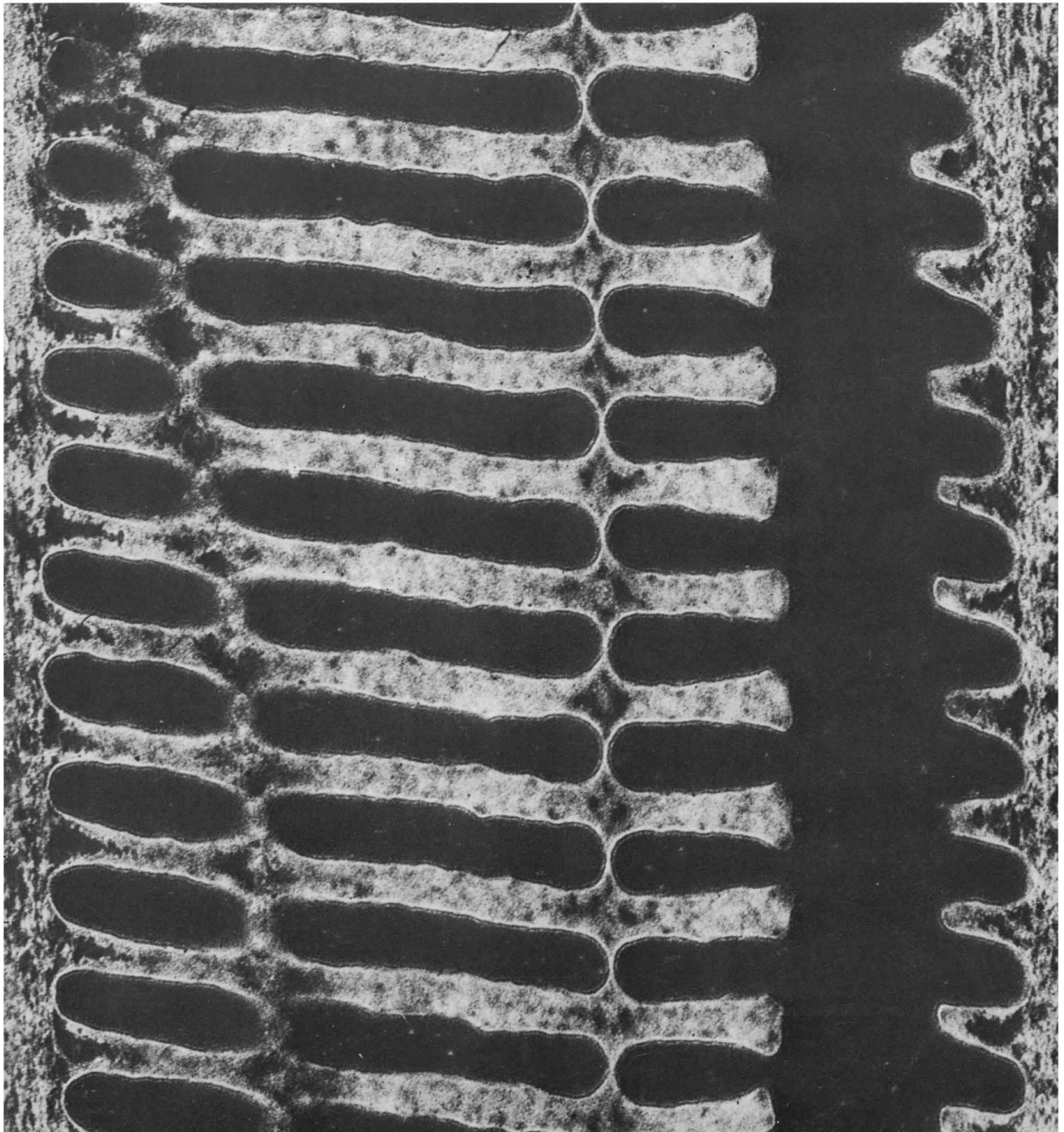


# SCIENCE

15 November 1968

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## COVER

Tapetum lucidum of a butterfly ommatidium which shows blue eyeshine. Air spaces (black) and cytoplasmic platelets in this interference filter each are one-quarter wavelength in thickness in their respective mediums for the eyeshine hue. Tapetal reflection increases intensity in rhabdom for a band of hues, thus enhancing selected color contrasts. (Negative print of electron micrograph, about  $\times 100,000$ ). See page 760. [W. H. Miller and G. D. Bernard, Yale University School of Medicine, New Haven, Connecticut]

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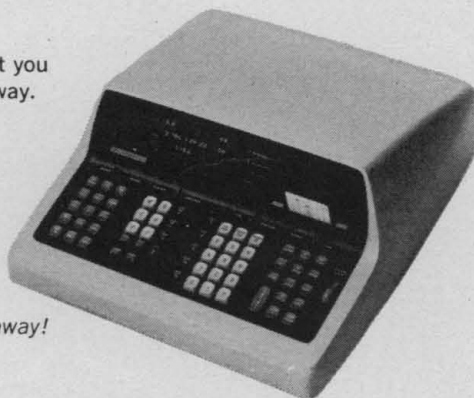
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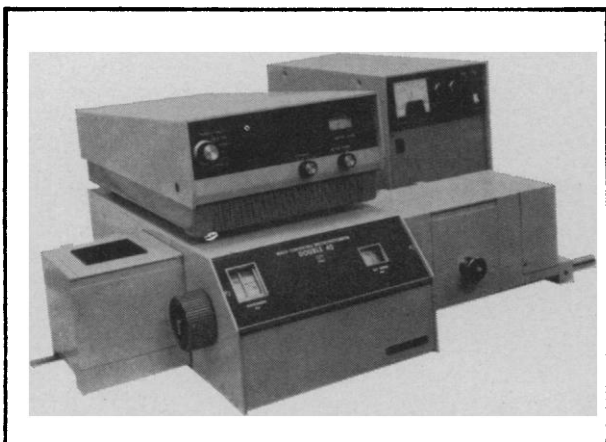


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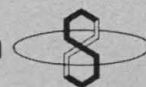
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**Editor: N. C. Brady**

476 pages, bibliography, author and subject indexes, 1967.  
Price: \$13.50. AAAS members' cash orders: \$11.50.

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## AGRICULTURAL SCIENCES FOR THE DEVELOPING NATIONS

**Editor: A. H. Moseman**

232 pp., 37 illus., bibliog., index, 1964.  
Price \$6.75. AAAS members' cash orders: \$6.00.

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## GROUND LEVEL CLIMATOLOGY

**Editor: Robert H. Shaw**

408 pp., 144 illus., bibliog., index, 1967.  
Price: \$12.50. AAAS members' cash orders: \$10.50.

*Ground Level Climatology* consists of twenty papers dealing generally with the theme of weather and agriculture (including forestry) and specifically with the climate closely surrounding plants and animals—the microclimate. Investigators in the field of ground level climatology seek to understand the complex relationships between living organisms and their environment: the relation of climate to the distribution and abundance of plants and animals; the effects of weather modification on physical processes within the microclimate; and the effects of moisture, temperature, and energy balance on physiological functions.

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**Editor: Ralph E. Hodgson**

394 pp., 59 illus., bibliog., index, 1961.  
Price: \$9.75. AAAS members' cash orders: \$8.50.

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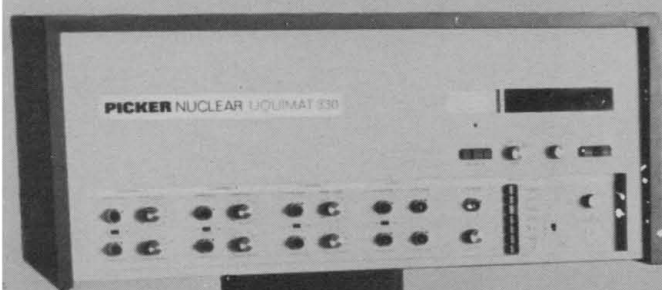
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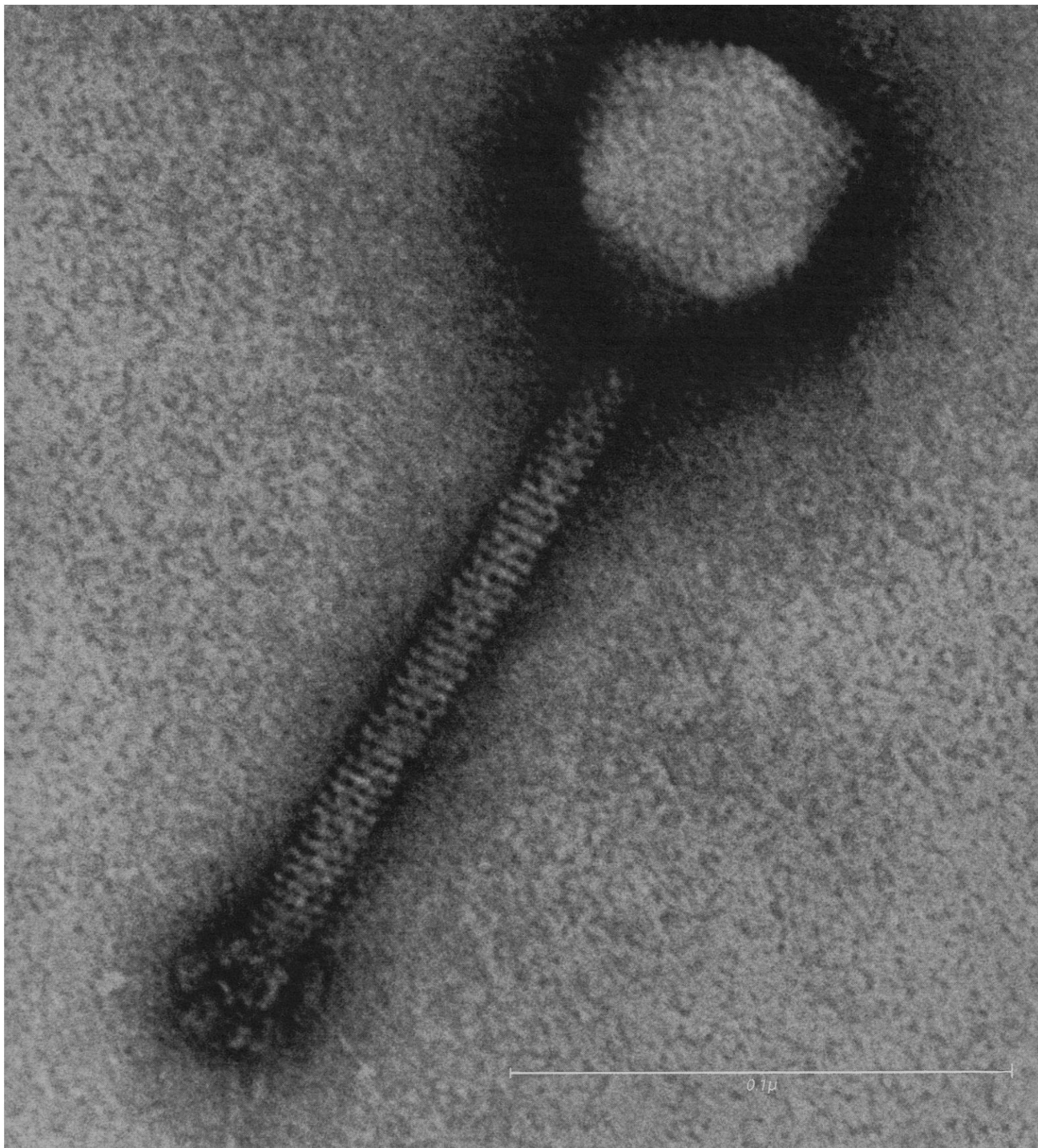
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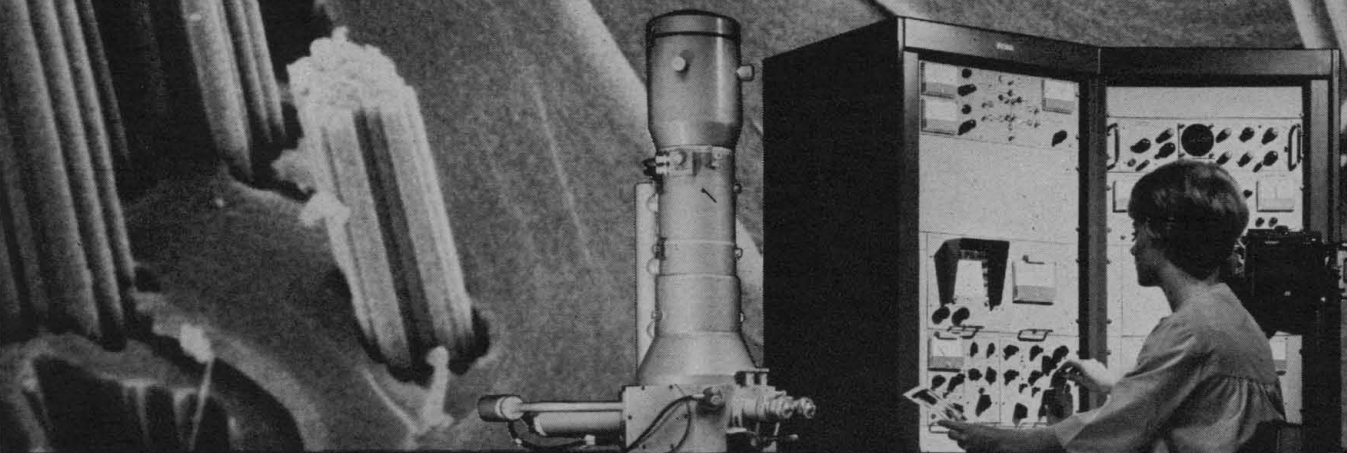
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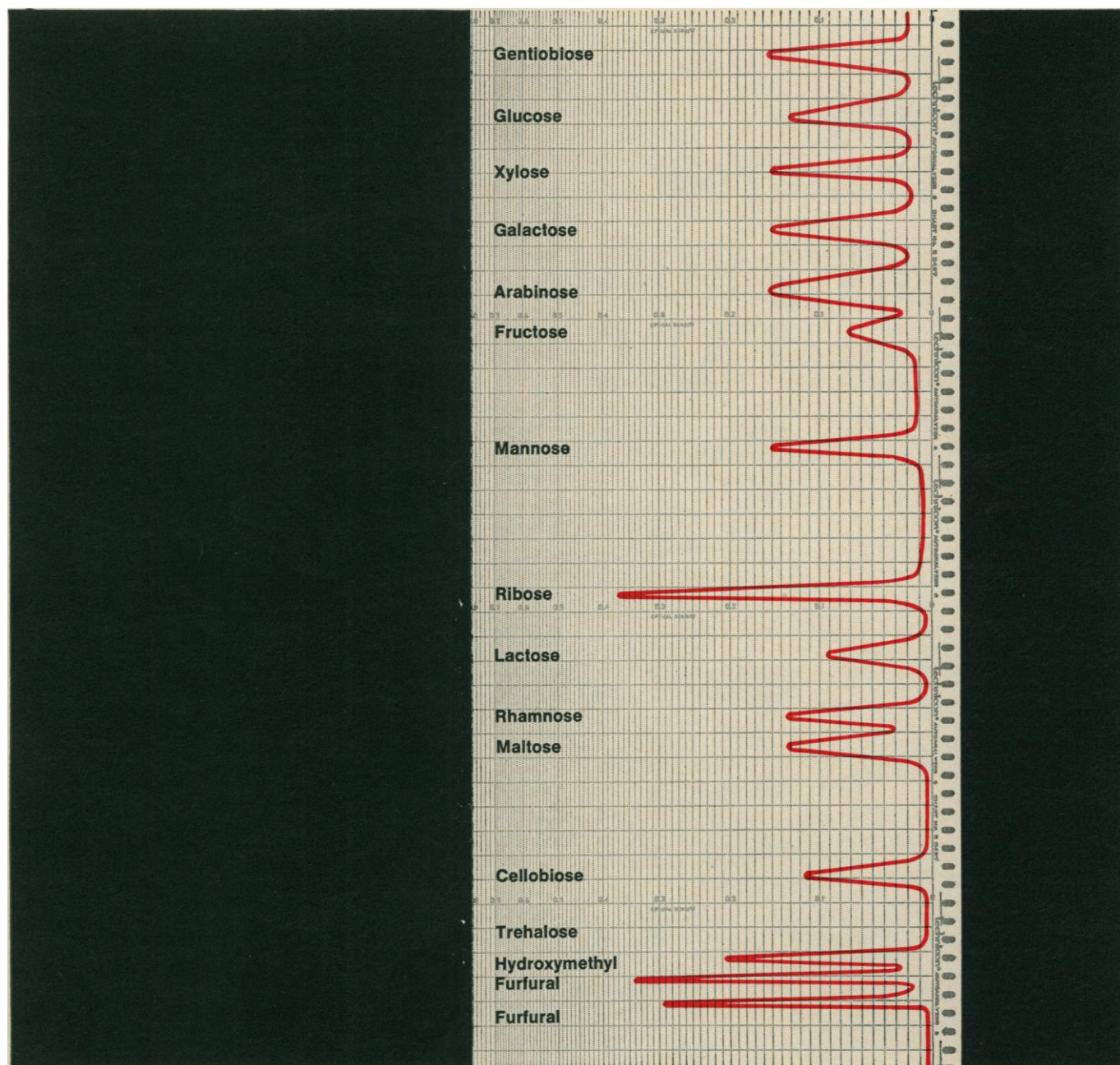


