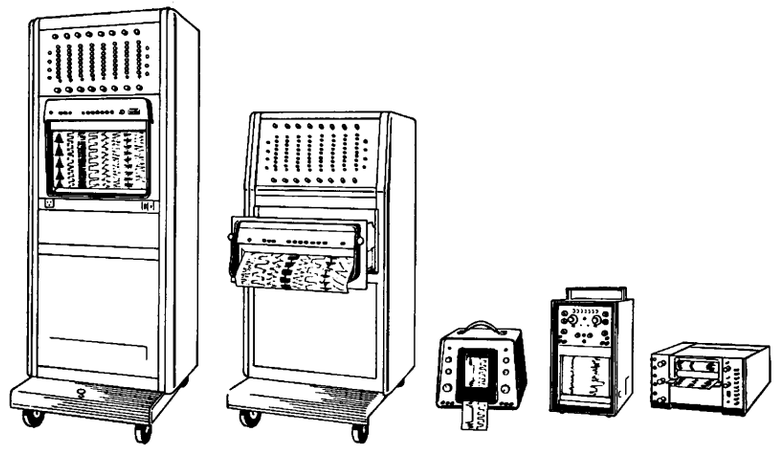
11 September 1964

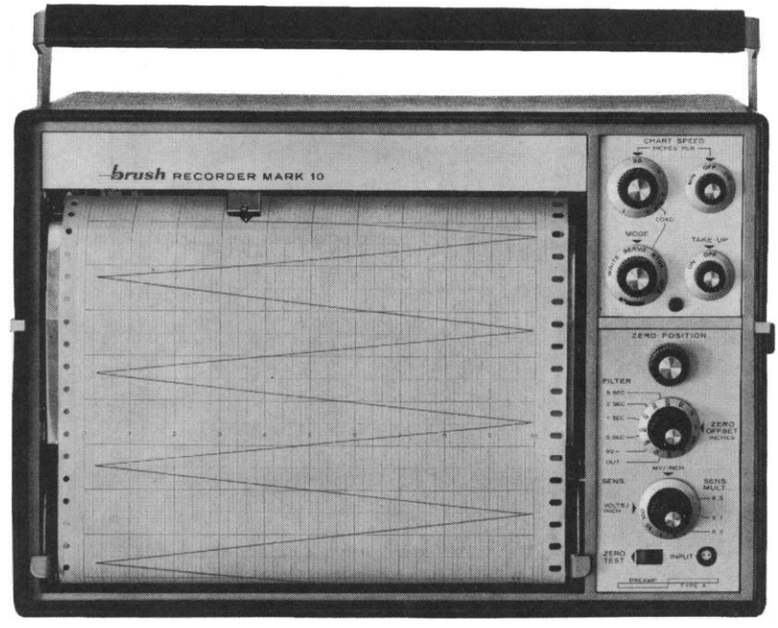
Vol. 145, No. 3637

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



ASH FRUITS





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A new strip chart recorder that's all solid state...even the ink!

A solid capsule *is* the ink supply in this new 10" servo-type recorder. Heated to flow freely from the pen . . . it dries instantly on contact with the paper. Modular electronic and mechanical assemblies simplify operation and maintenance. In addition, you have the complete flexibility of plug-in units. Check out these performance facts . . .

Full scale span of 5 mv to 200 volts in 15 steps
Zero positioned to within 0.1%
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10 chart speeds

Call Brush collect for complete details: 216-361-3315.

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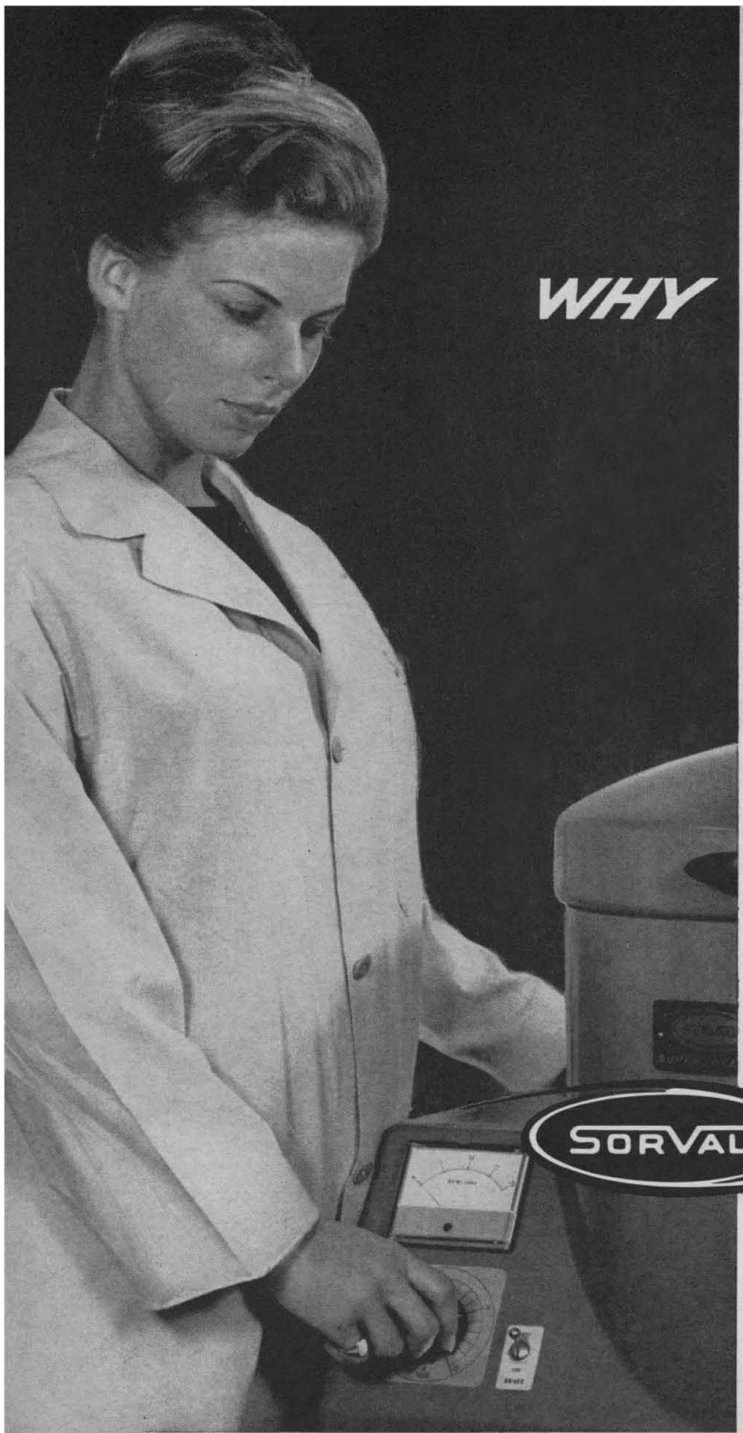
brush INSTRUMENTS
DIVISION OF CLEVITE 37TH AND PERKINS, CLEVELAND 14, OHIO



WHY SUPERSPEEDS?

You may ask why buy a superspeed centrifuge when perhaps many of your projects require only low speeds, say, about 3,500 RPM. *Reserve power* is one answer! Whereas the ordinary centrifuge feels the strain early when asked to perform continuously at 3,500 or 5,000 RPM, the SORVALL SS-3 and SS-4 are merely "loafing along" at such speeds. Think what this means in terms of instrument life. Reserve power is also a mighty handy thing for that special job where extra high G's are called for. With SORVALL, they're *there* when you *need* them. And, of course, with the SS-3 and SS-4 you get the added advantages of rotor versatility, Gyro-Action Self Centering Direct Drive*, reliable controls (automatic on the SS-3), and unique safety rotor-chamber guard and cover*. Why settle for just an ordinary centrifuge when the same amount of dollars will buy you a long-term investment? Interested? For further information ask us for illustrated literature number SC-9SS.

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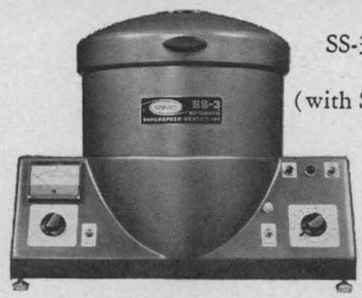

SS-3 Automatic Superspeed Centrifuge
Up to 17,000 RPM — 34,800 x G
(with SS-34 Rotor) Five Rotor versatility,
NEW Electronic RPM Stabilizer.

SS-4 Manual Superspeed Centrifuge
Up to 17,000 RPM — 34,800 x G
(with SS-34 Rotor)
Five Rotor versatility

Both the SS-3 and the SS-4 are adaptable to
"Szent-Gyorgyi & Blum" Tube-Type Continuous Flow Centrifugation

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Samaras of black ash (*Fraxinus nigra*). The fruits, each with a single pod at the proximal end, are admirably adapted to distribution by wind. In temperate North America and Eurasia the proportion of trees with wind-distributed seeds is considerably higher north of the glacial boundary than south of it. See review of *The Natural Geography of Plants*, page 1172.

U.S. Patent
No. 3,002,895

Overall dimensions: 40″ wide, 29″ deep, 65″ high;
chamber dimensions: 32½″ wide, 21″ deep, 26″ high

A 10½ CU. FT. "SHAKER ROOM" RIGHT IN YOUR OWN LABORATORY

Agitates, incubates, refrigerates, and illuminates static and shake cultures

THE PSYCROTHERM® is a controlled-environment incubator-shaker that provides a wide range of temperature and agitation for the growth of aerobic and anaerobic organisms. This versatile apparatus occupies little floor space, yet provides 10½ cubic feet of usable work space where static and shake cultures can be propagated under the same environmental conditions.

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Temperatures can be regulated from 0°C to 60°C with a control tolerance and gradient both within ±0.5°C. With integrated heating and refrigeration systems, the unit is ideal for work with psychrophilic, mesophilic, and thermophilic organisms.

Facilities are provided for circulation of gaseous atmospheres, and models are available with high-output illumination for photosynthetic studies.

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Models are equipped with Gyrotory® or reciprocating shakers, precision-built for smooth, quiet and reproducible agitation. Speeds are adjustable mechanically, and will not drift with changing workloads or normal voltage fluctuations.

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combines high resolution with simplicity of operation

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BIOLOGICAL B

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ultrahigh resolution on transmission specimens

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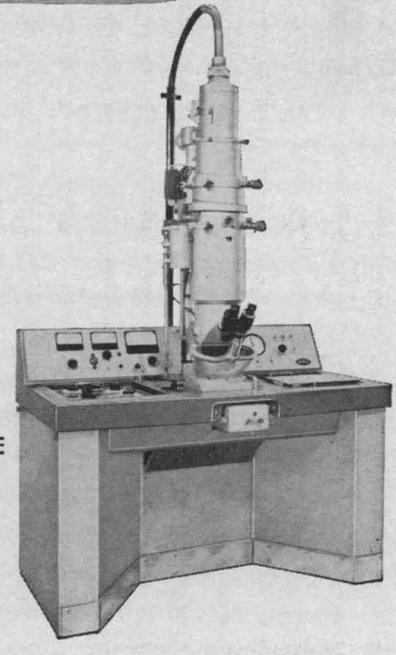
extremely simple control



the **EM6B** ELECTRON MICROSCOPE

product of Associated Electrical Industries of England

is marketed and serviced in the U.S.A. by

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more watts per dollar

Check the specs and the price ($145) and you will find: Sorensen's new QRB40-.75 "ranger" delivers 1½ times the watts per dollar of most competitive power supplies... with no stinting on performance.

CONSTANT CURRENT... Unit can be externally converted to a highly regulated (0.15%) constant current supply.

CURRENT LIMITING... Provides automatic protection against short circuit or overload. Also acts to provide automatic transfer from the normal constant voltage mode to a constant current mode whenever the load demands more current than the limiter has been set to supply.

RESOLUTION... Output can be finely adjusted to 4mv on the 40-volt model; 3mv on the 30-volt model; and 2mv on the 20-volt and 15-volt models.

OTHER QRB FEATURES include programmability, series/parallel operation, and remote sensing.

For complete data on the QRB series and other Sorensen products send for the new, 140-page "Controlled Power Catalog and Handbook." Write Sorensen, Richards Avenue, South Norwalk, Connecticut. Or use reader service card number **200**.

ELECTRICAL & MECHANICAL SPECIFICATIONS

MODEL NUMBER	OUTPUT VOLTAGE RANGE (VDC)	OUTPUT CURRENT (AMPS.)	% REG. (LINE & LOAD COMB.)	RMS RIPPLE	RESP. TIME (MICROSEC.)	TEMP. COEF. (%/°C.)	CABINET SIZE INCHES WIDTH	CABINET SIZE INCHES HEIGHT	CABINET SIZE INCHES DEPTH	RACK PANEL INCHES HEIGHT	WEIGHT (LBS.)
QRB15-2	0-15	0-2	±(0.01% + 1mv)	0.15mv	50	±0.015	8¼	5⅛	9	5¼	10.75
QRB20-1.5	0-20	0-1.5	±(0.01% + 1mv)	0.15mv	50	±0.015	8¼	5⅛	9	5¼	10.75
QRB30-1	0-30	0-1	±(0.01% + 1mv)	0.15mv	50	±0.015	8¼	5⅛	9	5¼	10.75
QRB40-.75	0-40	0-.75	±(0.01% + 1mv)	0.15mv	50	±0.015	8¼	5⅛	9	5¼	10.75

Sorensen

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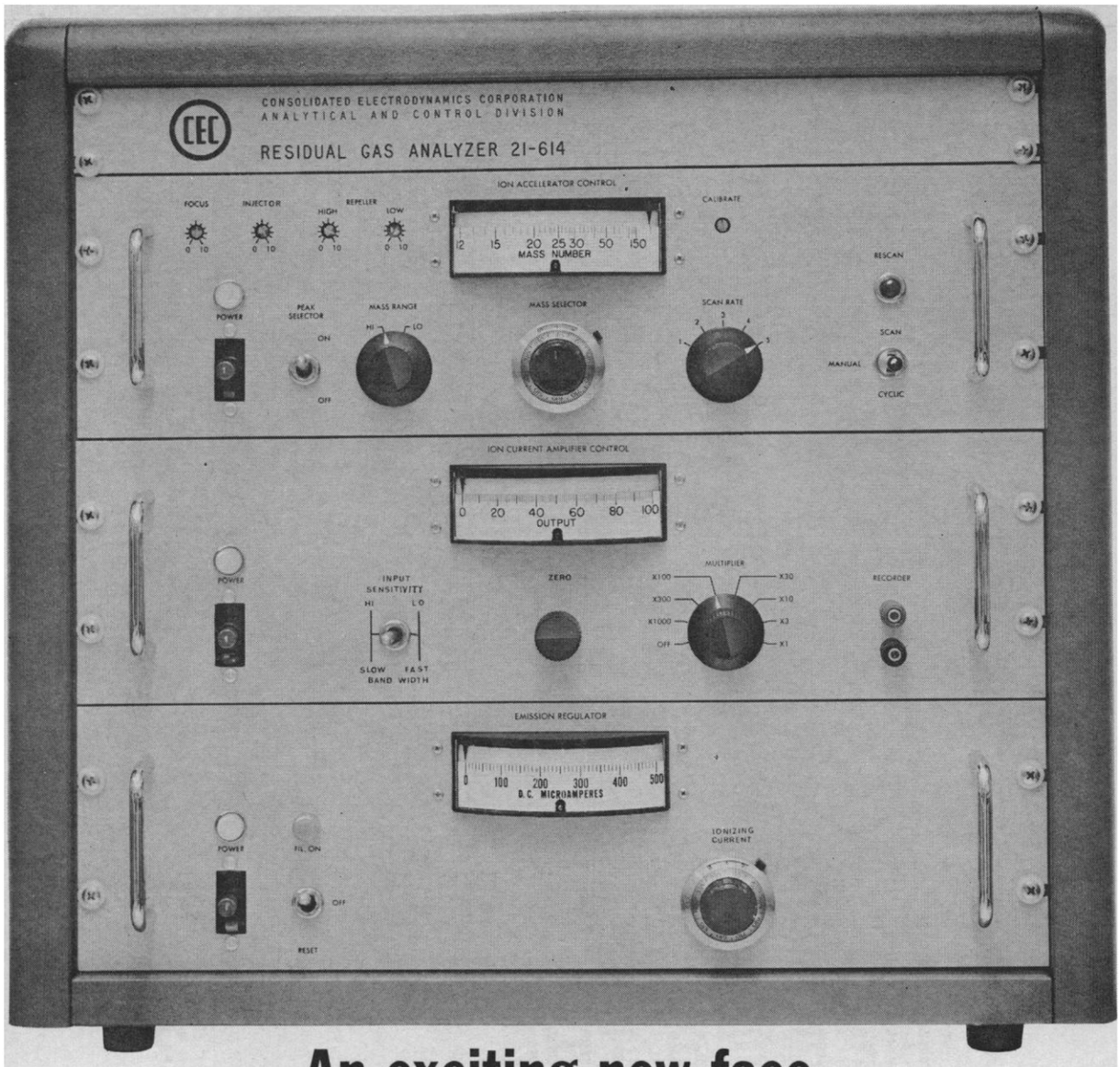


An exciting new face

CEC's new Residual Gas Analyzer

Much of what's exciting about CEC's new 21-614 Residual Gas Analyzer can be seen on its face.

A new *mass meter* reads in mass numbers — ends searching for reference peaks or computing mass numbers.

A new *scan rate selector switch* lets you switch to the best scanning speed for each analysis.

A new *input sensitivity switch* permits instant selection of high sensitivity/slow scan speed, or low sensitivity/high scan speed.

A new *rescan pushbutton* makes possible backtracking, and a *cyclic scan switch* lets you continuously scan back and forth across the top of a single peak.

In combination, these and the other panel components provide operating flexibility which accounts for much of the satisfaction assured by the new 21-614 Residual Gas Analyzer.

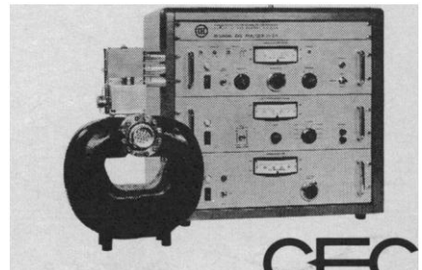
THERE's MORE TO THE STORY

This new RGA, like its predecessor, the 21-613, has a heated source that provides good reproducibility, and the highest analytical accuracy available.

The *perfect* focusing cycloidal analyzer lets the 21-614 operate over the greatest mass range (2 to 200 AMU) and at the highest unit resolution (150 AMU) of any residual gas analyzer.

