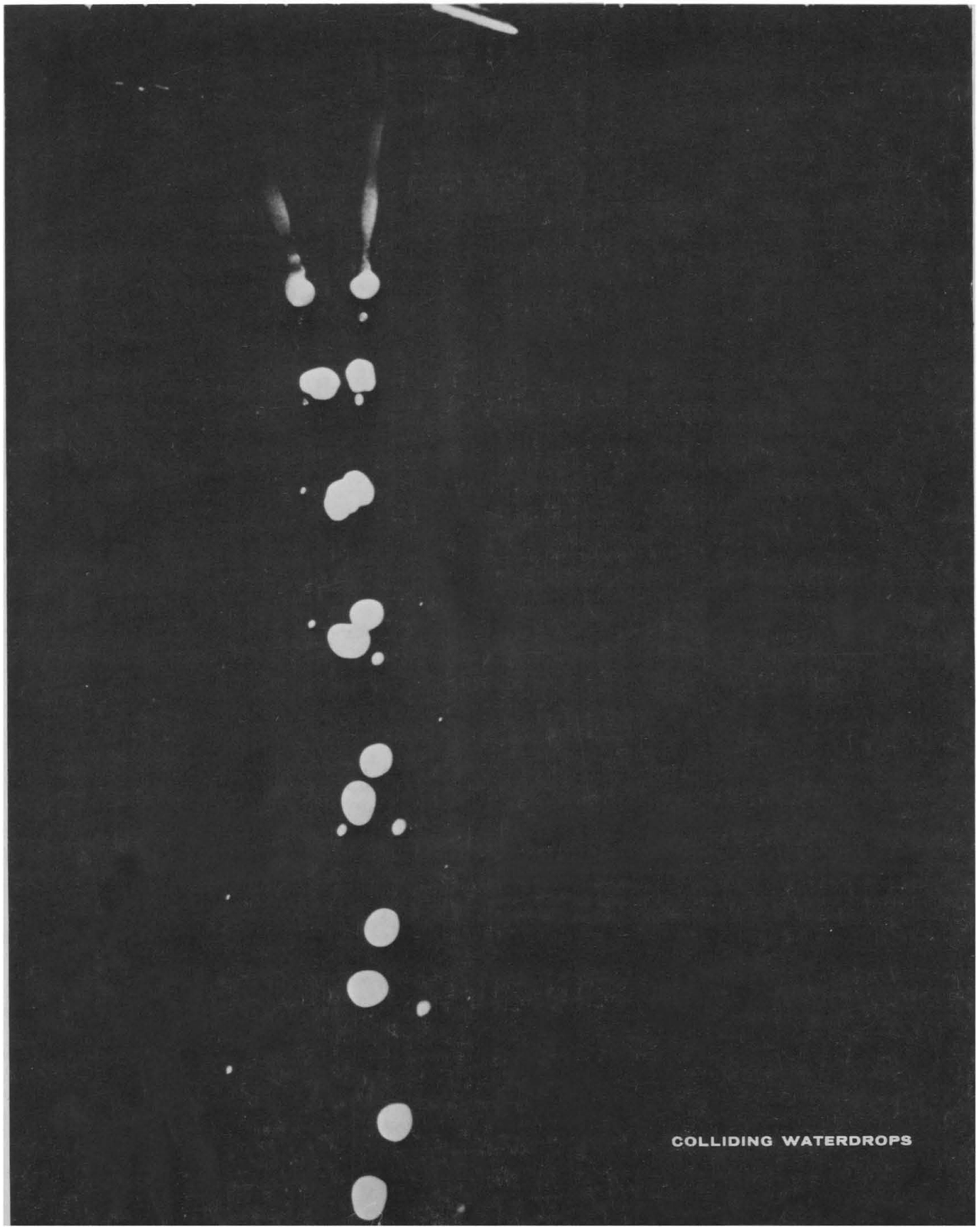
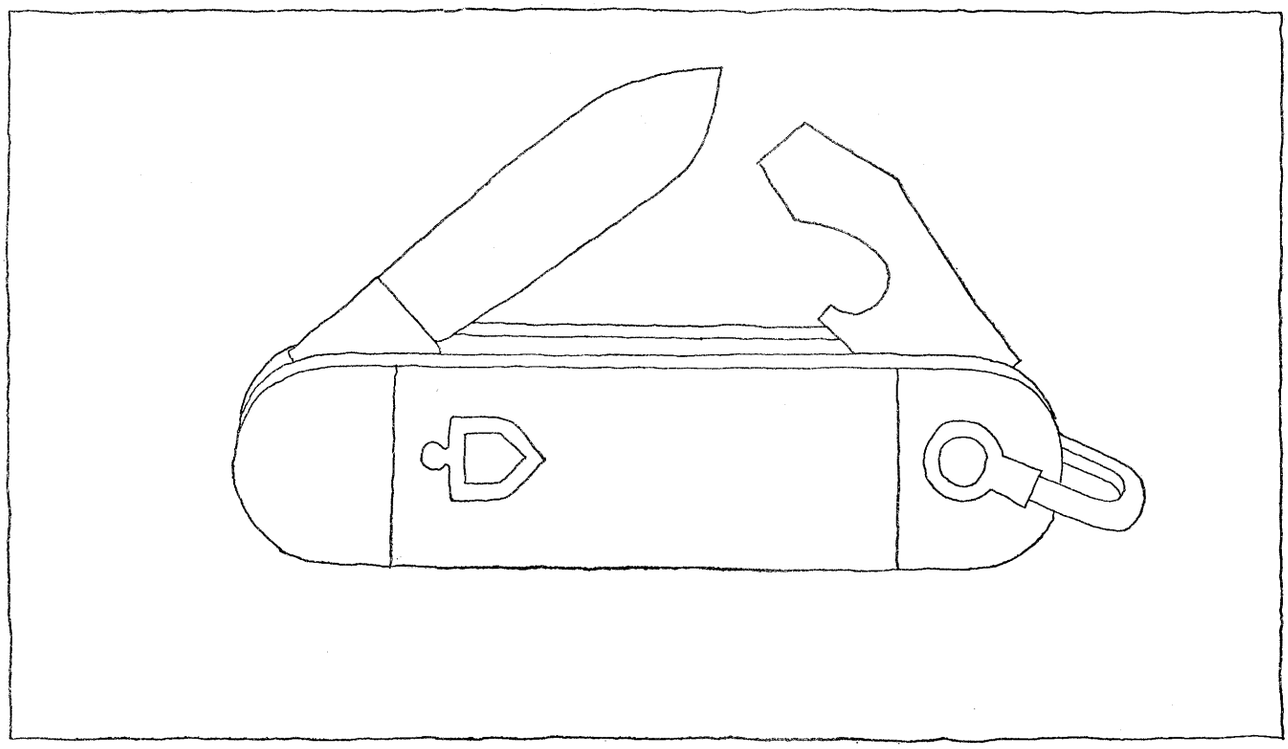
SCIENCE 5 November 1965
Vol. 150, No. 3697
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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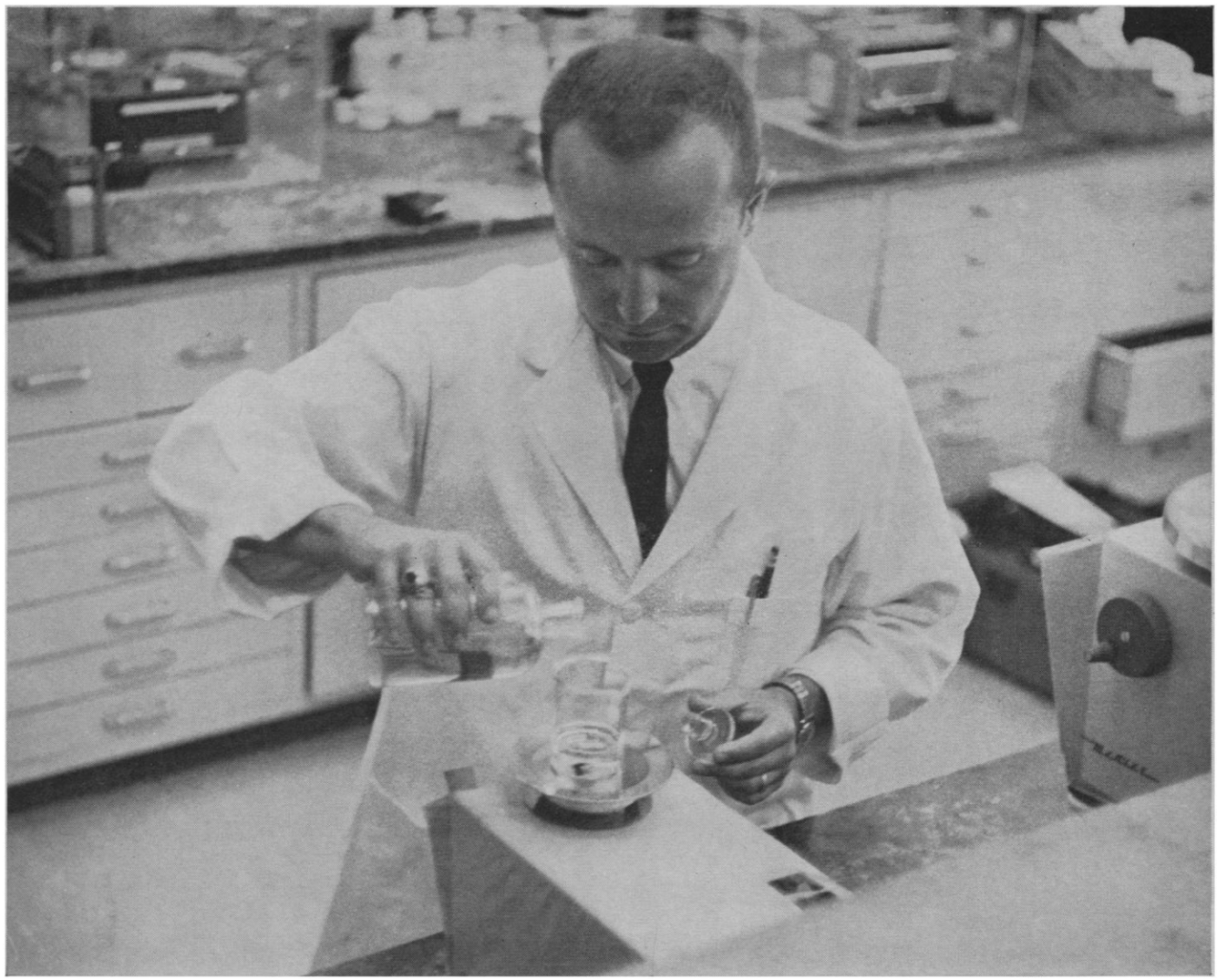

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Vol. 150, No. 3697

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COVER

A drop of water making contact with the top of another drop. If the relative velocity between two colliding drops is less than about 40 centimeters per second, the two drops approach each other and interact sufficiently to produce visible deformation. The drops recoil without coalescence if their initial relative kinetic energy is small and if no appreciable electric field is superimposed. See page 695. [Ross Gunn, American University]

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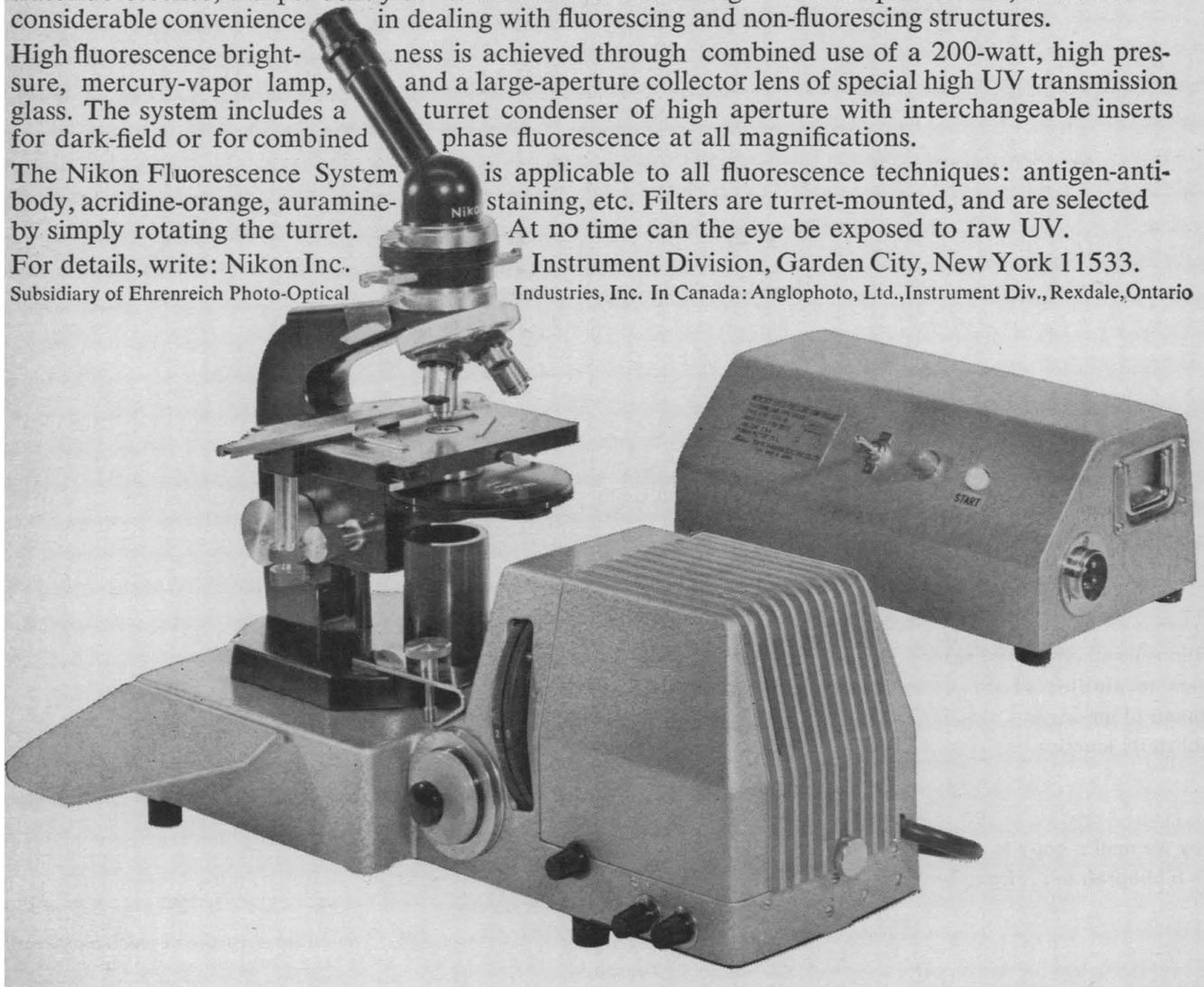

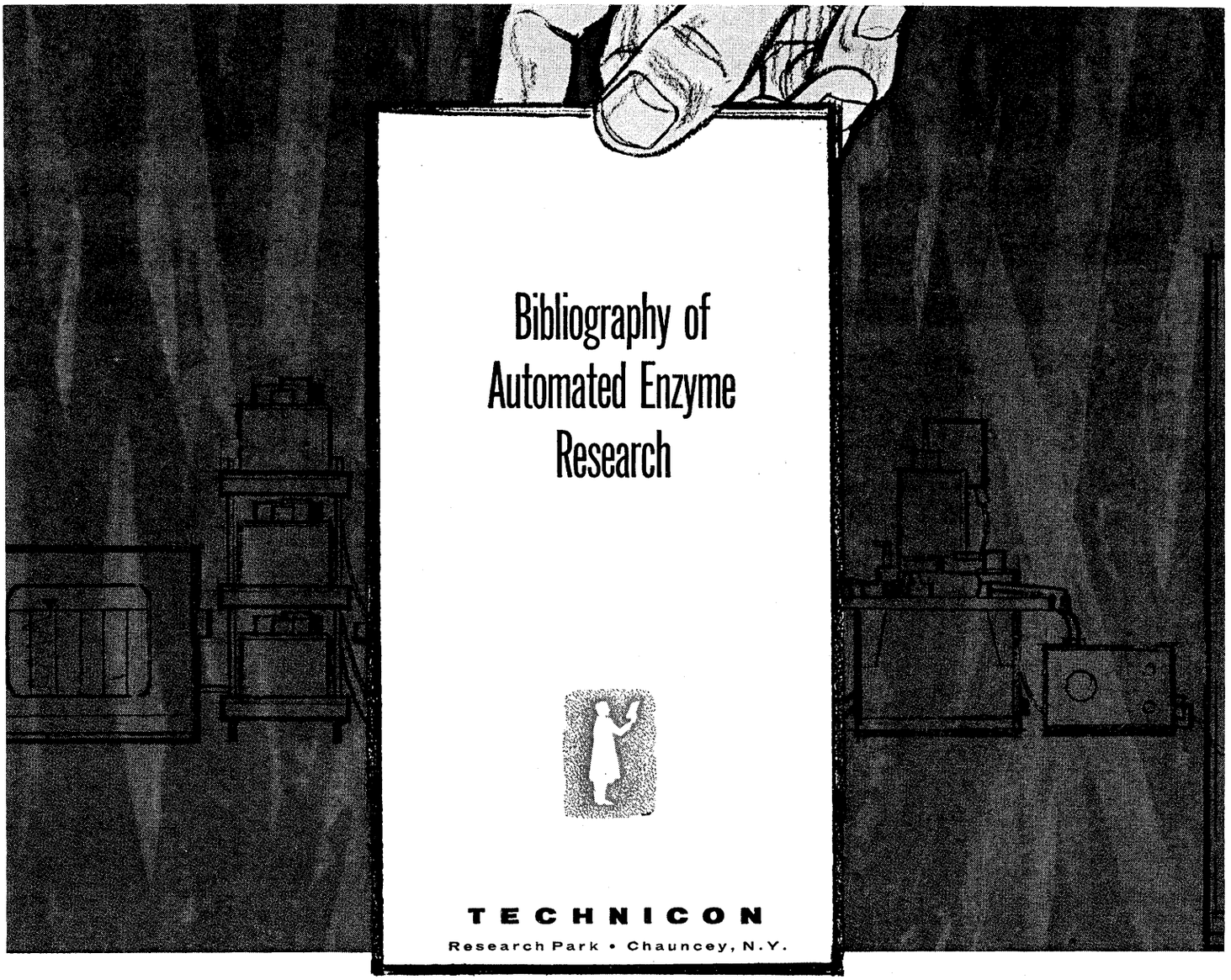

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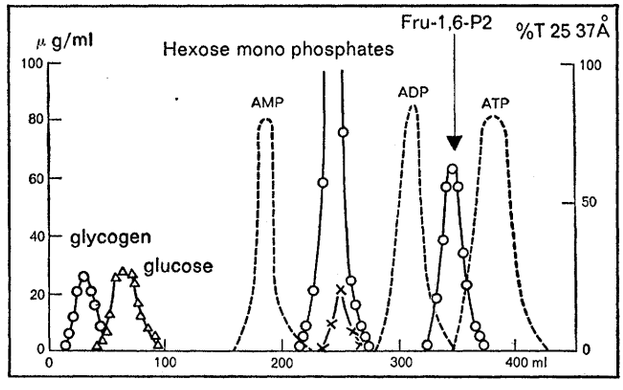

Model experiment with glycogen, glucose, sugar phosphates and adenosine phosphates on a column of DEAE-Sephadex A-25. Reproduced from Biochim. Biophys. Acta 74 (1963) 588, by permission of the author.