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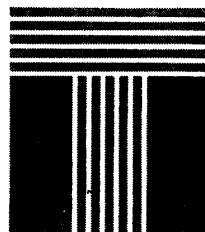


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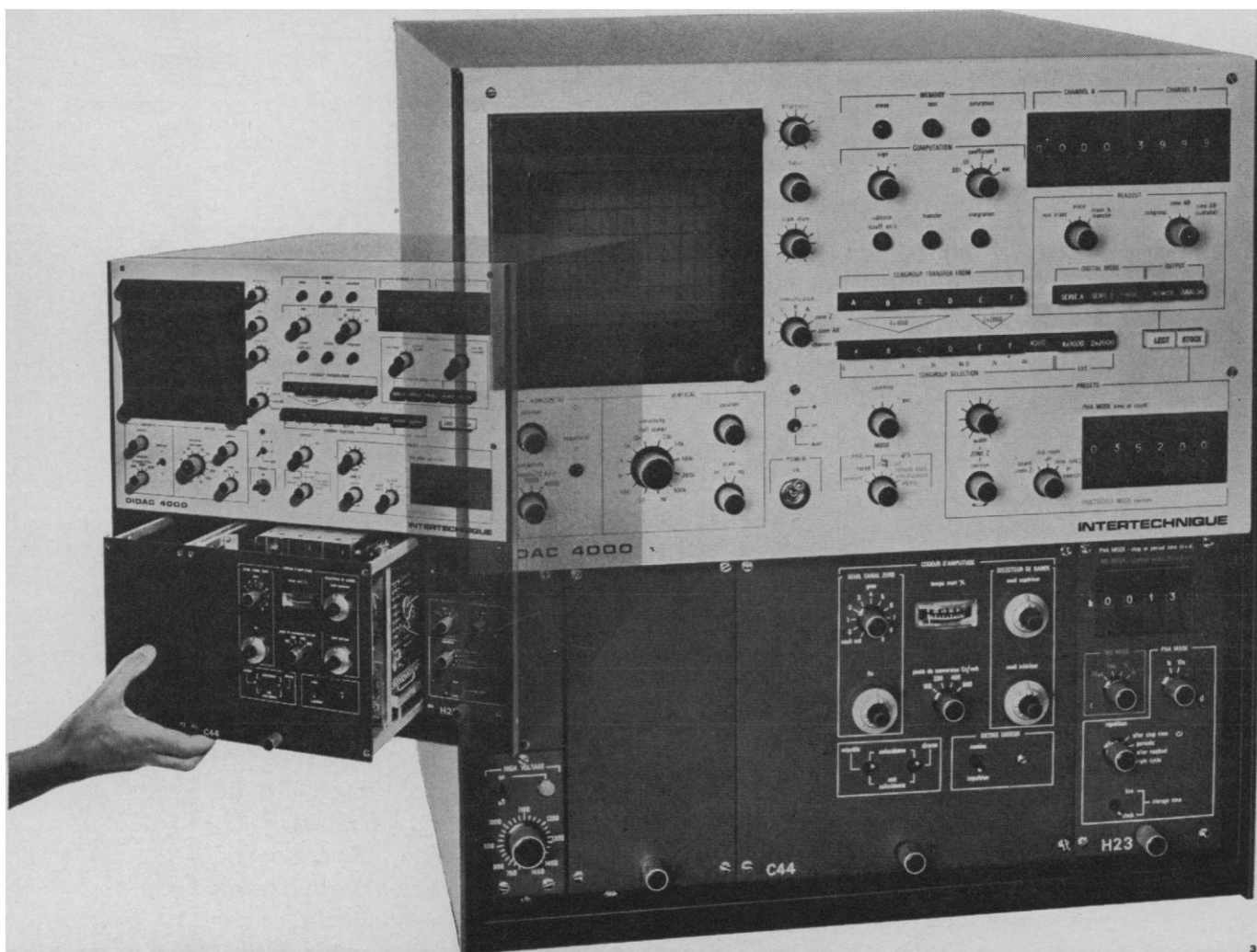
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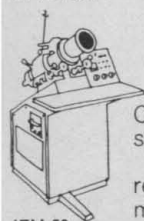
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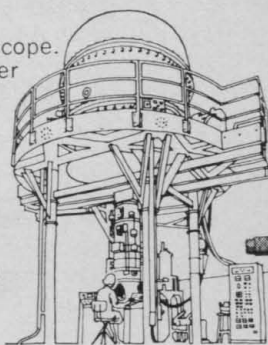
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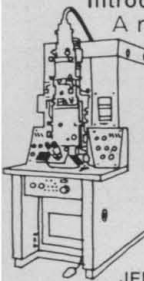
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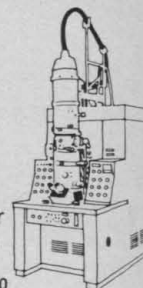