And, the 21-614 has a full line of accessories, including a high-speed recording oscillograph and automatic peak selector. It uses any standard 0-10 mv strip chart recorder.

If this looks like the RGA you have been waiting for, get the full story. Call your nearby CEC Sales and Service Office or write for CEC Bulletin 21614-X4.



Analytical & Control Division CEC

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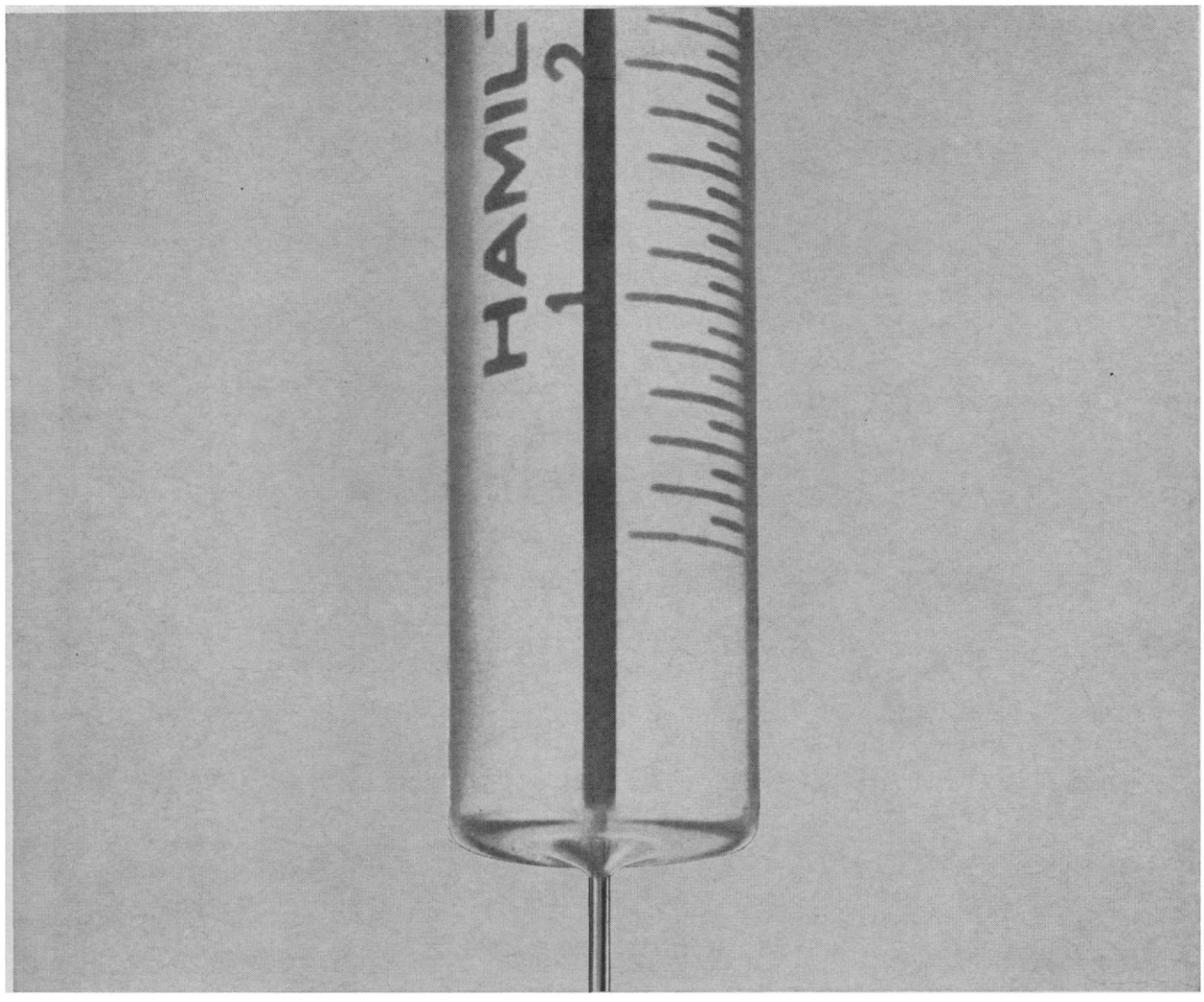
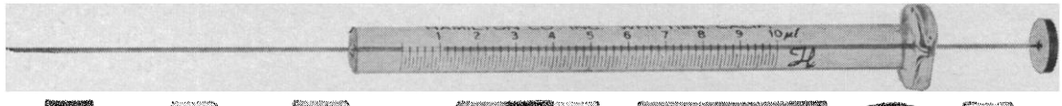


WHERE'S THE A-LUER?

The allure of a Hamilton "fixed needle" syringe is in the patient hand-crafting used to epoxy-cement the needle concentrically in the syringe bore and to snug it up to "zero" on the calibration. The lack of a luer on "fixed needle" syringes strengthens the union of stainless steel to glass, and reduces breakage. And it tests out leak-tight. Strong? You bet! It's strength you can count on every time you specify a "fixed needle" Hamilton Syringe.



HAMILTON

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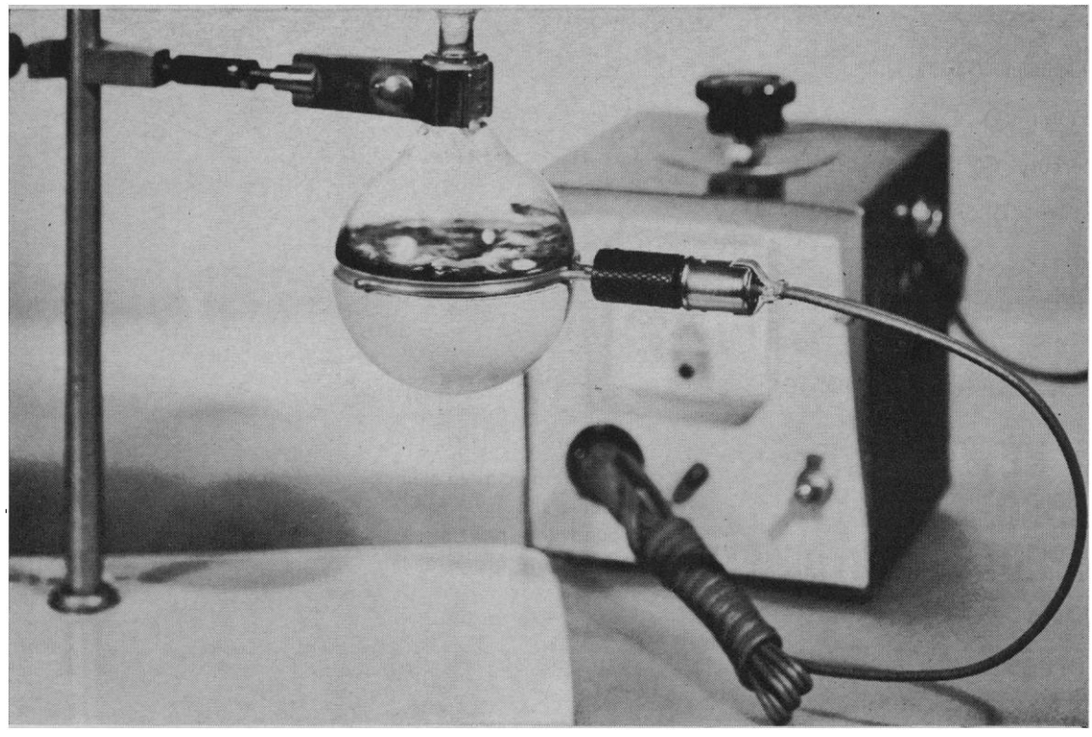
To: HAMILTON COMPANY • P.O. Box 307K • Whittier, California

Send me a catalog on your complete line of syringes and related equipment.

Name _____ Title _____

NEW FROM ACE



INSTATHERM*: An Integral Fused-to-Glass Heat Source

The Chemist's Tranquilizer - Saves Time, Effort, Maintenance!

If you get a little impatient waiting for the desired temperature, with the difficulty of holding it exactly where you need it; if inconsistency plus "bumping" prevent you from obtaining reproducible results, don't reach for a tranquilizer: Try INSTATHERM!

Instatherm, the result of more than ten years of experimentation with conductive films, employs an isothermal zone method of temperature regulation. Conductive and semi-conductive films are fused together and to the surface of the vessel to form integrated control circuits: infra-red energy absorbed by the glass is translated directly into useful heat. The apparatus responds almost instantaneously to control changes. Constant heat is more rapidly established, there is no bumping.

Instatherm's superior characteristics make sensitive reactions easier, reduce side reactions. For instance, a government chemist reports that he was able, for the first time, to duplicate results in the preparation of certain atropine derivatives. *Here is a resume of Instatherm's advantages:*

Rapid heating, equilibrium. High watt density is on the surface where it counts: reduces pre-heating time. For instance, 4ml of H^2O will boil in a 5 ml flask in 55 seconds; 70 ml in a 100 ml flask will boil in 3 minutes; 287 ml in a 400 ml beaker will boil in 13 minutes! Nearly instant response assures rapid equilibrium, saves time normally spent hunting for the right setting.

Smooth boiling. Prescribed heat distribution eliminates super-heating and "bumping". Spattering is reduced to a minimum on evaporating to dryness.

Low voltage. A maximum of 40V is employed with high amperage to minimize risk. Current is isolated from main power lines to prevent high voltages to ground. Most units provide adequate heat at 12 to 30 V.

Good regulation. Temperature can be held over long periods with generally imperceptible change.

Observation areas. Top to bottom clear strips and "windows" eliminate "blind" operation.

No hot mantle to detach at end of heating period. Flasks and beakers up to 250 ml may be supported by snap-on contact clamp which also makes convenient handle with or without power cord attached.

Operating economy. Direct surface heating, inwardly focused, gives up to 53% greater efficiency in power utilization. It literally more than pays for itself.

Long life expectancy. A resilient insulation coating also protects against mechanical shock, extends average glassware life, many times: tested by seven major laboratories in the United States, six of the seven experienced no breakage in three years of use. Spills do not ruin the heating element —usually evaporate or wipe off. Repair kits are available to reestablish electrical continuity and insulation in case of accidental burn-out.

Easy cleaning. Can be cleaned in standard washing machines or in situ. Coatings are resistant to all common organic solvents, and short time immersion in chromic acid cleaning solution. Internal surface is all glass.

Write for literature describing Instatherm flasks, beakers, funnels currently available.

*U.S. Pats. #2979594, #3050608, #3092704. Other pats. pending.

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Vineland, New Jersey

LOUISVILLE, Ky. SPRINGFIELD, MASS.

Aluminum ⊙ Antimony ⊙ Barium ⊙ Beryllium ⊙ Bismuth ⊙ Cadmium ⊙ Calcium ⊙ Cesium ⊙ Chromium
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Mercury ⊙ Molybdenum ⊙ Nickel ⊙ Palladium ⊙ Platinum ⊙ Potassium ⊙ Rhodium ⊙ Rubidium ⊙ Selenium
Silver ⊙ Sodium ⊙ Strontium ⊙ Tellurium ⊙ Titanium ⊙ Thallium ⊙ Tin ⊙ Vanadium ⊙ Zinc

performance-proved instruments for SPECTROSCOPY

A NEW ATOMIC ABSORPTION SPECTROPHOTOMETER FOR EASY ANALYSIS OF METALLIC TRACE ELEMENTS

To meet the need for an easy-to-operate atomic absorption spectrophotometer suited to general laboratory use in analyses of metallic trace elements, Perkin-Elmer presents the new Model 303. Designed around the principle of absorption by ground-state atoms of the resonance line of a lamp having a cathode of the metal being sought, the instrument is highly sensitive—detects concentrations ranging below one ppm for most metals. It is capable of producing, in less than 4 minutes, including set-up time, many analyses that take 2 to 3 *days* by wet chemistry.

Applications include determination of magnesium, calcium, potassium, sodium and trace metals in blood, urine and tissue samples; magnesium, zinc and lead content in ferrous, aluminum and copper alloys; trace metals in plants and animals; metal components in process streams; and changes in metals content of lubricating oils, as a check on engine performance.

For complete Model 303 specifications write to Instrument Division, Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Connecticut.

new automatic HEMAGGLUTINATION – HEMOLYTIC techniques

...introduce quantitation

with unique decantation principle that "puts a number" on end result. Traditional laborious hemagglutination-hemolytic techniques are so subjective that results may vary considerably from lab to lab. At best, answers are merely *qual*itative.

The AutoAnalyzer method not only standardizes and automates the procedure (in itself a considerable achievement), but it "puts a number" on the end result: expresses answers directly in *% agglutination or % hemolysis.*

The whole procedure is a simple, straightforward chemical method under precise control every step of the way...cell/anti-serum volume, reagent proportioning, mixing, time/temperature, etc. Equipment is rugged and simple, even down to the readout, which is colorimetric rather than cumbersome complicated electronic counting devices.

Beyond its use for routine blood typing and assay, the new method promises to open broad avenues of investigation in all fields where antigen-antibody reactions are measured by hemagglutination or hemolytic reactions.

TECHNICON® AutoAnalyzer®

TECHNICON INTERNATIONAL SYMPOSIA

PARIS
october 1, 2, 3

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october 5, 6

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october 9

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enlarged view of agglutinates being separated by decantation from the analytic stream. Reaction-produced agglutinated cells travel along with the stream: being heavier they drop to the bottom. On arriving at the "T" junction, the heavy agglutinates are drawn off: unreacted cells move on to hemolysis and colorimetry. Where hemolysis is to be measured the cells are decanted off and the hemolyzed material read out.

Technicon Bulletin H-1 gives details of the technique, with diagrams of instrumentation and flow, examples of the definite recording. Write us at the below address for a copy.

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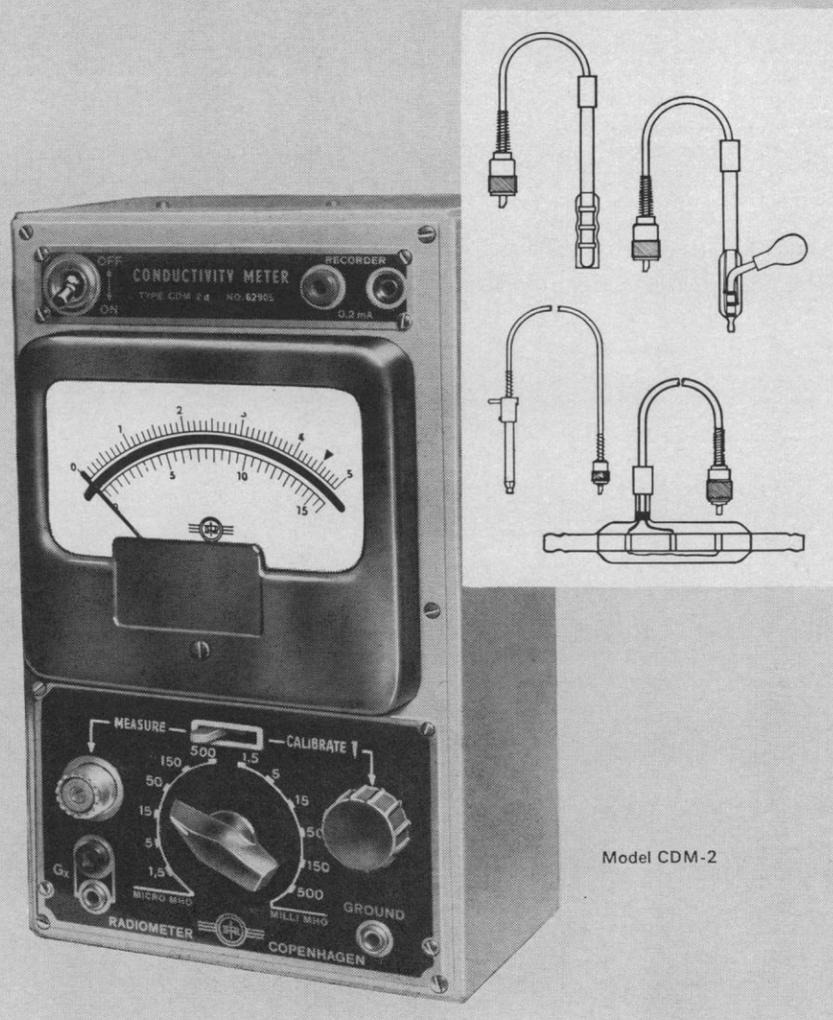
Its uniform heat minimizes chance of thermal strain to glass vessels. And it provides an effective shield in rare instances when vessels do collapse under high vacuum-high pressure conditions.

Glas-Col desiccator heating mantles have been used for years—safely, and with complete success.

CATALOG NUMBER	DESICCATOR FLANGE DIAMETER	WATTAGE	PRICE
M-200	160mm	330w-115v	$45.00
M-202	200mm	380w-115v	57.00
M-204	250mm	380w-115v	57.00

GLAS-COL®
HEATING MANTLES

Glas-Col Apparatus Company
Dept. SC, 711 Hulman Street, Terre Haute, Indiana
U.S. Patents 2,231,506; 2,739,220; 2,739,221; 2,282,078.



Model CDM-2

Direct reading CONDUCTIVITY METER *by RADIOMETER*

The Radiometer Model CDM-2 has been designed with laboratory requirements in mind. Without any sacrifice in accuracy it has been made more flexible and simpler to operate than the conventional conductivity bridge—and covers the *complete* range of conductivities.

Direct readings on 12 ranges are displayed instantly on a hand drawn illuminated mirror scale with an accuracy of better than ±1% on most ranges and ±2% at the extremes of conductivity.

A choice of conductivity cells makes CDM-2 ideal for all normal laboratory conductivity measurements as well as conductometric titrations. Available cells cover either immersion, flow, or pipette applications—all on grounded or ungrounded media.

Output terminals are provided for connection to recorders for continuous measurement, or to automatic titrators for automatic conductometric titrations.

Write for complete descriptive literature and prices.

RANGES: (12 complete full scale ranges)

0 - 1.5 - 5 - 15 - 50 - 150 - 500 micromhos.

0 - 1.5 - 5 - 15 - 50 - 150 - 500 millimhos.

