

# SCIENCE

12 August 1966

Vol. 153, No. 3737

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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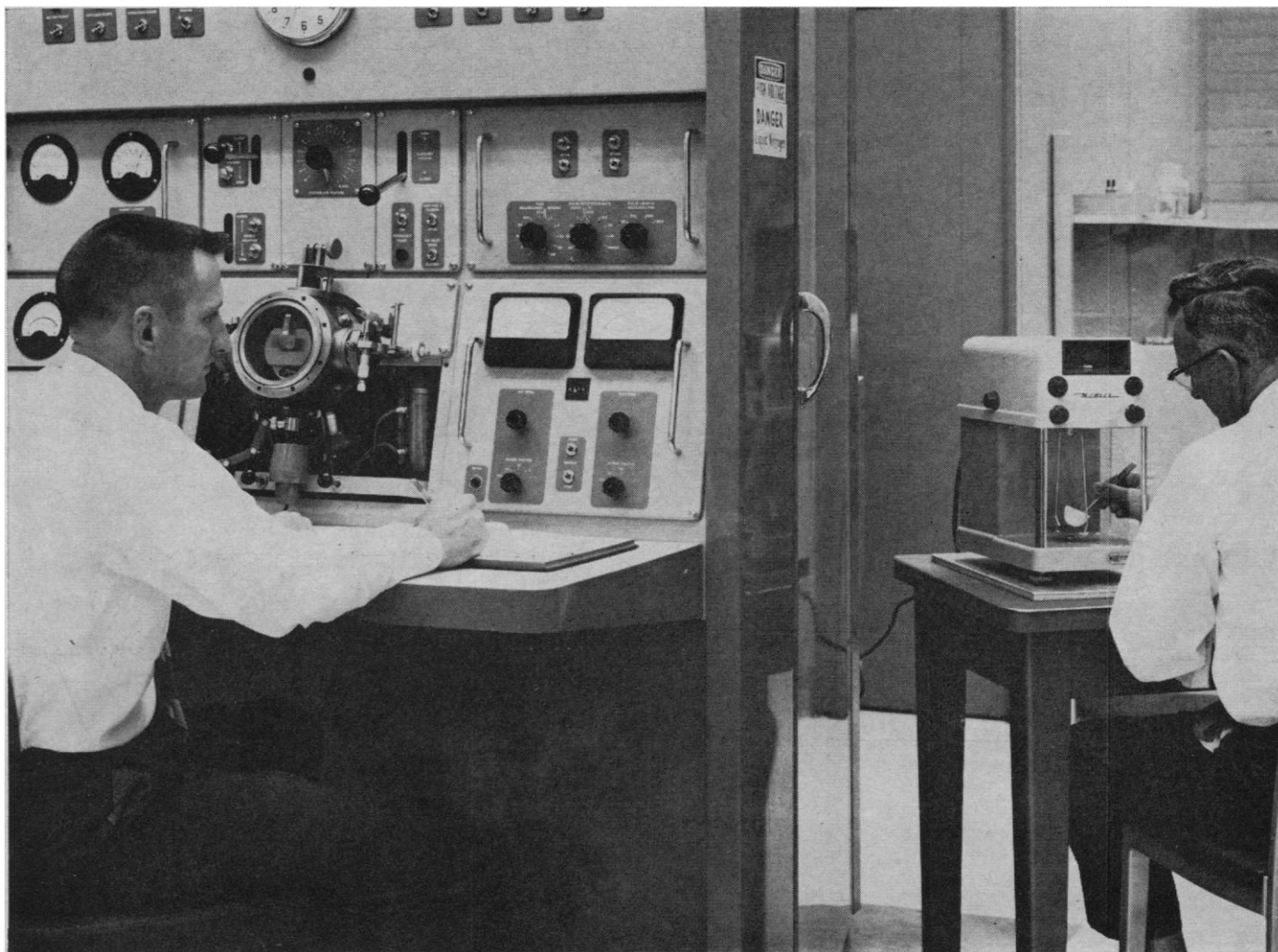
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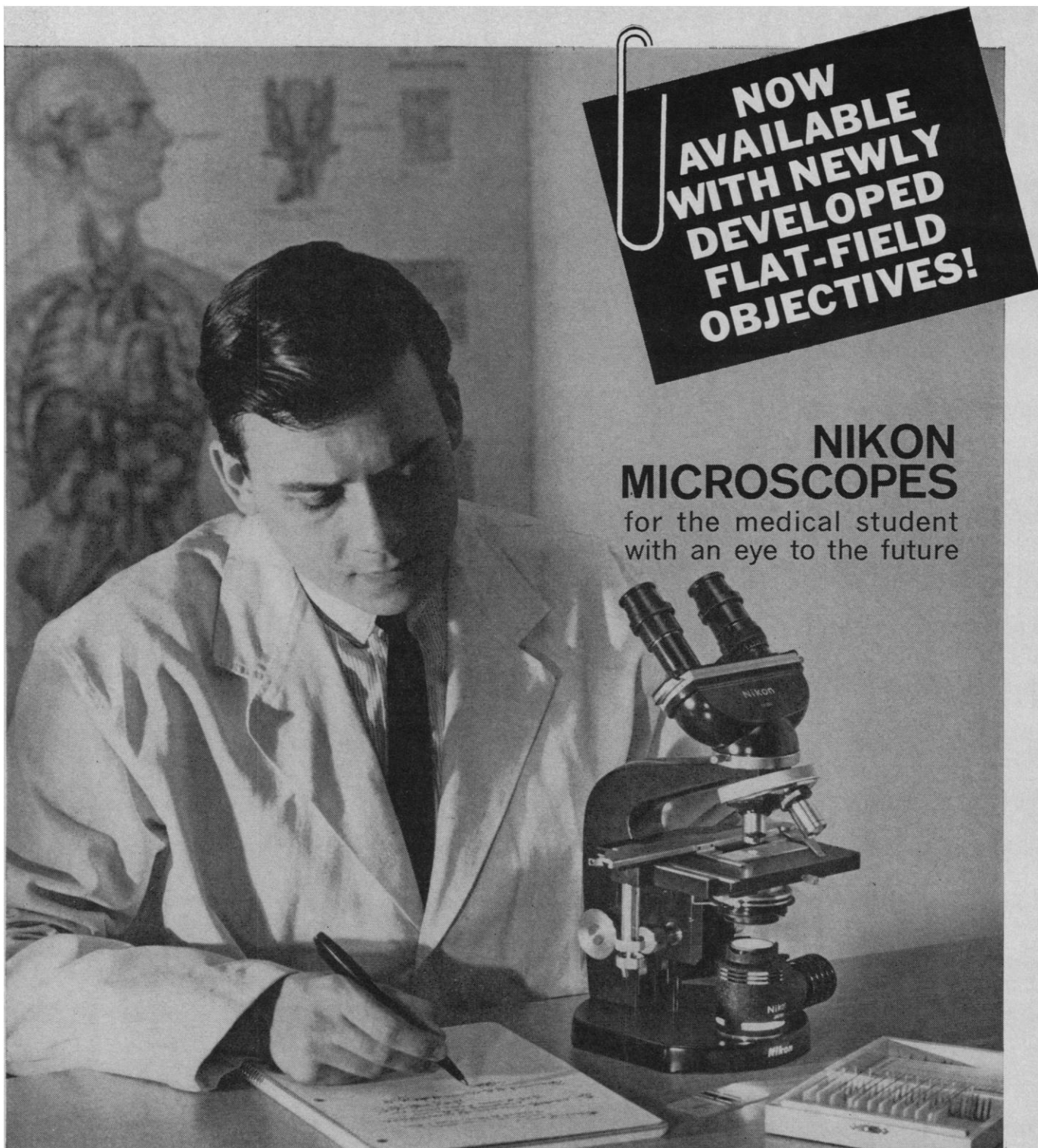
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## COVER

Cross section of a coal mine in South China in the 17th century. Because of the danger of gases, the miners were attached to winches by a safety line, and attempts were made to pipe out the gas with bamboo shafts. The drawing, slightly modified, is interesting as an early cutaway diagram, but the pipe and winch shown are probably based on hearsay rather than observation. See review of *T'ien-Kung K'ai-Wu. Chinese Technology in the Seventeenth Century*, page 730. [Pennsylvania State University Press]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



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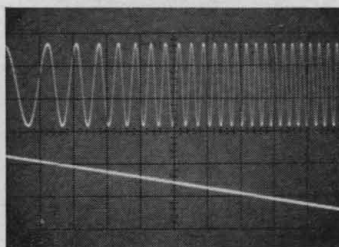
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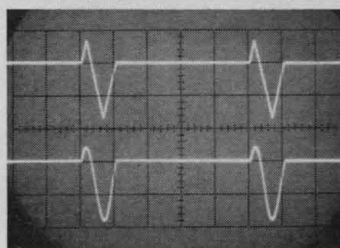
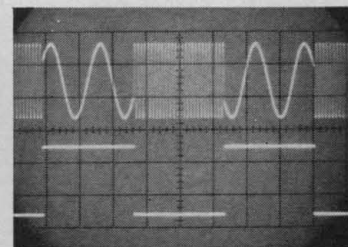
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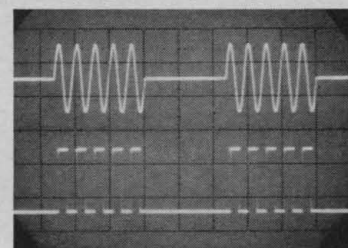
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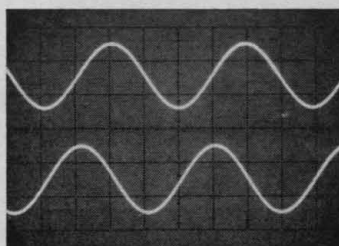
Voltage programming; frequency upper trace, programming voltage below.



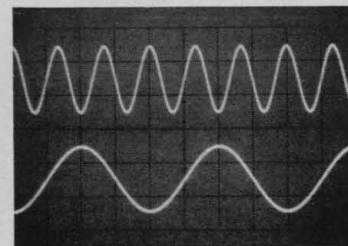
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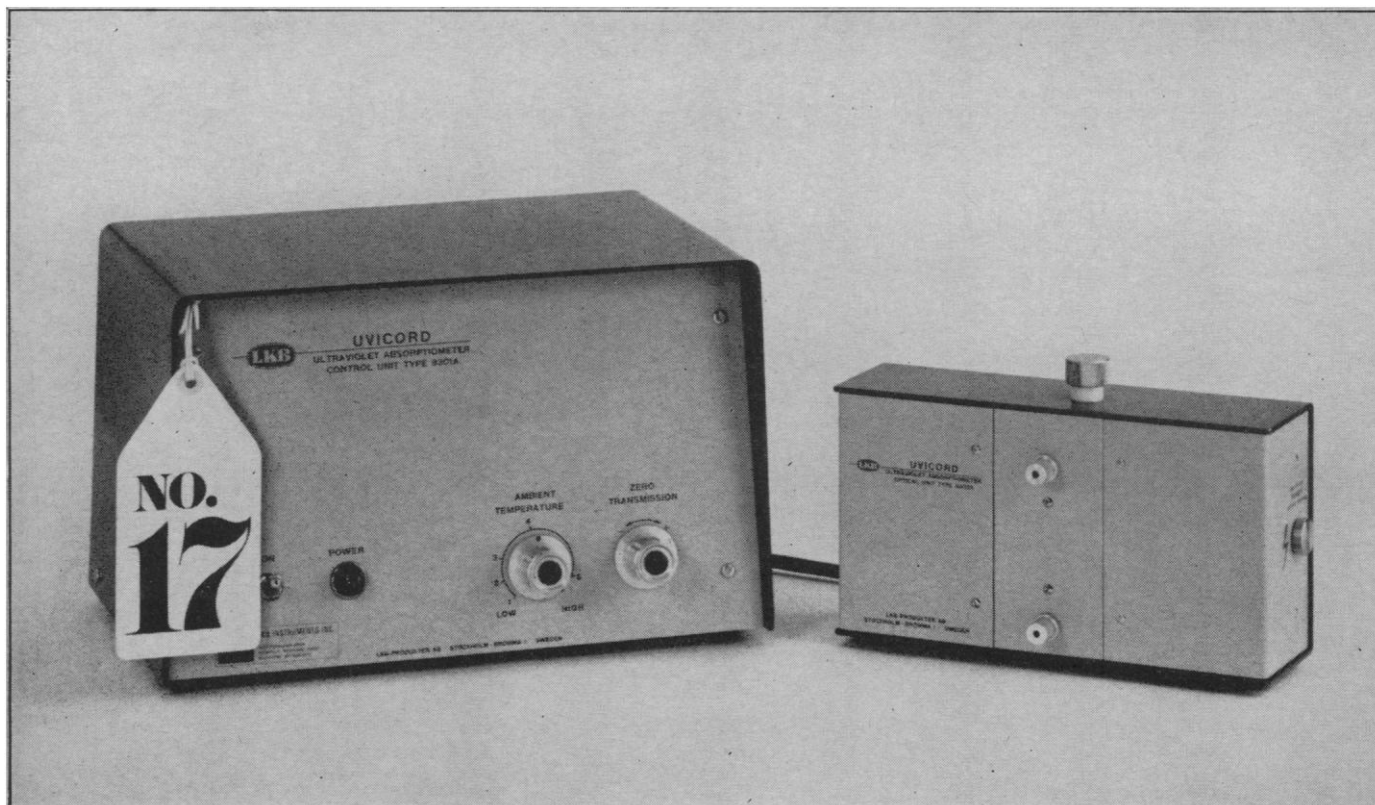
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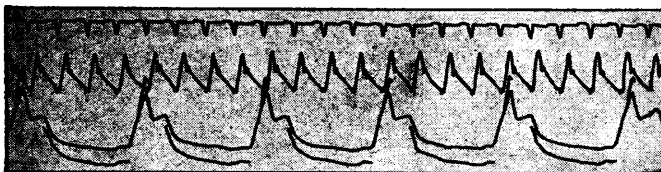
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Using the best of both analog and digital techniques, the AMBILOG™ 200 Stored Program Signal Processor is designed from the ground up to handle the "floods of data" generated in test and research programs. Although such programs cover many fields — biomedical monitoring, geophysical research, test stand instrumentation, automatic weapons checkout, speech analysis — all require complex *signal processing*: multiple input acquisition and output distribution, monitoring, editing, arithmetic, analysis, recording and display. Because of its high processing speed and extensive input/output for both analog *and* digital data, AMBILOG 200 is ideally suited for such tasks. Here are some examples.



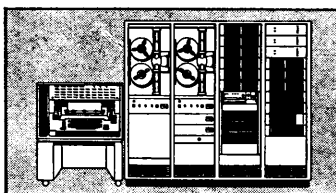
## Real Time Waveform Measurement

Peak values, axis crossings, ratios of successive differences, and other characteristics of analog signals are measured in real time. Incoming signals are monitored for events of interest, using complex programmed detection criteria. In a typical biomedical application, the result is a 100-to-1 reduction in the bulk of magnetic tape output records.

$$A(n,w) = \int_0^T W(t)F(n,t) \cos(wt)dt$$
$$B(n,w) = \int_0^T W(t)F(n,t) \sin(wt)dt$$

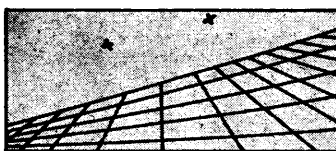
## Spectrum Analysis

Parallel hybrid multiplication and summing, 2 microsecond 30-bit digital storage, and a flexible instruction format providing efficient list processing combine to make the AMBILOG 200 powerful in statistical signal analysis techniques such as Fourier transformation, auto and cross correlation, power spectrum density analysis, and generation of histograms of amplitude spectra.



## Digitizing and Recording

Multiple inputs, from up to several hundred sources, are routed through a multiplexer switch array under stored program control. At no penalty in sampling rates over conventional systems, the AMBILOG 200 converts incoming data to engineering units for recording or monitoring. An analog-to-digital converter performs a complete 15-bit conversion in 4 microseconds for digital storage, recording or outputting.



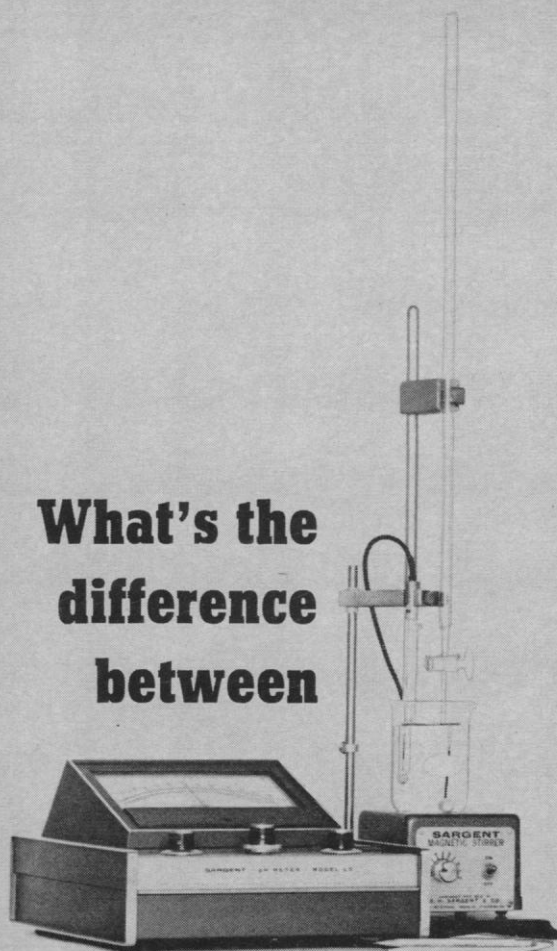
## Display Generation

Multiple analog outputs facilitate close man-machine relationships in systems involving visual displays. Points of an image stored in memory are rotated through three space angles and projected on a CRT at a 50 Kc rate. Co-ordinate transformation is accomplished simultaneously with digital-to-analog conversion.

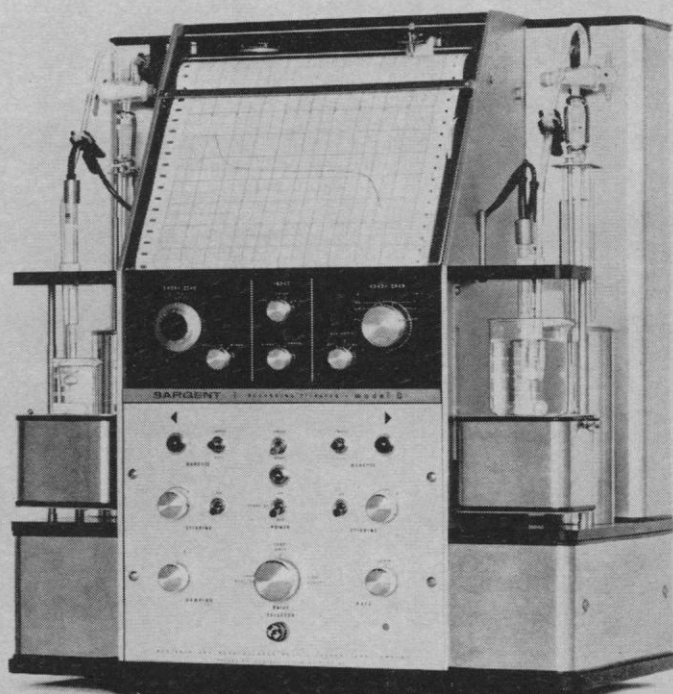
For technical reports describing in detail these and similar AMBILOG 200 applications, write I. R. Schwartz, Vice President.

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**First**, our Model D Dual Recording Titrator produces a permanent chart record of the fundamental potentiometric titration curve (or its first derivative). Accuracy is 0.25%. You can read the chart to within 0.002 ml and 0.01 pH units.