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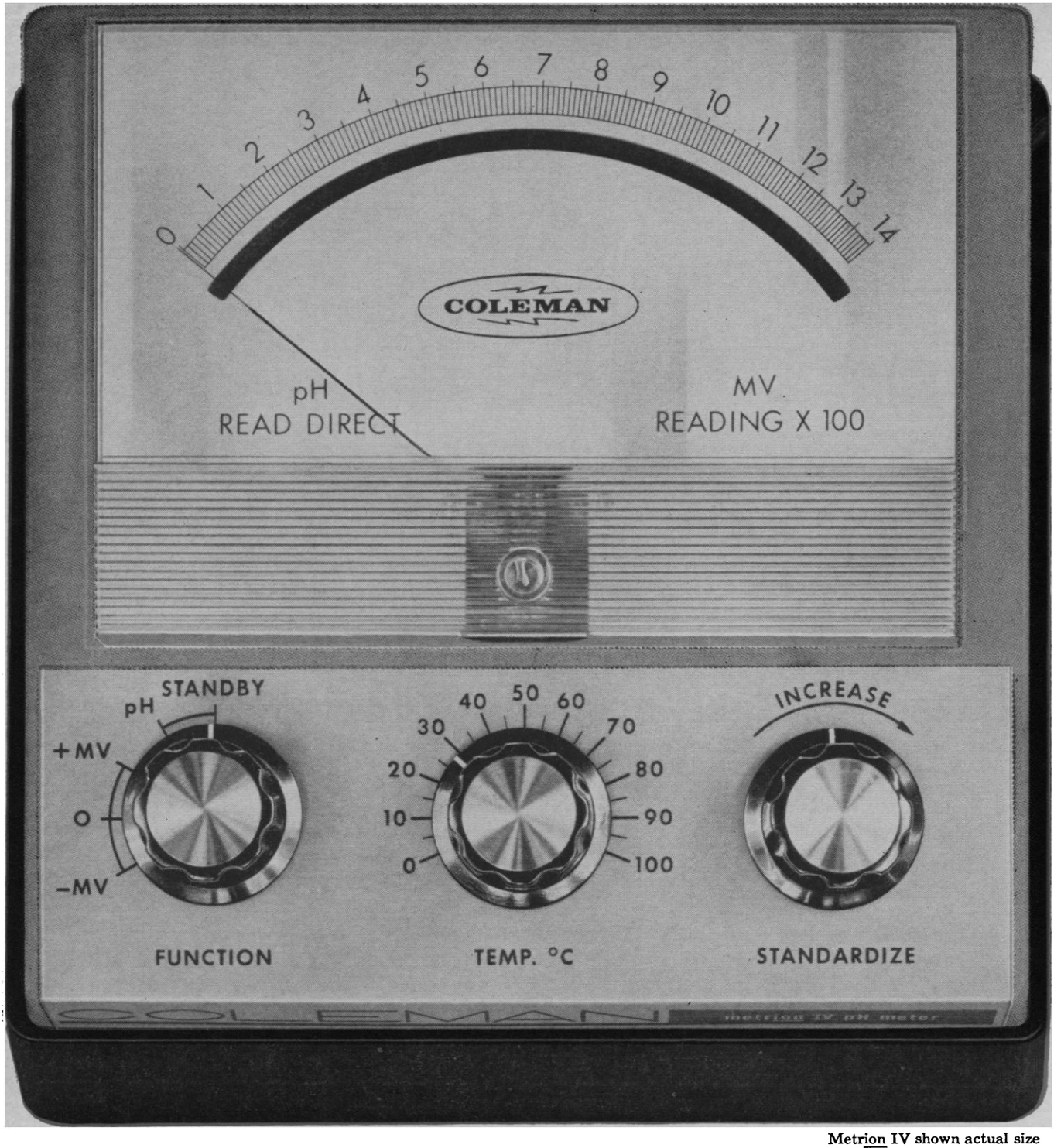

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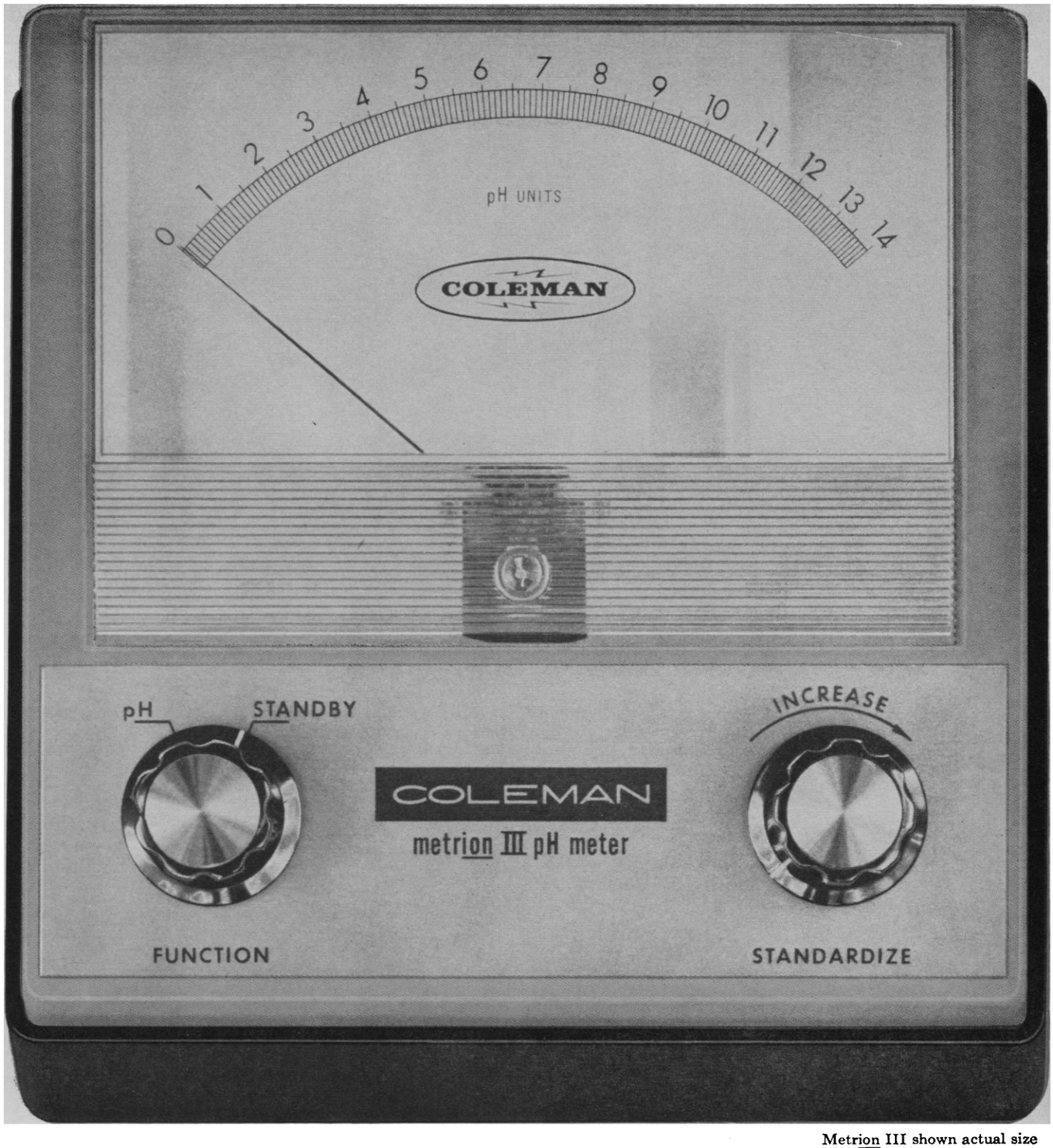

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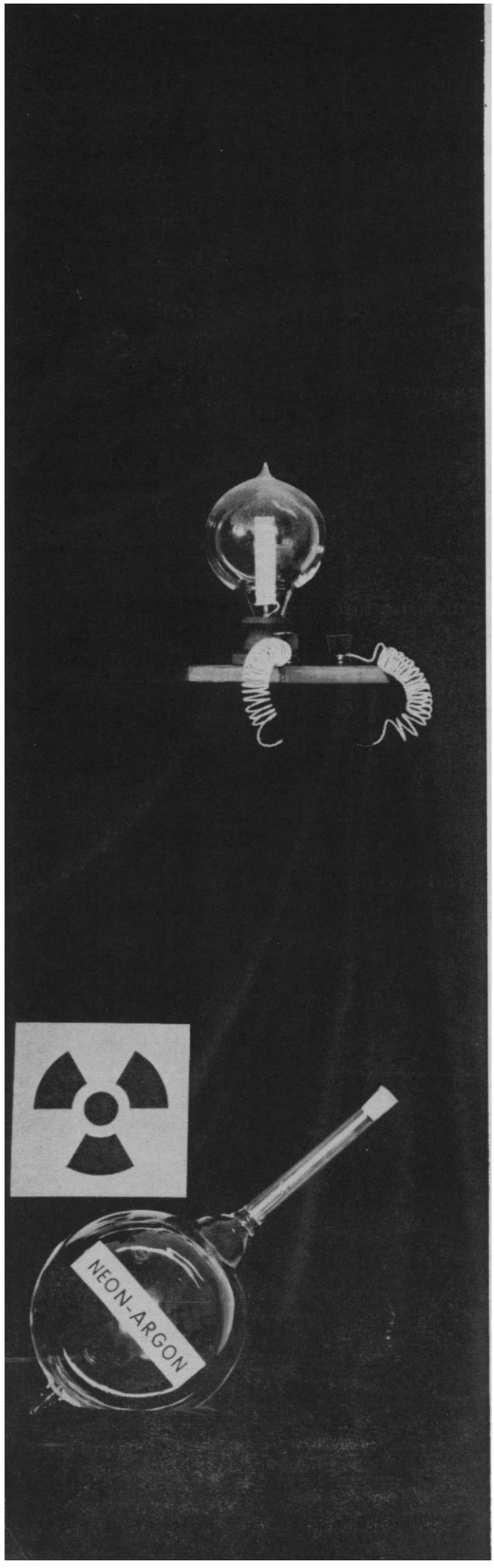

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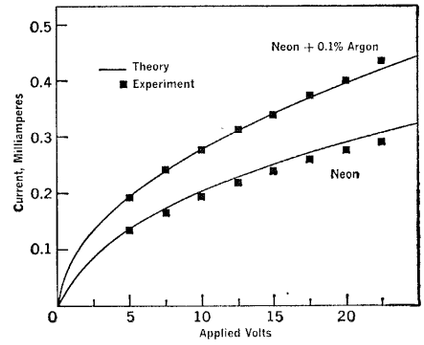

Characteristics of tubes filled with gases ionized by fission fragments. Resulting current is a function of ion generation rate, which is increased greatly (from 1.8 to 2.6 x 10^{16} ions per cm^3 per sec) by small addition of argon.

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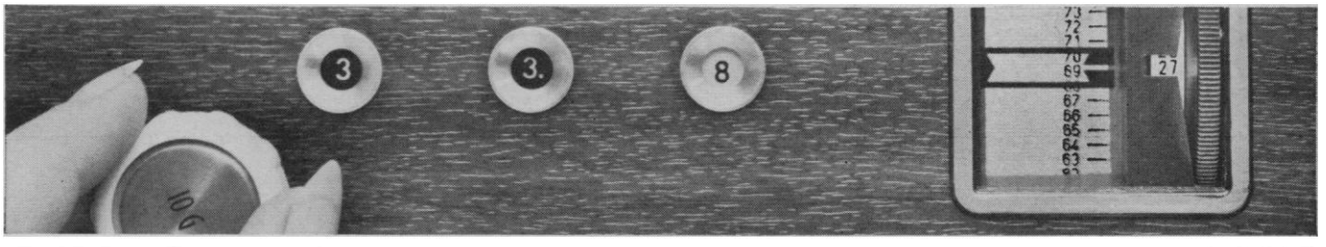

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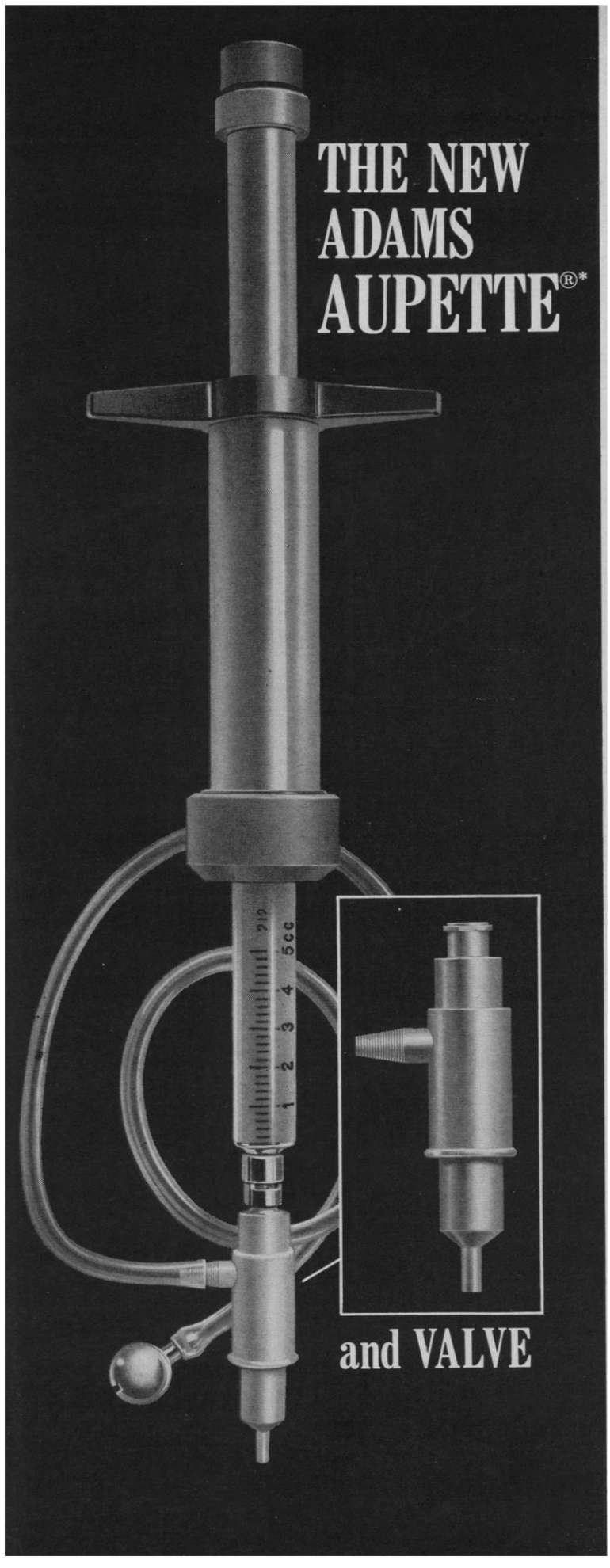

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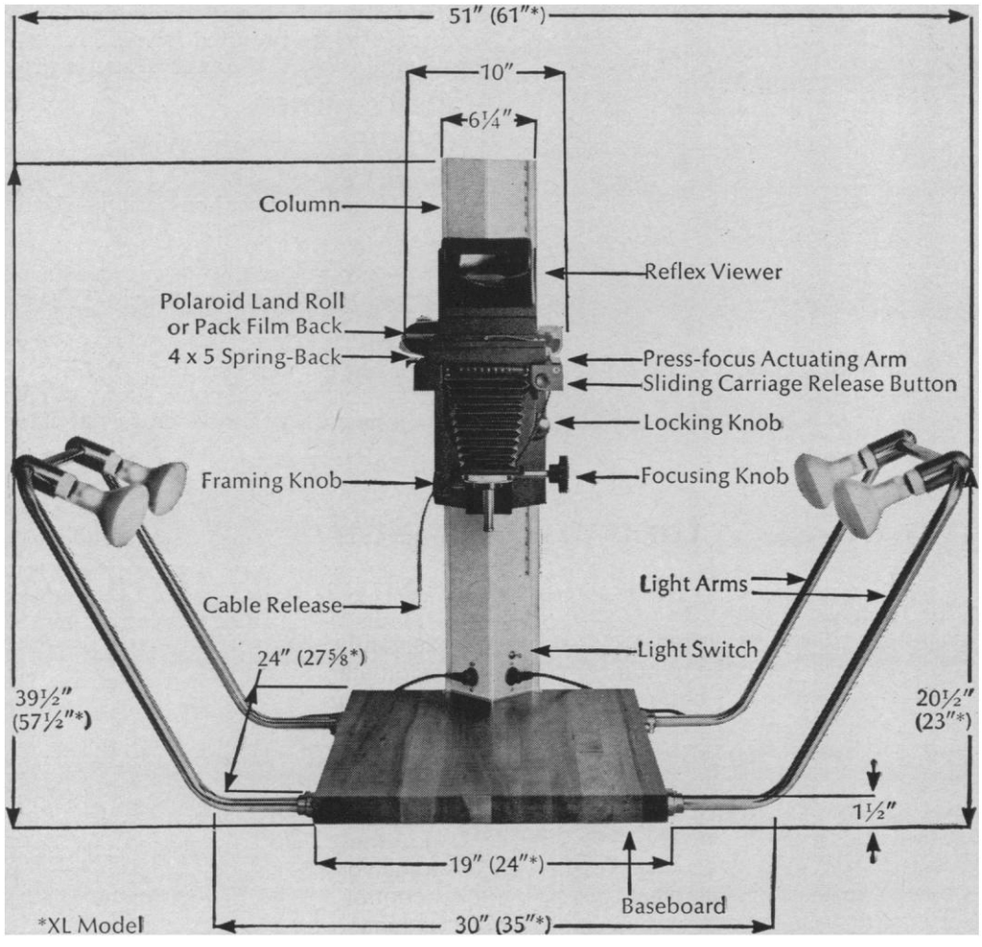

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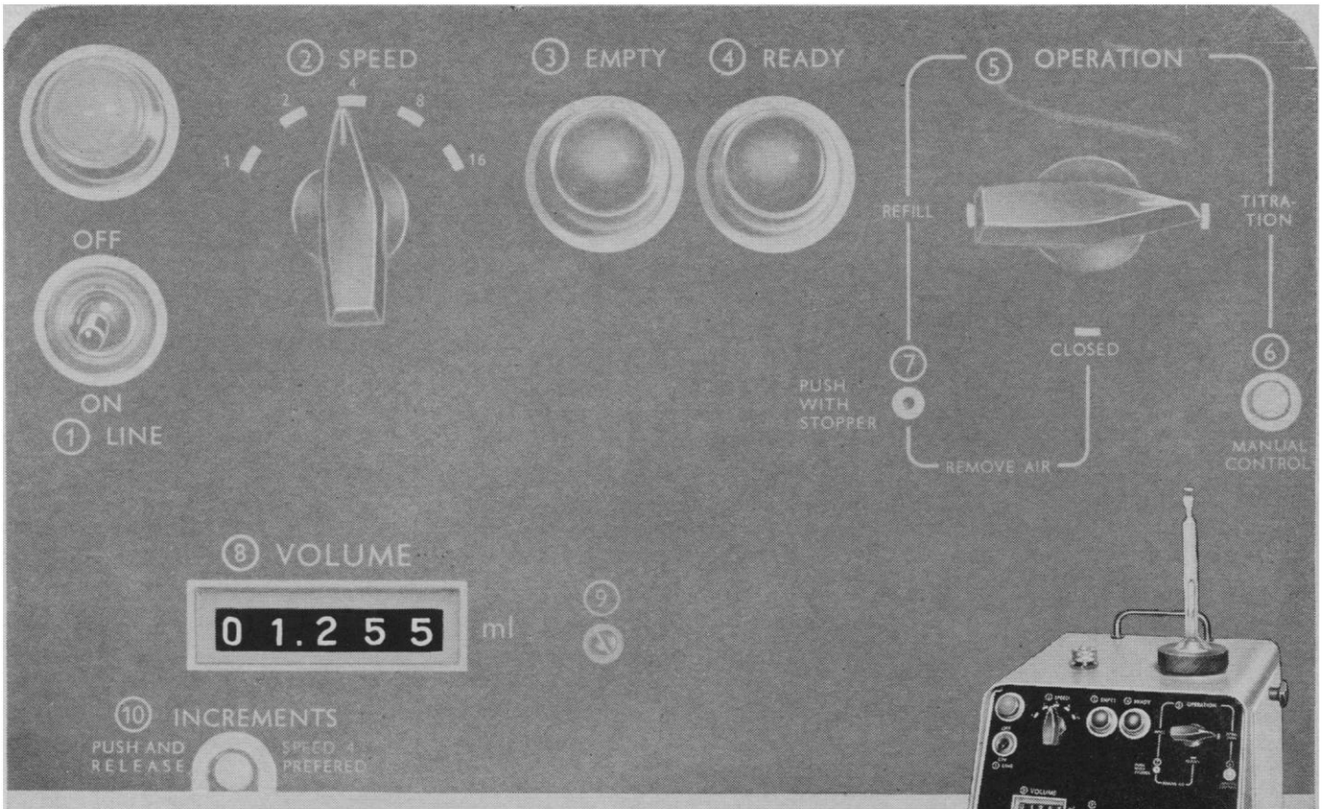

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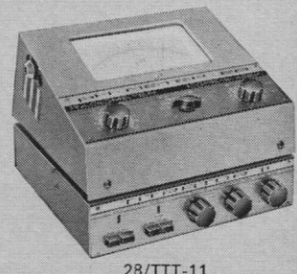

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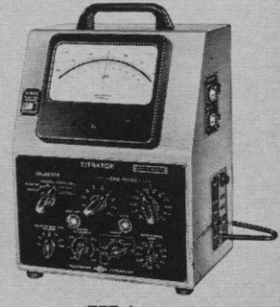

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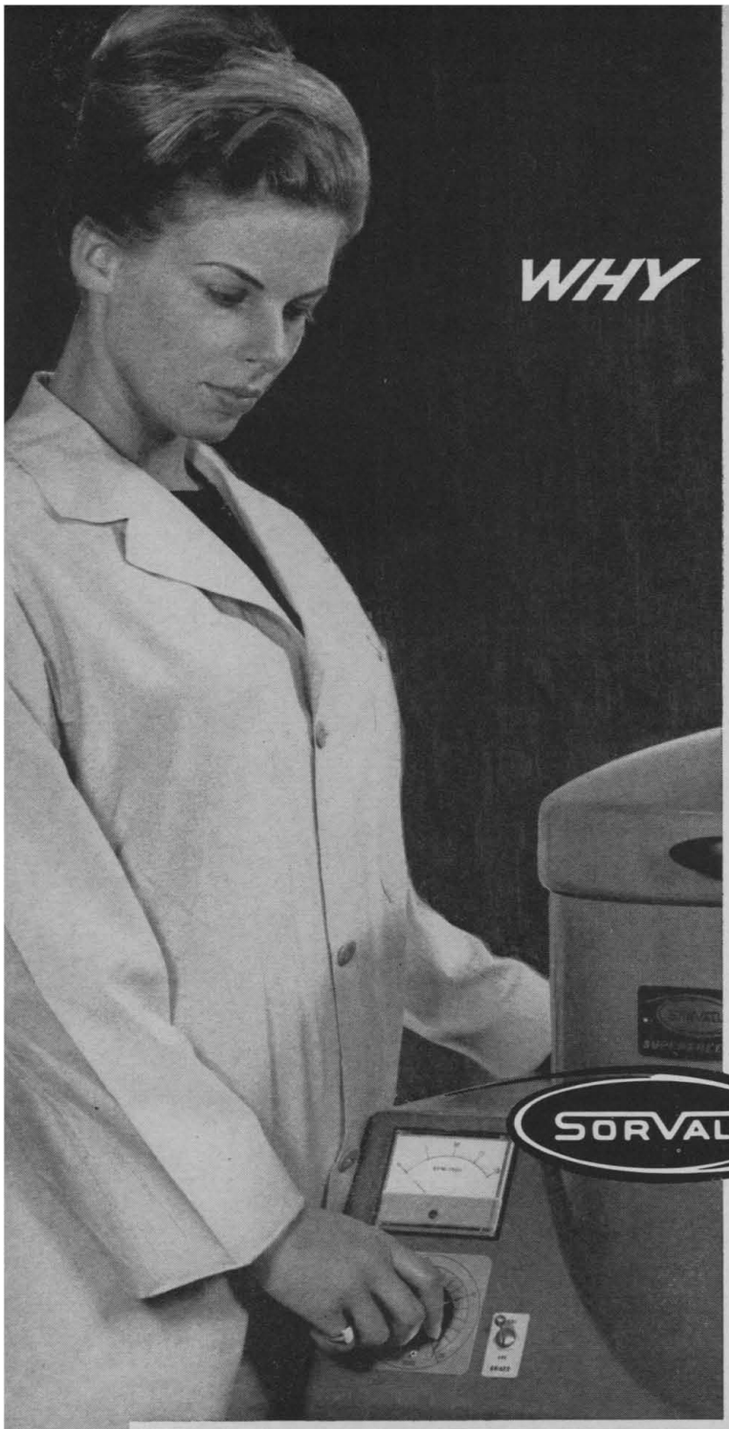

WHY SUPERSPEEDS?

