SCIENCE

24 June 1966

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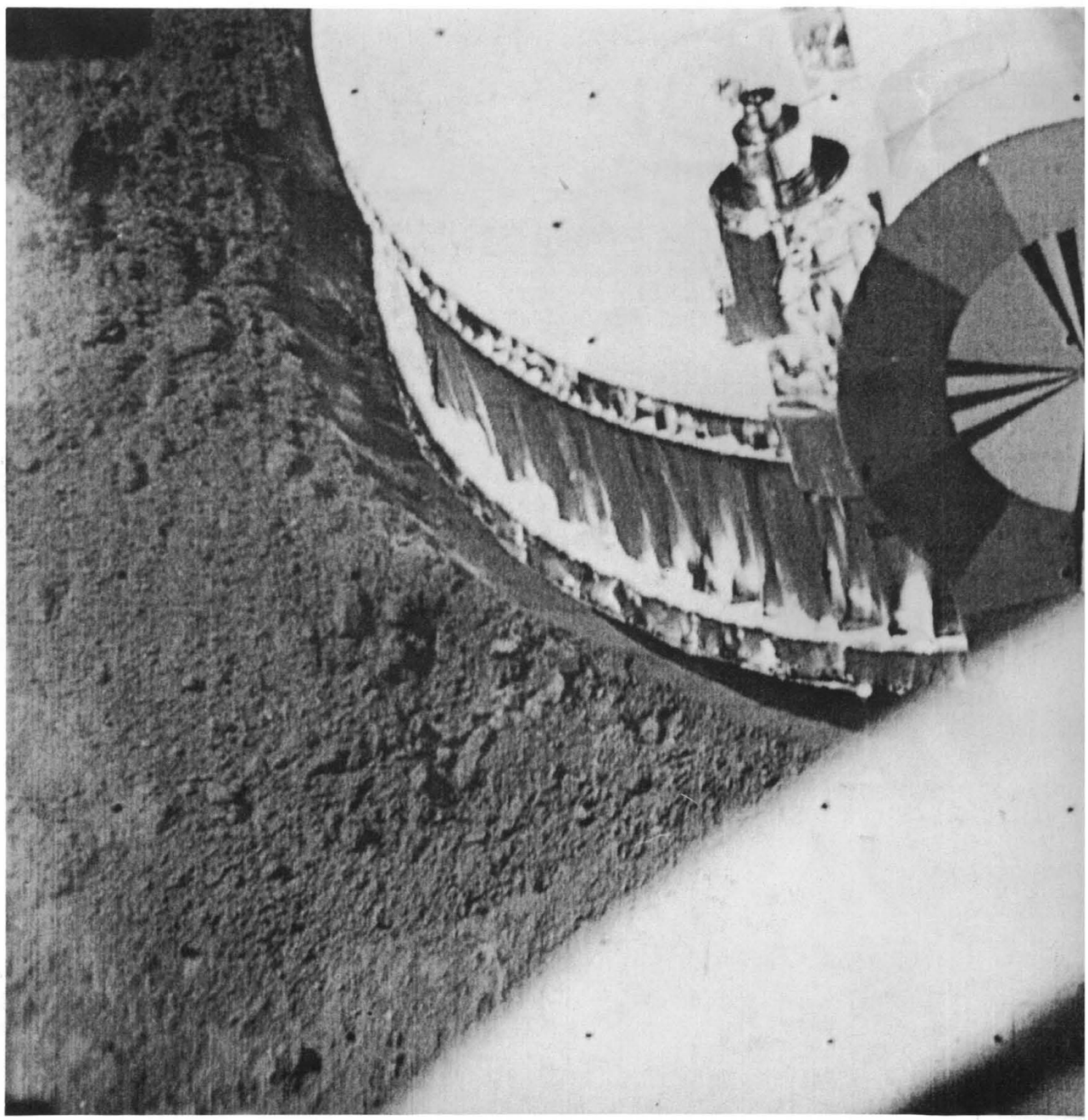
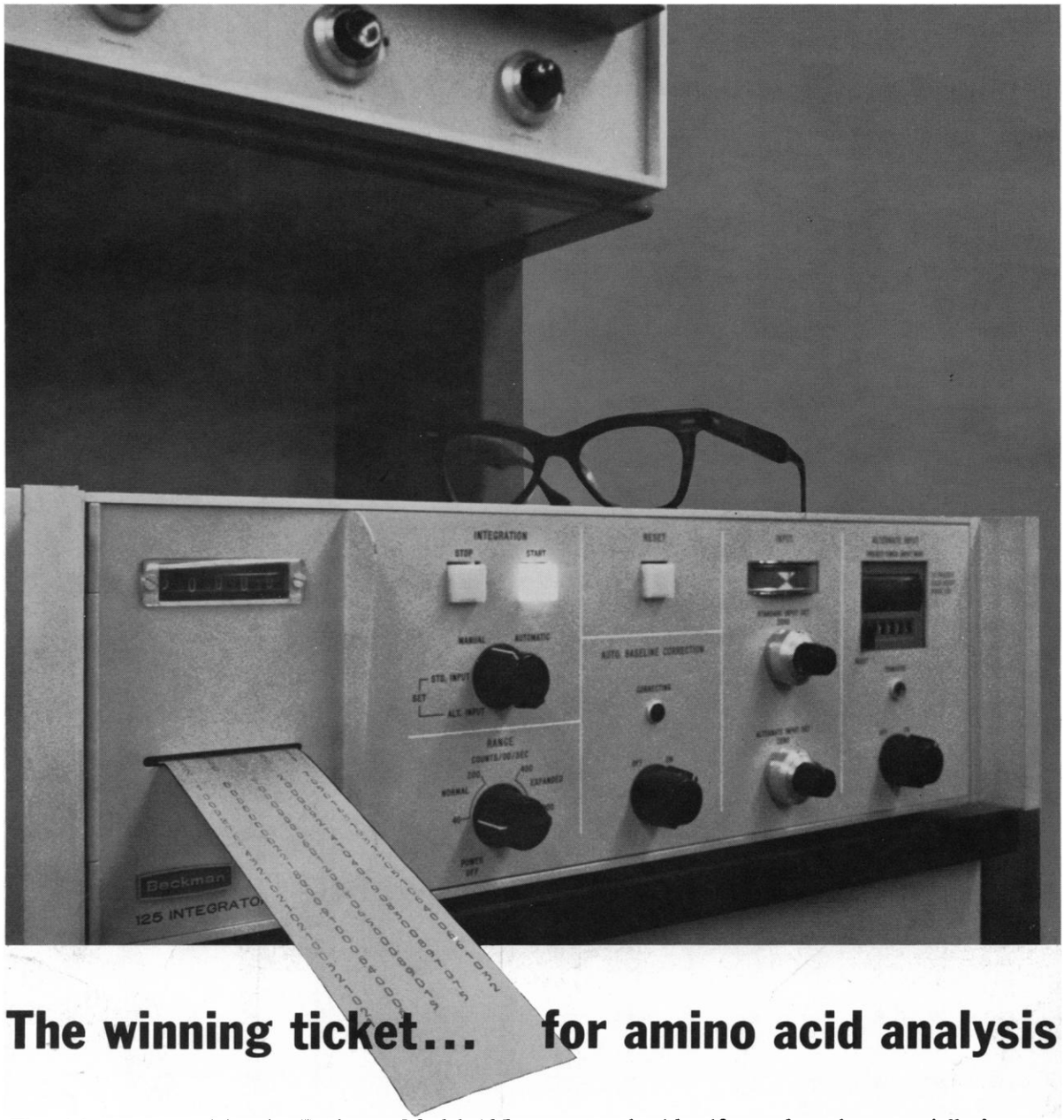
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



FOOTPAD ON THE MOON

Index Issue



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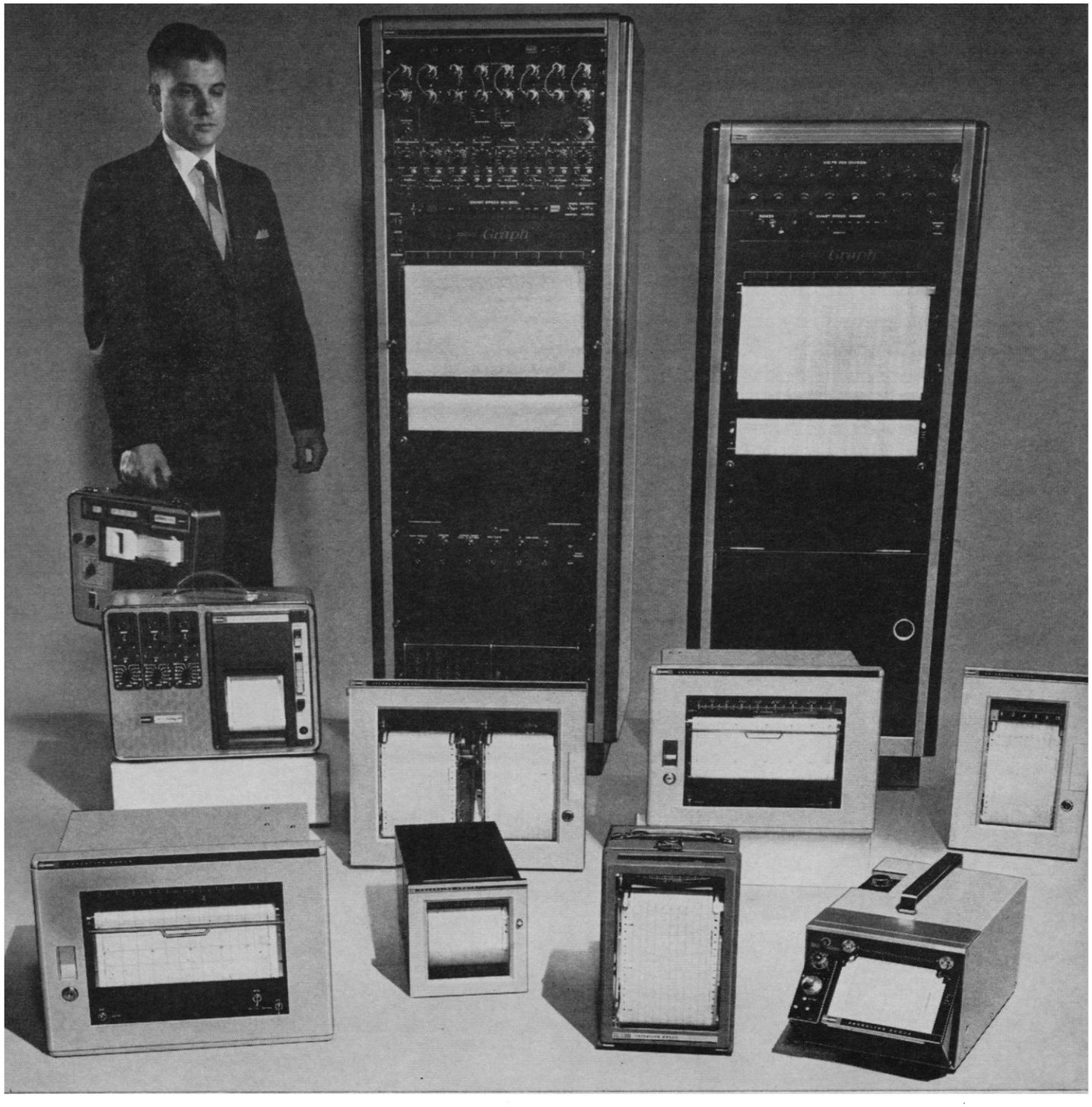

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24 June 1966
Vol. 152, No. 3730

SCIENCE

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COVER

Footpad of Surveyor I spacecraft resting on the lunar surface. Depression in soil caused by impact of pad is apparent. Surface material has been pushed up and thrown out to form a raised rim. The disturbed soil is apparently fine-grained and aggregates into chunks. At top of pad are television test target and an attitude-control jet which was used in test to blow gas against the surface. The photograph has been digitized and corrected by computer for the frequency response of the television system. See page 1737. [JPL-NASA photograph]

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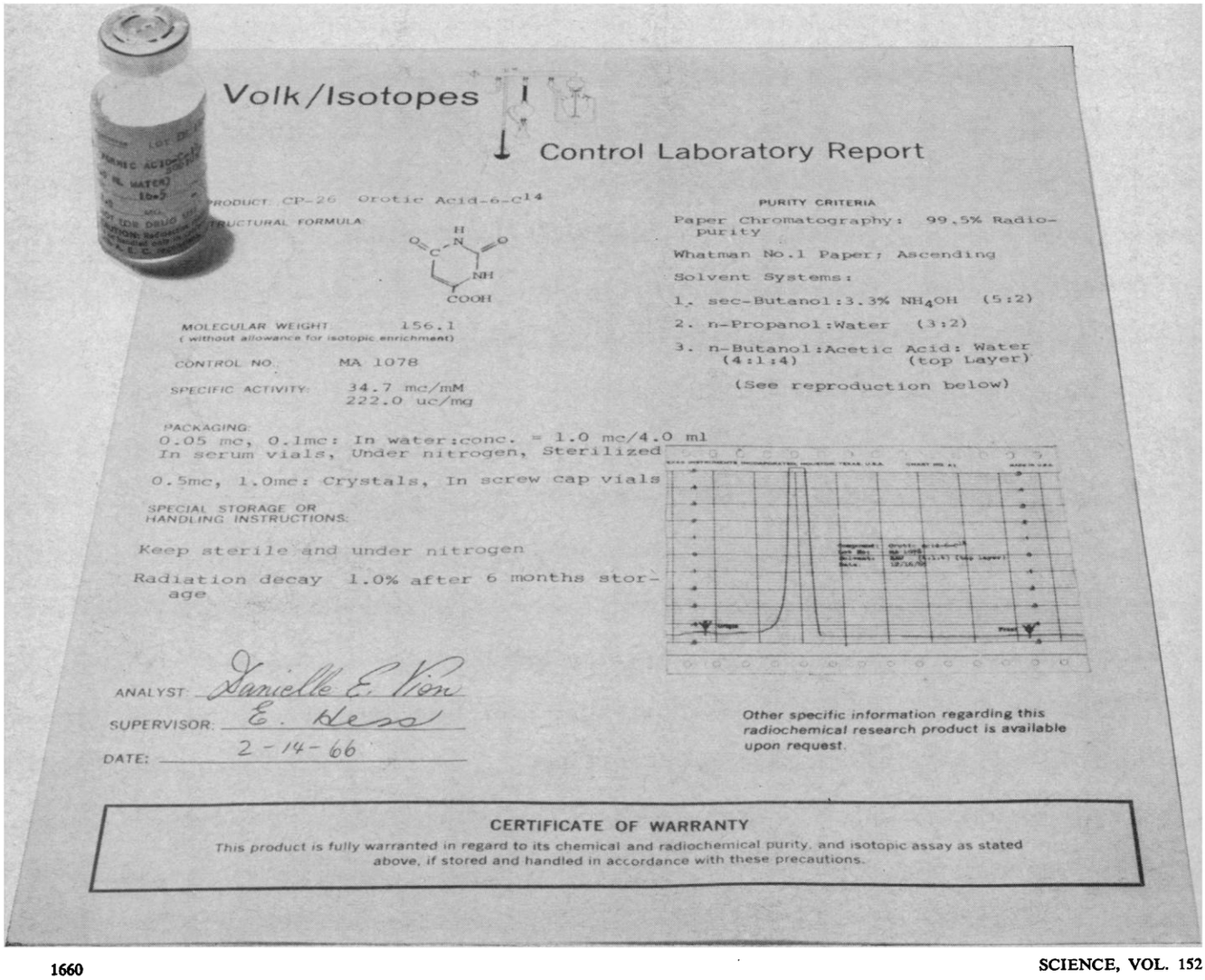