THE LONDON COMPANY

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RADIOMETER COPENHAGEN

In Canada: Bach-Simpson Limited, Box 2484, London

COMPOUND	LOW SPECIFIC ACTIVITY		HIGH SPECIFIC ACTIVITY		PRICES Prepaid air shipment included			
	Order No.	Range mc/mM	Order No.	Range mc/mM	50 μc	0.1 mc	0.5 mc	1.0 mc
L-Alanine-C^{14} (U.L.)	CFB-7	5-10	CFB-62	75-110	$38	$ 70	$350	$680
L-Arginine-C^{14} monohydrochloride (U.L.)	CFB-8	5-10	CFB-63	150-220	48	87	400	800
L-Aspartic-C^{14} acid (U.L.)	CFB-9	5-10	CFB-64	100-150	38	68	340	670
L-Glutamic-C^{14} acid (U.L.)	CFB-10	5-10	CFB-65	125-180	40	68	340	670
Glycine-C^{14} (U.L.)	CFB-11	5-10	CFB-66	50-70	23	32	125	225
L-Leucine-C^{14} (U.L.)	CFB-13	5-10	CFB-67	150-220	55	95	460	880
L-*iso*Leucine-C^{14} (U.L.)	CFB-14	5-10	CFB-68	150-220	45	88	440	870
L-Lysine-C^{14} monohydrochloride (U.L.)	CFB-15	5-10	CFB-69	150-220	55	90	450	870
L-Phenylalanine-C^{14} (U.L.)	CFB-16	5-10	CFB-70	200-320	56	92	450	880
L-Proline-C^{14} (U.L.)	CFB-17	5-10	CFB-71	125-180	55	105	525	990
L-Serine-C^{14} (U.L.)	CFB-18	5-10	CFB-72	75-110	55	92	450	870
L-Threonine-C^{14} (U.L.)	CFB-19	5-10	CFB-73	100-150	48	88	440	870
L-Tyrosine-C^{14} hydrochloride (U.L.)	CFB-20	5-10	CFB-74	200-320	58	105	518	940
L-Valine-C^{14} (U.L.)	CFB-21	5-10	CFB-75	125-180	48	88	440	880

HIGH PURITY AVAILABLE FROM STOCK: UNIFORMLY LABELLED CARBON-14 L-AMINO ACIDS

Immediate shipment of high specific activity—Advances in production techniques now permit immediate delivery from stock of uniformly labelled carbon-14 L-amino acids at high specific activities. The table above lists fourteen amino acids and provides separate order numbers for those having high and low specific activities.

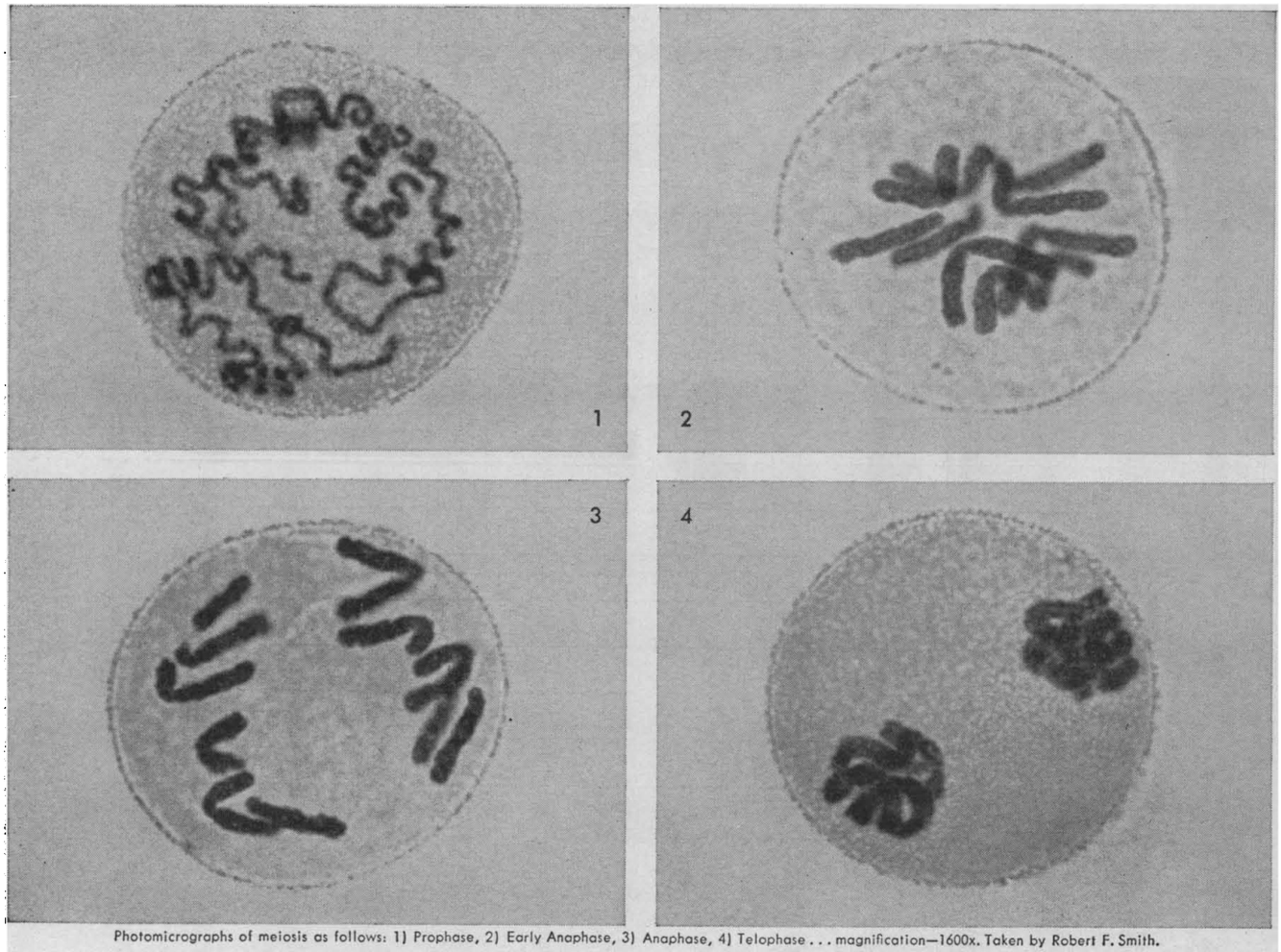
Purity verified and documented—Each of the uniformly labelled carbon-14 amino acids listed is purified by paper and ion-exchange chromatography and finally by crystallization. Radiochemical purities are checked by dilution analysis, paper chromatography (usually in two solvent systems), and by paper electrophoresis at two different pH levels. A data sheet showing the results of these analyses and copies of actual scans are provided with each shipment.

Packaged for greatest radiation stability—Those amino acids having low specific activity are supplied as freeze-dried solids. Higher range materials have been distributed in 0.01N HCl, and this practice is being continued where we are satisfied that it gives a reasonable shelf-life for our customers—at least six months with not more than 2% decomposition. For some of these amino acids, however, decomposition was found to be excessive. These are now being supplied on Whatman No. 3 paper in evacuated, sealed ampoules. The laboratory is always investigating methods for improving radiation stability and, therefore, the exact method used may change as further experience is gained.

Send for catalog—A complete catalog of nearly 400 carbon-14 labelled compounds is available on request. The Radiochemical Division of Nuclear-Chicago will also prepare carbon compounds on special order. For complete information, call us collect at 312 827-4456. NUC:G-4-235

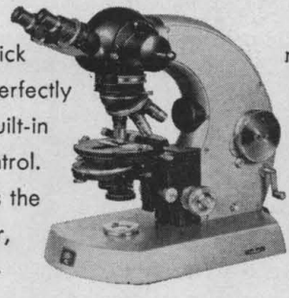
NUCLEAR-CHICAGO

A DIVISION OF NUCLEAR-CHICAGO CORPORATION
349 Howard, Des Plaines, Illinois 60018



Photomicrographs of meiosis as follows: 1) Prophase, 2) Early Anaphase, 3) Anaphase, 4) Telophase . . . magnification—1600x. Taken by Robert F. Smith.

Make a sequence like this by touching a button



With the Carl Zeiss Photomicroscope you can click off a whole series of photomicrographs, each perfectly exposed and in focus. The microscope has a built-in automatic camera with photoelectric exposure control. The touch of a button opens the shutter, exposes the film the proper length of time, closes the shutter, transports the film one frame, actuates a film counter . . . ready for the next exposure. You can take an entire series of photomicrographs rapidly in color or black-and-white.

This large universal microscope provides the full versatility of a fine Zeiss instrument. It can be equipped for transmitted or reflected light (Epi-illumination). It is also available as a polarizing microscope.

The inclined binocular is provided with an adjustment to maintain tube length regardless of interpupillary setting. Interchangeable stages and interchangeable condensers, for bright field, dark field and phase contrast work, are also available.

A 6-volt light source is built in, but a 12-volt light source is available as well as a base plate for carbon arc or high-pressure mercury burner illumination. Write Dept. SC for further details and literature on the Carl Zeiss Photomicroscope. **Complete service facilities available.**

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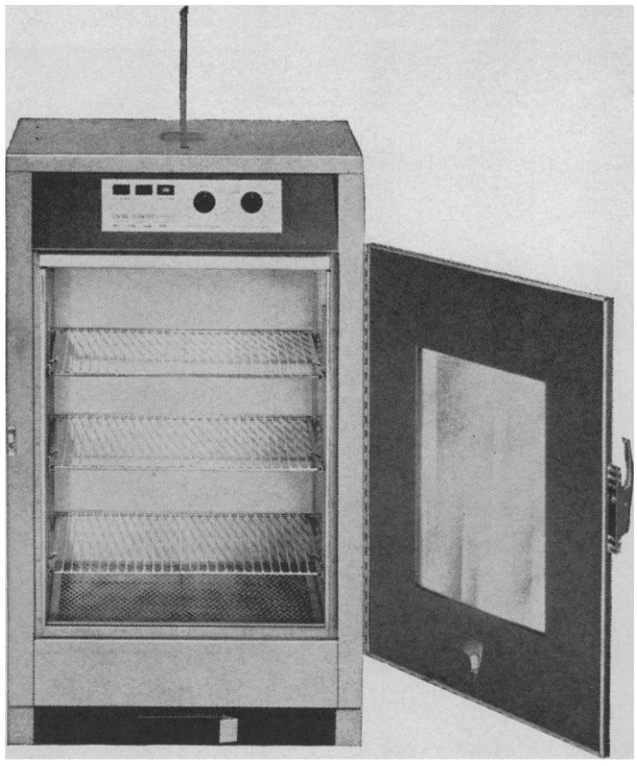
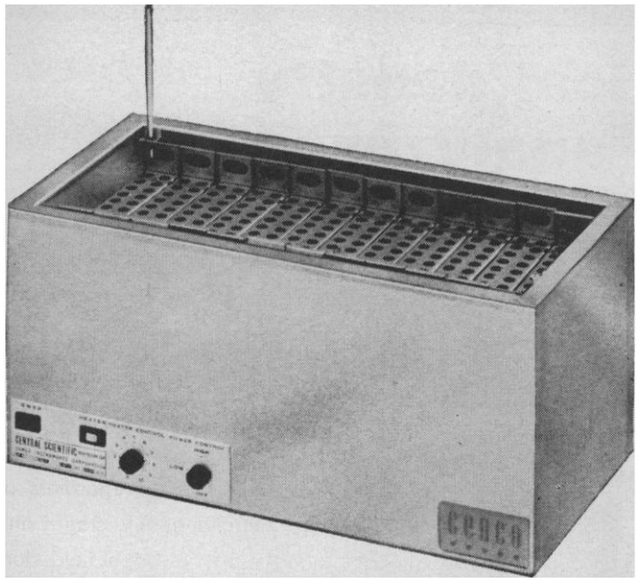


Floor Model Incubator. Cenco Catalog No. 46029-16.



Seriological and Utility Water Bath. Cenco Catalog No. 97014-16.

INCUBATORS

With 18 different models—forced draft or gravity convection, single wall or double wall, floor-standing, cylindrical, and low-temperature—Cenco has the incubator that meets your requirements.

The floor model incubators offer this unique combination of features:

High capacity . . . Forced draft circulation for uniform heat distribution no matter what the load . . . Unique control system —hydraulic thermostat and proportional power device ensure constant temperature and safety of sample contents . . . Sheathed Incoloy heaters—protected against spillage . . . Double-wall construction . . . Stainless steel interior . . . Adjustable shelves—48 positions on ½-in. centers.

Plus extra convenience features including interior light, glass viewing panel, eye-level control panel, and record card holder.

CHOOSE THE INCUBATOR OR WATER BATH THAT'S RIGHT FOR YOUR REQUIREMENTS— AND GET IMMEDIATE DELIVERY FROM CENCO

WATER BATHS

Cenco's expanded line of water baths includes a new series of three utility-medical baths capable of a wide variety of applications for medical and general testing, industrial quality control, and petroleum and chemical testing. Three sizes are offered, each with the following features:

Stainless steel construction, inside and outside . . . Sensitive temperature control with hydraulic thermostat and fast-response immersion heaters. Temperature range up to 100°C . . . Adjustable working depth—diffuser plate can be set at 5 or 7 inches.

All sizes of these new utility-medical baths can be equipped with a wide range of accessories such as test tube racks, gable covers, concentric ring covers, and water level regulators.

Cenco also has many other special-purpose constant-temperature baths available for immediate delivery. CEN-4-220

All of the equipment listed in this new *Constant Temperature Equipment* catalog is available *directly* from Central Scientific Company. Use the coupon to order your copy.

In Canada mail coupon to:
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CENCO: YOUR CONVENIENT SINGLE SOURCE FOR LABORATORY INSTRUMENTATION AND SUPPLIES

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I'd like to know more about Cenco's line of incubators and water baths. Please send the new CONSTANT TEMPERATURE EQUIPMENT catalog.

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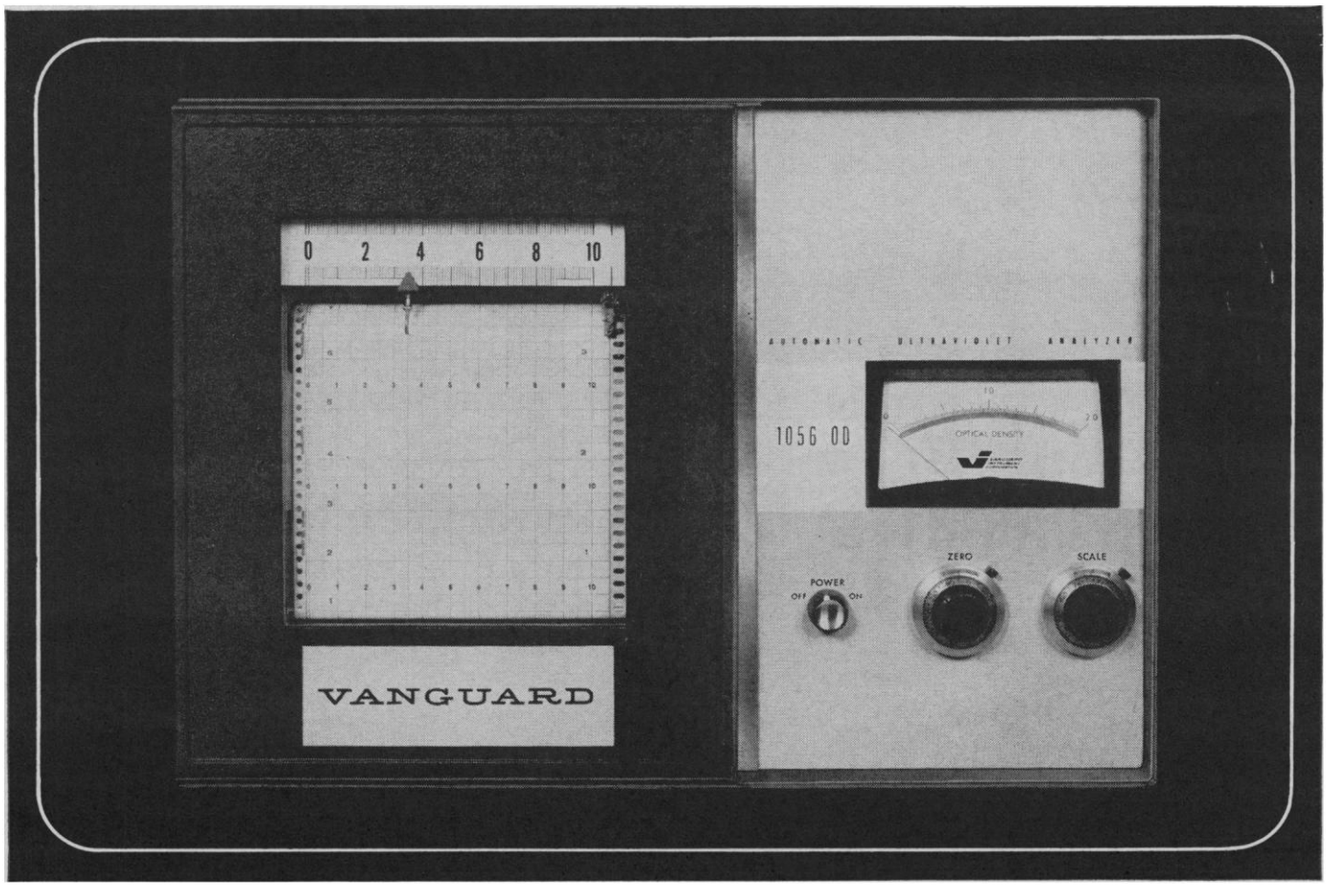
COMPANY OR INSTITUTION

STREET

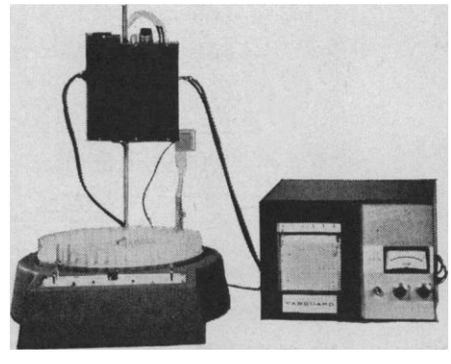
CITY STATE ZIP CODE



new automatic optical density ultra-violet analyzer

Vanguard Model 1056-OD Automatic Ultra-Violet Analyzer provides the investigator with unequaled reliability and versatility. Through the use of two independent logarithmic converters, this instrument provides a chart recording of the optical density of the effluent from a chromatographic column—the ordinate of which is linear with optical density. In addition, a plain diffraction grating monochromator enables the operator to select any wave length from 200 millimicrons into the visible spectrum.

■ Dual beam operation utilizing sample and reference cuvettes provides continuous base line compensation for gradient elutions or other applications where the optical density of the eluent may change ■ Automatic chart recorder marking system speeds location and identification of test tubes containing ultra-violet absorbing fractions ■ Completely transistorized for dependable, maintenance-free operation ■ Detection system completely self-contained and light-shielded.