**Next**, the Model D's front panel gives you control of chart span, titrant delivery rate, stirring speed, and burette fast-flush-and-fill. There's also a setting for automatic deceleration of the titration rate as the endpoint is approached.

**Further**, there are two independent titrating stations. Both accommodate any electrode. The swing-away beaker-support encloses the magnetic stirrer. Interchangeable 50-ml and 10-ml motorized burettes are synchronized with the chart drive.

**Finally**, a big difference is the price. The Model D costs \$2850 (without electrodes). Worth it? It is whenever your titrations are time-consuming, or are of widely varying types, or require a high degree of accuracy. That's when you need the Model D.

**The Model D** Dual Recording Titrator, designed and manufactured by E. H. Sargent & Co., employs premium-quality, conservatively-rated components. The instrument is thoroughly tested to give stable, long-term performance over a broad range of operating conditions.

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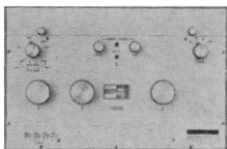
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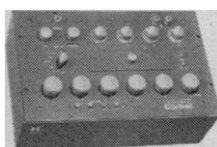
**Model 2784 Laboratory Potentiometer.** This new extended range instrument is twice as accurate as any potentiometer in its



price class; costs half as much as any potentiometer in its accuracy class. Calibrated accuracy — 0.002% at the one volt range. Range — 0 to 11.110 volts, with 5 ppm resolution. Features include multiple guarding, a non-convoluted slide wire, and complete self-checking.

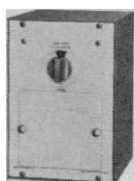
**Model 2783 High-Precision Guarded Laboratory Potentiometer.**

Used for checking and calibration of other potentiometers and accurate measurement or comparison of standard cells, this 6-dial instrument



can provide a limit of error of  $\pm 0.0003\%$  of reading when corrected in accordance with the optional Honeywell Certificate of Calibration.

**Models 2855 and 2856 Voltage Dividers.** Primarily for use with the Model 2784 Potentiometer, the 2855

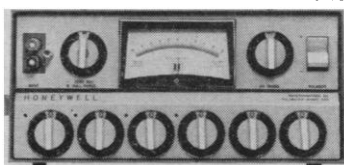


extends the 2784's range to a maximum of 1111.0 volts. Six multipliers (2, 5, 10, 20, 50, 100) are provided. The Model 2856 Voltage

Divider employs seven multipliers (2, 5, 10, 20, 50, 100, 200) to extend the 2784's range to 2222.0 volts. Both instruments have a maximum current drain of 1.11 milliamp.

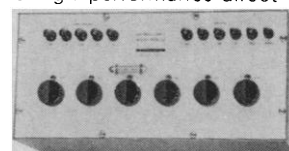
**Model 852 Guarded Potentiometric Voltmeter.**

Completely solid state throughout, the 852 is a high-precision DC measurement device for 0 to 1111.1 volts, with infinite impedance throughout the entire range. All six dials of the K-V divider are overrang-



ing, and long-term limit of error is  $\pm 0.01\%$  of reading for at least one year.

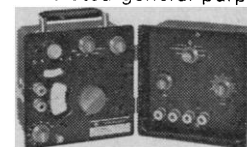
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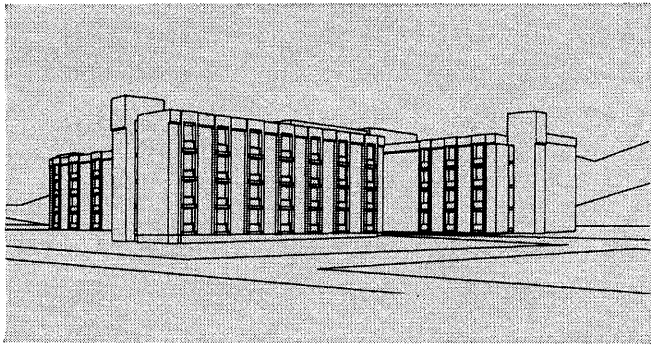
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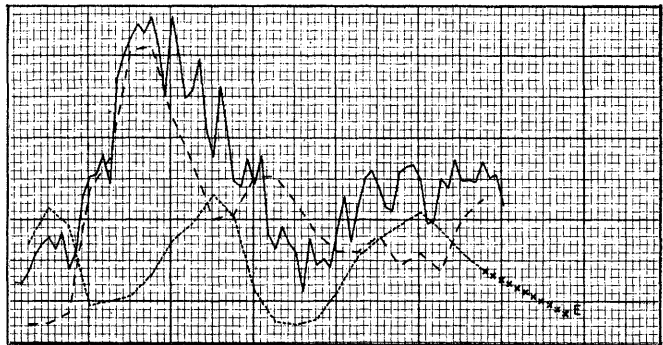
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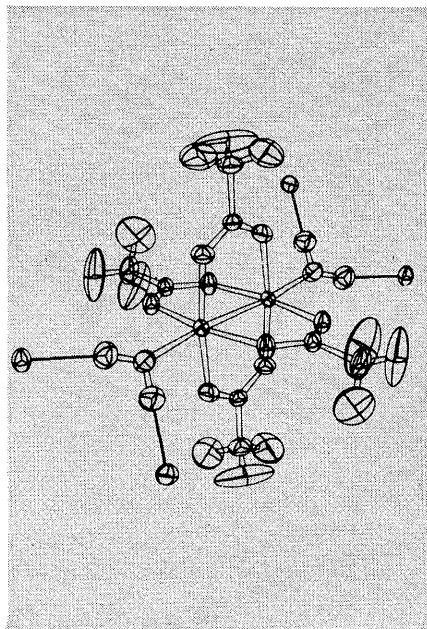
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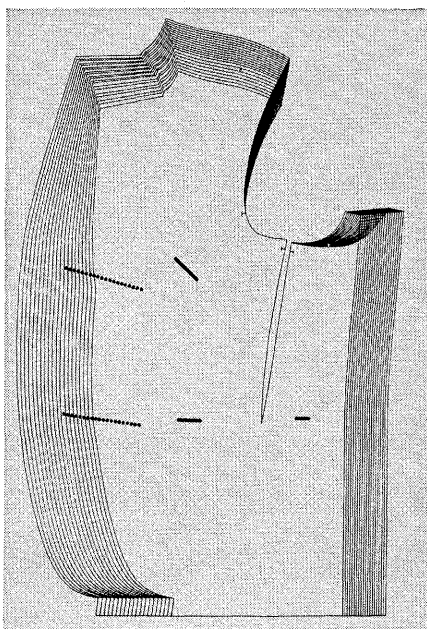
*a perspective sketch of your new plant*



*statistical trend charts*



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*apparel patterns, graded for sizes*



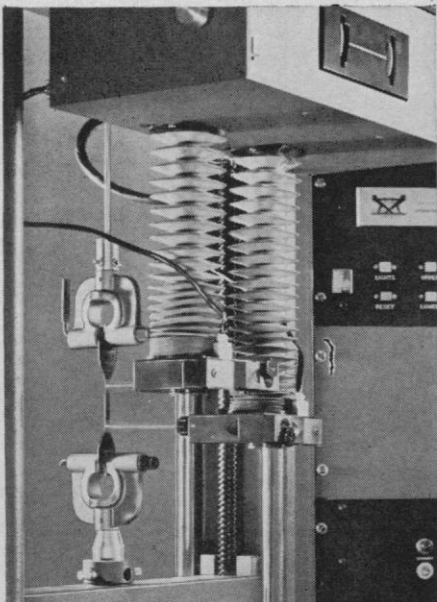
*and even the Mona Lisa*

# it can

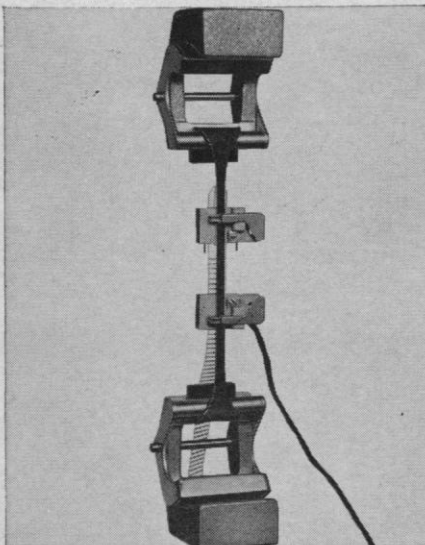
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**Counterbalanced:** Allows taking sample to break without disrupting test routine. ►

Instron has extended its line of extensometers. Used in conjunction with Instron's table or floor model testing instruments, the units offer easier, more convenient operation during set up and while accumulating test data. They provide a choice of techniques for measuring strain in a wide variety of elastomeric materials. Provisions for taking the sample to break without damage to the units or test arrangement have been included.

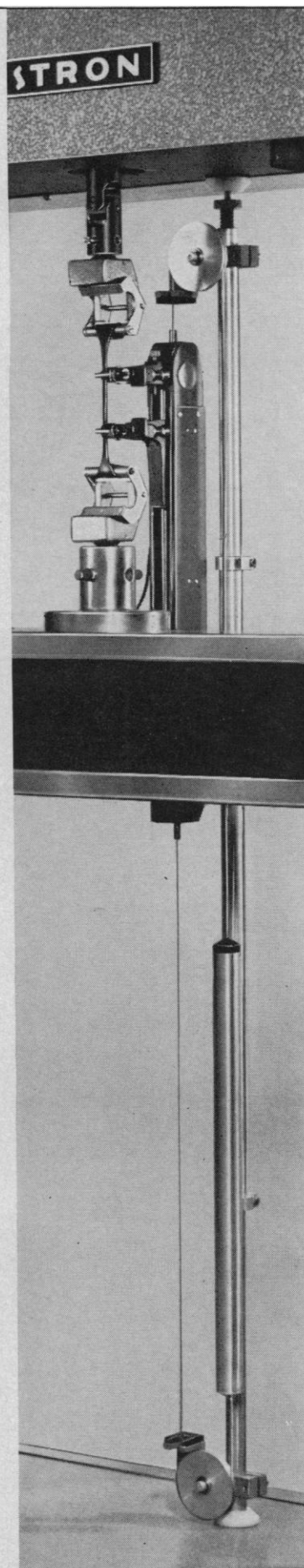
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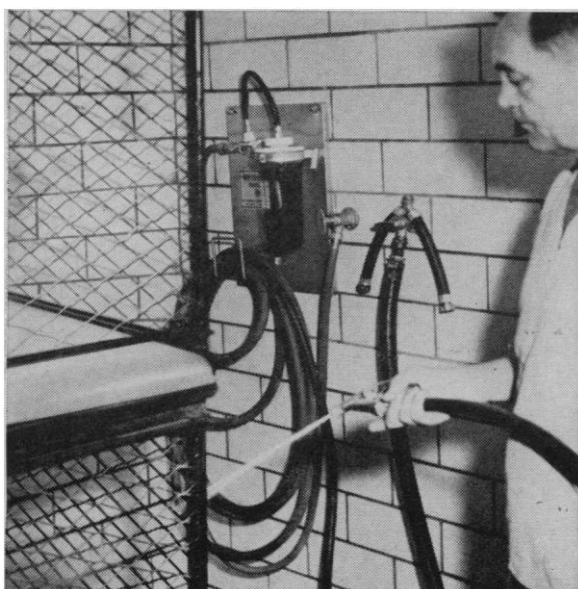
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Use of the MIKRO-SPRAY system, of course, is not limited to just in-place cage cleaning. It is equally effective in disinfecting and deodorizing cage racks, walls and floors of the cage room and for general clean-up duties in the incinerator and waste disposal room. Send coupon today for new manual on environmental sanitation, including complete details on application of MIKRO-SPRAY system.

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- External color-coded controls offer easy camera operation
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Fast camera operation is yours with easy to read, easy to adjust controls on an external panel. Color coding of controls indicates best settings for normal applications; lets you get the right picture the first time. Even photos of single-shot events are easy to take. The ultraviolet light for illuminating the hp internal graticule can be automatically flashed to provide graticule lighting simultaneously with the trace, eliminating the need for double exposures.

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Interchangeability of the standard Polaroid® camera back with an optional 4"x5" Graflok® back provides in-

creased versatility. A continuously adjustable reduction ratio lets you utilize the entire film area. The camera can be focused quickly with an external control and a split-image focusing plate which is provided. For multiple exposures the backs are rotatable and can be moved vertically through eleven detented positions. The entire camera swings away from its mounting when not in use.

Brief additional specifications here indicate the usefulness of this, today's most advanced scope camera. Further information is available with a call to your Hewlett-Packard field engineer or by writing Hewlett-Packard, Palo Alto, California 94304, Tel. (415) 326-7000; Europe: 54 Route des Acacias, Geneva.

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### SPECIFICATIONS

**Reduction ratio:** continuously adjustable, 1:1 to 1:0.7, simple screwdriver adjustment

**Lens:** Wollensak 75 mm, f/1.9, standard; aperture ranges f/1.9-f/16. Oscillo-Raptar 88 mm f/1.4 optional at extra cost

**Shutter:** electronically operated and timed; available speeds: Time, Bulb, 4, 2, 1, 1/2, 1/4, 1/8, 1/15, 1/30 sec.; input jack for remote operation; sync contact closure for triggering external equipment

**Viewing:** direct-viewing hood with flexible face mask; hood is removable and can be replaced with a panel to facilitate stacking on 7" rack-mounted scopes

**Camera backs:** Polaroid® Land Pack Film Back, interchangeable with optional 4 x 5 Graflok® back; backs can be rotated in 90° increments

**Multiple exposure:** back moves vertically through 11 detented positions

**Mounting:** direct on all Hewlett-Packard scopes, adapters available for other models; camera swings away to left

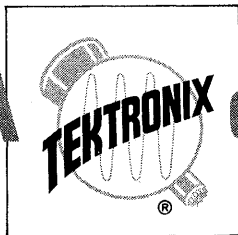
**Price:** 197A Oscilloscope Camera, \$475; Option 01 (without UV light), \$425

*Prices f.o.b. factory.*

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To measure stimulus and reaction  
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To measure transducer outputs,  
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To measure plots of X-Y curve-  
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**Features** • 2 identical vertical amplifiers • 17 calibrated steps of sensitivity • 21 calibrated sweep rates • 4 steps of sweep magnification • Continuously adjustable sweep and sensitivity controls • Push-button beam finders • Intensity-balance control.

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Passbands from dc-to-50 kHz, minimum, to dc-to-1 MHz maximum • Calibrated Vertical Sensitivity in 17 steps from 100  $\mu$ V/cm to 20 V/cm, both amplifiers • Calibrated Sweep Range in 21 rates from 1  $\mu$ sec/cm to 5 sec/cm • Common-Mode Rejection—Up to 40,000 to 1 • Phase Difference—Less than 5 degrees, at -3 db • Variable, Uncalibrated, Sensitivity and Sweep Range Controls • 2X, 5X, 10X, or 20X Sweep Magnification • Flexible Trigger Facilities • Amplitude Calibrator • Electronically-Regulated Power Supplies.

Type 502A Dual-Beam Oscilloscope . . . . . \$1050  
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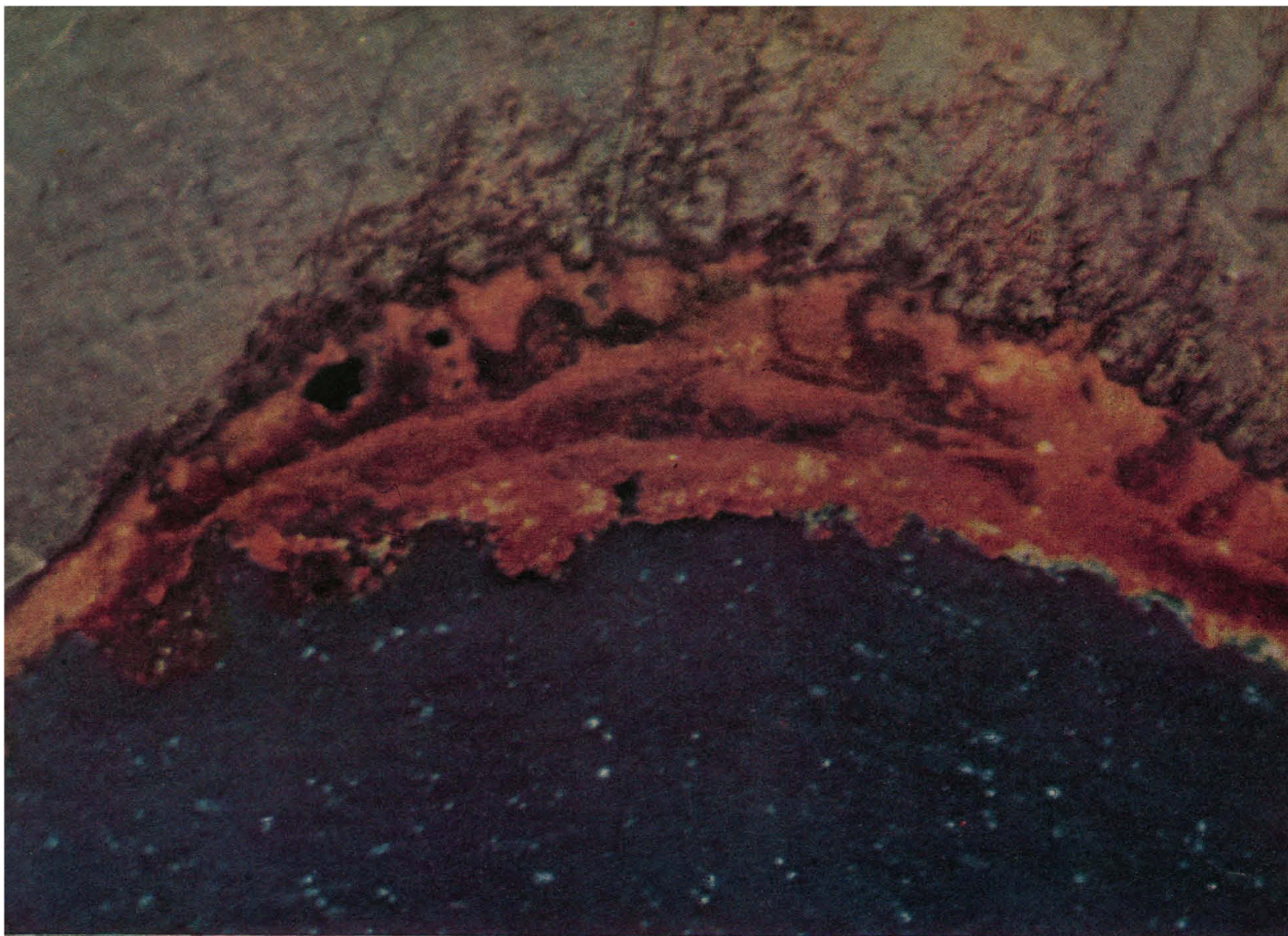
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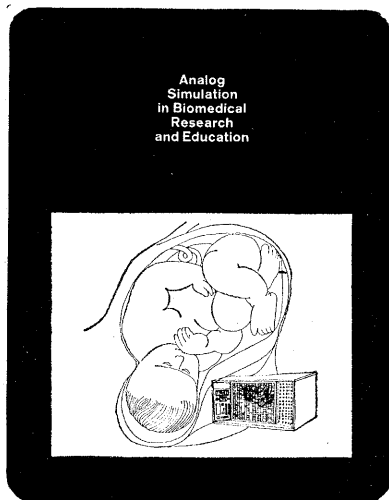


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other hand, is a pragmatic technique, used in experimental fashion as a last resort when the system under study cannot be satisfactorily analyzed by more rigorous mathematical approaches. Evidence of the difference between mathematical theory and computer simulation is found in titles of publications dealing with simulation; for example, *The Art of Simulation* (K. D. Tocher, English Universities Press, Ltd., London, 1963) and "Some tactical problems in digital simulation" (R. W. Conway, *Management Science* 10, October 1963). Simulation is about as much kin to information theory as is rat-maze experimentation to neural network theory.