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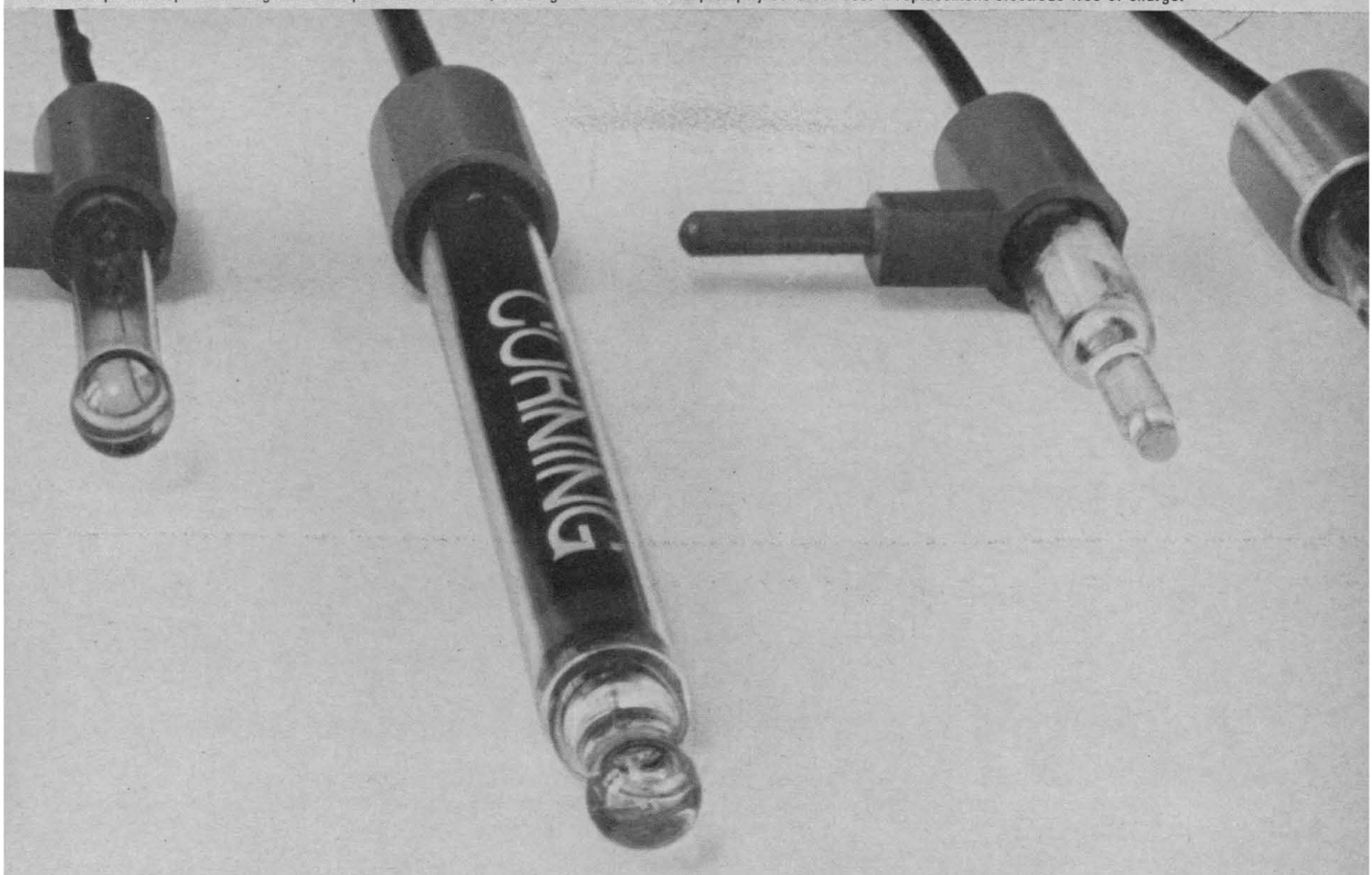

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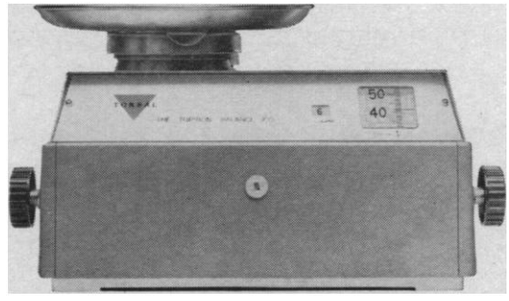

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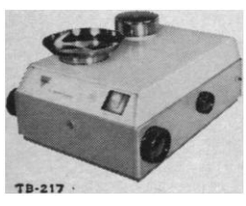

☐ **200 gram capacity. Weight control dial and fine weighing dial with vernier makes possible direct readings from 100 grams to 0.01 grams. 500 gram capacity model also available (DWL-5).**

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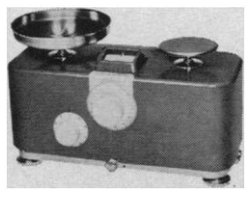
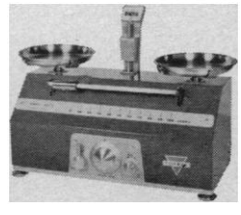


☐ **2000 gram capacity and with 10g. x 0.1g. and notched beam 100g. x 10g. increments. Available with tare beam instead of notched beam. (DH-2(b)). 4500 gram capacity models (DH-4(a) and DH-4(b)) also available.**

Model DH-2 (a)



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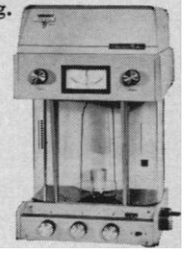

Laboratory refrigerators are repositories for solvents and standards, fractions and foodstuffs, buffers and beverages and, sometimes, even ice.

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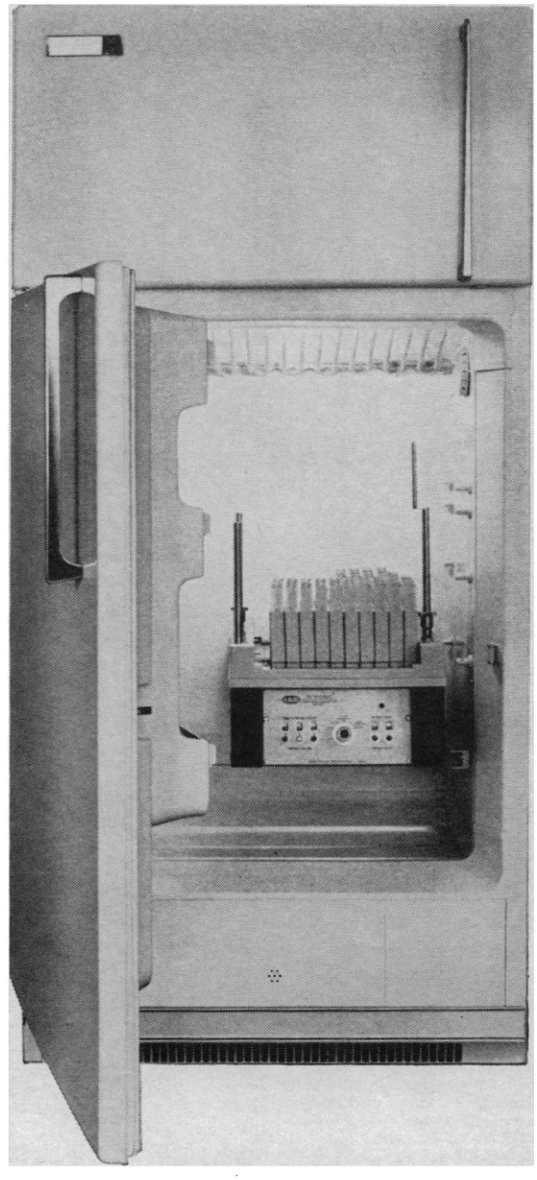

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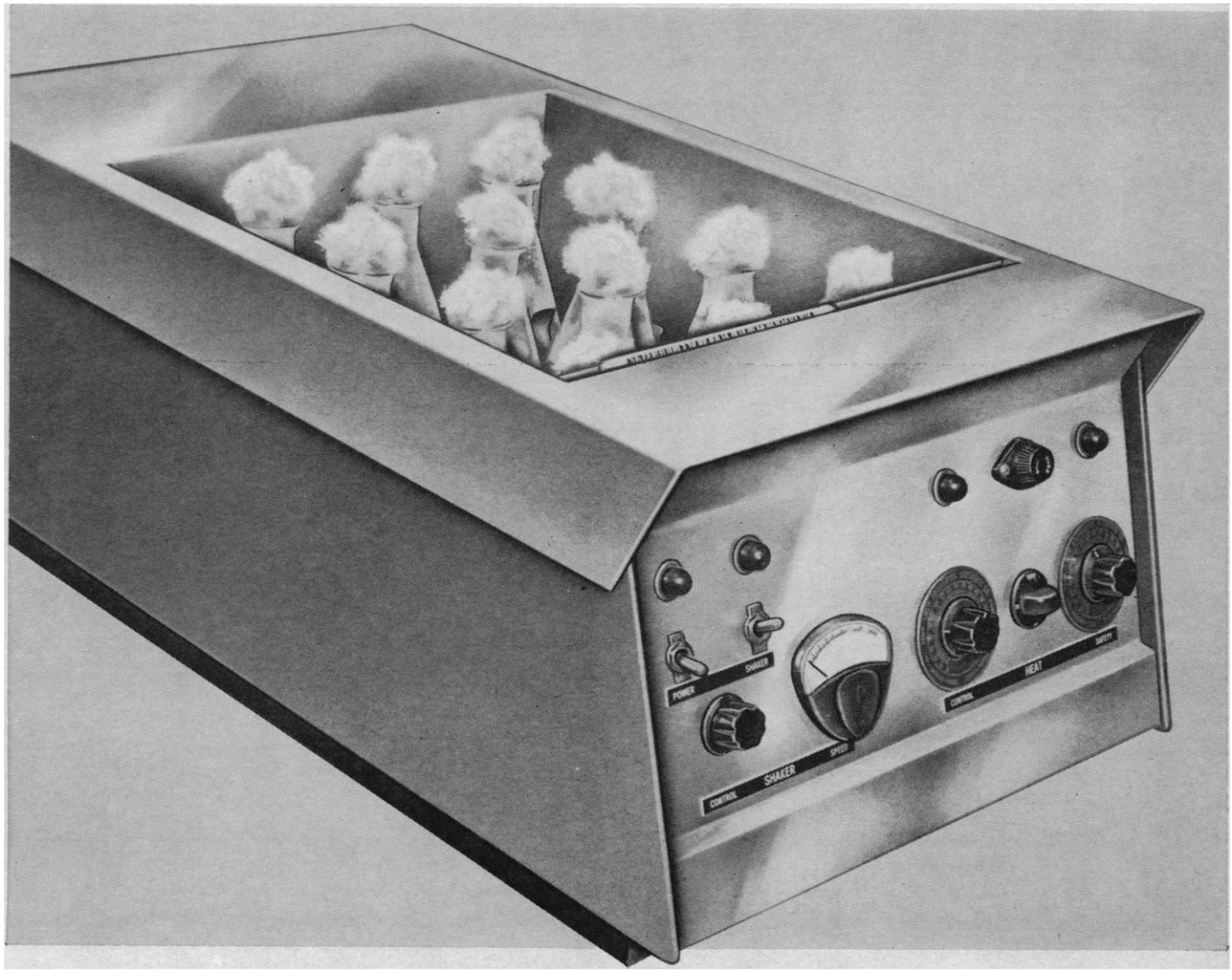

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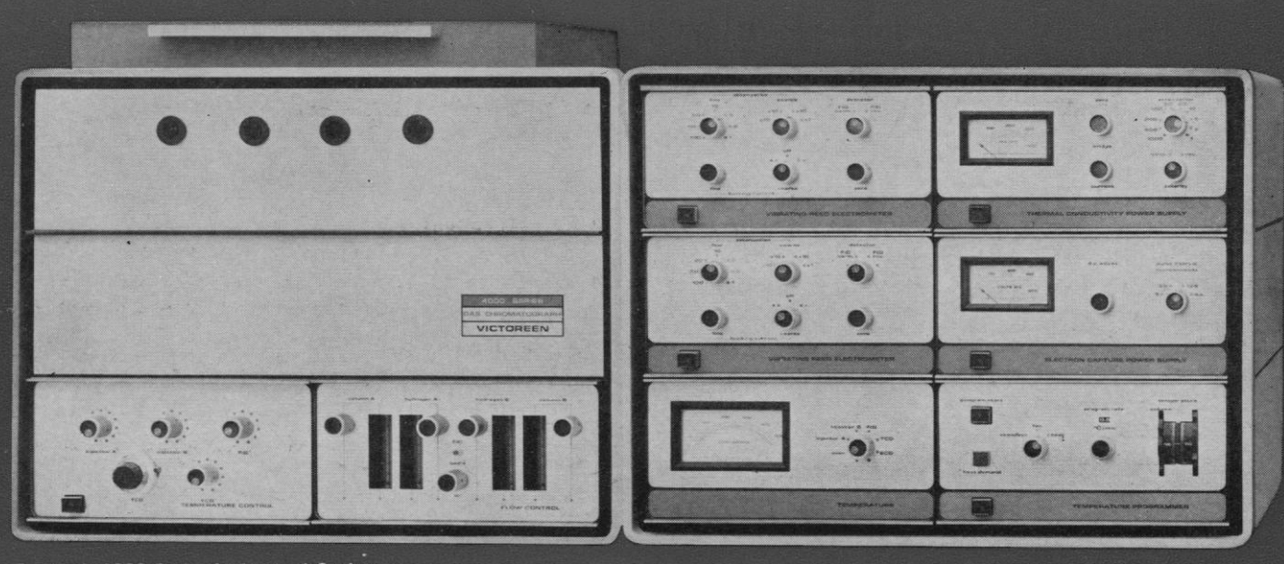

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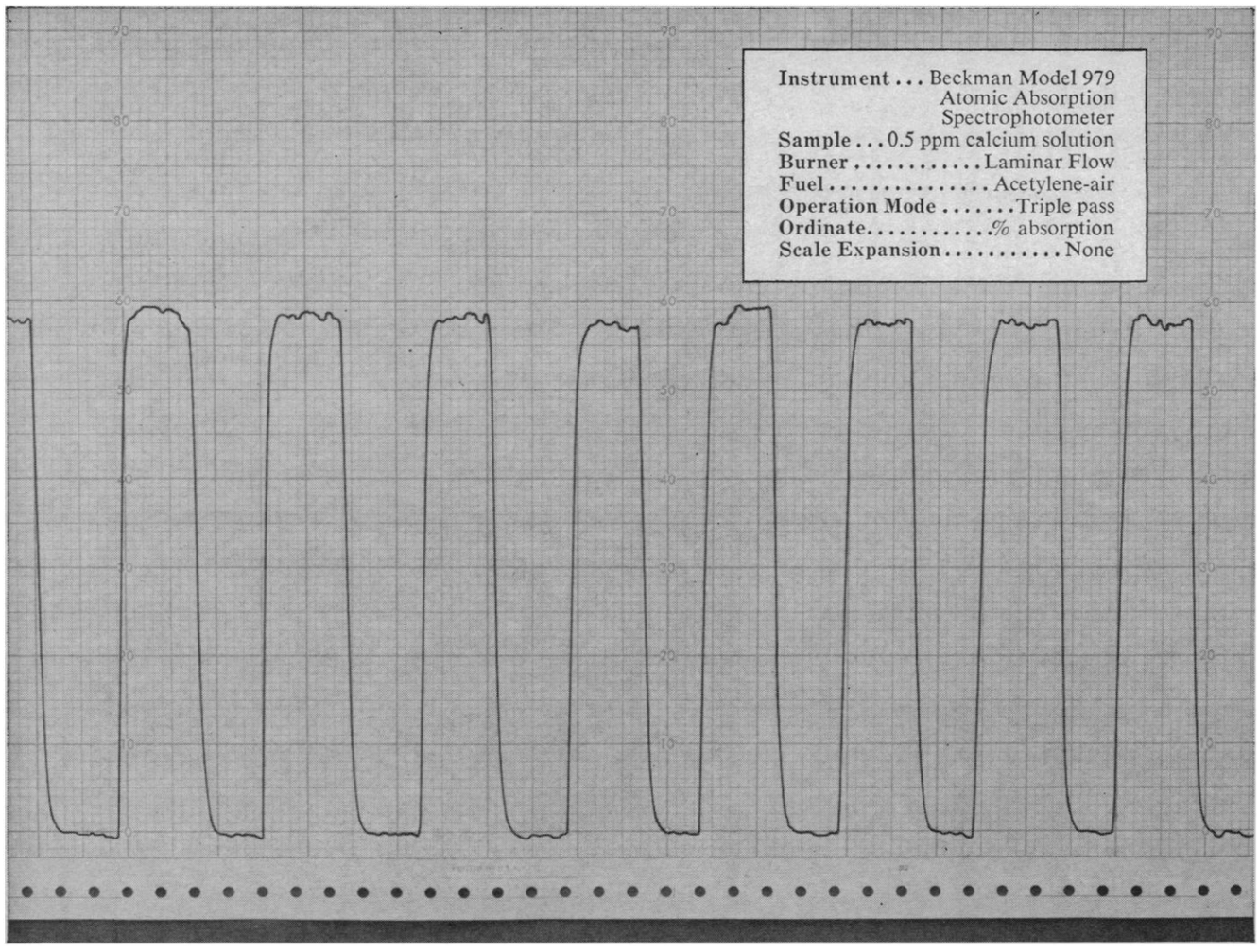