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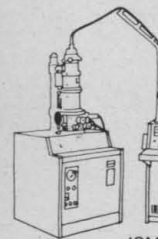
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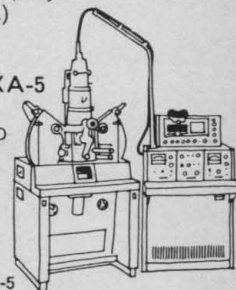
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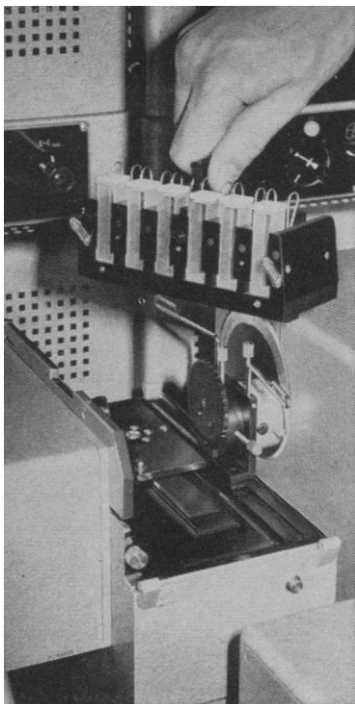
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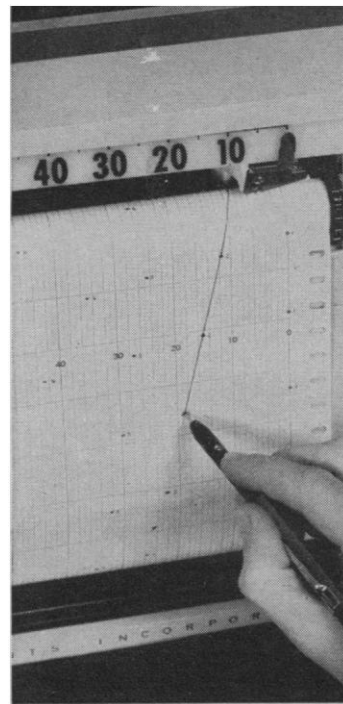
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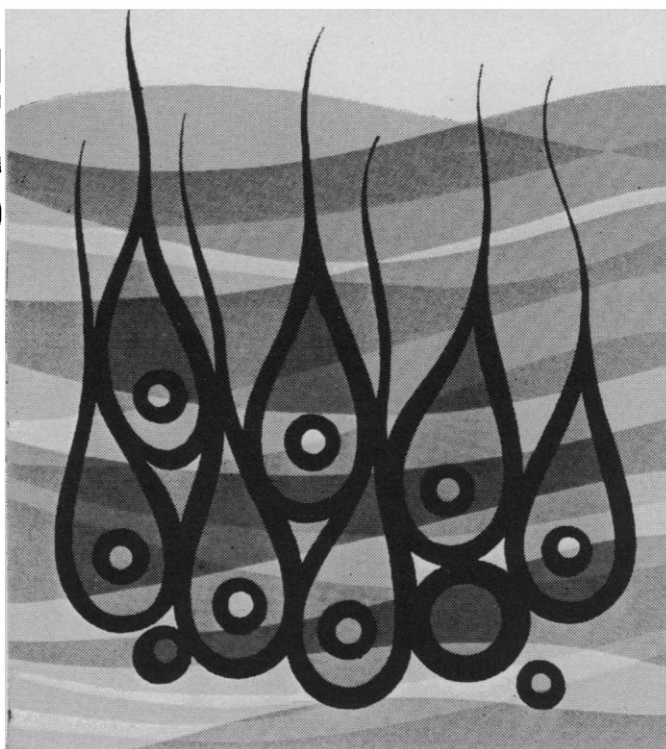
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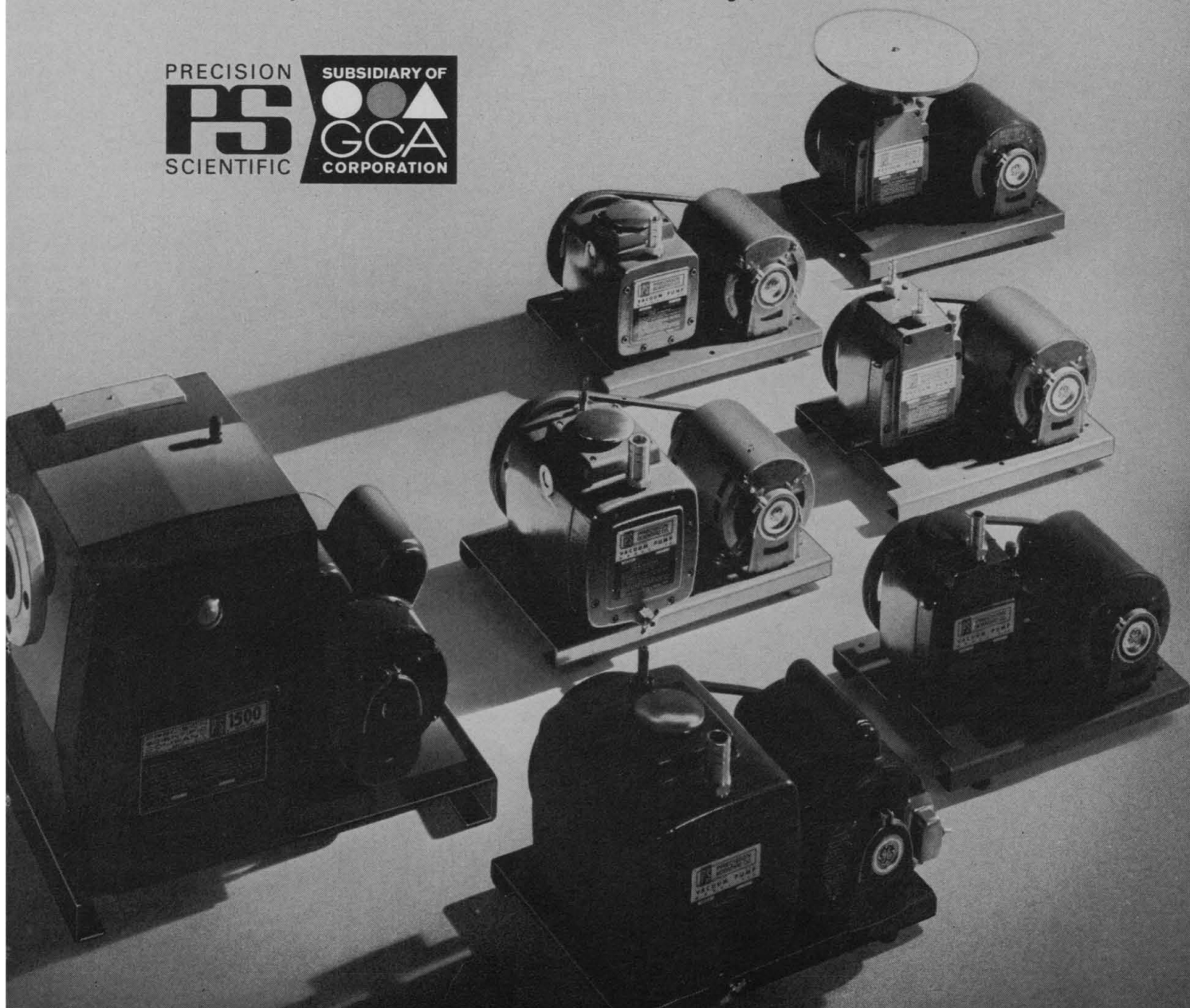
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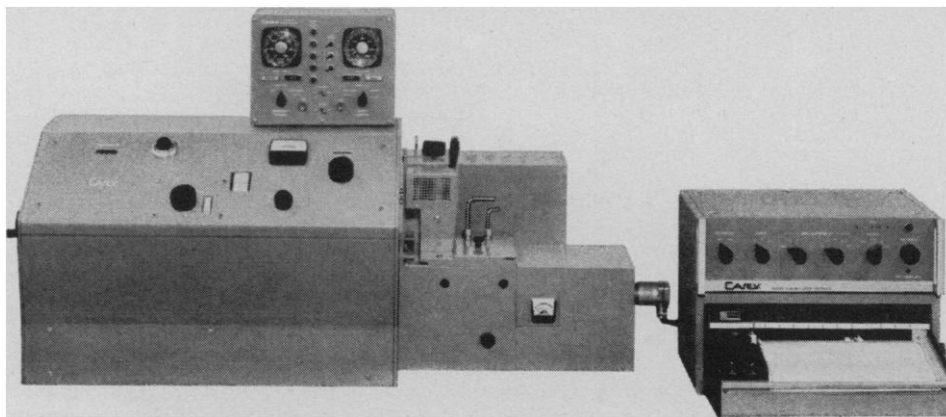
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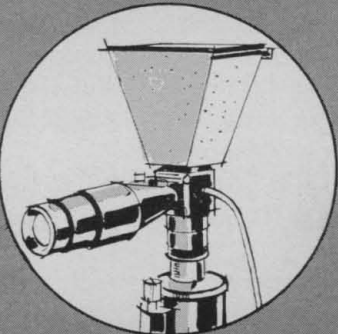
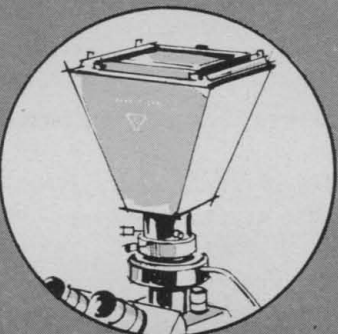
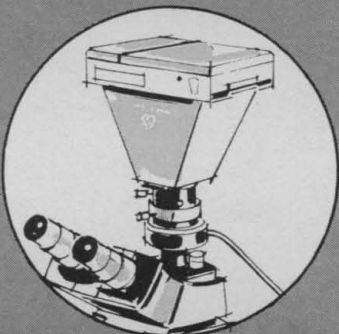
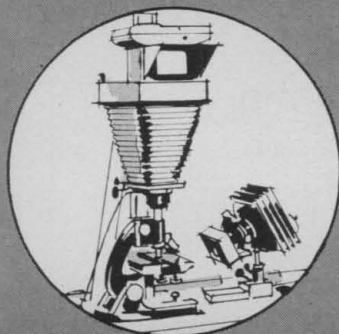
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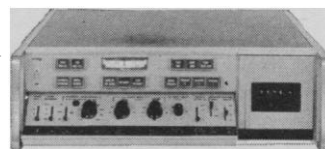
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Chartered buses will provide round-trip transportation from the Statler-Hilton Hotel. Afternoon tours will return to the Statler-Hilton Hotel no later than 6 p.m. Ticket sales are limited to registrants. A fee of \$2.00 per person is charged for each tour to cover transportation costs. Your ticket is your receipt and is required for transportation and admission. Tickets will be mailed with the *Program* and convention badge. Advance registration for tours will not be accepted after 29 November. Tickets for spaces unsold by 29 November will be on sale at the AAAS Tours desk in the registration area at the Statler-Hilton Hotel, starting 26 December.

Please use the form to register for tours. Indicate the number of tickets you wish to order for each tour and enclose payment of \$2.00 for each ticket ordered.

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Number  
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Total number of tickets ..... Total amount remitted for tours \$.....

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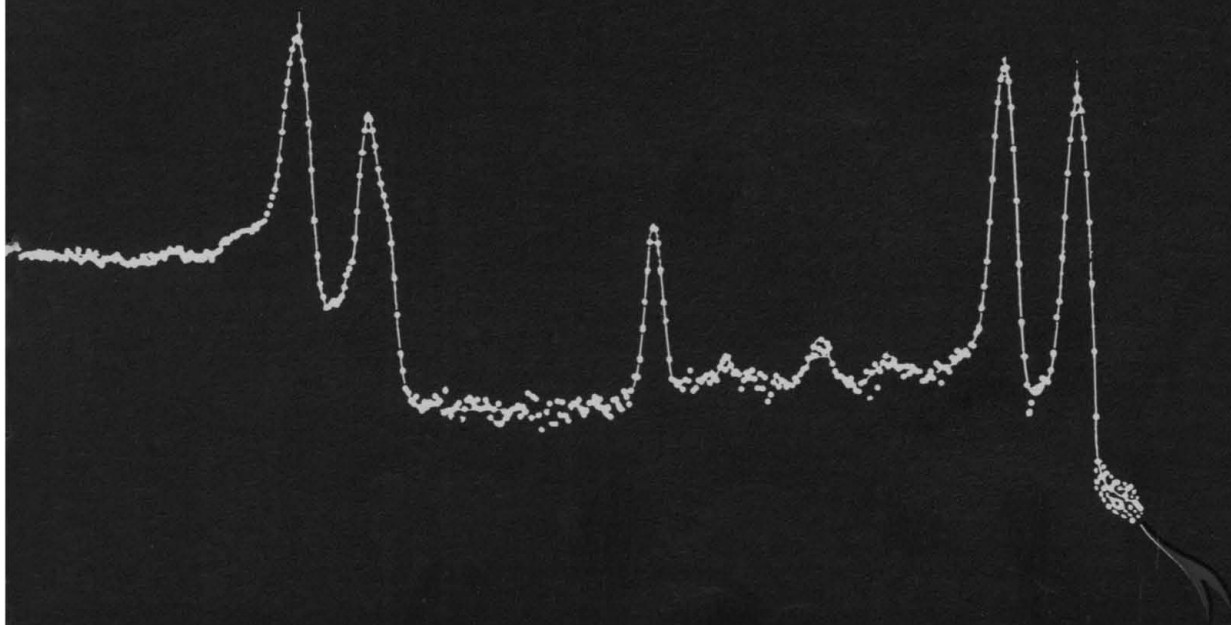
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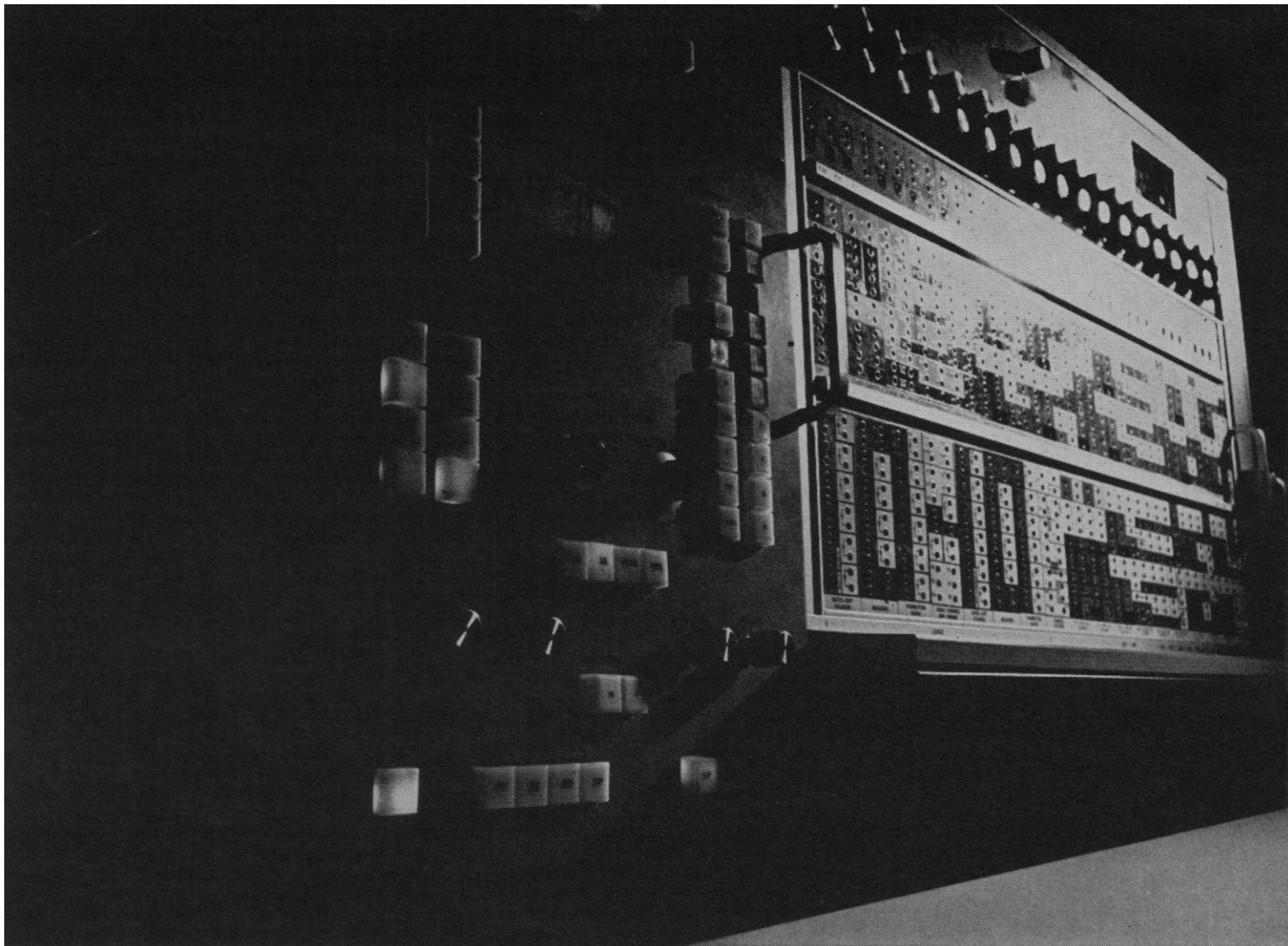
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# Our new analog/hybrid computer is 11,461 years old.