It is certainly true that "there is no magic in mathematical languages." It is not clear just how the failure of information theory as a productive field verifies this conclusion, nor how it bears on other areas such as computer simulation.

JON C. LIEBMAN

Department of Environmental  
Engineering Science, Johns Hopkins  
University, Baltimore, Maryland 21218

Bross is distressed over the failure of information theory to show practical results in an 18-year period. Perhaps, as he suggests, many modern mathematicians cannot resist the temptation to flights of fancy, particularly since there may be no practicalities to restrain them. On the other hand, mathematics is a most extraordinary aspect of the physical world. How can it be otherwise, when such useful manipulations as addition, subtraction, multiplication, and division have no counterparts in the physical world? Addition and multiplication might be represented in the physical world by moving objects, atoms, or particles, closer together; subtraction and division might be represented by moving these same objects further apart. Yet even without a basis in reality, who can deny that these four basic manipulations of mathematics have extraordinary practical value?

JOHN T. FLYNN

Beekman-Downtown Hospital,  
170 William Street, New York 10038

Since 1945 countless graduate students in mathematics have wasted time on simulation, game theory, war games, and information theory. The appeal was subtlety of the notation. The possibility that some computer application

would pull out a rabbit caused many to string along beyond the point where it should have been said: enough. Bross was right in inferring that not a single scientific discovery or achievement can be traced to these pseudosciences. If someone can point to a scientific discovery attributable to game theory or information theory, perhaps this journal is the place where it should be cited.

DAVID R. JENKINS

Montefiore Hospital and Medical  
Center, Bronx, New York 10467

... The allegation of Bross that information theory has been "almost entirely sterile and useless" demands that the product of science shall be immediately used in major technological advances. This is certainly based on a misconception of the roles of science and technology as well as the history of their interaction. By these rules, Darwin's evolution and Einstein's general relativity must be abandoned. Electromagnetic theory, nuclear physics, and quantum theory are certainly suspect since many years of development of their concepts were required before they became the basis of a practical technology. It is the function of science to supply the knowledge which illuminates and defines an area of human interest. Technology combines knowledge with the available means of implementation to accomplish useful ends when needed.

Even by the rules of technological usefulness, information theory has had a sturdy youth. It is now possible to determine the capacity of information systems, to predict the rate of error that will be created under specific transmission conditions, to compare theoretically the effectiveness for given applications of systems using different methods or coding. Methods of detecting and correcting many kinds of errors are well known although not yet widely practiced. The methods of trading off bandwidth and power are known and extensively practiced. Perhaps most importantly, the knowledge of the ultimate limits of channel capacity has prevented much work on impossible communication concepts. In all these ways, information theory is an invaluable tool for the communication system engineer.

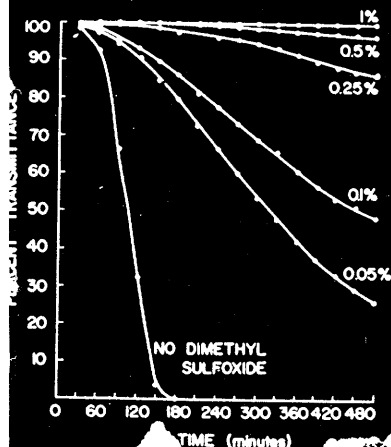
Bross's statement that Gilbert was "unable to cite a single tangible, scientific achievement that has resulted from information theory" is both irrelevant

# Why are so many analytical chemists switching to MC&B?

## Information in Dimethoxypropane-Induced Dimethyl Sulfoxide

**Reagents.** 2,2-Dimethoxypropane obtained from Eastman Organic Chemicals and redistilled from 78° to 30° C.

Methanolic HCl was prepared every two days by bubbling dry HCl into methanol until the concentration was 10% by weight. Methanol was spec-



troquality from Matheson Coleman & Bell Chemical Co.

Other chemicals were reagent grade. **Procedure.** Appropriate amounts of dimethyl sulfoxide were added to each of five tubes containing 0.5 ml. of DMP, and the volume in each tube was adjusted to 5 ml. with 10% methanolic HCl to give the following dimethyl sulfoxide concentrations: 1%, 0.5%, 0.25%, 0.1%, and 0.05%. A sixth tube contained 0.5 ml. of DMP and 4.5 ml. of 10% methanolic HCl but no dimethyl sulfoxide. Colorimetric readings were taken every 15 minutes over an eight-hour period at a wavelength of 525 mμ.

Two special mixtures were also prepared for gas chromatography: one from anthracene and naphthalene by the method of Fieser (9) and was purified by recrystallization and zone refining. Naphthalene (Matheson Coleman & Bell No. 9082) was used without further purification. All solvents used were spectroquality grade.

**Procedure.** Standard solutions of anthracene and naphthalene in isooctyl alcohol were mixed in proportions to prepare 39 solutions, each containing 0.50 mg. per ml. of anthracene, and with naphthalene content ranging from 0.6 to 4360 μg. of the anthracene content. These standard mixtures, in 4-ml. portions, were diluted with 125 ml. of distilled water to give clear solutions. Portions of the standard mixtures were used for the above measurements.

### Experimental<sup>10</sup>

**Compounds.**—Redistilled *p*-cresol (Matheson Coleman and Bell) was recrystallized from petroleum ether (b.p. 30–60°). Triethanolamine (Matheson Coleman and Bell) was converted to the hydrochloride, which was recrystallized from an ethanol-ethyl acetate mixture. *p*-Tyramine hydrochloride (Distillation products) was recrystallized from an ethanol-ethyl acetate mixture. Hordenine sulfate (Biochem. Pharm.) and DL-metanephine hydrochloride were obtained from Biochem. Pharm.

Laboratory

and cells were used previously (1, 8, 9). Triethanolamine (Matheson Coleman and Bell, commercial grade) was redistilled at 10 mm., and the fraction boiling at 185–7° C. was collected. The concentration was determined by pH titration. All other chemicals were reagent grade, and were used without further purification.

**PHENYL ISOCYANATE**, reagent grade, boiling point 60° to 62° C./2 mm. (10.55 grams) of phenyl isocyanate was dissolved in 50 ml. of dry toluene, diluted with additional toluene, and stored in the volumetric flask. If any crystalline precipitate formed the reagent is discarded.

**ALCOHOLS** used as standards were reagent grade chemicals.

**CATALYST.** Add 0.404 gram of catalyst T-9 from Matheson Coleman & Bell to 50 ml. of dry toluene and dry under reduced pressure.

**Solvents.** The benzene solution using Matheson Coleman and Bell Spectroquality *p*-dimethylaminobenzaldehyde, and in dilute mixtures using the above mentioned reagents.

**Apparatus.** The detection indices,  $n_D$ , of the above mixtures was determined at 20 to 60-mesh, reagent grade calcium oxalate monohydrate obtained from Matheson Coleman & Bell Co. The temperature chosen was the 50% weight loss point for the oxalate to carbonate decomposition. The confidence limits for the mean temperature based on 6 measurements at the 50% weight loss point was found to be less than 0.1° C.

## We asked them. Here are some of the answers.

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and incorrect. The statement is irrelevant because Gilbert's conclusion "portrayed that aspect of modern information theory which relates to explicit coding systems intended to signal at high rates." It did not deal with the general applications of the theory. Although that very difficult problem has not been solved in a broad and general sense, nevertheless Bross's statement is incorrect because Gilbert's paper cites many significant steps toward the solution of the problem.

These steps include many excellent special solutions which have not found wide technological use because of economic limitations. These are tangible achievements. The economic limitation in technology is being reduced rapidly by the decreasing cost of devices for coding and decoding. Would Bross suggest that we abandon thermodynamics because most heat engines do not reach ideal efficiency?

EVERETT B. HALES

2121 Thunderbird Trail,  
Maitland, Florida 32751

Excluding information theory, I have always had the impression that simulation and fields mentioned by Bross under the name of "mathematically oriented new sciences," are not "sciences" at all, in the full meaning of this word. These may be new tools in technological sciences, perhaps mathematical physics and the sociological sciences, constructed primarily for engineers, applied mathematicians, and theoretical sociologists (if the name is proper) to enable them to cope with more complicated problems.

M. Z. V. KRZYWOBLOCKI

College of Engineering, Michigan  
State University, East Lansing 48823

### Experimentation on Humans

Your debate on the ethics of human experimentation (Letters, 13 May) reminded me of my undergraduate experience in 1927 when I served as a human guinea pig for a Nobel laureate, Professor A. V. Hill. Hill was always eager to explain his theories concerning oxygen consumption by the human being while working under stress. At the time he was testing the candidates for crew, he even apologized for not using his oxygen measuring device on himself under the stress of rowing. He found it impracticable, he said, since he had great difficulty handling both the stick

and the sliding seat of a rowing machine.

Because I broke his record for the consumption of oxygen per unit of time while under stress of severe exercise, Hill paid me a great deal of attention. Later, when a track man surpassed my record, Hill was very eager for me to run with his device in an attempt to regain the "world's record for oxygen consumption," as he called it. Since running is a faster motion than rowing, he hoped that I would show greater oxygen intake. My coach was reluctant to give his permission as the rowing season was upon us and he feared running would make me lame. Although "jolly well disappointed," Hill would not consider testing me while the exercise stress was running. Throughout, Hill considered the convenience and welfare of his guinea pigs; the convenience of the experimenter came second.

Owing to my experience with Hill, I am strongly in favor of human experimentation, especially when the subject is also the experimenter. As a research scientist in biology, I have not hesitated to experiment on myself. Two years ago, when I developed symptoms of coronary disease I tested an essential trace element combined with a vitamin that had "no established minimum daily dosage." The results exceeded my fondest hopes, and numerous symptoms, including one that had been conspicuous for 40 years, disappeared.

PAUL D. HARWOOD

Ashland, Ohio

### A Protest of Innocence

In his article, "Speaking of space" (13 May, p. 875), David McNeill gives credit (or blame) where it is not due when he imputes certain contributions to "space speak" to newsmen.

"... some of the most popular specimens . . . [were] invented by newsmen . . . among these are A-OK, blast off, and spin off," McNeill says.

To my personal knowledge, "A-OK" was invented not by newsmen but by an imaginative public relations man named John A. Powers, who as "Voice of Mercury" of the flight of Alan B. Shepard in May 1961 attributed the phrase to the astronaut. Later it developed that Shepard had not said "A-OK," but by that time the phrase was a part of the English language, having been *adopted*, not *invented*, by newsmen.

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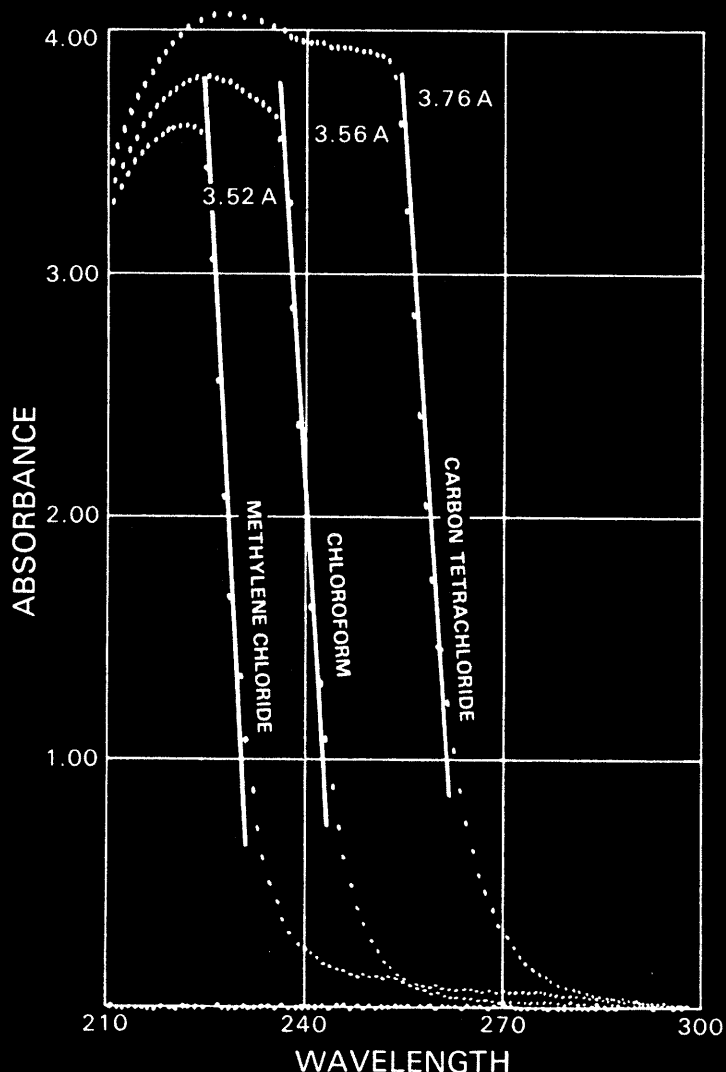
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I believe further research will show that *spin off* was invented not by newsmen but by NASA officials wishing to avoid the unpleasant connotations of the word *fallout*.

*Blast off* seems to have been carried over into science (fact) writing from science (fiction) writing, rather than having been invented *de novo* by newsmen. Whether *blast off* is "spurious," as McNeill suggests, is a matter of opinion; it is as precise in meaning as the engineer-approved word *liftoff* and a good deal more descriptive.

WILLIAM HINES

Washington Star,  
Washington, D.C. 20003

### Cowardly Patient

I wish to thank Preston J. Burnham for his proposed informed-consent form (Letters, 22 April). It is indeed heartwarming to learn that at least one member of the medical profession is capable of complete honesty and candor.

The matter is of personal interest to me because my doctor has insisted that I undergo the hernia operation Burnham outlined so eloquently. As explained to me, the prospect is not completely unthinkable, although terms like *incision*, *suture*, and others are obviously only synonyms for *hack*, *saw*, and *chop*. He has even been so devotious as to recommend a surgeon who has many (perhaps thousands of) successful operations to his credit, at the same time avoiding mention of the untold numbers who must surely have succumbed to the "possible complications" Burnham listed.

The latter must be aware though, that his proposed form will meet with some resistance from the more reactionary elements of the medical fraternity. When I showed it to one of my neighbors (who is said to be a competent surgeon but whom I know to be a lousy golfer), he broke up in uproarious laughter. Obviously, this sort of person will obstruct general acceptance of the proposal.

I am confident that if devout cowards like myself would sign the consent form seriously, we could not only halt medical progress but perhaps even set it back significantly.

R. L. ADDINALL

Research and Development Department,  
Steel Company of Canada,  
Hamilton, Ontario

### Information Exchange Group No. 5

Several information exchange groups (IEG) have been created by the National Institutes of Health as a means of facilitating scientific communication in certain specialized fields. In essence, each provides a selected list of participants with preprints of articles as well as with recent comments or memoranda written by members. Information disseminated in this manner may be cited in formal bibliographies as a "personal communication" but not treated as published work.

At the annual meeting of the American Association of Immunologists in Atlantic City in April, there was considerable discussion of the merits of IEG No. 5, Immunopathology. Though it was agreed that the IEG represented an important experiment in the area of rapid and effective dissemination of the results of scientific research, a number of disadvantages were noted:

1) IEG communications are sent only to a limited number of members of the scientific community. The implied selection, which might be permissible for the private dissemination of preprints, was considered improper in an operation conducted by a governmental agency.

2) While the IEG clearly accelerates communication, it does not add to it, since the preprints are read by the same scientists who will later read the published articles.

3) While the preprints are not intended to serve as a substitute for formal publications, they do so in effect, since complete manuscripts are reproduced. The contention that they are "not published work" is meaningless since they are, to an increasing degree, quoted in formal bibliographies. Attempts by a single journal, such as the Journal of Immunology, to restrict such quotation are likely to be ineffectual. There was unanimous agreement that each memorandum should be clearly marked with the warning that it does not constitute a formal publication and may not be cited.

4) Since the preprints are complete publications, there is a real danger that they will reduce the usefulness of existing journals in the field of Immunology and may ultimately supersede them.

5) No refereeing process is provided for what is, in essence, a form of publication.

6) The IEG places undue emphasis on priority. It is thus abused by many



authors who prepublish most or all of their papers in this form, apparently solely for this purpose. A recent memorandum encouraging use of the IEG specifically to assure priority was very unfortunate.

7) When manuscripts already accepted for publication are preprinted by IEG, there is an infringement of copyright. In general, the IEG preprint violates the requirement of most journals that manuscripts submitted to them have not been submitted elsewhere.

8) One of the principal objects of the IEG has not been achieved, insofar as little or no free discussion has taken place in its pages, judging by IEG No. 5.

9) A publication program of the magnitude of the IEG requires the expenditure of large sums of money. At a time when funds available for research are limited, the diversion of considerable amounts for this purpose is difficult to justify.

As a result of the discussion, in which the above points were raised, a resolution was passed by a vote of 56 in favor to 39 against that IEG No. 5 publication should not be continued.

SHELDON DRAY

*American Association of  
Immunologists, 9650 Wisconsin Avenue,  
Bethesda, Maryland 20014*

## For a Cleaner Lake Tahoe

As the attempt to reduce water pollution in the vicinity of Lake Tahoe progresses, Abelson predicts that the use of fertilizers may be banned (Editorial, 20 May, p. 1015). If one were to take all the fertilizers used in the entire area and dump them directly into Lake Tahoe, it would not change the measurable concentration, provided that uniform distribution could be accomplished. Only 2000 tons of nitrogen are used in an entire year in the whole state of Nevada. Even this amount of nitrogen would scarcely change the concentration in Lake Tahoe sufficiently to measure by any means, including a biological one. Banning the use of fertilizers on garden plots seems very extreme, but organic pollutants feeding constantly into lakes and streams in increasing quantities are another matter.