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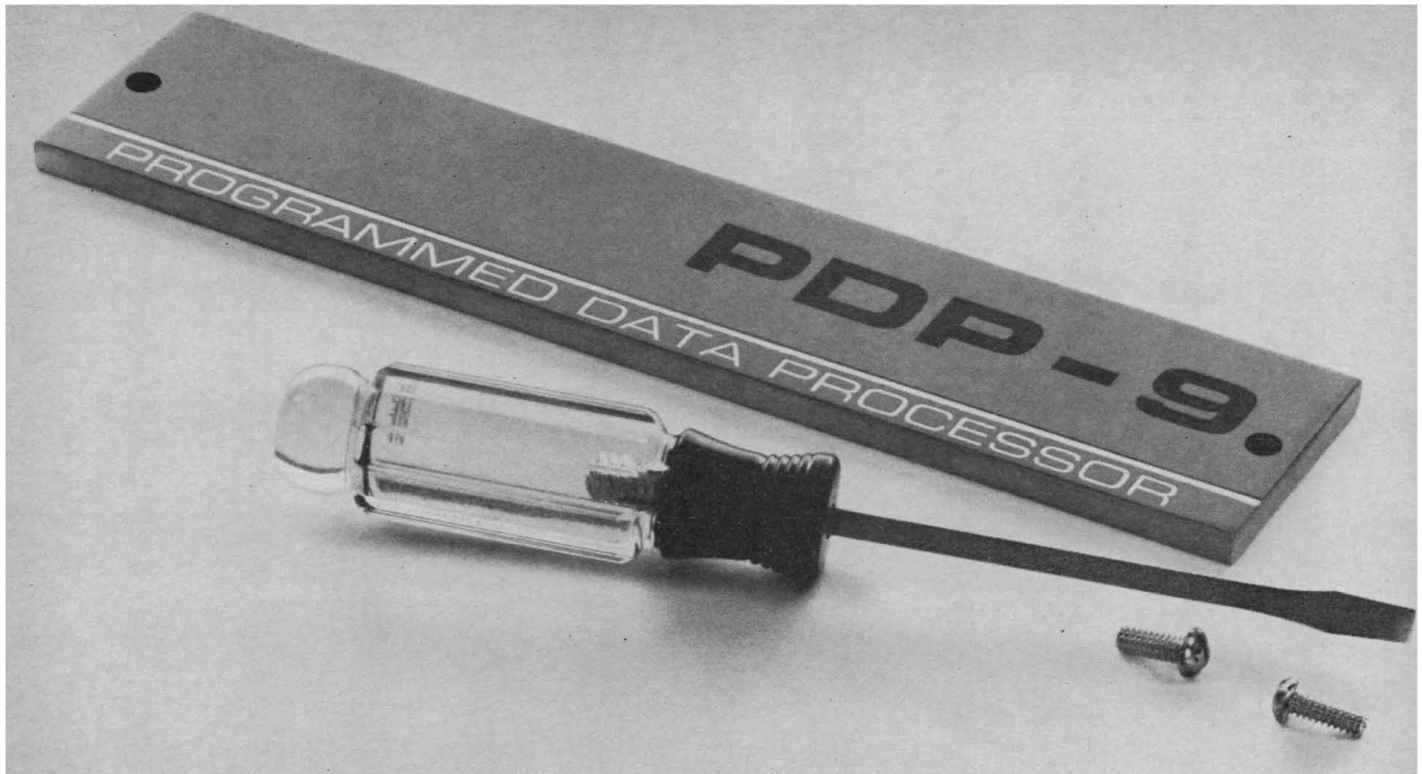

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ORAL CONTRACEPTION: Mechanism and Management *by* **Joseph W. Goldzieher,** *Southwest Foundation for Research and Education, San Antonio, and* **Edris Rice-Wray,** *Center for Investigation of Reproductive Physiology of the Association Pro-Salud Maternal, Mexico City.* Places in concise perspective both the theoretical and clinical aspects of oral contraceptives. Chemistry and physiological action are discussed in detail. *June '66, 160 pp., 35 il., 18 tables, (Amer. Lec. Living Chemistry edited by I. Newton Kugelmass), $7.50*

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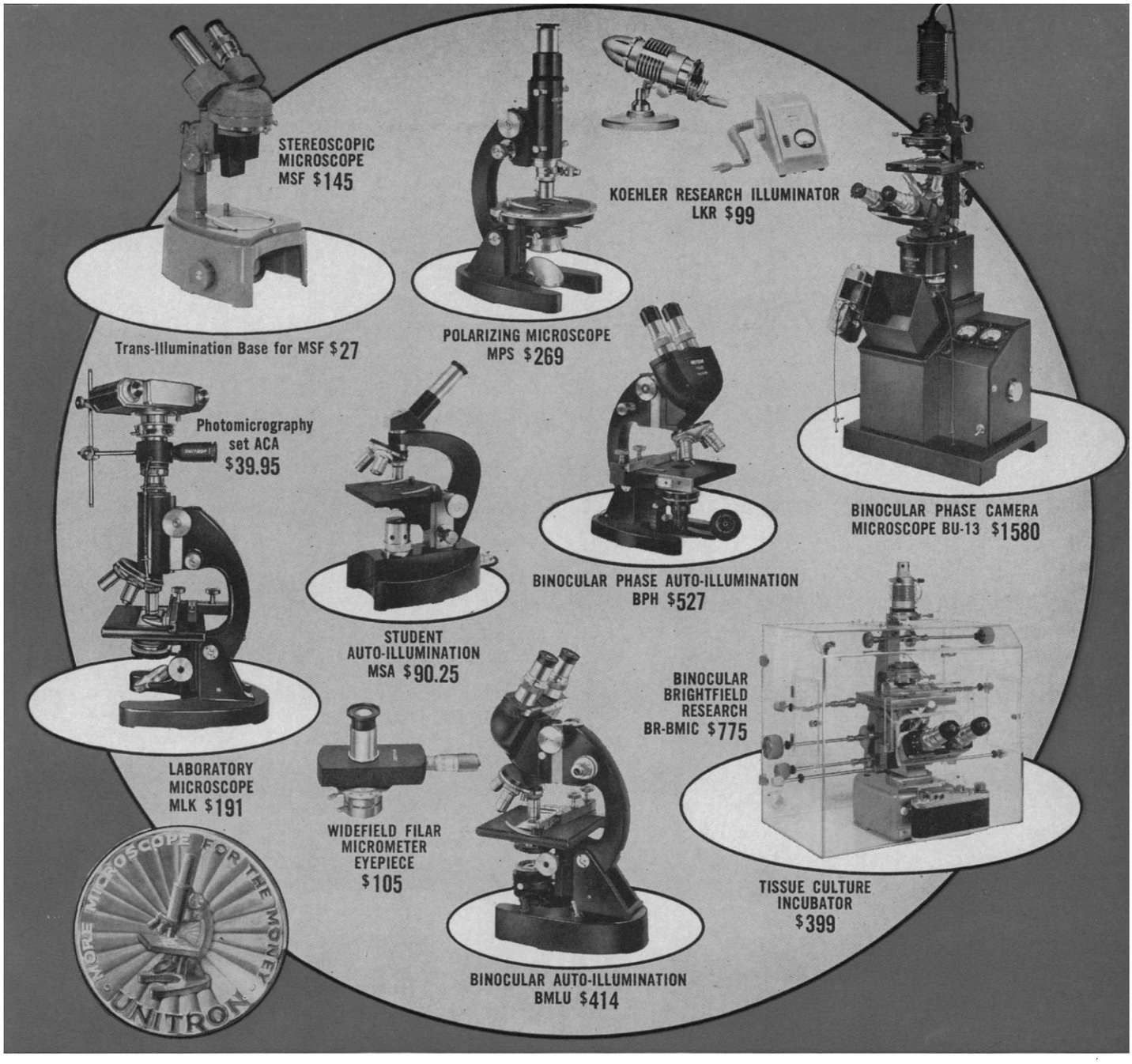

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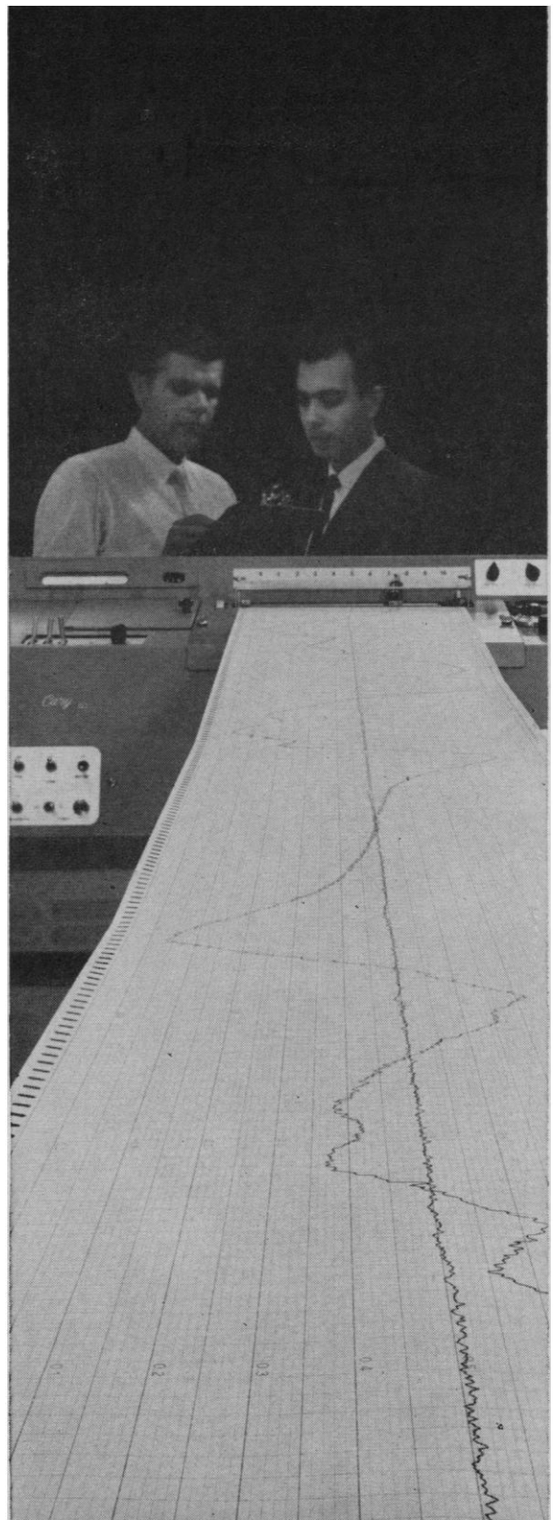
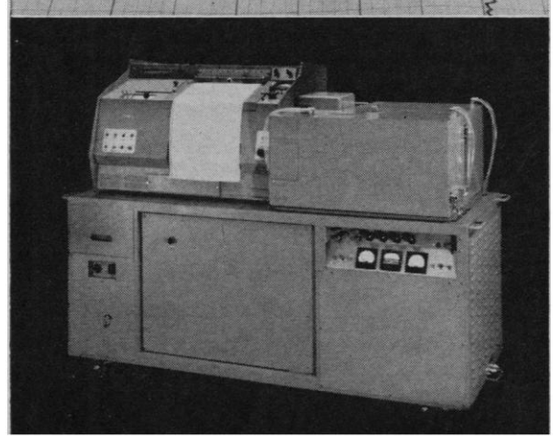
when you select a Spectro-polarimeter ...take a long look





LOOK AT THE CARY 60

Consider three basic factors that determine the value of any spectropolarimeter — performance, reliability, versatility.

Look at performance. Absorption tolerance must be sufficient to permit UV penetration where sample or solvent absorbs heavily. Sensitivity has to be adequate to detect minute amounts of optical activity. Baseline stability is vital.

Next, look at reliability. Can the instrument repeat yesterday's performance tomorrow? Next week?

Then, look at versatility. The instrument should adapt to a variety of samples. Controls must be provided for matching the instrument to sample limitations.

Now, look at the CARY 60. What are its performance benefits? Absorption tolerance: with absorbances as high as 3, valid readings are obtained in the important 2300Å region of bio-polymer activity. Sensitivity: 0.0004° rotation detectable with sample absorbance of 1.0 at 3000Å (15Å spectral bandwidth, 30 sec pen period). Baseline stability: less than 0.003° drift in a 15-hour period.

Reliability? Records show CARY 60's have been used as much as 10 hours daily for periods up to 2 years. With such reliable performance, data is accepted with complete confidence.

Versatility is inherent in the CARY 60. Adapts easily for differential measurements. Precisely calibrated controls permit selecting operating conditions for optimum performance. This means fewer time-consuming dilutions and minimum sample handling.

Take a longer look at the CARY 60. Write for Data File E607-66.

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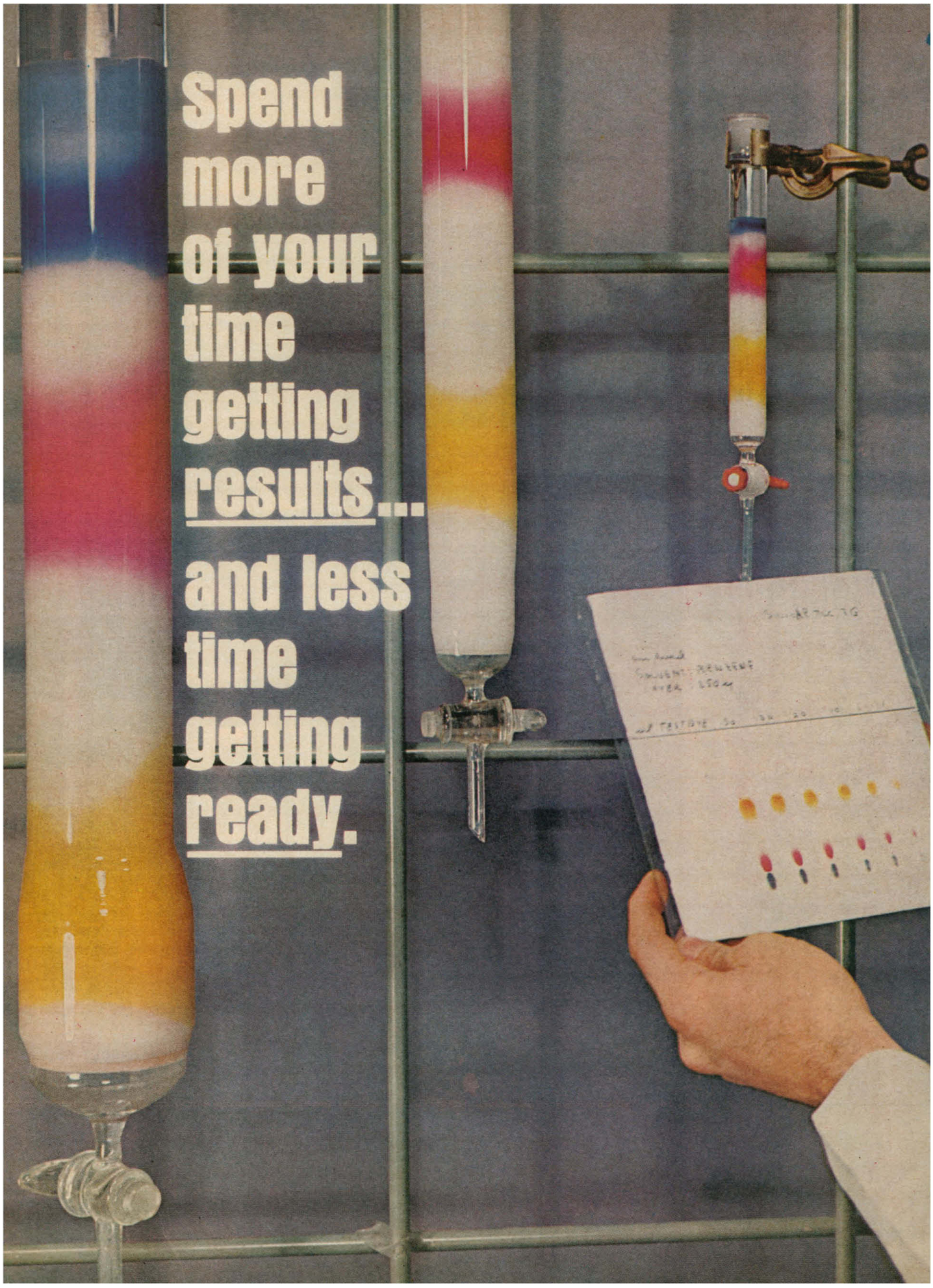
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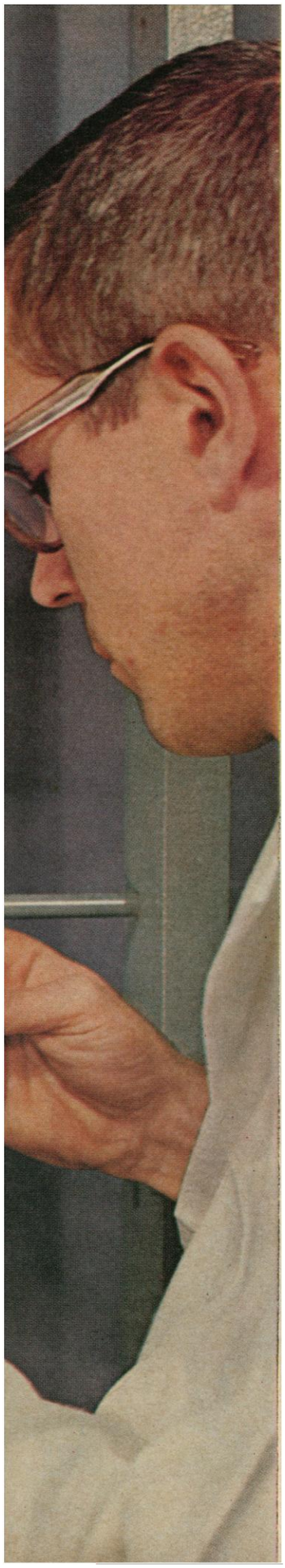