Which is one way of saying that the economical new EAI 380 10-volt analog/hybrid computer has been designed out of the experience of some 2000 EAI computers operational anywhere from 10 years to last week.

With its expandable logic, this versatile, flexible machine provides for the first time, in a low-cost portable format, the capability to study the dynamics of physical systems too complex for simplified analytical models. And unlike other methods, it allows *direct* interaction between investigator and the system.

The 380, both in component interchangeability and in slaving in multi-console operation is compatible with the thoroughly-proven EAI family of 10-V computers. That means

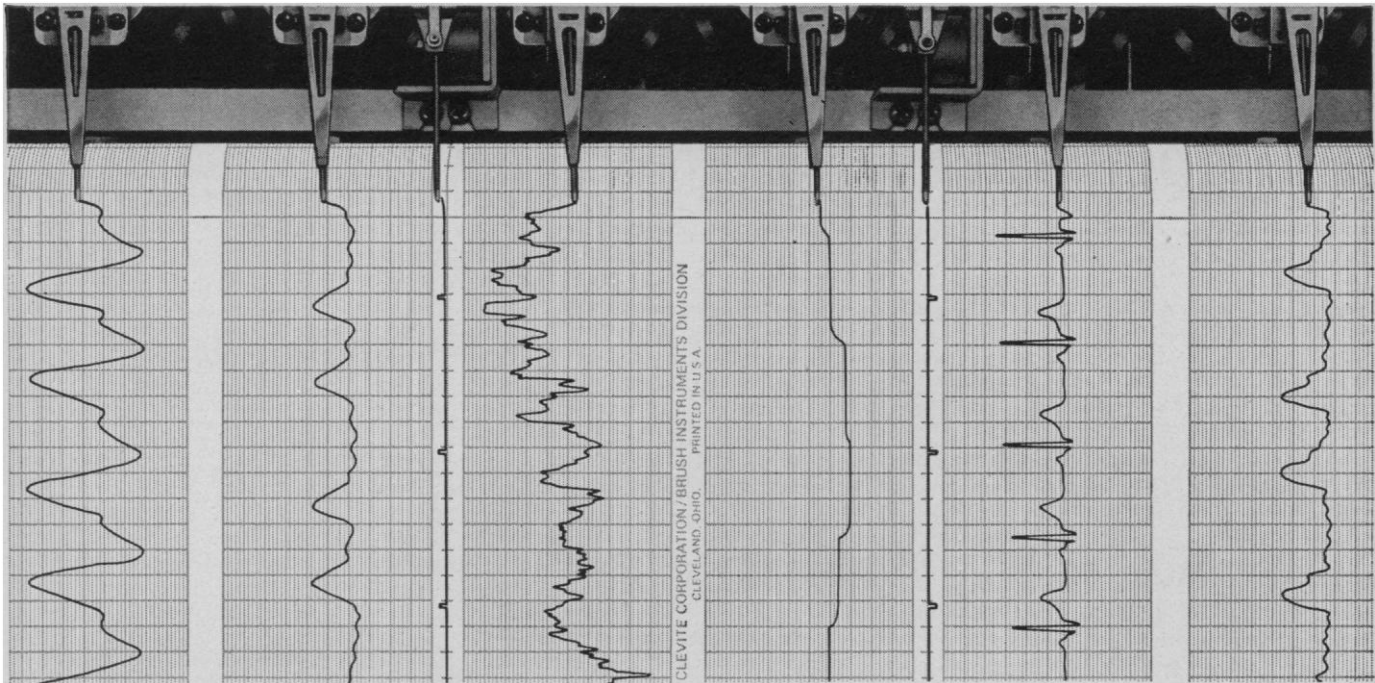
many benefits in reliability and economy.

Highlights of important features: Expand economically from 10 amplifiers to 50 with plug-in ease. Amplifiers operate at full scale over entire 100-KHz bandwidth. Built-in 3½-digit DVM with decimal. Program panel designed to take advantage of time-saving, error-reducing multi-pin bottle plugs. Basic system includes electronic mode control, two-mode timer, over-range hold/store capabilities. Easy-to-use sophisticated MPFGs. Multi-channel and X-Y recorders and rep-op scope for readout.

Whether you're thinking about a new computer or about upgrading your lab, find out first about the new 380. Better still, ask for a demonstration—on your own desk top!

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Close-up of a Brush medical recorder shows trace clarity, sharpness and high resolution that contribute to superb accuracy of Brush instruments.

## Brush medical recorders deliver more physiology and less fooling than any other make you can buy

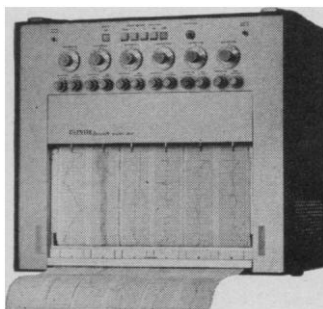
We take the fooling out of recording . . . both kinds: the deceptive traces which result from intermingling physiology with artifact, and the need to fool with calibration controls. Unlike ordinary medical recorders, the calibration of Brush recorders remains constant regardless of baseline position, attenuator setting, or gain. Test after test, year after year.

More physiology and less artifact. That's what Brush delivers.

In addition, Brush medical recorders maintain specified system accuracy from one edge of the chart to the other and at *all points* in between.

You can believe the high degree of resolution and system accuracy only when you see some physiological wave forms actually recorded on a Brush instrument. Write for your set of samples.

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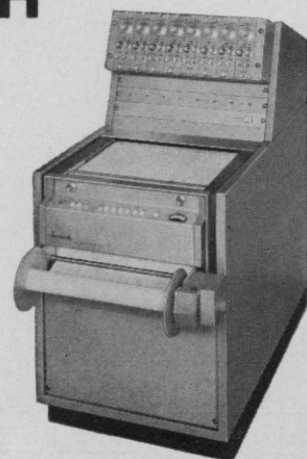


### CLEVITE BRUSH

There are Brush medical recorders with 1, 2, 3, 4, 5, 6, 7, and 8 channels for physiological data acquisition. Illustrated are the Mark 200 lowboy and the Mark 260.

The Mark 200 lowboy (right) is an eight-channel system that combines solid-state electronics with modular construction to economically meet your specific requirements. Choice of channel widths and biomedical front ends. Range of chart speeds 0.05 to 200 mm/sec. Patented pressure-fluid writing system.

The Mark 260 (left) is a high-performance portable recorder at half the big-system price. Six analog channels and four event channels. Features the Brush patented pressure-fluid system. Frequency response: 70 Hz at 0.5 full scale; 40 Hz at full scale.





# Six important reasons why Brush medical recorders are best for physiological data acquisition

## 1. Self-calibrating

Brush medical recorders are factory calibrated with instrument standards one step removed from The National Bureau of Standards. Unlike ordinary recorders, they stay that way, test after test, year after year, regardless of baseline position, attenuation, or gain setting.

## 2. More Physiology

We take the fooling out of recording . . . both kinds: the deceptive traces which result from intermingling physiology with artifact, and the need to fool with calibration controls.

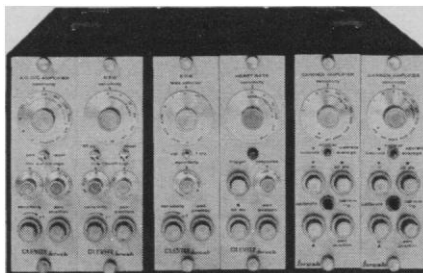
## 3. Wide Application

Brush data acquisition systems will accommodate a wide variety of physiological parameters, including:

Ballistocardiogram, Blood Pressure, Cardiac Output, Cerebral Potentials, Electrocardiogram, Electroencephalogram, Electrogastrogram, Electromyogram, Electroretinogram, Flow Rate, Gas Concentration, Gas Diffusion, Heart Rate, Muscle Contractions, Nystagmogram, Partial Gas Pressures, Phonocardiogram, Plethysmogram, Pulmonary Capacity, Pulse Waves, Respiration Rate, Smooth-muscle Potential, Temperature, Vectorcardiogram.

## 4. Choice of Front Ends

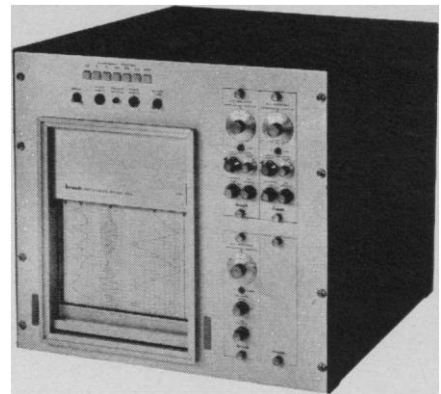
Brush's variety of bio-medical front ends can link nearly all physiological signal sources to any display device. All have broadband frequency response (to 10 kHz), a property which



not only preserves wave-form fidelity, but, combined with high power output, provides ample capability to drive tape recorders, oscilloscopes, digital counters, computers, and oscillographs. Or any combination at the same time.

## 5. High Performance

Physiological monitoring station at NASA's Manned Space Center, Houston, incorporates three 8-channel Brush Mark-200 recorders—one for each Apollo astronaut—for continuous display of ECG, respiration, blood pressure, and body temperature dur-



The Mark 240 is a smaller version of the Mark 200 series and therefore displays biophysical data with the fidelity required for exacting research. Choose from two 80-mm channels, four 40-mm, or a 3-channel combination.

ing flight. Telemetered data comes to Houston from stations around the world.



## 6. Quality Built

Ever since Brush introduced the direct-writing electrocardiograph in 1937 (its crystal penmotor was the first major improvement on Einthoven's string galvanometer), Brush recorders have been the quality standard of the industry.

From component production to system testing, modern Brush medical recorders are built to aerospace standards. No wonder Brush analog recorders are always used *whenever the data is important*.

# CLEVITE BRUSH

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Title \_\_\_\_\_

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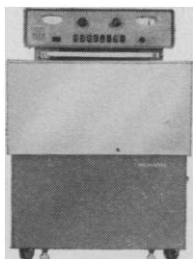
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**PLEASE SEND THIS  
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PHYSIOLOGICAL  
OSCILLOGRAMS  
(actual recordings.)**

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# SORVALL®

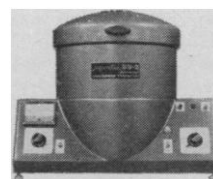
## CENTRIFUGES & LABORATORY INSTRUMENTS



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**SS-1 SUPERSPEED ANGLE CENTRIFUGE** — 16,000 RPM — 31,000 x G. The original concept in Superspeed Angle Centrifuges. The SS-1 was the first "work horse" of the busy laboratory. Performance and reliability are built-in features.



