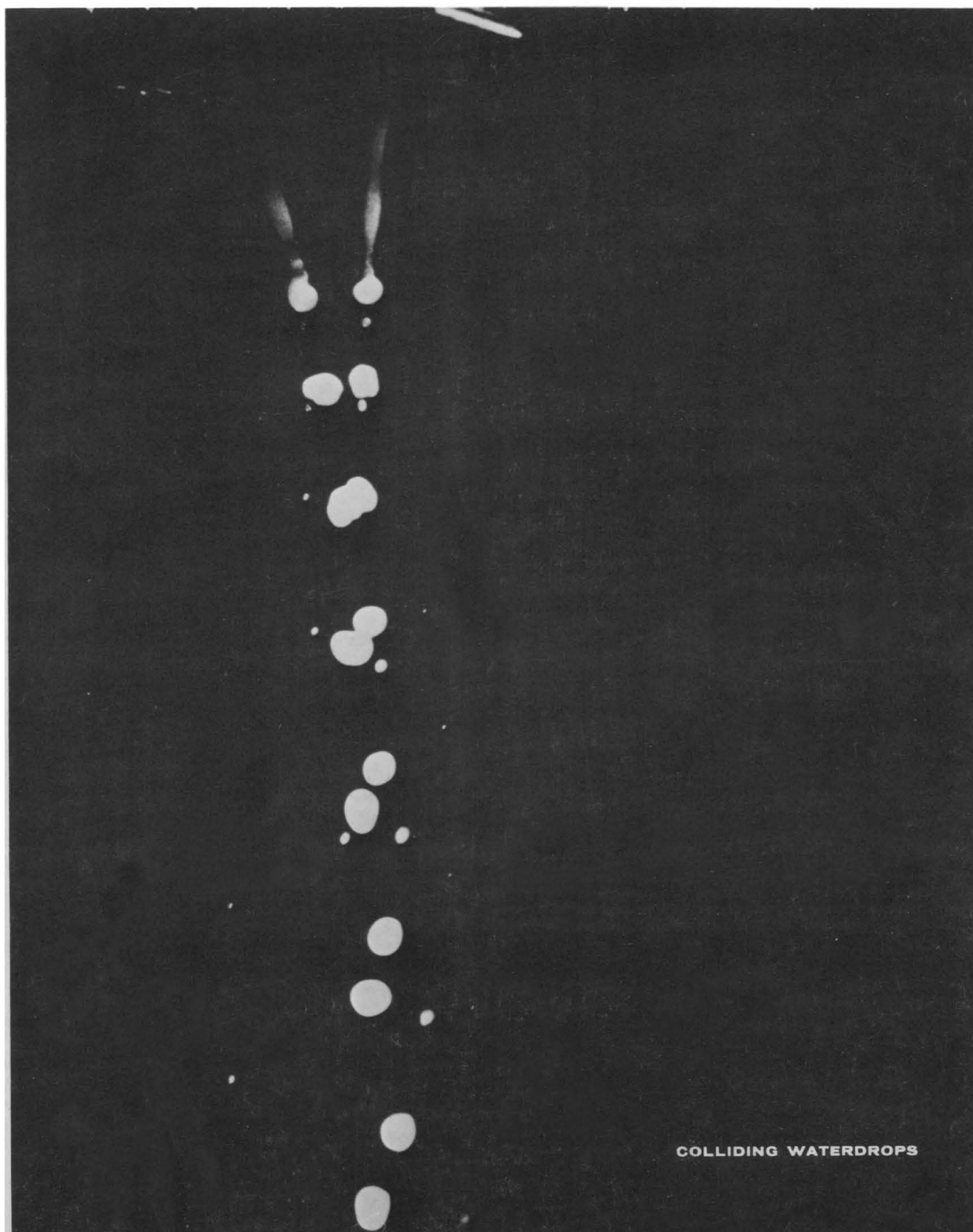


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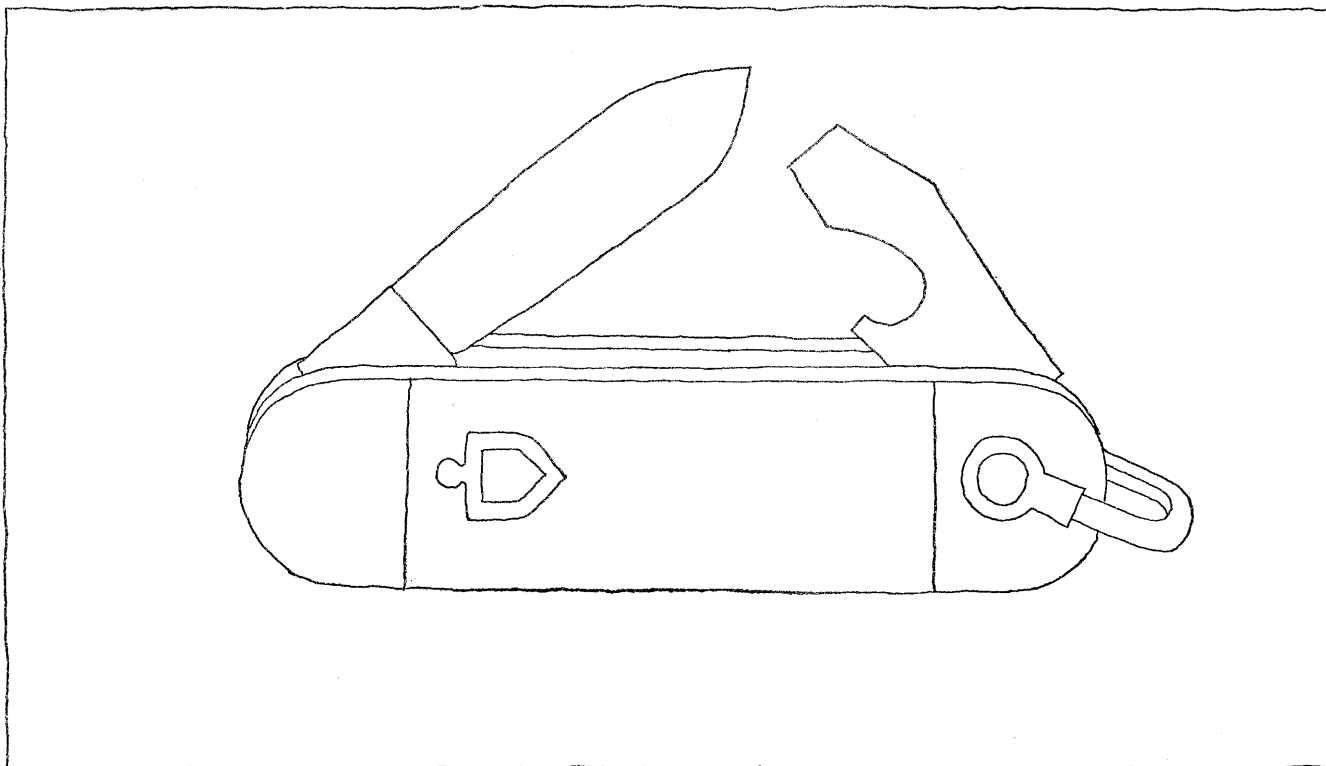
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Vol. 150, No. 3697

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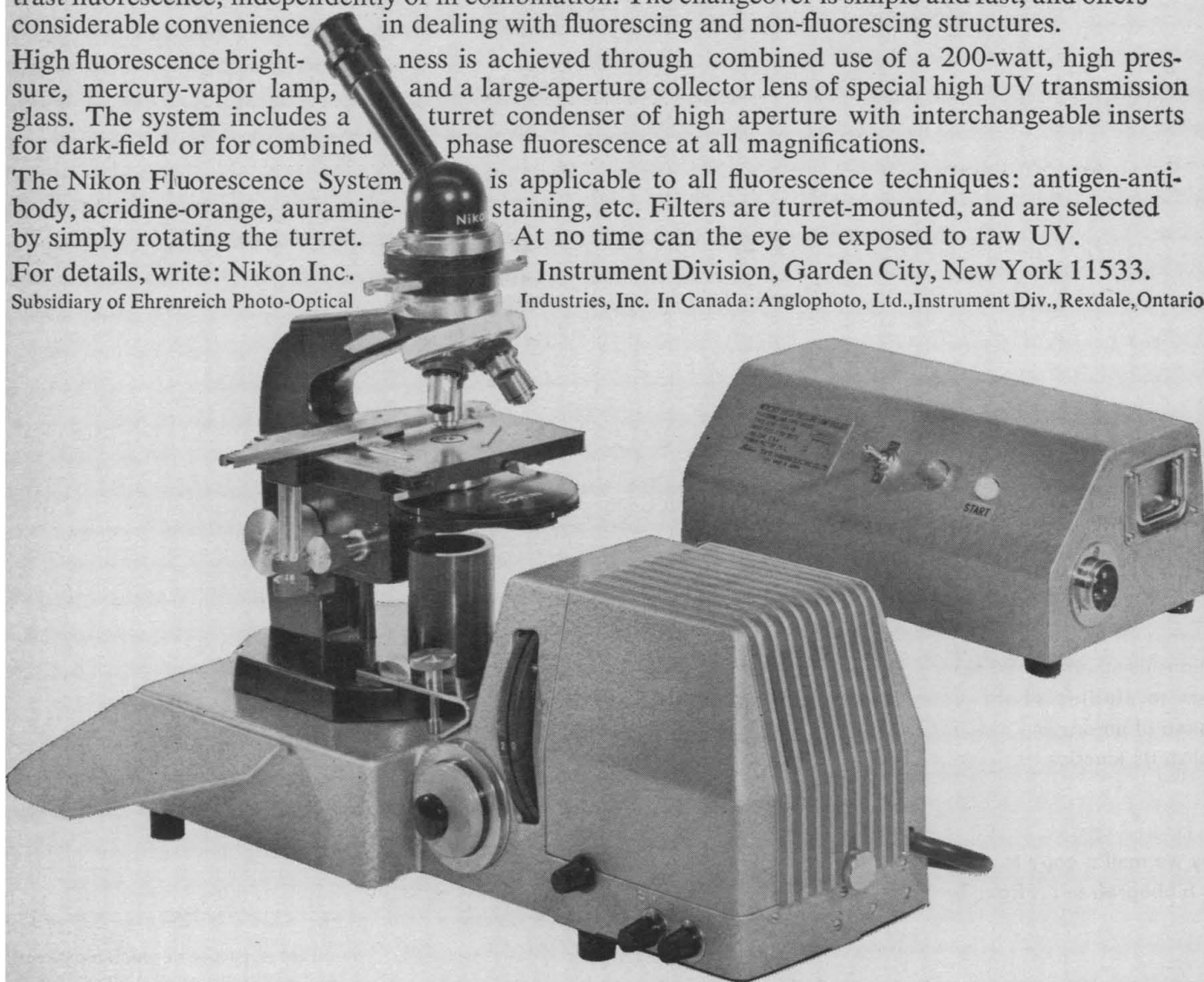
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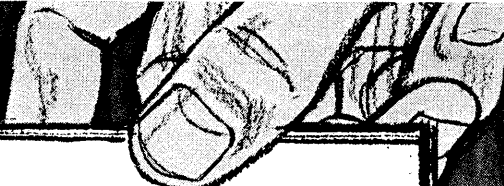
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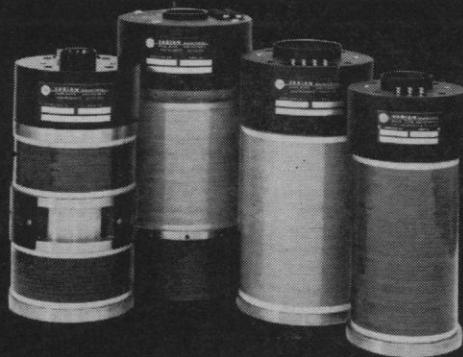
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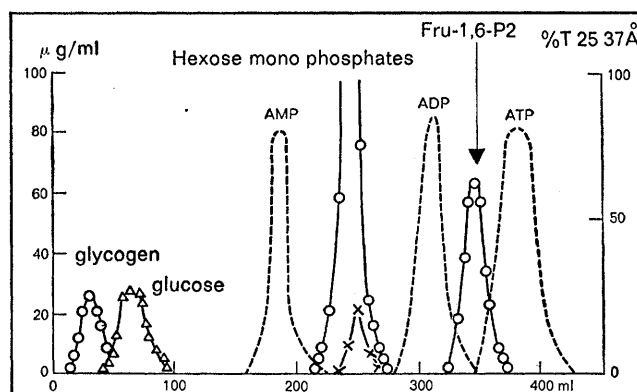
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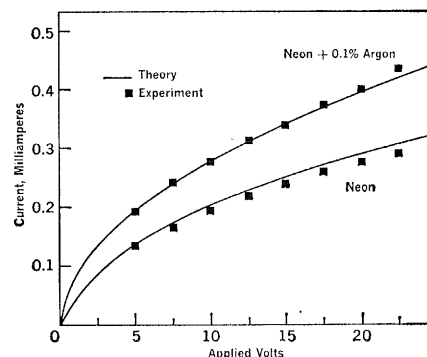
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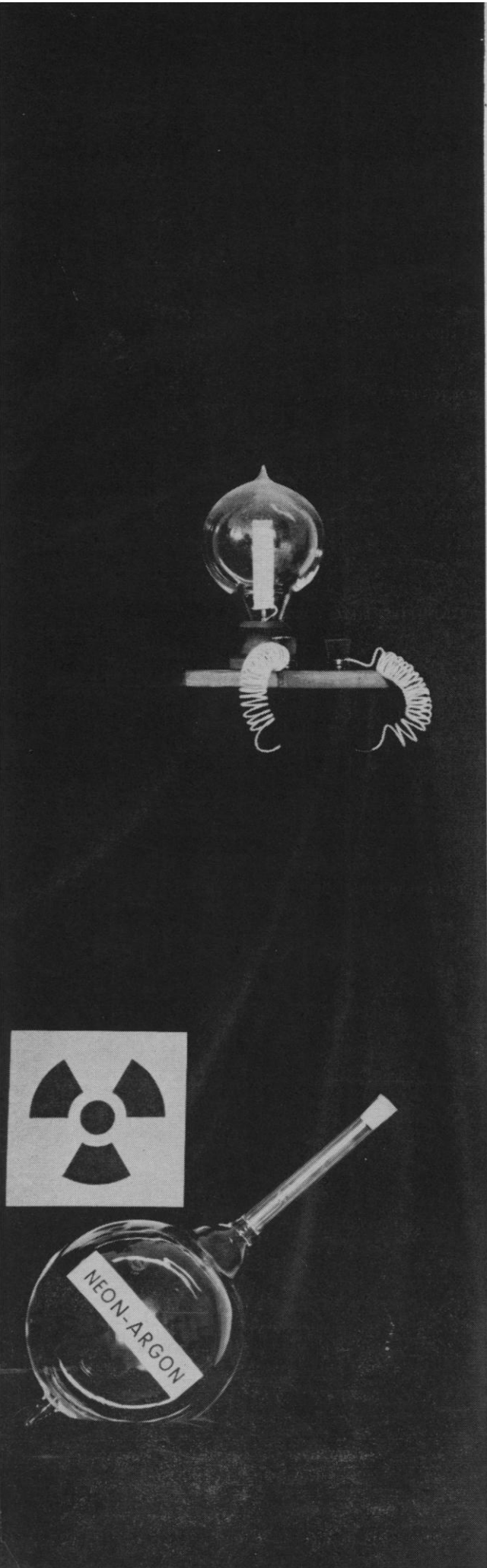
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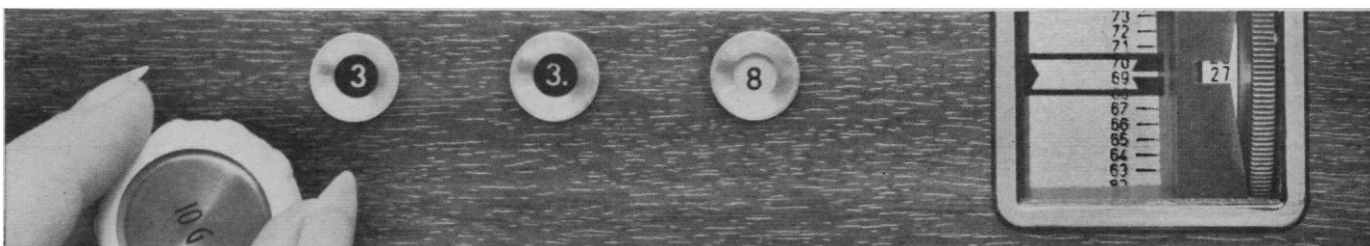