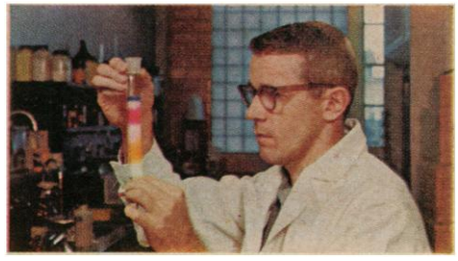
NEW MALLINCKRODT CHROMATOGRAPHIC PRODUCTS CUT TIME-WASTING "KITCHEN WORK"

If you think chromatography is fast now, wait until you try the new Mallinckrodt products.

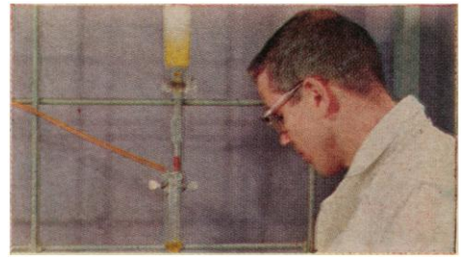
They all come from the same silicic acid production stream that brings you Mallinckrodt Silicic Acid AR 100—the classic sorbent for column chromatography.

But our new products are specialists. They offer you wide choices of physical, chemical and pH characteristics. They can eliminate platemaking, acid treating, sifting, mixing and other preparatory steps.

For column chromatography, there are four new Mallinckrodt SilicAR™ sorbents classified by particle size.



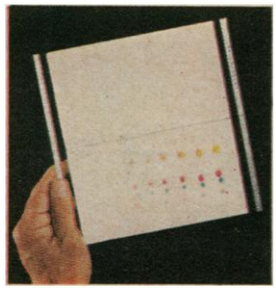
Two fine-mesh sorbents for maximum resolution in small columns.



Two coarser sorbents for the fast flow rates you want in large columns.

Notice the sharp bands. They result from close control of particle size and other physical properties. The sorbents are clear and white, too, because Mallinckrodt controls organic *and* inorganic impurities to the highest standards generally available in commercial sorbents.

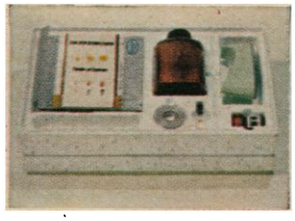
For TLC, try new, ready-to-use CHROMAR™ plates.



These are glass plates, just like the ones you make yourself. But CHROMAR plates are better, because they're more uniform. They'll take all standard sample sizes and methods of visualization.

(If you still want to be a hold-out and make your own plates, choose one of the many Mallinckrodt SilicAR™ TLC sorbents. SilicARs keep your chromatograms free of greyness on charred plates, contamination at the solvent front and other common troubles. They also have a bright white phosphor for sharper uv visualization.)

For preliminary experiments in thin layer techniques, get the $39.75 CHROMAR kit.



The CHROMAR kit gets you into business fast. It has everything you need, except the solvent, to make plates and chromatograms; and it does the work of equipment costing seven times as much.

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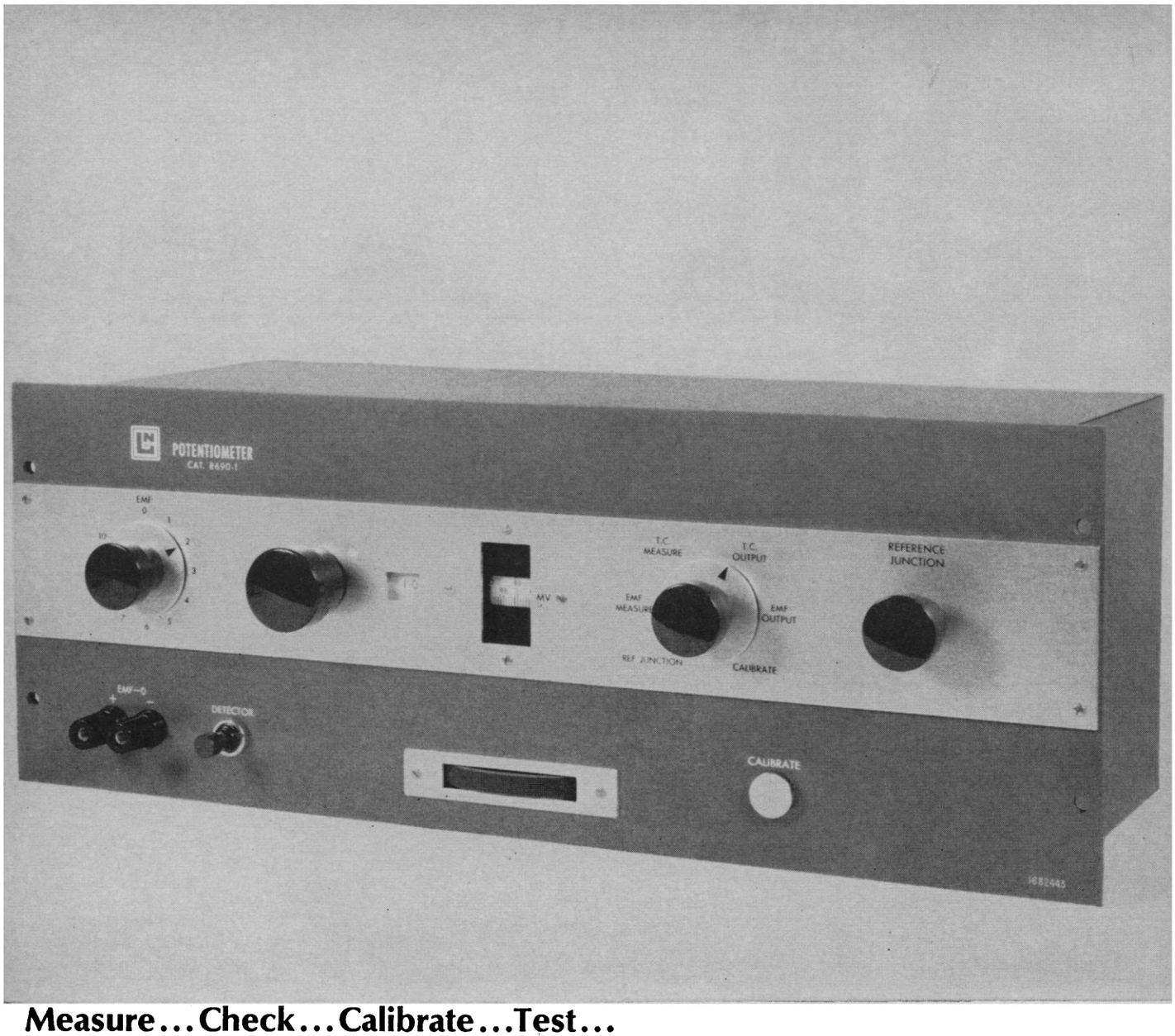

Measure...Check...Calibrate...Test... with L&N's new Panel-Mounted Bridges and Potentiometers.

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They combine the basic circuit features of our widely-used potentiometers and bridges (resistance and temperature) with convenience features for panel-mounting.

Line-operation, for example, to eliminate the need for batteries or standard cells. Detector terminals to provide the choice of an external galvanometer, null detector, null-balance recorder or control amplifier. Rear-mounted terminals to permit neat back-of-panel connections. Multi-point switching (and multiple input terminals) on potentiometers. Accessories (shunt, volt box, run-up box) redesigned for rack mounting—three to a rack.

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Process Measurements: For differential measurements, using a zero-center recorder or a digital voltmeter as continuous "readout" of the difference from input. For supervisory measurements—selected periodic indications from one or more remote locations. For production measurements—in plating, molding, mixing, drying, baking, etc.

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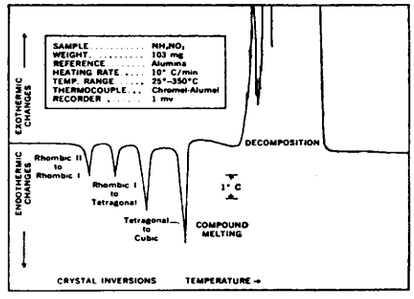
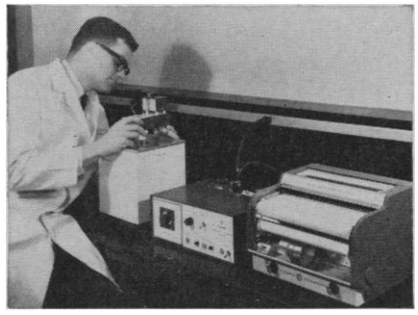
June, 1966

FISHER PRODUCT REPORT

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

You can leap on the DTA bandwagon and the ticket will cost only $950.





DTA equipment to make thermograms like that shown can knock a $35,000 hole in your lab budget. Fisher's Differential Thermalyzer™ costs a pinprick $950. Complete! Programmer, furnace, sample holder, crucibles. Used with a 1-mv recorder, the Model 260 plots thermal "fingerprints" that identify impurities in pharmaceuticals; analyze clays or ceramics; differentiate between different types of coal, soils or isomers; test polymer curing behavior. The programmer feeds power to the furnace, heating the samples at a uniform 5°, 10° or 25°C per minute, while differential thermocouples plot the thermogram. You can run two 50-200 mg samples simultaneously, heat them to 500° or 1200°C, record temperature changes as small as 0.25°C. If you'd like to look before you leap, get our bulletins. (a) ☐

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TYPE	Gravity Convection			Forced Draft		
CATALOG NO.	13-244-1	13-244-3	13-244-5W2	13-244-2	13-244-4	13-244-6W2
CAPACITY	1 cu ft	3 cu ft	8½ cu ft	1 cu ft	3 cu ft	8½ cu ft
TEMPERATURE RANGE	40°—200°C			40°—200°C		
CONSTANCY						
At 100°C	±0.8°C	±1.0°C	±1.3°C	±1.0°C	±1.5°C	±1.0°C
At 200°C	±1.8°C	±1.1°C	±2.2°C	±0.5°C	±0.9°C	±1.3°C
UNIFORMITY						
At 100°C	±0.5°C	±1.0°C	±2.0°C	±0.2°C	±0.5°C	±1.4°C
At 200°C	±1.4°C	±1.9°C	±2.8°C	±1.0°C	±1.5°C	±1.9°C
OVER-ALL DIMENSIONS						
Width	16⅛ in	22¼ in	41¼ in	16⅛ in	22¼ in	41¼ in
Front/Back	16½ in	19 in	20 in	16½ in	19 in	20 in
Height	22⅞ in	28¾ in	36¼ in	22⅞ in	28¾ in	36¼ in
SHELF AREA	450 sq in	1080 sq in	3456 sq in	412 sq in	990 sq in	2880 sq in
POWER REQUIREMENT	115 or 230-volt, 50/60-cycle AC		230-volt, 50/60-cycle AC	115 or 230-volt, 50/60-cycle AC		230-volt, 50/60-cycle AC
PRICE	$230	$345	$695	$335	$440	$795

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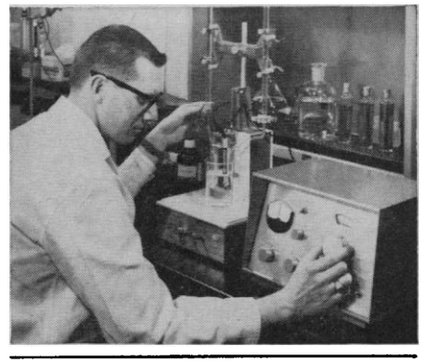

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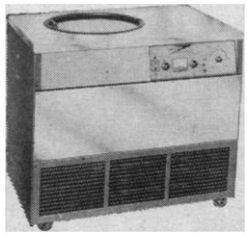
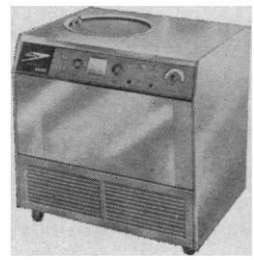
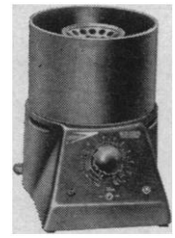


LOURDES Clini-Fuge 30-R
Combines low speed, super speed and ultra speed operations in one unit. Only one attachment is needed to increase maximum rpm from 6,000 to 25,000. Automatic, Refrigerated. Contains all safety features as in Beta-Fuge. The price is $2,775.00; high speed attachment only $385.00. Non-refrigerated model (No. 30)—$840.00.



LOURDES Beta-Fuge A-2
Capacity to 3,300 ml; forces to 41,300 X G. Automatic, Refrigerated. Temperature control ±1° C. Many safety features such as "Fail-Safe" brush life control to prevent motor damage, automatic imbalance trip to stop the unit if there is excessive vibration, double independent shafts so rotors cannot fly off, etc. The price is $2,530,00 with rotor.

LOURDES Series LC
Bench type Centrifuges, automatic and non-automatic, with speed, volume and force combinations for every requirement. Prices — $760.00 and $925.00.



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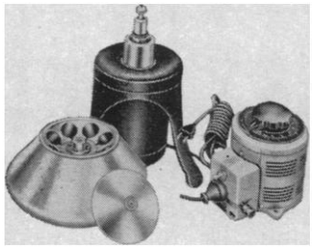

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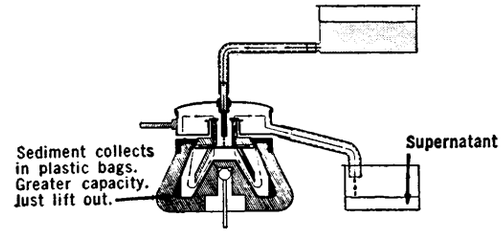
16,500 rpm with up to 400 ml; forces to 34,800 x G. Only $265.00.