For complete specifications on the Model 1056-OD Automatic Ultra-Violet Analyzer, send for new informative literature. For immediate information and/or a quotation, call your nearest Vanguard office.

Model 1056-OD Automatic Ultra-Violet Analyzer shown with Model 1000 Fraction Collector. Model 1056-OD is compatible with all Fraction Collectors.

VANGUARD INSTRUMENT CORPORATION

Designers and Manufacturers of Precision Instrumentation for Research • P. O. Box 244, LaGrange, Illinois 60526, FL 2-1600

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Sephadex® Beads

EXTEND THE USEFULNESS OF GEL FILTRATION IN ANALYTICAL AND PREPARATIVE OPERATIONS

Effluent delivery rates increased full order of magnitude

Improvements in the production of SEPHADEX now permit this useful cross-linked dextran material to be supplied in the form of spherical beads. Substitution of the new beads for the irregularly shaped particles in which SEPHADEX was heretofore available (see Figure I) results in far more uniform hydrodynamic conditions within SEPHADEX columns. Tangible results? *Flow rates are greatly improved with remaining good resolution.*

The introduction of the new beads greatly extends the possibilities to use SEPHADEX gel filtration in production-scale preparative operations. We strongly suggest that laboratory workers acquaint their colleagues in semiworks and production engineering with the new beads of SEPHADEX. The use of the spherical particles could open entirely new avenues in unit operations.

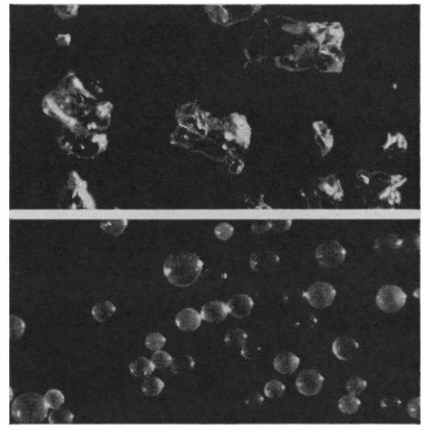

Figure 1. SEPHADEX was formerly supplied in the form of irregularly shaped particles as shown in top photograph. Now available in spherical beads as shown below, SEPHADEX facilitates packing of columns and greatly increases speed of operations.

SEPHADEX LABORATORY COLUMN

A chromatographic column, designed by Pharmacia, especially for gel filtration with SEPHADEX, is available and is described in a separate leaflet. Please ask for information.

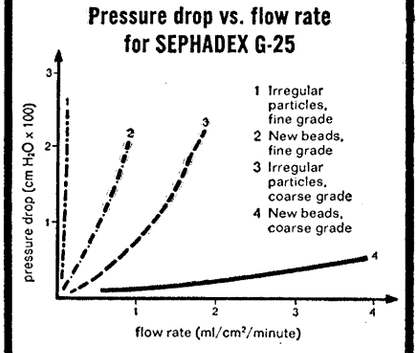

Figure 2. The curves above depict pressure-drop/flow-rate functions for columns using a 50 cm bed of SEPHADEX G-25. For given hydrostatic heads, note that the new spherical beads give up to tenfold greater effluent deliveries. Analytical procedures are hastened and preparative operations are put within economically practical engineering ranges.

Available forms of new SEPHADEX beads

SEPHADEX Type	Exclusion Limit (MW)	Grade	Size (microns)	Bed Volume ml/g
G-25	5,000	coarse fine	100-300 20-80	5
G-50	10,000	coarse fine	100-300 20-80	10
G-75	50,000	one grade	40-120	12-15
G-100	100,000	one grade	40-120	15-20
G-200	200,000	one grade	40-120	30-40

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LEADING IN DEXTRAN CHEMISTRY

For full information on the use of SEPHADEX in gel filtration, send the coupon with your letterhead.

(Inquiries outside North America should be directed to AB PHARMACIA, Uppsala, Sweden.)

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☐ "SEPHADEX": A Unique Substance for Modern Chromatography

☐ "SEPHADEX in Gel Filtration": Theory and Experimental Technique

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Company _____

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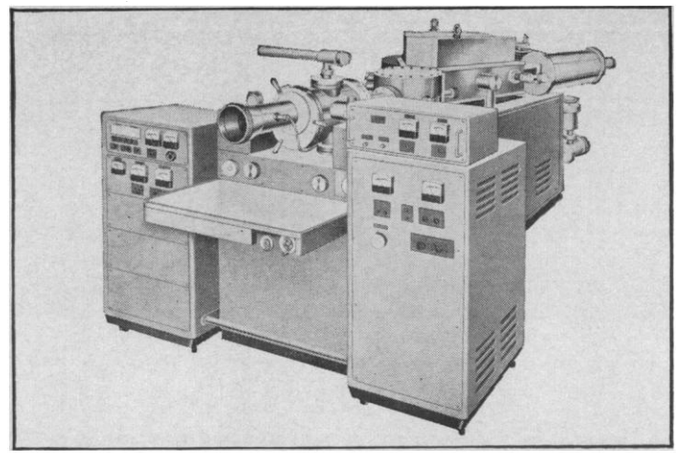
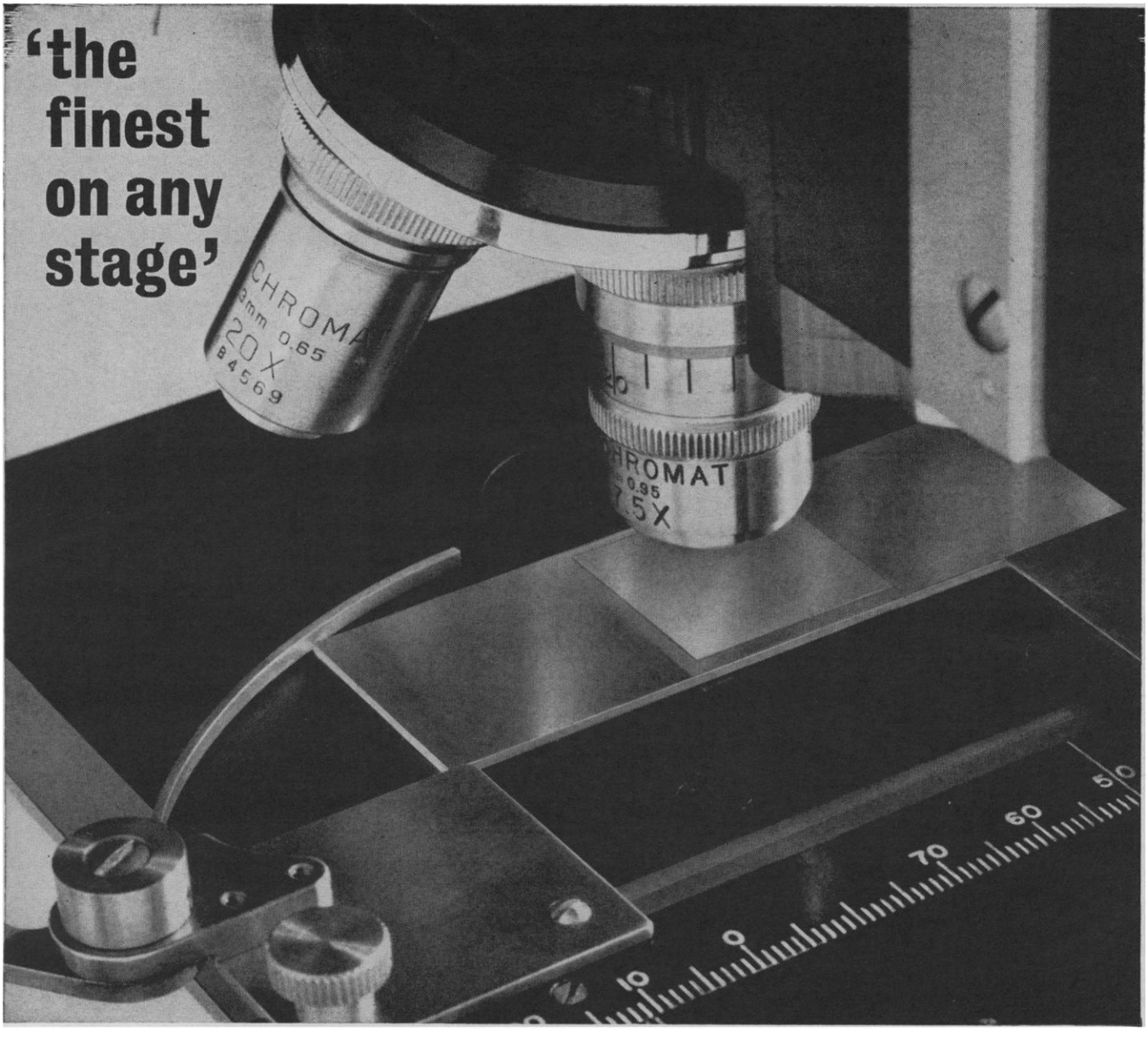


mass

High Resolution (M/ Δ M)
Spark Ion Source — 5,000
Electron Bombardment Ion Source — 20,000

The JEOL (Japan Electron Optics Laboratory Co.) Double Focusing Mass Spectrometer, JMS-01U is an unconventional Mattauch type instrument. It features, in one instrument, the use of either or both types of ion sources — spark and electron bombardment, and either or both detection methods — photographic and electrical. This flexibility allows high resolution analysis of metals and semiconductor impurities and high molecular weight organic structures. The basic analyzer tube is very easily adjustable through a unique mechanism for ion beam focusing and intensity control to attain exceptionally high resolution, sensitivity and reproducibility. Direct sample inlet and reservoir type heated inlet systems are optionally available as well as a peak matching device and emission outlet. Specially designed and convenient front panel controls assure simple operation. JEOLCO (U.S.A.), Inc. has established a fully staffed servicing network in the United States to provide technical assistance and assure continuous trouble-free service. For complete technical and sales information please call or write JEOLCO (U.S.A.), Inc., 461 Riverside Avenue, Medford, Massachusetts 02155, telephone 396-6241, area code 617.

JEOLCO



GOLD SEAL® SLIDES and COVER GLASSES

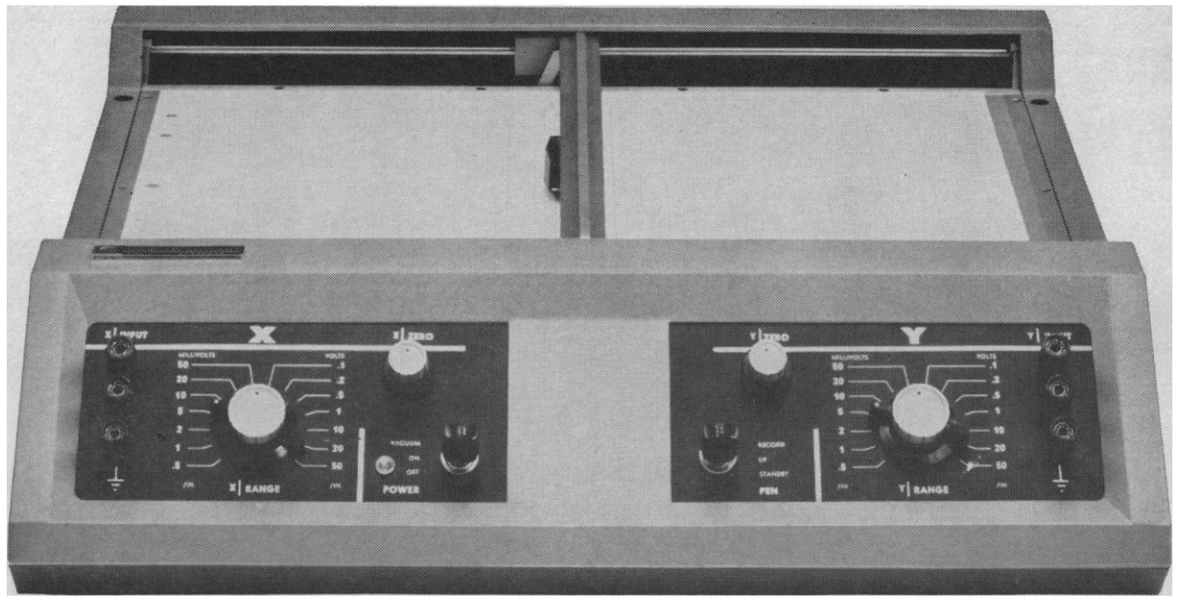
Microslides and cover glasses bearing the familiar "Gold Seal" label have set standards of quality for many years. They are as perfect as painstaking manufacturing processes can make them. And as a final safeguard, they are individually inspected before being packaged.

"Gold Seal" microslides are made of flawless, colorless, non-corrosive glass. Each slide is of uniform thickness, length, and width and has ground, polished edges. Each is precleaned and ready for use. A special-edged Stand-Rite dispenser box, used to pack all "Gold Seal" microslides, keeps slides upright, permits finger-tip removal without smearing or fingerprinting.

"Gold Seal" cover glasses are of equal excellence. Carefully selected and guaranteed perfect, they are made of rigidly specified, non-corrosive, nonfogging glass of uniform thinness. Available in every convenient size and thinness, "Gold Seal" cover glasses are dispensed clean from lint-free plastic boxes holding one ounce of glass.

Your dealer carries "Gold Seal" microslides and cover glasses and a large selection of microslide boxes, cabinets, and other accessories. Illustrations and full details of all items may be found in the Clay-Adams catalog No. 107 If you do not have a copy, write today on your institutional letterhead to:

Clay-Adams
New York 10, N. Y.



ANOTHER NEW X-Y RECORDER FROM VARIAN?

Yes and no. The new F-81 is the same high quality recorder as our recently introduced F-80. It is also the most accurate, fully-equipped X-Y you can buy for under $1900. Here's a basic instrument that comes with all the features you need to do the job. It has a unique vacuum hold down for the chart, electric pen lift, and solid-state ruggedness throughout. You can use any size or shape of paper from 2" x 2" to 11" x 17", without masking. And you can position the chart with the vacuum on. □ Human engineering on the F-81 gives you new operating convenience. Simple control panel, easy-to-service magnetic pen holders and field-convertible bench top or rack mounting make it easy for you to build this X-Y recorder into test consoles, control panels, and analytical instruments.

IMPORTANT FEATURES OF THE NEW F-81:

- accuracy 0.2%
- 17"/sec pen speed
- 14 DC voltage ranges, 0.5 mv/in to 50 v/in
- vernier adjustment between ranges
- full scale zero plus 100% suppression
- exceptionally high input impedance
- zener diode reference
- independent servo-operated X and Y axes
- weight, 29 pounds
- F-81 price $1875

What's the difference between the F-80 and the F-81? The F-80 has an automatic-cycling time base and sells for $2025. □ For further information or a demonstration write Recorder Division. In Europe contact Varian A.G., Zug, Switzerland.

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LASERS!

Gas — Solid State — Semiconductor

Write or call for your free copy of Raytheon's new laser condensed catalog.

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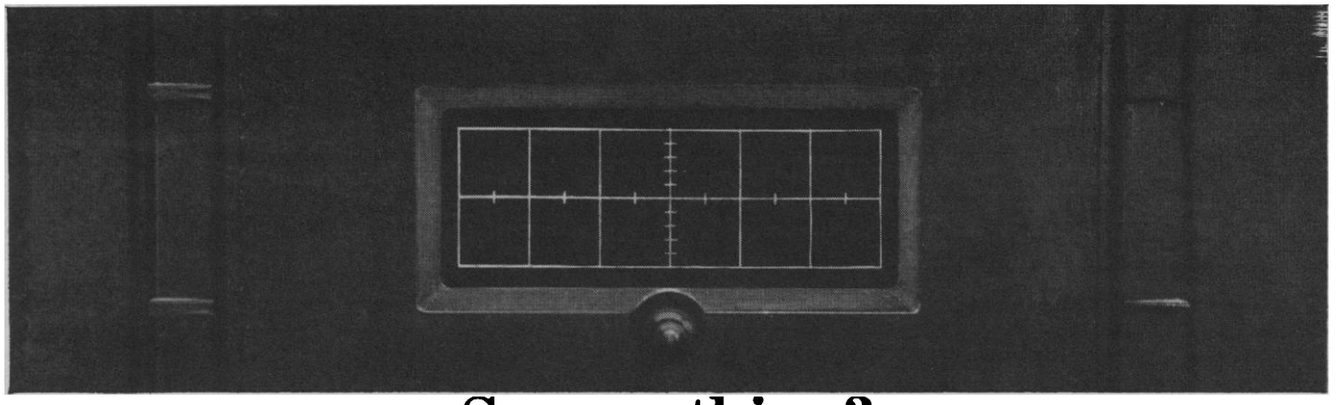
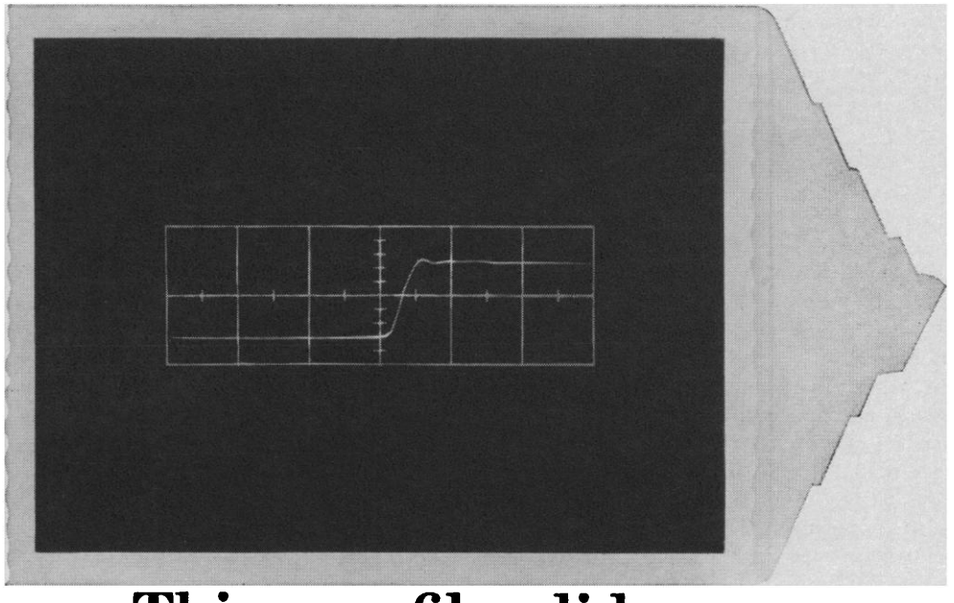


See anything?



This new film did.