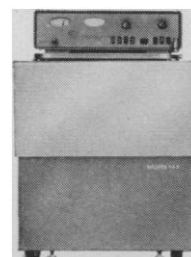
**SS-3 AUTOMATIC SUPERSPEED CENTRIFUGE** — 17,000 RPM — 34,800 x G with standard 8 x 50 ml SS-34 Rotor. Easily the most advanced table-top centrifuge available today. Designed for the busy laboratory. Six Rotors — more under development.



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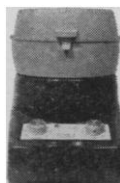
**SMALL & MEDIUM CENTRIFUGES** — versatile, inexpensive instruments offering a motor base that accepts two 35° angle rotors. Up to 3,440 x G. For routine laboratory centrifuging.



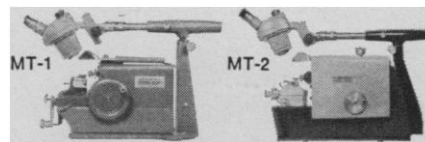
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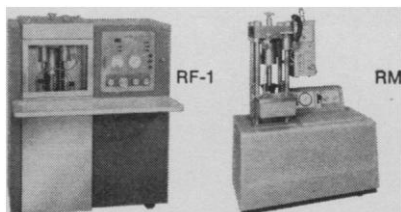
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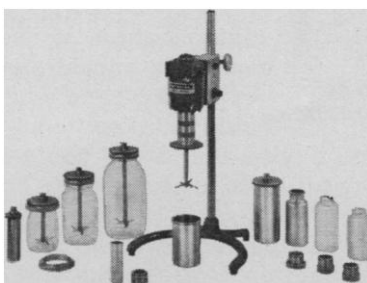
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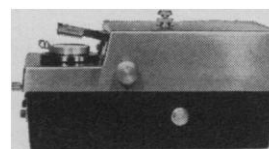
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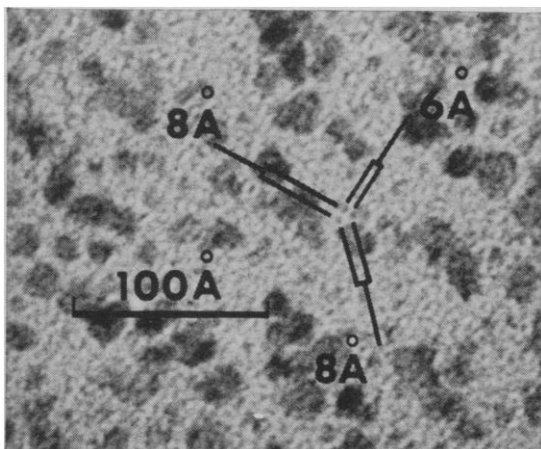
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Evaporated gold specimen shows a point-to-point resolution of 6 to 8 Å. Magnification is 2,500,000X.

Here's an instrument that's so easy to align, so easy to use, so compact and reliable, that it far surpasses all other instruments in its price class. It offers high resolution and automatic operation.

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The Hitachi Perkin-Elmer HS-8 is the only instrument in its price range that gives you two accelerating voltages—25 KV for high contrast and 50 KV for general purpose use—at the

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It's the only instrument in its class that has a double condenser lens. The double condenser and objective-intermediate lenses are unitized and pre-aligned.

The HS-8 gives you 20 precalibrated steps of magnification with direct console readout —1000X to 100,000X direct . . . over 1,000,000 photographically. A special, small, fine-grain screen makes focusing easy.

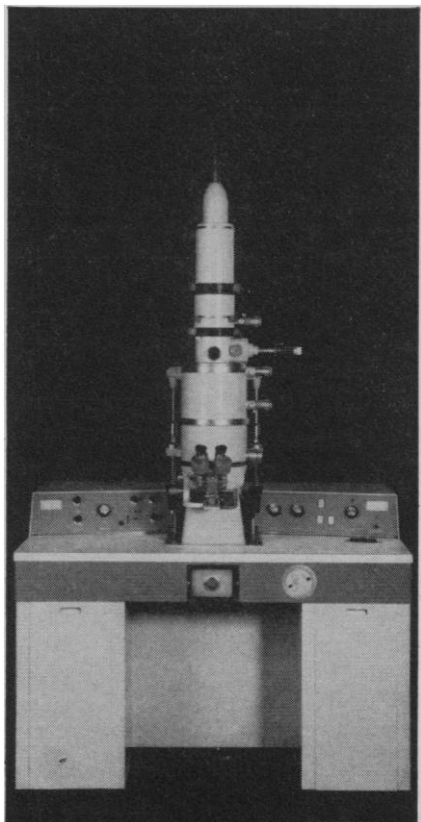
The HS-8 has a new pushbutton vacuum system that practically eliminates specimen contamination. It uses a new non-backstreaming pump oil and a new built in anti-contamination device that traps contamination before it reaches the specimen.

The camera system is also pushbutton. Correct exposure is automatic. You get a pre-pump chamber that can keep 54 photo plates under vacuum, ready for use.

We'd like you to know more about this fine new microscope. In its price range, you won't find an instrument with more consistent high performance or more of the outstanding features

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While its millions of uniform pores are comparable in size to those of other membrane filters, flow rates through a Sartorius are up to ten percent faster. If you do continuous filtrations, this may mean considerable savings in time. More important, there's really no need to worry about extractables when you use a Sartorius. With commonly used solvents, there are virtually none (no more than 0.3 percent).

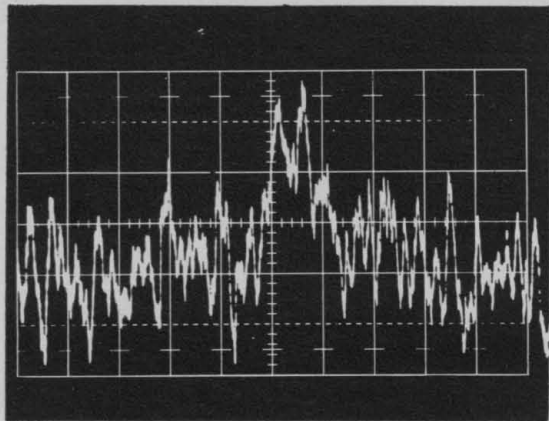
Do these characteristics make Sartorius a 'better' membrane filter? That's for you to decide, but you'll never know without trying them. Besides, whether you use membrane filters for particle collection, separation or analysis, isn't it nice to know that when it comes to selecting a membrane filter, at last you really have a choice?

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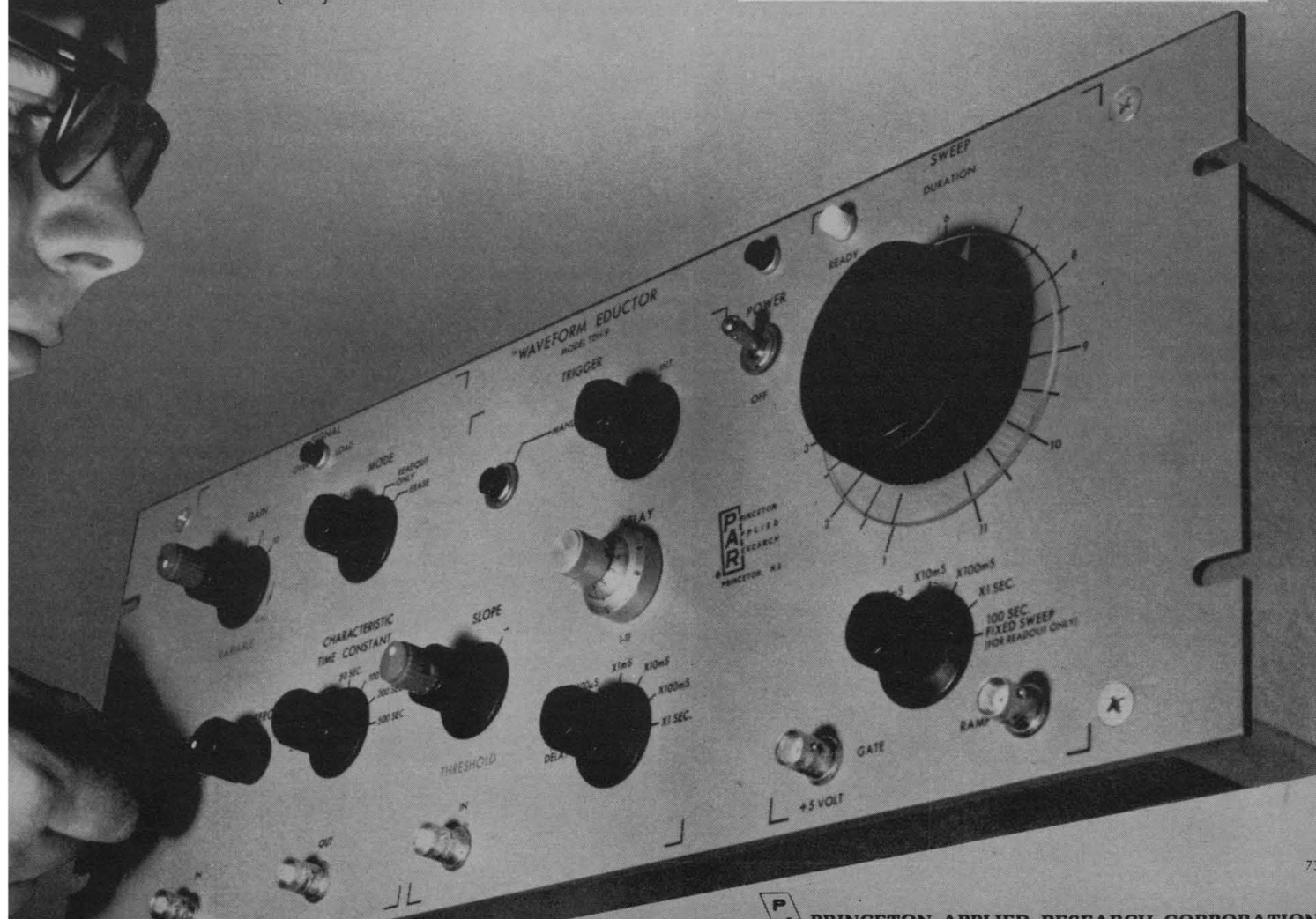
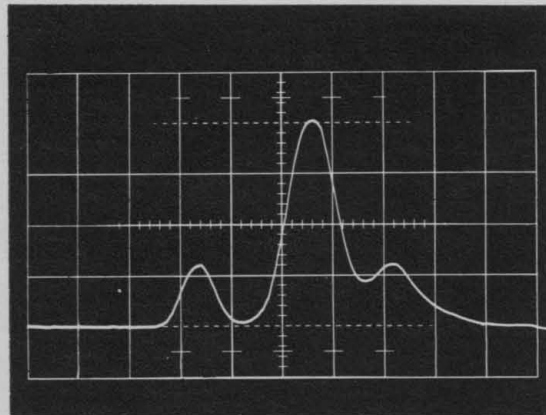


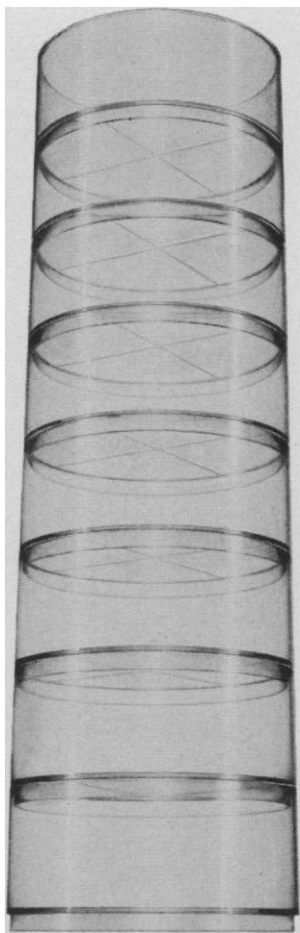
# Noisy Signal?



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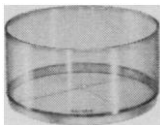
The PAR Waveform Educator is a signal averager used to extract repetitive signals from noise. For complete information or to arrange a demonstration of this instrument, which is priced at only \$4,200, write Princeton Applied Research Corporation, P.O. Box 565, Princeton, New Jersey 08540, or call (609) 924-6835.





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inations while under the influence of stimulatory and depressant drugs? Should we take urine samples or blood samples from those achieving the highest scores? Should we take urine samples from all the students and select several for evaluation? And then, how much of the drug is too much? What are the proper educational standards? How can we compare drugged and nondrugged students?

And this also—how can we turn out professionally trained doctors, lawyers, engineers, and architects whose learning periods were framed by a border of tranquilizers and whose test periods were flown through on stimulants? Can a doctor who spent his clinical years on tranquilizers maintain the standards established by those free from these drugs?