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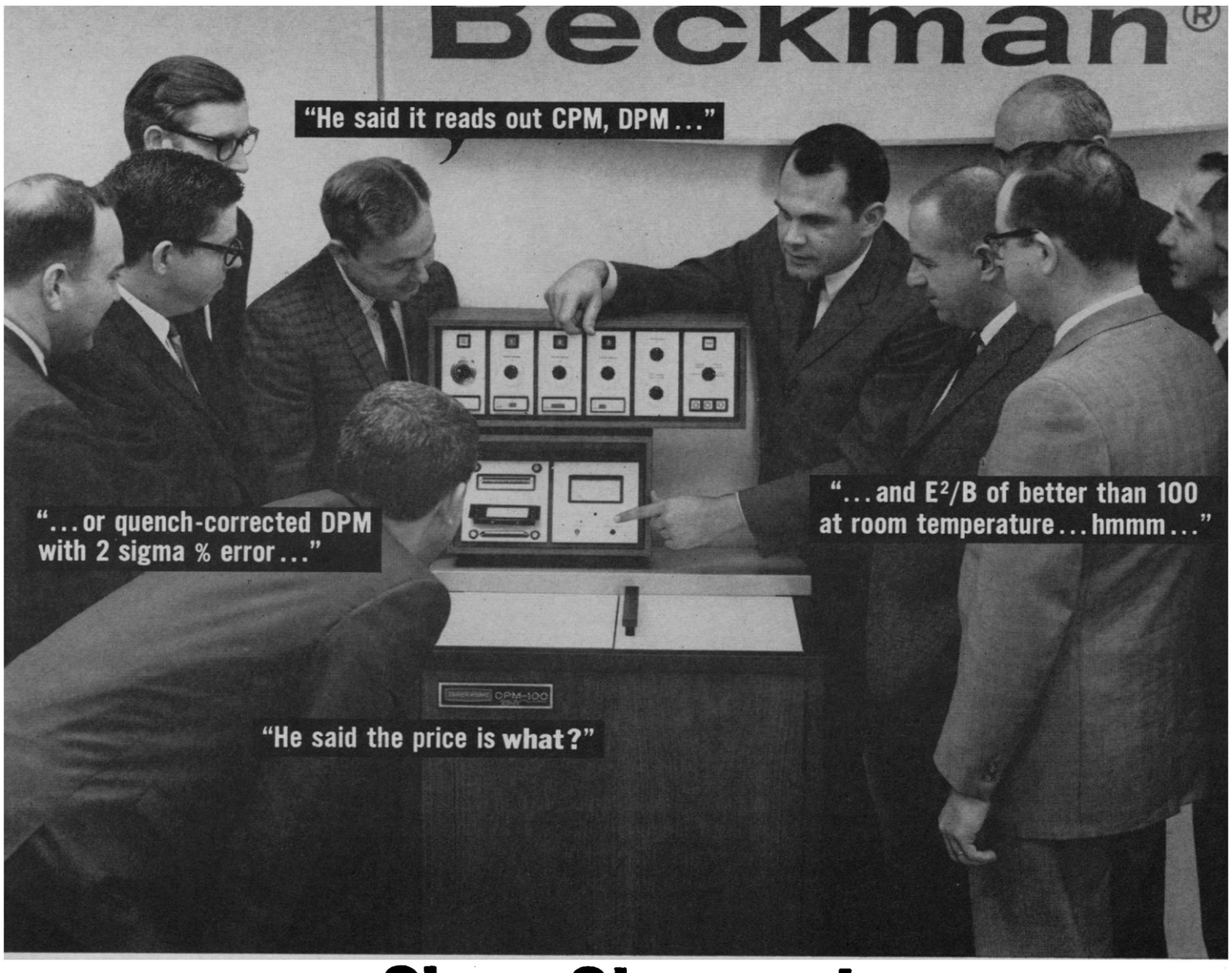

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†Prices are stated in U.S. funds and are subject to change without notice.

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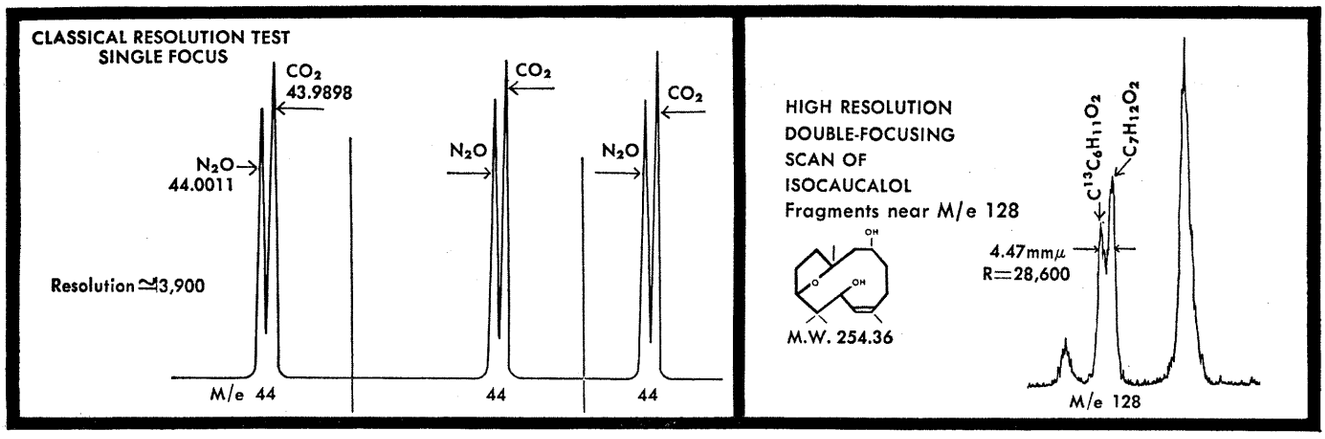

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The new Hitachi Perkin-Elmer RMU-6E is an instrument that gives you exceptional performance and versatility at moderate cost. It is easy to operate, compact and reliable. Its building-block design allows you to add all the analytical capability you need as your mass spectrometer program grows. For example: you can attach the electrostatic sector to allow high resolution (M/△M 10,000 routine, 30,000 attainable) and precision mass measurement (better than 1 in 200,000.) For computer-aided spectral interpretation, our new DDA-1 Digital Data Acquisition System records 12,000 twelve-bit data points per second on magnetic tape with compatible format.

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• **Gas Chromatograph Connection System** heatable to 350°C with efficient all-glass helium separator allows on-the-fly identification (M/e 12-450 in 2 secs) of as little as 3 nanograms of component injected into the G.C.

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• **Precision Mass Marker** directly indicates the mass number and marks the chart for faster data interpretation.

• **Accessories** include Fox-type ion source, Knudsen cell, double collector for isotope ratio work.

The cost of a typical RMU-6E from sample inlet to electron multiplier and high speed recorder is less than $35,000. A high-resolution double-focusing instrument costs less than $60,000. Where diverse requirements exist within a single department, we have been able to install two complete high performance systems within a tight budget originally established for one mass spectrometer. For more information, or to arrange a visit to our Mass Spectrometer Demonstration Laboratory, contact Perkin-Elmer, Distributor Products Department, 779 Main Ave., Norwalk, Conn. 06852.

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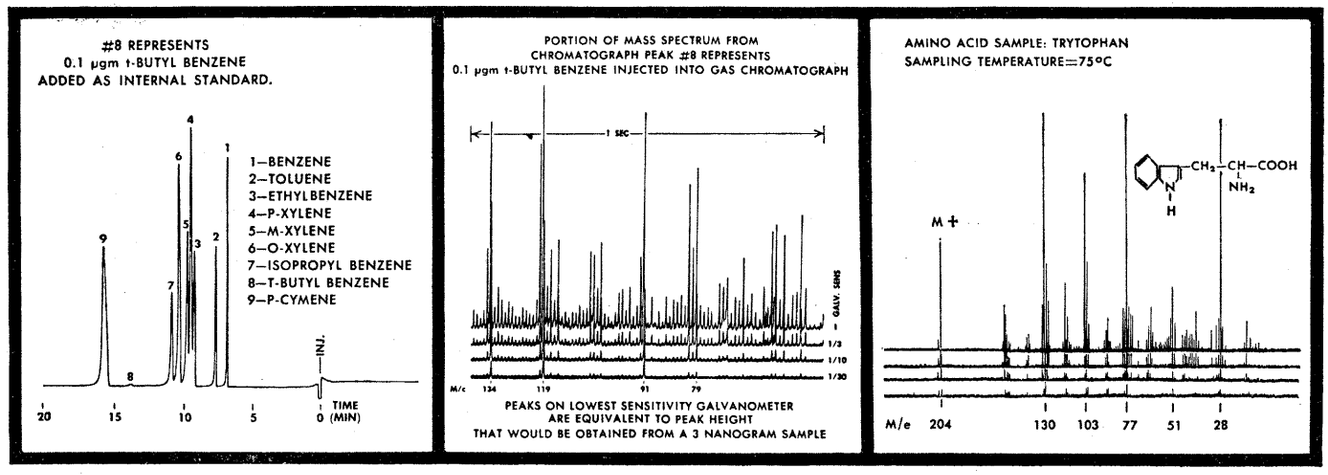


ANALOG MONOLOGUE

On Means for Modelling, Measuring, Manipulating, & Much Else

ANALOG ELECTRONICS & OPERATIONAL AMPLIFIERS

Surely we are at least thirty years too late to justify the use of electronics — in *measuring* almost any physical or chemical parameter; in *manipulating* the measured data; or in *computing, simulating,* or otherwise *predicting* the behavior of a physical system. After three decades, however, the outlines of any discipline become blurred — hence this refresher.

One process is at the root of every contribution electronics ever made to its sister sciences: *Amplification.* There are many ways to characterize this effect, but perhaps the most general is to say that electronic circuits raise the energy level of data — that they are inherently very *sensitive* — and can be made to respond, with *reliability* (stability) and fidelity (accuracy) to very small changes in the input parameter. If the input is not already an electrical signal, it must be converted to an equivalent electrical parameter, by a "transducer."

The need for amplification — for high sensitivity — is apparent from first principles. For example, we may restate Heisenberg's Exclusion Principle as follows: *"The accuracy of a measurement is a direct function of the observer's ability to make it with a minimum of disturbance to the system observed."* If we read "loading", or "burden" for "disturbance", the need for sensitive circuits is apparent. Unfortunately, electronic amplifiers are not ideal. Left to itself, the sensitivity of a simple electronic amplifier circuit will vary so much (in response to both external influences and the instability of its own component parts) as to render it useless for all but the crudest of applications. For this reason, among others, we have had to invent ways of stabilizing amplifier gain. The most convenient, powerful, and successful of these ways is called *Feedback.*

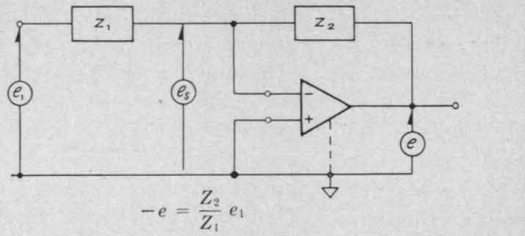
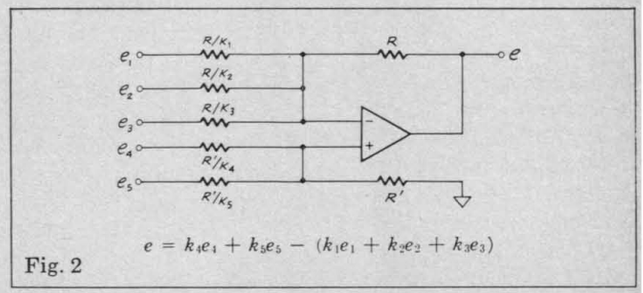


Fig. 1 $\quad -e = \frac{Z_2}{Z_1} e_i$

There are many ways to describe feedback. We shall use a simple example. To obtain a particular value of amplification, with a specific degree of stability and fidelity, one first designs an unstabilized amplifier having much higher "raw" amplification than is required; then one interconnects the output and input circuits of the amplifier by means of a more-readily-stabilized electrical circuit, called a feedback loop, or feedback network (see Figure 1) in such a way that this feeding back of output energy *reduces the apparent amplification, but gives to that modified amplification characteristic the inherently-higher stability of the feedback network.* Thus, we can trade excess amplification for superior stability — *and* superior fidelity, by the way. Because this kind of feedback *reduces* the apparent amplification, it is called "negative" feedback.

The feedback "network" may be as simple as a pair of resistors. The cost of such a circuit is modest, and its data-measurement and data-manipulation capabilities are impressive. . . but it is only the beginning.



$e = k_4e_4 + k_5e_5 - (k_1e_1 + k_2e_2 + k_3e_3)$

Fig. 2

By modifying the feedback network, so as to include *reactances* (capacitors or inductors) as well as resistances, you may create circuits that perform important and useful *mathematical operations* on a signal; for example one can differentiate or integrate it. Differentiation will convert velocity signals into acceleration, or position into velocity; or, with two differentiators, in cascade, position into acceleration. By integrating, one may reverse the process.

There is almost no limit to the ingenious behavioral variations one may create and control, merely by choosing appropriate feedback network configurations. Nowadays, using inexpensive standard "hardware", one may quickly assemble circuits that respond logarithmically, exponentially, or trigonometrically and circuits that multiply and divide too — almost as faithfully as the circuit of Figure 2 adds and subtracts.

Remember — all of this is done with equipments that cost, generally, hundreds of dollars or less, and not the thousands or more one might expect, from their capabilities and potential usefulness.

The kind of amplifier required for performing these operations with accuracy and fidelity is a very special beast, called (naturally) an Operational Amplifier, and we have devoted much of our time and energy over more than 20 years to its development and refinement.

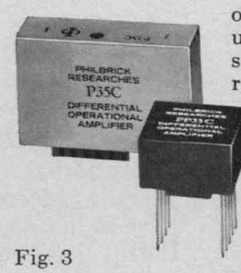


Fig. 3

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acy; and, in any case, they cannot have the specialized backgrounds required in the many technical fields under their jurisdiction. Second, day-to-day management of a modern university requires a vast number of nonacademic administrators who have no special orientation toward the university or its purposes and who could just as well keep the vital "paper gas" flowing in business or government. In many cases they make decisions which impinge strongly on scientific or academic issues. It is symptomatic of this situation that the study "The Administration of Government Supported Research at Universities" (News and Comment, 29 April) was carried out by the Budget Bureau rather than by the universities. Inaction by the universities on this matter would be expected if the government were engaged in trying to reduce support and curtail the freedom of universities to manage federal funds. The reverse is true, and we now have the Budget Bureau suggesting "research agreements" to replace research grants or contracts. The research agreement presumably would fit the nature of most university research more appropriately than the grant or contract does and would enlarge the area of freedom of the research scientist or at least legalize the freedom he already exercises. It may also serve to shift responsibility for allocation of funds from the granting agency to the university administration.

But in order for the proposed system to operate effectively there must be an impedance match between federal and university administrations; at present many scientists have reason to believe that the match is poor indeed. There is widespread doubt that universities are capable of managing research funds wisely or of making the crucial decisions which will influence science in fundamental ways.

Universities would do well to borrow a page from the book of the federal agencies written since World War II. This book teaches that a proper impedance match between the scientific community and government agencies has been achieved when active and leading scientists have a significant role in policy and in budget allocations and when the government administrator has training and background in the field for which he is responsible, knows the scientists in his field and their work, and is encouraged by his agency to seek new ways to advance his science. The parallel in the university would find for each broad and active research field a dean who knows the overall field closely. The dean would work closely with an advisory panel of scientists, including members from other universities, and they would jointly be responsible for allocation of funds for education and research and for decisions affecting the future of the field in other crucial ways. A structure of this sort, combining specialized knowledge and administrative responsibility, is essential if universities are to assume the more important role which is implied in the Budget Bureau study.

ROBERT G. FLEAGLE
Department of Atmospheric Sciences, University of Washington, Seattle

International Education Dialogue

The recent congressional hearings on the International Education Bill show the growing interest of the U.S. government in funding programs for international studies. All persons concerned with the crisis in education in developing countries welcome our widening interests, but they wonder if our new plans offer a genuine dialogue.

They demand both technical assistance and associated science-teaching programs, but rarely can we give assistance without adding our social ideas as part of the package. Much as the developing countries call for a wide variety of assistance programs to become effective, it is hoped, before they and we are overwhelmed by problems of survival, they need dignity and acceptance as colleagues working for the common good. Other nations see much of our international dialogue polarized into an offensive parochialism as a price for assistance. Our ideas of science education are exported, and much of this is right, but in this process there is little humble search for new ways of seeing others and understanding ourselves.

There are now several centers, in addition to the Division of Science Teaching at UNESCO, for collecting information on science education programs in various countries, but none is based on service as a means to obtain information and create the needed climate of friendly inquiry between different peoples and between physical sciences and the social sciences such as cultural anthropology.