WILLARD H. GARMAN

*National Plant Food Institute,  
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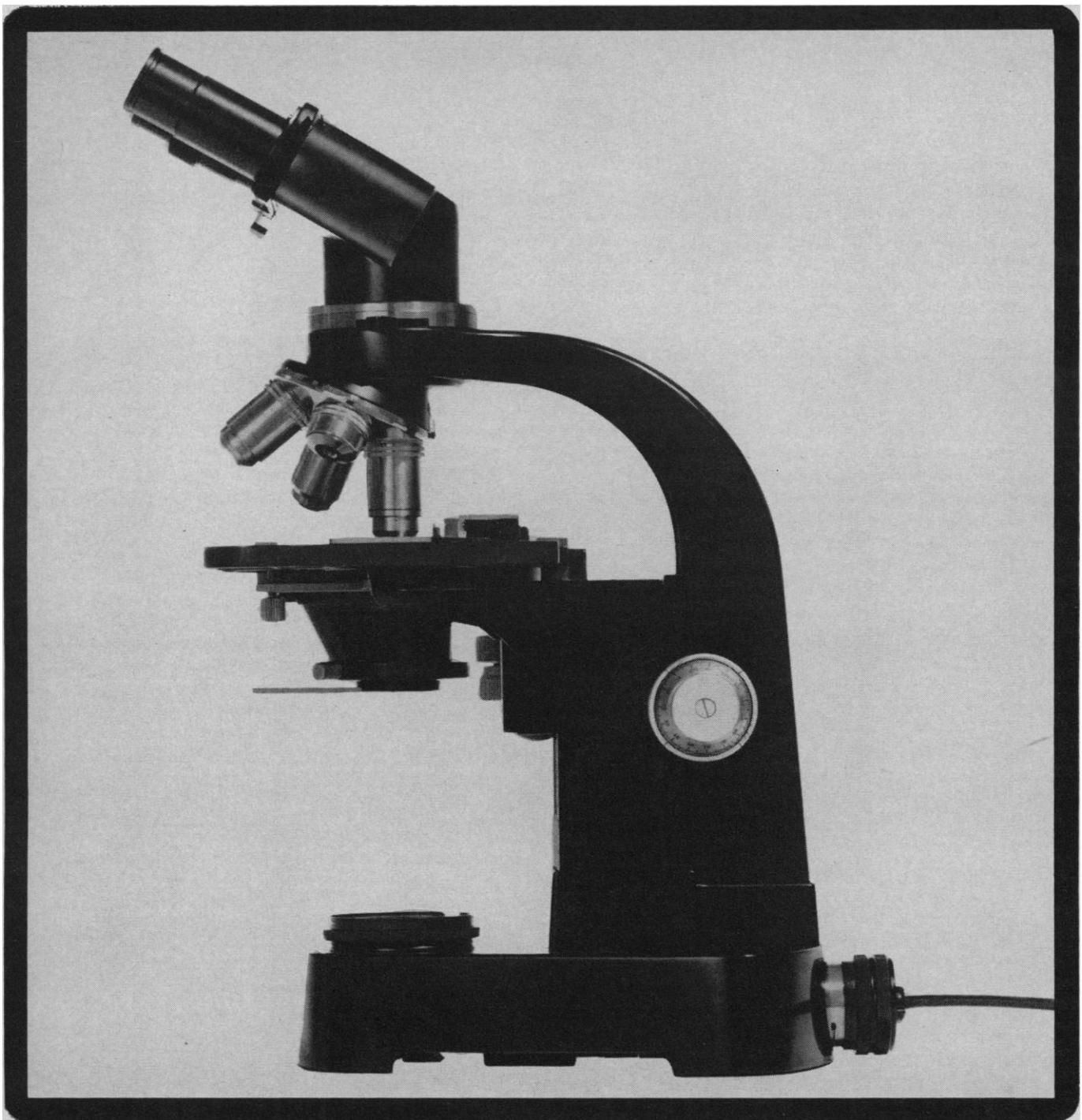
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**Help for Small Colleges**

Undernourished small colleges are often talent traps, dulling the interest of their most promising students with inadequate facilities and out-of-date teachers. The effect on potential scientists is important, but the effect on other students is of at least as great importance. The president of the Research Corporation recently expressed the foundation's conviction that "the liberal arts colleges represent the major promise in education for development of the leaders and responsible citizens who will be needed to cope with and to shape the world in the years ahead. It is our further conviction that science—for the non-scientist as well as for the researcher or teacher of science—is an essential element in this kind of education." If the facilities are inadequate and the faculty is inferior, the attitudes of all students are adversely affected and their understanding of science is stunted and warped.

Shortly after World War II, to help combat these shortcomings, the Research Corporation began to make grants to liberal arts colleges. The primary reason was to strengthen science in liberal arts colleges, but many recipients reported that the grants had a secondary effect of stimulating improvements in the colleges' other academic departments. The program has been effective; it was expanded some 10 years ago; and now the budget is being doubled.

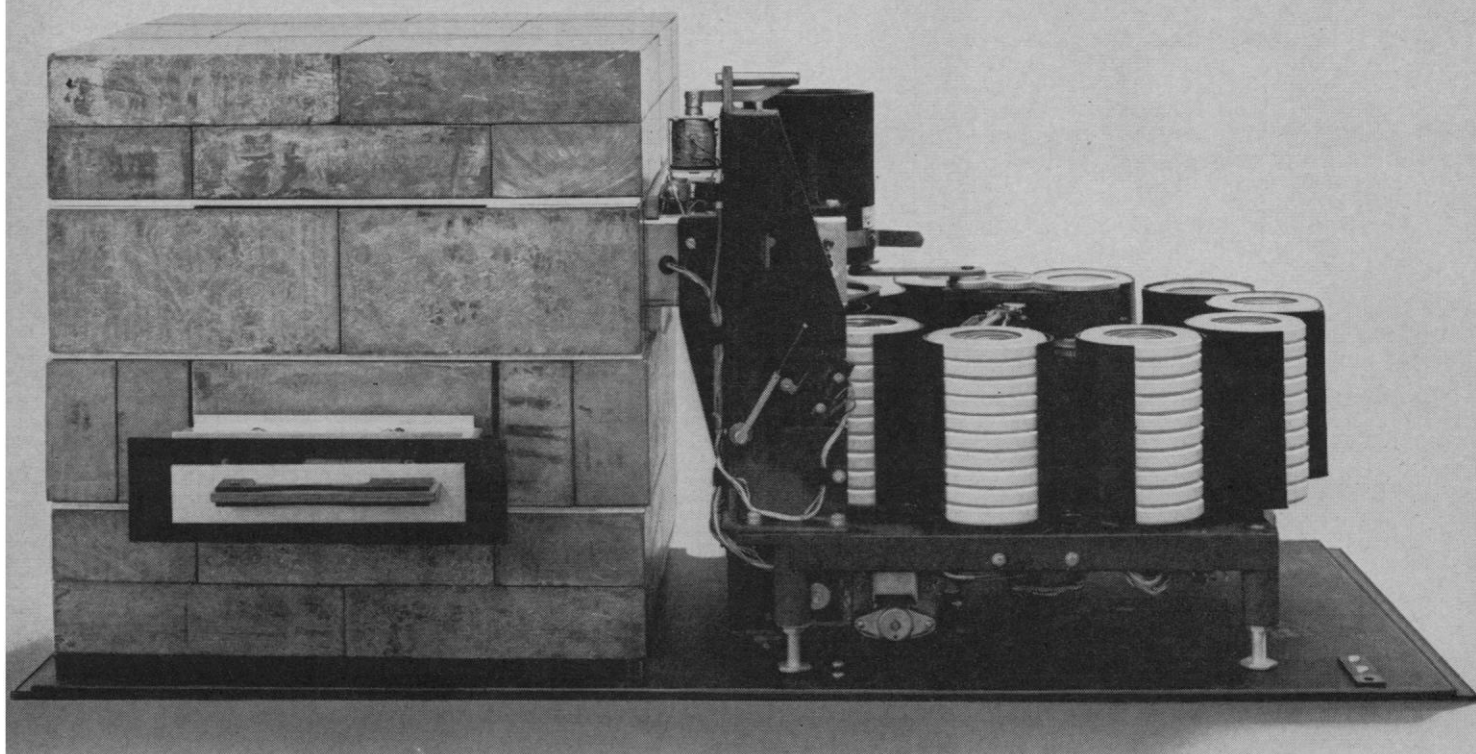
Some of the large grants of the Ford Foundation go to liberal arts colleges. The National Science Foundation, too, is seeking to help. The 1967 budget includes \$10 million for grants to aid science departments in liberal arts colleges and in small universities that grant few doctoral degrees. If Congress continues to provide the funds, NSF hopes to make grants to several hundred colleges during the coming years.

If the financial support promised by these, or other similar, programs is to be of maximum benefit, help is also needed from college administrators and from scientists. Several years ago Laurence Gould found that the administrators of some small colleges were uninterested in faculty research. Some were even hostile. Scientific societies can help overcome such difficulties by demonstrating their interest. The American Chemical Society makes research grants to chemists at small colleges. The Committee on Physics Faculties in Colleges, of the American Association of Physics Teachers, has conducted an illuminating study on the teaching of physics in colleges. One finding was that physics majors who received their bachelor's degrees at a university had a one-in-four chance of continuing to the doctorate. Those whose first degrees were from a college (except for a few of the prestigious ones) had only a one-in-twenty chance.

The widely held belief that a liberal arts college is the "best" place to get an undergraduate education has had hard sledding, at least in the sciences, against such evidence. Nevertheless, liberal arts colleges continue to be an important component of higher education. They can continue to be such, but now they can give a good liberal education only if science faculties and facilities are adequate. The new NSF program, Ford Foundation grants, and the increased emphasis of the Research Corporation will help, and will be of great significance if they stimulate other major efforts to improve liberal arts colleges.—DAEL WOLFLE



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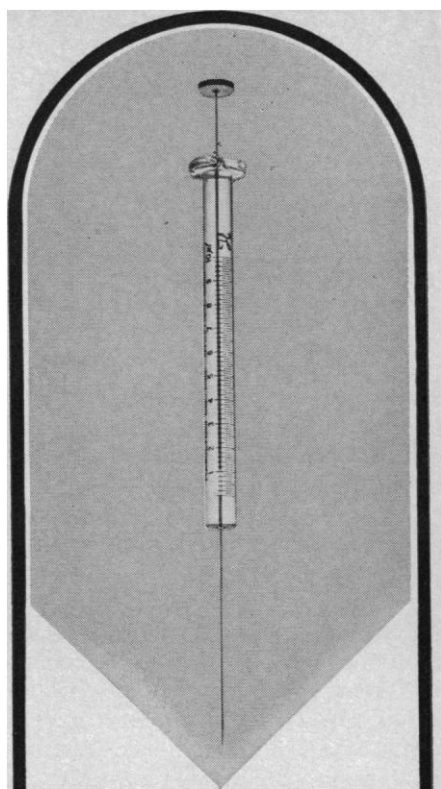
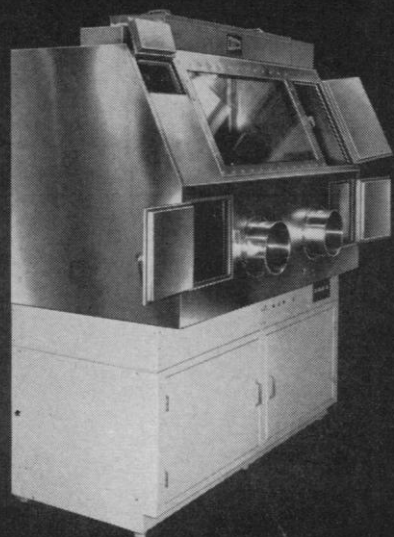
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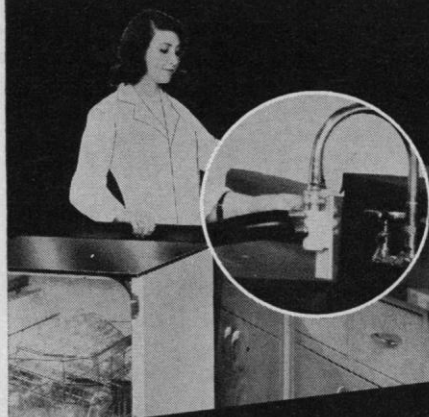
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date interpretations of the echolocating capacities of these animals.

The need for more communication among researchers in the field of marine bioacoustics was first expressed at a meeting held in March 1961, at the Lerner Marine Laboratory, Bimini, Bahamas. That meeting was held in connection with the then newly established acoustic-video system, installed at Bimini by the Institute of Marine Science, University of Miami [*Science* 134, 288 (1961)]. Accordingly a symposium was planned and organized by William N. Tavolga, John C. Steinberg, and Robert F. Mathewson. This first symposium on marine bioacoustics was held at Bimini, in April 1963; it was cosponsored by the Office of Naval Research and the American Museum of Natural History. After the publication of the proceedings of this symposium [*Marine Bioacoustics* (Pergamon Press, 1964)], it became clear that the field was advancing rapidly and a second symposium was in order. The U.S. Naval Training Device Center has been developing a project, in collaboration with the American Museum, of accumulating available data on marine animal sounds. Recognizing the need for bringing communication in this field up to date, the center, particularly its technical director of research, Hanns H. Wolff, proposed the convocation of this second symposium on marine bioacoustics.

The discussions following each paper at this symposium were quite extensive. Both the papers and the discussions are in the process of being assembled and edited for eventual publication.

WILLIAM N. TAVOLGA  
*Department of Animal Behavior,  
American Museum of Natural History,  
and Department of Biology,  
City College of the City University of  
New York*

## Forthcoming Events

### September

1-3. **Genetics Soc. of America**, Chicago, Ill. (R. P. Wagner, Dept. of Zoology, Univ. of Texas, Austin)

1-5. **International College of Angiology**, 8th annual mtg., Madrid, Spain. (H. E. Shaftel, 50 Broadway, New York, N.Y. 10004)

2-4. **Czechoslovak Soc. of Arts and Sciences in America**, 3rd congr., New York, N.Y. (R. Sturm, Skidmore College, Saratoga Springs, N.Y. 12866)

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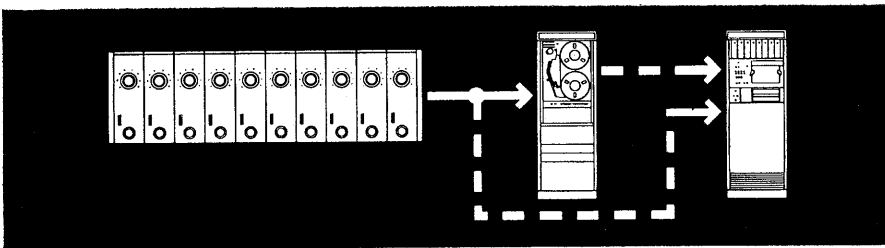
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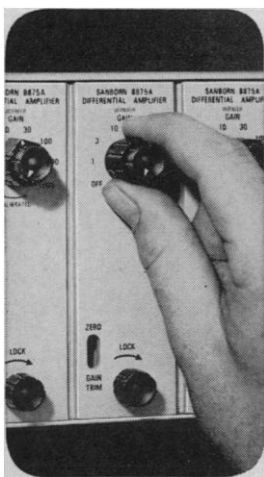
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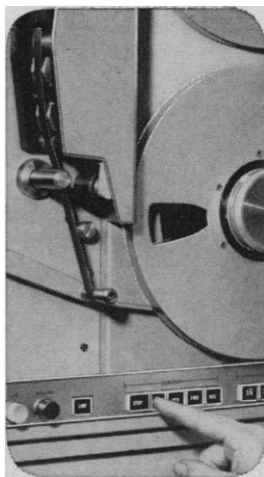


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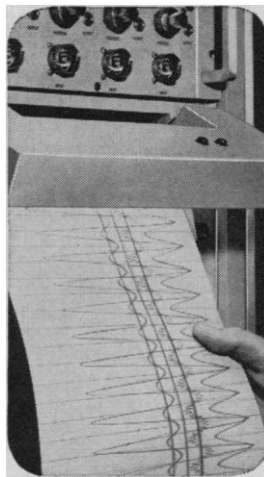
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2-6. American Psychological Assoc., 74th annual mtg., New York, N.Y. (A. H. Brayfield, 1200 17th St., NW, Washington, D.C. 20036)

2-6. Psychometric Soc., mtg., New York, N.Y. (W. G. Mollenkopf, Procter and Gamble Co., Box 599, Cincinnati, Ohio 45201)

3-5. International Soc. for the History of Pharmacy, 40th conf., Heidelberg, Germany. (W. Luckenbach, Friederich-Ebert-Anlage 23a, Postfach 1109, 69 Heidelberg 1 West Germany)

3-7. Solid State Science, intern. conf., American Univ., Cairo, Egypt. (A. Bishay, Dept. of Physical Sciences, American Univ. in Cairo, 113 Kasr El Aini St., Cairo, UAR)

4-9. American Phytopathological Soc., Caribbean Div., 6th annual mtg., Maracay, Venezuela. (G. Malaguti, Centro de Investigaciones Agronomicas Apartado Postal 4690, Maracay)

4-11. Sociology, 6th world congr., Evian, France. (G. G. Reader, Dept. of Medicine, Cornell Univ. Medical College, 1300 York Ave., New York 10021)

5-7. Rare Earths, conf., Inst. of Physics and the Physical Soc., Univ. of Durham, Durham, England. (Meetings Officer, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London S.W.1)

5-8. American Ornithologists' Union, mtg., Univ. of Minnesota, Duluth. (L. R. Mewaldt, Dept. of Biological Sciences, San Jose College, San Jose, Calif. 95114)

5-9. Biophysics, 2nd intern. congr., Vienna, Austria. (A. K. Solomon, Biophysical Laboratory, Harvard Medical School, Boston, Mass. 02115)

5-9. Coordination Chemistry, intern. conf., St. Moritz, Switzerland. (G. Schwarzenbach, Eidg. Technical High School, Zurich)

5-9. Use of Isotopes in Plant Nutrition and Physiology Studies, symp., Vienna, Austria. (J. H. Kane, Conferences Branch, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

5-9. Polar Meteorology, symp., Geneva, Switzerland. (K. K. Langlo, World Meteorological Organization, 41 Ave. Giuseppe-Motta, 1200, Geneva)

5-9. Water Pollution Research, 3rd intern. conf., Munich, Germany. (B. B. Berger, Box 5557, Friendship Station, Washington, D.C. 20016)

5-10. Human Genetics, 3rd intern. congr., Univ. of Chicago, Chicago, Ill. (B. S. Strauss, Dept. of Microbiology, Univ. of Chicago, Chicago 60637)

5-10. Insect Pathology, intern. colloquium, Wageningen, Netherlands. (P. Grison, Laboratoire de Biocoenotique et de Lutte Biologique, La Minière par Versailles, Seine-et-Oise, France)

5-10. International Radiation Protection Assoc., first intern. congr., Rome, Italy. (C. Polvani, Casella Postale 2359, Rome)

5-11. Psychiatry, 4th world congr., Madrid, Spain. (Chair of Psychiatry, Faculty of Medicine, Univ. of San Carlos, Calle Atocha 106, Madrid)

5-11. Vital Substances, Nutrition, and Civilization Diseases, 12th intern. conv., Charleroi, Belgium. (H. A. Schweigart, Intern. Soc. for Research on Nutrition and Vital Substances, Berneroder str., 61, Hannover, Kirochrode, West Germany)

5-13. International Committee of **Electrochemical Thermodynamics and Kinetics**, 17th mtg., Tokyo and Kyoto, Japan. (M. Fleischmann, Dept. of Physical Chemistry, Univ. of Newcastle upon Tyne, Newcastle upon Tyne 1, England)

15-17. **Rock Mechanics**, 8th symp., Minneapolis, Minn. (Symposium Committee, Univ. of Minnesota, Minneapolis)

5-19. International **Scientific Radio Union**, 15th general assembly, Munich, Germany. (E. Herbays, 7, pl. Emile Danco, Brussels 18, Belgium)

6-8. **Selenium in Biomedicine**, intern. symp., Corvallis, Ore. (O. H. Muth, DVM Nutrition Research Inst., Oregon State Univ., Corvallis 97331)

6-9. **Bacterial Intestinal Infectious Diseases**, intern. symp., Prague, Czechoslovakia. (M. Duniewicz, Czechoslovak Medical Soc. J. E. Purkyne Sokolska 31, Prague)

6-10. **Molecular Structure and Spectroscopy**, mtg., Ohio State Univ., Columbus. (R. N. Rao, Dept. of Physics, Ohio State Univ., Columbus 43210)

6-10. American **Political Science Assoc.**, mtg., New York, N.Y. (E. M. Kirkpatrick, 1726 Massachusetts Ave., NW, Washington, D.C.)