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-11SS.

Ivan Sorvall, Inc.
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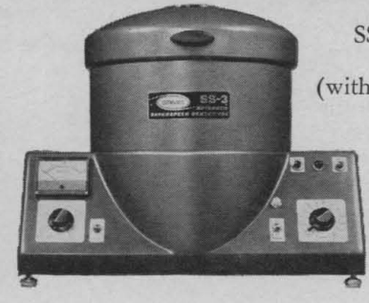
SORVALL CENTRIFUGES SERVE YOU BEST

*Patented



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

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

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

HITACHI PERKIN-ELMER ULTRAVIOLET VISIBLE GRATING SPECTRO-PHOTOMETER

The Model 139 Grating Spectrophotometer, a compact, precise modern instrument, out performs similar spectrophotometers costing significantly more.

Check these features: High resolution grating Monochromator — gives exceptional radiation purity in transmittance / absorbance measurement from 205 to 800 millimicrons; Direct reading meter — presents measurements in both transmittance and absorbance quickly and accurately; Single wide-range phototube — covers the entire range from 205 to 800 millimicrons, eliminates need to change even at wavelength extremes; Dual Hydrogen/Tungsten lamp source assembly — has high energy output, gives instant switching from one source to the other; Direct line-operated power supply — is stable, fully transistorized, eliminating batteries and drift problems; Low cost — brings the advantages of modern instrumentation to any laboratory with unmatched economy and superior performance.

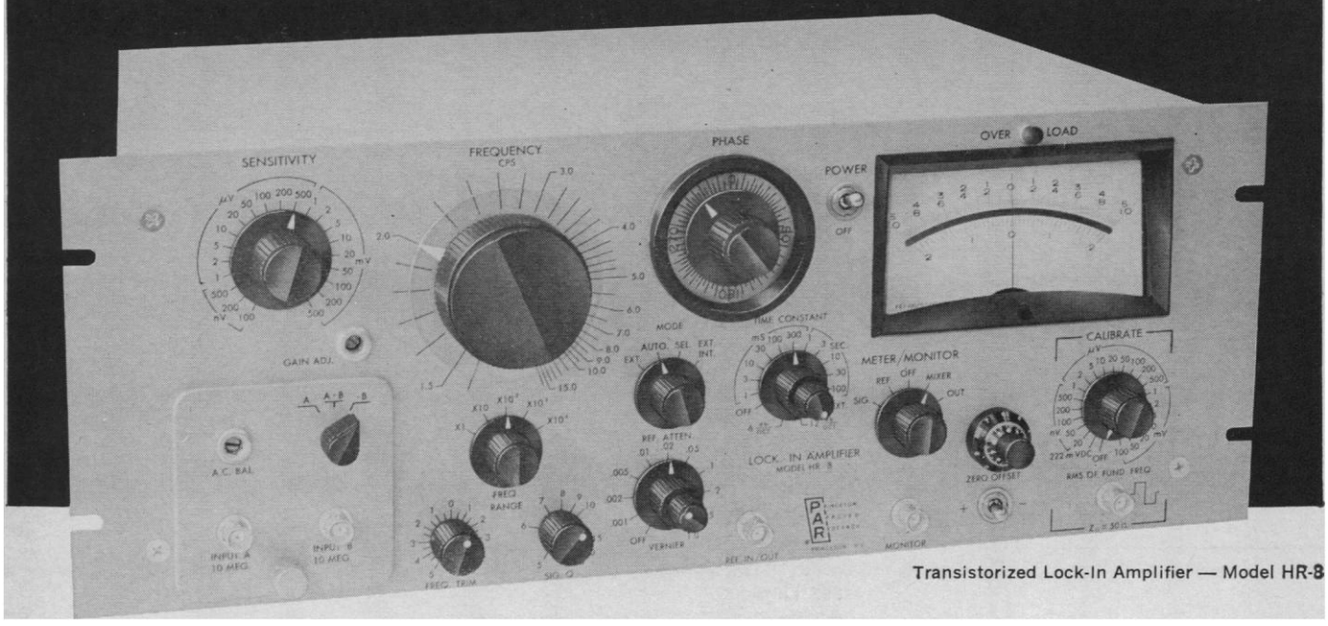
The five basic functional units, in combination, provide the analyst with a fully integrated instrument for the rapid and precise analysis of any sample by absorption measurement.

For details see your Aloe Scientific representative or write Aloe Scientific, ⓑ Division of Brunswick, 1831 Olive Street, St. Louis 3, Mo.

Serving the Sciences that Serve Mankind

ALOE SCIENTIFIC

New PAR Lock-In Amplifier Measures Signals in the Presence of Noise by Crosscorrelation



Transistorized Lock-In Amplifier — Model HR-8

The PAR Model HR-8 Lock-In Amplifier represents a significant advance in signal processing equipment for experimentalists who must measure low-level signal intensities in the presence of noise. It employs the theoretically optimum technique for signal recovery, and can be incorporated into a large class of experiments in which the signal of interest is, or can be made periodic, and in which a reference voltage related in frequency and phase to the signal can be obtained. The Model HR-8 first amplifies and bandlimits the input signal and then crosscorrelates it with the reference signal, suitably phase shifted and shaped. The crosscorrelation of input and reference signals yields a DC output voltage proportional to the signal of interest, while the crosscorrelation of the reference and noise results in no net DC voltage. The system can also be described as a continuously integrating, highly sensitive, phase conscious voltmeter, the response of which is "locked" to that particular frequency and phase at which the signal information has been made to appear.

Technical Features:

Frequency Range: 1.5 cps to 150 KC continuously tunable in 5 ranges.

Time Constants: 11 values in 1-3 sequence extending from 0.001 to 100 seconds. Single or double section RC filtering.

Pre-Amplifiers: Interchangeable low-noise pre-amplifiers, operable either within the HR-8 or remotely, are used.
Type A: Differential 10 megohm input.
Type B: Low impedance transformer input for low source impedances.

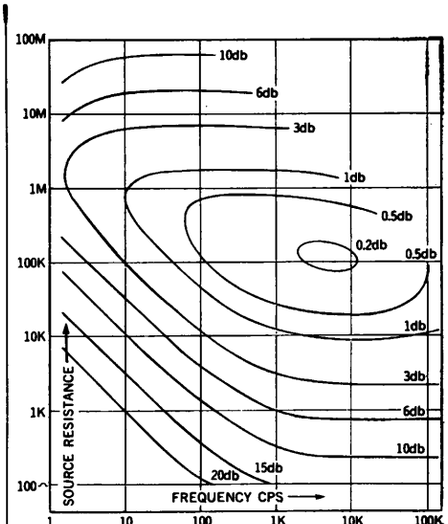
Sensitivity: 21 calibrated full scale ranges in 1-2-5 sequence.
With Type A Pre-Amplifier: 100 nanovolts to 500 millivolts rms.
With Type B Pre-Amplifier: 1 nanovolt to 5 millivolts rms.

Output: ± 10 volts full scale, single-ended with respect to ground. Will drive galvanometric and servo recorders.

Frequency Selective Amplifiers: Notch network in negative feedback loop used in both signal and reference channel tuned amplifiers. Reference channel Q of 10. Signal channel Q adjustable from 5 to 25 with calibrated dial (no gain change with Q adjustment).

Phase Adjustment: Calibrated 360° phase shifter, providing continuous rotation as well as a four position quadrant switch which shifts phase in 90° increments.

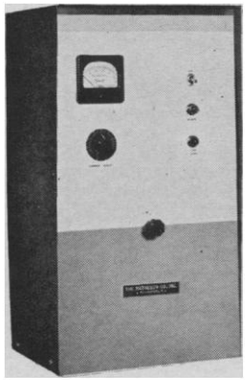
Price: $2,250 with either Type A or Type B Pre-Amplifier.



Contours of constant noise figure for a typical PAR Type A preamplifier plotted to show dependence on frequency and source resistance at 300° K. Amplifier operated single-ended.

Write for bulletin No. 120 on the HR-8 or ask for information on PAR's complete line of Lock-In Amplifiers and accessories.

New Equipment from Matheson

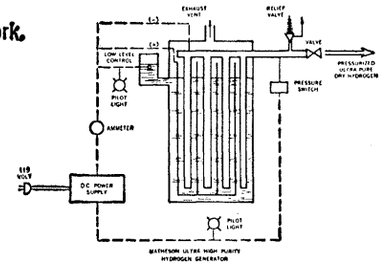


Ultra-High Purity Hydrogen Generator

Produces dry hydrogen under pressure for less than 2¢ per 100 liters. Impurities less than 1:100,000,000. Eliminates contamination possibility. unit is especially applicable for gas chromatography and semi-conductor work.

Generator operates on new principle and is self regulating. Uses only water & electrical energy. Assures continuous hydrogen at pressures to 60 p.s.i.g. Rated capacity: 150 milliliters per minute. (0.31 scfh.) Hydrogen is produced as required to rated capacity. Easy to install & operate. Needs no maintenance.

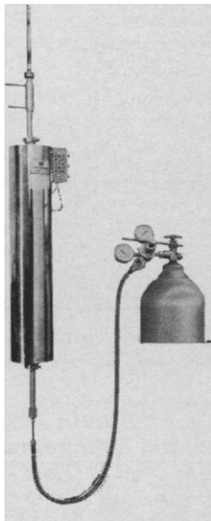
Generator consists of electrolytic cell, rectifier, regulating valves & switches. Electrolytic cell anode is nickel; cathode is bundle of palladium-alloy tubes. Electrolyte is strong alkali. During electrolysis, oxygen collects at anode and is vented to atmosphere. Ionic hydrogen is deposited at cathode. Ions drawn by electrolytic solution pressure penetrate tubes and recombine to form molecular hydrogen under pressure. Mail coupon for data.



Mass Flowmeter

Highly accurate and stable direct reading unit for wide range of flow rates for practically all gases. Needs no ambient temperature correction from 40°F. to 200°F. Needs no gas pressure correction from 0.1 to 250 p.s.i.a.; 2% accuracy in these ranges.

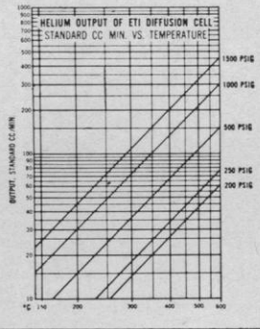
Measures gas flow down to 0.01 standard cc/min. even for hydrogen or helium. Measurement repeatability within 1%. Can be used with recorders. Output signal approximately 0-2 mv. d-c. Once installed, needs no recalibration. Circuity is 100% solid state for maximum reliability. Flow transducer withstands extreme vacuum, pressure and flow rates Comes in 4 basic flow ranges. Mail coupon for data.



New Helium Diffusion Cell Purifier

Produces low-cost, ultra-pure helium continuously from commercial cylinder helium without use of liquid nitrogen-cooled absorbents. Total impurity levels as low as 1:2,000,000. Produces pure helium at 1% the cost of Research Grade helium yet 10 to 20 times purer.

Output of pure helium up to 450 cc/min (0.95 CFH), with inlet pressure of 1500 p.s.i.g. Even at cylinder pressures as low as 200 p.s.i.g., flow rates sufficient for most gas chromatography applications (50 cc/min) are realized. (See graph.) May be installed in any position. Supplied complete with pressure regulator to attach to CGA 590 standard helium cylinder and high pressure flexible metal transfer line.



Mail Coupon Now! The Matheson Company, Inc., P.O. Box 85, East Rutherford, N.J.
Please send the following literature:

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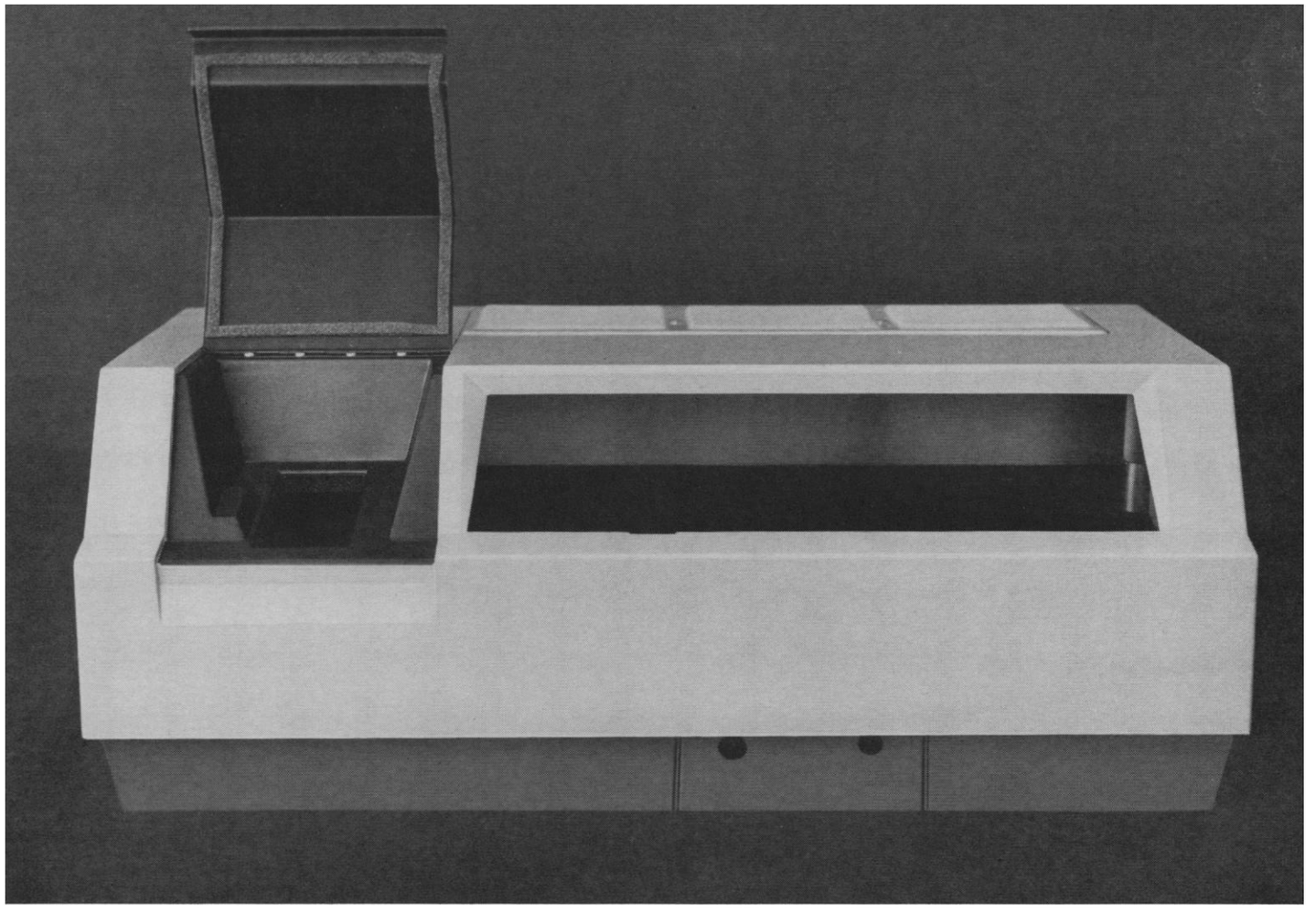


This is a case for something new...

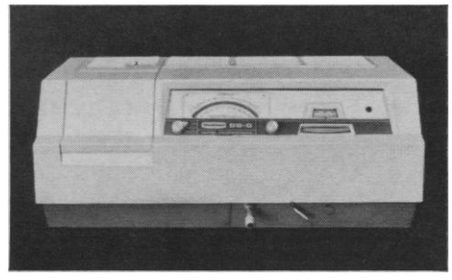
A new DB® Spectrophotometer? Yes, Beckman now offers the proven performance of the DB Spectrophotometer in a new grating version. It's called the DB-G Grating Spectrophotometer. It sells for $2595 — only $225 more than the prism DB. Both versions, which are identical except for optics, give you these advantages:

Wavelength Range. The 205-770 mμ range of the DB is extended to 190-700 mμ in the new DB-G. Add an inexpensive detector and go to 800 mμ with the DB-G. Both instruments give high resolution and wavelength accuracy, plus the proven performance common to Beckman Spectrophotometers.

Dependability. Both use time-proven electronics and optics. Since their introduction five years ago, several thousand DB Spectrophotometers have established an outstanding record of dependable service.

Rapid, simple operation. Set the desired wavelength, insert the sample and reference, and read the meter. Ten minutes training and even your least experienced technician can operate the DB. And the double-beam design saves 60-80% of the time required for routine single-beam analysis.

Versatility. A full line of low-cost accessories greatly enhances the use of DB Spectrophotometers. Add a Beckman recorder to either version and you have a precision, double-beam, ratio-recording instrument priced at a thousand dollars less than comparable instruments. Other accessories permit wavelength scanning, reflectance studies, and atomic absorption measurements.



Does this sound too good to be true? Call your local Beckman Sales Engineer and have him show you both prism and grating DB Spectrophotometers. Or write for Data File LUV-165. You get a lot more than you expect when you get a Beckman DB Spectrophotometer.

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It provides complete, detailed information about all the sessions and symposia scheduled, the Annual Exposition of Science and Industry, and the Science Theatre.

Program Highlights

Moving Frontiers of Science: F. Clark Howell on Significant Advances in Human Evolutionary Studies; Norman F. Ness on A New Look at the Earth's Magnetic Field; Jerome Y. Lettvin on Physiological Basis of Mental Activity; and William M. Fairbank on Some Aspects of Low Temperature Physics.

AAAS Distinguished Lecture: Genetics and Cultural Change by George W. Beadle, president, University of Chicago.

Interdisciplinary Symposia: Ground-level Climatology; Proteins and Nucleic Acids; Materials Science in Medicine, Dentistry, and Pharmacy; Behavior, Brain, and Biochemistry; Mathematical Bases in Economic Planning.

Special Sessions: AAAS Presidential Address on Antarctica: Continent of International Science by Laurence M. Gould; the Joint Address of Sigma Xi and Phi Beta Kappa by J. Bronowski; the George Sarton Memorial Lecture by Stillman Drake on "The Accademia dei Lincei"; and the National Geographic Society Illustrated Lecture.

AAAS Committees: Special Program of the AAAS Committee on Council Affairs on Civil Defense: Speakers: Eugene Wigner, Wolfgang Panofsky, Owen Chamberlin, Fred Payne, Barry Commoner, Bentley Glass, and Anatol Rapoport, moderator, and Henry Eyring, chairman; Committee on Desert and Arid Zones Research.

Lawrence Hall of Science: Director Harvey E. White will lecture twice on this splendid Center of Science Education, 27 and 29 December.