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SCIENCE

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The Spirit of Science

School and college enrollments are increasing. Students are using better texts and teaching materials. Team teaching, television, language laboratories, and other innovations are coming into wider use. More attention is being given to how children learn and to how learning and teaching can be improved. Nations are helping other nations to reform and improve their educational systems. Now, into the midst of all this change, comes a proposal for a more fundamental and sweeping change than any yet seen. The Educational Policies Commission (of the National Education Association and the American Association of School Administrators) offers the radical proposal that education—all of education—be infused with the spirit of science.*

The spirit of science is defined in terms of seven underlying values: longing to know and to understand; questioning of all things; search for data and their meaning; demand for verification; respect for logic; consideration of premises; and consideration of consequences. The authors call these the values of science; one might also call them the values of rational thought.

In discussing these values, they are not talking about the education of scientists or the subject matter of science, but about the basic objectives or methods of thought that should characterize all education. What is advocated is "the understanding that the spirit of science applies to other facets of man's existence. . . . The values of which the spirit of science consists should permeate the educative process, serving as objectives of learning in every field, including the humanities and practical studies."

So great a change will require a revolution in attitudes and methods of teaching and in the methods of educating teachers. Perhaps the revolution will fail; the Educational Policies Commission speaks only for its 20 members. Some of their past statements, however, have become influential parts of the educational literature, and perhaps this one will also. If it does, the change will be revolutionary indeed, for the goal is no less than "the development of persons whose approach to life as a whole is that of a person who thinks—a rational person." The spirit and values of science "can enable each person to free himself from blind obedience to the dictates of his emotions, of propaganda, of group pressures, of the authority of others. . . . It can enable him to sift through the forces which act upon him and, to some degree, to determine and to become his own ideal self." The spirit underlying science "can enable entire peoples to use their minds with breadth and dignity and with striking benefit to their health and standard of living. It promotes individuality. It can strengthen man's efforts in behalf of world community, peace, and brotherhood. . . . Insofar as an individual learns to live by the spirit of science, he shares in the liberation of mankind's intelligence and achieves an invigorating sense of participation in the spirit of the modern world. To communicate the spirit of science and to develop people's capacity to use its values should therefore be among the principal goals of education in our own and every other country."

It is easy to criticize these lofty goals as being too idealistic, to say that other persons have espoused similar ideals, or to point out that we do not yet know how to foster the development of rational thought in all students and may never be able to do so in some. No matter, it is good to have a banner held high. And great significance can be attached to the fact that this banner has been raised in the heartland of the educational establishment.—DAEL WOLFLE

* *The Spirit of Science* can be obtained from the Educational Policies Commission, National Education Association, 1201 16th Street, NW, Washington, D.C. 20036.

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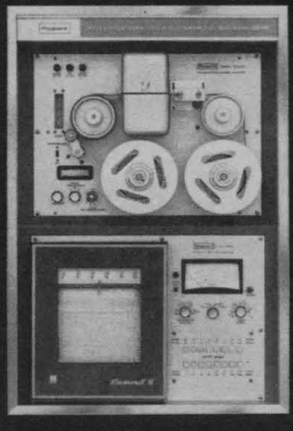

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pollution raise extraordinarily intricate questions. The mysterious smoking-lung cancer puzzle awaits new approaches.

4) Drugs administered for prolonged periods (for example, tranquilizers, agents for substitution therapy, "the pill" for contraception) may affect almost any system of the body, generally in unpredictable ways. The thalidomide tragedy dramatically highlights effects on reproductive performance.

5) Carcinogenesis remains high on the list of the leading causes of death. Studies of chronic toxicity offer advantages (for example, predictability of calendar and of costs). The disadvantages are well-known—the empirical results, the fallibility of predictions based on animal data. The responses of many species and strains must be related to those of man. New statistical procedures can strengthen chronic studies. An international center of toxicological information should be established; the World Health Organization might logically serve as the repository.

Although there was no specific grouping on any one day of papers emphasizing general physiology, the interests of this group were represented throughout the program. Areas covered included excitable membranes, molecular physiology, cell physiology, and subcellular structures. There was also a perceptible and welcome trend in papers dealing with comparative physiology in connection with functions of all systems.

The relatively small number of papers presented in other fields may have been due to the fact that many other meetings and symposia were held before, during, and after the congress meetings, and their programs and proceedings were not included in the congress program or in the official registration lists. Thus, symposia on the physiology of the activity of the "AMA" were held on 31 August and 1 September in Tokyo, on comparative neurophysiology on 10–12 September in Tokyo, on olfaction and taste on 11–13 September at Lake Yamanaka (together with a conference on food and water intake), and on environmental physiology in Kyoto to 13–17 September. There was also a symposium on structure and function of the limbic system in Hakone on 10–12 September which supplemented the papers given at the congress meetings.

The congress was also the occasion for meetings of other groups which now

have established programs of their own. A typical example is the group of investigators working in respiratory physiology who, at the previous congress in Leiden, held an excursion and dinner in honor of Wallace Fenn. A similar program was developed in Tokyo where the VA/Q Club of Japan arranged a tour to Mt. Fuji and Hakone on 5 September.

An important by-product of the congress meetings was the opportunity for the various groups in Japanese schools to have the privilege of visits and lectures from the many scientists attending the meetings. Many of the participants visited the medical schools in Tokyo, Osaka, Kyoto, and in other cities.

The congress was held under the auspices of the International Union of Physiological Sciences. The lectures and symposia are available in a monograph published by the Excerpta Medica Foundation as International Congress Series No. 87.

HYMEN S. MAYERSON
The Touro Infirmary,
New Orleans, Louisiana

Great Lakes Research

The Great Lakes contain about 30 percent of the world's fresh water, and their basin is estimated to be capable of supporting about 3 billion people. However, much of the water in the lakes is not referred to as fresh, and we are experiencing difficulties in supporting 1/100 as many people. The 9th conference on Great Lakes Research was held at IIT Research Institute in Chicago, 28–30 March 1966. Over 400 persons attended to listen to 120 papers and panel discussions. The topics included water budget and quality, biology, physical limnology, air-water interactions, marine geophysics, geology, and inorganic materials, as well as some economic and legal aspects.

Introductory remarks by B. M. McCormac (IIT Research Institute) emphasized that in planning this conference he concluded that, (i) no single U.S. government agency was responsible for the total Great Lakes problem; (ii) there is poor management of water, but no water shortage; (iii) current pollution control steps are based on very fragmentary information; (iv) the failure of industrial organizations to present papers at the conference was due to fear that the data might be used

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against them; (v) there is insufficient multidisciplinary research; and (vi) that although it seems likely that municipalities will eventually be forbidden to inject any sewage effluent into the lakes, the issue is not being faced directly.

The welcoming address was delivered by T. F. Bates (science adviser and assistant to the Secretary of the Interior). When the Federal Water Pollution Control Administration is transferred to the Department of Interior on 1 May 1966, Interior will have a vast responsibility in the Great Lakes. Bates believes that this transfer will improve the U.S. government's role in the support of Great Lakes research. The Cabinet and the White House are going to give more attention to the Great Lakes. The emphasis will reflect the transportation, recreation, municipal, and industrial needs. Much more scientific limnological data must be generated and intelligibly communicated before an effective lake management program can be expected.

A number of papers and discussions were devoted to water quality and budget. Although great interest was shown in T. W. Kieran's (Gibb, Underwood, and McLellan, Sudbury) grand canal scheme for recycling Canadian waters for both Canadian and U.S. use, it was generally believed that there is not a water shortage, but very poor water management. Bates suggested that if there is a water shortage, weather modification might prove more feasible than mass maneuver of North American water flow. It is difficult to study the water budget properly because evaporation has never been adequately measured. It was pointed out by C. R. Ownbey (Federal Water Pollution Administration) that water standards must be precisely specified. Different parts of the lakes will have different standards. These standards are very difficult to establish because of a lack of information about many of the pollutants.

The papers on physical limnology emphasized mass movements of water, temperature distribution, and dissolved oxygen content. As attempts are being made to obtain synoptic data, experimenters are being faced with a large data collection and processing task. Most of these studies were undertaken to investigate the health of the lakes. Dissolved oxygen content provides a good measure of water quality. The dissolved oxygen is in turn dependent upon temperature distribu-

tions and the motion of water masses. The dispersal of effluent by lake currents and eddies has been investigated by G. T. Csanady (University of Waterloo). Although one is interested in probability distributions, only some mean-value data exists. Preliminary results indicate that horizontal diffusion is related to the complex current system and vertical diffusion to eddies. J. L. Verber (Federal Water Pollution Administration) has made extensive current measurements in the lakes which show that complex inertial currents are found in all the lakes at all depths, and at all times of the year.

Several papers covering the whole field of biology from microorganisms to fish were presented. The dominant species are constantly changing. Many parts of the lakes and the contiguous stream and river systems are extremely hazardous because of contamination with the intestinal disease-producing bacteria, salmonella, according to L. E. Scarce (Federal Water Pollution Administration). It is hazardous to swim, fish, or even get the water spray in the face. Tests show that many types of salmonella are not completely removed by the treatment plants of the Chicago Sanitary District. The inland waters of the Chicago area are especially contaminated, as are parts of southern Lake Michigan from time to time.

Many experimenters have been examining benthic mud samples. The dominant species vary with time. Especially in Lakes Michigan and Erie, the present dominant forms of midge larvae are indicative of pollution. N. W. Britt (Ohio State University) showed that 15 years ago the dominant benthic organism in western Lake Erie was the Mayfly, *Hexagenia*. Many of us remembered how they would collect knee-deep around the base of street lamps near the lake. The Mayfly has almost disappeared to be replaced by the *Chironomidae*, which is now declining in favor of the *Tubificidae*.

An excellent panel on eutrophication was monitored by A. D. Hasler (University of Wisconsin). Eutrophication tends to be used to mean productivity and is a general indicator of the pollution of a lake. The indices of eutrophication were discussed by A. M. Beeton (University of Wisconsin). Not enough indicators of the ecological state of the lakes are being monitored. More research is needed to select the proper indicators. There is also some confusion about the trends of those indices that have been measured, such as ni-

trates and phosphates. It is apparently difficult to compare data because of variations in experimental techniques and uncertainty as to whether a specific phosphorus compound or total phosphorus was measured.

G. L. Harlow (Federal Water Pollution Administration) discussed the sources of nutrients. At certain times of the year, phosphate measurements can be significantly biased by runoff from farmland; however, the major source of nutrients is from sewage effluent. Nutrients in Lakes Erie, Michigan, and Ontario are showing significant increases. These results are compatible with the measurements of the distribution of biological species as reported by C. F. Powers (University of Michigan). The dominant species reflect the increased pollution in the last 30 to 40 years and the spatial distribution reflects the injection of sewage effluent by the various lake border towns. J. C. Ayers (University of Michigan) checked to see if water temperature changes could stimulate the eutrophic plankton species now being observed. He concluded that this is not the case after a very detailed study of the available weather records for the last century. Although the air temperatures over Lakes Erie and Michigan are rising, Lake Erie's water temperature has an upward trend, while Lake Michigan's has a downward trend. Lake Erie, being a shallow lake, more closely follows the air temperature, whereas the deeper Lake Michigan depends on storms for mixing. The number of storms over Lake Michigan has been decreasing.

The removal of pollutants in treatment plants was discussed by G. A. Rohlich (University of Wisconsin). Much more research is required in order to be able to remove more than 99 percent of the effluent. Current techniques of removing 50 to 75 percent of the phosphates are not adequate when the total remaining quantity is considered. Research is continuing on techniques to remove various organic and inorganic compounds. This research should lead to a building block design of a treatment plant depending on the types of pollutants to be removed.

Pollution control programs are being developed under the supervision of W. Kehr (Federal Water Pollution Administration). The Lake Michigan and Lake Erie plans should be ready about 1 January 1967, with the other plans expected within the following 12

months. The standards are difficult to select; however, they will be flexible, that is, they will vary with locale. When more research has been accomplished, the standards will be modified, if necessary. Peter Kuh (Enforcement Branch of the Federal Water Pollution Administration) discussed the enforcement policies. It is hoped that his branch will do most of their enforcement through informal discussions rather than formal hearings or court actions.

There does not seem to be any doubt that Lakes Erie, Michigan, and Ontario are seriously polluted and are getting worse year by year. There are insufficient data on which to base decisions. The biological cycles, chemical cycles, and physical properties of the lakes are not adequately known. There is no doubt that the lakes can be restored to a desirable ecology, but it will require much research, time, and money. Although Lake Erie is more polluted than Lake Michigan, it can probably be improved easier because there is a significant water flow in Lake Erie, whereas Lake Michigan is a culde-sac. These lakes will probably require some positive action, such as the introduction of specific biological species, recovering the bottom with sand, injection of oxygen, and other actions. It seems to be only a matter of time until it is realized that no sewage or other waste can be deposited into the lakes.

In the last session J. L. Verber conducted a review of future Great Lakes research plans. Additional cooperation and exchange of information are required. Although there will be more research accomplished next year than last, it will not be adequate. The Universities of Michigan and Toronto have outstanding research programs, and the University of Wisconsin gives indication of significant growth. The U.S. government agencies have a large amount of research but the only significant State research program is conducted by Ontario. In the United States only Illinois seems to have an active program.

This conference was sponsored by IIT Research Institute in cooperation with the Great Lakes Research Division, University of Michigan, which will publish the proceedings. The next conference will be held at the University of Toronto in April 1967.

BILLY M. MCCORMAC
JAMES E. ASH
IIT Research Institute, Chicago, Illinois 60616

Forthcoming Events

July

20–21. **Crystal Growth**, symp., Moscow, U.S.S.R. (N. V. Belov, Inst. of Crystallography, Academy of Sciences of the U.S.S.R., Lenin Prospekt 59, Moscow B-333)

21–24. **Data Processing**, intern conf., Chicago, Ill. (Data Processing Management Assoc., 524 Busse Highway, Park Ridge, Ill. 60068)

22–23. **Pennsylvania Acad. of Science**, summer mtg., Pennsylvania State Univ., University Park. (E. W. Miller, Dept. of Geography, Pennsylvania State Univ., University Park 16802)

23–28. **Anatomy**, 1st Pan American congr., Mexico, D.F. (Congress Secretariat, Apt. Postal 25279, Admon. de Correos 70, Mexico 20)

24–30. **Microbiology**, 9th intern. congr., Moscow, U.S.S.R. (N. E. Gibbons, Intern. Assoc. of Microbiological Soc., Div. of Applied Biology, Natl. Research Council, Ottawa 2, Ont., Canada)

24–30. **Ornithology**, 14th intern. congr., Oxford, England. (N. Tinbergen, Dept. of Zoology, Oxford Univ., Oxford)

24–30. **Pharmacology**, intern. congr., São Paulo, Brazil. (M. Roche e Silva, Dept. of Pharmacology, Faculty of Medicine, Univ. of São Paulo, Ribeirao Preto, São Paulo)

25–27. **Data Acquisition and Processing in Biology and Medicine**, conf., Univ. of Rochester, Rochester, N.Y. (Office of Technical Activities Board, Inst. of Electrical and Electronics Engineers, 345 E. 47 St., New York 10017)

25–29. Interpretation and Therapy of **Cardiac Arrhythmias**, conf., Hahnemann Medical College and Hospital, Philadelphia, Pa. (L. S. Dreifus, Hahnemann Medical College, 230 N. Broad St., Philadelphia)

25–30. **Animal Husbandry**, intern conf., Göttingen, West Germany. (Intern. Agency Liaison Branch, Office of the Director General, Food and Agriculture Organization, Via delle Terme di Caracalla, Rome, Italy)

25–31. **Genetics**, intern, symp., São Paulo, Brazil. (G. Pavan, Dept. of Biology, Univ. of São Paulo, Caixa Postal 8105, São Paulo, Brazil)

26–28. American **Astronomical** Soc., Cornell Univ., Ithaca, N.Y. (G. C. McVittie, Univ. of Illinois Observatory, Urbana)

26–30. **Clinical Chemistry**, 6th intern. congr., Munich, Germany. (O. Wieland, 11. Medizinische Universitätsklinik, Ziemssenstr. 1, 8 Munich)

27–30. **International Primatological Soc.**, mtg., Frankfurt-am-Main, Germany. (D. Stark, Ludwig-Rehnstr. 14, Frankfurt)

28–31. **Psychosomatic Medicine in Obstetrics and Gynecology**, 3rd intern. congr., Vienna, Austria. (A. H. Palmrich, Vienna Acad. of Medicine, Alserstr. 4, Vienna 9)

29–30. **Linguistic** Society of America, Univ. of California, Los Angeles. (A. A. Hill, Box 8120 University Station, Austin, Tex.)