6-10. **Radiochemistry**, 4th Czechoslovak conf., Bratislava, Czechoslovakia. (Nuclear Chemistry Section, Czechoslovak Chemical Soc., Hradčanské nám 12, Prague 1)

6-11. **Magnetic Resonance and Relaxation**, intern. conf., Ljubljana, Yugoslavia. (R. Blinc, Nuclear Inst. "J. Stefan", Ljubljana)

7-9. **Aerodynamic Deceleration Systems**, conf., Houston, Tex. (R. S. Ross, Good-year Aerospace Corp., 1210 Masillon Rd., Akron, Ohio 44315)

7-9. Influence of **Synthetics and Pesticides on Food Chemistry**, symp., Aachen, Germany. (German Chemical Soc., Geschäftsstelle, 6 Frankfurt am Main, Postfach 9075, Germany)

7-10. National **Agricultural Chemicals Assoc.**, 33rd annual mtg., White Sulphur Springs W. Va. (The Society, 1155 15th St. NW, Washington, D.C. 20005)

7-10. American **Geophysical Union**, 6th western natl. mtg., Los Angeles, Calif. (AGU, 1145 19th St. NW, Washington, D.C. 20036)

7-10. **Internal Medicine**, intern. conf., Amsterdam, Netherlands. (Secretariat, Holland Organizing Center, 16, Lange Voorhout, The Hague)

7-10. **Invertebrates and the Chemistry of Learning**, symp., Michigan State Univ., East Lansing. (W. C. Corning, Fordham Univ., Bronx, N.Y.)

7-10. **Space Simulation**, conf., Houston, Texas. (A. C. Bond, Code EA, NASA Manned Spacecraft Center, Houston 77058)

8-10. **Atherosclerosis and the Reticulo-Endothelial System**, intern. symp., Como, Italy. (R. Paoletti, Inst. of Pharmacology, Via Vanvitelli n. 32, Milan)

8-10. International Soc. of **Geographical Pathology**, 9th conf., Leiden, Netherlands. (Secretariat, Holland Organizing Centre, 16, Lange Voorhout, The Hague)

8-10. **Parapsychological Assoc.**, 9th annual conv., New York, N.Y. (J. G. Pratt, Box 152, Univ. of Virginia Hospital, Charlottesville 22901)



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8-13. **Semiconductor Physics**, intern. conf., Kyoto, Japan. (G. M. Hatoyama, Physical Soc. of Japan, Hongo P.O. Box 28, Tokyo)

9-10. **Instrumentation for High Energy Physics**, intern. conf., Stanford, Calif. (D. W. Dupen, Stanford Linear Accelerator Center, P.O. Box 4349, Stanford, Calif. 94305)

9-10. **Scandinavian Neurosurgical Soc.**, 19th annual mtg., Gothenburg, Sweden. (G. Norlen, Sahlgrenska Sjukhus, Gothenburg)

10-21. **Industrial Chemistry**, 36th intern. congr., Brussels, Belgium. (A. Guilmoit, 49, Sq. Marie-Louise, Brussels 4)

11-15. **Cell, Tissue, and Organ Culture**, 2nd conf., Tissue Culture Assoc., Bedford, Pa. (V. J. Evans, Natl. Cancer Inst., NIH, Bethesda, Md. 20014)

11-16. **American Chemical Soc.**, 152nd natl. mtg., New York, N.Y. (The Society, 1155 16th St., NW, Washington, D.C.)

11-16. **International Soc. of Orthopedic Surgery and Traumatology**, 10th mtg., Paris, France. (P. Lance, 34 rue Montoyer, Brussels, Belgium)

11-17. **International Soc. for Rehabilitation of the Disabled**, 10th world congr., Wiesbaden, Germany. (S. G. Whittier, Natl. Soc. for Crippled Children and Adults, 2023 W. Ogden Ave., Chicago, Ill. 60612)

11-18. **Comparative Pathology**, intern. congr., Beirut, Lebanon. (J. K. Frenkel, Dept. of Pathology and Oncology, Univ. of Kansas Medical Center, Kansas City)

12-13. **Chromatography and Electro-**

**phoresis**, 4th intern. symp., Brussels, Belgium. (Belgian Soc. of Pharmaceutical Sciences, 11, rue Archimède, Brussels 4)

12-14. **American Fisheries Soc.**, Kansas City, Mo. (R. F. Hutton, The Society, 1404 New York Ave., Washington, D.C.)

12-14. **Physics of Free Atoms**, conf., Berkeley, Calif. (V. W. Cohen, Physics, Dept. Brookhaven Natl. Laboratory, Upton, N.Y. 11973)

12-14. **Society for Industrial and Applied Mathematics**, fall mtg., Stony Brook, N.Y. (A. H. Zemanian, Dept. of Applied Analysis, State Univ. of New York, Stony Brook 11790)

12-14. **Production and Applications of Intense Magnetic Fields**, intern. colloquium, Grenoble, France. (National Center of Scientific Research, 15, quai Anatole France, Paris 7)

12-15. **Sarcoidosis**, 4th intern. conf., Paris, France. (J. Chretien, Hospital Cochin, rue Faubourg St.-Jacques, Paris 14)

12-15. **Society of American Foresters**, 66th annual mtg., Seattle, Wash. (The Society, 1010 16th St., NW, Washington, D.C. 20036)

12-16. **International Council of the Aeronautical Sciences**, 5th congr. London, England. (American Inst. of Aeronautics and Astronautics, 1290 Sixth Ave., New York 10019)

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12-17. **Angiology**, 8th Latin American congr., Caracas, Venezuela. (J. Morales Rocha, avda. Diego de Lazada 12, San Bernardino, Caracas)

12-17. **Insect Chemistry**, European conf., Milan, Italy. (Polytechnical Inst. of Milan, Piazza Leonardo da Vinci 32, Milan)

12-17. **Nuclear Physics**, intern. conf., Gatlinburg, Tenn. (A. Zucker, Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn. 37831)

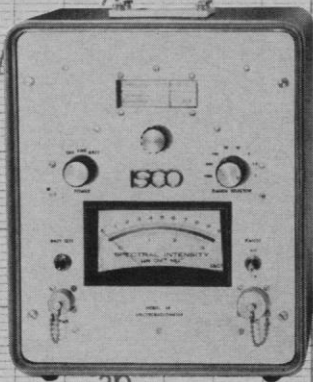
13-16. **Antarctic Oceanography**, symp., Santiago, Chile. (H. Mosby, Geophysics Inst., Bergen, Norway)

14-16. **Deformation and Flow in High Polymer Systems**, conf., Loughborough, England. (R. E. Wetton, Dept. of Chemistry, Loughborough College of Technology, Loughborough, England)

14-18. **International Federation of Operational Research Soc.**, 4th intern. conf., Cambridge, Mass. (P. M. Morse, Room 6-107, Massachusetts Inst. of Technology, Cambridge 02139)

14-21. **Neurobiology**, symp., Stockholm,

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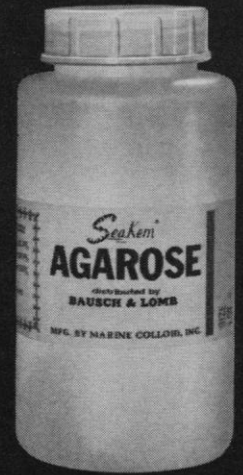
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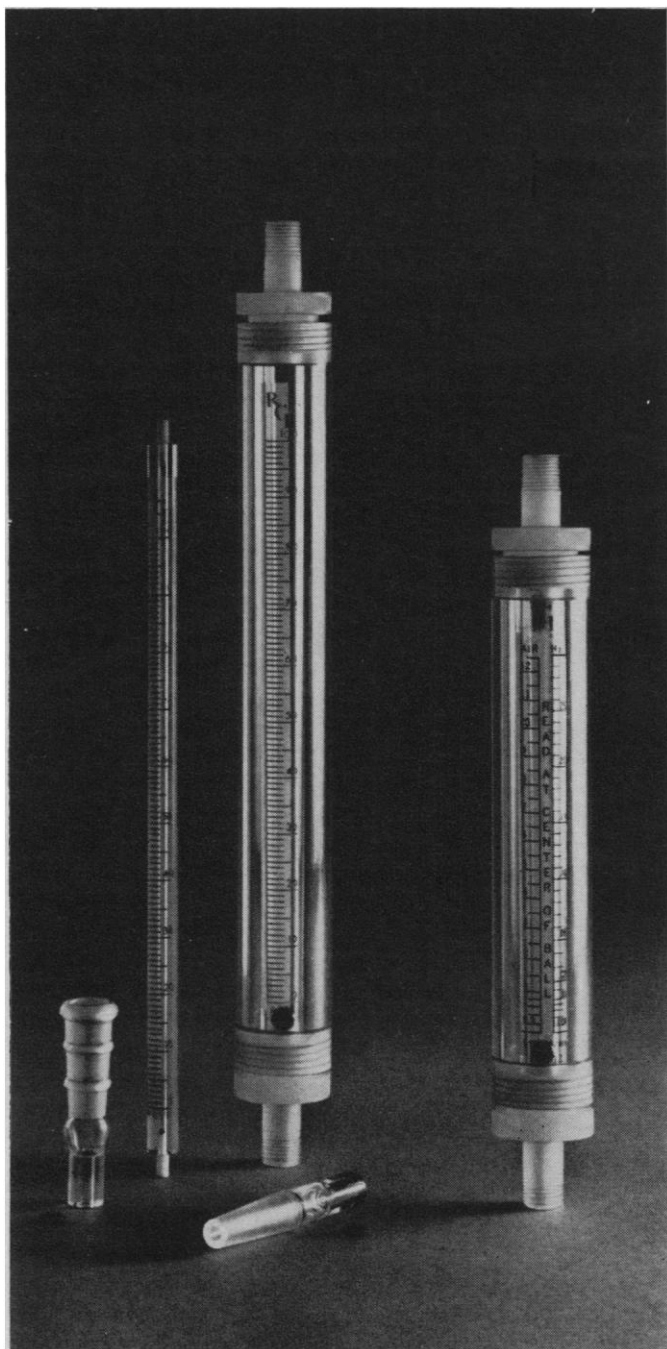
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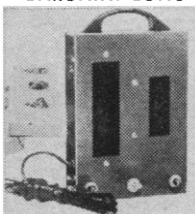
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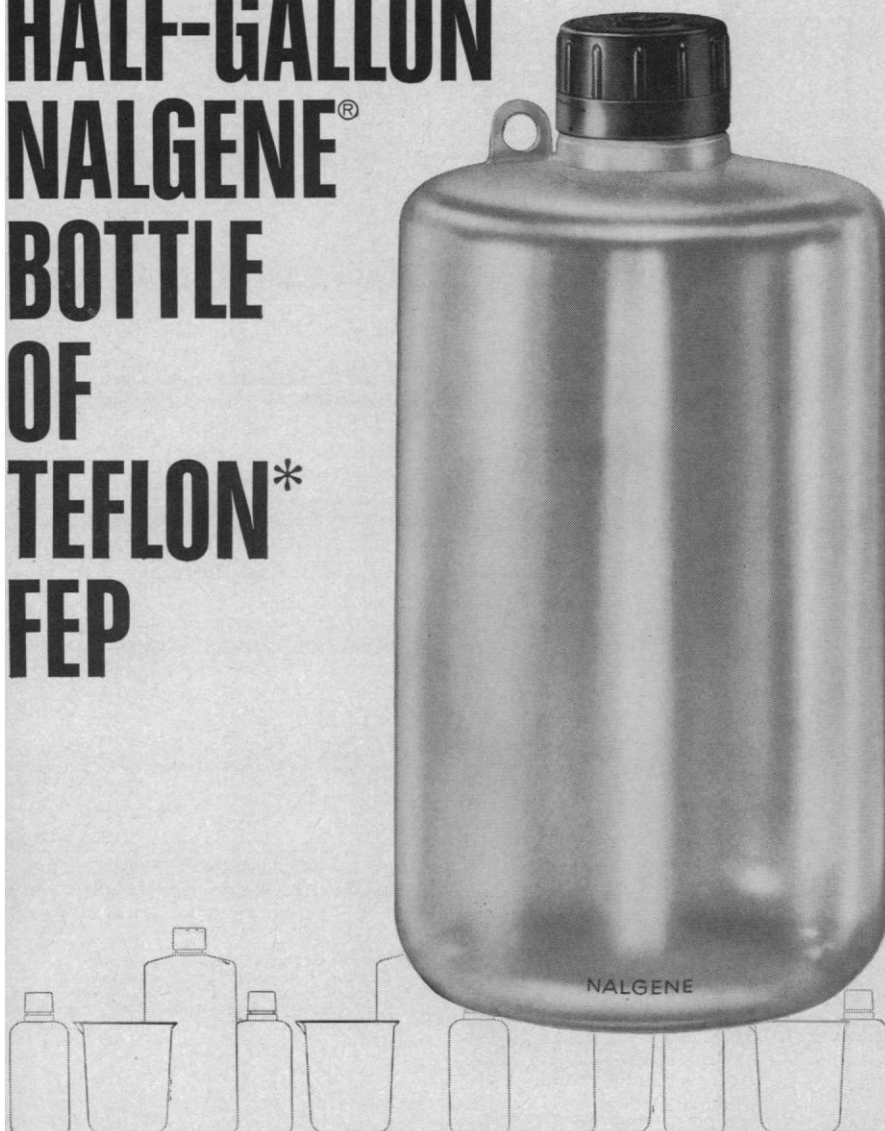
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Sweden. (UNESCO, Pl. de Fontenoy, Paris 7, France)

15-16. **Pyrolysis-Gas Chromatography**, symp., Paris, France. (G. Guichon, Ecole Polytechnique, 17 rue Descartes, Paris 53)

17-24. **Pharmaceutical Sciences**, 26th intern. congr., Madrid, Spain. (J. H. M. Winters, Alexanderstraat 111, The Hague, Netherlands)

18-21. American Inst. of **Chemical Engineers**, 58th natl. mtg., Atlantic City, N.J. (Asst. Secretary, 345 E. 47 St., New York 10017)

18-24. International Soc. of **Gastroenterology**, 5th world congr., Tokyo, Japan. (Secretary General, School of Medicine, Jikei Univ., Atago-cho, Shiba, Minato-Ku, Tokyo)

18-24. **Veterinary Medicine and Zootechnic**, 5th Pan American congr., Caracas, Venezuela. (P.O. Box 5212, Chacao, Caracas)

19-21. **Instrumental Optics and Optical Design**, conf., Chelsea College of Science and Technology, Chelsea, England. (Meetings Officer, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

19-22. **Cybernetic Medicine**, 4th intern. congr., Nice, France. (Dr. Cossa, 29 boul. Victor-Hugo, Nice)

19-22. Applications of **Electronic Engineering to Oceanography**, conf., Southampton, England. (Inst. of Electronic and Radio Engineers, 8-9 Bedford Sq., London, W.C.1, England)

19-22. **Neurobiologists**, 4th intern. mtg., Stockholm, Sweden. (Secretary General, Nobel Inst. for Neurophysiology, Karolinska Inst., Stockholm 60)

19-23. American Soc. of **Oral Surgeons**, mtg., Chicago, Ill. (E. Larson, 211 E. Chicago Ave., Chicago)

19-24. **Boundary Layers and Turbulence**, symp., Kyoto, Japan. (I. Tani, Inst. of Space and Aeronautical Science, Univ. of Tokyo, Tokyo, Japan)

19-24. International Federation for **Documentation**, 32nd conf., The Hague, Netherlands. (Organizing Secretary, 7 Hofweg, The Hague)

20-22. **Tube Techniques**, 8th conf., Inst. of Electrical and Electronics Engineers, electron devices group, New York, N.Y. (R. J. Bondley, General Electric Co., Schenectady, N.Y.)

20-23. **Comminution**, 2nd symp., European Federation of Chemical Engineering, Amsterdam, Netherlands. (Congress Bureau, 3 Sint Agnietenstraat, Amsterdam)

20-23. **Gas Chromatography and Associated Techniques**, intern. symp., Rome, Italy. (A. B. Littlewood, School of Chemistry, The University, Newcastle on Tyne 1, England)

20-23. **Immunity, Cancer, and Chemotherapy**, intern. symp., Buffalo, N.Y. (E. Mihich, Roswell Park Memorial Inst., Buffalo 14203)

21-22. Significance of **Water Composition**, natl. symp., American Soc. for Testing and Materials, Philadelphia, Pa. (The Society, 1916 Race St., Philadelphia)

21-23. **Aerodynamic Testing**, conf., Los Angeles, Calif. (R. E. Covey, Jet Propulsion Laboratory, 4800 Oak Ridge Dr., Pasadena, Calif. 91103)

21-23. International Assoc. of **Geochemistry and Cosmochemistry**/Intern. Union of Geological Sciences, mtg., Paris,

France. (UNESCO, Pl. de Fontenoy, Paris)

21-23. **Molecular Motion** in Solids, Liquids, and Gases by Magnetic Resonance, mtg., Canterbury, England. (E. F. W. Seymour, British Radio Spectroscopy Group, School of Physics, Univ. of Warwick, Coventry, England)

21-23. **Nuclear and Particle Physics**, conf., Univ. of Glasgow, Glasgow, Scotland. (Meetings Officer, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London S.W.1, England)

21-23. **Origin and Abundance-Distribution of the Elements**, symp., UNESCO headquarters, Paris, France. (W. D. Page, Div. of Earth Sciences, Natl. Acad. of Sciences, 2101 Constitution Ave., Washington, D.C. 20418)

21-23. **Origin and Distribution of the Elements**, symp., Paris, France. (E. Ingerson, Dept. of Geology, Univ. of Texas, Austin 78712)

21-23. **Supermolecular Structure in Fibers**, 25th conf., Fiber Society, Boston, Mass. (L. Rebenfeld, Textile Research Inst., P.O. Box 625, Princeton, N.J.)

21-24. **New Methods of Stellar Dynamics**, colloquium, Besançon, France. (Assistant Secretary, Intern. Astronomical Union, Observatory of Nice, Le Mont-Gros, Nice, France)

21-29. **International Atomic Energy Agency**, 10th general conf., Vienna, Austria. (IAEA, Kärrtnerring 11, Vienna 1)

22-24. **American College of Cardiology**, regional mtg. Univ. of Florida, Gainesville. (M. W. Wheat, Jr., Div. of Postgraduate Education, Univ. of Florida College of Medicine, Gainesville 32601)

22-24. **Muscle Circulation**, symp., Smolenice, Czechoslovakia. (O. Hudlická, Inst. of Physiology, Czechoslovak Acad. of Sciences, Budějovická 1083, Prague 4)

23-1. **American Soc. of Clinical Pathologists**, Chicago, Ill. (Secretary, 445 North Lake Shore Dr., Chicago 11, Ill.)