We need standards for this problem. *They are not being developed.* The student counselors steadily tranquilize nervous sophomores—without controls and without study of the effect of these drugs on the individual during the time of his schooling and later in his career.

GILBERT E. CORRIGAN  
*Department of Pathology, University of Texas Medical Branch, Galveston*

### A Pretty Kettle of Fish

With reference to the cover (13 Sept.), all I can say is Holy Mackerel!

FRANCIS V. HOWELL  
*Post Office Box 1965,  
La Jolla, California 92037*

... Fish may have many local names but to transplant Boston mackerel from New England to the Pacific Ocean and name them Pacific salmon is jolting. I caught enough Boston mackerel during the time I worked on a seine boat in Maine to recognize one even if mislabeled.

D. W. FRANCIS  
*Department of Poultry Science,  
New Mexico State University,  
University Park 88070*

### Eternity of Print

On reading Dael Wolffe's editorial, "The next Rosetta Stone" (6 Sept., p. 967), I was reminded of an inscription in the market place of Haarlem, Holland, carved on the home of Lourens Janszoon Coster (who, it is still con-

tended by a dwindling few, was the true inventor of printing with movable type): *Memoriae sacrum typographia, ars artium omnium conservatrix* . . . which has since been modified to the more familiar and more euphonious "Printing: the art preservative of all the arts."

While Wolffe rightly emphasizes the question of information content of any "Rosetta Stone" we may leave for scholars of future civilizations, he also raises the interesting point of the medium of language communication between "lost" civilizations. Future scholars digging into the remains of our world in search of some meaningful communication symbols will undoubtedly have to do their research without the help of contemporary linguistics' sophisticated equipment for recording and analyzing oral language. They will have to rely—as today's paleographers must—on remnants of our *visible* language.

Visible language may be an unfamiliar distinction. Linguists were early to stake out oral language as being the only meaningful province for language research. Indeed, it would be improper to speak of visible language, since all but a few linguists consider any written or printed medium of communication as only a system of visual signs with which language is *symbolized*.

The study of visible language is fragmented, an academic orphan, and only in the first stages of international organization. Omnipresent as letter forms and related symbols are today, we are conducting relatively little research on them; much basic information and theory is yet to be determined. What, for example, constitutes the "g-ness" of the scores of differently shaped letter g's you see as you page through the advertisements of this number of *Science*? Could we isolate the nature of a prototype "g"? Or, what is behind the contemporary artist's fascination with letter forms? The answer may be reflected in the emphasis the program committee for the AAAS Annual Meeting this year has placed on the interaction between art and science (three general symposia are scheduled: Arts and Science—will there be a difference? Interface—art and technology, and Art and Science—the analysis of communication of form). Since its earliest beginnings, the alphabet has provided a meeting ground for such an interaction. No educated person can look at letter forms without encountering two conflicting stimuli: the *meaning*

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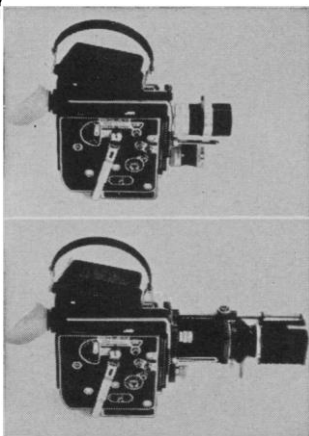
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**BOLEX**  
Bolex H-16 Rex 5,  
The Microbe Hunter.

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of the letters (the underlying "g-ness") and the form of the letters (the presence of genius)—in other words, a convergence of reason and beauty.

Certainly the more immediate communication problems in our own society take precedence, but if we hope to save future civilizations some of the ambiguity our contemporaries find in ancient language remains, an important part of this concern should be more careful analysis and understanding of what may well be our only link with the distant future—our visible language.

MERALD E. WROLSTAD

Journal of Typographic Research,  
Cleveland Museum of Art,  
Cleveland, Ohio 44106

### First AIBS National Biological Congress

The American Institute of Biological Sciences, at its recent meeting, passed a resolution to hold national biological congresses in 1970, 1971, and 1972. The first will be held in Detroit, 6-10 November 1970, under the chairmanship of William D. McElroy of Johns Hopkins University. The congresses will be concerned with various social, educational, and scientific problems with the morning sessions devoted to interdisciplinary symposia covering the major scientific advances in all areas of biology. National and international leaders in the biomedical sciences will be invited to participate. Afternoon sessions will be devoted to papers by biologists who are active in research in areas ranging from molecular, genetic, and developmental biology to evolutionary, ecological, and environmental sciences. Younger scientists will be invited to contribute original research papers on the subjects covered by the major symposia. The evening session, to be open to the public, will be designed to provide a forum in which the interrelationships of biology, technology, society, and public affairs are considered. National, state, and local leaders will be invited to participate. Among the topics to be considered are water and air pollution, pest control, population pressures, community health, food quality, and the effects of drugs on human development and behavior. Ideas are needed for other topics that might be considered.

Programs of lectures, exhibits, and organized tours will be arranged for

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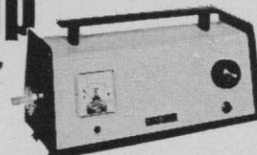


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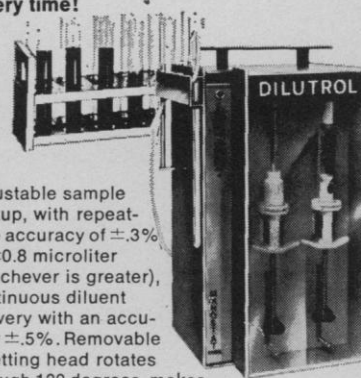
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local high school and college students who are interested in careers in the biomedical sciences.

The National Biological Congress will not supplant the regular AIBS meetings, which will continue to be held on college campuses in late August. The 1969 meeting will be at the University of Vermont, Burlington, 17-22 August, and the 1970 meeting will be held at Indiana University, Bloomington, 23-28 August.

JOHN R. OLIVE

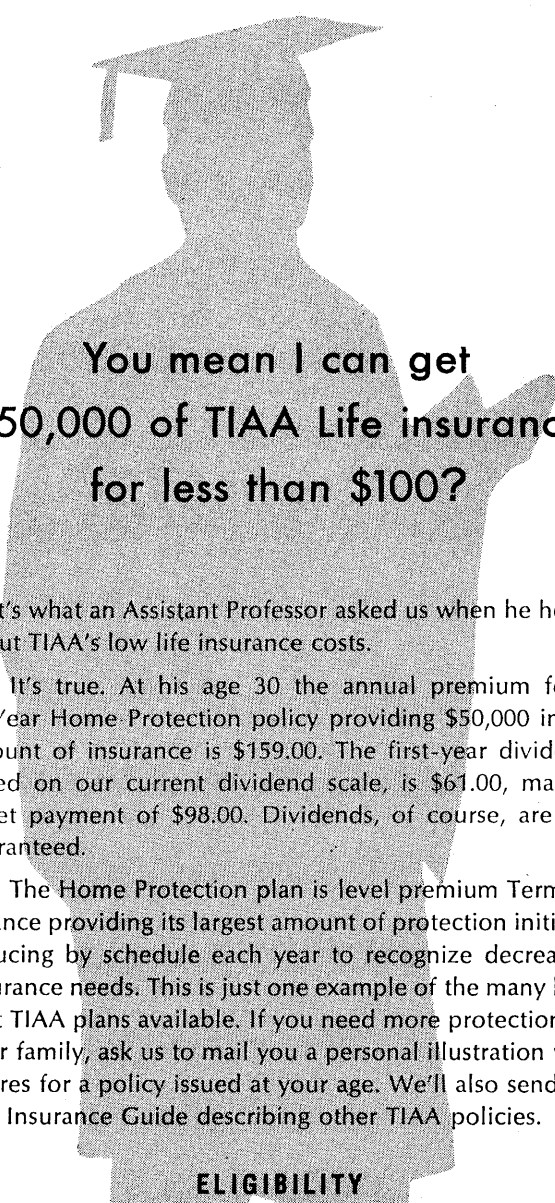
*American Institute of Biological Sciences, 3900 Wisconsin Avenue, NW, Washington, D.C. 20016*

### New Roles for Pharmacology

Maren has presented a case for greater medical school support and recognition for pharmacology departments ("Pharmacology: Its nature in medicine," 2 Aug., p. 443). Perhaps pharmacology can make one of its greatest contributions by helping prepare many health professionals for roles in total health care. It seems unlikely that future health care demands will be filled merely by turning out more health professionals. Even if we could do this, we must find ways of better utilizing those health professionals that we have and will train.

Pharmacy is at last making some strong effort to prepare its young graduates to make a more significant contribution to patient care. The pharmacy student during his 5 (or 6) years of academic training has the greatest exposure to drugs—their use and misuse—of any health professional. The average curriculum well prepares the pharmacy student in the natural sciences and, increasingly, in the biological sciences. A key course prior to his clinical pharmacy experience is pharmacology. It is the fortunate pharmacy school that has the optimal type of pharmacology courses which aid its students in preparing for their roles as "drug-use control" specialists. More and newly designed pharmacology courses are now needed.

Perhaps pharmacologists can find the additional recognition which I believe they deserve if they look beyond their traditional roles in medical schools and determine the needed contributions which they can make to *all* the health sciences (dentistry, medicine, pharmacy, nursing, veterinary medicine). This will take courage and a realistic look at



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health care needs. It also will take a change in attitude toward the nongraduate teaching programs. A meaningful contribution will earn pharmacology departments the recognition they seek. We in the other health sciences will welcome their increased interest.

L. C. WEAVER

*College of Pharmacy, University of Minnesota, Minneapolis 55455*

### **Impudence Displaces Discipline**

The title of Carter's article, "Making of a president: Stanford students decry lack of voice" (20 Sept., p. 1229), is evidence of the currently distorted idea of the role of students in our institutions of higher learning. I noted the impudent statement of a Stanford student leader regarding the choice of Kenneth S. Pitzer as university president, a selection which was made without any participation by student representatives.

Students are in college to get an education, not to tell their elders how to run the school. It is typical of youngsters growing up for them to think they know more than their parents and even their teachers. But discipline, the most important factor in education, is the antidote for this impudence. If the young don't learn discipline at home or in school, they will learn it in the workaday world in a measure of cruelty beyond their capacity to withstand.

GEORGE EVERSON

*Azalean, Gualala, California 95445*

### **Bioenergetics: Birth of a Bulletin**

At a recent Gordon Research Conference on Energy Coupling Mechanisms held in New Hampshire, it was decided to establish a means of rapid and informal communication among workers in the field of bioenergetics, including electron transfer, oxidative phosphorylation, photosynthesis and photophosphorylation, associated energy-linked functions, biogenesis of mitochondria and chloroplasts, and related topics.

A scientific memorandum to be called *Bioenergetics Bulletin* will be circulated monthly and will contain summaries of research results and papers submitted for publication in regular journals, conceptual insights into bioenergetic

phenomena with or without factual bases, requests for information, summaries of meetings which only a fraction of the workers in bioenergetics are able to attend, news of artifacts arising from commercial samples of biochemicals containing contaminants, and so forth, as well as reports of controversial research which might not otherwise come to the attention of other interested parties. Communications from participating members of the group should not exceed two typewritten pages. This service is expected to begin at the end of November 1968.

Information presented in *Bioenergetics Bulletin* will be treated as a private, nonquotable communication, although this restriction will be considered by the group members at a later date. It should be stressed that the success of such a venture depends almost entirely upon the eagerness with which members will be willing to supply information to their colleagues through such a medium.

The initial annual subscription rate will be \$20 (U.S.) or 8 pounds, 8 shillings (British), according to the region of the subscriber, and checks should be made out to *Bioenergetics Bulletin*. It is hoped that the cost will be lowered in subsequent years. Membership is open to individuals and groups of workers, but groups should designate an individual to whom *Bioenergetics Bulletin* should be addressed. Inquiries and subscriptions from areas of the Western Hemisphere should be addressed to me; and those from remaining areas should be directed to R. B. Beechey, Shell Research Ltd., Woodstock Agricultural Research Centre, Sittingbourne, Kent, England.