31–4. American Soc. of **Animal Science**, annual mtg., Rutgers Univ., New Brunswick, N.J. (A. M. Pearson, Dept. of Food

See 3 June issue for comprehensive list

Science, Michigan State Univ., East Lansing)

31–5. **Dermatology,** 13th intern. congr., Munich, West Germany. (C. G. Shirren, Frauenlobstr. 9, Munich)

31–6. **Mycology,** 4th European congr., Warsaw, Poland. (Intern. Union of Biological Sciences, General Secretariat, Dept. of Zoology, Univ. of Washington, Seattle 98105)

August

1–3. **Electron Spin Resonance Spectroscopy,** symp., American Chemical Soc. Div. of Physical Chemistry, Michigan State Univ., East Lansing. (M. T. Rogers, Dept. of Chemistry, Michigan State Univ., East Lansing 48823)

1–4. **Psychoanalysis,** 2nd Pan American congr., Buenos Aires, Argentina. (M. Heiman, 1148 Fifth Ave., New York, N.Y. 10028)

1–4. **Toxicology and Occupational Medicine,** 5th inter-American conf., Miami, Fla. (W. B. Deichmann, Univ. of Miami School of Medicine, Coral Gables, Fla. 33134)

1–5. **Instrumentation Science,** 3rd research conf., Instrument Soc. of America, William Smith College, Geneva, N.Y. (K. B. Schnell, ISA, 530 William Penn Pl., Pittsburgh, Pa. 15219)

1–6. **Nuclear Physics,** intern. seminar, Joensuu, Finland. (Research Inst. for Theoretical Physics, Univ. of Helsinki, Helsinki, Finland)

1–6. European **Seismological Commission,** mtg., Copenhagen, Denmark. (E. Peterschmitt, Inst. de Physique du Globe, 38, boulevard d'Anvers, Strasbourg, France)

1–6. **Upper Mantle,** symp., Copenhagen, Denmark. (H. C. Smith, Upper Mantle Commission, Geological Survey of Canada, Ottawa, Ont.)

1–7. International Union of **Scientific Psychology,** 18th congr., Moscow, U.S.S.R. (Secretary-General, Dept. of Psychology, Univ. of Moscow, Marx Ave. 18, Moscow)

2–4. **Vaso-Active Polypeptides,** symp., Ribeiraõ Prêto, Brazil. (M. Rocha e Silva, Dept. of Pharmacology, Faculty of Medicine, Ribeiraõ Prêto)

2–5. **Synaptic Mechanisms,** symp., Rio de Janeiro, Brazil. (C. Chagas, Inst. of Biophysics, Natl. Faculty of Medicine, Avda. Pasteur 458, Rio de Janeiro)

3–8. International **Geographical Union,** Latin American regional conf., Mexico City, Mexico. (A. Bassols Batalla, Mexican Soc. of Geography and Statistics, Justo Sierra 19, Mexico City 1)

3–10. **Nutrition,** 7th intern. congr., Hamburg, West Germny. (U. Ritter, 1st Medical Clinic of the University, Martinistr. 52, Hamburg 20)

4–11. **Psychology,** 18th intern. congr., Moscow, U.S.S.R. (A. R. Luria, Univ. of Moscow, 13 Frunze Str., Moscow G. 19)

7–12. Latin American Assoc. of **Physiological Sciences,** 7th mtg., Mar del Plata, Argentina. (V. G. Foglia, Paraguay 2155 7th flr., Buenos Aires, Argentina)

8–10. Society for **Cryobiology,** annual mtg., Boston, Mass. (I. Wodinsky, A. D. Little Co., 30 Memorial Dr., Cambridge, Mass.)

8–11. **Biometry and Statistics in Food, Population, and Health Research**, mtg., Mexico City, Mexico. (General Secretariat, Intern. Union of Biological Sciences, Dept. of Zoology, Univ. of Washington, Seattle 98105)

8–12. **Heat Transfer**, 3rd intern. conf., Chicago, Ill. (T. F. Irvine, College of Engineering, State Univ. of New York, Long Island Center, Stoney Brook)

8–12. National **Medical Assoc.**, 71st annual session, Chicago, Ill. (J. T. Givens, 2400 Corprew Ave., Norfolk, Va.)

8–13. **Anesthesiology**, 2nd European congr., Copenhagen, Denmark. (H. Poulson, Dept. of Anesthesia, University Hospital, Aarhus, Denmark)

10–11. European Assoc. for **Animal Production**, study commissions, mtgs., Edinburgh, Scotland. (K. Kállay, Corso Trieste 67, Rome, Italy)

10–12. Applications of **X-ray Analysis**, 15th annual conf., Denver, Colo. (J. B. Newkirk, Metallurgy Div., Denver Research Inst., Univ. of Denver, Denver 80201)

11–18. **Animal Production**, 9th intern. congr., Edinburgh, Scotland (Congress Secretary, 5 Hope Park Sq., Edinburgh 8)

14–17. **Cryobiology**, intern. conf., Sapporo, Japan. (Z. Yosida, Inst. of Low Temperature Science, Hokkaido Univ., Sapporo)

14–17. **Soil Conservation** Soc. of America, Albuquerque, N.M. (H. W. Pritchard, 7515 NE Ankeny Rd., Ankeny, Iowa)

14–18. Canadian **Pharmaceutical** Assoc., 59th conv., St. John, New Brunswick. (P. W. Bell, 175 College St., Toronto 2B, Ont.)

14–19. American Inst. of **Biological Sciences**, 17th annual, Univ. of Maryland, College Park. (AIBS, 3900 Wisconsin Ave., Washington, D.C.)

The following societies will meet in conjunction with the AIBS. Additional information is available from AIBS or from the program chairmen listed below.

American **Bryological** Soc. (W. B. Schofield, Dept. of Botany, Univ. of British Columbia, Vancouver, Canada)

American **Fern** Soc. (I. Knobloch, Dept. of Botany and Plant Pathology, Michigan State Univ., East Lansing)

American **Fisheries** Soc. (L. E. Cronin, Natural Resources Inst., Administration Bldg., Univ. of Maryland, College Park)

American **Genetic** Assoc. (S. Burhoe, American Univ. Graduate School, Washington, D.C.)

American **Microscopical** Soc. (R. M. Cable, Dept. of Biological Sciences, Purdue Univ., Lafayette, Ind.)

American Soc. for **Horticultural Science** (A. H. Thompson, Dept. of Horticulture, Univ. of Maryland, College Park)

American Soc. of **Plant Physiologists** (R. S. Loomis, Dept. of Agronomy, Univ. of California, Davis)

American Soc. of **Plant Taxonomists** (L. R. Heckard, Dept. of Botany, Univ. of California, Berkeley)

American Soc. of **Professional Biologists** (A. Dickman, 1415 W. Erie Ave., Philadelphia, Pa.)

American Soc. of **Zoologists** (L. E. DeLanney, Wabash College, Crawfordsville, Ind.)

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

Biometric Soc.–ENAR (J. Meade, Univ. of Arkansas Medical School, Fayetteville)

Botanical Soc. of America (W. A. Jensen, Dept. of Botany, Univ. of California, Berkeley)

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

Mycological Soc. of America (P. L. Lentz, Crops Research Div., USDA, Beltsville, Md.)

Natl. Assoc. of **Biology** (W. K. Stephenson, Earlham College, Richmond, Ind.)

Nature Conservancy (Local Representative: W. Van Eck, Dept. of Agronomy and Genetics, West Virginia Univ., Morgantown)

Phi Sigma (Local Representative: R. G. Stross, Dept. of Zoology, Univ. of Maryland, College Park)

Phycological Soc. of America (B. C. Parker, Dept. of Botany, Washington Univ., St. Louis, Mo.)

Society for **Industrial Microbiology** (J. Coats, Upjohn Co., Kalamazoo, Mich.)

Society of **Protozoologists** (R. W. Hull, Dept. of Biological Sciences, Florida State Univ., Tallahassee)

Tomato Genetics Cooperative (Local Representative: F. Angell, Dept. of Horticulture, Univ. of Maryland, College Park)

Wildlife Disease Assoc. (C. Herman, Patuxent Wildlife Disease Assoc., Laurel Md.)

14–19. **Ophthalmology**, 20th intern. congr., Munich, West Germany. (The Congress, Beethovenstr. 8, Munich 15)

14–20. **Combustion**, 11th intern. symp., Univ. of California, Berkeley. (Combustion Inst., 986 Union Trust Bldg., Pittsburgh, Pa. 15219)

14–21. American Assoc. of **Clinical Chemists**, natl. conv., Miami Beach, Fla. (G. T. Lewis, Univ. of Miami Medical School, Coral Gables, Fla.)

15–17. **Guidance and Control** Specialists, conf., Seattle, Wash. (D. B. DeBra, Dept. of Aeronautics and Astronautics, Stanford Univ., Stanford, Calif.)

15–17. Institute of **Mathematical Statistics**, Los Angeles, Calif. (G. E. Nicholson, Jr., Univ. of North Carolina, Chapel Hill)

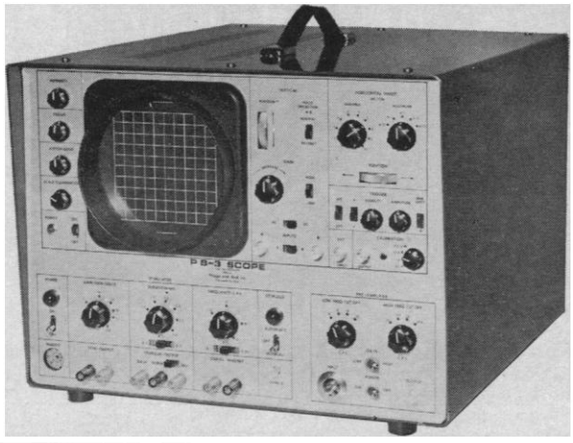
15–17. German-Speaking **Mycological** Soc., 6th scientific mtg., Vienna, Austria. (H. Rieth, The Society, Univ. Hautklinik, Martinistr. 52, 2 Hamburg 20, West Germany)

15–18. **Forensic Immunology, Medicine, Pathology, and Toxicology**, 4th intern. mtg., Copenhagen, Denmark (J. Voight, Dis Congr. Service, Skindergade 36, Copenhagen K)

15–18. **Physics of Snow and Ice**, conf., Sapporo, Japan. (Z. Yosida, Inst. of Low Temperature Science, Hokkaido Univ., Sapporo)

15–19. New England Assoc. of **Chemistry Teachers**, 28th summer conf., Dartmouth College, Hanover, N.H. (E. B. Moore, Science Dept., Hanover High School, Hanover, N.H.)

15–19. **Microscopy**, 13th intern. symp., Chicago, Ill. (W. C. McCrone, Research Inst., 451 E. 31 St., Chicago 60616)



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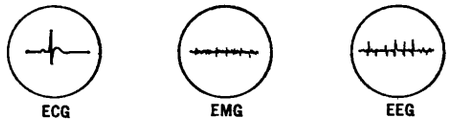

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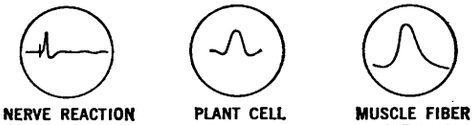

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15–19. American **Statistical** Assoc., Los Angeles, Calif. (D. C. Riley, The Association, 810 18th St. NW, Washington, D.C. 20006)

16. International Assoc. for the **Prevention of Blindness**, general assembly, Munich, West Germany. (J. P. Baillart, 47, rue de Bellechasse, Paris 7, France)

16–17. Central Nervous System Effects of **Analgesic Drugs**, symp., Santiago, Chile. (J. Mardones, Inst. of Pharmacology, Univ. of Chile, Casilla 12967, Santiago)

16–19. International Assoc. of **Milk, Food, and Environmental Sanitarians**, Minneapolis, Minn. (H. L. Thomasson, P.O. Box 437, Shelbyville, Ind. 46176)

16–26. **Mathematicians**, intern. congr., Moscow, U.S.S.R. (V. G. Karamanov, Acad. of Sciences of the U.S.S.R., Lenin Prospekt, Moscow)

17–19. Joint **Automatic Control** Conf., 7th annual, Univ. of Washington, Seattle. (G. Kovatch, NASA, Electronics Research Center, 575 Technology Sq., Cambridge, Mass. 02139)

19–26. Applied **Geography**, symp., Intern. Geographical Union Commission on Applied Geography, West Greenwich, R.I. (P. H. Nash, Graduate School, Univ. of Rhode Island, Kingston 02881)

19–28. **Geology**, 23rd intern. congr., Prague, Czechoslovakia. (Organizing Committee, Ústredni ústav geologicky, Malostranské náměstí 19, Prague 1)

20–24. American **Phytopathological** Soc., Denver, Colo. (C. J. R. Shay, Dept. of Botany and Plant Pathology, Purdue Univ., Lafayette, Ind. 47907)

20–25. **Diseases of the Chest**, 9th intern. congr., Copenhagen, Denmark. (M. Kornfeld, American College of Chest Physicians, 112 E. Chestnut St., Chicago, Ill. 60611)

21–24. **Free Radicals in Solution**, intern. symp. Ann Arbor, Mich. (R. C. Elderfield, Dept. of Chemistry, Univ. of Michigan, Ann Arbor 48104)

21–25. American Soc. of **Agronomy**, Oklahoma State Univ., Stillwater. (M. Stelly, The Society, 677 S. Segoe Rd., Madison, Wis. 53711)

21–25. **Electron Microscopy** Soc. of America, San Francisco, Calif. (G. Thomas, Dept. of Mineral Technology, Univ. of California, Berkeley)

21–26. **Hematology**, 11th intern. congr., Sydney, Australia. (F. P. Walsh, 1 York St., Sydney)

21–26. **Illuminating Engineering** Soc., natl. technical conf., Minneapolis, Minn. (A. D. Hinckley, The Society, 345 E. 47 St., New York 10017)

21–7. British Assoc. for the **Advancement of Science**, 128th annual mtg., Nottingham, England. (Secretary, 20 Great Smith St., 3 Sanctuary Bldg., London S.W.1)

22–24. **Computer and Information Sciences**, symp., Columbus, Ohio. (J. T. Tou, Communication Science Research Center, Columbus Laboratories, Battelle Memorial Inst., 505 King Ave., Columbus, Ohio 43201)

22–24. **Physiology**, 12th Scandinavian congr., Turku, Finland. (K. Hartiala, Dept. of Physiology, Turku Univ., Turku)

22–26. Society of **Photo-Optical Instrumentation** Engineers, 11th annual techni-

cal symp., St. Louis, Mo. (R. T. Hedden, 16 Harneywold Dr., St. Louis 63136)

22–26. **Poultry Science** Assoc., Utah State Univ., Logan. (C. B. Ryan, Dept. of Poultry Science, Texas A&M Univ., College Station 77843)

22–27. **Food Science and Technology**, 2nd intern. congr., Warsaw, Poland. (A. Borys, Inst. Przemyslu Miesnego, Rakowiecka 36, Warsaw 12)

22–27. **History of Medicine**, 20th intern. congr., Berlin, Germany. (Secretariat, Augustastr. 37, 1 Berlin 45)

22–27. Pan American Federation of Associations of **Medical Schools**, 1st general assembly, Bogota, Colombia. (E. Braga, Caixa Postal 26-ZC-39, Rio de Janeiro, GB, Brazil)

22–10. **Science**, 11th Pacific congr., Tokyo, Japan. (Pacific Science Assoc., Bishop Museum, Honolulu, Hawaii 96819)

23–25. **Biological Photographic** Assoc., 36th annual mtg., Lexington, Ky. (P. Brook, The Association, Cornell Univ. Medical College, 1300 York Ave., New York, N.Y.)