24-26. **Phage Genetics and Physiology**, mtg., Naples, Italy. (Organizing Committee, Intern. Laboratory of Genetics and Biophysics, Naples)

25-28. **Gastrointestinal Radiation Injury**, symp., Richland, Wash. (M. F. Sullivan, Biology Dept., Battelle-Northwest, P.O. Box 999, Richland 99352)

25-29. **Water Pollution Control Federation**, 39th mtg., Kansas City, Mo. (R. E. Fuhrman, 4435 Wisconsin Ave., NW, Washington, D.C. 20016)

25-30. **Nephrology**, 3rd intern. congr., Washington, D.C. (Secretariat, 9650 Wisconsin Ave., Washington, D.C. 20014)

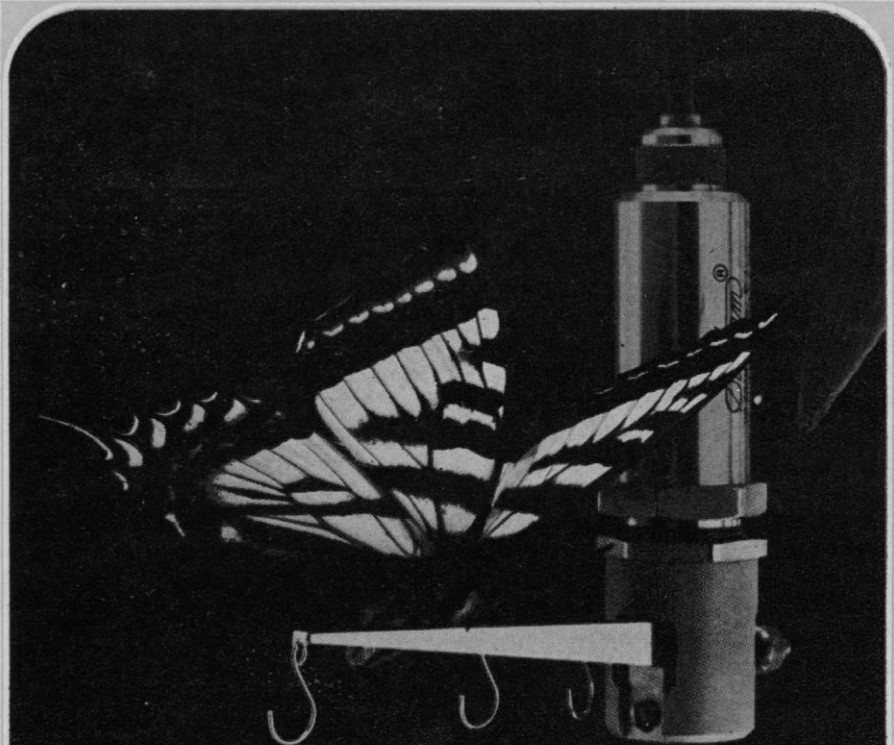
26-27. **Engineering Management**, 14th annual joint conf. (JEMC), Washington, D.C. (H. M. Sarasohn, IBM Corp., Armonk, N.Y. 10504)

26-27. **Prospects for Simulation and Simulators of Dynamic Systems**, symp., Baltimore, Md. (S. Burik, MS 452A, Westinghouse Electric Corp., P.O. Box 746, Baltimore 21203)

26-28. **Colloid Stability** in Aqueous and Nonaqueous Media, mtg., Faraday Soc., Univ. of Nottingham, Nottingham, England. (The Society, 6 Gray's Inn Sq., London W.C.1, England)

26-28. **Nonconventional Energy Conversion Applications**, first conf., Los Angeles, Calif. (R. E. Henderson, Research Manager, Applied Sciences, Allison Div., GMC, Indianapolis, Ind. 46202)

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## NEW BOOKS

(Continued from page 733)

**Classics in Education.** Wade Baskin, Ed. Philosophical Library, New York, 1966. 740 pp. \$12. Fifty-eight contributions ranging from Aristotle to Alfred North Whitehead.

**Compton's Dictionary of the Natural Sciences.** vols. 1 and 2. Charles A. Ford, Ed. Compton, Chicago, 1966. vol. 1, 436 pp.; vol. 2, 459 pp. Illus. \$24.95 set (secondary level).

**A Conflicting View of the Universe.** John J. Durie. Harlo Press, Detroit, 1966. 45 pp. \$3.

**Dictionary of Geography.** Sir Dudley Stamp, Ed. Wiley, New York, 1966. 508 pp. \$10.

**Dictionary of Semiconductor Physics and Electronics: English-German, German-English.** Werner Bindmann. VEB Verlag Technik, Berlin; Pergamon, New York, 1965. 615 pp. \$25.

**Diplomats, Scientists, and Politicians: The United States and the Nuclear Test Ban Negotiations.** Harold Karan Jacobson and Eric Stein. Univ. of Michigan Press, Ann Arbor, 1966. 548 pp. \$8.50.

**The Drugs You Take.** S. Bradshaw. Hutchinson, London, 1966. 224 pp. 30s.

**Experiments in Visual Science: For Home and School.** James R. Gregg. Ronald, New York, 1966. 166 pp. Illus. \$5.

**Exploring Pacific Coast Tide Pools.** Vinson Brown. Naturegraph Publishers, Healdsburg, Calif., 1966. 56 pp. Illus. Paper, \$1.95.

**A Field Key to the Savanna Trees of Nigeria.** Brian Hopkins and D. P. Stanfield. Ibadan Univ. Press, Ibadan, Nigeria, 1966. 47 pp. Paper, 5s. 6d.

**German Chemical Abbreviations.** Compiled and edited by Gabriele E. M. Wohlaue and H. D. Gholston. Special Libraries Assoc., New York, 1966. 67 pp. Paper, \$6.50. Contains about 2500 abbreviations, with German and English meanings, listed alphabetically in a three-column format.

**The Globe of Martin Bylica of Olkusz: Celestial Maps in the East and in the West.** Zofia Ameisenowa. Translated by Andrzej Potocki. Wydawnictwo Polskiej Akademii Nauk, Warsaw, 1959. 108 pp. Illus. Paper.

**Guide to the Underwater.** Bill Slosky and Art Walker. Sterling, New York, 1966. 192 pp. Illus. \$10.

**Harper's University: The Beginnings.** A history of the University of Chicago. Richard J. Storr. Univ. of Chicago Press, Chicago, 1966. 427 pp. Illus. \$8.95.

**Hebrew Amulets: Their Decipherment and Interpretation.** T. Schrire. Routledge and Kegan Paul, London; Humanities Press, New York, 1966. 192 pp. Illus. \$8.50.

**IAEA Research Contracts.** Sixth annual report. Internatl. Atomic Energy Agency, Vienna, 1966 (order from Natl. Agency for Internatl. Publications, New York). 141 pp. Illus. Paper, \$1. Technical Reports Series, No. 53. Thirty-seven papers.

**The Images of Space.** Harold Leland Goodwin. Holt, Rinehart, and Winston, New York, 1965. 189 pp. \$2.95.

**The Impact of Highway Investment on Development.** George W. Wilson, Barbara

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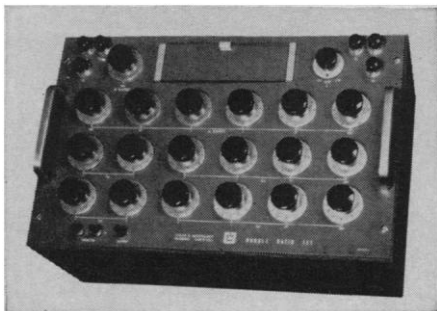
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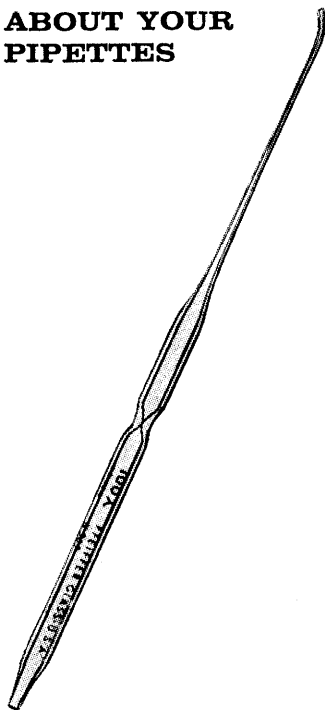
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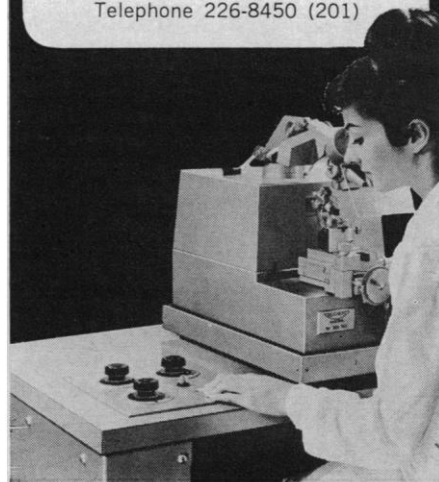
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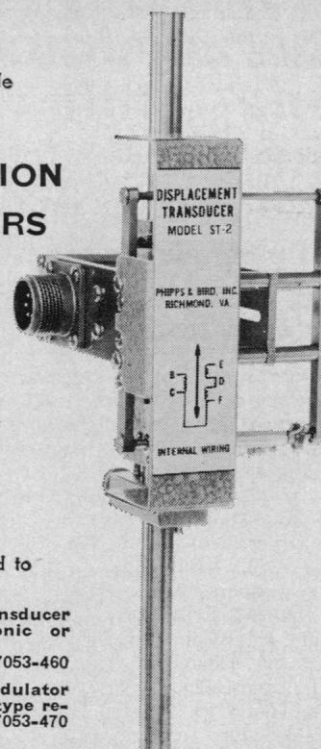
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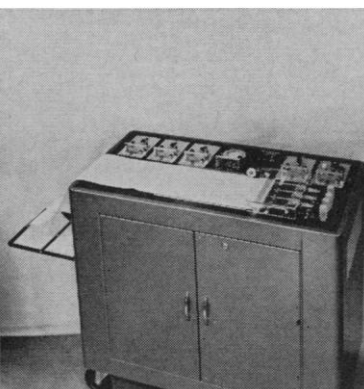


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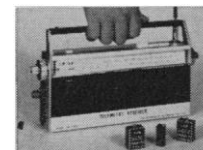
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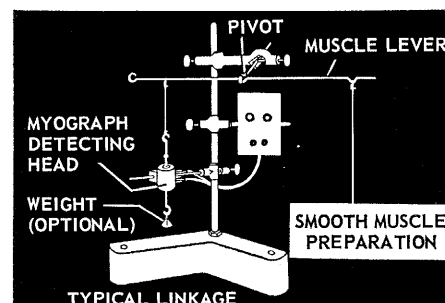
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R. Bergmann, Leon V. Hirsch, and Martin S. Klein. Brookings Institution, Washington, D.C., 1966. 238 pp. Illus. \$6.

**Incident at Exeter: The Story of Unidentified Flying Objects over America Today.** John G. Fuller. Putnam, New York, 1966. 251 pp. \$5.95.

**Indian Legends from the Northern Rockies.** Ella E. Clark. Univ. of Oklahoma Press, Norman, 1966. 376 pp. Illus. \$6.95.

**Indian Scientific and Technical Publications, 1960-1965.** Compiled by S. B. Deshaprabhu and others. Council of Scientific and Industrial Research, New Delhi, 1966. 296 pp. \$6.

**The Invention of the Aeroplane (1799-1909).** Charles H. Gibbs-Smith. Taplinger, New York, 1966. 384 pp. Illus. \$14.95.

**IQ: A Mensa Analysis and History.** Victor Serebriakoff. Hutchinson, London, 1966. 192 pp. Illus. 30s.

**The Man-Made Object.** Gyorgy Kepes, Ed. Braziller, New York, 1966. 236 pp. Illus. \$12.50. Vision and Value Series. Seventeen papers by Gillo Dorfles, Herbert Read, Joan M. Erikson, Kazuhiko Egawa, Michael J. Blee, Marshall McLuhan, Christopher Alexander, Leonardo Ricci, Marcel Breuer, Theodore M. Brown, Jean Hélon, Henry S. Stone, Jr., Frederick S. Wight, Dore Ashton, and Françoise Choay.

**McGraw-Hill Basic Bibliography of Science and Technology.** Compiled by the Editors of the McGraw-Hill Encyclopedia of Science and Technology. McGraw-Hill, New York, 1966. 748 pp. \$19.50. A compilation of recent titles and annotations on more than 7000 subjects.

**McGraw-Hill Modern Men of Science.** Editors of McGraw-Hill Encyclopedia of Science and Technology. McGraw-Hill, New York, 1966. 628 pp. Illus. \$19.50. Contains biographical data and descriptions of over 400 contemporary scientists.

**Les Mécaniques de Galilée: Mathématicien et Ingénieur du duc de Florence.** P. Martin Mersenne. Bernard Rochot, Ed. Presses Universitaires de France, Paris, 1966. 93 pp. Illus. Paper.

**Memoirs of the California Academy of Sciences.** vol. 6, *Studies of Opisthobranchiate Mollusks of the Pacific Coast of North America.* Frank Mace MacFarland. California Acad. of Sciences, San Francisco, 1966. 564 pp. Plates.

**Men, Machines, and Modern Times.** Elting E. Morison. M.I.T. Press, Cambridge, Mass., 1966. 245 pp. \$5.95.

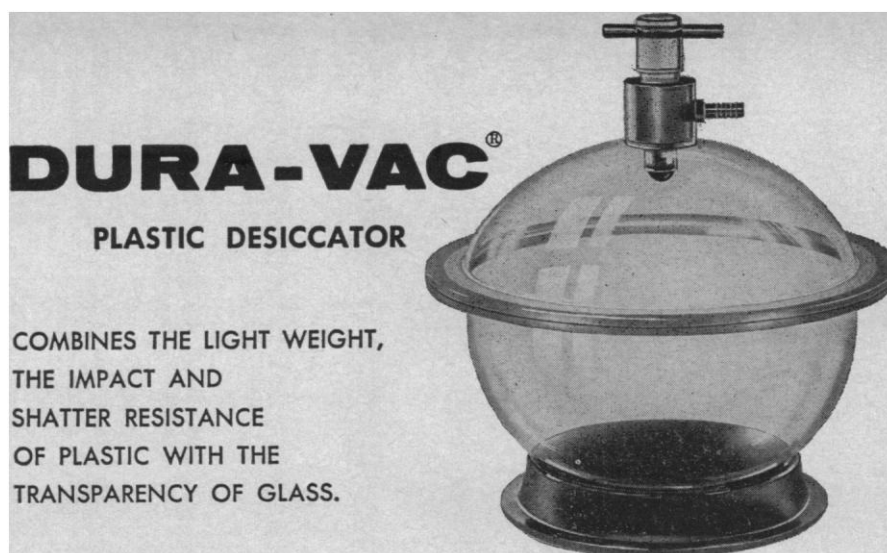
**Meteorological Satellites.** William K. Widger, Jr. Holt, Rinehart, and Winston, New York, 1966. 280 pp. Illus. \$2.95.

**Module, Proportion, Symmetry, Rhythm.** Gyorgy Kepes, Ed. Braziller, New York, 1966. 237 pp. Illus. \$12.50. Vision and Value Series. Essays by Philip Morrison, C. H. Waddington, Arthur L. Loeb, Stanislaw Ulam, Lawrence B. Anderson, Ezra D. Ehrenkrantz, Richard P. Lohse, Anthony Hill, Ernő Lendvai, John Cage, François Molnar, and Rudolf Arnheim.

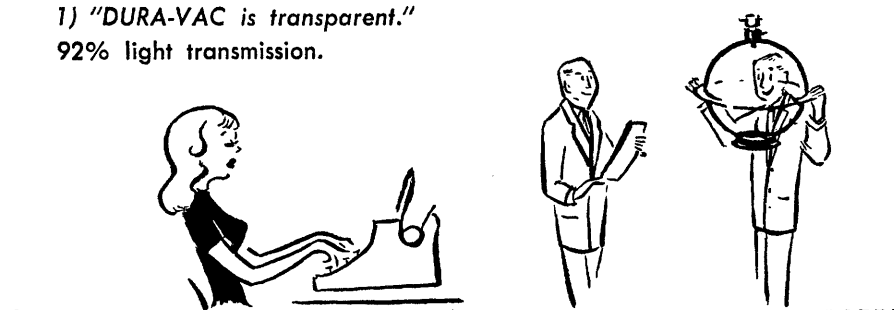
**The Nature of Matter and Energy.** Gerald I. Lebau. The Author, Elizabeth, N.J., 1965. 377 pp. Illus.

**Optical Page Reading Devices.** Robert A. Wilson. Reinhold, New York, 1966. 207 pp. Illus. \$10.

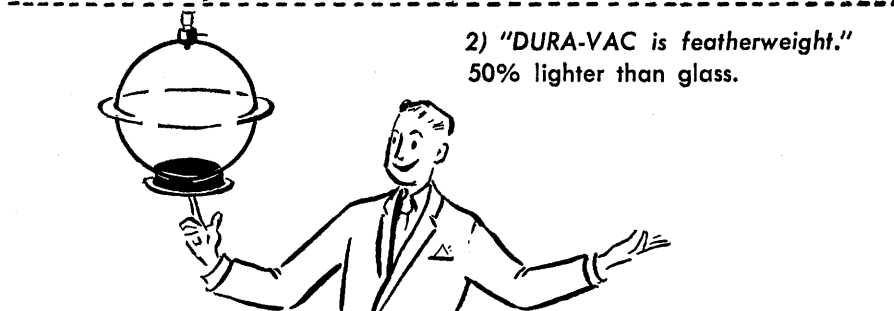
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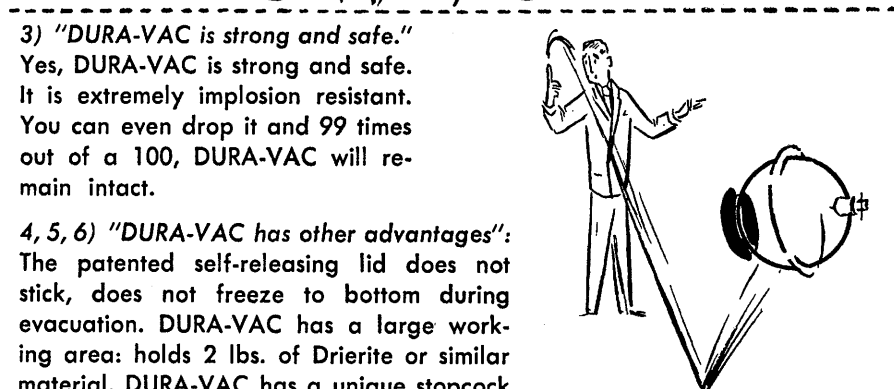
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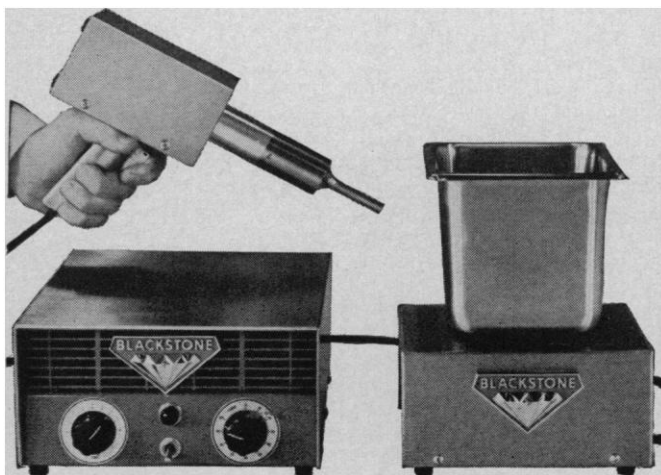


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Newton, and others. Hobbs, Dorman, New York, 1966. 204 pp. Illus. \$14.50.

**Nicole Oresme: De proportionibus proportionum and Ad pauca respicientes.** Edward Grant, Ed. Univ. of Wisconsin Press, Madison, 1966. 488 pp. Illus. \$10.75.

**Penguin Science Survey.** pt. B. Anthony Allison. Penguin Books, Baltimore, 1966. 205 pp. Illus. Paper, \$1.95. Twelve papers.

**Periodicals for Latin American Economic Development, Trade and Finance: An Annotated Bibliography.** Martin H. Sable. Latin American Center, Univ. of California, Los Angeles, 1966. 78 pp. Paper.

**Photography on Expeditions: Recommended Techniques for Difficult Surroundings.** D. H. O. John. Focal Press, New York, 1966. 176 pp. Illus. \$12.50. The Focal Library.

**Planets.** Carl Sagan, Jonathan Norton Leonard, and the Editors of *Life*. Time Inc., New York, 1966. 200 pp. Illus. \$3.95.

**Principles of Scientific and Technical Writing.** Jackson E. Morris. McGraw-Hill, New York, 1966. 277 pp. Illus. \$6.95.

**Raising Laboratory Animals.** A handbook for biological and behavioral research. James Silvan. Published for the American Museum of Natural History. Natural History Press, Garden City, N.Y., 1966. 239 pp. Illus. \$4.95.