This new film saw something the eye couldn't: the rise time of a single pulse on a Tektronix 519 scope at a sweep rate of 2 nanoseconds/cm. The new film, Polaroid PolaScope Land Film, actually extends the usefulness of existing oscilloscopes by supplying "brightness" that the scope hasn't got!

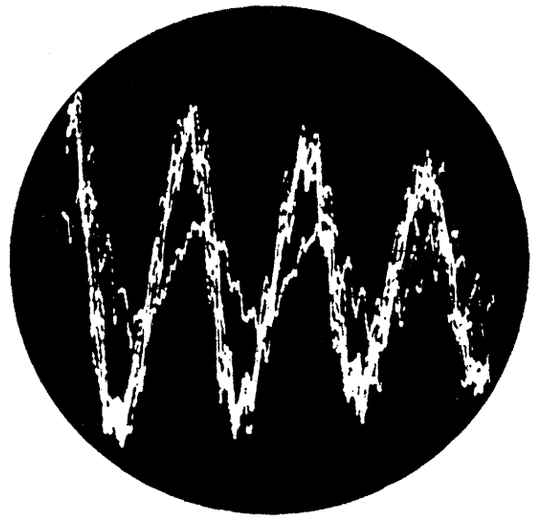
The reason is that this PolaScope film has an ASA equivalent rating of 10,000, which means it can see things your eye cannot. It has about twice the writing rate of the Polaroid 3000-speed film, currently the standard for high speed oscilloscope photography. (No other commercially available films come anywhere near the speed of PolaScope film.) And because it's made by Polaroid you get a finished usable print – see above – ten seconds after exposure.

PolaScope film will also give you better shots of slower pulses and stationary waveforms. So little light is required, camera aperture and scope intensity can be reduced considerably, and that's how to get really sharp oscilloscope pictures.

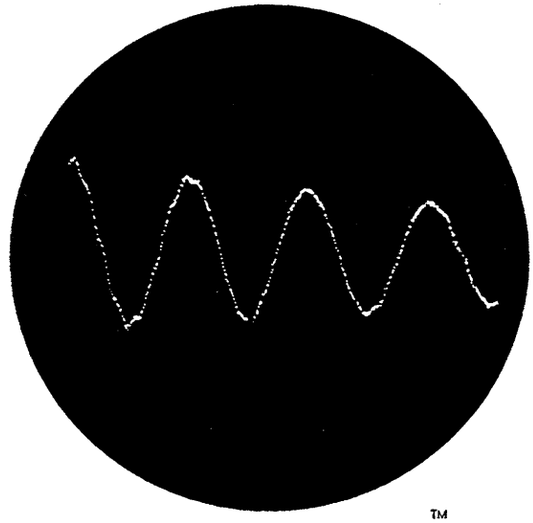
And wherever else light is at a premium – such as photomicrography and Kerr Cell photography – PolaScope film will make new applications possible, old applications more useful.

PolaScope Type 410 Film is packed 12 rolls to the carton. The price is actually lower than the Polaroid 3000-speed film. For the name of the industrial photographic dealer nearest you, write to Technical Sales Department, Polaroid Corporation, Cambridge 39, Massachusetts. POLAROID®

New Polaroid Land 10,000-speed film for oscillography

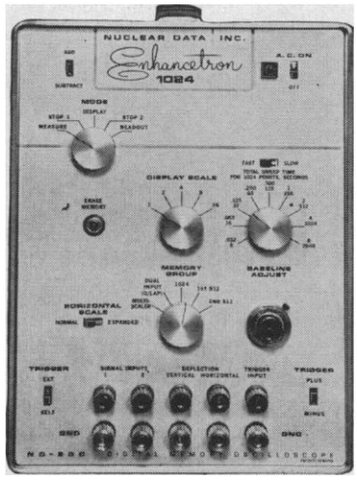


THAT'S NOISE...



THAT'S ENHANCETRON!™

New major instrument extracts signals from noise!



What's Enhancetron? What does it do? Enhancetron 1024 extracts the signal of interest from non-filterable noise. It's a portable signal-averaging digital computer that enhances signal-to-noise ratios. It's a new electronic measurement tool that finds immediate application in astronomy, bio-medicine, physics, electrophysiology, NMR, EPR, mass spectometry, and other fields.

The illustration shows how Enhancetron works. Signals obscured by noise are digitized at 1024 time intervals, and the results are recorded as 1024 numbers in a magnetic core memory. Subsequent sweeps are added numerically. The repetitive signal of interest adds in direct proportion to the number of samples taken; noise adds in proportion to the square root of the number of samples taken. The signal of interest literally "grows" out of the noise, as you can see, and is displayed on an external oscilloscope.

The list of electronic features is impressive. Ask your Nuclear Data salesman for a demonstration of ND-800— Enhancetron 1024— or write for details and specifications on this remarkable new solution to your noise problems.

(As you'd expect, it's from Nuclear Data)

Nuclear Data, Inc.

P.O. Box 451, 100 W. Golf Rd.. Palatine, Illinois 60067

11 September 1964, Volume 145, Number 3637

SCIENCE

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The Social Sciences and Society

Hard-nosed social scientists strive to avoid problems of policy and to concentrate on process. When they deal with value preferences at all, it is to measure their incidence, distribution, and intensity in a given population. Matters of this kind can be treated objectively, quantitatively, and scientifically, and the social scientist thus can avoid the fact-value syndrome that plagues his more traditionally oriented colleagues.

Unfortunately this value-free posture tends to blind the so-called hard-nosed social scientist to the really great problems of man and society and often focuses his attention upon relatively unimportant issues. It helps to explain the monumental accumulation of trivia and the ponderous elaboration of platitudes that characterize so much contemporary social science. And it tends to make social science a more or less sophisticated servant of any power elite that may seek its services in the manipulation of human behavior, regardless of goal or purpose.

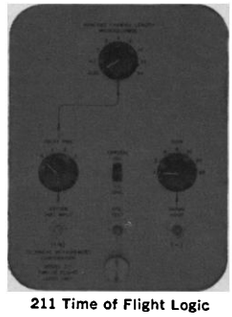
A value-free science is of course absurd in any strict sense since science has its own norms, standards, or values, by which its statements are tested and/or evaluated. Nor is it enough to say that scientific values are merely methodological or procedural, concerned with means and not ends, except only as they aid in the objective pursuit of truth. For truth wears many faces, and to discover what is true or false is not unrelated to the discovery of what is good or bad. A scientific concept can be true or false in the degree to which it corresponds to the norms or standards of science itself—i.e., to meter readings—and it may be good or bad in the degree that it contributes to, or corresponds with, the basic needs and goals of human life. Unless science is merely random behavior or idle curiosity without purpose, it has a responsibility to discover and to serve these basic needs and goals.

This lays a special obligation on the social sciences because they are by definition concerned with man and society. So-called behavioral science, whether hard-nosed or soft-nosed, assumes that human behavior is goal-directed, and that in striving for these goals, men choose among alternative modes of conduct. It assumes also that in choosing, they are conditioned not merely by the physical world and the pressures of appetite and instinct but by formal education in rational modes of thought and behavior. Rationally induced changes in human behavior thus become as reasonable—as scientific—as rationally induced changes in the physical environment. There is nothing unscientific in social scientists' seeking to change those conditions of character and environment that impair man's ability to make rational choices among alternative modes of behavior.

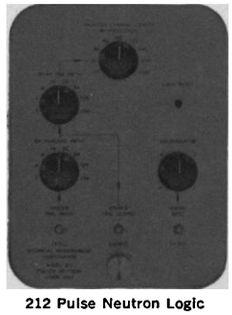
Not less important is the task of social scientists, by precept and example, to encourage in everyone they can reach a conscious and continuous reflection on the human condition and on alternative roads to the basic goals for which all men strive. Scientists are not immune from the responsibilities of other citizens. They need to be reminded that attitudes of Olympian indifference or cynicism toward moral and ethical problems in a society that has all but canonized the scientist can issue in apathy and cynicism among others, attitudes dangerous alike to science and a good society.—PETER H. ODEGARD

[Excerpted from *The Educational Record* **45**, 190 (1964)]

210B Pulse Height Logic



211 Time of Flight Logic



212 Pulse Neutron Logic

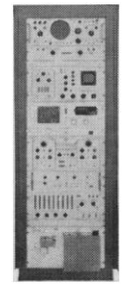
213 Pulse Height Logic

1024-CHANNEL QUICK-CHANGE ARTIST

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.

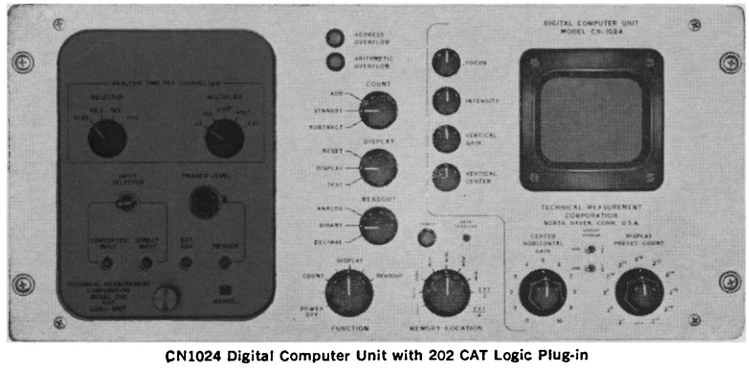


Important analyzer features:

- 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

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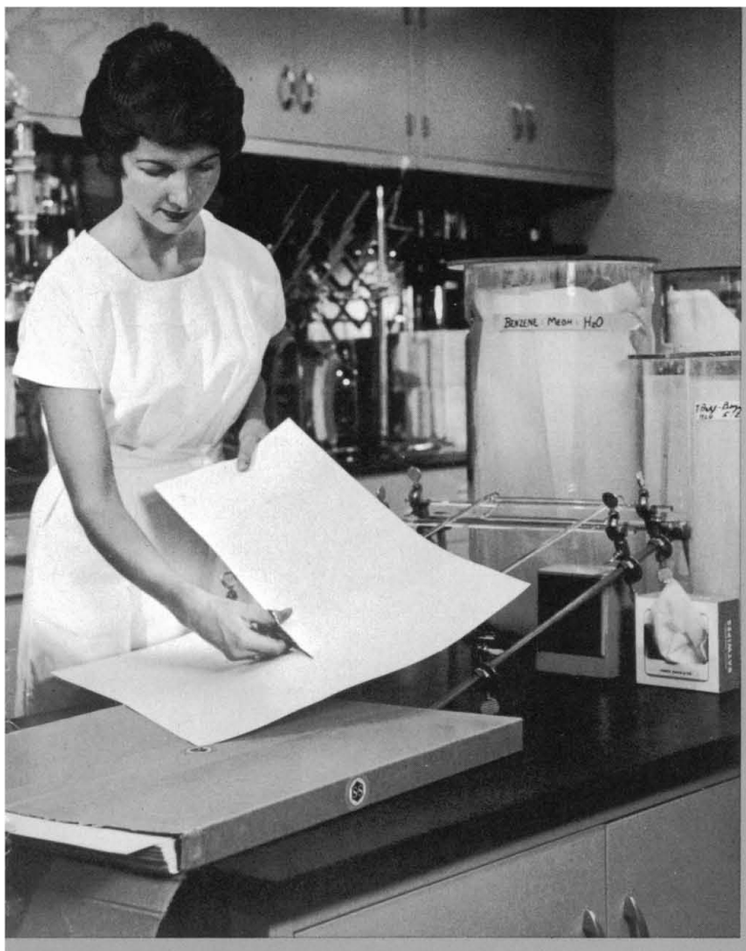

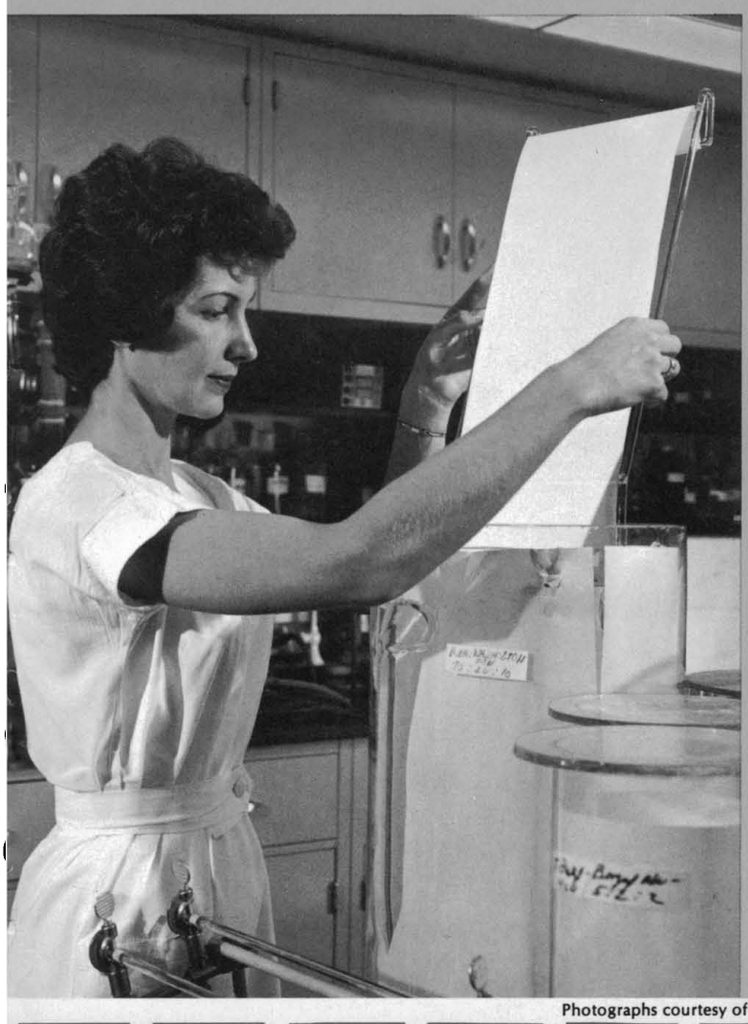

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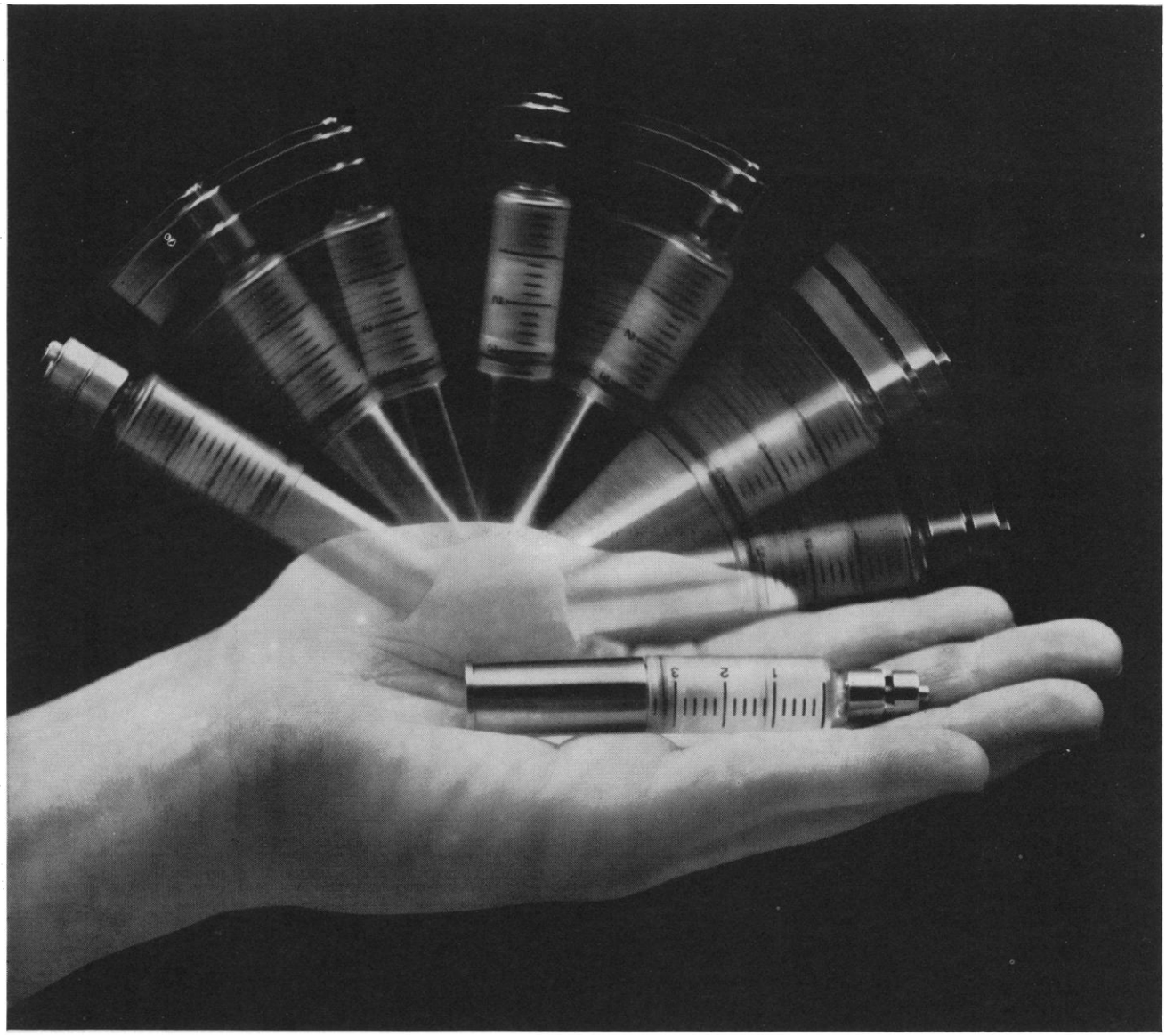

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towns have subsided, perhaps by a combination of effects of compaction and slumping.

Landslides were widespread, but the slides in Anchorage are best known. Slides there occurred along cliffs in outwash gravels overlying silt and sand. Several slides were more or less conventional rotational slides. The Turnagain Heights slide which was the largest is quite different; it consists of a series of slices that slid down and then away from the cliff, along what seems to be an almost horizontal surface. This sliding stopped when the earthquake stopped. Incipient cracks occur on the relatively undisturbed land surface behind the head of the slide.

Structures built on bedrock were less severely damaged than structures built on unconsolidated sediments. For example, large buildings at Anchorage built on unconsolidated sediments were extensively damaged, whereas large buildings built on bedrock at Whittier, only half as far from the epicenter as Anchorage, suffered minor damage. It is hard to estimate intensity because so many factors affect the damage. Large structures of reinforced concrete were significantly damaged although adjacent small, woodframe structures were undamaged. The amount of damage is affected not only by epicentral distance but also by the kind of foundation material, bedrock or unconsolidated deposits, the type of construction, the height of the structure, and the duration of shaking.