23–26. **Electronics**, western show and conv., Los Angeles, Calif. (S. Sensiper, WESCON, 3600 Wilshire Blvd., Suite 1920A, Los Angeles 99005)

23–30. **Luminescence**, intern. congr., Budapest, Hungary. (G. Szigeti, Research Inst. for Technical Physics, Hungarian Acad. of Sciences, P.O. Box Ujpest 1, No. 76, Budapest)

23–1. **Radio Astronomy** and the Galactic System, symp., Noordwijk, Netherlands. (J. H. Oort, University Observatory, Leiden, Netherlands)

24–26. Principles of **Radiation Protection**, conf., Oak Ridge, Tenn. (Special Projects Office, Oak Ridge Associated Univs., P.O. Box 117, Oak Ridge, Tenn. 37830)

24–29. International Soc. of **Blood Transfusion**, 11th biennial congr., Sydney, Australia. (G. T. Archer, 1 York St., Sydney)

24–29. **Prehistoric and Protohistoric Sciences**, 7th intern. congr., Prague, Czechoslovakia. (S. J. De Laet, Seminaire d'Archéologie de l'Université, 2 Blandijnberg, Ghent, Belgium)

25. Scandinavian **Pharmacologists**, mtg., Turku, Finland. (K. Hartiala, Dept. of Physiology, Turku Univ., Turku)

25–27. Inter-Union Commission on **Solar and Terrestrial Relationships**, mtg., Belgrade, Yugoslavia. (C. W. Allen, Univ. of London Observatory, Mill Hill Park, London N.W.7, England)

26–29. **Low Temperature Calorimetry**, conf., Otaniemi, Finland. (O. V. Lounasmaa, Dept. of Technical Physics, Inst. of Technology, Otaniemi)

26–29. Rural **Sociological** Soc., annual mtg., Miami, Fla. (J. A. Beegle, Dept. of Sociology and Anthropology, Michigan State Univ., East Lansing)

26–2. **Biometeorology**, 4th intern. congr., Rutgers Univ., New Brunswick, N.J. (F. Sargent, II, 524 Burrill Hall, Univ. of Illinois, Urbana 61801)

27. American Assoc. of **Electromyography and Electrodiagnosis**, San Francisco, Calif. (M. K. Newman, 16861 Wyoming Ave., Detroit 21, Mich.)

27–28. Society for the Study of **Social Problems**, annual mtg., Miami Beach, Fla.

(F. F. Lee, Dept. of Sociology and Anthropology, Northeastern Univ., Boston, Mass. 02115)

28-1. Association of American **Geographers**, Toronto, Ont., Canada. (J. K. Hart, 1146 16th St., NW, Washington, D.C. 20036)

28–2. **Hormones**, Laurentian conf., Mont Tremblant, P.Q., Canada. (J. Sanford, 222 Maple Ave., Shrewsbury, Mass. 01545)

28–4. **Electron Microscopy**, 6th intern. congr., Kyoto, Japan. (Chairman of the Organizing Committee, Inst. for Virus Research, Kyoto Univ., Kyoto)

29–1. **Technical Information Center Administration**, 3rd annual conf., Philadelphia, Pa. (M. Warrington, Graduate School of Library Science, Drexel Inst. of Technology, Philadelphia 19104)

29–31. Preparation and Properties of Electronic Materials for **Control of Radiative Processes**, conf., Boston, Mass. (E. P. Warekois, MIT Lincoln Laboratory, Lexington, Mass. 02173)

29–31. **Electronic Materials**, conf., Boston, Mass. (American Inst. of Mining, Metallurgical and Petroleum Engineers, 345 E. 47 St., New York 10017)

29–31. **Instrumentation in Aerospace Simulation Facilities**, 2nd intern. congr., Stanford Univ., Stanford, Calif. (P. L. Clemens, VKF/AP, Arnold Air Force Base Station, Tenn.)

29–31. **Mathematical** Assoc. of America, Rutgers Univ., New Brunswick, N.J. (H. M. Gehman, State Univ. of New York at Buffalo, Buffalo 14214)

29–31. **Metallurgists**, 5th annual conf., Toronto, Ont., Canada. (Canadian Inst. of Mining and Metallurgy, 906 Drummond Bldg., 117 St. Catherine St., W., Montreal 2, P.Q.)

29–31. **Physical Chemistry of Solids**, symp., Univ. of Montreal, Montreal, P. Q., Canada. (W. C. Cooper, Noranda Research Centre, 240 Hymus Blvd., Pointe Claire, P.Q., Canada)

29–31. **Solvent Extraction Chemistry**, intern. conf., Göteborg, Sweden. (The Conference, Dept. of Chemistry, Gibraltargatan 5 H, Göteborg S)

29–31. **Textiles**, Canadian seminar, Queens Univ., Kingston, Ont. (Textile Technical Federation of Canada, 4795 St. Catherine St., W. Westmount, Montreal, P.Q.)

29–1. American **Sociological** Assoc., Miami Beach, Fla. (E. H. Volkart, 1001 Connecticut Ave., NW, Washington, D.C. 20036)

29–2. **Internal Medicine**, Czechoslovak congr., Prague, Czechoslovakia. (O. Riedl, 4th Medical Clinic, Faculty of General Medicine, Charles Univ., U Nemocnice 2n, Prague 2)

29–2. American **Mathematical** Soc., Rutgers Univ., New Brunswick, N.J. (G. L. Walker, The Society, P.O. Box 6248, Providence, R.I.)

29–2. **Neutron Monitoring** for Radiological Protection, symp., Vienna, Austria. (S. Somasundaram, Div. of Health, Safety, and Waste Disposal, Intern. Atomic Energy Agency, Vienna)

29–2. **Operations Research**, 4th intern. conf., MIT, Cambridge, Mass. (K. D. Tocher, United Steel Co., Cybor House, 1–5 Tapton Hall Rd., Sheffield, England)

NEW BOOKS

(Continued from page 1736)

ington: From the New Deal to McCarthy. Earl Latham. Harvard Univ. Press, Cambridge, Mass., 1966. 460 pp. Illus. $7.95.

Cost Study of Dental Education. George M. Norwood, Jr., Ed. American Assoc. of Dental Schools, Chicago, 1965. 99 pp. Illus.

Crystals, Diamonds, and Transistors. L. W. Marrison. Penguin Books, Baltimore, 1966. 311 pp. Illus. Paper, $1.95.

Death of the Sweet Waters. Donald E. Carr. Norton, New York, 1966. 257 pp. Illus. $5.95.

A Dictionary of Astronautics. J. L. Nayler. Hart, New York, 1965. 320 pp. Illus. Paper, $2.65; cloth, $6.95.

Educational Therapy in the Elementary School. An educational approach to the learning problems of children. Patrick Ashlock and Alberta Stephen. Thomas, Springfield, Ill., 1966. 118 pp. Illus. $6.75.

The English Paracelsians. Allen G. Debus. Watts, New York, 1966. 222 pp. Illus. $5.95. Watts History of Science Library.

ESP: A Scientific Evaluation. C. E. M. Hansel. Scribner, New York, 1966. 285 pp. Illus. $6.95.

The Evolution of Urban Society: Early Mesopotamia and Prehispanic Mexico. Robert McC. Adams. Aldine, Chicago, 1966. 203 pp. Illus. $5.95. The Lewis Henry Morgan Lectures.

Explorer of the Universe: A Biography of George Ellery Hale. Helen Wright. Dutton, New York, 1966. 480 pp. Illus. $10.

Five-Year Bibliography on Fatigue 1955–1959 (with Index). Prepared by Committee E-9 on Fatigue. Walter S. Hyler, chairman. American Soc. for Testing and Materials, Philadelphia, 1966. 108 pp. Paper, $17; members, $11.90. Contains a list of references covering the literature of the United States, England and other English-speaking countries, Western and Eastern European countries, and Asia and Far Eastern countries; there is a subject index, an author index, and a list of reference sources.

Flight to the Stars. An inquiry into the feasibility of interstellar flight. James Strong. Hart, New York, 1965. 190 pp. Illus. Paper, $1.45; cloth, $4.95.

German-English Mathematical Vocabulary. Sheila Macintyre and Edith Witte. Oliver and Boyd, London; Interscience (Wiley), New York, 1966. 105 pp. $2.95. University Mathematical Texts, edited by Alexander C. Aitken and Daniel E. Rutherford.

Giant Molecules. Herman F. Mark and the Editors of *Life*. Time, Inc., New York, 1966. 200 pp. Illus. $3.95. *Life* Science Library.

Good Hunting: Fifty Years of Collecting and Preparing Habitat Groups for the American Museum. James L. Clark. Univ. of Oklahoma Press, Norman, 1966. 254 pp. Illus. $5.95.

History and Geography of the Most Important Diseases. Erwin H. Ackerknecht. Hafner, New York, 1965. 224 pp. Illus. $5.50.

The History of Cell Respiration and Cytochrome. David Keilin. Cambridge Univ. Press, New York, 1966. 436 pp. Illus. $17.50.

History of the Indian Ocean. Auguste Toussaint. Translated from the French edition (Paris, 1961) by June Guicharnaud. Univ. of Chicago Press, Chicago, 1966. 304 pp. Illus. $6.

A History of the Theories of Rain: And Other Forms of Precipitation. W. E. Knowles Middleton. Watts, New York, 1966. 231 pp. Illus. $5.95. The Watts History of Science Library.

How Animals Communicate. Bil Gilbert. Pantheon Books, New York, 1966. 185 pp. Illus. $3.95 (juvenile book).

How to Use a Microscope. Walter Shepherd. New American Library, New York, 1966. 127 pp. Illus. Paper, 60¢.

Human Aims in Modern Perspective. Outlines of a general theory of value with special reference to contemporary social life and politics. D. W. Gotshalk. Antioch Press, Yellow Springs, Ohio, 1966. 133 pp. $4.

The Knower and the Known. Marjorie Grene. Basic Books, New York, 1966. 283 pp. $6.

The Language of Life: An Introduction to the Science of Genetics. George Beadle and Muriel Beadle. Doubleday, Garden City, N.Y., 1966. 256 pp. Illus. $5.95.

Life Styles of Educated Women. Eli Ginzberg, Ivar E. Berg, Carol A. Brown, John L. Herma, Alice M. Yohalem, and Sherry Gorelick. Columbia Univ. Press, New York, 1966. 236 pp. $5.95.

McGraw-Hill Yearbook of Science and Technology. Compiled by the staff of the McGraw-Hill Encyclopedia of Science and Technology. McGraw-Hill, New York, 1966. 461 pp. Illus. $24.

The Mathematical Practitioners of Hanoverian England, 1714–1840. E. G. R. Taylor. Cambridge Univ. Press, New York, 1966. 519 pp. Illus. $16.50.

The Medical Department: Medical Service in the Mediterranean and Minor Theaters. Technical Services, U.S. Army. Charles M. Wiltse. Office of the Chief of Military History, Washington, D.C., 1965 (order from Superintendent of Documents, Washington, D.C.). 692 pp. Illus. $5.

Men Near the Top. Filling key posts in the federal service. John J. Corson and R. Shale Paul. Johns Hopkins Press, Baltimore, 1966. 207 pp. $6.

The Metropolitan Transportation Problem. Wilfred Owen. Brookings Institution, Washington, D.C., ed. 2, 1966. 280 pp. Illus. $6.

Mind, Matter, and Method. Essays in philosophy and science in honor of Herbert Feigl. Paul K. Feyerabend and Grover Maxwell, Eds. Univ. of Minnesota Press, Minneapolis, 1966. 530 pp. Illus. $9.75. Twenty-six papers on the following topics: Philosophy of Mind and Related Issues (10 papers); Induction, Confirmation, and Philosophical Method (11 papers); and Philosophy of the Physical Sciences (5 papers).

Modern Technical Writing. Theodore A. Sherman. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1966. 438 pp. Illus. $10.

Monographie des principales variétés

de Pêchers étudiés à la Station d'Arboriculture fruitière du Sud-Ouest, Période 1950–1962. Jean Hugard and Raymond Saunier. Institut National de la Recherche Agronomique, Paris, 1966. 275 pp. Illus. Paper, F. 48.

Muscles of the Ox. R. M. Butterfield and N. D. S. May. Univ. of Queensland Press, St. Lucia, 1966. 176 pp. Illus. $8.50.

The Neutrino: Guest Particle of the Atom. Isaac Asimov. Doubleday, Garden City, N.Y., 1966. 239 pp. Illus. $4.95.

North Atlantic Arena: Water Transport in the World Order. Charles C. Colby. Southern Illinois Univ. Press, Carbondale, 1966. 267 pp. Illus. $7.50.

On the Syllogism and Other Logical Writings. Augustus De Morgan. Peter Heath, Ed. Yale Univ. Press, New Haven, Conn., 1966. 387 pp. Illus. $10. Rare Masterpieces of Philosophy and Science Series, edited by W. Stark.

The Origins of Field Theory. L. Pearce Williams. Random House, New York, 1966. 160 pp. Illus. Paper, $1.95. Studies in the History of Science.

Philosophical Foundations of Physics: An Introduction to the Philosophy of Science. Rudolf Carnap. Martin Gardner, Ed. Basic Books, New York, 1966. 310 pp. Illus. $6.50.

The Politics of Research. Richard J. Barber. Public Affairs Press, Washington, D.C., 1966. 175 pp. $4.50.

The Psychology of Science: A Reconnaissance. Abraham H. Maslow. Harper and Row, New York, 1966. 190 pp. $4.50. The John Dewey Society Lectureship Series, edited by Arthur G. Wirth.

The Psychology of Sleep. David Foulkes. Scribner, New York, 1966. 281 pp. Illus. $6.95.

Purpose in Nature. John V. Canfield, Ed. Prentice-Hall, Englewood Cliffs, N.J., 1966. 121 pp. Paper, $2.50. Contemporary Perspectives in Philosophy Series, edited by Joel Feinberg and Wesley C. Salmon. Six papers: "Behavior, purpose, and teleology" by Arturo Rosenblueth, Norbert Wiener, and Julian Bigelow; "Comments on a mechanistic conception of purposefulness" by Richard Taylor; "Causal and teleological explanation" by Richard D. Braithwaite; "Thoughts on teleology" by Israel Scheffler; "Teleological explanation" by Ernest Nagel; and "The logic functional analysis" by Carl G. Hempel.

The RAND Corporation: Case Study of a Nonprofit Advisory Corporation. Bruce R. L. Smith. Harvard Univ. Press, Cambridge, Mass., 1966. 348 pp. $7.95.

Science and the University. Boyd R. Keenan, Ed. Columbia Univ. Press, New York, 1966. 219 pp. Illus. $5.95. Seventeen papers contributed by Philip Abelson, Sir Eric Ashby, John Brademas, Harvey Brooks, Albert V. Crewe, Beardsley Graham, William J. Harris, Leland J. Haworth, Donald F. Hornig, J. Edward Roush, Frederick Seitz, Edward Teller, Kenneth W. Thompson, James S. Triolo, and Alvin Weinberg.

Red China Today. Hugo Portisch. Translated from the German edition (1965) by Heinz von Koschembahr. Quadrangle Books, Chicago, 1966. 383 pp. Illus. $6.95.

The Reluctant Space-Farers. The political and economic consequences of Ameri-

ca's space effort. Frank Gibney and George J. Feldman. New American Library, New York, 1966. 172 pp. Paper, 60¢.

The Role of Mathematics in the Rise of Science. Salomon Bochner. Princeton Univ. Press, Princeton, N.J., 1966. 396 pp. Illus. $9.

The Scientific Approach. J. T. Davies. Academic Press, New York, 1965. 110 pp. Illus. $5.50.

In Search of Philosophic Understanding. Edwin A. Burtt. New American Library, New York, 1966. 349 pp. $5.75.

Small Group Research: A Synthesis and Critique of the Field. Joseph E. McGrath and Irwin Altman. Holt, Rinehart, and Winston, New York, 1966. 611 pp. Illus. $12.50.

The Strategy of World Order. vols. 1 to 4. vol. 1, *Toward a Theory of War Prevention* (416 pp.); vol. 2, *International Law* (398 pp.); vol. 3, *The United Nations* (864 pp.); vol. 4, *Disarmament and Economic Development* (688 pp.). Richard A. Falk and Saul H. Mendlovitz, Eds. World Law Fund, New York, 1966. Illus. $14 set. 116 papers.

The Step to Man. John Rader Platt. Wiley, New York, 1966. 224 pp. $5.95. A collection of essays on the evolving social and intellectual nature of man.

Sword of Pestilence: The New Orleans Yellow Fever Epidemic of 1853. John Duffy. Louisiana State Univ. Press, Baton Rouge, 1966. 205 pp. Illus. $5.

Supply and Competition in Minor Metals. David B. Brooks. Published for Resources for the Future, Washington, D.C., by Johns Hopkins Press, Baltimore, 1966. 165 pp. Illus. Paper, $3.

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