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AAAS Science Theatre: The latest foreign and domestic films.

Exhibits: The Annual Exposition of Science and Industry is on the lower level of the ASUC Student Center, AAAS Headquarters.

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5. FIELD OF INTEREST .....

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Please mail this coupon and your check or money order for the total amount to the AAAS in Washington, D.C. (address as shown)

MEETING • 26-31 DECEMBER

Make Your Reservations

Make sure you have the sleeping accommodations you prefer. Since this is a campus meeting—and the ASUC Student Center is AAAS headquarters—society headquarters will be mainly in university buildings.

Hotel and Motel Information. A deposit of $5 is required by all hotels and motels. Deposits are credited toward the final bill, and are refunded if cancellation is received not later than 10 days before the date of your reservation. Make checks payable to the AAAS Housing Bureau.

Residence Hall Information. Accommodations are available for one or two persons per room, for couples, and for children 14 years or older. Hours for room registration at the Hall are 8:00 a.m.–10:30 p.m. daily. The full amount for room, with or without meals, is collected in advance. There is a special charge for overnight 30 December (no meals December 31): $6.00 single occupancy, $5.00 per person double. Parking is 50¢ per 24-hour day. The general deadline for residence hall reservations is 10 December.

For more details on all of the above facilities and services, see the 23 July issue of Science, page 454.

The hotel, motel, and residence hall sleeping accommodations are for your convenience in making your room reservation in Berkeley. **Please use the coupon below and send it and any necessary deposit directly to the AAAS Housing Bureau in Berkeley.** Give a definite date and estimated hour of arrival, and also your probable date of departure. The Housing Bureau will make the assignment and promptly send you a confirmation.

Rates per Day

HOTELS	Single	Double	Twin	Suite	Parking
Claremont (300)	$11.00	$15.00	$15.00		Free
Durant (200)	8.50*		12.00*	$18.00-22.00	50¢, $1.00
Shattuck (250)	8.50	11.00	14.00	25.00-35.00	Public
* A few single rooms at $5.50, twins at $7.50.					
MOTELS					
Berkeley House (112)	9.50	13.50	13.50	25.00-28.00	
Berkeley Plaza (52)	7.00	8.50	9.50	15.00	
Berkeley Travelodge (46)	8.00	10.00	11.00		
California Motel (42)	6.50	7.00	8.00		
Golden Bear (44) (and others)	7.00-8.00	8.00-10.00	10.00-12.00	18.00	

RESIDENCE HALLS

Single occupancy—$7.50 without meals; $8.50 with breakfast and lunch
Two in a room—$6.50 each without meals; $7.50 each with breakfast and lunch

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AAAS Housing Bureau
P.O. Box 210
Berkeley, California 94701

Date of Application ..... Deposit of $..... enclosed

Please reserve the following accommodations for the 132nd Meeting of the AAAS in Berkeley, 26-31 December 1965

First Choice of Hotel, Motel, or Residence Hall .....**Second Choice** .....

Type of room: Single ☐ Double bed ☐ Double, twin beds ☐ Suite ☐ Rate: Desired ..... Maximum rate.....

Number in party ..... Sharing this room will be: .....
(List name and address of each person, including yourself. Attach list if space is insufficient.)

.....

DATES: ARRIVAL ..... A.M. .....P.M. ..... DEPARTURE .....
(These must be indicated—add approximate hour, A.M. or P.M.)

NAME .....
(Individual requesting reservation) (Please print or type)

ADDRESS .....
(Street) (City) (State) (ZIP Code)

Mail this coupon now to the AAAS Housing Bureau. Enclose hotel or motel room deposit if needed. Make checks payable to AAAS Housing Bureau. All rooms will be assigned and confirmed in order of receipt of reservation.

IN APRIL, 1963 (IEC) INTRODUCED THE FIRST 60,000 rpm preparative ultracentrifuge.

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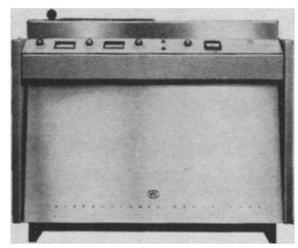
IN APRIL, 1964 (IEC) INTRODUCED THE FIRST lifetime-rated rotors.

IN APRIL, 1965 (IEC) INTRODUCED THE FIRST complete preparative ultracentrifuge system with volumes to 2000 ml.

Anyone for follow-the-leader?

The essence of leadership is to lead. These advancements in ultracentrifugation, the new landmarks that help perfect the state of the art, are all IEC innovations.

The latest IEC achievement is another technological breakthrough: a complete ultracentrifuge preparative system with capabilities in both large volumes and ultra-high gravities unequalled by any prior instrumentation. These ultracentrifuges are at work now in laboratories like yours. They are worthy of your most serious consideration. Write today for new, detailed brochure.

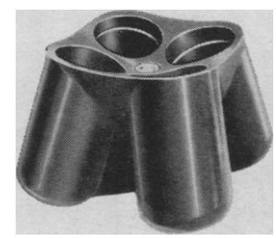


THE NEW IEC B-35 ULTRACENTRIFUGE

For large volume, plus high gravities. Heavy duty. Versatile. Can swing two liters at 28,500 g; 400 ml at 147,100 g; 6 x 15 ml at 206,200 g. Electronic temperature controls. Precise vacuum system. Barely audible noise level.

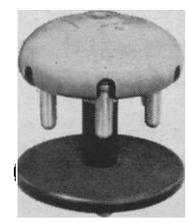
THE NEW IEC B-60 ULTRACENTRIFUGE

Speeds to 60,000 rpm, gravities to 405,900 g. Silicon oil diffusion pump produces vacuum to 0.5 μ. Ultra quiet. The ultimate in preparative instrument sophistication.



THE NEW IEC A-28 ROTOR

4 x 500 ml at 28,500 g — and no derating ever! 600 ml more than any other rotor at this gravity level. Larger volumes save significant time in preparative work.



THE NEW IEC SB-405 ROTOR

405,900 g . . . long-tube configuration, and no derating ever! This titanium rotor handles six 5 ml tubes at 60,000 rpm. Produces high resolution gradient definitions, never before obtainable.

INTERNATIONAL (IEC) EQUIPMENT CO.

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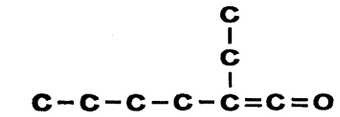
Eastman Briefs
FOR NOVEMBER

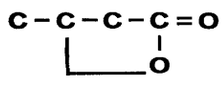


Butyl Ethyl Ketene

Form ..... *yellow liquid*
Boiling point, 12 mm. ..... *36° C.*
Flash point, T.O.C. ..... *18° C.*

Not quite so ravenously reactive as ketene itself, B61 still reacts readily with anything sporting an active hydrogen or double bond. When you get your sample (20% in hexane) read the instructions about storage carefully. Physical data above are for undiluted BEK.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B61**

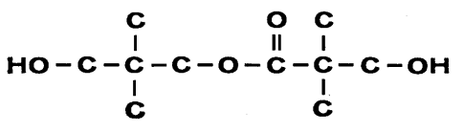


β-Butyrolactone

Form ..... *colorless liquid*
Specific gravity, 20°/20° *1.0409*
Refractive index, n_D^{20} *1.4772*
Flash point, C.O.C. ..... *80° C.*

The fact that you can open the ring on either side of the oxygen makes BBL a versatile as well as reactive compound. It's useful, as you can understand, in preparing butyric, β-hydroxybutyric, and crotonic derivatives.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B62**

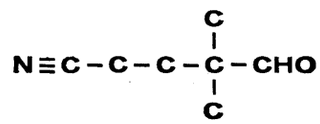


Hydroxypivalyl Hydroxypivalate (Neopentyl Glycol Monohydroxypivalate)

Form ..... *crystalline solid*
Melting point ..... *51-53° C.*
Boiling point, 1 mm. ..... *120° C.*
Molten color, APHA ..... *90 ppm*

An interesting new glycol for developing polyester, urethane and other resins, plasticizer and more complicated molecules, HPHP offers a pleasing and useful near-symmetry based on the stable neopentyl configuration. The hydroxyls are nicely reactive, the internal ester link not overly so.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B67**

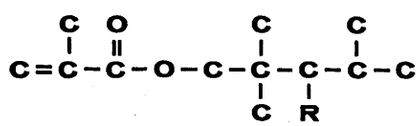


4-Cyano-2,2-dimethylbutyraldehyde

Form ..... *colorless to amber liquid*
Specific gravity, 20°/20° C. *0.9498*
Boiling point, 5 mm. ..... *92-94° C.*
Assay, minimum *98%*

To save breath we call this compound ibanitrile, or more simply, IBAN. Should you want a sample and a technical data sheet covering a few of its hydrolysis reactions, condensations, oxidations and reductions, use the handy coupon.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B68**



R is OH or $CH_2C(CH_3)COO$

Trimethylpentanediol Methacrylates

Form ..... *liquid*
Ester ratio, approximate ... *70% di; 30% mono*
Inhibitor ..... *20 ppm*

This mixture of monomers has obvious applications in polymerization reactions. T_g can be raised, solvent resistance improved, and numerous other rheological and chemical properties modified. The inhibitor is hydroquinone monomethyl ether.

Eastman Chemical Products, Inc.
Kingsport, Tennessee **B69**

Chemicals Sales Development Dept.
Eastman Chemical Products, Inc.
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Please send more data on these chemicals:

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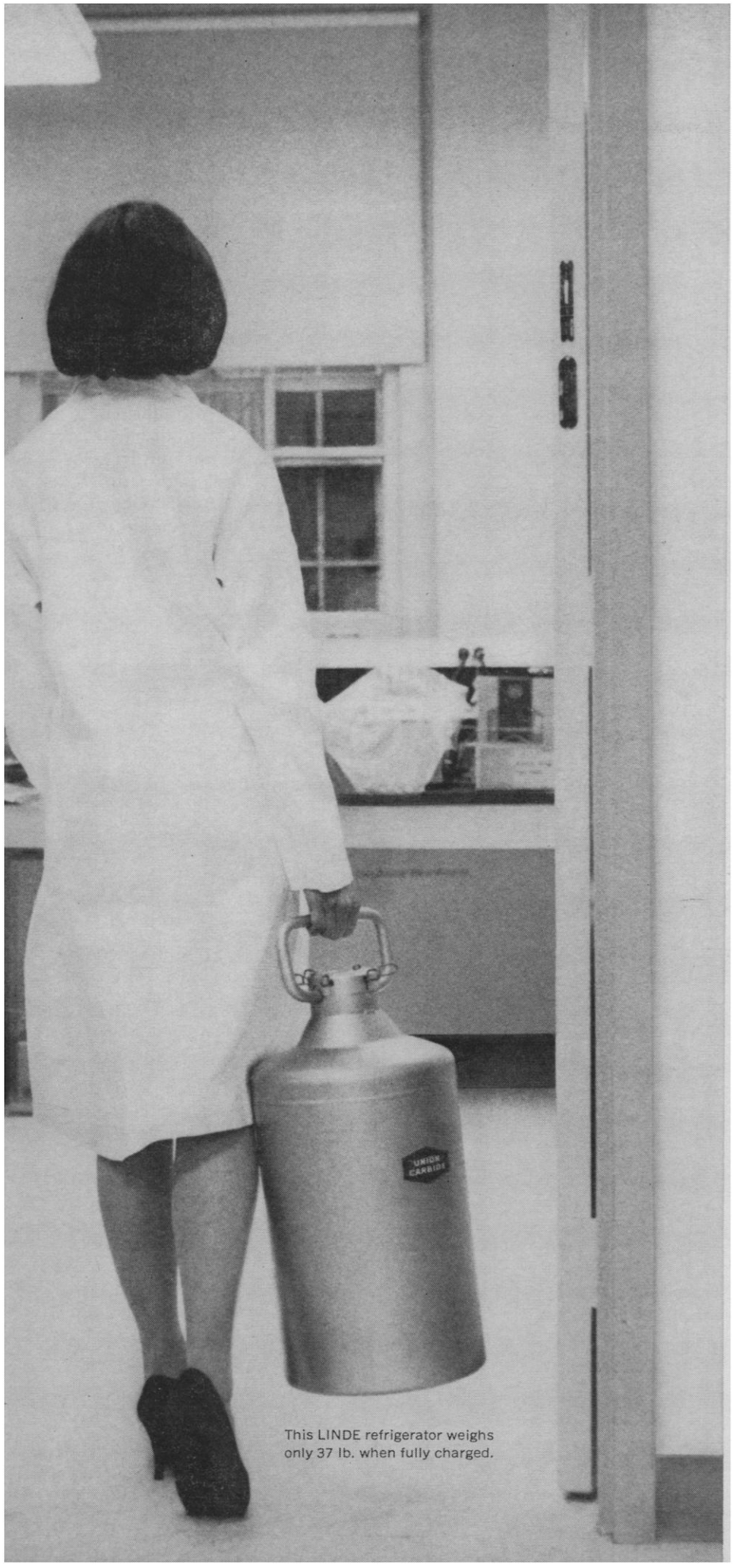

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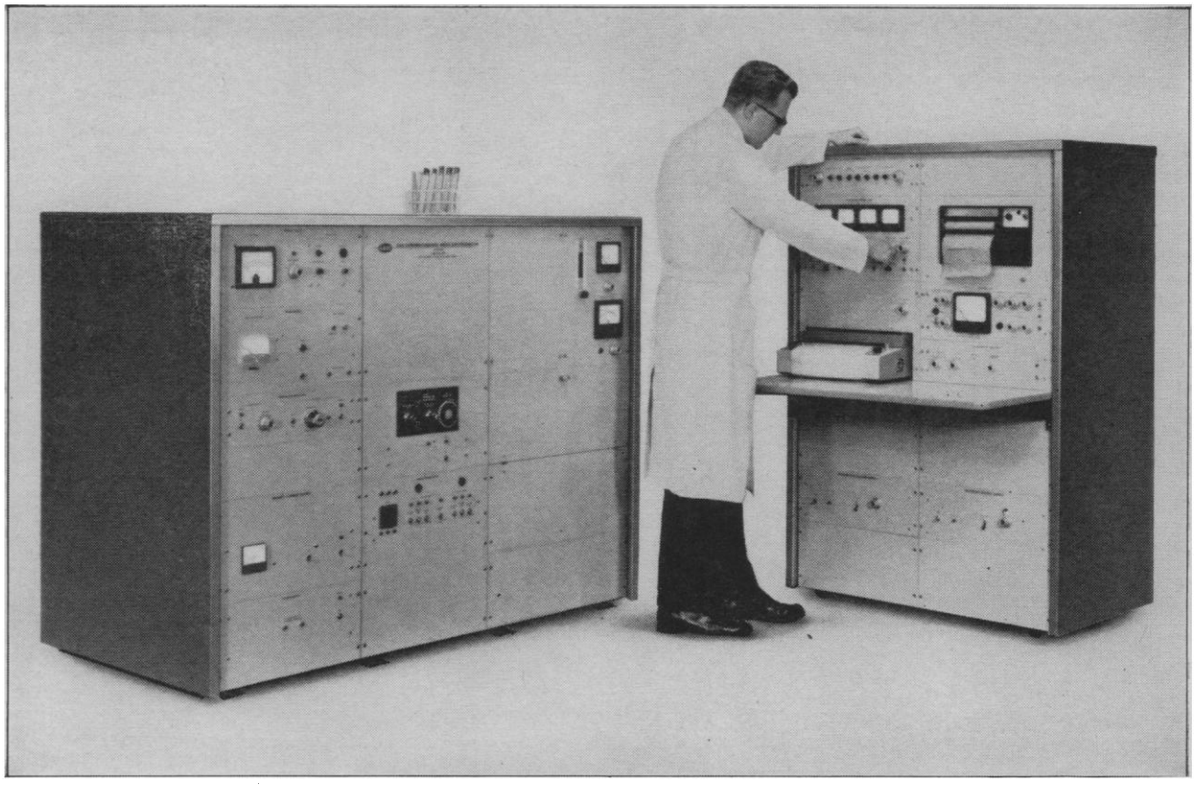

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The plan circumvents rivalry from groups in different parts of the country. (The possibility of building the quadrants in smaller units that could pass through the St. Lawrence Seaway and be assembled in Lake Erie or Lake Michigan has not been ruled out.) Also, four different parts of the country could be given contracts for building the four arc-shaped platforms. (Already, a bid has been received from a Japanese shipbuilding firm experienced in building supertankers.) Since these four quadrants—and the linac structure and the experimental hall structures—could be built simultaneously in different shipyards, as much as 2 years could be saved relative to the time needed to construct a fixed synchrotron.

Only in the last few weeks has the last and thorniest problem been solved: the problem of radiation beamed toward a particular part of the city adjacent to the harbor in question. If an emergent beam were aimed toward a certain portion of the city, persons living there would receive, during a typical month, five or ten times the permissible dose (from muons, which are fundamentally aquatic and can travel freely in water). The solution is to mount a 5-hp outboard motor tangentially at the outer edge of the platform and keep the motor running continuously, so as to rotate the entire accelerator at the rate of one revolution per week and thus distribute the radiation uniformly along the entire harbor-front. The direction of rotation will be the same as that of the protons in the accelerator, so as to add to their speed; even a slight increase is significant if the particles are already traveling at a speed almost equal to that of light.

WILLIAM A. SHURCLIFF
Underwater Consultant, CECU, 42 Oxford Street, Cambridge, Massachusetts

Metric System: Easy Conversions

Anyone who did not read Manuel Mateos' letter (24 Sept., p. 1450) missed an important proposal. Mateos suggests a "metricized British system" whereby our quart and pound would be made slightly larger, thus making the new "metric quart" equal to 1 liter and the "metric pound" to 1/2 kilogram; the inch would become a bit shorter, so that 1 "metric inch" would equal 25 millimeters and 40 "metric inches"—1 "metric yard"—would be 1 meter.

This would be an easy way to make the metric system more acceptable to the general public. More important, however, for those of us who are not interested in the precise conversion when reading (or writing) articles using metric units, it is an ideal method of beginning to think in these equivalent units without constantly referring to conversion factors.

R. G. PETERSEN
U.S. Geological Survey, Water Resources Division, 211 Congress Street, Boston, Massachusetts 02110

Psychologists' Title

In the recent exchange of letters about degrees and titles, Wiesinger (10 Sept., p. 1174) writes that "it is not good form in English for a Ph.D. . . . to refer to himself as Dr. . . ." It should be noted that the clinical psychologist, who is a Ph.D., cannot function professionally without referring to himself as "Dr." If he calls himself "Mr." he is respected by neither his physician colleagues nor his patients. This poses a special problem for psychologists who work simultaneously in clinical and academic settings.