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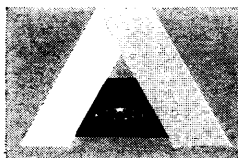
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Primes fast and easy every time!

Operates on an exclusive *flap valve* principle. The pressure of the liquid being pipetted causes the flaps to open and close as required. Prevents back flow. No moving parts to stick.

The Adams Aupette Valve is made of durable, inert, temperature-resistant plastic. It is available separately and may be used wherever a reliable two-way valve is required. The Adams Aupette and Valve are available from your dealer

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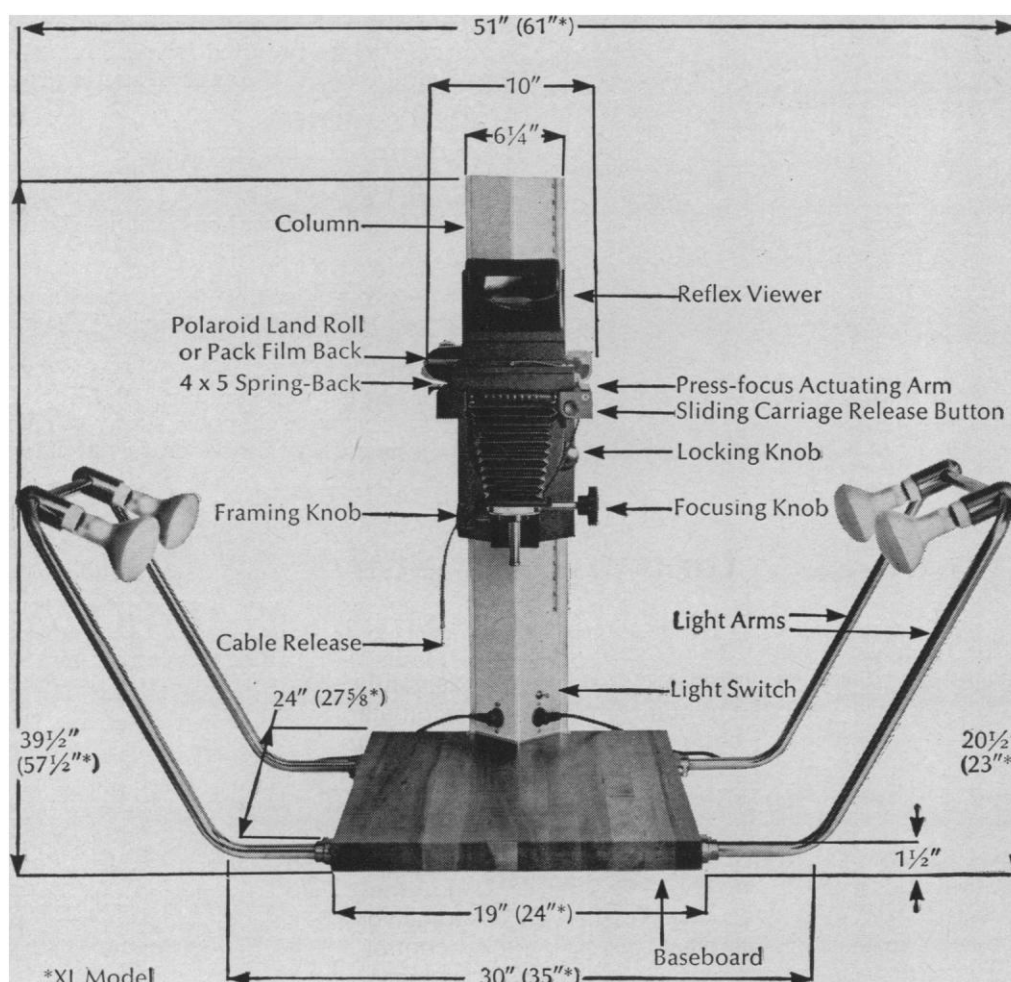
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The Polaroid MP-3 camera measures only 57 1/2" x 61". Yet it can knock off any job you hand it without a darkroom. Just seconds after you snap the shutter you have your finished picture.

In 10 seconds you get prints of big objects, macrophotos of small ones, photomicrographs, copies of X-rays, gross specimen photos, slides of line work, correctly sized screened prints, copies of any artwork, photos of anything.

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In 60 seconds you get full-color prints.

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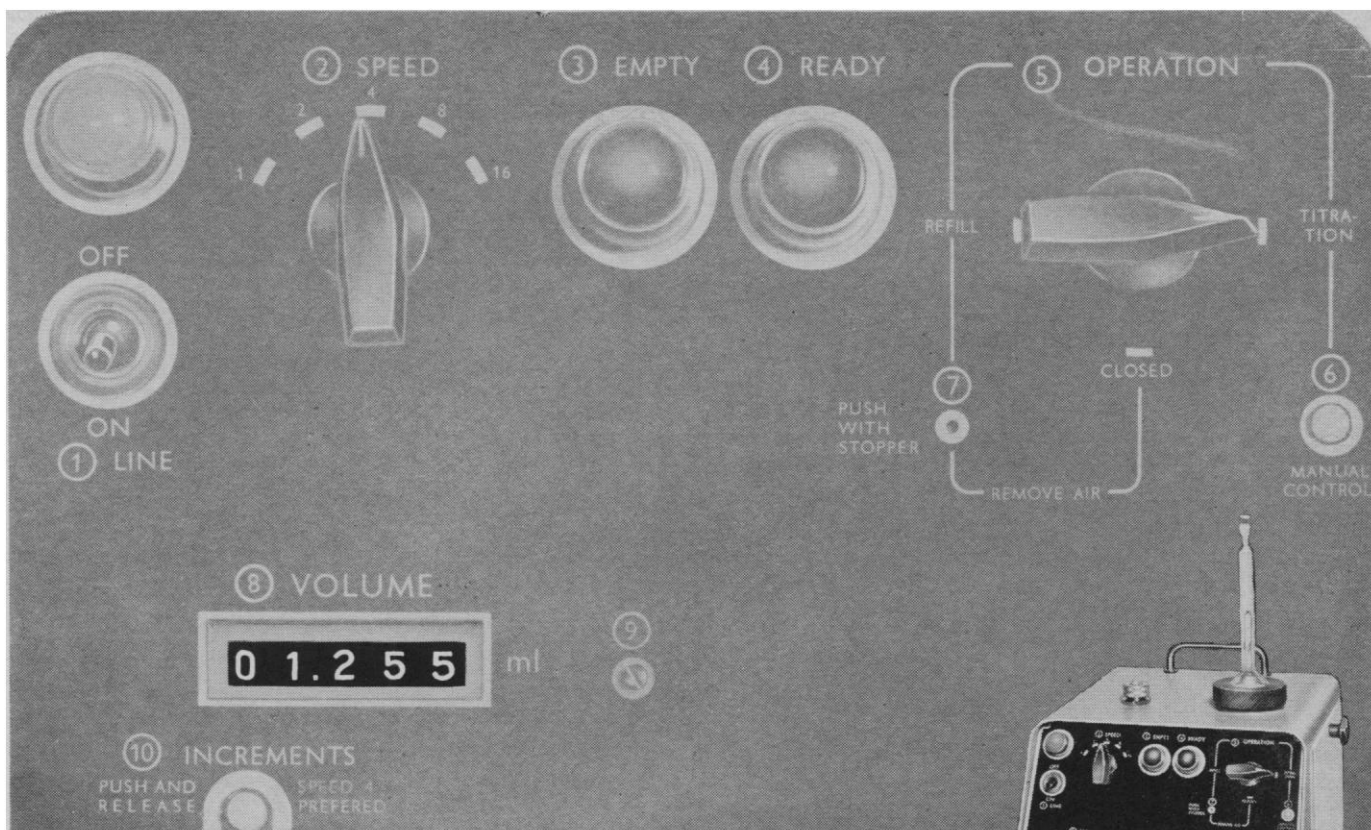
The MP-3 is that versatile. Here's what makes it that way.

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If you think you have a studio photographic job that the MP-3 can't handle, we'd love to discuss it with you. Write Sales Department, Polaroid Corporation, Cambridge, Massachusetts 02139.

Polaroid MP-3 Industrial View Camera

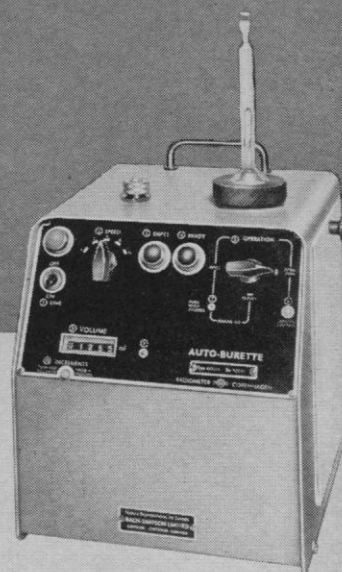


A new auto burette unit for repetitive routine end point titrations

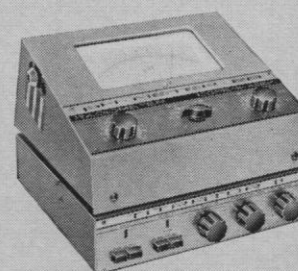
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ABU-1




28/TTT-11



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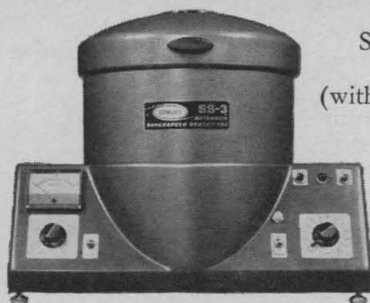
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VISIBLE GRATING
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The Model 139 Grating Spectrophotometer, a compact, precise modern instrument, out performs similar spectrophotometers costing significantly more.