**Science and Man.** Lord Russell Brain. Elsevier, New York, 1966. 109 pp. Illus. \$3.75.

**The Shape of Medieval History: Studies in Modes of Perception.** William J. Brandt. Yale Univ. Press, New Haven, Conn., 1966. 197 pp. \$5.75.

**Sign, Image, Symbol.** Gyorgy Kepes, Ed. Braziller, New York, 1966. 288 pp. Illus. \$12.50. Vision and Value Series. Twenty-one papers.

**The Sources of Instinctive Life: A Theory of Mental Functioning.** R. Palmeri. Philosophical Library, New York, 1966. 72 pp. Illus. \$3.

**Statistical Abstract of Latin America, 1963.** Compiled and edited by Donald S. Castro, Berl Golomb, and Christopher Breyer. Center of Latin American Studies, Univ. of California, Los Angeles, 1966. 144 pp. Paper, \$3.

**Strategic Defenses.** Stanley L. Englehardt. Crowell, New York, 1966. 184 pp. Illus. \$4.95.

**A Syntax-Oriented Translator.** Peter Zilahy Ingerman. Academic Press, New York, 1966. 141 pp. Illus. \$5.95.

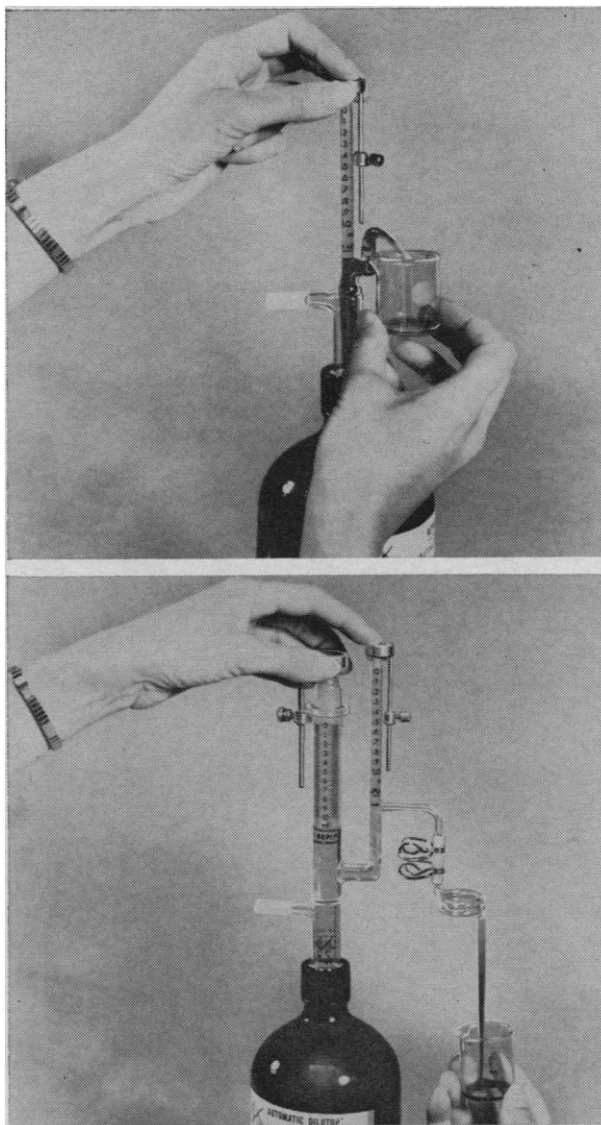
**Thermal, Oxidative, and Light Stabilization of Polypropylene.** A literature survey. Science Surveys, Mountainside, N.J., 1966. 148 pp. Illus. Paper. Survey covers the literature between 1954 and 1966.

**The Ways of Paradox and Other Essays.** W. V. Quine. Random House, New York, 1966. 268 pp. \$6.95. Contains twenty-one papers written between 1934 and 1964.

**Meyer Weisgal at Seventy: An Anthology.** Edward Victor, Ed. Weidenfeld and Nicolson, New York, 1966. 228 pp. Illus. Thirty-four papers.

**Wonders of the Modern World.** Joseph Gies. Crowell, New York, 1966. 255 pp. Illus. \$5.95.

**Working with Atoms.** O. R. Frisch. Basic Books, New York, 1966. 96 pp. Illus. \$3.50. Science and Discovery Series.



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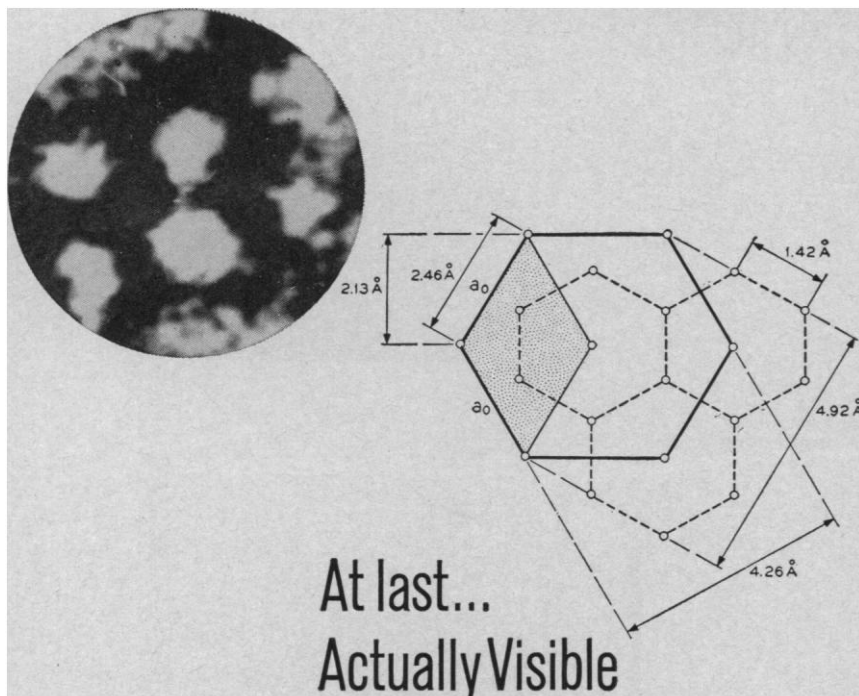
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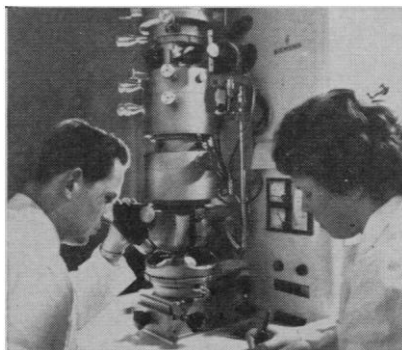


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## Conference and Symposium Reports

**Advances in Fluorine Research and Dental Caries Prevention.** vol. 4. Proceedings of the 12th Congress of the European Organization for Research on Fluorine and Dental Caries Prevention (Utrecht, Netherlands), June 1965. P. M. C. James, Klaus G. Konig, and Hans R. Held, Eds. Pergamon, New York, 1966. 254 pp. Illus. \$18.50. Thirty-one papers.

**Antimicrobial Agents and Chemotherapy.** Proceedings of the Fifth Interscience Conference on Antimicrobial Agents and Chemotherapy and Fourth International Congress of Chemotherapy (Washington, D.C.), October 1965. Gladys L. Hobby, Ed. American Soc. for Microbiology, Ann Arbor, Mich., 1966. 1154 pp. Illus. \$15. 184 papers.

**Biochemical Studies of Antimicrobial Drugs.** Symposium of the Society for General Microbiology (London), April 1966. B. A. Newton and P. E. Reynolds, Eds. Cambridge Univ. Press, New York, 1966. 359 pp. Illus. \$11.50. Fifteen papers.

**The Biology of Human Variation** (Ann N.Y. Acad. Science. 134). Edward M. Weyer, Ed. New York Acad. of Sciences, New York, 1965. 570 pp. Illus. Paper, \$12. Fifty papers given at a conference held in February 1965 on the following topics: General Concepts (11 papers); Mechanisms—Evolutionary and Genetic (8 papers); Physiological Considerations (8 papers); Developments Abroad (7 papers); Implications and Applications (9 papers); and Antecedents of Illness (7 papers).

**Comparative Phytochemistry.** Based on papers presented at a meeting of the Phytochemical Group (Cambridge, England), April 1965. T. Swain, Ed. Academic Press, New York, 1966. 374 pp. Illus. 93s. Eighteen papers.

**Current Concepts of Acid-Base Measurement** (Ann. N.Y. Acad. Sci. 133). Harold E. Whipple, Ed. New York Acad. of Sciences, New York, 1966. 274 pp. Illus. Paper, \$6. Seventeen papers and two reports presented at a conference held in November 1964. The topics considered were: Acid-Base Measurements *In Vitro* (7 papers); Discussion: Acid-Base Measurement *In Vitro* (1 paper); Acid-Base Disturbances *In Vivo* (8 papers); Discussion: Description of Clinical Disturbances in Acid-Base Equilibrium (1 paper); and Reports of the *Ad Hoc* Committees (2 reports).

**East African Academy, Proceedings.** vol. 2. A symposium (Nairobi), June 1964. W. B. Banage, Ed. East African Publishing House, Nairobi, Kenya, 1966. 164 pp. Illus. Paper, 35s. Twenty-one papers on the physical, earth, biological, medical, and agricultural sciences.

**Economic Progress and Social Welfare.** Papers presented at a conference (Washington, D.C.), December 1965. Leonard H. Goodman, Ed. Published for the National Conference on Social Welfare. Columbia Univ. Press, New York, 1966. 245 pp. \$5. Seven papers: "Poverty, policy, and purpose: The dilemmas of choice" by Martin Rein and S. M. Miller; "Administrative decisions and fund allocation in social welfare" by Charles I. Schottland; "Assessing effectiveness of methods for meeting social and economic problems

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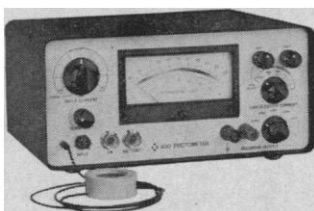
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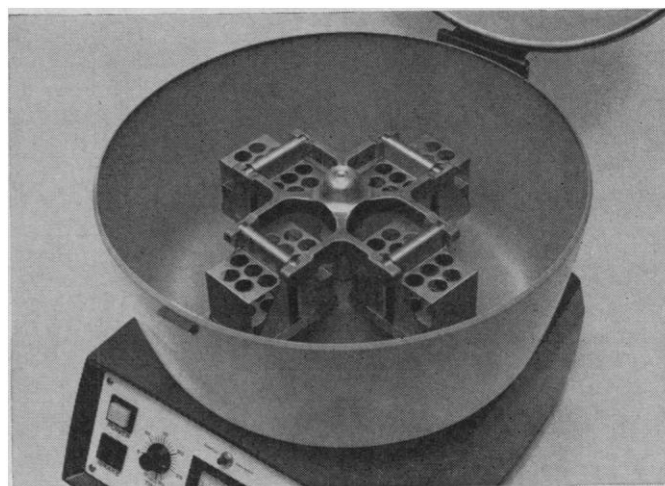


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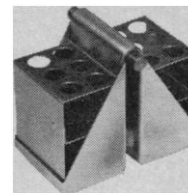
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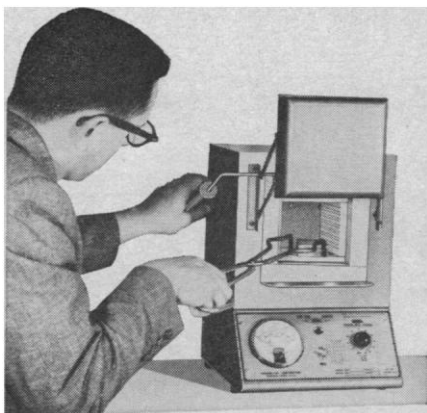
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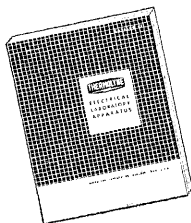
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**The Electron Microprobe.** Proceedings of the symposium sponsored by the Electrothermics and Metallurgy Division, The Electrochemical Soc. (Washington, D.C.), October 1964. T. D. McKinley, K. F. J. Heinrich, and D. B. Wittry, Eds. Wiley, New York, 1966. 1051 pp. Illus. \$27.50. Forty-three papers on the following topics: Analysis of Light Elements (6 papers); Quantitative Analysis (12 papers); New Techniques and Instrumentation (6 papers); and Applications (19 papers).

**Endogenous Substances Affecting the Myometrium.** Proceedings of a symposium (Bristol, England), July 1965. V. R. Pickles and R. J. Fitzpatrick, Eds. Cambridge Univ. Press, New York, 1966. 283 pp. Illus. \$13.50. Twenty-three papers.

**Family Planning and Population Programs.** A review of world developments. Proceedings of the International Conference on Family Planning Programs (Geneva), August 1965. Bernard Berelson and others, Eds. Univ. of Chicago Press, Chicago, 1966. 864 pp. Illus. \$12.50. Sixty-one papers on the following topics: National Programs: Achievements and Problems (21 papers); Organization and Administration of Programs (7 papers); Contraceptive Methods: Programmatic Implications (14 papers); Research and Evaluation (17 papers); and Summary (2 papers).

**Food Science and Technology.** Proceedings of the First International Congress (London), September 1962. vol. 2, *Biological and Microbiological Aspects of Foods*. James Muil Leitch, Ed. Gordon and Breach, New York, 1965. 670 pp. Illus. \$45. Eighty-four papers on the following topics: Effects of Conditions of Husbandry and Cultivation on Quality of Foods (15 papers); Physiology of Maturation, Transport and Storage of Foods (17 papers); Food Preservation (19 papers); Microbial Ecology of Sound and Spoiled Foods (8 papers); Hygiene—Microbiological Assessment of Quality (8 papers); Industrial Fermentations (9 papers); and Laboratory Techniques. Most of the paper are in English, others in French or German.

**Identification Methods for Microbiologists.** Pt. A. B. M. Gibbs and F. A. Skinner, Eds. Academic Press, New York, 1966. 159 pp. Illus. 37s. 6d. The Society for Applied Bacteriology Technical Series No. 1. Fifteen papers given at an autumn demonstration meeting, October 1964.

**Impact of Basic Sciences on Medicine.** Based on lectures given at an international symposium (Jerusalem), June 1965. Ben-Yamin Shapiro and Moshe Prywes, Eds. Academic Press, New York, 1966. 336 pp. Illus. \$14.95. Thirty-one papers.

**Initiation of Labor.** Proceedings of a conference (Princeton, N.J.), December 1963. Jean M. Marshall, Ed. U.S. Department of Health, Education, and Welfare, Washington, D.C., 1966 (order from Superintendent of Documents, Washing-

ton, D.C.). 257 pp. Illus. Paper, \$1. Eight papers: "Physiological principles of contraction in uterine muscle" by Walter J. Woodbury, Gertrude van Wagenen, Arpad I. Csapo, Jean M. Marshall, and Hugo Jung; "Effects of oxytocin on uterine contractility" by Roberto Caldeyro-Barcia, Anna-Riitta Fuchs, Arpad I. Csapo, Jean M. Marshall, and Allan C. Barnes; "Effects of progesterone on uterine contractility" by Arpad I. Csapo and Hugo Jung; "Chemistry and physiology of relaxin" by Meyer X. Zarrow, Robert L. Kroc, and Nils E. Wiquist; "Effects of the placenta on uterine contractility" by Nils E. Wiquist, Allan C. Barnes, Arpad I. Csapo, Anna-Riitta Fuchs, Hugo Jung, Willard M. Allen, and John D. Biggers; "The fetus as a factor in the initiation of labor" by Louis W. Holm, Kenneth J. Ryan, Ernest W. Page, John D. Biggers, and Carl G. Hartman; "The role of immune phenomena in labor" by Jonathan T. Lanman; and "Clinical circumstances at the time of labor" by James Walker, Kenneth J. Ryan, Allan C. Barnes, Nils E. Wiquist, Duncan E. Reid, Roberto Caldeyro-Barcia, Arpad I. Csapo, and Evelyn Johnsen.

**Instrumentation Methods for Predictive Medicine.** Proceedings of the ISA Symposium (Los Angeles, Calif.), October 1965. Thomas B. Weber and Joe Poyer, Eds. Instrument Soc. of America, Pittsburgh, Pa., 1966. 223 pp. Illus. \$12; members, \$9.50. Thirteen papers.

**Internal Conversion Processes.** Proceedings of an International Conference (Nashville, Tenn.), May 1965. Joseph H. Hamilton, Ed. Academic Press, New York, 1966. 697 pp. Illus. \$22.50. Sixty-three papers.

**Ironmaking Conference 1964.** Proceedings of a conference (Pittsburgh, Pa.), April 1964. D. J. Enochs and W. D. Gifford, Eds. Gordon and Breach, New York, 1966. 500 pp. Illus. \$15. Twenty-one papers.

**Macromolecules and Behavior.** Report of a conference (Manhattan), April 1964. John Gaito, Ed. Appleton, Century, Crofts (Meredith), New York, 1966. 207 pp. Illus. \$8. Eleven papers.

**Marine Sciences Instrumentation.** vol. 3. Proceedings of the Third National Marine Sciences Symposium (Miami, Fla.), April 1965. William C. Knopf and Herbert A. Cook. Published for the Instrument Soc. of America. Plenum Press, New York, 1965. 303 pp. Illus. \$12.50; members, \$9.50. Twenty-one papers on the following topics: General Instrumentation (5 papers); Expendable Instrumentation (7 papers); Instrumentation for Oceanography (5 papers); and Water Motion Measurement (4 papers).

**Mass Spectrometry.** A NATO Advanced Study Institute (Glasgow, Scotland), August 1964. R. I. Reed, Ed. Academic Press, New York, 1965. 473 pp. Illus. \$16. Twenty-three papers.

**Matscience Symposia on Theoretical Physics.** vol. 1. Proceedings of the First Anniversary Symposium (Madras, India), January 1963. Alladi Ramakrishnan, Ed. Plenum Press, New York, 1966. 181 pp. Illus. \$9.50. Twelve papers.

**Mechanisms of Release of Biogenic Amines.** Proceedings of an International Wenner-Gren Center Symposium (Stockholm), February 1965. U. S. von Euler,



S. Rosell, and B. Uvnäs, Eds. Pergamon, New York, 1966. 490 pp. Illus. \$20. Thirty-eight papers.

**Methods in Drug Evaluation.** Proceedings of the international symposium (Milano), September 1965. P. Mantegazza and F. Piccinini, Eds. North-Holland, Amsterdam, 1966. 592 pp. Illus. \$16.80. Forty-four papers.

**Molecular Relaxation Processes.** Based on papers given at a symposium (Aberystwyth, Wales), July 1965. Chemical Society, London; Academic Press, New York, 1966. 314 pp. Illus. 65s. Forty-one papers. Most of the papers are in English, others are in French or German.

**Muscular Afferents and Motor Control.** Proceedings of the First Nobel Symposium (Lidingö, Sweden), June 1965. Ragnar Granit, Ed. Almqvist and Wiksell, Stockholm; Wiley, New York, 1966. 466 pp. Illus. \$20. Thirty-nine papers.

**The Nature of the Lunar Surface.** Proceedings of symposium (Greenbelt, Md.), April 1965. Wilmot N. Hess, Donald H. Menzel, and John A. O'Keefe, Eds. Johns Hopkins Press, Baltimore, 1966. 328 pp. Illus. \$13.50. Eighteen papers on the following topics: Interpretation of Ranger Photographs and Related Topics (5 papers); Crater Formation and Surface Structure (5 papers); Physics and Chemistry of the Lunar Surface (7 papers); and Conclusions (1 paper).