Kachadoorian commented that during a comparable earthquake near the San Francisco Bay area he would expect compaction to occur in the marginal lands around the bay that are being developed with engineered fill over bay muds. He noted that much of the highway fill in Alaska could be called engineered fill, yet in most places in the meizoseismal region where the highways crossed unconsolidated sediments they were disturbed by the earthquake. He had no examples of the behavior of large buildings on engineered fill over loosely consolidated, water-saturated sediments. He thought that frozen ground had little influence on the damage because the frost zone was only a small fraction of the thickness of unconsolidated sediments. He noted that steel railroad bridges as far north as Hurricane had buckled in compression. Many highway bridges had pounded and damaged their terminal piers.

An account of the structural damage

in Anchorage was given by K. V. Steinbrugge (Pacific Fire Rating Bureau, San Francisco). As a possible cause of the compression in bridges mentioned by Kachadoorian, lurch-cracks parallel to many streams, which had been observed from a helicopter, might be considered. Steinbrugge stressed the close connection between the behavior of both the building and the ground. More attention must be given to the quantitative measurement of ground motion in an earthquake. The character of this motion is a function of distance. In the Good Friday earthquake, the changes in ground motion over the 120-km distance from the focus to Anchorage evidently were the reason for selective damage to tall structures in comparison with the usually undamaged, small rigid buildings. Similar selective damage occurred in Mexico City from the 28 July 1957 earthquake, located just off the Mexican coast. The three key factors of poor construction, poor foundation material, and long-period ground motion were also common to the two cases.

The different effects produced by long-period and short-period motion make intensity scales difficult to apply. An extreme example of intensity variation is the Turnagain area with both total destruction (intensity XII) and little or no damage to many houses on the bluff (intensity VII), including their unreinforced, concrete-block chimneys. The duration of the earthquake motion is an important datum; in one case a group of men left and reentered a building twice while shaking continued. In certain single-story shops in Anchorage moveable goods were undisturbed on shelves. This indicated a small proportion of short-period accelerations. The damage studied in detail was that due to vibraton in structures whose substrata had not failed by compaction, lurching, or landsliding. Most of the vibration damage could be explained as failure to meet standards of construction or design of the quality accepted in the San Francisco Bay area. Some doubt must remain, however, on the adequacy of even this relative standard; Anchorage was about the same distance from the primary shock as Sacramento is from San Francisco. With many modern structures such as precast concrete, the interconnections between elements are critical. There were numerous examples of failure in joints and connections. Some failures within reinforced concrete columns were related

to the irregular manner in which reinforcing steel was tied together before the concrete was poured.

Only close examination of particular structural damage provided reasonable conclusions in many cases and these were instances of ineptly handled design or construction, or both. This raises the question of whether special knowledge of effects of earthquakes should not be taught more widely in schools of structural engineering. In the case of one multi-storied, damaged building, initial opinion blamed the foundation soils. Excavations now made show that the poor quality of the concrete foundations allowed them to fail in this building. The pattern of damage in Anchorage should not lull us into a sense of security; a strong earthquake nearer to Anchorage could give quite a different pattern.

During the questions, the chairman asked if there was an earthquake building code in Anchorage. Steinbrugge replied affirmatively and commented that interpretation and enforcement are important. In answer to a question of whether any concrete, multi-storied building was undamaged, he indicated that of the buildings over six stories personally inspected only the New Providence Hospital had little damage. Other questions raised concerned (i) the correspondence between the free periods of buildings and the predominant ground motion and (ii) the effect of the extreme seasons on the curing of concrete. The reply in the first case was that only the strong-motion record from the aftershock referred to by Cloud was available. A period of 6/10 second would probably affect more the taller buildings. In the second case, reasons other than frozen concrete could usually account for the damage. In response to a question concerning damage at Spenard High School, F. McClure (consulting structural engineer) replied that the key to failure in that case was in execution of the design rather than in the design itself.

Before turning to a general discussion, the chairman invited R. E. Goodman (Department of Mineral Technology, Berkeley) to report on his field observations in Alaska of the relation between soil mechanics and damage to structures. Goodman observed that we are ignorant about many factors that are fundamental to the safety of structures now being erected in the San Francisco Bay area. We do not fully understand the mechanics of soils under dynamic loads. We do not know

how foundations interact with structure. Much current research on these problems is based on data from smaller earthquakes. Shaking table experiments with soils indicate that we cannot scale up effects of small earthquakes to anticipate effects of large earthquakes because there is a transition from elastic to inelastic behavior. The magnification factor of ground accelerations and displacements on soft grounds in laboratory models subjected to shaking is much higher in response to horizontal forcing motion than in response to vertical. Furthermore, it has been demonstrated that horizontal shaking has a much larger effect on slope stability than the vertical component of motion. Because there are no strong motion records in Anchorage of the Alaskan earthquake, there is little information that can be of use in soil mechanics about the design of foundations. We urgently need the installation of more strong-motion seismographs in seismic areas. We must evaluate all the exceptions to the generalizations on the relation of damage to substrata and all possible relevant variables, in order to acquire further understanding.

After Goodman's remarks, the chairman invited comments and a lively discussion took place. Kachadoorian commented that although there is much we need to know in order to develop criteria for design, the geologic observations very clearly point out the problems with which engineers must deal. He disputed the point that, because of the lack of strong motion records, little useful information has been acquired from the Alaska earthquake; strong motion records would certainly be valuable, but the available information on the ways that foundations and structures fail should be very useful. Steinbrugge noted that experience in how structures fail, even where we do not have all the data we wish, provides an empirical basis for future design. C. A. Wahrhaftig (Department of Geology and Geophysics, Berkeley) remarked that the report of the State Earthquake Investigation Commission on the 1906 earthquake in California showed a nearly perfect correlation between intensity of damage and nature of the substratum. Lines of equal damage are parallel to contacts of alluvium with bedrock and roughly follow the contours of depth of alluvium, not only within San Francisco, but also over the coast ranges and central valley. G. B. Oakeshott (California Division of Mines) reported a few of his ob-

servations in Alaska. Cordova is about as far east of the epicenter of the earthquake as Anchorage is west. Cordova is built on bedrock and the town suffered no shaking damage. The highway to the Cordova airport crosses the delta of the Copper River on gravel fill over mud and muskeg for a distance of about 2 km. Over this interval there was almost total failure of the pavement; the part of the highway built on bedrock was not even cracked. The town of Girdwood is in the area of highest intensity of damage; railroad and highway beds on filled ground failed completely, but the windows were not broken in a schoolhouse built on bedrock even though it had a concrete block foundation.

The question was next raised as to whether the correlation between substrata and damage is as clear as previous speakers had implied; in the Arvin-Tehachapi earthquake of 1952 railroad tunnels in bedrock were severely damaged whereas dams and other structures on loose ground at comparable epicentral distances were not damaged. Oakeshott replied that the tunnels at Tehachapi are in deeply weathered, granitic rock; they were dug without the use of explosives. Wahrhaftig added that three of the four damaged tunnels were along the line of surface breakage on the fault.

A number of salient scientific and practical points emerged as a result of this symposium. The earthquake has drawn attention to a region that is of exceptional geological and geophysical interest because of the intersection of island arc and continental structures, and has revealed an unexpected pattern of regional crustal movement. The continuing lack of records of ground vibration in epicentral areas was emphasized. Valuable information was obtained and questions were raised regarding problems of design and execution of buildings that must withstand shaking. The knowledge necessary for design of stable structures built on unconsolidated materials is apparently very incomplete; fills that were stable enough for operations under static conditions failed abruptly under seismic conditions. The problems for expanding metropolitan areas in seismic zones where marginal land is being developed are grave.

Details of much of the material presented by Grantz and Kachadoorian are available in the U.S. Geological Survey Circular 491. For additional material, Cloud referred to the U.S.

Coast and Geodetic Survey *Preliminary Report* (17 April 1964).

This symposium was sponsored by the Department of Geology and Geophysics, University of California, Berkeley.

MARK N. CHRISTENSEN
BRUCE A. BOLT
Department of Geology and Geophysics, University of California, Berkeley

Botanical Field Meeting

Each year, usually toward the latter part of June, the North East Section of the Botanical Society of America has a field meeting. The central theme is plants in their natural environment. This year Drew University at Madison, New Jersey, was host (14–17 June 1964).

Kemble Widmer (state geologist for New Jersey) spoke on the relationship between the extremely complex geology (formations from archaeozoic to the last glaciation are represented) and the distribution of plants in the Garden State. An exhibit of herbarium specimens of the flora of the Great Swamp was arranged by Florence M. Zuck. Visits by the group were made to the Great Swamp (the newest National Wildlife Refuge, dedicated 29 May 1964) and the Cedar Bog at High Point. The rather rare submerged aquatic *Hottonia inflata*, first reported from the Great Swamp by R. K. Zuck, was, perhaps, the outstanding botanical feature. The bog at High Point is one of the rare sites where all plants expected in a particular environment are well represented and can easily be seen from an encircling road. The display of the swamp calla was spectacular.

Louis Hand and Dorothy Everett spoke on the plants of the Pine Barrens of New Jersey in preparation for a field trip to this area. Everett's slides, produced by her and her husband, were some of the most technically perfect ever done for the flora of this area. The Pine Barrens are among the richest areas in the temperate region for number and variety of species of plants. Two outstanding and rare plants, the curly grass fern, *Schizaea pusilla*, and a curious morning glory, *Breweria Pickeringii* var. *caesariensis*, the latter a true endemic, were seen in the field, as well as hosts of three species of sun dews (*Drosera rotundifolia, D. intermedia*, and *D. filiformis*) and two orchids (*Pogonia ophioglossoides* and *Calopogon pulchella*).

At Island Heights, New Jersey, John Small (Rutgers University) spoke on the general botanical aspects of New Jersey and about Island Beach State Park in particular. He discussed the relationship of wind and wave action to the formation of Island Beach and the stabilizing influence of plants on the sand dunes in the area. Plant life is delicately balanced, and man's inroads must be curtailed if the area is to be maintained in its present state. Here we saw sea rocket (*Cakile edentula*), beach plum (*Prunus maritima*), and Spanish Oak (*Quercus falcata*) as plants typical of the region.

The host institution for the 1965 summer field meeting will be the University of Maine.

ROBERT K. ZUCK
Drew University, Madison, New Jersey

Forthcoming Events

September

16–18. American Assoc. of **Medical Clinics**, annual, Bal Harbour, Fla. (The Association, Box 58, Charlottesville, Va.)

17–18. **Computing**, 7th annual Northwest conf., Seattle, Wash. (R. K. Smith, Northwest Computing Assoc., Box 836, Seahurst, Wash.)

17–18. **Engineering Management**, conf., Cleveland, Ohio. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y. 10021)

17–18. **Polypropylene Fibers**, symp., Southern Research Inst., Birmingham, Ala. (W. C. Sheehan, SRI, 2000 Ninth Ave. S., Birmingham, Ala. 35205)

17–19. **Cancer**, 5th natl. conf., Philadelphia, Pa. (American Cancer Soc., 219 E. 42 St., New York, N.Y. 10017)

17–19. British Assoc. of **Urological Surgeons**, annual, Sheffield, England. (Joint Secretariat, 47 Lincoln's Inn Fields, London, W.C.2, England)

17–20. **Science Education**, intern. conf., Banff, Alberta, Canada. (S. Trieger, Faculty of Education, Univ. of Alberta, Edmonton, Canada)

18. Hungarian **Chemical** Soc., Tihany. (M. T. Beck, Szabadsag ter 17, Budapest 5, Hungary)

19–26. **Gynecology and Obstetrics**, 4th world congr., Buenos Aires, Argentina. (R. Lede, Primera Catedra de Ginecología, Hospital de Clínicas, Córdoba 2149, Buenos Aires)

19–27. **Scientific Films** Assoc., 18th intern. congr., Athens, Greece. (SFA, 38, Avenue des Ternes, Paris 17e, France)

20–23. **Ceramic-Metal Systems**, American Ceramic Soc., French Lick, Ind. (ACS, 4055 North High St., Columbus, Ohio)

20–23. American Inst. of **Chemical Engineers**, Las Vegas, Nev. (F. J. Van

Antwerpen, 345 E. 47 St., New York, N.Y. 10017)

20–24. American Soc. of **Oral Surgeons**, Chicago, Ill. (E. W. Gilgan, 119 North Michigan Ave., Chicago 11)

20–25. **Neuroradiology**, 7th symp., New York, N.Y. (J. M. Taveras, Neurological Inst., Columbia-Presbyterian Medical Center, New York, N.Y. 10032)

20–26. **Anaesthesiology**, 3rd world congr., São Paulo, Brazil. (L. Rodrigues Alves, Caixa Postal 330, São Paulo)

21–24. **Agricultural Engineering**, intern. congr., Lausanne, Switzerland. (P. Regamey, Etat de Vaud, 14. Cité-Devant Lausanne)

21–24. German Soc. for **Psychology**, 24th congr., Vienna, Austria. (J. Rohracher, Deutsche Gesellschaft für Psychologie, Am Hof le, 5300 Bonn, Germany)

21–25. **Animal Care Panel**, 15th annual, New York, N.Y. (ACP, P.O. Box 1028, Joliet, Ill. 60434)

21–26. **Documentation**, 30th intern. conf., The Hague, Netherlands. (Intern. Federation for Documentation, 7 Hofweg, The Hague)

21–26. **Electrochemical Thermodynamics and Kinetics**, intern., London, England. (M. Fleischmann, Dept. of Physical Chemistry, Univ. of Newcastle upon Tyne, England)

21–26. **Parasitology**, 1st intern. congr., Rome, Italy. (A. Corradetti, Instituto di Parassitologia, Citta Universitaria, Rome)

22–24. **Many-Body Problems** in Physics and Chemistry, conf., Manchester, England. (Administration Assistant, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

22–25. Middle East **Neurological** Soc., Ankara, Turkey. (N. Avman, c/o Hacettepe Tip Fakültesi, Ankara)

22–25. **Soil Micromorphology**, 2nd intern., Arnhem, Netherlands. (A. Jongerius, Stichting voor Bodenmartering, Postbus 10, Bennekom, Netherlands)

22–28. **Radiology**, 11th intern, congr., Rome, Italy. (L. Turano, Instituto de Radiologia, Univ. of Rome, Rome)

23–26. British Assoc. for **Cancer Research**, annual, Edinburgh, Scotland. (J. G. Bennette, Courtauld Inst., Middlesex Hospital, London, W.1, England)

23–26. Viral Diseases of **Poikilothermic Vertebrates**, New York, N.Y. (S. P. Snieszko, Eastern Fish Disease Laboratory, Leestown, P.O. Kearneyville, W.Va.)

24–27. **American Medical Writers'** Assoc., annual, Philadelphia, Pa. (American Medical Writers Assoc., 2000 P St., NW, Washington, D.C.)

25–26. **Communications**, 3rd Canadian symp., Montreal, Quebec. (F. G. R. Warren, P.O. Box 802, Station B, Montreal)

27–30. Society of American **Foresters**, 64th annual, Denver, Colo. (SAF, Mills Bldg., Washington, D.C. 20006)

27–1. **Water Pollution Control** Federation, 37th annual, Bal Harbour, Fla. (WPCF, 3900 Wisconsin Ave., Washington, D.C. 20016)

27–2. Society of **Motion Picture and Television Engineers**, 96th technical conf., New York, N.Y. (SMPTE, 619 W. 54 St., New York, N.Y. 10019)

28–30. **Circuit and System Theory**, conf., Monticello, Ill. (W. R. Perkins,

Dept. of Electrical Engineering, Univ. of Illinois, Urbana)

28–2. Society for **Applied Spectroscopy**, 3rd natl. conf., Cleveland, Ohio. (E. Yeager, Dept. of Chemistry, Western Reserve Univ., Cleveland 44106)

29–1. Physics of **Failure in Electronics**, 3rd annual symp., Chicago, Ill. (M. Goldberg, IIT Research Inst., 10 W. 35 St., Chicago 60616)

29–1. **Physics and Nondestructive Testing**, symp., Dayton, Ohio. (W. J. McGonnagle, Southwest Research Inst., P.O. Box, 2296, San Antonio, Tex. 78206)

29–1. American College of **Preventive Medicine**, New York, N.Y. (R. E. Coker, Jr., Box 1263, Chapel Hill, N.C.)

29–1. Technical Assoc. of the **Pulp and Paper** Industry, 1964 testing conf., Portsmouth, N.H. (TAPPI, 360 Lexington Ave., New York, N.Y. 10017)

29–2. American **Roentgen Ray** Soc., 65th annual, Minneapolis, Minn. (C. A. Good, Mayo Clinic, Rochester, Minn.)

30–2. **American Council on Education**, 47th annual, San Francisco, Calif. (L. Wilson, ACE, 1785 Massachusetts Ave., NW, Washington, D.C. 20006)

30–2. **Earth Sciences**, intern. conf., Cambridge, Mass. (H. G. Houghton, Dept. of Meteorology, Massachusetts Inst. of Technology, Cambridge)

30–2. **Standards Engineers** Soc., 13th annual, New York, N.Y. (SES, 170 Livingston Ave., New Providence, N.J.)

30–2. **Vacuum**, 11th natl. symp., Chicago, Ill. (G. H. Bancroft, Bendix-Balzers Vacuum, Inc., 1645 St. Paul St., Rochester, N.Y. 14621)

30–4. **Spectroscopy**, 11th intern. conf., Belgrad, Yugoslavia. (Sekretarijat, Prorodno-matematicki fukultet, Fizickochemijsky zavod Belgrad, Studeniski trg., 16, Bloc C, Yugoslavia)

October

1–2. Emission of **Electrons** from Solids, conf., Univ. of Keele, Keele, England. (Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

1–3. American Assoc. for **Surgery of Trauma**, Chicago, Ill. (S. R. Gaston, 18 Fort Washington Ave., New York 10022)

2–3. Council for International **Organizations of Medical Societies**, 6th general assembly, Brussels, Belgium. (P. A. Messerli, 6 rue Franklin, Paris 16e, France)

2–3. **Psychotherapy of the Family**, symp., Milwaukee, Wis. (B. C. Burris, Milwaukee Psychiatric Hospital, Milwaukee 53213)

2–9. **Radiology**, 8th inter-American congr., Caracas, Venezuela. (R. Merenfeld, Apartado Postal 9362 Candelaria, Caracas)

3–4. New England Intercollegiate **Geological** Conf., Yale Univ., New Haven, Conn. (J. Rodgers, Dept. of Geology, Yale Univ., New Haven 06520)

3–4. **Medical Radiobiology**, 7th natl. congr., Pisa, Italy. (Segreteria, Inst. di Radiologia dell'Università, Spedali Riuniti de "S. Chiara," Pisa)

3–13. **Weights and Measures**, 12th conf., Paris, France. (Intern. Bureau of Weights and Measures, Pavillon de Breteuil, Sèvres, Seine-et-Oise, France)

4–9. American College of **Surgeons**, clinical congr., Chicago, Ill. (American College of Surgeons, 55 East Erie St., Chicago 60611)

5–6. **Enzyme Regulation**, 3rd intern. symp., Indianapolis, Ind. (G. Weber, Indiana Univ. School of Medicine, Indianapolis)

5–7. Association of **Medical Illustrators**, annual, Los Angeles, Calif. (C. Bridgman, Dept. of Anatomy, UCLA Center for Health Sciences, Los Angeles)

5–7. **Radiation Effects on Electronics**, natl. meeting, American Nuclear Soc., Syracuse, N.Y. (ANS, 244 East Ogden Ave., Hinsdale, Ill.)