JOHN G. WATKINS
Department of Psychology, University of Montana, Missoula

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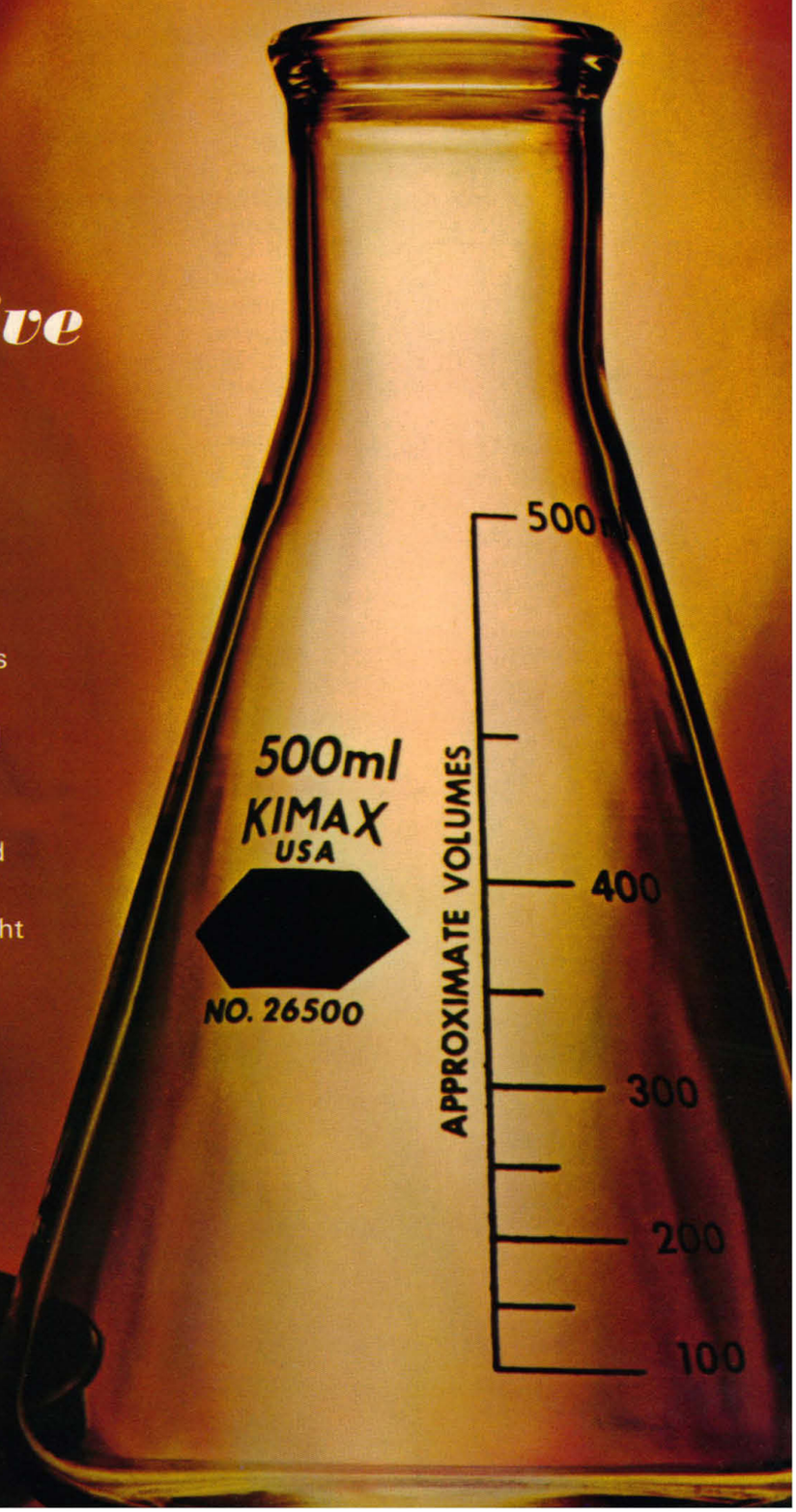

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Example: *Small sample analysis*

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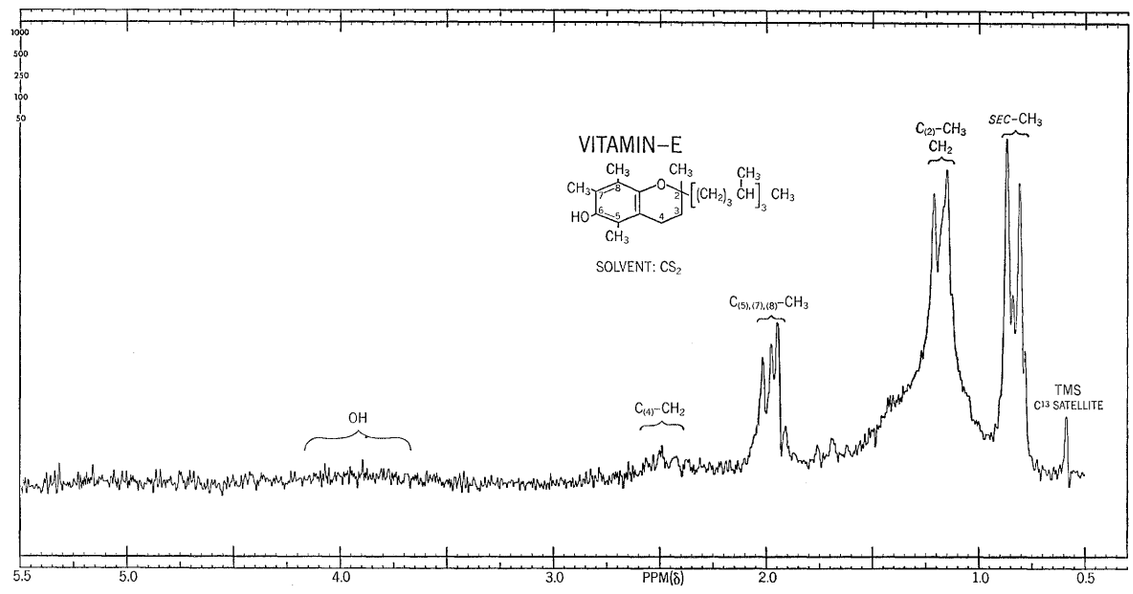

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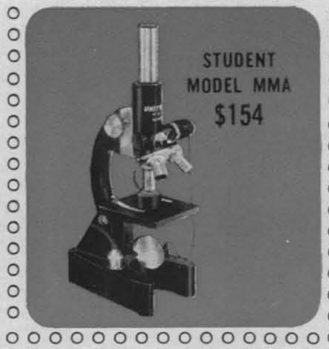

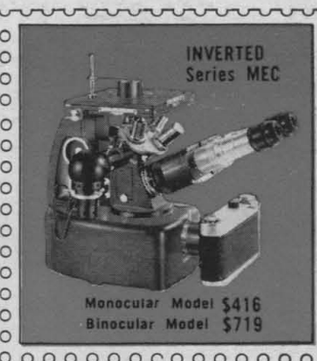

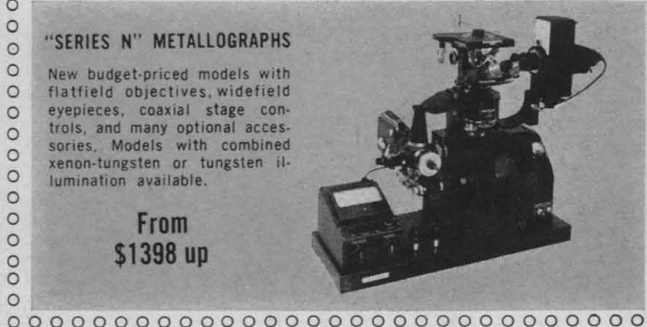

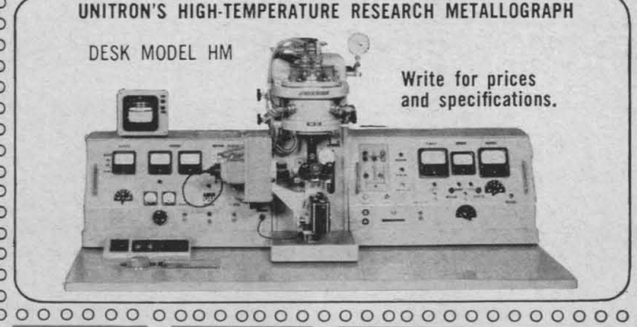

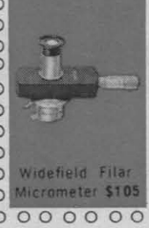

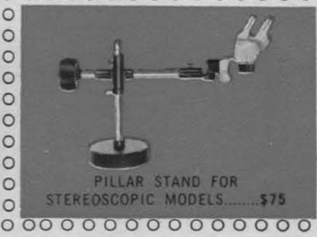

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5 November 1965, Volume 150, Number 3697 **SCIENCE**

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A New Level of Understanding

The congressional year just concluded has been a period of unusual interest for scientists, politicians, political scientists, and others who are concerned with the relations of science and government. Some new ground has been broken and some past relationships extended through omnibus legislation on higher education and an enhanced role for the U.S. Office of Education; by legislation on medical education and service, drug controls, industrial research, and air and water pollution; through some reorganization of federal scientific bureaus; and by the establishment of the National Arts and Humanities Foundation.

The year has also seen the National Academy of Sciences become a formal adviser to Congress, while continuing in its long-established role of adviser to the Executive Branch. The extensive reports of the Elliott Committee were published, and the Daddario Committee held the first major review of National Science Foundation legislation, activities, and future responsibilities since the Foundation came into being. Although a proposal to establish a commission to study the desirability of a federal department of science and technology was shelved, as it has been in several earlier sessions, there was plenty of evidence that Congress is seeking a better understanding of the relations between science and the agencies of government and between scientists and the other segments of our society.

Although the problems that have been dealt with through legislation or discussed in hearings and reports have been handled individually and empirically, each in terms of its own characteristics and requirements, the very amount of such segmental activity has increased the need for a more generalized, more theoretical, treatment of the relation of science to government. Wallace Sayre in last week's issue of *Science* (page 595) reviewed a first answer to this need: Don K. Price's *The Scientific Estate*. Most past discussions of the relations between scientists and government have dealt with such topics as the conflict of interest of members of advisory bodies, the distribution of research funds, the proper growth rate for basic research, the relative advantages of alternative methods of support, the allocation of patents and copyrights, and various forms of organization of government bureaus. Price discusses something much more fundamental, "the problem of the relation of science and scientists to the political ideas and constitutional system of the United States."

The political theorists who wrote the U.S. Constitution sought to protect a democratic government and society against the then major sources of power: property, the military, and the church. Since that time, science and technology have become important sources of power. How would the Founding Fathers have handled this problem? It is at this general and fundamental level that Price considers the relations between scientists and government and the problem of keeping the growing influence of science compatible with representative government.

Detailed questions will continue to be treated, as they must be at least in part, at their own level and in their own pragmatic terms. Nevertheless, they can now be considered in a deeper perspective as a result of Price's analysis, and that analysis can be a starting point for a more rational and more unified treatment of a diversity of problems. Sayre concludes his review with the statement that the book's "excellence as a venture in theory stands as a strong invitation to an empirical testing of its wide-ranging conclusions." *The Scientific Estate* has moved the discussion of the relation of science and government to a new level of understanding.—DAEL WOLFLE

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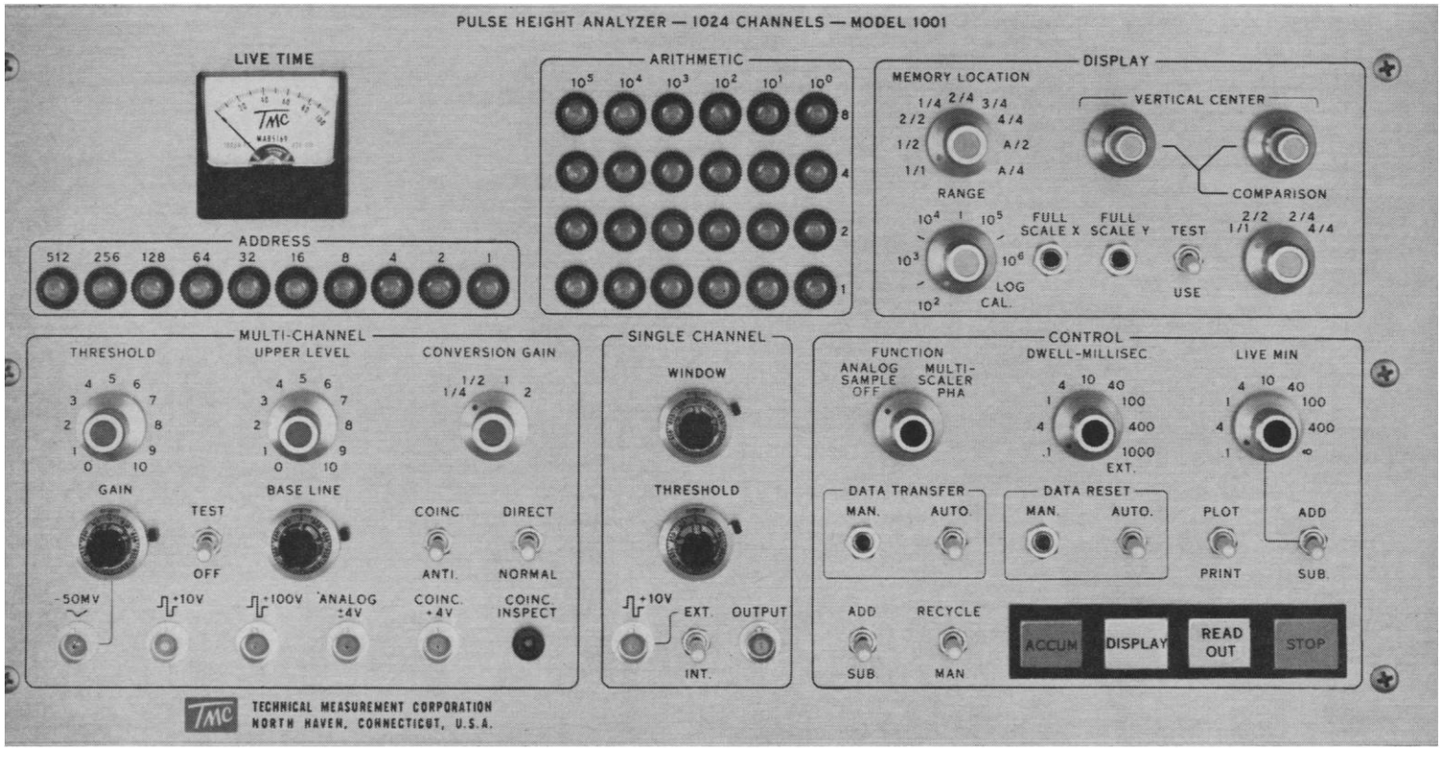

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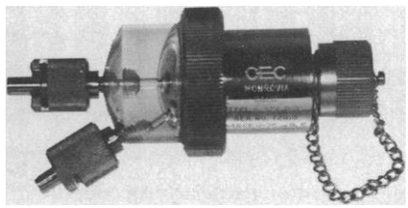

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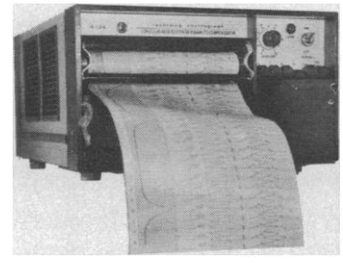

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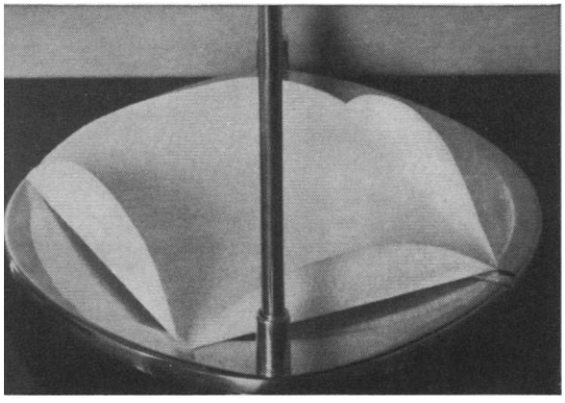

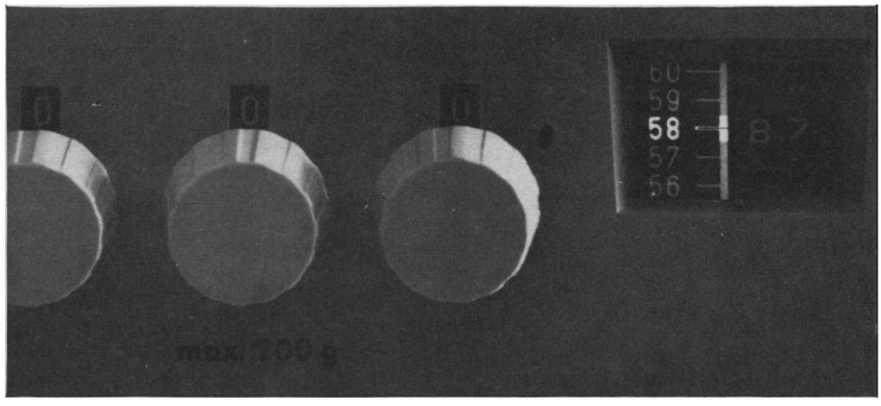

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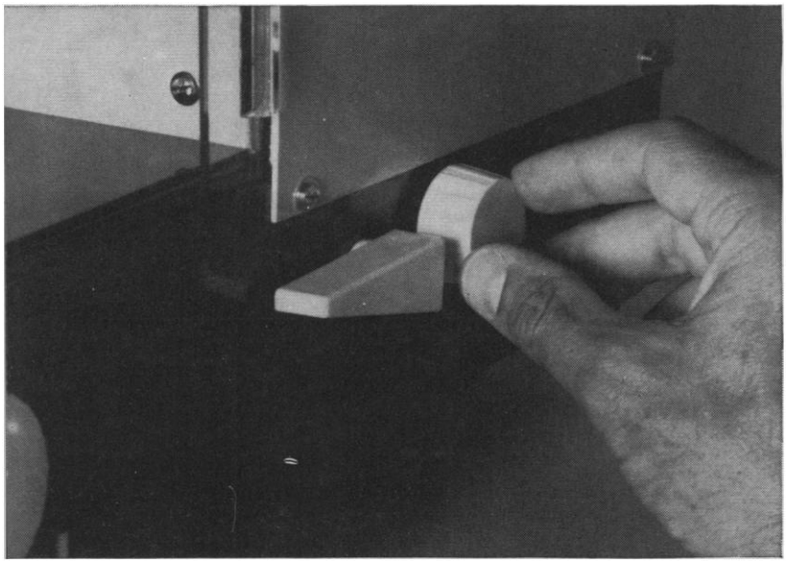

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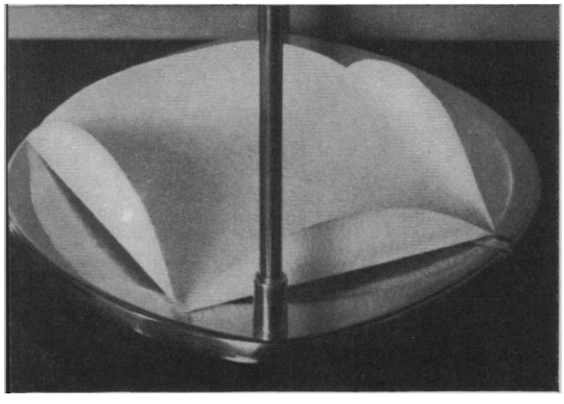

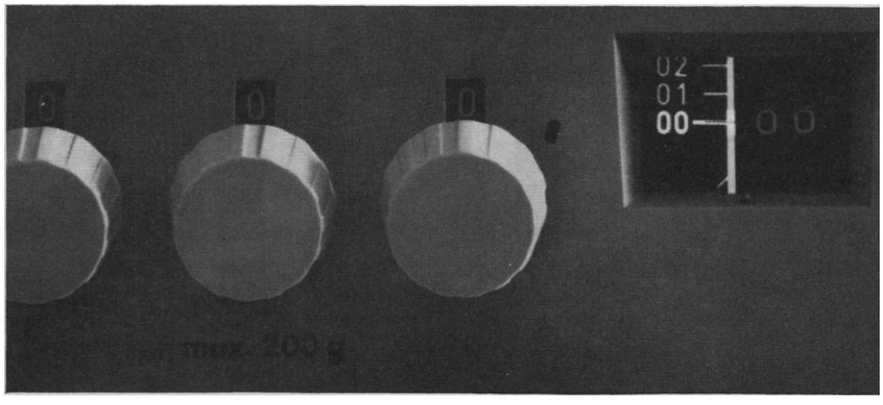

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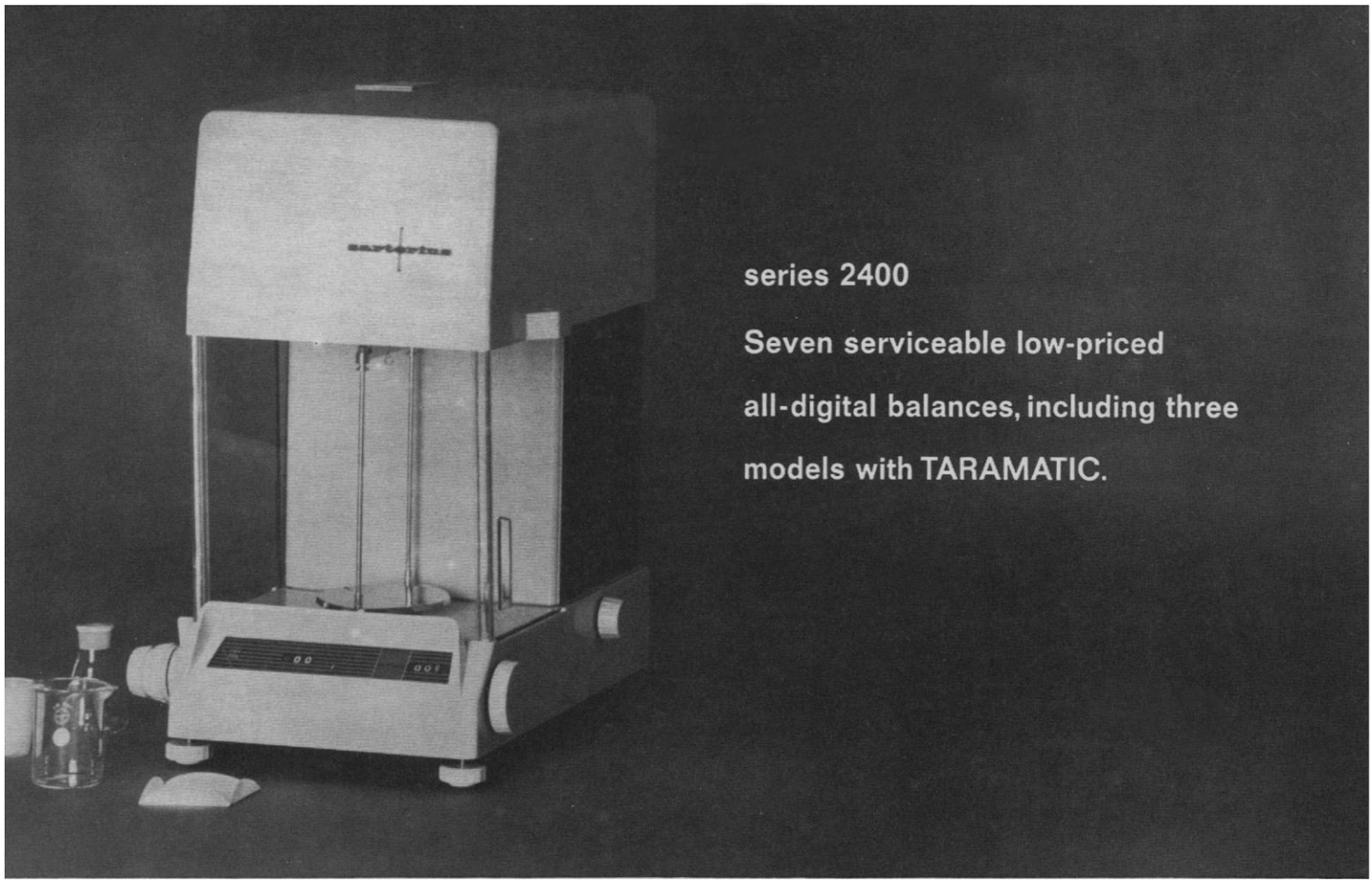