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

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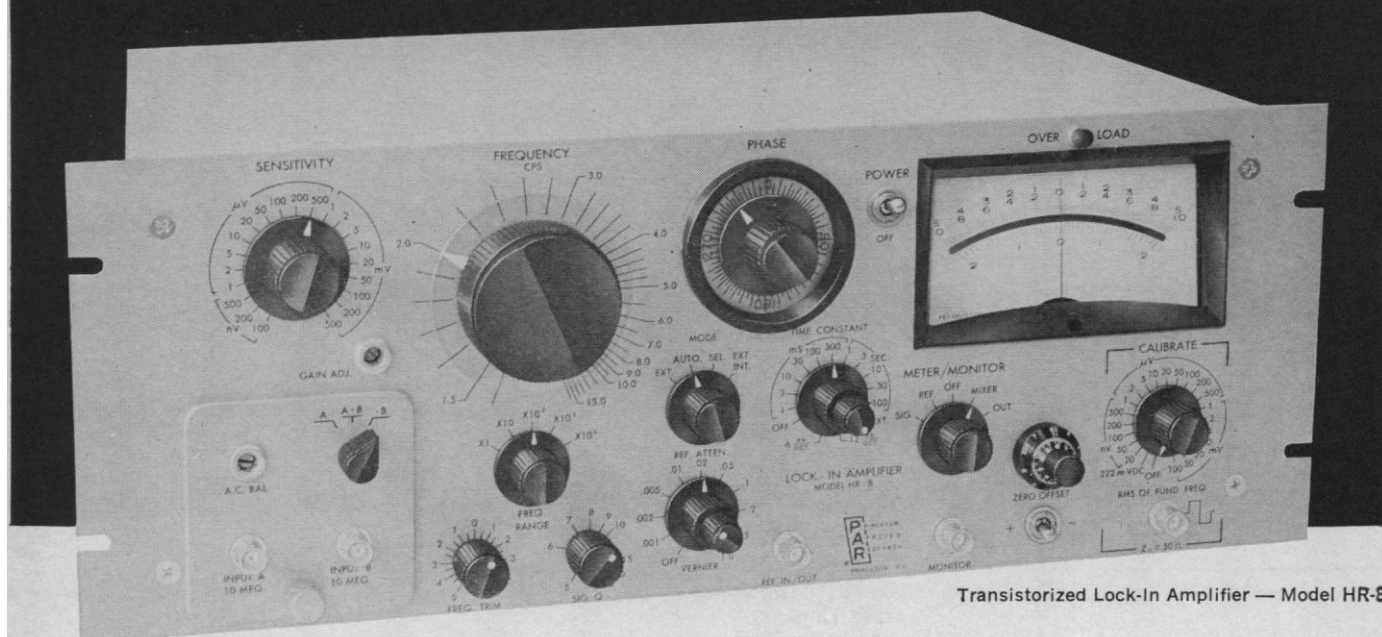
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New PAR Lock-In Amplifier Measures Signals in the Presence of Noise by Crosscorrelation



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.

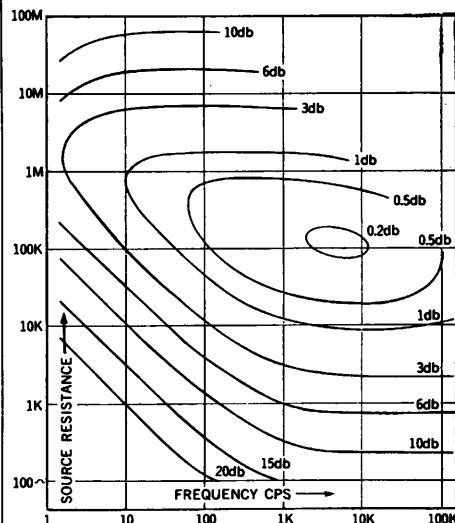
With Type B Pre-Amplifier: 1 nanovolt to 5 millivolts rms.

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.

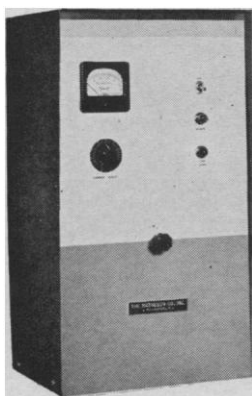


Contours of constant noise figure for a typical PAR Type A preamplifier plotted to show dependence on frequency and source resistance at 300° K. Amplifier operated single-ended.

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

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APPLIED RESEARCH CORP.
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New Equipment from Matheson



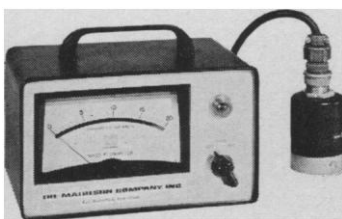
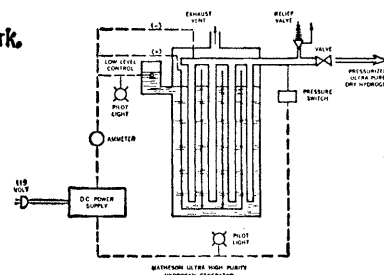
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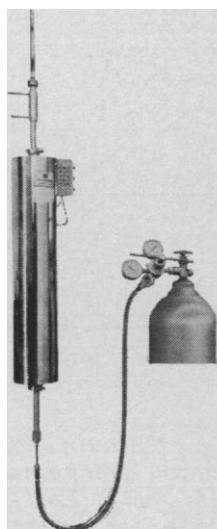
Generator consists of electrolytic cell, rectifier, regulating valves & switches. Electrolytic cell anode is nickel; cathode is bundle of palladium-alloy tubes. Electrolyte is strong alkali. During electrolysis, oxygen collects at anode and is vented to atmosphere. Ionic hydrogen is deposited at cathode.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



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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.

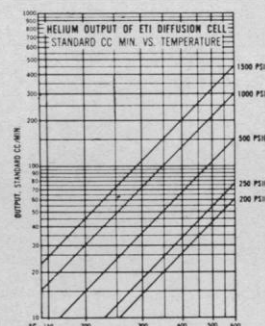
Measures gas flow down to 0.01 standard cc/min. even for hydrogen or helium. Measurement repeatability within 1%. Can be used with recorders. Output signal approximately 0-2 mv. d-c. Once installed, needs no recalibration. Circuitry is 100% solid state for maximum reliability. Flow transducer withstands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



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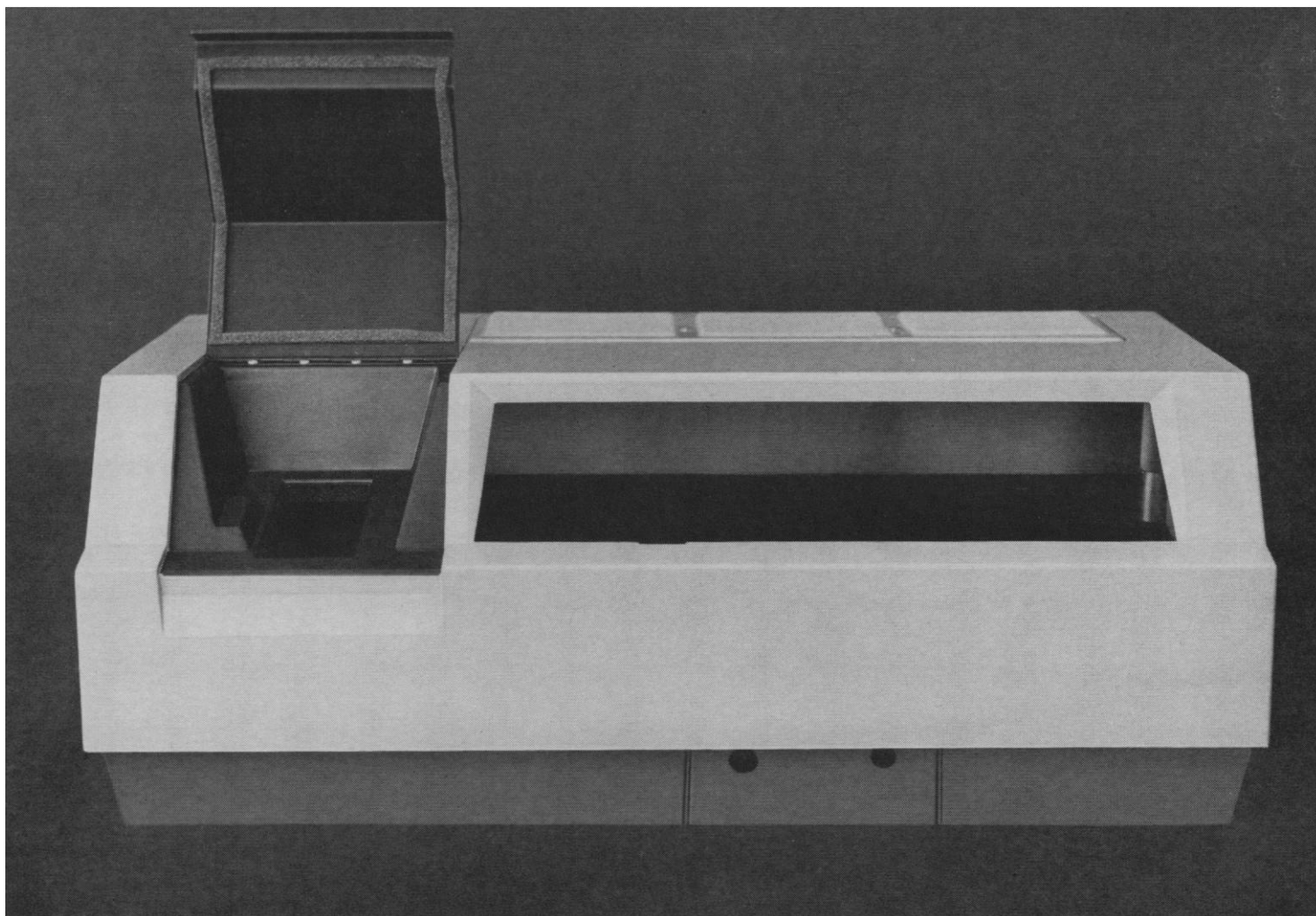
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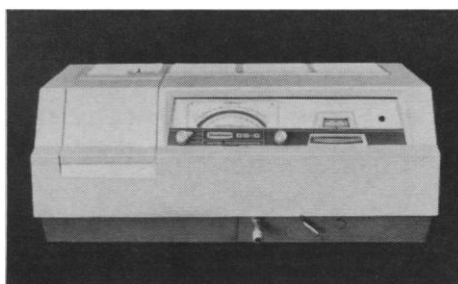
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AAAS Distinguished Lecture: Genetics and Cultural Change by George W. Beadle, president, University of Chicago.

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.

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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.

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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.

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* 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
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Berkeley Travelodge (46)	8.00	10.00	11.00	
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(These must be indicated—add approximate hour, A.M. or P.M.)

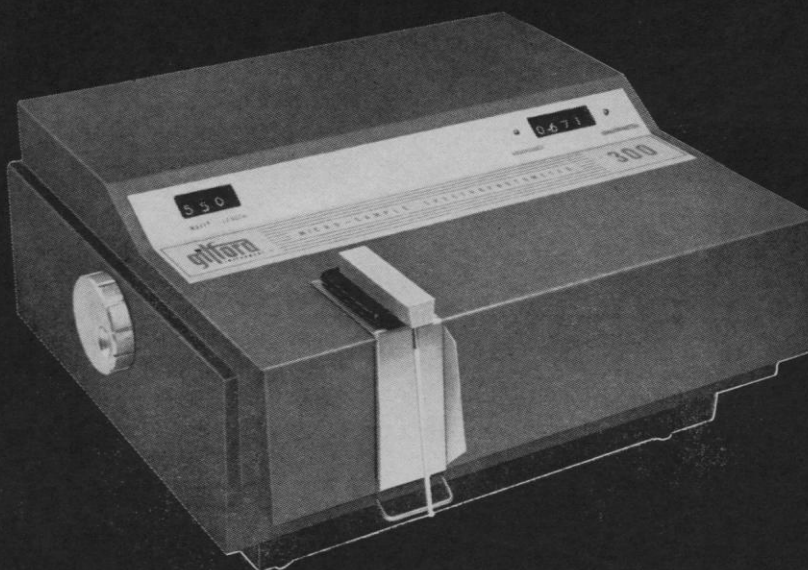
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(Individual requesting reservation) (Please print or type)

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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.

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This instrument maintains a usable resolution of 0.001 absorbance unit over its entire measurement span of 0.000 to 2.000 A units. Its long term stability is better than 0.005 A per hour, requiring only occasional zero setting on a reference. And it combines this uncommon performance with explicitly simple operation.

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The remarkable sensitivity and stability of the Model 300 is a product of a unique electronic circuit, sophisticated optical and mechanical design and close tolerance manufacturing.

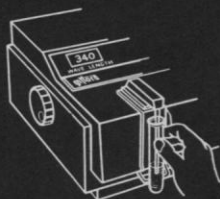
For special applications there are accessories for continuous flow arrangements, use of standard cuvettes and chart recording of absorbance data.

As vital diagnostic and research techniques improve, measurements often require new orders of sensitivity, precision and speed. The Gilford Model 300 is clearly ahead of this trend.