5–8. **Clay Mineral** Soc., Univ. of Wisconsin, Madison. (M. L. Jackson, Univ. of Wisconsin College of Agriculture, Madison 6)

5–8. American **Documentation** Inst., annual, Philadelphia, Pa. (B. F. Cheydleur, Philco Corp., Willow Grove, Pa. 19090)

5–8. Research Methods and **Instrumentation**, 14th symp., Bethesda, Md. (J. B. Davis, Natl. Insts. of Health, Bethesda, Md. 20014)

5–9. **Aeronautics and Space Engineering**, Soc. of Automotive Engineers, Los Angeles, Calif., (E. V. Albert, 399 N. Sepulveda Blvd., El Segundo, Calif. 90245)

5–9. American **Public Health** Assoc., New York, N.Y. (B. F. Mattison, 1790 Broadway, New York, N.Y.)

5–10. German **Physical** Soc., Düsseldorf. (GPS, Gänsheidestr. 15a, Stuttgart, Germany)

6–8. **Analytical Chemistry in Nuclear Technology**, 8th conf., Gatlinburg, Tenn. (C. D. Susano, Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn.)

6–8. **Cornea**, world congr., Washington, D.C. (J. H. King, 1746 K St., NW, Washington, D.C.)

6–9. **Optical** Soc. of America, annual, New York, N.Y. (M. E. Warga, OSA, 1155 16th St., NW, Washington, D.C. 20006)

6–9. **Space Electronics**, symp., Las Vegas, Nev. (C. H. Doersam, Jr., Box 177, Port Washington, N.Y.)

6–10. Clinical and Experimental **Hypnosis**, 16th annual, Pittsburgh, Pa. (Soc. for Clinical and Experimental Hypnosis, 353 W. 57 St., New York, N.Y. 10019)

7. **California** Acad. of Sciences, San Francisco. (G. E. Lindsay, California Academy of Sciences, Golden Gate Park, San Francisco)

7–9. Structure and Functions of **Epidermal Barriers**, intern. symp., Brno, Czechoslovakia. (Zd. Vlašin, Dermatological Clinic, 53, Pekařská, Brno)

7–9. Electronic **Information Handling**, natl. conf., Pittsburgh, Pa. (A. Kent, Univ. of Pittsburgh, Pittsburgh)

7–9. Institute of **Management Sciences** (TIMS)/**Operations Research** Soc. of America (ORSA), joint natl. meeting, Minneapolis, Minn. (G. B. Davis, School of Business Administration, Univ. of Minnesota, Minneapolis)

8–10. **Agricultural Meteorology**, 6th conf., Lincoln, Nebr. (American Meteorological Soc., 45 Beacon St., Boston 8, Mass.)

9–10. **Undergraduate Courses and Curricula**, midwestern regional conf., Univ.

of Kansas, Lawrence. (R. E. McNair, Assoc. of Midwest College Biology Teachers, Univ. of Kansas, Lawrence)

10. **Paleontological Research Inst.**, annual, Ithaca, N.Y. (R. S. Harris, 109 Dearborn Pl., Ithaca 14850)

11–14. American **Oil Chemists** Soc., Chicago, Ill. (C. H. Hauber, AOCS, 35 E. Wacker Dr., Chicago 60601)

11–14. International **Scientific Radio Union**/Inst. of **Electrical and Electronics Engineers**, joint meeting, Univ. of Illinois, Urbana. (E. C. Jordan, Dept. of Electrical Engineering, Univ. of Illinois, Urbana)

11–15. **Diseases of the Chest**, 8th intern. congr., Mexico City, D.F. (M. Kornfeld, American College of Chest Physicians, 112 E. Chestnut St., Chicago 11, Ill.)

11–15. **Electrochemical** Soc., Washington, D.C. (ES, 30 E. 42 St., New York, N.Y. 10017)

11–16. **Allergology**, 5th intern. congr., Madrid, Spain. (F. Lahoz, Clínica de la Concepción, Avda. Reyes Católicos 2, Madrid 3)

11–16. American Assoc. of **Medical Record Librarians**, annual, Miami Beach, Fla. (M. J. Waterstraat, RRL, 840 North Lake Shore Dr., Chicago, Ill. 60611)

11–16. Pan American Assoc. of **Ophthalmology**, 7th, Montreal, Canada. (J. W. McKinney, PAAO, 921 Exchange Bldg., Memphis, Tenn.)

11–16. American Soc. of **Plastic and Reconstructive Surgery**, annual, San Francisco, Calif. (P. P. Pickering, 2850 Sixth Ave., Suite B, San Diego, Calif.)

12–14. **Aviation Pathology**, 5th scientific session, Washington, D.C. (Secretary, Joint Committee on Aviation Pathology, Armed Forces Inst. of Pathology, Washington, D.C. 20305)

12–14. **Entry Technology**, American Inst. of Aeronautics and Astronautics conf., Williamsburg, and NASA-Langley Research Center, Va. (S. P. Johnston, AIAA, 1290 Sixth Ave., New York, N.Y.)

12–14. Protection Against **Radiations** in Space, 2nd symp., Gatlinburg, Tenn. (F. C. Maienschein, Oak Ridge Natl: Laboratory, P.O. Box X, Oak Ridge, Tenn.)

12–15. **Instrument** Soc. of America, 19th **Instrument-Automation** conf., New York, N.Y. (ISA, 530 William Penn Pl., Pittsburgh, Pa. 15219)

13–15. Air Force **Science and Engineering**, 11th symp., Brooks Air Force Base, Tex. (G. E. Schafer, Headquarters Aerospace Medical Div., Brooks AFB)

13–16. **Calorimetry**, 19th conf., Washington, D.C. (W. N. Hubbard, Argonne Natl. Laboratory, 9700 S. Cass Ave., Argonne, Ill.)

13–16. **Lubrication**, 1st intern. conf., American Soc. of Mechanical Engineers/American Soc. of Lubrication Engineers, Washington, D.C. (W. J. Anderson, MS 6-1, NASA-Lewis Research Center, 21000 Brookpark Rd., Cleveland, Ohio)

13–17. **Electron Microscopy** Soc. of America, 22nd annual, Detroit, Mich. (A. R. Taylor, Virus Div., Parke, Davis & Co., Detroit 32)

14–15. American Soc. of **Tool and Manufacturing Engineers**, Minneapolis, Minn. (R. E. Gariss, 6523 El Pulcro St., Long Beach, Calif.)

14–16. **Gaseous Electronics**, 7th conf., Atlantic City, N.J. (S. Schneider, U.S. Army Electronics R&D Laboratories, Fort Monmouth, N.J. 07703)

14–16. **Parenteral Drug** Assoc., annual conv., New York, N.Y. (PDA, Broad and Chestnut Sts., Philadelphia 7, Pa.)

14–16. **Remote Sensing of Environment**, 3rd symp., Ann Arbor, Mich. (D. C. Parker, Univ. of Michigan, Box 618, Ann Arbor 48107)

14–16. **Sonics and Ultrasonics**, symp., Santa Monica, Calif. (A. H. Meitzler, Bell Telephone Laboratories, Inc., Murray Hill, N.J.)

15–16. **Bioenergetics**, symp., Univ. of Western Ontario, London, Ontario, Canada. (K. P. Strickland, Dept. of Biochemistry, Faculty of Medicine, Univ. of Western Ontario, London)

15–16. **Systems Science**, first annual conf., Inst. of Electrical and Electronics Engineers, Univ. of Pennsylvania, Philadelphia. (H. G. Sparks, Moore School of Engineering, Univ. of Pennsylvania, Philadelphia)

15–17. **Correlation of Particles** Emitted in Nuclear Reactions, intern. conf., Gatlinburg, Tenn. (A. Zucker, Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn. 37830)

15–17. Central **Neuropsychiatric** Assoc., Denver, Colo. (W. P. Shelton, 8215 Westchester Dr., Dallas 25, Tex.)

15–22. Association of **American Medical Colleges**, 75th annual, Denver, Colo. (P. J. Sanazaro, Div. of Education, Assoc. of American Medical Colleges, 2530 Ridge Ave., Evanston, Ill. 60201)

16–17. Western **Industrial Medical** Assoc., Los Angeles, Calif. (C. Einert, 2151 Berkeley Way, Berkeley 4, Calif.)

16–17. **Systemics**, 11th annual symp., St. Louis, Mo. (H. C. Cutler, Missouri Botanical Garden, St. Louis)

16–20. American **Medical Women's** Assoc., New York, N.Y. (M. A. Sears, Anderson Hospital, Houston 25, Tex.)

16–24. American Soc. of **Clinical Pathologists**, annual, Bal Harbor, Fla. (ASCP, 445 N. Lake Shore Dr., Chicago, Ill.)

17–18. Society for **Psychophysiological Research**, 4th annual, Washington, D.C. (L. A. Gustafson, SPR, 74 Fenwood Rd., Boston, Mass. 02115)

17–20. College of American **Pathologists**, Bal Harbor, Florida. (E. E. Simard, Box 136, Salinas, Calif.)

17–25. International **Aeronautic** Federation, general conf., Tel Aviv, Israel. (M. J. Randleman, Natl. Aeronautic Assoc., 1025 Connecticut Ave., NW, Washington, D.C. 20036)

18–21. Association of **Military Surgeons** of the U.S., Washington, D.C. (Brig. Gen. F. E. Wilson, Suite 132, 1500 Massachusetts Ave., NW, Washington, D.C. 20005)

18–22. **Metallurgical** Soc., fall meeting, Philadelphia, Pa. (D. A. Parks, Inst. of Metals Div., Metallurgical Soc. of AIME, 345 E. 47 St., New York, N.Y. 10017)

18–23. American Acad. of **Ophthalmology and Otolaryngology**, Chicago, Ill. (W. L. Benedict 15 Second St., SW, Rochester, Minn. 55901)

18–24. **Dental Education**, 2nd Latin American seminar, Mexico City. (D. Restrepo, Pan American Sanitary Bureau, 1501 New Hampshire Ave., NW, Washington, D.C. 20036)

19–20. **Unconventional Inertial Sensors**, symp. (secret), Farmingdale, N.Y. (R. E. McIntyre, RMG-8, Bureau of Naval Weapons, Washington 25, D.C.)

19–21. Academy of **Psychosomatic** Soc. of Mechanical Engineers, Lafayette, Ind. (T. P. Goodman, Technological Inst., Northwestern Univ., Evanston, Ill.)

19–21. Academy of **Psychosomatic Medicine**, New York, N.Y. (R. N. Rutherford, 200 Broadway, Seattle, Wash.)

19–21. Technical Assoc. of the **Pulp and Paper Industry**, plastics-paper conf., Washington, D.C. (TAPPI, 360 Lexington Ave., New York 10017)

19–22. Association of Official **Agricultural Chemists**, 78th annual, Washington, D.C. (L. G. Ensminger, AOAC, Box 540, Benjamin Franklin Station, Washington, D.C. 20044)

19–23. American Soc. of **Civil Engineers**, New York, N.Y. (W. H. Wisely, ASCE, 345 E. 47 St., New York, N.Y. 10017)

19–23. American Soc. for **Metals**, Philadelphia, Pa. (A. R. Putnam, ASM, Metals Park, Ohio)

19–23. **Radiochemical Methods of Analysis**, symp., Salzburg, Austria. (Intern. Atomic Energy Agency, 11 Karntnerring, Vienna 1, Austria)

20–30. Nov. **UNESCO**, 13th session, general conf., Paris, France. (UNESCO, Place de Fontenoy, Paris 7°)

21–22. American Heart Assoc., Council on **Arteriosclerosis**, annual, Atlantic City, N.J. (D. M. Smith, AHA, 44 E. 23 St., New York, N.Y. 10010)

21–22. **Industrial Hygiene Foundation**, annual, Pittsburgh, Pa. (R. T. P. deTreville, IHF, 4400 Fifth Ave., Pittsburgh 15213)

21–23. **Aerospace and Navigational Electronics**, 11th East Coast conf., Baltimore, Md. (M. Hastings, Mail No. 1281 A, Baltimore Space and Defense Center, Westinghouse Electric Corp., P.O. Box 1693, Baltimore 21203)

21–23. **Pain**, intern. symp., Detroit, Mich. (R. S. Knighton, 2799 W. Grand Blvd., Detroit)

21–23. **Spectroscopy, Instrumentation and Chemistry**, 3rd Pacific meeting, San Francisco, Calif. (J. G. Conway, Lawrence Radiation Laboratory, Univ. of California, Berkeley 4)

21–24. **Acoustical** Soc. of America, 68th, Austin, Tex. (W. Waterfall, ASA, 335 E. 45 St., New York, N.Y. 10017)

21–25. **Cybernetics**, 4th intern. congr., Namur, Belgium. (Intern. Assoc. for Cybernetics, 13 rue Basse-Marcelle, Namur)

22–23. **New Mexico** Acad. of Science, Albuquerque. (K. S. Bergstresser, 739 42 St., Los Alamos, N.M.)

23–24. **Kentucky** Acad. of Science, Morehead. (G. Levey, College Box 2325, Berea, Ky.)

23–24. American **Physical** Soc., Chicago, Ill. (R. G. Sachs, Argonne National Laboratory, Argonne, Ill. 60440)

23–25. Association of **Clinical Scientists**, Washington, D.C. (R. P. MacFate, 300 N. State St., No. 5422, Chicago, Ill. 60610)

23–25. Experimental **Gerontology**, symp., Basel, Switzerland. (Prof. Verzar, Inst. de Gerontologie Experimentale, Nonnenweg 7, Basel, Switzerland)

24–29. American Acad. of **Pediatrics**,

annual, New York, N.Y. (AAP, 1801 Hinman Ave., Evanston, Ill.)

25–31. American Soc. for **Horticultural Science**, Caribbean Region, 12th annual, Maracay, Venezuela. (E. H. Casseres, Londres 40, México 6, D.F.)

26–27. American Inst. of **Aeronautics and Astronautics**/Canadian Aeronautics and Space Inst., joint meeting, Ottawa, Ont., Canada. (P. J. Burr, AIAA, 1290 Sixth Ave., New York, N.Y. 10019)

26–27. **Combustion** Inst., western states section, fall meeting, Univ. of Utah, Salt Lake City. (Secretary, CI, 16902 Bollinger Dr., Pacific Palisades, Calif. 90272)

26–28. **Antimicrobial Agents and Chemotherapy**, 4th conf., American Soc. for Microbiology, New York, N.Y. (ASM, 115 Huron View Blvd., Ann Arbor, Mich.)

26–28. Chemical Inst. of Canada, 14th **Chemical Engineering** meeting, Hamilton, Ont. (CIC, 48 Rideau St., Ottawa 2)

26–28. Society of **Rheology**, 35th annual, Pittsburgh, Pa. (H. Markovitz, Mellon Inst., 4400 Fifth Ave., Pittsburgh 13)

26–14. Pan American **Standards** Committee, textiles seminar, Lima, Peru. (American Standards Assoc., 810 18th St., NW, Washington, D.C.)

27. Oak Ridge Inst. of **Nuclear Studies**, Oak Ridge, Tenn. (W. G. Pollard, Box 117, Oak Ridge)

27–29. Joint **Computer** Conf., San Francisco, Calif. (R. I. Tanaka, c/o Lockheed Missiles and Space Co., 3251 Hanover St., Palo Alto, Calif.)

28–30. Society of **Experimental Stress Analysis**, annual, Cleveland, Ohio. (B. E. Rossi, 21 Bridge Square, Westport, Conn.)

28–30. **Inertial Guidance Test**, 2nd symp., Holloman Air Force Base, N.M. (F. P. Ray, Holloman AFB).

28–30. **Nuclear Science**, 11th symp., Philadelphia, Pa. (U.S. Office of Aerospace Research, 4th and Independence Ave., SW, Washington, D.C.)

28–30. **Rock Mechanics**, 6th symp., Rolla, Mo. (C. Christianson, Dept. of Mining Engineering, School of Mines and Metallurgy, Univ of Missouri, Rolla)

28–30. Southeastern **Library** Assoc., 21st biennial conf., Norfolk, Va. (E. F. Jesse, c/o Armed Forces Staff College Library, Norfolk)

29–31. American Soc. for **Aesthetics**, Chicago, Ill. (J. R. Johnson, Cleveland Museum of Art, Cleveland 6, Ohio)

29–31. **Electron Devices**, Inst. of Electrical and Electronics Engineers, Washington, D.C. (M. Mass, Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.)