ROBERT E. BEYER

Laboratory of Chemical Biology,  
Department of Zoology, University of  
Michigan, Ann Arbor 48104

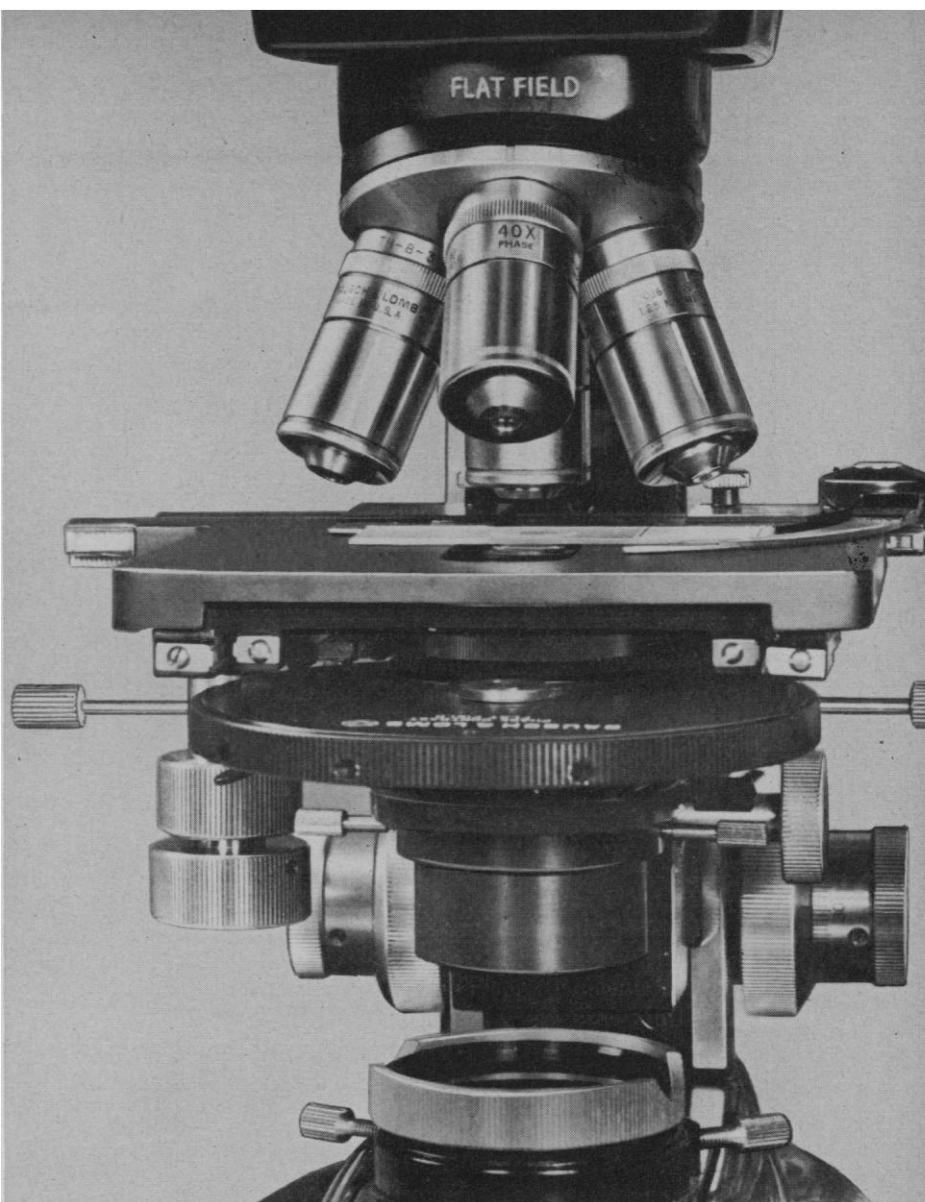
### Einstein Memorabilia

I have been commissioned by British, American, and Continental publishers to write a life of Albert Einstein which will deal not only with his scientific work, but with his influence on contemporary affairs. I would be grateful to hear from readers who have letters from him, reminiscences, or other material which would be relevant to the book.

RONALD W. CLARK

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15 NOVEMBER 1968



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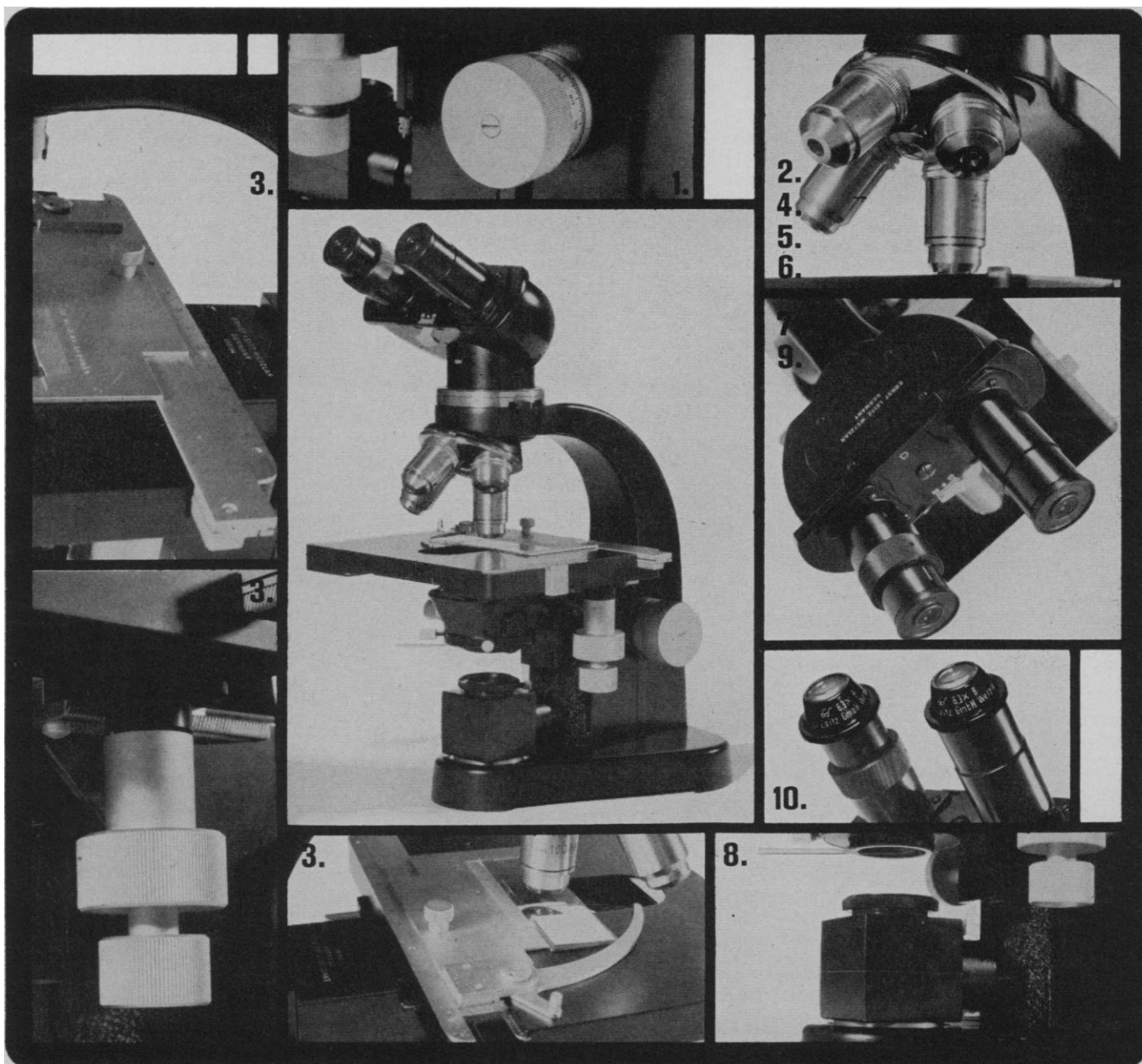
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## The Administration of NASA

The retirement of James E. Webb as Administrator of the National Aeronautics and Space Administration has evoked a flurry of congressional and newspaper tributes to his leadership of the space agency for the past 7½ years. Most of the compliments have been directed to the achievements in space that preceded and led up to the recent successful mission of Apollo 7. But not all have had this emphasis. Senator Holland spoke of "an outstanding accomplishment of management," and Congressman Albert hailed Webb as "one of the finest administrators in the history of this country." It is the administrative history of NASA that Webb himself emphasized in an address at Harvard a few days before his retirement. He spoke not of what NASA had done but of how it had been accomplished. This emphasis is consistent with his long-standing personal interest in organizational problems and administrative methods, his service to the American Society for Public Administration and the Municipal Manpower Commission, and his policy of opening NASA's offices and records to study by advanced students who wanted to learn how NASA worked.

In terms of numbers of dollars or of men, NASA has not been our largest national undertaking, but in terms of complexity, rate of growth, and technological sophistication it has been unique. Involved have been a government headquarters and widely dispersed set of laboratories and technological facilities; some 20,000 industrial contractors, subcontractors, and suppliers; almost 400,000 nongovernmental workers; and faculty members and students at 200 universities. Keeping all of these parts—often working right at the edge of technological knowledge and capacity—finely tuned and in close harmony has been an organizational achievement of high order.

How NASA accomplished its missions should be of interest to the planners and directors of other great national undertakings. Many of the large problems that confront us—for example, health care, the control of pollution, and the remaking of our urban living and working accommodations—differ from those of the space program in focusing on people rather than on rockets and space vehicles. And already there are protests against thinking of social problems as engineering tasks or in terms of technological models. True enough, human welfare is the objective, and the customs, the values, and even the idiosyncrasies and prejudices of man must influence means as well as ends. But the social programs, like the space program, call for management structures linking government, industry, and universities. The new programs will involve research, planning, coordination, and testing. And they will be bothered by multiple divisions of responsibility, conflicting ambitions and interests, decisions to use existing facilities or to assemble new ones, multiple channels of communication and authority, and the problems of building up and of phasing down as priorities shift to new targets or as new opportunities open up. In all of these respects NASA has had extensive and recent experience; its procedures have been deliberately thought out; and its records are available.

Ever since the space program began to take shape there has been talk of technological spin-offs. It may turn out that the most valuable spin-off of all will be human rather than technological: better knowledge of how to plan, coordinate, and monitor the multitudinous and varied activities of the organizations required to accomplish great social undertakings.—DAEL WOLFLE

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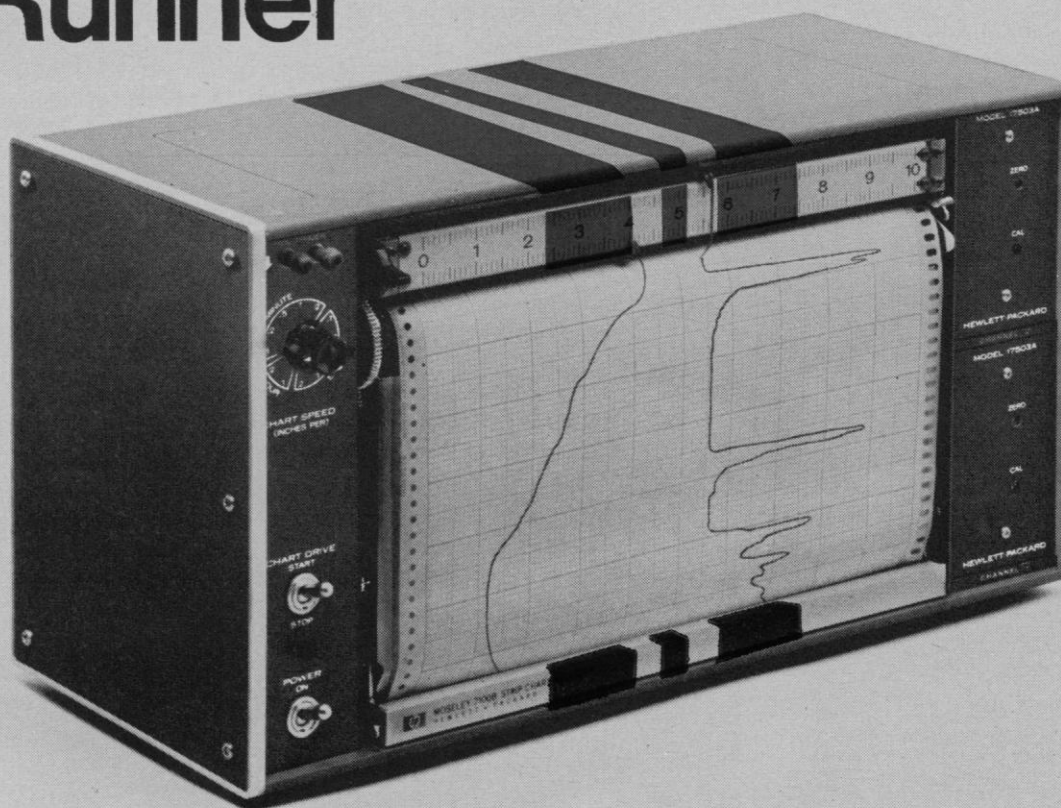
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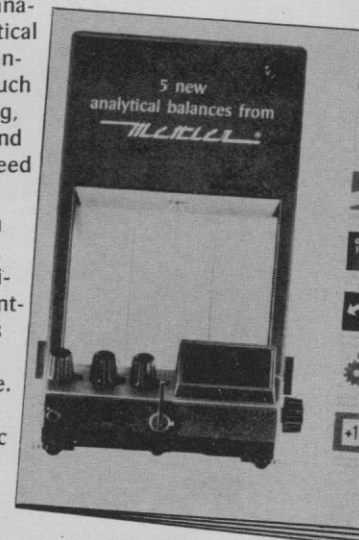
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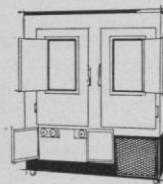
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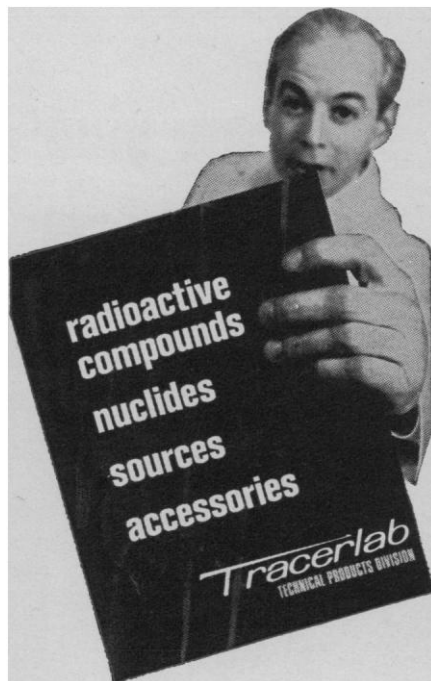
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neutral beams is that of neutralizing the charge from ionic beams without disturbing the momentum of the traveling species. N. Utterback (Defense Research Laboratory, General Motors Corp., Santa Barbara) reviewed this topic in a session chaired by E. Greene (Brown University). Using charge transfer, Utterback and his collaborators have produced neutral beams from the high-energy range down to a few electron volts. They have successfully studied several reactions, avoiding the problem of detecting neutrals by choosing processes yielding ionic products. If resonant charge transfer is used, it appears that the internal energy state of the resulting neutral beam can be reasonably well controlled. (Talroze's talk had already made it clear that resonant transfer processes were common and occurred with large cross sections.) L. M. Branscomb (Joint Institute for Laboratory Astrophysics) discussed possibilities of producing neutral beams by photoelectron detachment from negative ions. This technique should become useful when more intense lasers and negative ion beams are developed. In competition with positive-ion-neutralization methods this technique has potential advantages at low energies, at high angular resolution and when excited-state control in the initial beam is needed.