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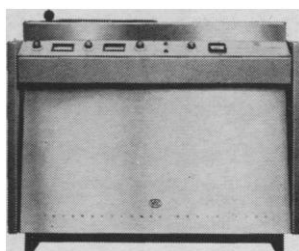
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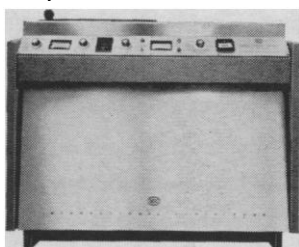
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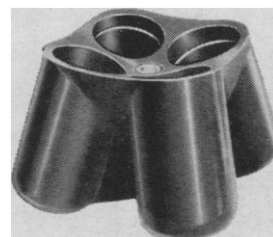
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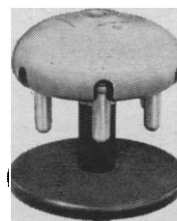
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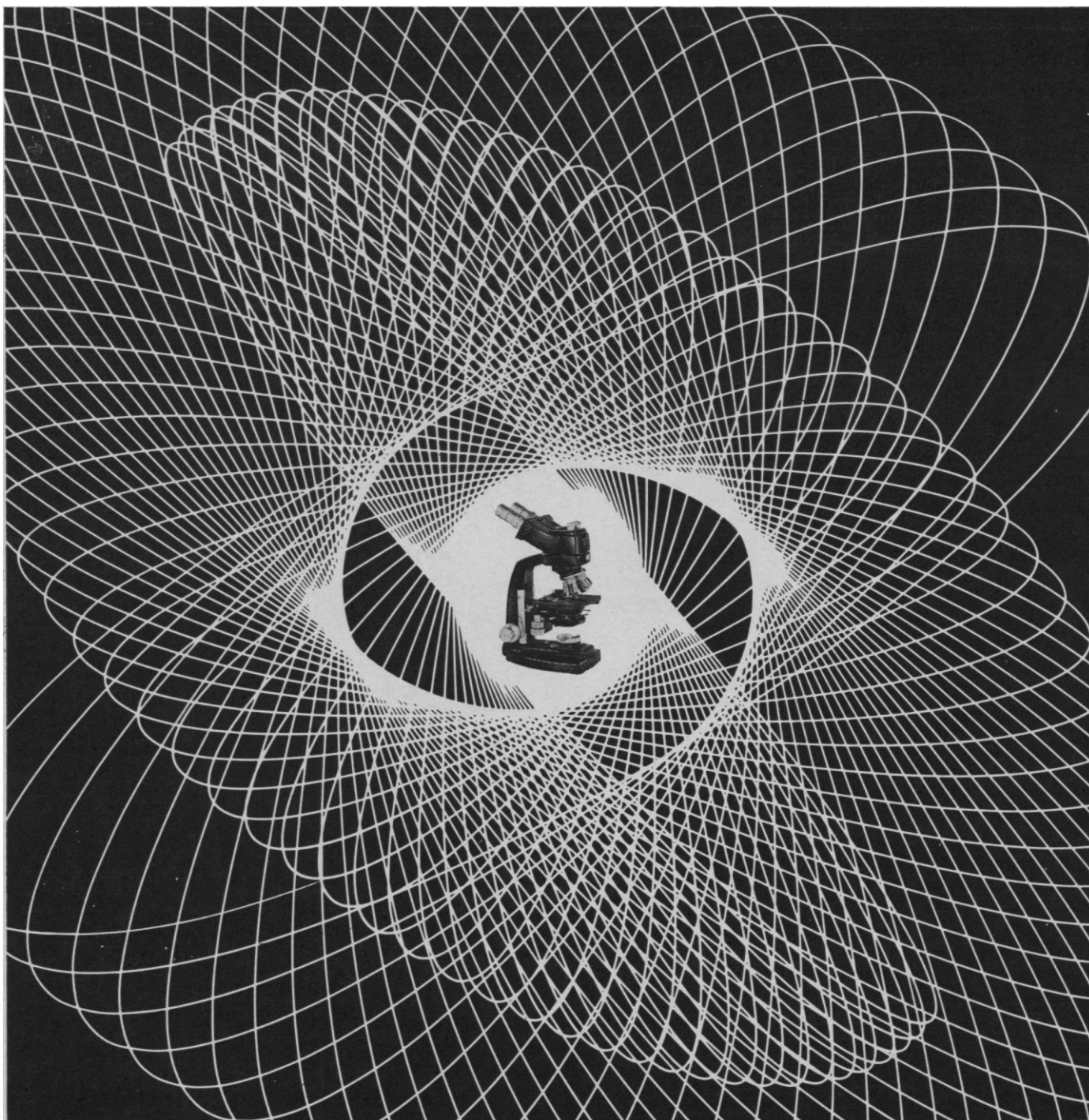


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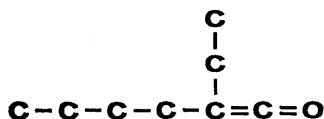
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FOR NOVEMBER



Butyl Ethyl Ketene

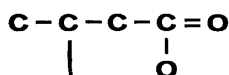
Form yellow liquid
Boiling point, 12 mm. 36° C.
Flash point, T.O.C. 18° C.

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.

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Kingsport, Tennessee

B61



β-Butyrolactone

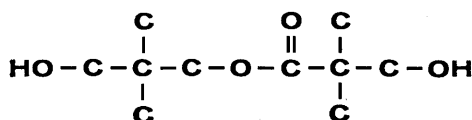
Form colorless liquid
Specific gravity, 20°/20° 1.0409
Refractive index, n_D²⁰ 1.4772
Flash point, C.O.C. 80° C.

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.

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Kingsport, Tennessee

B62



Hydroxypivalyl Hydroxypivalate (Neopentyl Glycol Monohydroxypivalate)

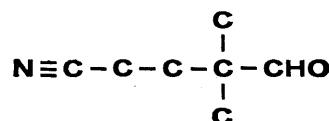
Form crystalline solid
Melting point 51-53° C.
Boiling point, 1 mm. 120° C.
Molten color, APHA 90 ppm

An interesting new glycol for developing polyester, urethane and other resins, plasticizer and more complicated molecules, HPHG 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.

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B67



4-Cyano-2,2-dimethylbutyraldehyde

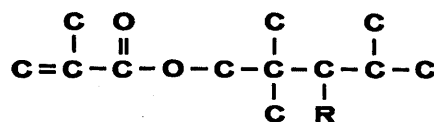
Form colorless to amber liquid
Specific gravity, 20°/20° C. 0.9498
Boiling point, 5 mm. 92-94° C.
Assay, minimum 98%

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 CH₂C(CH₃)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

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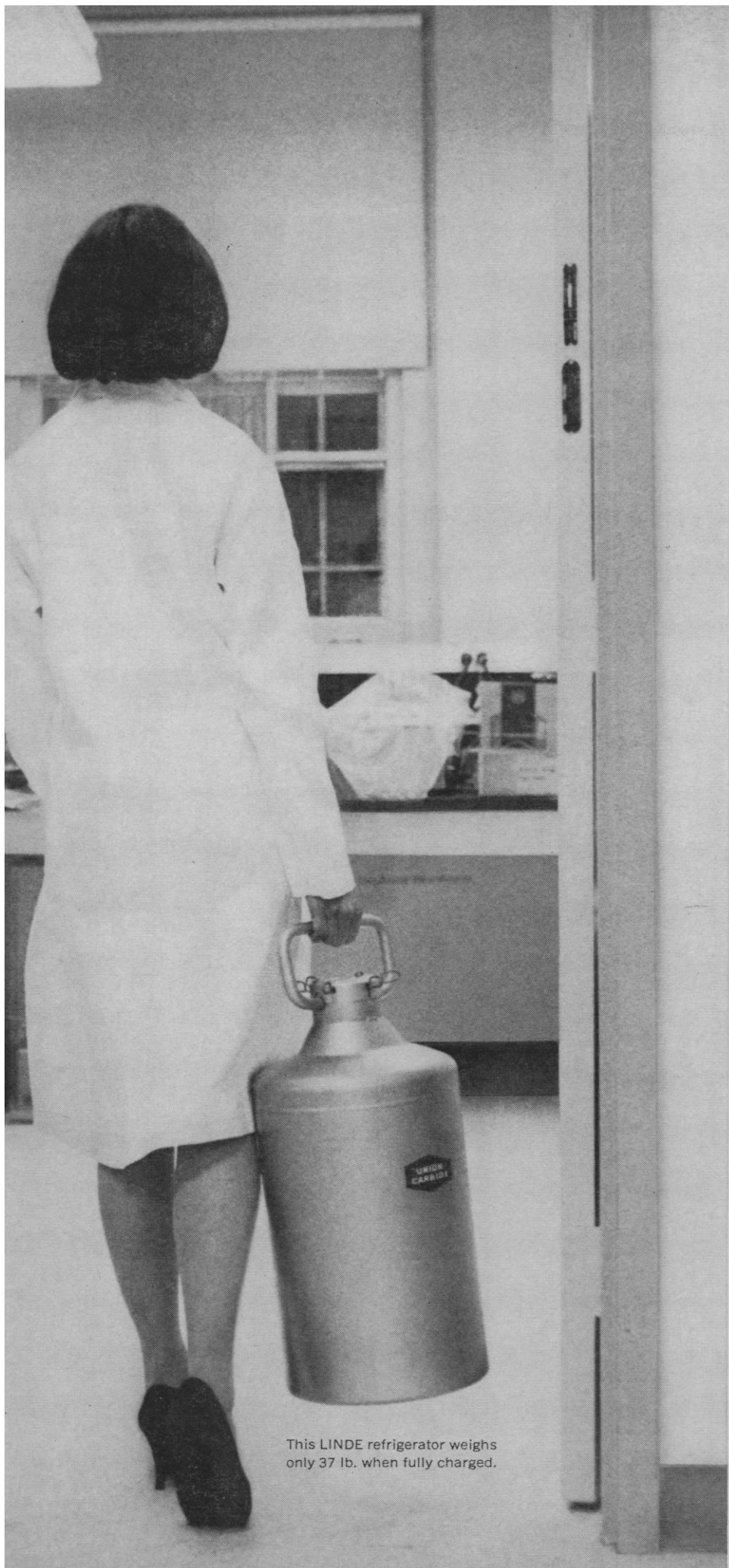
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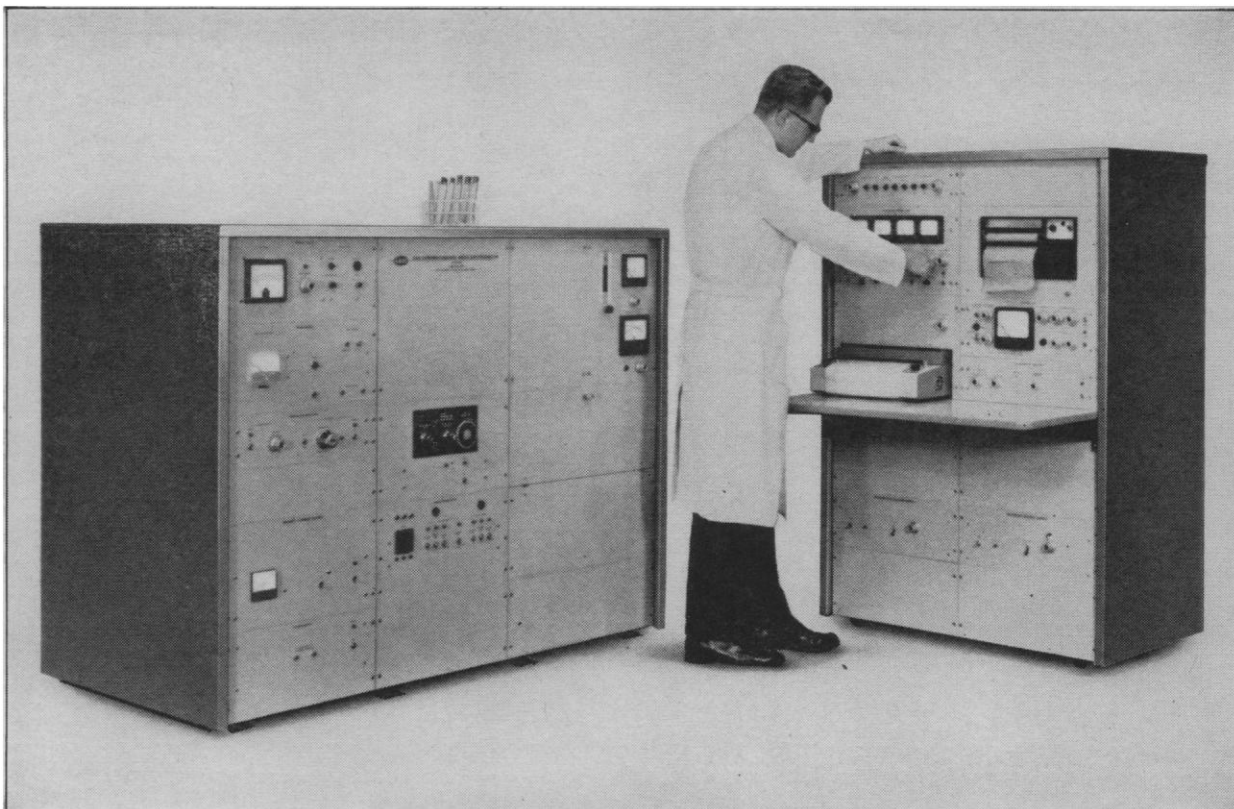
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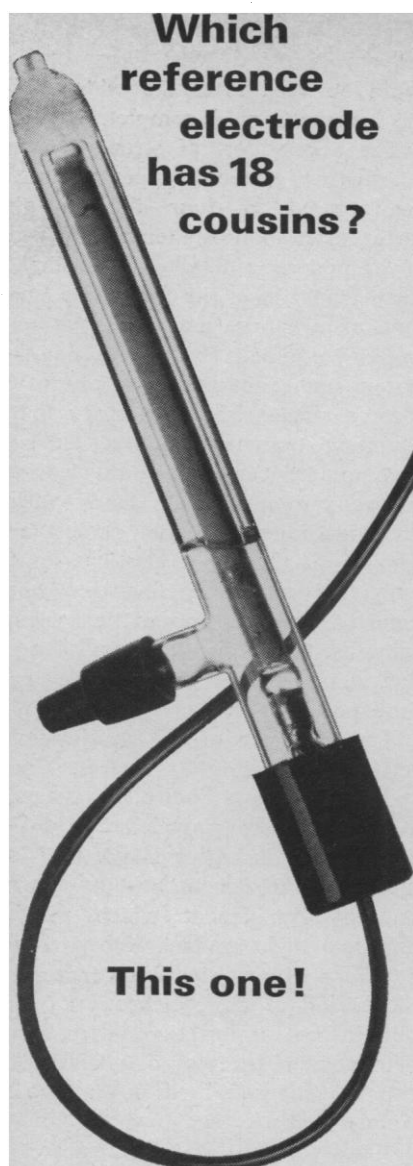
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may be in short supply during the day-time, the accelerator may have to be operated at night only. (If so, tourists could visit the accelerator during the day, and the entrance fees charged might pay a significant fraction of the operating cost.)