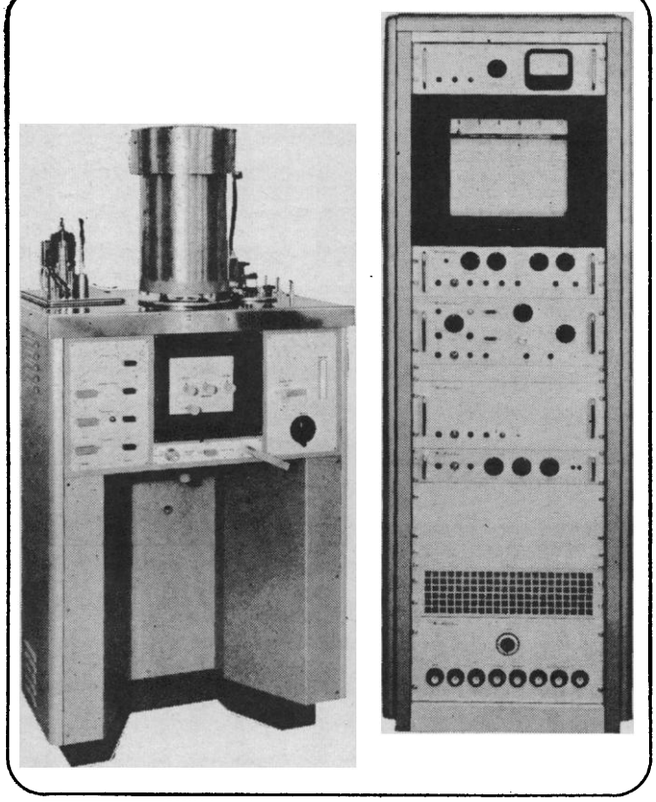
29–31. **Gerontological** Soc., 7th annual, Minneapolis, Minn. (GS, 660 South Euclid, St. Louis, Mo. 63110)

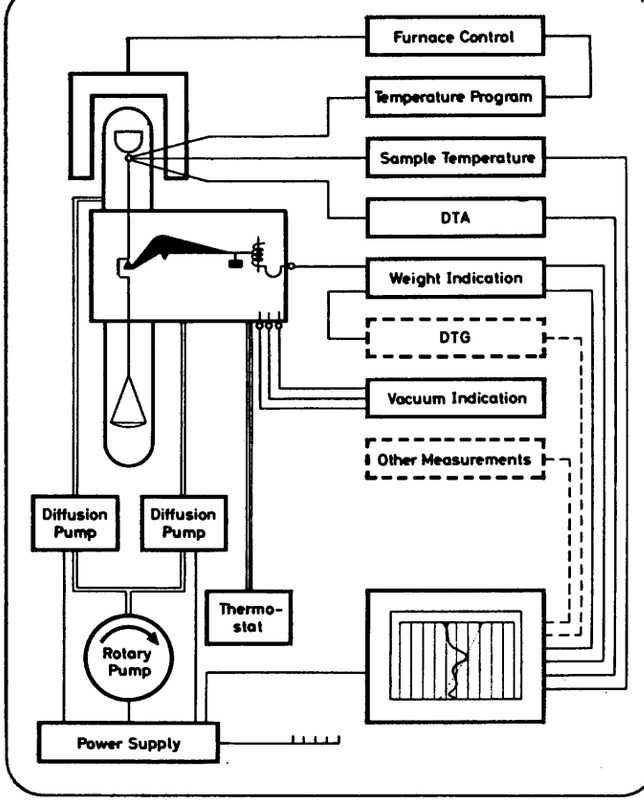
29–31. **Indiana** Acad. of Science. Indianapolis. (C. F. Dineen, Biology Dept., St. Mary's College, Notre Dame, Ind.)

29–31. Society of **Photographic Scientists and Engineers**, annual symp., Washington, D.C. (W. S. Dempsey, FMA, Inc., 4925 Fairmont Ave., Washington, D.C.)

29–31. Society for the **Scientific Study of Religion**, Washington, D.C. (S. Z. Klausner, SSSR, 1424 16th St., NW, Washington, D.C.)

30–1. **Meteoritical Soc.**, 27th meeting, Arizona State Univ., Tempe. (C. B. Moore, Dept. of Geochemistry, Arizona State Univ., Tempe)





Simultaneous TGA/DTA with better control of variables than ever before

This is the new Mettler Thermoanalyzer. It provides, in one unit, the capabilities of all the thermoanalytic instruments available today, and allows you to perform work beyond the threshold of existing instrumentation.

A unique combination of components permits a degree of control of variables never before possible. The instrument is more than a versatile survey tool; it also provides meaningful quantitative measurements for detailed analyses. Despite its complexity, it is easy to operate.

The Thermoanalyzer is designed to give a wide range of freedom in the control of important variables: an arrangement which permits simultaneous thermogravimetric analysis and differential thermal analysis on the same sample; weighings to ± 0.05 mg precision with loads up to 16 g; temperatures up to 1600° C and linear programming with ± 0.5° C accuracy.

The new instrument also provides a gas flow system which permits work in any environment—including corrosive gas atmospheres—at pressures down to 8×10^{-6} Torr; and a recorder simultaneously plots temperature, the TGA curve, a 10 x expansion of the TGA curve, the DTA curve, the first derivative of weight (DTG), vacuum pressure or other desired data.

The Thermoanalyzer's capabilities and applications can only be suggested here. If you would like complete performance and design information, write directly to Mettler Instrument Corporation, 20 Nassau Street, Princeton, N. J.

Mettler ®

New Products

High-speed microcentrifuge with a speed range of from 0 to 28,000 rev/min is designed to be used directly with the VirTis "45" Homogenizer or as a separate unit for a variety of tasks in medical, pharmaceutical, biological, and bacteriological laboratories. A rheostat provides speed variation of from 0 to 28,000 rev/min, with samples being subjected to a force of 40,000*g* at maximum speed. The unit processes a total volume of 2 ml at a time—0.5 ml in each of four butyl acetate tubes. Samples are placed in the four tubes, which have nylon closures with "O" rings to prevent spillage, and the tubes are then placed in the stainless-steel centrifuge head. The centrifuge can be operated at full speed for 15 minutes without the sample temperature rising above 80°F, by placing crushed dry ice in the bottom section of the aluminum housing.—D.J.P. (VirTis Company, Inc., Gardiner, N.Y.)

Circle 1 on Readers' Service card

Laboratory timer provides accurate timing, from 15 seconds to 24 hours, with the convenience of turning an apparatus on or off. Actually a long- and short-range timer wired in tandem, the instrument eliminates the need for estimating between scale divisions or having two separate units. The timers which run simultaneously are synchronous motor types, 0 to 24 hours with 15-minute divisions, and 0 to 15 minutes with 15-second divisions. The unit handles 15-amp loads through separate color-coded receptacles—one for switching on and one for switching off an apparatus at the end of the interval. A flasher indicates the approaching end of the interval, and a buzzer sounds at termination. Either signal may be discontinued through the use of front-panel toggle switches.—D.J.P. (LaPine Scientific Co., 6001 S. Knox Ave., Chicago, Ill. 60629).

Circle 2 on Readers' Service card

Heated infrared gas cell (model GH-5) is designed for studying infrared spectra of gases and vapors from room temperature up to 250°C. The advantage of this cell over ordinary gas cells is that spectra of many substances which are solid or liquid at room temperature can be observed. The stainless-steel body of the gas cell has a bore in the form of a truncated cone to conform with the convergence of the spectrophotometer beam. It is heated by a 60-watt electric heater run directly from a 100-volt a-c supply or, preferably, from a variable transformer or energy regulator. Demountable cell windows are held in position at each end of the cell by screw-on caps hermetically sealed with silicone rubber O-rings fitted in rectangular grooves at each end of the cell body. Two window covers, with rectangular apertures, serve as thermal shields to prevent cooling of windows and consequent condensation of the sample on them. The heated gas cell is also equipped with a stainless-steel high-temperature vacuum value for evacuation of the cell and admission of gaseous samples. A silicone rubber septum is provided for admission of volatile liquid samples when the cell is under vacuum. Temperature of the cell is measured by a prepared iron-constantan thermocouple introduced into the cell through a silicone rubber seal. To prevent heat transfer from the cell to the spectrophotometer, the instrument is supplied with an asbestos V-block support. This heated gas cell has a path length of 9 cm and, with the two window covers in place, has an overall length of 10.8 cm. Standard windows supplied are NaCl or KBr, but other windows can be specially ordered. This cell can be used with all American and British spectrophotometers except the Unicam SP-100. A cell specifically designed for the Unicam instrument is the GH-7, which has a path length of 7 cm and an overall length of 8.8 cm. Its other design features duplicate those of the GH-5. Although designed specifically for the Unicam SP-100, the GH-7 also fits all other British and American spectrophotometers.—D.J.P. (Limit Research Corp. P. O. Box 852, Darien, Conn.

Circle 3 on Readers' Service card

Optical balance provides direct readout to 10 mg on a balance of 800-g capacity with an accuracy of ± 10 mg. The optical range of the balance is from 0 to 50 g in tenths of a gram, and direct readings to hundredths can be made accurately with the vernier. Weight-loading knobs on each side of the balance operate with either the right or left hand. Fast weighing by substitution is accomplished by turning either knob to remove weights in 50-g increments up to 750 g. For smooth operation and long life, the internal weight-loading mechanism has cams of Delrin and cam followers of Nylon. Direct taring to 40 g can be done by turning a knob on the side of the balance. For additional taring, a 100-g weight can be placed on the back pan of the balance. The balance operates on the torsion principle, with conventional knife edges replaced by three torsion bands supported by trusses, and with all bearings eliminated. A silicone fluid dashpot can be adjusted to damp oscillations and bring the balance to rest almost immediately. The weighing pan, 6 inches in diameter, is of stainless steel. The unit measures 16½ by 12⅝ by 7½ inches and requires 110 volts, 60 cy/sec a-c.—D.J.P. (Torsion Balance Co., Clifton, N.J.)

Circle 4 on Readers' Service card

Recycling chromatography apparatus applicable to analytical as well as preparative separations is intended for fractionating complex solutions of substances by gel filtration. In recycling chromatography the sample is passed many times through the same column so that the effective height of the bed is increased greatly without extremely

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The material in this section is prepared by the following contributing writers:

Robert L. Bowman (R.L.B.), with the assistance of Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writers assume responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on pages 1109 and 1227. Circle the department number of the items in which you are interested on this card.

long columns with their inherent disadvantages. Components which cannot be resolved either on simple chromatographic columns of moderate length or by other methods (for example, electrophoresis and ultracentrifugation) are often separated easily by this technique. Beyond the better resolution which can be attained, recycling chromatography has a number of other advantages over previous separation methods. The progress of separation can be observed after each cycle and the experiment stopped when the components of interest have attained their optimal separation. Completely separated components, and uninteresting or disturbing parts of the effluent, may be bled out of the system after any cycle, while the remaining components are allowed to continue separation. The causes of an asymmetrical peak can be revealed by studying its development from cycle to cycle. The system is composed of four interconnected main subunits which can be assembled on a special cart: a separation column, a selector valve, a peristaltic pump, and a flow analyzer. These units are separately available for incorporation into other instrument systems. The Plexigum columns, fitted with adjustable plungers at both ends, are specially constructed to permit flow in either direction and can be sealed completely to eliminate the water-head pressure. These features ensure that the flow rate, even through beds of materials with low mechanical strength (gels), does not fall off with use. Columns in two standard lengths, 60 and 100 cm, both with 32-mm bore, are available at present. The peristaltic pump has a pumping rate continuously variable from 0 to 390 ml/hr with a flow constancy of 0.5 percent over a period of several days. The selector valve is used to divert the stream from open to closed circuit. Open circuit is used when introducing the sample, bleeding out selected parts of the effluent, equilibrating the column with buffer, and running a single-cycle separation, as during a pilot separation. Closed circuit is used during recycling. The valve will operate under a pressure head of 18 kg/cm² and its holdup when in the recycling position is only 150 μl. The plunger heads in the column, and the valve channels, are machined to keep turbulence in the stream to a minimum. LKB manufactures three instruments suitable as the flow analyzer, namely, the UVICORD UV absorptiometer, the Conductolyzer for continu-

ous conductivity measurement, and a multichannel absorptiometer for the visible range. Introduction of the sample is reproducible and noncritical, being carried out simply by immersing the inlet capillary tube into the dissolved substance, opening the valve, and switching on the pump until the desired volume has been sucked up.—D.J.P. (LKB Instruments, Inc., 4840 Rugby Ave., Washington 14, D.C.)

Circle 5 on Readers' Service card

Vacuum system modifiers seal glass or metal components vacuum tight to systems through the use of O-rings with glass screw threads and fluorocarbon screw caps. Helex adapters consist of two O-rings positioned and confined by a Teflon bushing, fluorocarbon screw cap and a ground and fire-polished glass screw thread end. The O-rings are confined in all directions so that when they are compressed they deform in a way to make maximum use of their sealing properties. These adapters can be employed for vacuums to 1×10^{-7} mm-Hg and temperatures to 200°C. No greases or waxes are required and the adapters are highly inert. Helex connectors with screw threads formed on standard wall tubing are available with outside diameters of 20, 28, and 38 mm. Adapters are available to match these connector sizes to tubing with outside diameters of 6, 8, 10, 13, 16, and 19 mm.—D.J.P. (Polytechnical Products Co., P.O. Box 517, Vineland, N.J. 08360).

Circle 6 on Readers' Service card

Standard microspheres are stable nonaggregating polymeric microspheres in various support media designed for primary counting calibration of electronic gate, optical, acoustical, and fluorescent particle counters. "Micules" afford a reliable counting yardstick for erythrocytes, leucocytes, platelets, bacteria, spores, molds and inorganic particles in aqueous and nonaqueous media. Particle number standardization is accomplished by classical gravimetric and microphotometric methods. The controlled parameters feasible are: (i) any diameters 1 to 500 μ, (ii) surface characteristics from highly polar to nonpolar, (iii) densities of 1.01 to 2.00 g/cm^3, (iv) isotopic labeling with standard radioisotopes, fluorescent dyes, and (v) any desired osmotic character and other design characteristics. —D.J.P. (Microspheres, Inc., 931 Commercial St., Palo Alto, Calif.)

Circle 7 on Readers' Service card

NEW BOOKS

(Continued from page 1176)

Antimicrobial Agents and Chemotherapy, 1963. Proceedings, Third Interscience Conference (Washington, D.C.), October 1963. J. C. Sylvester, Ed. American Soc. for Microbiology, Ann Arbor, Mich., 1963. 820 pp. Illus. $12.

Aphasia in Adults: Diagnosis, Prognosis, and Treatment. Hildred Schuell, James J. Jenkins, and Edward Jiménez-Pabón. Harper and Row, New York, 1964. 440 pp. Illus. $12.

An Approach to Dental Prosthetics. D. C. Berry and J. K. Wilkie. Pergamon, London; Macmillan, New York, 1964. 127 pp. Illus. $4.75.

The Bacteria. A treatise on structure and function. vol. 5, *Heredity*. I. C. Gunsalus and Roger Y. Stanier, Eds. Academic Press, New York, 1964. 533 pp. Illus. $16.

Bacterial Endotoxins. Proceedings of a symposium (New Brunswick, N.J.), September 1963. Maurice Landy and Werner Braun, Eds. Rutgers Univ. Press, New Brunswick, N.J., 1964. 707 pp. Illus. $12.

Bacteriologia y Virologia Medicas. Eustaquio Roch. Editorial Porrua, Mexico City, 1964. 645 pp. Illus.

The Basis of Human Evolution. Bertram S. Kraus. Harper and Row, New York, 1964. 396 pp. Illus. Paper, $4.75; cloth, $6.50.

The Biochemical Aspects of Hormone Action. A symposium (St. Louis, Mo.). 1962. Albert B. Eisenstein, Ed. Little, Brown, Boston, 1964. 256 pp. Illus. $8.50.

Biochemistry and Behavior. Samuel Eiduson, Edward Geller, Arthur Yuwiler, and Bernice T. Eiduson. Van Nostrand, Princeton, N.J., 1964. 566 pp. Illus. $15.

Biochemistry of Phenolic Compounds. J. B. Harborne, Ed. Academic Press, New York, 1964. 628 pp. Illus.

The Biochemistry of Semen and of the Male Reproductive Tract. Thaddeus Mann. Methuen, London; Wiley, New York, 1964. 517 pp. Illus. $16.50.

Biologie de l'Amérique Australe. vols. 1 and 2, *Études sur la Faune du Sol*. Delamare Debouteville and Eduardo Rapoport, Eds. Éditions du Centre National de la Recherche Scientifique, Paris. vol. 1, 657 pp., Illus., 1962; vol. 2, 399 pp., Illus. $16.60.

Biology of the Antarctic Seas. vol. 1. Milton O. Lee, Ed. American Geophysical Union, Washington, D.C., 1964. 88 pp. Illus. $10.

The Biology of the Trace Elements. Their role in nutrition. Karl H. Schütte. Lippincott, Philadelphia, 1964. 248 pp. Illus. $8.

Bleeding in the Surgical Patient (*Ann. N.Y. Acad. Sciences*, **115**, art. 1). Harold E. Whipple, Ed. New York Acad. of Sciences, New York, 1964. 546 pp. Illus. Paper, $7.

Bone and Tooth. Proceedings of a conference (Oxford, England) April 1963. H. J. J. Blackwood, Ed. Pergamon, London; Macmillan, New York, 1964. 443 pp. Illus. $15.

Cellular Fine Structure. An introductory student text and atlas. James A. Freeman and Jack C. Geer. McGraw-Hill, New York, 1964. 208 pp. Illus. $9.50.

The Chemical Origin of Life. Alexander I. Oparin. Translated from the Russian by Ann Synge. Thomas, Springfield, Ill., 1964. 152 pp. Illus. $6.75.

The Chemistry of Some Life Processes. Vernon H. Cheldelin and R. W. Newburgh. Reinhold, New York; Chapman and Hall, London, 1964. 128 pp. Illus. Paper, $1.95.

Chemotherapie maligner Tumoren. Dosierungsprobleme—Untersuchungen zum Wirkmechanismus von Cyclophosphamid. Bielefelder Symposion, November 1962. Hilmar Wilmanns, Ed. Schattauer, Stuttgart, Germany, 1964. 228 pp. Illus. DM. 32.

The Conduction of the Nervous Impulse. A. L. Hodgkin. Thomas, Springfield, Ill., 1964. 108 pp. Illus. $5.50

Congenital Malformations. Second International Conference (New York), July 1963. Compiled and edited by the International Medical Congress. The Congress, New York, 1964. 456 pp. Illus.

Cunningham's Textbook of Anatomy. G. J. Romanes, Ed. Oxford Univ. Press, New York, ed. 10, 1964. 1028 pp. Illus. $22.50.

Dynamic Pathology. Structural and functional mechanisms of disease. Maurice M. Black and Bernard M. Wagner. Mosby, St. Louis, Mo., 1964. 296 pp. Illus. $8.

The Ecology of Rocky Shores. J. R. Lewis. English Universities Press, London, 1964. 335 pp. Illus. 42s.

Electron Microscopic Anatomy. Stanley M. Kurtz, Ed. Academic Press, New York, 1964. 437 pp. Illus. $14.

Electronic Aspects of Biochemistry. Proceedings of a symposium (Ravello, Italy), September 1963. Bernard Pullman, Ed. Academic Press, New York, 1964. 598 pp. Illus. $20.

Environmental Biology. vol. 1. R. F. Morgan. Pergamon, London; Macmillan, New York, 1963. 254 pp. Illus. Paper, $2.95.

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