**New Antituberculosis Agents: Laboratory and Clinical Studies** (*Ann. N.Y. Acad. Sci.* 135). Edward Weyer, Ed. New York Academy of Sciences, New York, 1966. 440 pp. Illus. Paper, \$8. Thirty-five papers given at a conference held in September 1965.

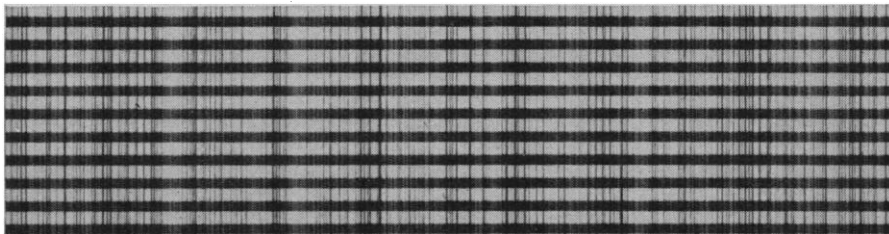
**Nuclear Materials Management.** Proceedings of a symposium (Vienna), August, September 1965. Internatl. Atomic Energy Agency, Vienna, 1966 (order from Natl. Agency for Internatl. Publications, New York). 900 pp. Illus. \$18. Fifty-eight papers; most are in English, others in Russian, French, or Spanish; abstracts in English, French, Russian, and Spanish; discussions in English.

**Peaceful Uses of Automation in Outer Space.** Proceedings of a symposium (Stavanger, Norway), June 1965. John A. Aseltine, Ed. Plenum Press, New York, 1966. 601 pp. Illus. \$22.50. Forty-four papers on the following topics: Launch and Mid-course Guidance (6 papers); Specific Systems (5 papers); Attitude Control (9 papers); Ground Stations and Tracking (5 papers); Components and Techniques (8 papers); Entry and Landing (5 papers); and General Topics (6 papers).

**The Petroleum Industry in the United Kingdom.** Proceedings of a conference (London), November 1965. Peter Hepple, Ed. Institute of Petroleum, London; Elsevier, New York, 1966. 197 pp. Illus. \$12. Seven papers: "Indigenous petroleum and natural gas" by R. G. W. Brunstrom; "The sources of petroleum" by R. N. Sutton; "Petroleum refining" by R. C. Porten; "Gases from petroleum resources, part I; Use by the gas industry" by G. H. Gibson; "Gases from petroleum resources, part II; Use of LPG in industry" by T. W. B. Browne; "The petrochemical industry" by A. J. Gait; and "The U.K. market for petroleum products" by A. B. Mumford.

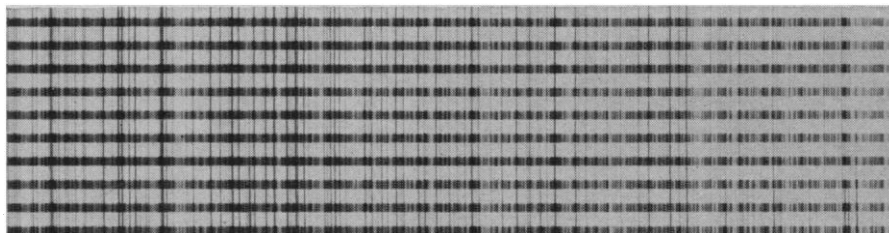
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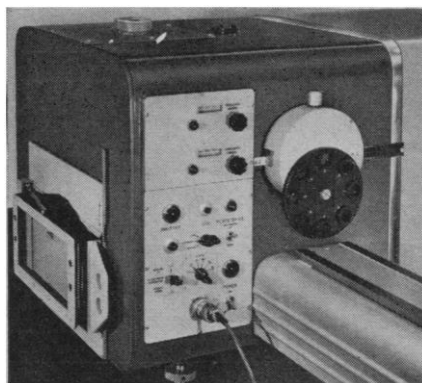
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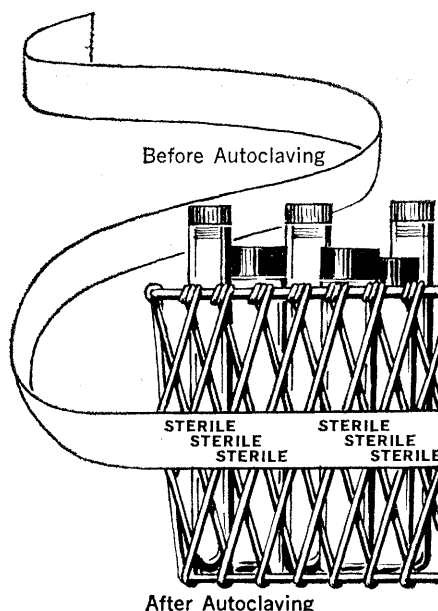
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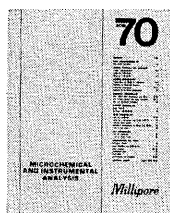
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**Petroleum Supply and Demand.** Report of the Summer Meeting of the Institute of Petroleum (Brighton, England), 1965. Peter Hepple, Ed. Elsevier, New York, 1966. 151 pp. Illus. \$7. Five papers: "Reserves in relation to demand" by D. C. Ion and W. Jamieson; "The petroleum prospects under the marine areas of the world" by A. Bryce Cameron; "The recovery of petroleum" by R. D. West; "The impact of natural gas on the West European fuel economy" by W. L. Culbertson and Paul W. Tucker; and "Matching supply/demand—the problems and flexibility of the downstream functions" by J. W. O. Clifford and M. F. Hoare.

**Photographic Science.** A symposium (Torino, Italy), September 1963. G. Semeraro and U. Mazzucato, Eds. Focal Press, New York, 1966. 248 pp. Illus. \$30. Seventy-two papers.

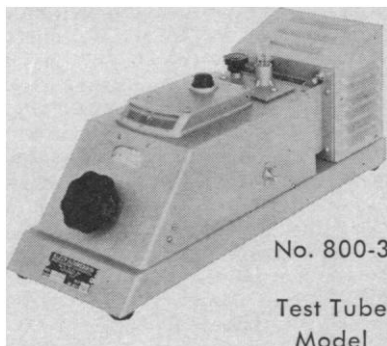
**Physiology of Breath-Hold Diving and the Ama of Japan.** Papers presented at a symposium (Tokyo), August-September 1965. Herman Rahn, Ed. Natl. Acad. of Sciences-Natl. Research Council, Washington, D.C., 1965. 381 pp. Illus. \$7.50. Twenty-five papers.

**Pioneers of Canadian Science.** A symposium presented to the Royal Society of Canada (Charlottetown), June 1964. G. F. G. Stanley, Ed. Univ. of Toronto Press, Toronto, 1966. 160 pp. Illus. \$5. Six papers: "La Trame scientifique de l'histoire du Canada" by Léon Lortie; "Biologists and biological research since 1864" by W. Kaye Lamb and Thomas W. M. Cameron; "L'Abbé Léon Provancher, 1820-1892" by G. P. Holland; "L'Oublié de l'histoire de la science canadienne—George Lawson, 1827-1895" by Jacques Rousseau and William G. Dore; "The Reverend James Bovell, M.D., 1817-1880" by C. E. Dolman; and "Sir John William Dawson, 1820-1899" by T. H. Clark.

**Plasma Physics and Controlled Nuclear Fusion Research.** vols. 1 and 2. Proceedings of a conference (Culham, England), September 1965. Internatl. Atomic Energy Agency, Vienna, 1966 (order from Natl. Agency for Internatl. Publications, New York). vol. 1, 790 pp., \$15; vol. 2, 1012 pp., \$21. Illus. Paper. Most of the 102 papers are in English, others in Russian or French; abstracts are in English, French, Spanish, and Russian, and the summaries are in English and Russian.

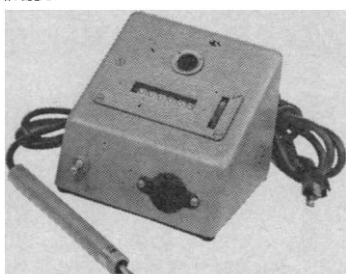
**Poverty amid Affluence.** Papers given at the West Virginia University Conference (Morgantown), May 1965. Leo Fishman, Ed. Yale Univ. Press, New Haven, Conn., 1966. 258 pp. Paper, \$1.75; cloth, \$6. Eleven papers: "Poverty from the Civil War to World War II" by Oscar Handlin; "Population change and poverty reduction, 1947-1965" by Robert J. Lampman; "Poverty and social organization" by Harold A. Gibbard; "Poverty and the individual" by I. Thomas Stone, Dorothea C. Leighton, and Alexander H. Leighton; "Poverty and the Negro" by Herman P. Miller; "Poverty in Appalachia" by Donald A. Crane and Benjamin Chinitz; "Poverty and resource utilization" by Joseph L. Fisher; "Public approaches to minimize poverty" by Theodore W. Schultz; "Unemployment and poverty" by Harry G. Johnson; "Strategies

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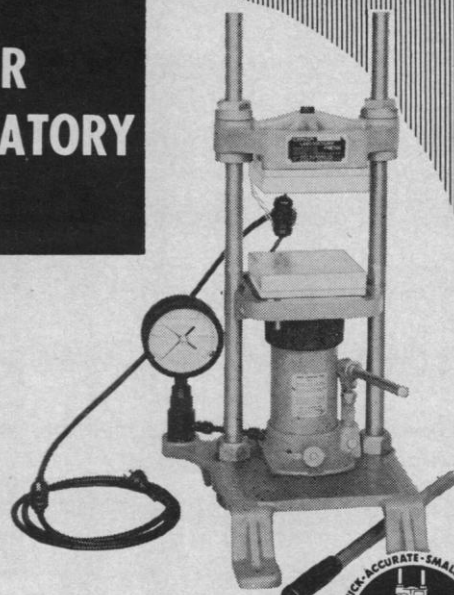
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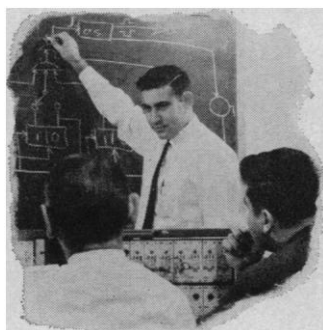
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in the war against poverty" by Otto Eckstein; and "Ends and means in the war against poverty" by Robert J. Lampman.

**Proceedings of the 1966 Heat Transfer and Fluid Mechanics Institute.** (Stanta Clara, Calif.), June 1966. Michel A. Saad and James A. Miller, Eds. Stanford Univ. Press, Stanford, Calif., 1966. 456 pp. Illus. \$12.50. Twenty-four papers.

**Psychiatric Drugs.** Proceedings of a research conference (Boston). Philip Solomon, Ed. Grune and Stratton, New York, 1966. 272 pp. Illus. \$9.75. Seventeen papers on the following topics: Mechanisms of Drug Action (4 papers); Drugs and Psychotherapy (7 papers); and Present Status of Drug Therapy (6 papers).

**Radioactive Pharmaceuticals.** Proceedings of a symposium (Oak Ridge, Tenn.), November 1965. Gould A. Andrews, Ralph M. Kniseley, and Henry N. Wagner, Jr., Eds. U.S. Atomic Energy Commission, Oak Ridge, Tenn., 1966 (order from Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.). 736 pp. Illus. Paper, \$5. Forty papers.

**Recent Advances in Optimization Techniques.** Proceedings of a symposium (Pittsburgh, Pa.), April 1965. Abraham Lavi and Thomas P. Vogl, Eds. Wiley, New York, 1966. 670 pp. Illus. \$12.50. Thirty papers.

**Recent Developments in Particle Symmetries.** Proceedings of the International School of Physics "Ettore Majorana" (Erice, Sicily), September-October 1965. A. Zichichi, Ed. Academic Press, New York, 1966. 472 pp. Illus. \$12. Contains eight lectures, six seminars, and ten discussions presented at the School.

**Regulation of Metabolic Processes in Mitochondria.** A symposium (Bari, Italy), April-May 1965. J. M. Tager, S. Papa, E. Quagliariello, and E. C. Slater, Eds. Elsevier, New York, 1966. 594 pp. Illus. \$27.50. Thirty-four papers.

**Science, Government, and the Universities.** A symposium (Seattle, Wash.), Autumn 1965. Organized by Hans Neurath. Univ. of Washington Press, Seattle, 1966. 124 pp. \$3.95. Seven papers: "A look ahead" by Donald F. Hornig; "The role of the university in the exploration of space" by Hugh L. Dryden; "Some problems and trends in the support of academic science" by Leland J. Haworth; "Biomedical sciences—Present status and problems" by James A. Shannon; "Humanistic aspects of science" by Charles E. Odegaard; "Science and government—Opportunities and conflicts" by Philip Handler; "Appendix Strengthening academic capability for science throughout the nation" by Lyndon B. Johnson; and an introduction by Frederick Seitz.

**Small Angle Scattering from Fibrous and Partially Order Systems.** Based on an American Chemical Society symposium (Detroit, Mich.), May 1965. R. H. Marchessault, Ed. Interscience (Wiley), New York, 1966. 173 pp. Illus. Paper, \$7. *Journal of Polymer Science*, pt. C, Polymer Symposia, No. 13. This volume is an expanded version of the contributions which were read at the symposium and which appeared in the American Chemical Society *Polymer Preprints*, vol. 6, No. 1 (1965). Nine papers: "The-

ory of light scattering from oriented and fiber structures" by R. S. Stein, P. Erhardt, J. J. van Aartsen, S. Clough, and M. Rhodes; "Small angle light scattering from deformed spherulites. Theory and its experimental verification" by Robert J. Samuels; "Quantitative studies of ringed spherulite deformation in polyethylene films" by Robert S. Moore and Chester Gieniewski; "Light scattering from polymer films" by M. L. Wallach; "A new technique for observing light-scattering patterns from polymer films" by Robert S. Moore and Chester Gieniewski; "Characterization of cellulose gels by small angle light scattering" by E. V. Beebe, R. L. Coalson, and R. H. Marchessault; "Small angle scattering by a three-component system. Testing the theory for light scattering" by R. L. Coalson, R. H. Marchessault, and A. Peterlin; "Chain folding in oriented nylon 66 fibers" by Paden F. Dismore and W. O. Statton; and "Small angle x-ray scattering from bulk crystalline polymers" by P. H. Geil.

**Space Research: Directions for the Future.** Report of a study by the Space Science Board, Woods Hole, Mass. Harry H. Hess, Chairman. Natl. Acad. of Sciences—Natl. Research Council, Washington, D.C., 1966. 651 pp. Illus. Paper, \$7.50. Report of a Summer Study at Woods Hole, Mass., June-July 1965.

**Statistical Association Methods for Mechanized Documentation.** Symposium proceedings (Washington, D.C.), March 1964. Mary Elizabeth Stevens, Vincent E. Giuliano, and Laurence B. Heilprin, Eds. National Bureau of Standards, Washington, D.C., 1965 (order from Superintendent of Documents, Washington, D.C.). 269 pp. Illus. \$2.75. Twenty-seven papers on the following topics: Background and Principles (6 papers); Models and Methods (10 papers); Applications to Citation Indexing (3 papers); and Tests, Evaluation Methodology, and Criticisms (8 papers).

**Stress-Corrosion Cracking of Titanium.** A symposium (Seattle, Wash.), October-November 1965. American Soc. for Testing and Materials, Philadelphia, 1966. 269 pp. Illus. \$14; members, \$9.80. Thirteen papers.

**Surface Chemistry.** Proceedings of the Second Scandinavian Symposium on Surface Activity (Stockholm), November 1964, sponsored by The Royal Swedish Academy of Engineering Sciences. Per Ekwall, Kjell Groth, and Vera Runnström-Reio, Eds. Academic Press, New York, 1965. 315 pp. Illus. \$15.50. Twenty-five papers.

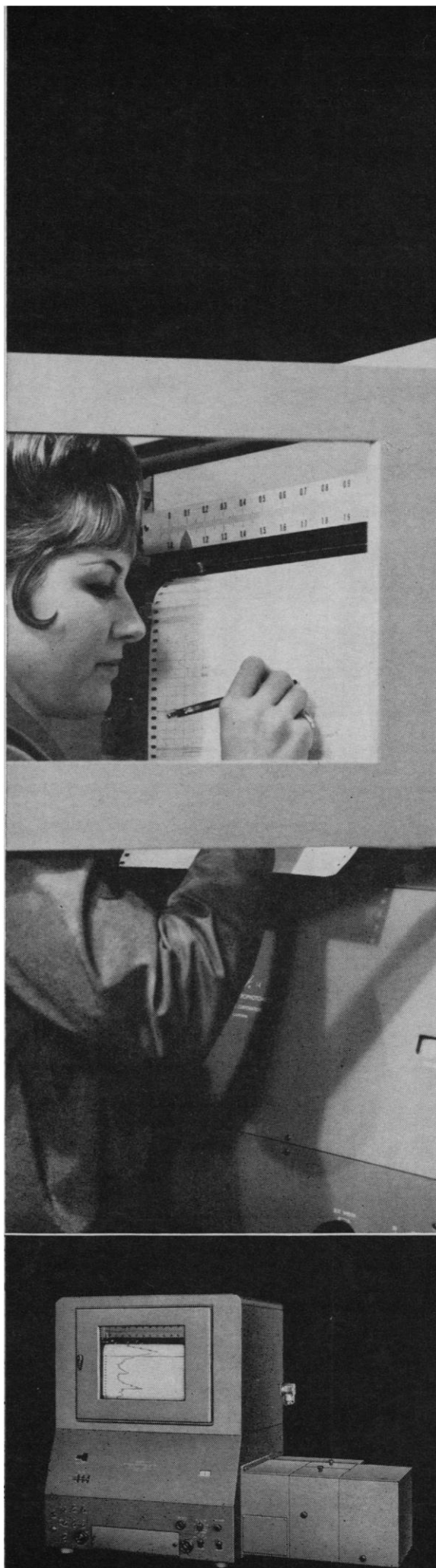
**Symmetry Principles at High Energy.** Third Conference (Coral Gables, Fla.), January 1966. Arnold Perlmutter, Joseph Wojtaszek, George Sudarshan, and Behram Kurzunoglu, Eds. Freeman, San Francisco, 1966. 288 pp. Illus. Paper, \$6.50. Nineteen papers.

**Technical Information Center Administration.** vol. 2. Report of the second conference (St. David's, Pa.), June 1965. Arthur W. Elias, Ed. Spartan Books, Washington, D.C., 1965. 175 pp. \$6.75. Thirteen papers.

**Technological Innovation and Society.** Columbia Univ. Seminar on Technology and Social Change, 1965. Dean Morse and Aaron W. Warner, Eds. Columbia



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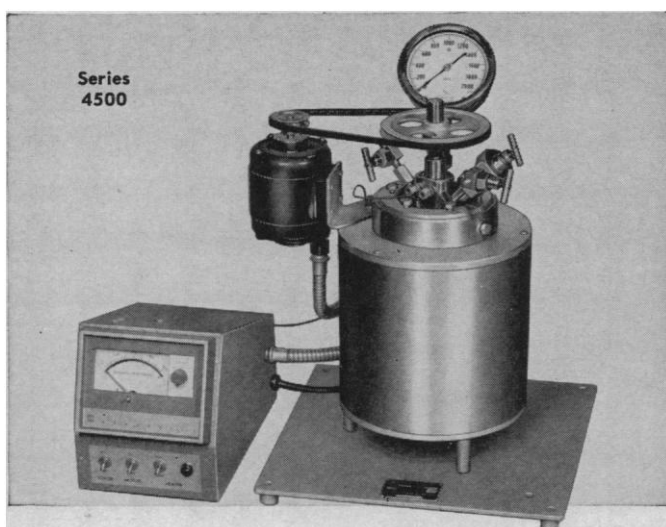
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