When repair work must be performed in the circular tunnel, which would soon become highly radioactive, accelerator engineers would fill the entire tunnel with sea water. Mechanics employing aqualungs or diving suits could then work in complete safety.

A separately constructed central area of the assembly would contain machine shops, special power supplies, a large control room, administrative headquarters, and also a kind of motel (with parking for helicopters rather than cars) for the crew of approximately 1000 engineers and technicians. Recreation facilities would include a movie theater, squash courts, swimming pools, and a specially stocked fishing pool.

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,
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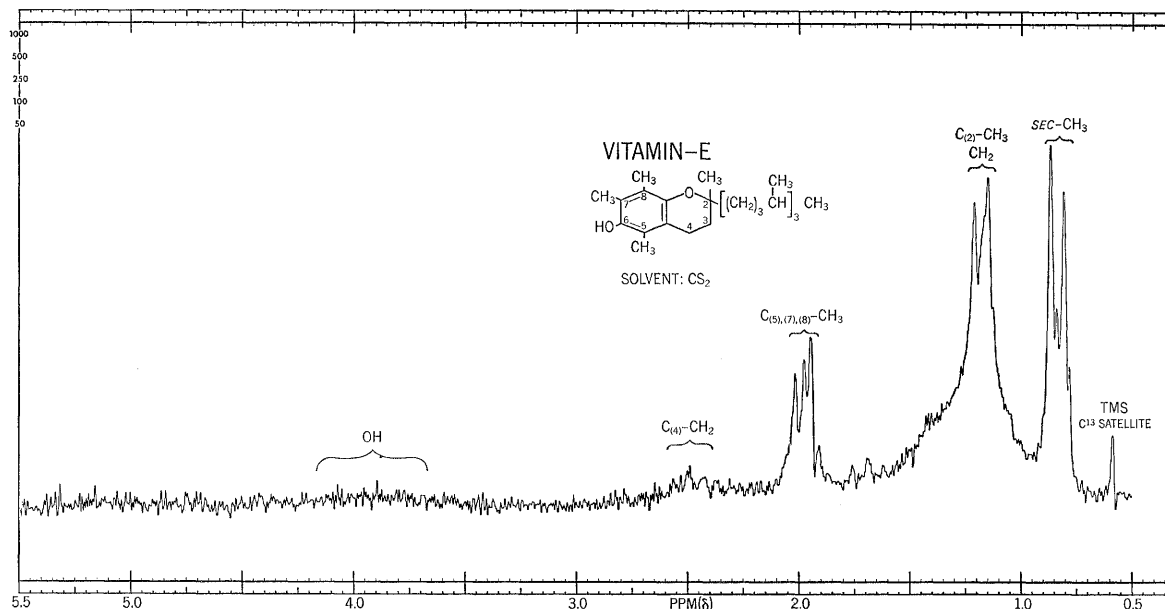
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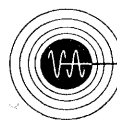
Example: Small sample analysis

Probably the most severe basic limitation in the application of NMR spectroscopy to molecular structure determination is the inherent lack of sensitivity of this tool compared to other spectrographic methods. Fortunately, this problem can be attacked by using electronic computer techniques to store spectral information accumulated from many scans of the same sample. In this way sensitivity is improved by a factor equal to the square root of the number of scans taken. The

spectrum shown below is a readout of the memory of a C-1024 computer which stored 200 scans accumulated during an overnight period of 15 hours. The sample is 0.2 mg Vitamin-E, or α -tocopherol, dissolved in 0.4 ml CS_2 , corresponding to a concentration of 1.2×10^{-3} molar. Assignments for key signals are shown in the illustration and these can be compared to the 60 Mc CDCl_3 spectrum in the Varian NMR spectra catalog, Vol. 1, No. 366.

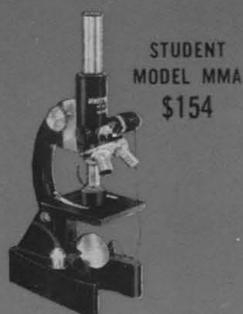


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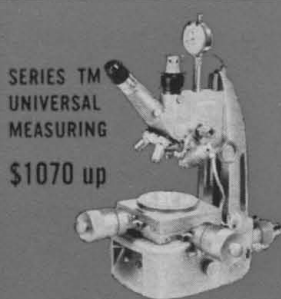
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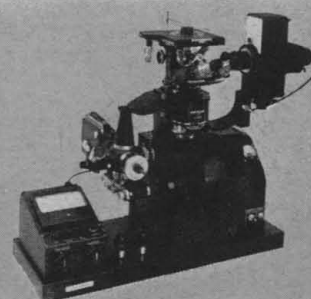


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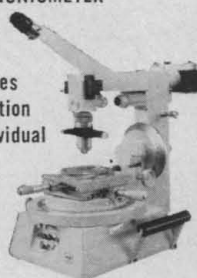
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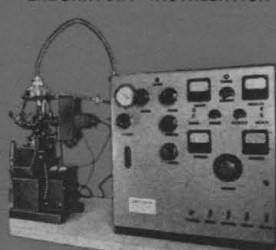


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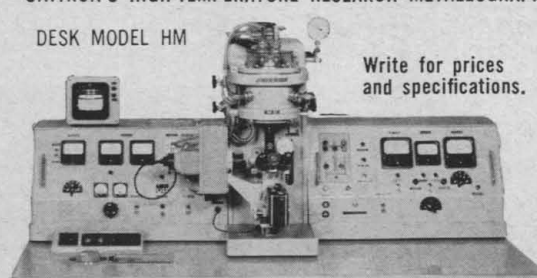
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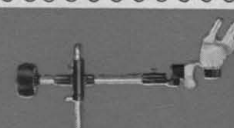
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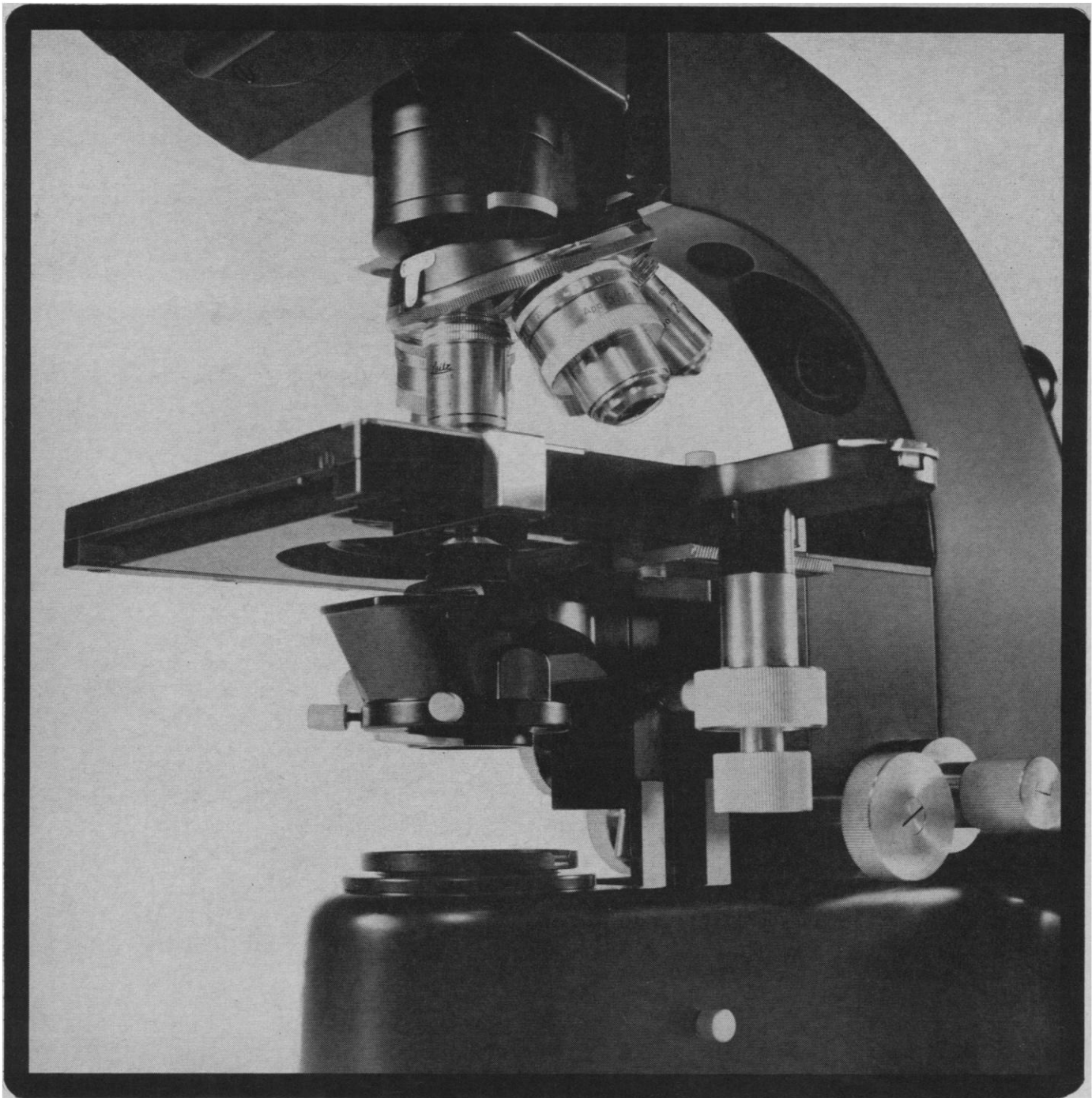
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A New Level of Understanding

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.

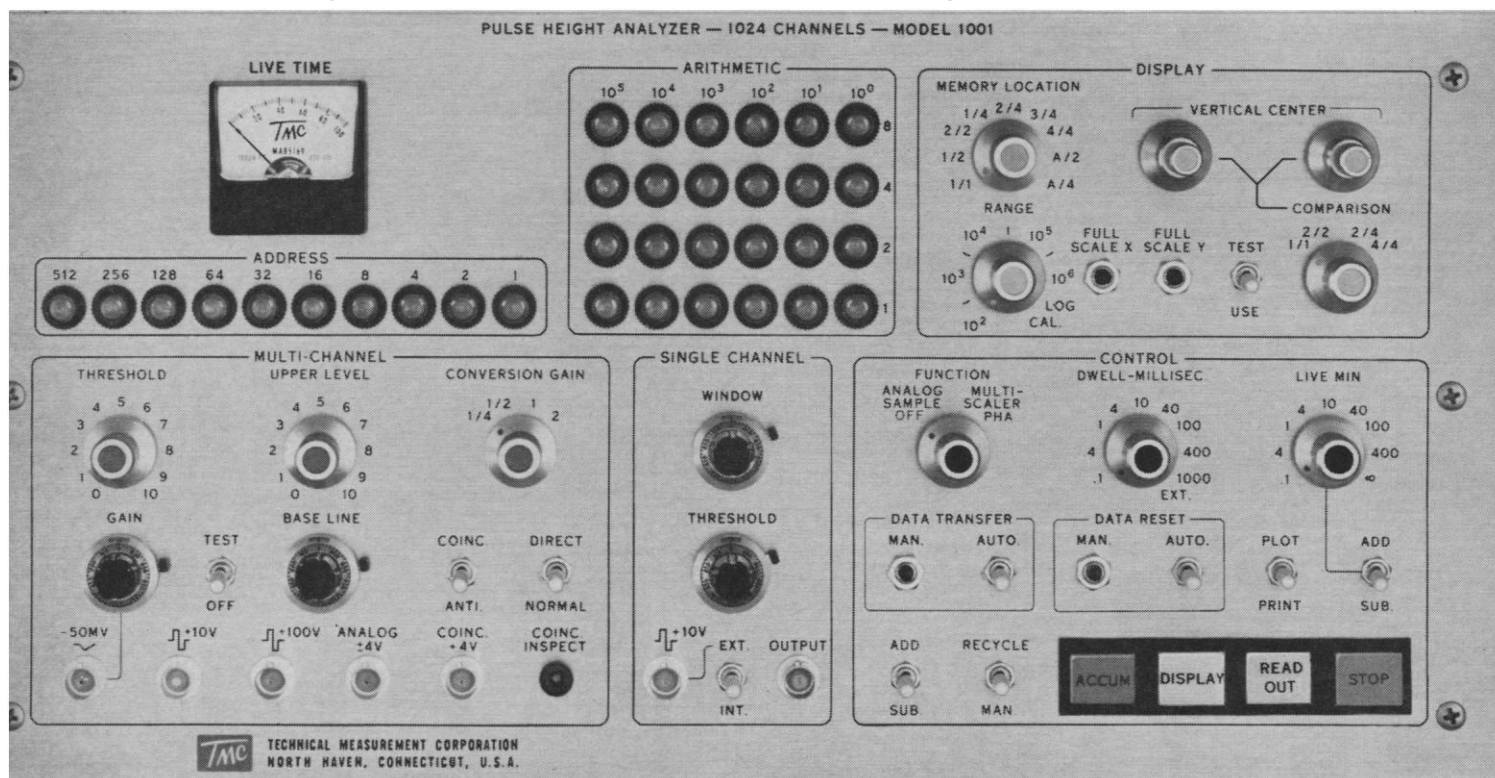
Although the problems that have been dealt with through legislation or discussed in hearings and reports have been handled individually and empirically, each in terms of its own characteristics and requirements, the very amount of such segmental activity has increased the need for a more generalized, 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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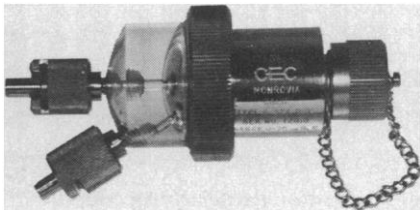
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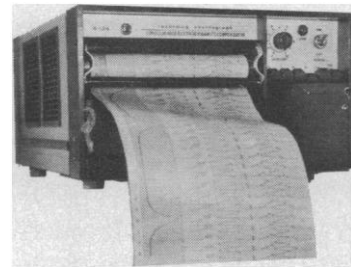