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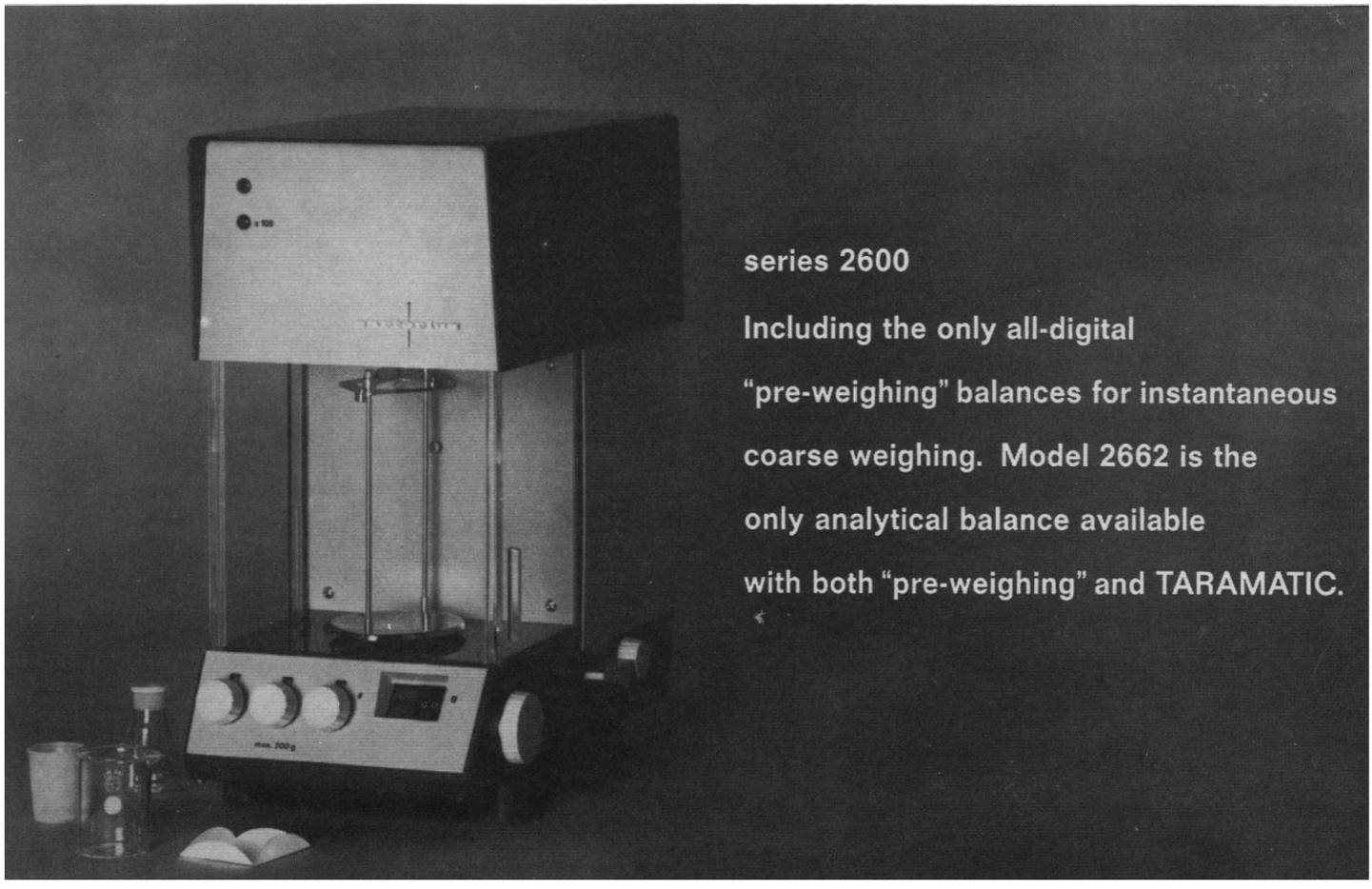

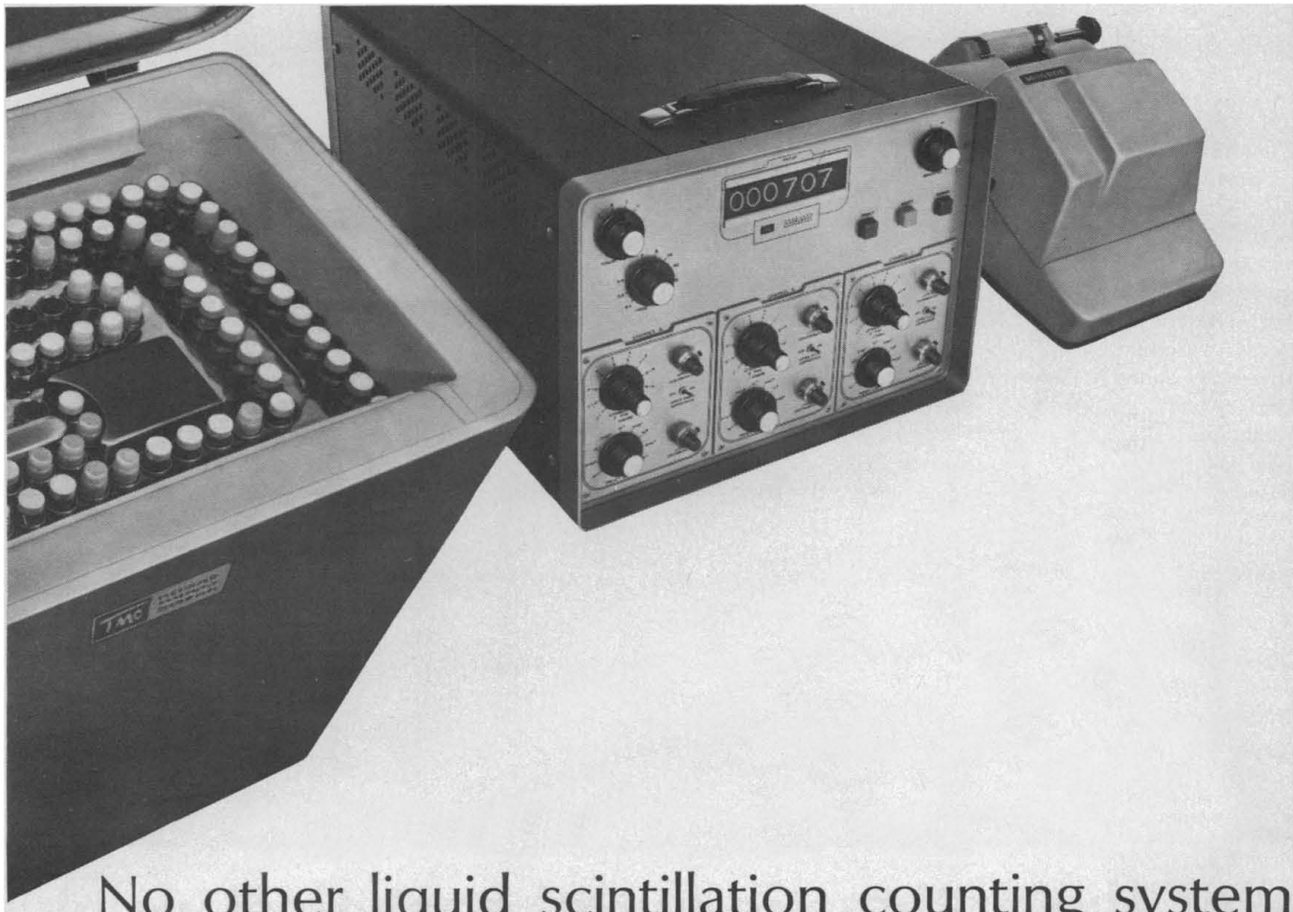

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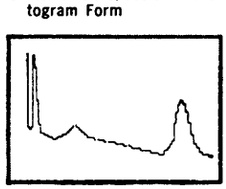

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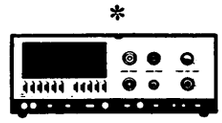
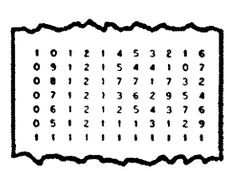


WITH AUTO PRINT OUT

Print out sample number, count, and time



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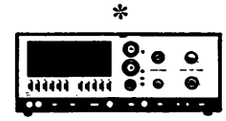

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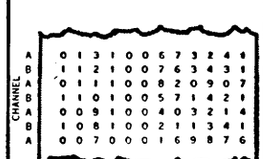

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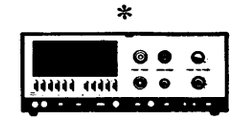

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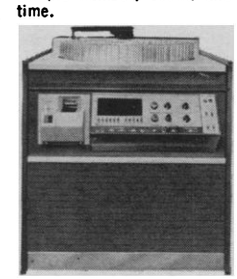

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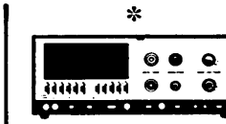

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as the C_6-C_3 intermediates in lignin formation was discussed. Other biochemical contributions of interest dealt with the synthesis in vitro of glycine and the metabolic utilization of C^{14}-ethanol (E. A. Cossins *et al.*, Alberta). N. E. Good (Michigan) discussed the preparation of several new H-ion buffer systems. They were mostly substituted derivatives of *tris* (hydroxmethyl) amino methane covering the *p*H range from 6 to 8 and were claimed to be superior to both tris and phosphate buffers.

Several speakers described the structure and the effects of environment on plant cells as observed with the electron microscope and the light microscope. A. J. Mia and G. Setterfield (Carleton, Ottawa) reported the synthesis of cell wall material by apposition in Rauwolfia sclereids with H^3-glucose pulse labeling. In a session on translocation in the higher plants, researchers from the Biosciences Division (N.R.C., Ottawa) described the experimental control of C^{14}-sugar movement by changing the node temperature (J. A. Webb and P. R. Gorham) and discussed the distinct lack of evidence demonstrating sugar conduction in the sieve tubes (D. C. Mortimer and M. Suzuki). D. S. Fensom and D. C. Spanner (London, England) reported their measurements of microelectrode potentials in the conducting tissue of *Nymphoides* and *Heracleum*; they had calculated that the electroosmotic efficiency was sufficient to maintain sugar flow through partially blocked pores of the sieve plate.

Exogenously supplied giberellins and IAA strongly influence plant development. E. Schneider and F. Wightman (Carleton, Ottawa) showed IAA-2-C^{14} to be metabolized mainly through conjugation to indoleacetyl aspartic acid, indoleacetyl glucose, and 2-OH indoleacetylglucose in barley seedlings over a 24-hour period. A. Winter and K. V. Thimann (Harvard), however, could find no evidence for conjugate compounds over a 2-hour period in *Avena* coleoptiles, and considered exogenously supplied C^{14}-IAA to be physically bound to a protein fraction. N. A. Andreae (Dept. Agriculture, London) showed that conjugate products were formed, with IAA inactivation, when pea roots were pretreated with an excess of IAA and naphthalene acetic acid. An adaptive period of 2 to 4 hours was necessary before the conjugate products were discerned. 2,4-Dichlorophenoxyacetic acid was not conjugated and remained inhibitory regardless of the pretreatment time. J. I. Toohey and C. D. Nelson (Queens, Kingston) reported two new herbicides derived from a soil bacterium inhabiting old pastures. The compounds were toxic to algae and higher plants but not to insects, fish, or mammals. They were isolated and identified as phenazine-1-carboxylic acid, most toxic to higher plants, and the 2-OH derivative, most toxic to the algae.

Officers of the society elected for 1965–66 were president, G. H. N. Towers (University of British Columbia); vice president, D. Simminovitch (Department of Agriculture, Ottawa); secretary-treasurer, D. Canvin (Queens, Kingston); eastern director, A. R. A. Taylor (University of New Brunswick), western director, M. S. Spencer (University of Alberta).

J. A. WEBB

Department of Biology,
Carleton University, Ottawa, Ontario

Hermaphroditic Fish

Functional hermaphroditism is widespread among the bony fish, but until recently so few coordinated data on the subject have been available that it has been ignored by comparative endocrinologists, behaviorists, and ecologists—all of whom should find among these unusual fish exceptions to prove some of their "rules." That hermaphroditic fish are now beginning to get the attention they deserve, however, was apparent from the conference on intersexuality in fishes held on 20–21 May 1965 at the Cape Haze Marine Laboratory in Sarasota, Florida. Specialists and students from the United States, Germany, and Japan attended. Most of the studies reported dealt with species of fish in which the individual functions both as male and female during its life history. Experimentally induced hermaphroditism and other related aspects of piscine sexuality were also discussed. The conference was appropriately dedicated to two recently deceased pioneers in the field—Umberto D'Ancona and G. J. van Oordt.

Most hermaphroditic fish are marine, and marine fish are notoriously loath to exhibit sexual activity in captivity. Moreover, it has been nearly impossible to collect examples in all the different stages of sexual develop-

ment, both ontogenetic and seasonal. As a result, we do not have a single reasonably complete sexual history of an hermaphroditic marine fish. Underwater observations made possible by SCUBA, and careful histological analyses of available specimens are helping to fill in the gaps, however, and an inkling into the hormonal mechanisms is being provided by experiments with sex hormones. In addition, two freshwater hermaphroditic species that thrive in aquariums are now known—the Asiatic synbranchid, *Monopterus albus*, and the neotropical killifish, *Rivulus marmoratus*.

All of the known Florida specimens of *Rivulus* are either males or self-fertilizing hermaphrodites that exhibit female secondary sex characteristics. Fertilization takes place within the ovotestes, and the fish lay eggs that have already undergone some development. Robert W. Harrington (Florida State Board of Health) described the unique mode of reproduction of this small fish. Hermaphrodites about to oviposit repel other hermaphrodites but tolerate the participation of a male in the spawning act, if one is present. Cross fertilization could conceivably occur on the rare occasions when an unfertilized egg, not too old, is laid. Older hermaphrodites sometimes transform into males with functional testes. No males have yet been found in nature, but Harrington can produce them at will by manipulating the environment in which the eggs develop. In contrast, *Monopterus* is protogynous; all individuals function first as females and then, after the complete transformation of the gonad at the age of about 3 years, as males. Karel F. Liem (University of Illinois Medical Center) reviewed his extensive studies on this eel-like inhabitant of swamps, ponds, and paddy fields. Liem found that starvation accelerated sex reversal, and he suggested that this is adaptive since it provides males for the reproduction that follows the termination of the droughts to which this air-breathing fish is periodically subjected.

Sea bass of the family Serranidae exhibit both synchronous and protogynous hermaphroditism, and their ovotestes represent at least five morphological variants on a common theme. C. Lavett Smith (American Museum of Natural History) has found these patterns of sexuality critically important in determining phylogenetic relationships. From a recent histological

study of the gonads of the kelp bass, *Paralabrax clathratus*, Smith obtained evidence indicating that this species is a secondary gonochorist, that is, a species with separate sexes derived from hermaphroditic ancestors. He pointed out that, in a protogynous species in which some of the individuals have come to reverse sex precociously (a phenomenon for which there is good evidence), selection will favor female-functioning fish that delay their transformation, thus leading to a secondarily gonochoristic form. Martin A. Moe, Jr. (Florida State Board of Conservation), has determined that the red grouper, *Epinephelus morio*, does not change from female to male until it is approximately 12 years old, and he emphasized the necessity of understanding the sexual pattern of this important commercial serranid for its proper conservation and management. Eugenie Clark (Cape Haze Marine Laboratory) described the reproductive behavior of *Serranus subligarius*, the only sea bass whose actual spawning behavior has been seen. Although this synchronous hermaphrodite can lay its eggs and more or less immediately fertilize them, oviposition is typically accompanied by courtship and pairing in which one member acts as female, the other as male. Reversal of roles may occur suddenly and within a very short time, but it has not been determined whether, at the moment of spawning climax, a fish emits only eggs or milt, or some of both. Clark could detect no difference between the development of self-fertilized and cross-fertilized eggs. Live *Serranus*, which were spawning in the Sarasota area, were on display in laboratory aquariums.

Rudolf Reinboth (Johannes Gutenberg University, Mainz) compared the protogynous and protandrous porgies of the family Sparidae. Protandrous species lay pelagic eggs and lack sexual dimorphism, and the process of sex reversal from male to female requires several months. Protogynous species lay adhesive eggs, exhibit sexual dimorphism, and change from female to male in as little as 6 weeks. The members of the related family Maenidae (Centracanthidae) are protogynous and they resemble the protogynous sparids in all of these characteristics. With a single injection of androgen, Reinboth was sometimes able to effect essentially normal sex reversal in two protogynous forms, but a series of several estrogen in-

jections produced no sign of gonad transformation in one of the protandrous sparids.

Among the wrasses (family Labridae), protogyny is widespread and is frequently, but not invariably, associated with dimorphic males. For *Coris julis*, Reinboth presented a convincing case that the larger, more brightly colored, and more ornately finned males represent transformed females, while the other type of male, which looks like the female, does not undergo either sex reversal or change in secondary sex characters. Reinboth found that after a single injection of androgen female-colored fish permanently assumed the "high" male coloration, but that many of them did not become sex reversed. An unexpected finding was that the testes of the smaller, dull-colored males are larger and better developed than those of the other morph. A similar observation was made on other species of wrasses by Machteld J. Roede (Zoologisch Museum, Amsterdam). All seven of the West Indian species studied by her showed evidence of protogynous hermaphroditism. John E. Bardach (University of Michigan) reported that preliminary field studies along the shores of Madagascar have revealed a similar situation among the wrasses there, in particular members of the genus *Stethojulis*. Observations in nature indicate that the two types of male wrasse behave quite differently toward other members of their own species. The labrids offer challenging ecological as well as endocrinological problems.

Although hundreds of thousands of pounds of the flathead, *Cociella crocodilia*, are trawled each year in the Yellow Sea and adjacent waters, it was not until 1963 that Tsuneo Aoyama (Seikai Regional Fisheries Research Laboratory) made public his surprising discovery of protandry in this foodfish. Aoyama has now recorded that two other Western Pacific species of flathead are protandrous hermaphrodites, namely *Suggrundus meerdervoortii* and *Rogadius asper*. The addition of the flatheads (family Platycephalidae) brings to 13 the number of families of teleost fish known to have members that normally function as both male and female during their life histories.

Apparently spontaneous sex reversal has been detected in several laboratory strains of three species of gonochoristic fish by means of sex-

linked color patterns and abnormal sex ratios among the offspring of the fish in question. Klaus D. Kallman (New York Zoological Society) analyzed the relatively numerous examples he has found of platyfish, *Xiphophorus maculatus*, with the genotype of one sex and the phenotype of the other. He concluded that previously held ideas about the cause of these sex reversals are no longer tenable; the concept of genic balance, originally developed by Bridges to explain intersexuality and related phenomena in *Drosophila*, cannot, at least by itself, explain the frequency distribution and genetic histories of the many sex-reversed platyfish.

Under certain conditions—unfortunately seldom defined—the teleost gonad seems to show remarkable sensitivity to environmental influences, and ovotestes may appear in considerable numbers of ordinarily gonochoristic fish. Such a case has recently been brought to light by Norbert Simon (Johannes Gutenberg University). Almost 20 percent of the green sunfish, *Lepomis cyanellus*, from a pond near Mainz were hermaphrodites with ovaries that exhibited varying amounts of testicular tissue. Another nearby pond, which undoubtedly had provided the sunfish for stocking the pond in question, when it was dug in 1959, contained no abnormal fish, and this may indicate that some environmental factor was at work. Simon is investigating the possibility that human urine was responsible for the masculinization. In the laboratory, Toki-o Yamamoto (Nagoya University) has developed a technique for completely reversing either sex of the medaka, *Oryzias latipes*, by feeding sex steroids to the fry. During the course of his extensive experiments, however, Yamamoto has produced remarkably few partially transformed individuals; treatment has proved completely effective, not effective at all, or has suppressed gonadal development entirely. Yamamoto described the experimentally produced ovotestes, and he interpreted them as partly the result of a primary antero-posterior gradient of differentiation and a secondary dorso-ventral one. Nobuo Egami and Yasudo Hyodo (National Institute of Radiological Sciences, Chiba) reported that irradiation of developing medaka eggs results in ovotestes in some of the males. By following Yamamoto's method of feeding methyl testosterone to newly hatched fish, Howard P. Clemens (Univer-

sity of Oklahoma) has produced functional sex-reversed *Tilapia mossambica*. When mated to normal females, these fish sired all-female broods. Clemens' success in reversing sex in *Tilapia* and in obtaining unisexual broods opens the way for a practical means of producing large numbers of fish for the monosex culture that must be practiced in order to prevent "runting" in various species of *Tilapia*, since these prolific pondfish soon overpopulate their ponds if allowed to reproduce.