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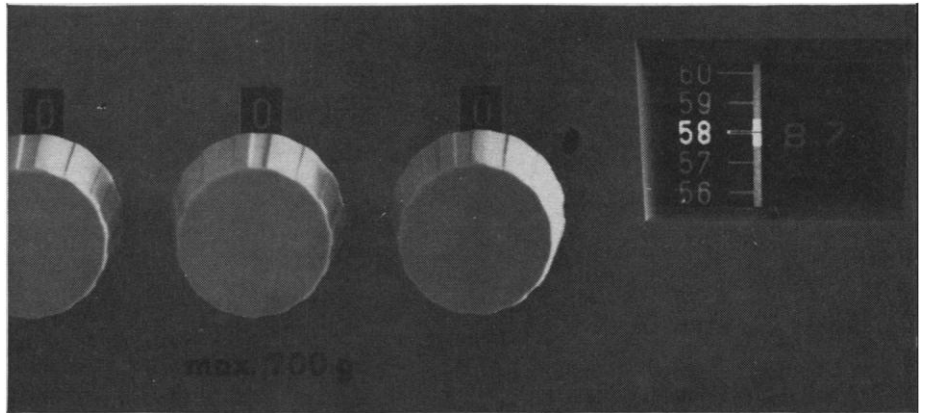
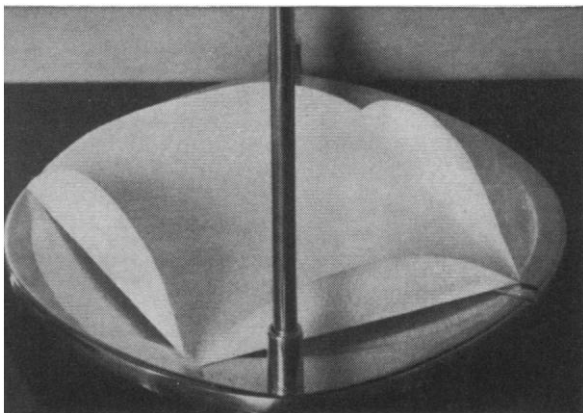
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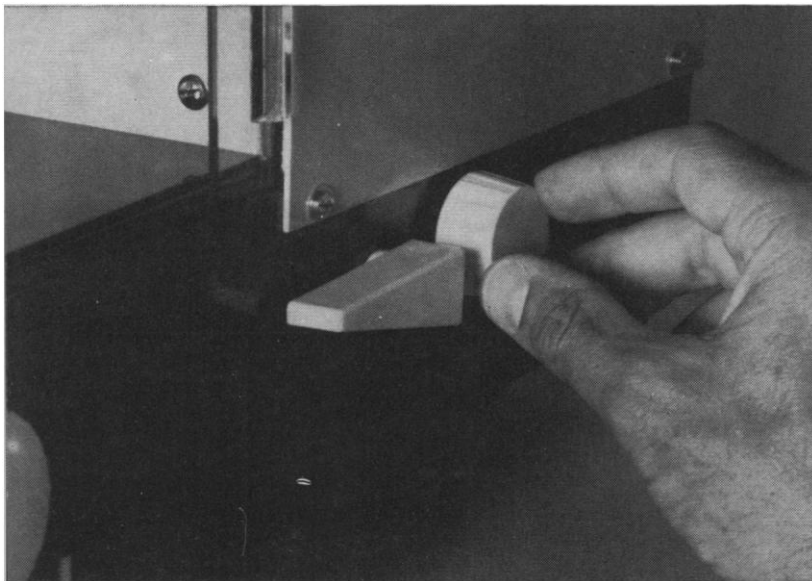
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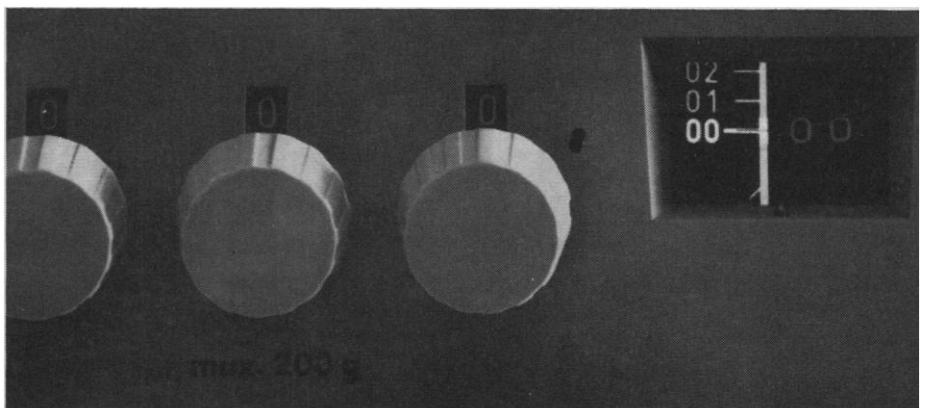
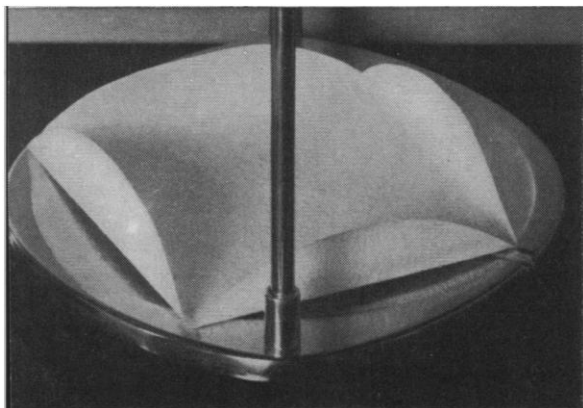


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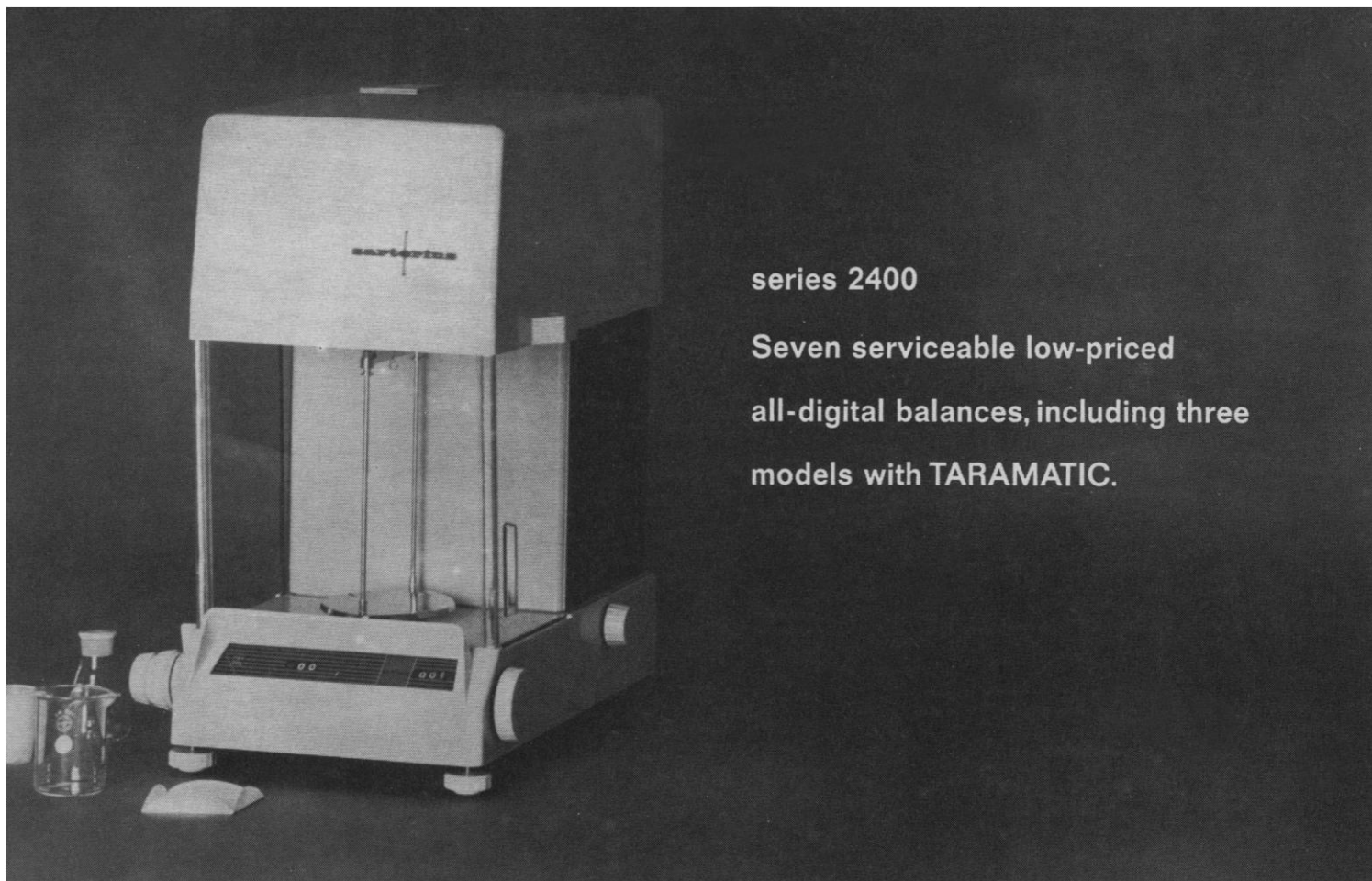
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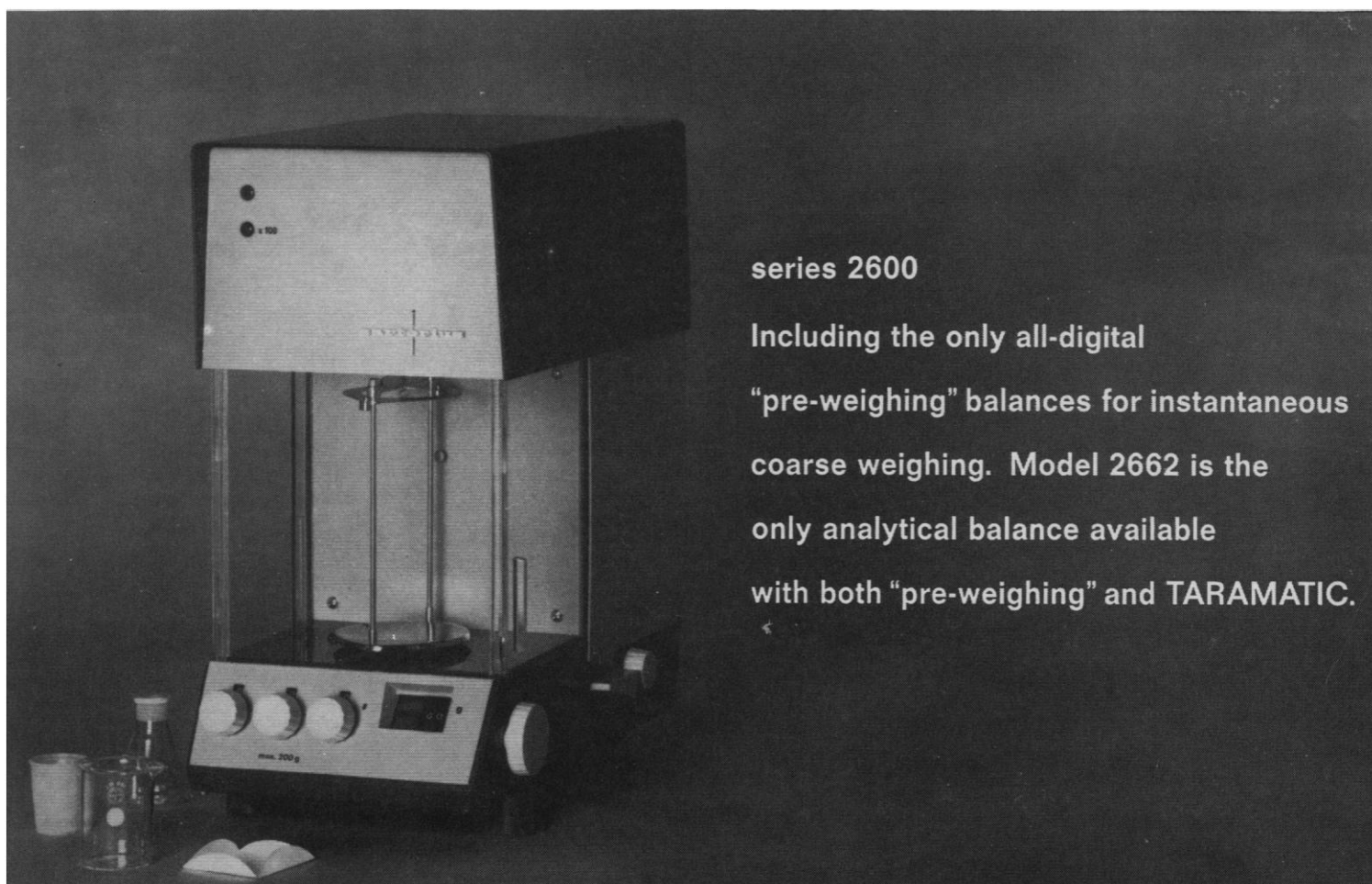
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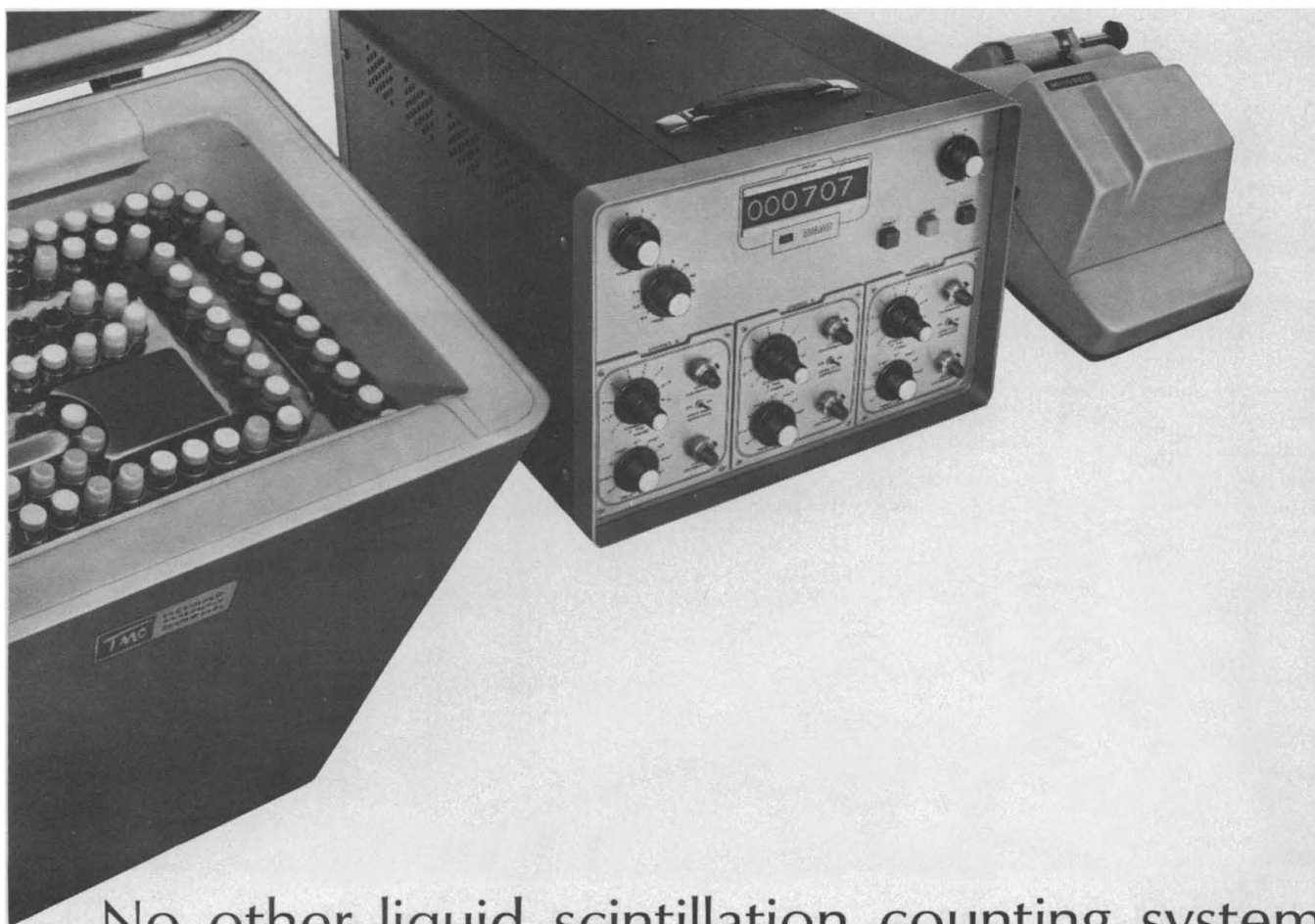
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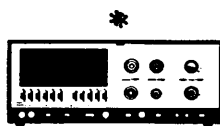