Charles M. Breder (American Museum of Natural History) pointed out how surprisingly similar the reproductive activities of the male and female fish sometimes are. It has occasionally seemed as if only the emission of eggs by one sex and of milt by the other distinguish them. An obvious question is whether this apparent similarity in sexual behavior has facilitated the evolution of hermaphroditism among the teleosts. George W. Barlow (University of Illinois) described his carefully monitored experiments with *Etroplus maculatus*, a member of the family Cichlidae, the group in which males and females have most often been recorded as behaving more or less identically. Barlow pointed out that even when a particular courtship behavior was ostensibly identical in both sexes, analysis revealed it to be strikingly different in its relation to the social events and environmental factors previously experienced by either male or female. Thus, male and female motor patterns that the most careful observations cannot distinguish are nevertheless of different significance in the lives of the two sexes. We now have no reason to believe that the sexes of fish do not differ fundamentally in all aspects of reproductive behavior. In another study of cichlids that was not primarily directed toward hermaphroditism, Hans M. Peters (Tübingen University) described how fruitful a quantitative approach to gonadal function, involving simple parameters like weight and egg size, could be, and he suggested that such studies could profitably be made on hermaphroditic forms.

A recurrent question concerned the identity of the sex steroids of fish. The key role that hermaphroditic fish might play in elucidating the functions of piscine sex hormones was emphasized by J. J. Christian (Albert Einstein Medical Center, Philadelphia), but he and James H. Leathem (Rutgers

University) cautioned against assuming that mammalian and teleostean hormones are the same. Lester R. Aronson (American Museum of Natural History) presented convincing experimental evidence that mammalian or synthetic estrogens cannot be substituted for the natural ones in *Tilapia macrocephala*. He also showed that functioning males occasionally produce significant quantities of estrogens.

Practically nothing is known about the selective advantages that hermaphroditism presumably must confer on the fish exhibiting it. It may be deduced that, all things being equal, a synchronously hermaphroditic species should have a reproductive potential nearly twice that of a gonochoristic one, since the hermaphroditic form has dispensed with separate sperm producers, each of which requires about as much food and *lebensraum* as does an egg producer. If this is true, it might well be asked why all species are not hermaphrodites and what are the special problems that must be met before functional hermaphroditism can be acquired. These and related questions were discussed by Christian, Liem, Barlow, and the conference chairman, James W. Atz (American Museum of Natural History).

After the conference, many of the participants took an extended field trip to the Dry Tortugas where they spent 4 days observing the marine life of the islands. The conference was supported in part by the National Science Foundation.

JAMES W. ATZ
Department of Ichthyology, American Museum of Natural History, New York, New York

Forthcoming Events

November

11–12. **Kentucky** Acad. of Science, Univ. of Kentucky, Lexington. (D. M. Lindsay, Georgetown College, Georgetown, Ky.)

11–13. **Gerontological** Soc., 18th annual, Los Angeles, Calif. (W. D. Obrist, Dept. of Psychiatry, Duke Univ. Medical Center, Durham, N.C. 27706)

11–13. Bases for **Nuclear Spin-Parity** Assignments, conf., Gatlinburg, Tenn. (F. K. McGowan, Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn. 37831)

12–13. **Clinical Pathology of Infancy**, Assoc. of Clinical Scientists, Washington, D.C. (F. W. Sunderman, 1833 DeLancey Pl., Philadelphia, Pa. 19103)

12–13. Society for **Industrial and Applied Mathematics**, western regional, Seattle, Wash. (B. H. Colvin, Boeing Scientific Research Laboratories, P.O. Box 3981, Seattle)

12–14. Association of **Clinical Scientists**, Washington, D.C. (R. MacFate, 300 N. State St., No. 5322, Chicago, Ill. 60610)

12–15. **Neutrality of Medicine**, 2nd intern. congr., Paris, France. (R. Ellenboger, Ministère des Anciens Combattants et Victimes de Guerre, 37, rue de Bellechasse, Paris 7e)

14–15. National Medical Foundation for **Eye Care**, Chicago, Ill. (L. A. Zupan, Room 6, 1100 17th St., NW, Washington, D.C.)

14–16. Hedrologicum Conlegium, Intern. Soc. for the Study of **Diseases of the Colon and Rectum**, 2nd congr., Tokyo, Japan. (J. F. Montague, 104 E. 40 St., New York 10016)

14–17. Southern **Medical** Assoc., Washington, D.C. (R. F. Butts, 2601 Highland Ave., Birmingham 5, Ala.)

14–18. Mexican **Dental** Assoc., 1st intern. congr., Mexico City. (R. Espinosa de la Sierra, Asociación Dental Mexicana, Sinaloa no. 9, Mexico 7, D.F.)

14–18. **Dental**, Pacific intern. conf., Honolulu, Hawaii. (W. A. Wakai, 291 Alexander Young Bldg., Honolulu 96813)

14–18. Society of **Exploration Geophysicists**, 35th annual intern., Dallas, Tex. (Dallas Geophysical Soc., Dallas)

14–19. American Acad. of **Ophthalmology and Otolaryngology**, Chicago, Ill. (W. L. Benedict, 15 Second St., SW, Rochester, Minn.)

14–21. **Air Pollution**, 1st world congr., Buenos Aires, Argentina. (D. D. Torti, Asociación Argentina Contra la Contaminación del Aire, Sarmiento 680, Buenos Aires)

15–16. **Hypervelocity Techniques**, 4th symp., Tullahoma, Tenn. (J. Lukasiewicz, vonKarman Gas Dynamics Facility, ARO, Inc., Arnold Air Force Station, Tenn. 37706)

15–16. **Science** conf., 4th annual, Belfer Graduate School of Science, Yeshiva Univ., New York, N.Y. (A. Gelbart, Belfer Graduate School of Science, Amsterdam Ave. and 186th St., New York 10033)

15–17. Association of **Military Surgeons** of the U.S., Washington, D.C. (F. E. Wilson, 1500 Massachusetts Ave., NW, Washington, D.C.)

15–18. **Aircraft Design and Technology**, Los Angeles, Calif. (American Inst. of Aeronautics and Astronautics, 1290 Sixth Ave., New York 10019)

15–18. **Information Problems in the Drug Industry**, conf., Philadelphia, Pa. (C. P. Butcher, Graduate School of Library Science, Drexel Inst. of Technology, 32nd and Chestnut Sts., Philadelphia)

15–18. American **Nuclear** Soc./Atomic Industrial Forum, winter meeting, Washington, D.C. (O. J. DuTemple, American Nuclear Soc., 244 E. Ogden Ave., Hinsdale, Ill. 60521)

15–19. **Animal Care Panel**, 16th annual, Philadelphia, Pa. (H. P. Schneider, Hahnemann Medical College, 230 N. Broad St., Philadelphia 19102)

15–19. **Gulf and Caribbean Fisheries** Inst., 18th annual session, Miami, Fla. (Executive Secretary, 1 Rickenbacker Causeway, Miami 33149)

15–19. **Magnetism and Magnetic Materials**, San Francisco, Calif. (W. D. Doyle, Franklin Inst. Laboratories, Philadelphia, Pa.)

15–19. World Federation for **Mental Health**, 18th annual, Bangkok, Thailand. (F. Cloutier, 1, rue Gevray, Geneva, Switzerland)

15–19. Disposal of **Radioactive Wastes** into the Sea and Fresh Waters, symp., Vienna, Austria. (Intern. Atomic Energy Agency, 11 Kärntnerring, Vienna I)

15–20. **Productivity, Technology, and Change**, conf., London, England. (British Productivity Council, Vintry House, Queen St. Pl., London, E.C.4)

16–18. **Physics of Failure in Electronics**, 4th annual symp., Chicago, Ill. (M. Goldberg, IIT Research Inst., 10 W. 35 St., Chicago 60616)

16–18. **Spacecraft Sterilization Technology**. 1st natl. conf., California Inst. of Technology, Pasadena. (Office of Space Science and Applications, NASA, 400 Maryland Ave., SW, Washington, D.C.)

17–19. Eastern **Analytical** Symp., New York, N.Y. (M. E. McGoldrick, Armco Steel Corp., P.O. Box 1697, Baltimore, Md. 21203)

17–19. **Micrography**, intern. congr., Tokyo, Japan. (Mrs. J. Lang, 2501 Hudson Rd., St. Paul, Minn. 55119)

17–20. Canadian **Cardiovascular** Soc., Winnipeg, Man. (J. B. Armstrong, 1130 Bay St., Toronto 5, Ont.)

17–20. **Hyperbaric Oxygenation**, 3rd intern. conf., Duke Univ. Medical Center, Durham, N.C. (I. W. Brown, Jr., Dept. of Surgery, Duke Univ. Medical Center, Durham)

18. Society of Military **Otolaryngologists**, Chicago, Ill. (G. R. Hart, Box 223, U.S. Naval Hospital, Philadelphia, Pa.)

18–19. **Computational Methods in Crystallography**, conf., London, England. (Meetings Officer, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1)

18–19. **Electronics**, Mid-America conf., Kansas City, Mo. (W. Wiley, Bonzer Inc., 11111 W. 59th Terrace, Shawnee, Kan.)

18–21. American **Anthropological** Assoc., Denver, Colo. (S. T. Boggs, 1530 P St., NW, Washington, D.C. 20005)

18–24. **Tropical Oceanography**, intern. conf., Miami Beach, Fla. (F. F. Koczy, Inst. of Marine Science, Univ. of Miami, Miami 33149)

20–21. American **Folklore** Soc., Denver, Colo. (T. P. Coffin, Box 5, Bennett Hall, Univ. of Pennsylvania, Philadelphia 19104)

21–26. **Orthopedics and Traumatology**, 6th Latin American congr., Lima, Peru. (G. de Velasco Polo, Zacatecas 117, Mexico 7, D.F.)

22–24. **Electromagnetic Sensing of Earth** by Satellites, intern. symp., Coral Gables, Fla. (R. Zirkind, Polytechnic Inst. of Brooklyn, Graduate Center, Farmingdale, L.I., N.Y.)

22–26. **Nuclear Electronics**, conf., Bombay, India. (K. Zybylski, Div. of Scientific and Technical Information, Intern. Atomic Energy Agency, 11 Kärntnerring, Vienna, Austria)

22–26. **Plutonium**, intern. conf., London, England. (Inst. of Metals, 17 Belgrave Sq., London, S.W.1)

22–3. **Volcanology**, intern. symp., Auckland and Wellington, New Zealand. (J. Healy, Dept. of Scientific and Industrial Research, Rotorua, New Zealand)

24–29. American College of **Apothecaries**, Inc., Miami Beach, Fla. (R. E. Abrams, Hamilton Court Hotel, 39th and Chestnut St., Philadelphia, Pa. 19104)

25. Central Assoc. of **Science and Mathematics Teachers**, Chicago, Ill. (A. M. Hach, 1220 Wells St., Ann Arbor, Mich.)

25–27. National Council for **Geographic Education**, New York, N.Y. (T. G. Gault, The Council, Indiana State College, Indiana, Pa.)

25–27. **Reinforced Plastics**, 4th intern. conf., British Plastics Federation, London, England. (The Federation, 47–48 Piccadilly, London, W.1)

26–27. **Interactions of Space Vehicles with an Ionized Atmosphere**, 2nd symp., Univ. of Miami, Coral Gables, Fla. (A. R. Hochstim, Inst. for Defense Analyses, 400 Army-Navy Drive, Arlington, Va.)

26–27. American Inst. of **Ultrasonics in Medicine**, 1st Pan American meeting, Lima, Peru. (C. Bustamante Ruiz, Dept. of Physical Medicine and Rehabilitation, Hospital Obrero, Lima)

28–3. **Radiological** Soc. of North America, Chicago, Ill. (M. D. Frazer, 713 Genesee St., Syracuse, N.Y.)

28–4. **Odontological** Federation of Central America and Panama, San Jose, Costa Rica. (R. Pauly S., Univ. of Costa Rica, San Jose)

28–4. **Odontological** Soc. of Chile, 5th intern. congr., Santiago. (J. Pequeño, San Antonio 510, Santiago)

29–30. Biochemical and Pharmacological Aspects of **Basal Ganglia Disease**, symp., Columbia Univ. College of Physicians and Surgeons, New York, N.Y. (M. D. Yahr, New York Neurological Inst., 710 W. 168 St., New York 10032)

29–2. **Entomological** Soc. of America, New Orleans, La. (R. H. Nelson, ESA, 4603 Calvert Rd., College Park, Md., 20740)

29–3. **Metallurgy**, 1st operating conf., Pittsburgh, Pa. (Metallurgical Soc. of American Inst. of Mechanical Engineers, 345 E. 47 St., New York 10017)

29–3. **Phytopharmacology**, intern. conf., Amsterdam, Netherlands. (California Chemical S.A. Française, 19, avenue George V, Paris 8e)

29–4. **Space Technology and Science**, 6th intern. symp., Tokyo, Japan. (D. Mori, Inst. of Space and Aeronautical Science, Univ. of Tokyo, 856 Koma-ba-machi, Meguro-ku, Tokyo)

29–8. **Rehabilitation of Persons with Dulled Sensory Perception**, intern conf., Braunschweig, Germany. (Sonnenberg Intern. Center, P.O. Box 460, 33 Braunschweig)

30–2. **Computers**, fall conf., Las Vegas, Nev. (R. Sheehy, Bunker-Ramo, Co., 8433 Fallbrook Ave., Canoga Park, Calif.)

December

1–3. **Ultrasonics**, symp., Boston, Mass. (J. H. Rowen, Bell Telephone Laboratories, Murray Hill, N.J. 07971)

1–3. American **Water Resources** Assoc., first annual, Univ. of Chicago, Chicago, Ill. (AWRA, P.O. Box 434, Urbana, Ill.)

2–3. **Bone Marrow**, conf., San Francisco, Calif. (L. J. Cole, Experimental Pathology Branch, U.S. Naval Radiological Defense Laboratory, Hunter Point, San Francisco 94135)

2–3. Society of **Plastics Engineers**, regional technical conf., Newark, N.J. (SPE, 65 Prospect St., Stamford, Conn. 06902)

3–5. **Leptospiras**, intern. colloquium, Antwerp, Belgium. (A. Grare, Inst. de Médicine, Tropicale Prince-Leopold, Antwerp)

3–5. Academy of **Psychoanalysis**, midwinter meeting, New York, N.Y. (H. Davidman, 125 E. 65 St., New York 10021)

3–5. American **Psychoanalytic** Assoc., fall meeting, New York, N.Y. (APA, 1 E. 57 St., New York 10022)

3–4. **Macromolecular Metabolism**, symp., New York, N.Y. (New York Heart Assoc., 10 Columbus Circle, New York 10019)

5. American Acad. of **Dental Medicine**, mid-winter annual meeting, New York, N.Y. (S. Conrad, 133–28 228th St., Laurelton, N.Y. 11413)

5–9. American Inst. of **Chemical Engineers**, Philadelphia, Pa. (AICE, 345 E. 47 St., New York 10017)

5–11. American **Rheumatism** Assoc., congr., Mar del Plata, Argentina. (G. Speyer, 10 Columbus Circle, New York)

6. **Food Law** Inst. and Food and Drug Administration, joint educational conf., Washington, D.C. (FDA, Washington, D.C.)

6–7. Medical and Social Aspects of **Migration**, Ciba Foundation guest symp., London, England. (Ciba, 41 Portland Pl., London, W.1)

6–8. **Transmission of Viruses** by the Water Route, symp., Cincinnati, Ohio. (G. Berg, U.S. Public Health Service, 4676 Columbia Parkway, Cincinnati 45226)

6–10. **Space Communication**, Paris, France. (UNESCO, Pl. de Fontenoy, Paris 7e)

6–10. Practices in the Treatment of Low and Intermediate Level **Radioactive Wastes**, symp., Vienna, Austria. (Intern. Atomic Energy Agency, Kärtner Ring 11, Vienna 1)

6–10. Structure and Function of the **Nucleolus**, symp., Montevideo, Uruguay. (F. A. Saez, Instituto de Investigaciones de Ciencias Biológicas, avda. Italia 3318, Montevideo)

6–12. **Hydraulics and Fluid Mechanics**, 2nd Australasian conf., Auckland, New Zealand. (A. J. Raudkivi, Univ. of Auckland, School of Engineering, Ardmore College Post Office, Auckland)

7–10. American Soc. of **Agricultural Engineers**, winter meeting, Chicago, Ill. (J. L. Butt, P.O. Box 229, St. Joseph, Mich.)

8–10. **Coccidioidomycosis**, 2nd natl. symp., Phoenix, Ariz. (Arizona Tuberculosis and Health Assoc., 733 W. McDowell Rd., Phoenix 85007)

8–10. Changing Concepts of **Human Habitation**, symp., Roorkee, India. (D. Mohan, Central Building Research Inst., Roorkee)

8–10. New Concepts in **Gynecological Oncology**, symp., Hahnemann Medical College and Hospital, Philadelphia, Pa.

(Miss S. Rosen, Hahnemann Medical College and Hospital, 230 N. Broad St., Philadelphia 19102)

8–15. American Acad. of **Optometry**, Chicago, Ill. (C. C. Koch, 1506 Foshay Tower, Minneapolis, Minn.)

9–10. **Ciba Foundation** guest meeting European Pancreatic Club. London, England. (H. T. Howat, 41 Portland Pl., London, W.1)

12–14. **Lymphatic System**, intern. conf., New Orleans, La. (H. S. Mayerson, Dept. of Physiology, School of Medicine, Tulane Univ., New Orleans 70112)

13–15. **Aerothermochemistry of Turbulent Flows**, conf., American Inst. of Aeronautics and Astronautics, San Diego, Calif. (H. Yoshihara, Space Sciences Laboratory, Mail Zone. 596–00, General Dynamics/Astronautics, Kearny Villa Rd., San Diego)

13–15. European **Biological Editors**, Paris, France. (D. S. Ferner, Dept. of Biology, Univ. of Washington, Seattle)

13–15. Radiological Protection in the **Industrial Use of Radioisotopes**, intern. conf., Paris, France. (J Pradel, 66 rue Augustin Dumont, Malakoff, Seine, France)

13–18. **Engineering and Technological Sciences**, conf., Bangkok, Thailand. (P. Purachatra, Assoc. of Southeast Asian Insts. of Higher Learning, Chulalongkorn Univ., Race Course Rd., Bangkok)

15–18. **Microbiology**, 1st Central American congr., Univ. of Costa Rica, San José. (F. Montero-Gei, School of Microbiology, Univ. of Costa Rica, Apartado 2157, San José)

19–21. Middle East **Neurological** Soc., Jerusalem, Jordan. (F. S. Haddad, Orient Hospital, Beirut, Lebanon)

19–23. Indian **Statistical** Inst., Malleswaram, Bangalore. (S. R. Ranganathan, Indian Statistical Inst., Documentation Research and Training Centre, 112 Cross Rd. 11, Malleswaram)

20–21. **Nuclear Medicine**, 2nd natl. congr., Tel Aviv, Israel. (P. Czerniak, Israel Atomic Commission, Soreq Nuclear Research Center, Doar Yavne)

20–22. British **Biophysical** Soc., 20th winter meeting, London, England. (R. E. Burge, Physics Dept., Queen Elizabeth College, Campden Hill Rd., London W.8)

20–22. American **Physical** Soc., Los Angeles, Calif. (W. Whaling, California Inst. of Technology, Pasadena 91109)

26–31. **American Assoc. for the Advancement of Science**, annual, Berkeley, Calif. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C.)

In addition to the 20 sections of the Association and five AAAS committees, the following organizations have arranged sessions at AAAS annual meeting 26–31 December in Berkeley:

Mathematics

American Mathematical Soc. (R. S. Pierce, Univ. of Washington, Seattle)

Association for Computing Machinery. (H. D. Huskey, Univ. of California, Berkeley)

National Council of Teachers of Mathematics. (J. D. Gates, 1201 16 St., NW, Washington, D.C.)

Society for Industrial and Applied Mathematics (J. H. Griesmer, IBM, Yorktown Heights, N.Y.)

Physics

American Astronautical Soc. (P. B. Richards, General Precision, Little Falls, N.J.)

Chemistry

American Chemical Soc., California Section. (R. L. LeTourneau, Chevron Research Co., Richmond, Calif.)