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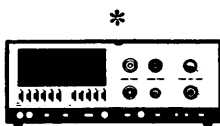
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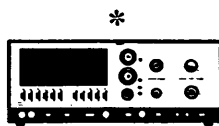
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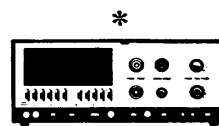
1	0	1	2	1	4	5	3	2	1	6
0	9	1	2	1	5	4	4	1	0	7
0	8	1	2	1	7	7	1	7	3	2
0	7	1	2	1	3	6	2	9	5	4
0	6	1	2	1	2	5	4	3	7	6
0	5	1	2	1	1	1	3	1	2	9
1	1	1	1	1	1	1	1	1	1	1



WITH DUAL BASELINE

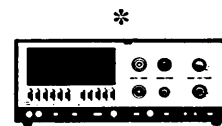
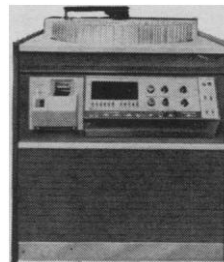
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A	0	1	3	1	0	0	6	7	3	2	4
B	1	1	2	1	0	0	7	6	3	4	3
A	0	1	1	1	0	0	8	2	0	9	0
B	1	1	0	1	0	0	5	7	1	4	2
A	0	0	9	1	0	0	4	0	3	2	1
B	1	0	8	1	0	0	2	1	1	3	1
A	0	0	7	0	0	0	1	6	9	8	7



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as the C₆-C₃ intermediates in lignin formation was discussed. Other biochemical contributions of interest dealt with the synthesis in vitro of glycine and the metabolic utilization of C¹⁴-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* (hydroxymethyl) amino methane covering the pH 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 H³-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 C¹⁴-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 gibberellins and IAA strongly influence plant development. E. Schneider and F. Wightman (Carleton, Ottawa) showed IAA-2-C¹⁴ 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 C¹⁴-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-Dichlorophenoxy-

acetic 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-

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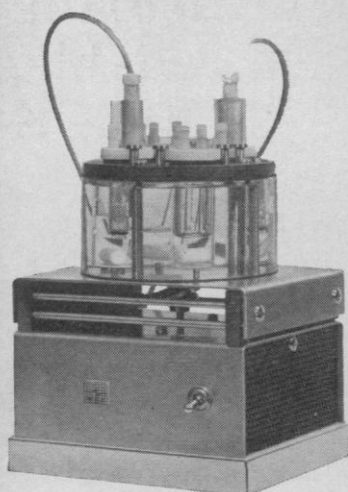
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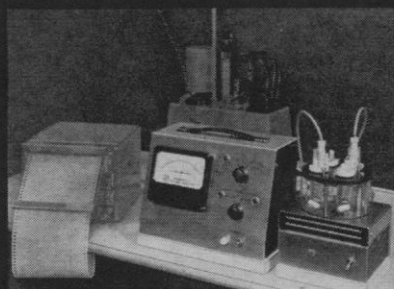


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ment, both ontogenetic and seasonal. As a result, we do not have a single reasonably complete sexual history of an hermaphroditic marine fish. Underwater observations made possible by SCUBA, and careful histological analyses of available specimens 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

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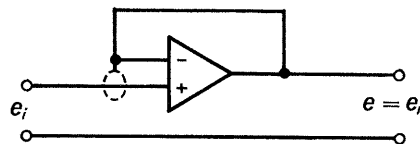
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study of the gonads of the kelp bass, *Paralabrax clathratus*, Smith obtained evidence indicating that this species is a secondary gonochorist, that is, a species with separate sexes derived from hermaphroditic ancestors. He pointed out that, in a 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.

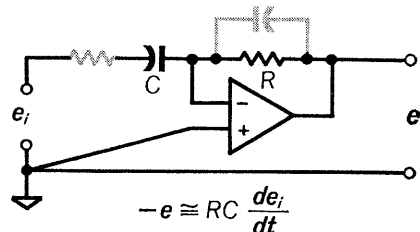
Rudolf Reinboth (Johannes Gutenberg University, Mainz) compared the protogynous and protandrous porgies of the family Sparidae. Protandrous species lay pelagic eggs and lack sexual dimorphism, and the process of sex reversal from male to female requires several months. Protogynous species lay adhesive 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-

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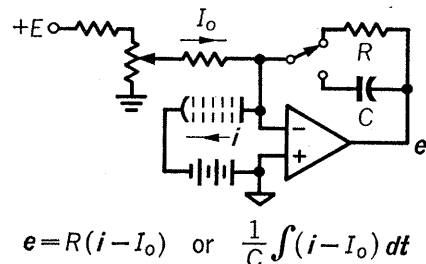
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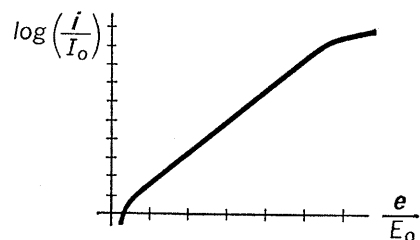
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Important Texts & References

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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-

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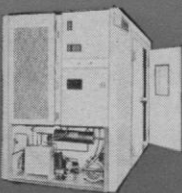
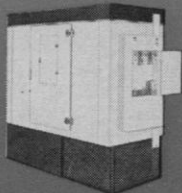
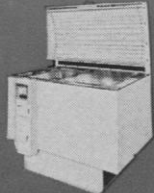
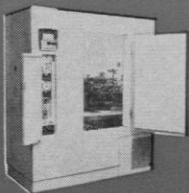
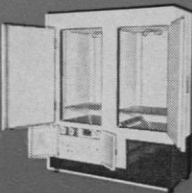
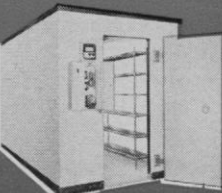
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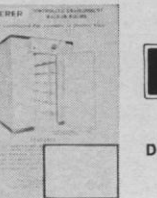
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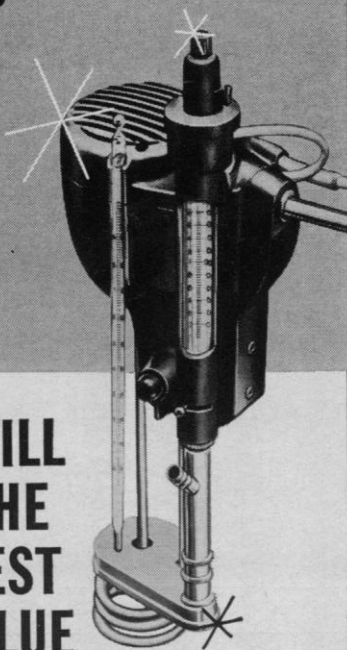
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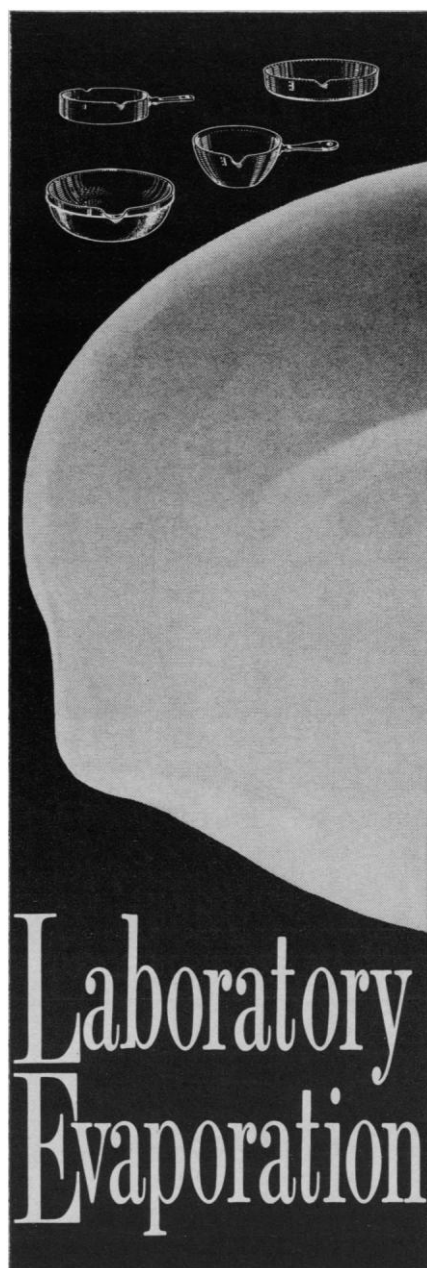
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linked color patterns and abnormal sex ratios among the offspring of the fish in question. Klaus D. Kallman (New York Zoological Society) analyzed the relatively numerous examples he has found of platyfish, *Xiphophorus maculatus*, with the genotype 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-



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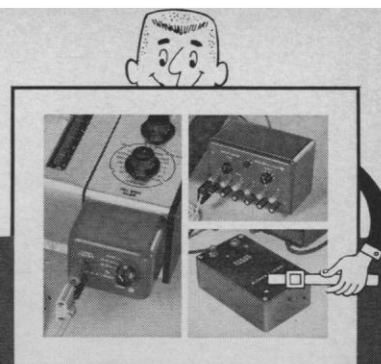
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sity of Oklahoma) has produced functional sex-reversed *Tilapia mossambica*. When mated to normal females, these fish sired all-female broods. Clemens' success in reversing sex in *Tilapia* and in obtaining unisexual broods opens the way for a practical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

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 *Etoplus 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. Leatham (Rutgers

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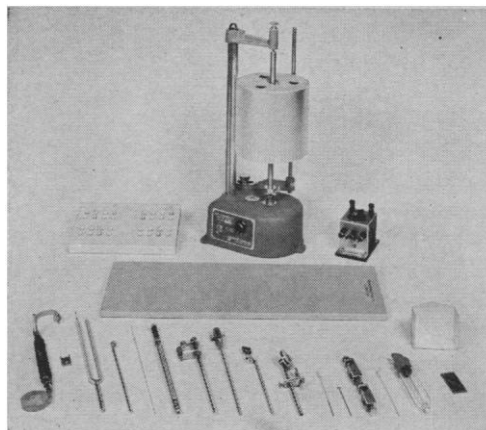
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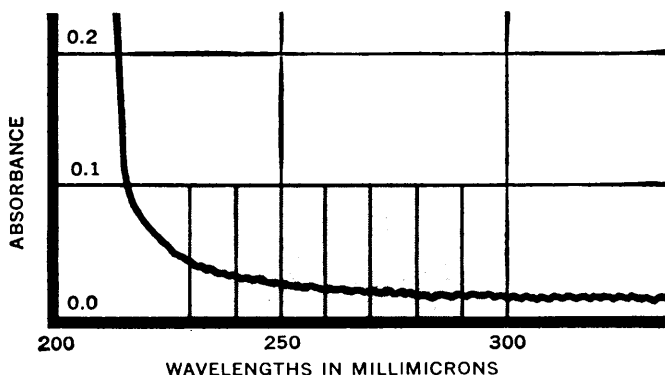
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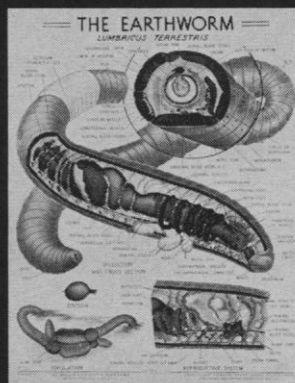


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University) cautioned against assuming that mammalian and teleostean hormones are the same. Lester R. Aronson (American Museum of Natural History) presented convincing experimental evidence that mammalian or synthetic estrogens cannot be substituted 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 Ap-**

plied 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 7^e)

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)

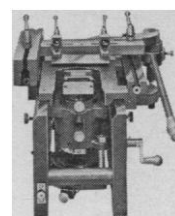
15-18. **Information Problems in the Drug Industry**, conf., Philadelphia, Pa. (C. P. Butcher, Graduate School of Library Science, Drexel Inst. of Technology, 32nd and Chestnut Sts., Philadelphia)

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)

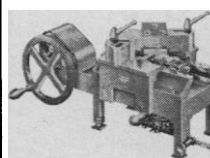
15-19. **Animal Care Panel**, 16th annual, Philadelphia, Pa. (H. P. Schneider, Hahemann Medical College, 230 N. Broad St., Philadelphia 19102)

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

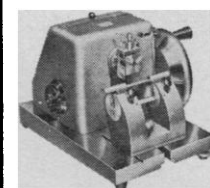
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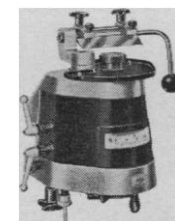
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15-19. **Magnetism and Magnetic Materials**, San Francisco, Calif. (W. D. Doyle, Franklin Inst. Laboratories, Philadelphia, Pa.)

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., Auck-

land 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 8°)

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)

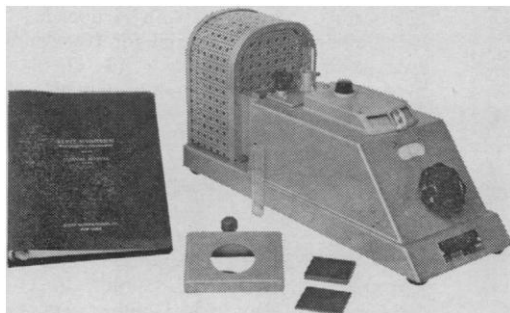
30-2. **Computers**, fall conf., Las Vegas, Nev. (R. Sheehy, Bunker-Ramo, Co., 8433 Fallbrook Ave., Canoga Park, Calif.)

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.)

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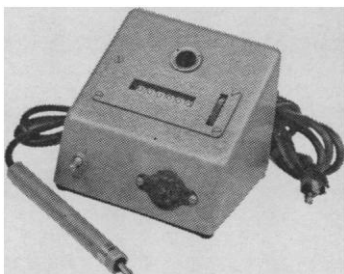


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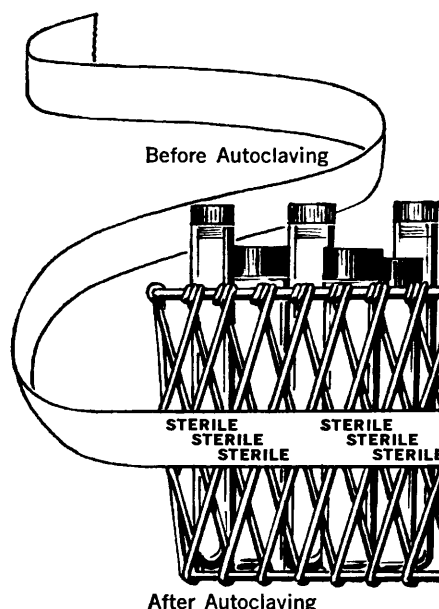
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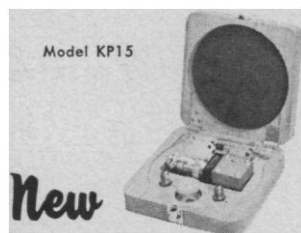


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2-3. **Bone Marrow**, conf., San Francisco, Calif. (L. J. Cole, Experimental Pathology Branch, U.S. Naval Radiological Defense Laboratory, Hunter Point, San Francisco 94135)

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

3-5. **Leptospirosis**, intern. colloquium, Antwerp, Belgium. (A. Grare, Inst. de Médecine, Tropicale Prince-Leopold, Antwerp)

3-5. Academy of **Psychoanalysis**, mid-winter 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 7^e)

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.

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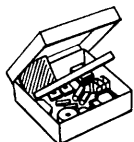


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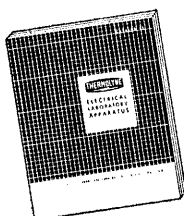
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9-10. **Ciba Foundation** guest meeting European Pancreatic Club. London, England. (H. T. Howat, 41 Portland Pl., London, W.1)

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.)

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

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

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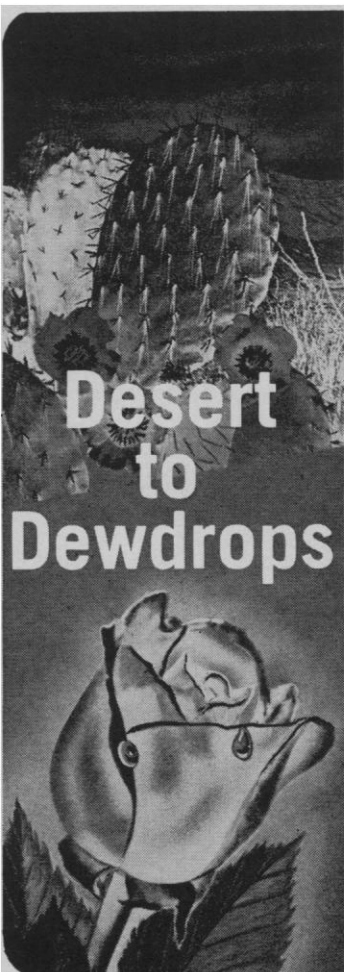
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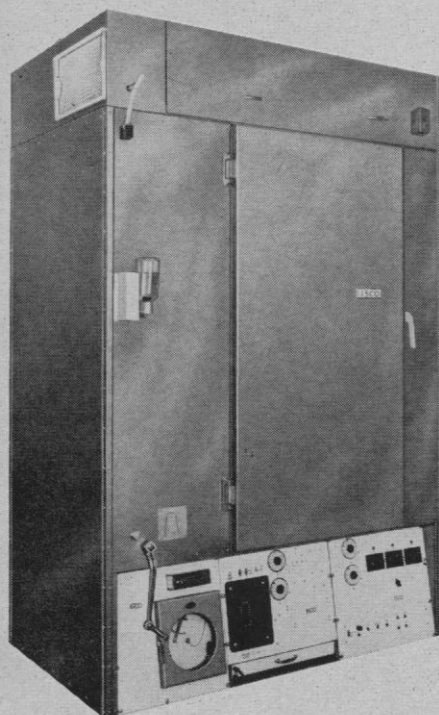
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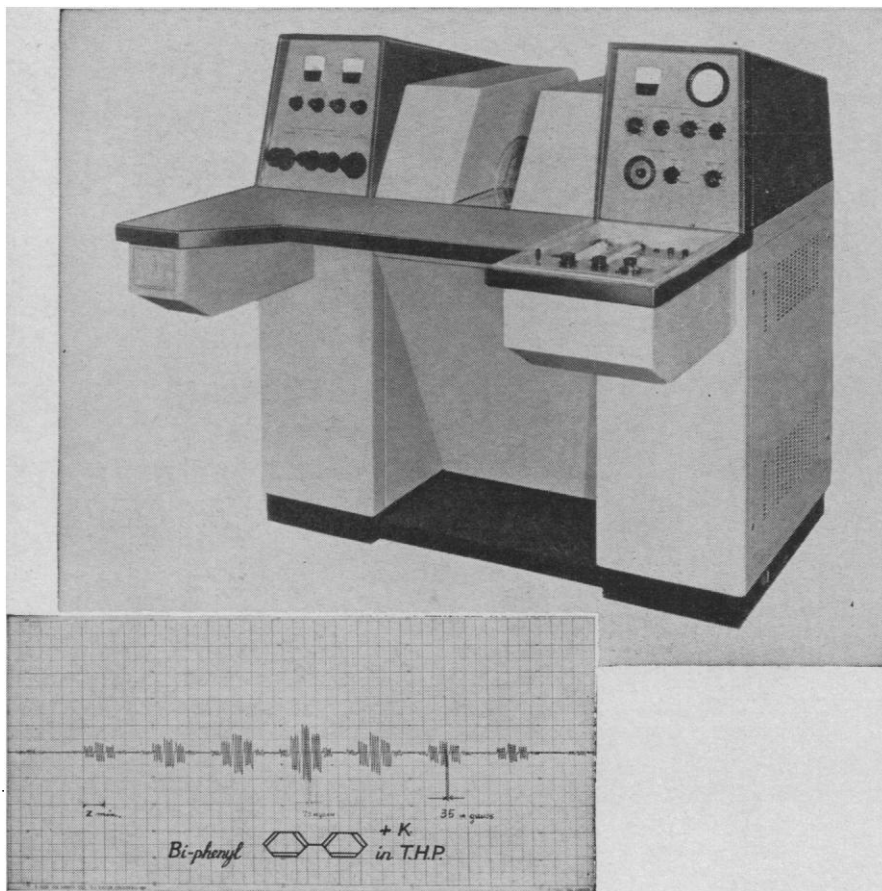
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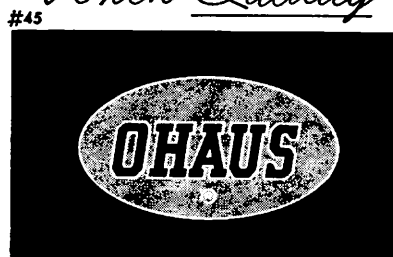
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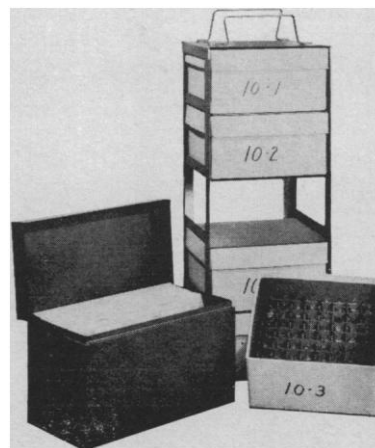
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