Astronomy

American Astronomical Soc. (G. C. McVittie, Univ. of Illinois, Urbana)

Geology and Geography

Association of American Geographers. (M. Mikesell, Univ. of Chicago, Chicago, Ill.)

National Geographic Soc. (R. Gray, 17th & M Sts., NW, Washington, D.C.)

National Speleological Soc. (G. W. Moore, U.S. Geological Survey, Menlo Park, Calif.)

Zoological Sciences

American Fisheries Soc. (H. K. Chadwick, California Dept. of Fish and Game, Sacramento)

American Soc. of Zoologists. (A. G. Richards, Univ. of Minnesota, St. Paul)

Animal Behavior Soc. (E. M. Banks, Univ. of Illinois, Urbana)

Herpetologists' League. (F. B. Turner, Univ. of California, Los Angeles)

Society of Systematic Zoology. (J. G. Rozen, Jr., American Museum of Natural History New York, N.Y.)

Zoological and Botanical Sciences

American Soc. of Naturalists. (C. Hubbs, Scripps Inst. of Oceanography, La Jolla, Calif.)

Ecological Soc. of America. (G. M. Woodwell, Brookhaven Natl. Laboratory, Upton, L.I., N.Y.)

Western Soc. of Naturalists. (J. M. Craig, San Jose State College, San Jose, Calif.)

Psychology

Western Psychological Assoc. (G. A. Mendelsohn, Univ. of California, Berkeley)

Social and Economic Sciences

American Economic Assoc. (R. R. Nelson, RAND Corp., Santa Monica, Calif.)

American Political Science Assoc. (J. F. Triska, Stanford Univ., Stanford, Calif.)

American Soc. of Criminology. (C. Newman, Univ. of Louisville, Louisville, Ky.)

American Sociological Assoc. (W. Form, Michigan State Univ., East Lansing)

Metric Assoc. (R. Fischelis, Ohio Northern Univ., Ada)

National Inst. of Social and Behavioral Science. (D. P. Ray, 863 Benjamin Franklin Station, Washington, D.C.)

Population Assoc. of America. (E. S. Lee, Univ. of Pennsylvania, Philadelphia)

Society for the Scientific Study of Religion. (C. Y. Glock, Univ. of California, Berkeley)

History and Philosophy of Science

Philosophy of Science Assoc. (C. W. Churchman, Univ. of California, Berkeley)

Society for General Systems Research. (H. Thal-Larsen, Univ. of California, Berkeley)

Science Courses for Baccalaureate Education Project. (V. L. Parsegian, Rensselaer Polytechnic Inst., Troy, N.Y.)

Medical Sciences

Alpha Epsilon Delta. (M. L. Moore, 7 Brookside Circle, Bronxville, N.Y.)

American Assoc. of Bioanalysts, Western Region. (M. Menesini, 1287 Rudgear Rd., Walnut Creek, Calif.)

American Physiological Soc. (R. M. Iverson, Univ. of Miami, Coral Gables, Fla.)

American Soc. for Microbiology, Northern California–Hawaiian Branch. (K. J. Taylor, Cutter Laboratories, Berkeley, Calif.)

California Veterinary Medical Assoc. (A. G. Edward, Univ. of California, Davis)

Society for Experimental Biology and Medicine, Pacific Coast Section. (E. L. Dobson, Donner Laboratories, Univ. of Calif., Berkeley)

Education

Commission on Science Education. (J. R. Mayor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

American Nature Study Soc. (H. E. Weaver, Univ. of Illinois, Urbana)

National Assoc. for Research in Science Teaching. (F. B. Dutton, Michigan State Univ., East Lansing)

National Assoc. of Biology Teachers. (H. K. Wong, Menlo-Atherton High School, Atherton, Calif.)

National Science Teachers Assoc. (A. F. Eiss, 1201 16 St., NW, Washington, D.C. 20005)

Information and Communication

National Assoc. of Science Writers. (L. S. Zahn, Hill and Knowlton Inc., 150 E. 42 St., New York, N.Y.)

Society of Technical Writers and Publishers. (G. Marx, Illinois Inst. of Technology, Chicago)

Statistics

BIO: Biomedical Information-Processing Organization. (M. Woodbury, New York Univ. Medical Center, New York, N.Y.)

Biometric Soc., ENAR. (D. S. Robson, Cornell Univ., Ithaca, N.Y.)

Biometric Soc., WNAR. (S. W. Nash, Univ. of British Columbia, Vancouver, Canada)

Mathematical Statistics and Probability, 5th Berkeley symp. (J. Neyman, Statistical Laboratory, Univ. of California, Berkeley)

Science in General

Academy Conf. (J. T. Self, Univ. of Oklahoma, Norman)

Scientific Research Soc. of America (D. B. Prentice, 51 Prospect St., New Haven, Conn.)

Sigma Delta Epsilon. (Miss A. Hanson, Univ. of Minnesota, Minneapolis)

Society of the Sigma Xi. (T. T. Holme, 51 Prospect St., New Haven, Conn.)

27–29. Academy of **Management**, New York, N.Y. (P. P. LeBreton, College of Business Administration, Univ. of Washington, Seattle)

27–30. **Differential Equations and Dynamical Systems**. Univ. of Puerto Rico, Mayaguez. (Center for Dynamical Systems, Brown Univ., Providence, R.I.)

NEW BOOKS

(Continued from page 738)

An Introduction to Mathematical Statistics. H. D. Brunk. Blaisdell (Ginn), New York, ed. 2, 1965. 447 pp. Illus. $8.50. A Blaisdell Book in the Pure and Applied Sciences.

Introduction to Space Science. Wilmot N. Hess, Ed. Gordon and Breach, New York, 1965. 930 pp. Illus. $10, to individuals. Twenty-three papers contributed by the Staff of Goddard Space Flight Center, NASA.

Isomerization of Aromatic Compounds. V. A. Koptyug. N. N. Vorozhtsov, Jr., Ed. Translated from the Russian edition (Novosibirsk, 1963) by L. Mandel. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1965. 191 pp. Illus. $7.50.

Low Reynolds Number Hydrodynamics: With Special Applications to Particulate Media. John Happel and Howard Brenner. Prentice-Hall, Englewood Cliffs, N.J., 1965. 569 pp. Illus. $15.

Mathematical Aspects of the Three-Body Problem in the Quantum Scattering Theory. L. D. Faddeev. Translated from the Russian edition (Moscow, 1963) by Ch. Gutfreund. I. Meroz, Translation Ed. Israel Program for Scientific Translations; Davey, New York, 1965. 116 pp. Illus. $6.25.

Mechanical Testing of Materials. A. J. Fenner. Philosophical Library, New York, 1965. 231 pp. Illus. $15. Newnes International Monographs on Materials Science and Technology.

Microscopic Identification of Minerals. E. Wm. Heinrich. McGraw-Hill, New York, 1965. 427 pp. Illus. $10.50.

The Mineral Resources of Africa. Nicolas de Kun. Elsevier, New York, 1965. 766 pp. Illus. $40.

Modern Algebra. vol. 2. Seth Warner. Prentice-Hall, Englewood Cliffs, N.J., 1965. 358 pp. Illus. $15.

The Nature of Solids. Alan Holden. Columbia Univ. Press, New York, 1965. 251 pp. Illus. $6.95.

New Foundations of Quantum Mechanics. Alfred Landé. Cambridge Univ. Press, New York, 1965. 183 pp. Illus. $7.50.

Nouveau Traité de Chimie Minérale. vol. 8, pt. 2, *Silicum*. Paul Pascal, Ed. Masson, Paris, 1965. 732 pp. Illus. Paper, F. 120; cloth, F. 132. Contributors: Raymond Calas, Paul Pascal, and Jean Wyart.

Operational Methods in Nonlinear Mechanics. Louis A. Pipes. Dover, New York, 1965. 107 pp. Illus. Paper, $1.50.

Organic Reaction Mechanisms: An Introduction. Ronald Breslow. Benjamin, New York, 1965. 244 pp. Illus. Paper, $3.95; cloth, $7. The Organic Chemistry Monograph Series, edited by Ronald Breslow.

Oxidation of Metals. Karl Hauffe. Translated from the German edition (1956) by Karl Vorres. Plenum Press, New York, 1965. 464 pp. Illus. $19.50.

Petrochemical Calculations: Based on Equivalents (Methods of Paul Niggli). Conrad Burri. Translated from the German edition (Basel, 1959) by A. Katz. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1965. 312 pp. Illus. $15.25.

Phase Diagrams of Titanium Alloys. E. K. Molchanova. S. G. Glazunov, Ed. Translated from the Russian edition (Moscow, 1964) by A. Halbreich, N. Kaner, and M. Statter. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1965. 318 pp. Illus. $15.25.

Philosophical Problems of Elementary Particle Physics. I. V. Kuznetsov and M. E. Omel'yanovskii, Eds. Translated from the Russian edition (Moscow, 1963) by A. Sen and R. N. Sen. Israel Program for Scientific Translations. Jerusalem; Davey, New York, 1965. 300 pp. Illus. $15.25.

Physical Methods in Inorganic Chemistry. Russell S. Drago. Reinhold, New York; Chapman and Hall, London, 1965. 450 pp. Illus. $14.50.

The Physical Principles of Magnetism. Allan H. Morrish. Wiley, New York, 1965. 696 pp. Illus. $16.50.

The Physics of Ice. E. R. Pounder. Pergamon, New York, 1965. 159 pp. Illus. Paper, $2.95. The Commonwealth and International Library.

Polypropylene Fibers and Films. Anthony V. Galanti and Charles L. Mantell. Plenum Press, New York, 1965. 191 pp. Illus. $12.50.

Preparing for the Professional Engineer's Examination: A Review with Questions and Answers. Irving J. Levinson. Prentice-Hall, Englewood Cliffs, N.J., 1965. 367 pp. Illus. $12.50.

Principles of Chemical Equilibrium. Kelso B. Morris. Reinhold, New York; Chapman and Hall, London, 1965. 128 pp. Illus. Paper, $1.95. A volume in the series Selected Topics in Modern Chemistry Series, edited by Harry H. Sisler and Calvin A. VanderWerf.

Principles of Radiation Protection Engineering. Thomas Jaeger. Translated from the German edition by Lawrence Dresner. McGraw-Hill, New York, 1965. 463 pp. Illus. $15.

Problems on the Design of Machine Elements. Virgil M. Faires and Roy M. Wingren. Macmillan, New York, ed. 4, 1965. 169 pp. Illus. Paper, $3.95.

La Propagation des Ondes. Guy Boillat. Gauthier-Villars, Paris, 1965. 50 pp. Illus. Paper, F. 20. Traité de Physique Théorique et de Physique Mathématique Series, vol. 23, edited by J.-L. Destouches.

Quantum Organic Chemistry. Keniti Higasi, Hiroaki Baba, and Alan Rembaum. Interscience (Wiley), New York, 1965. 366 pp. Illus. $13.

Queues and Inventories: A Study of Their Basic Stochastic Processes. N. U. Prabhu. Wiley, New York, 1965. 287 pp. Illus. $12.95.

Random Processes and the Growth of Firms. A study of the Pareto law. Josef Steindl. Hafner, New York, 1965. 249 pp. Illus. $10.

Real and Abstract Analysis. Edwin Hewitt and Karl Stromberg. Springer-Verlag, New York, 1965. 484 pp. Illus. $9.50.

Recovery, Recrystallization, and Grain Growth. J. G. Byrne. Macmillan, New York, 1965. 189 pp. Illus. Paper, $3.95; cloth, $6.95. Macmillan Series in Materials Science, edited by Morris E. Fine, Johannes Weertman, and Julia R. Weertman.

Reference Electrodes for Fused Salts. A. F. Alabyshev, M. F. Lantratov, and A. G. Morachevskii. Translated from the Russian edition (Moscow, 1965) by Adam Peiperl. Sigma Press, Washington, D.C., 1965. 192 pp. Illus. $8.

Solid Semiconductors. A. K. Jonscher. Dover, New York, 1965. 101 pp. Illus. Paper, $1.35. Solid-State Physics Series, edited by L. Jacob.

Solids: Elementary Theory for Advanced Students. Gabriel Weinreich. Wiley, New York, 1965. 177 pp. Illus. $6.95.

Soviet Progress in Applied Ultrasonics. vol. 2, *Ultrasonics in the Chemical Industry*. Vladimir Andreevich Nosov. Translated from the Russian edition (Kiev, 1963) by J. E. S. Bradley. Consultants Bureau, New York, 1965. 172 pp. Illus. Paper, $25.

Squares and Square Roots. C. Attwood. Pergamon, New York, 1965. 137 pp. Paper, $2.95. Practical Tables Series, No. 6.

Stable Radicals. Anatolii Leonidovich Buchachenko. Translated from the Russian edition (Moscow, 1963) by C. Nigel Turton and Tatiana I. Turton. Consultants Bureau, New York, 1965. 188 pp. Illus. $15.

Structure of Aqueous Electrolyte Solutions and the Hydration of Ions. O. Ya. Samoilov. Translated from the German edition by D. J. G. Ives. Consultants Bureau, New York, 1965. 197 pp. Illus. Paper, $15.

The Structure of Lie Groups. G. Hochschild. Holden-Day, San Francisco, Calif., 1965. 240 pp. $10.95. Holden-Day Series in Mathematics, edited by Earl L. Coddington and Andrew M. Gleason.

Structures of Organic Molecules. Norman L. Allinger and Janet Allinger. Prentice-Hall, Englewood Cliffs, N.J., 1965. 144 pp. Illus. Paper, $2.50; cloth, $4.95. Prentice-Hall Foundations of Modern Organic Chemistry Series, edited by Kenneth L. Rinehart, Jr.

Théorie des Systèmes Évolutifs. Thèodore Vogel. Gauthier-Villars, Paris, 1965. 178 pp. Illus. Paper, F. 45. Traité de Physique Théorique et de Physique Mathématique Series, vol. 22, edited by J.-L. Destouches.

Theory of Categories. Barry Mitchell. Academic Press, New York, 1965. 284 pp. $13.75. Pure and Applied Mathematics, vol. 17, edited by Paul A. Smith and Samuel Eilenberg.

Theory of Functions of a Complex Variable. vol. 2. A. I. Markushevich. Translated from the Russian and edited by Richard A. Silverman. Prentice-Hall, Englewood Cliffs, N.J., 1965. 347 pp. Illus. $16. Selected Russian Publications in the Mathematical Sciences, edited by Richard A. Silverman.

Theory of Heat and Mass Transfer. A. V. Lykov and Yu. A. Mikhailov. Translated from the Russian edition (Moscow, 1963) by I. Shechtman. R. Hardin, Translation Ed. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1965. 568 pp. Illus. $21.50.

Theory of Jets in Ideal Fluids. M. I. Gurevich. Translated from the Russian edition (Moscow, 1961) by Robert L.

Street and Konstantin Zagustin. Academic Press, New York, 1965. 601 pp. Illus. $15.

The Theory of Metals. A. H. Wilson. Cambridge Univ. Press, New York, ed. 2, 1965. 354 pp. Illus. Paper, $2.95.

A Theory of Sets. Anthony P. Morse. Academic Press, New York, 1965. 162 pp. $7.95. Pure and Applied Mathematics Series, edited by Paul A. Smith and Samuel Eilenberg.

The Thermal Properties of Solids. H. J. Goldsmid. Dover, New York, 1965. 80 pp. Illus. Paper, $1.35. Solid-State Physics Series, edited by L. Jacob.

Threshold Logic: A Synthesis Approach. Michael L. Dertouzos. M.I.T. Press, Cambridge, Mass., 1965. 268 pp. Illus. $6.

Transistor Circuits. K. W. Cattermole. Gordon and Breach, New York, ed. 2, 1965. 486 pp. Illus. $14.50.

Conference and Symposium Reports

The Anatomy of Memory. vol. 1, *Learning, Remembering, and Forgetting.* A conference sponsored by the American Institute of Biological Sciences (Princeton, N.J.), September 1963. Daniel P. Kimble, Ed. Science and Behavior Books, Palo Alto, Calif., 1965. 463 pp. Illus. Paper, $4.35. The contributors are Sir John C. Eccles, Lawrence Kruger, Holgar Hyden, James McGaugh, Albert M. Uttley, and Heinz Von Foerster.

Biological Aspects of Social Problems. J. E. Meade and A. S. Parkes, Eds. Plenum Press, New York, 1965. 236 pp. $9.75. Proceedings of a symposium held by the Eugenics Society (of Great Britain) in October 1964.

Education and Economic Development. C. Arnold Anderson and Mary Jean Bowman, Eds. Aldine, Chicago, Ill., 1965. 448 pp. Illus. $10.75. Twenty-two papers presented at the Conference on The Role of Education in the Early Stages of Development (Chicago, Ill.), April 1963.

Energy Metabolism. Proceedings of the Third Symposium (Troon, Scotland), May 1964. K. L. Baxter, Ed. Academic Press, New York, 1965. 466 pp. Illus. $15. Forty-one papers.

Fluids in Subsurface Environments. Transactions of the 6th Annual Meeting of the Southwestern Federation of Geological Societies (Midland, Texas), January-February 1964. Addison Young and John E. Galley, Eds. American Assoc. of Petroleum Geologists, Tulsa, Okla., 1965. 422 pp. Illus. $10.

Gas Chromatography of Steroids in Biological Fluids. Proceedings of the workshop (Warrenton, Va.), February 1965. Mortimer B. Lipsett, Ed. Plenum Press, New York, 1965. 335 pp. Illus. $12.50. Twenty-eight papers.

Gases in Cast Metals. B. B. Gulyaev, Ed. Translated from the Russian edition (Moscow, 1964). Consultants Bureau, New York, 1965. 265 pp. Illus. Paper, $27.50. Forty-eight papers given at the Ninth Conference on the Theory of Casting Processes.

Ideas in Modern Biology. John A.

Moore, Ed. Natural History Press, Garden City, N.Y., 1965. 572 pp. Illus. $8. This book, volume 6 of the *Proceedings of the 16th International Congress of Zoology*, brings together 19 essays "based on papers delivered at the . . . Congress . . . and published here in expanded form. . . ." The sections are Genetic Continuity (2 papers); Cell Biology (4 papers); Development (3 papers); Evolution (4 papers); Phylogeny (3 papers); and Behavior (3 papers). Details about the other eight volumes of the *Proceedings* can be obtained from the Printing and Publishing Office, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, NW, Washington, D.C., 20418.

Information System Sciences. Second Congress, November 1964. Joseph Spiegel and Donald Walker, Eds. Spartan Books, Washington, D.C., 1965. 531 pp. Illus. $23.75. Forty-seven papers presented at a symposium sponsored by Air Force Electronic Systems Division and the Mitre Corporation.

Life Sciences and Space Research. vol. 3. A session of the Fifth International Space Science Symposium (Florence), May 1964. M. Florkin, Ed. North-Holland, Amsterdam; Interscience (Wiley), New York, 1965. 269 pp. Illus. $8.25.

Lubrication and Wear. Proceedings of the International Symposium (Houston, Texas), June 1963. D. Muster and B. Sternlicht, Eds. McCutchan, Berkeley, Calif., 1965. 982 pp. Illus. $20.

Mammalian Cytogenetics and Related Problems in Radiobiology. Proceedings of a symposium (Sao Paulo and Rio de Janeiro, Brazil), October 1962. C. Pavan, C. Chagas, O. Frota-Pessoa, and L. R. Caldas, Eds. Pergamon, New York, 1964. 445 pp. Illus. $15. Twenty-eight papers.

Mathematics and Computer Science in Biology and Medicine. Proceedings of a conference held by the Medical Research Council in association with the Health Departments (Oxford), July 1964. Harold Himsworth and George Godber, Eds. Her Majesty's Stationery Office, London, 1965. 327 pp. Illus. Paper. Twenty-seven papers.

Microelectronics and Large Systems. A symposium (Washington, D.C.), November 1964. Samuel J. Mathis, Jr., Richard E. Wiley, Lester M. Spandorfer, Eds. Spartan Books, Washington, D.C., 1965. 278 pp. Illus. $8.50. Thirteen papers.

Perspectives in Virology. vol. 4. Morris Pollard, Ed. Harper and Row, New York, 1965. 351 pp. Illus. $10.50. Seventeen papers presented at the Gustav Stern Symposium.

Plant Indicators of Soils, Rocks, and Substance Waters. A. G. Chikishev, Ed. Translated from the Russian edition (Moscow, 1964). Consultants Bureau, New York, 1965. 222 pp. Illus. $27.50. Forty-one papers given at the Conference on Indicational Geobotany, February 1961.

Quantitative Electron Microscopy. Proceedings of a symposium (Washington, D.C.), March-April 1964. Gunter F. Bahr and Elmar H. Zeitler, Eds. Williams and Wilkins, Baltimore, 1965. 615 pp. Illus. $12.50. Fifty papers presented at a symposium sponsored by Intersociety Committee for Research Potential in Path-

Science and Practice in Anesthesia. James E. Eckenhoff, Ed. Lippincott, Philadelphia, 1965. 160 pp. Illus. $7. Eighteen papers presented at the Bicentennial Anniversary Meeting of the University of Pennsylvania School of Medicine (Philadelphia), June 1965.

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