A partial solution to the detection problem is inherent in experiments being performed by J. Paulus (Centre de Recherches Nucléaire, Strasbourg), S. Wexler (Argonne National Laboratory), and M. Menzinger and R. Wolfgang (University of Colorado). They have used beams labeled with radioisotopes to detect labeled products by radioactivity counting. The Colorado group reported experiments in which a tritium ion beam was charge exchanged and reacted with a solid target. By this means they found it possible to make the first determinations of the thresholds of hot-atom displacement reactions. Given the availability of radioisotopes of useful half-life, this detection method could have wide applicability. An even more general, indeed universal, method of detection is reionization of neutrals by electrons or protons. So far, however, such reionizers only operate with low efficiency.

J. Ross (MIT) was chairman of a session in which nozzle expansion techniques were discussed. This method, growing out of a suggestion by Kantrowitz and Grey, has been more intensively investigated than any other

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for the production of neutral beams. J. Fenn (Yale University) reviewed the topic, emphasizing "seeding" methods in which a heavy species is swept along by lighter "driver" molecules, thus increasing its translational energy. E. Knuth (UCLA) discussed means of reaching higher energies by plasma heating the gas before expansion. In general, nozzle expansion seems an excellent approach to the low- and medium-energy range (1 to 10 ev). It should provide intense beams and excellent energy control. However, the seeding technique is limited to heavier species, and high-temperature heating before expansion leaves some question as to the internal state of the beam molecules. At the time of the conference, no hot reaction appears to have been identified by using nozzle techniques. However, J. Deckers (University of Toronto) and J. Anderson (Princeton University) discussed some interesting negative results.

In a session conducted by E. Ferguson (ESSA, Boulder), L. Wharton (University of Chicago) first reviewed the historic device of Bull and Moon (University of Birmingham) which can claim the distinction of being the first chemical accelerator. Regretfully, this charming method of acceleration by slapping molecules with a spinning rotor seems limited to the low energies achieved by these pioneers. Wharton then reviewed the building of his accelerator for neutral species having permanent dipole moments or which are highly polarizable. Though expensive and time consuming in its construction, this is a most interesting machine. Cost considerations tend to limit the device to the acceleration of permanent dipolar molecules at low energies. However, it should have excellent energy control. Moreover it was the only concept discussed which inherently yields a polarized beam.

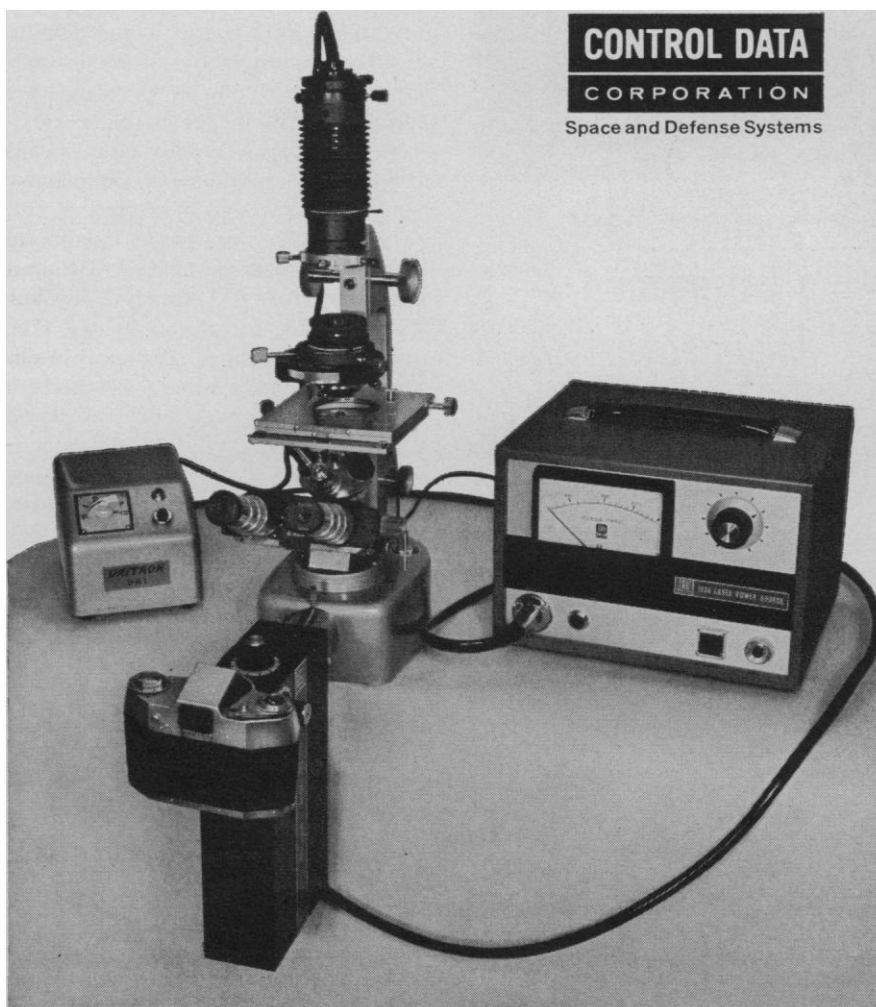
C. Schlier (University of Freiburg) and J. Los (FOM Institute, Amsterdam) discussed sputtering methods in which atoms are dislodged from surfaces by impact of high-energy ions. The atoms in the resulting spray have electron-volt energies, but their velocity distribution is so wide that a high-speed chopper is required to select a reasonably homogeneous beam. To date, sputtering has been used largely to study nonreactive scattering, but its future as a means of studying chemical reactions appears bright.

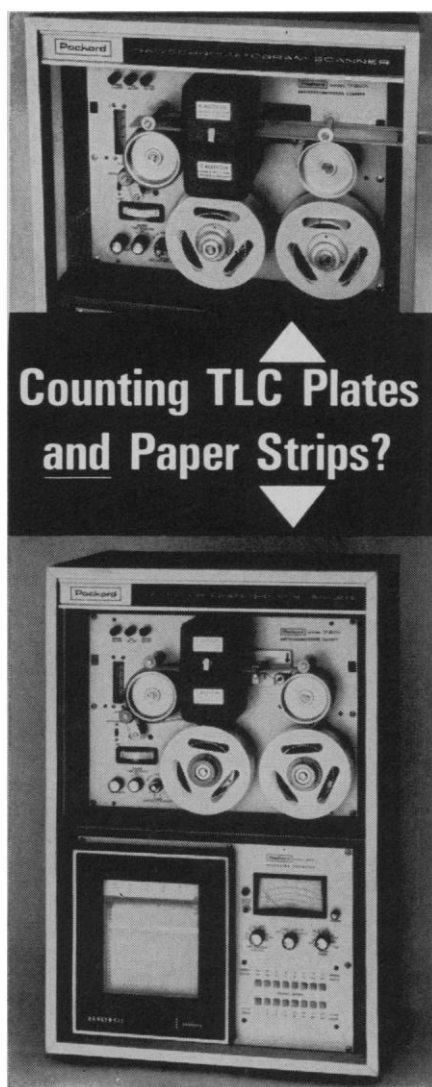
This does not exhaust the catalog of methods discussed at the meeting. For

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instance, D. Hansen (Thompson-Ramo-Woolridge) mentioned experiments aimed at producing bursts of fast atoms by volatilizing electrostatically accelerated dust particles with a laser pulse. And it seems certain that additional techniques will be developed in the future.

The meeting closed with a panel discussion led by I. Amdur (MIT). The panelists, R. Bernstein (University of Wisconsin), S. Datz (Oak Ridge National Laboratories), M. Karplus, A. Kupperman (California Institute of Technology), B. Mahan, and the undersigned organizing committee, discussed the problems and the prospects of the field. Much of the critical appraisal of the comparative merits of chemical accelerators, which has already been mentioned in this report, resulted from this session. Quite obviously the field is in its early infancy and the direction of its development is still far from evident. However, it was generally agreed that in the more distant future the production of beams having not only a high kinetic energy, but also in selected states of internal excitation, would be important. Just what combination of techniques will prove to be most useful in the next 10 years is something about which few participants were willing to speculate. One general conclusion seems quite clear; the field will grow rapidly now that its fundamental importance to elementary chemical kinetics has been recognized.

This conference was supported through a grant from the Advanced Research Projects Agency (Project DEFENDER), monitored by the U.S. Army Research Office, Durham, North Carolina, under contract DA-31-124-ARO-D-139.

R. WOLFGANG

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## Calendar of Events

### National Meetings

#### December

1. **Medical Aspects of Sports**, 10th, Miami Beach, Fla. (F. Hein, American Medical Assoc., Dept. of Health Education, 535 N. Dearborn St., Chicago, Ill.)

1. **American Acad. of Oral Medicine**, New York, N.Y. (S. Conrad, 133-28 228th St., Laurelton, N.Y. 11413)

1-4. **American Medical Assoc.**, Miami Beach, Fla. (F. J. L. Blasingame, 535 N. Dearborn St., Chicago, Ill. 60610)

1-4. **Reticuloendothelial Soc.**, 5th, New York, N.Y. (F. J. DiCarlo, Warner-Lambert Research Inst., Morris Plains, N.J. 07950)

1-5. **American Inst. of Chemical Engineers**, 61st, Los Angeles, Calif. (Secretary, 345 E. 47 St., New York 10017)

1-6. **Radiological Soc. of North America**, Chicago, Ill. (M. D. Frazer, 1744 S. 58 St., Lincoln, Neb. 68506)

2. **Quantum Chemistry**, 9th winter inst., Gainesville, Fla. (Winter Institute, 525 Nuclear Sciences Bldg., Univ. of Florida, Gainesville 32601)

2-3. **Applications of Simulation**, 2nd conf., New York, N.Y. (A. Ockene, IBM Corporation, 112 E. Post Road, White Plains, N.Y. 10601)

2-4. **New England Conf. on Air Pollution**, Waterville, Maine. (Director, Colby News Bureau, Colby College, Waterville 04901)

2-4. **Western National Geophysical Union**, San Francisco, Calif. (J. C. Harrison, Dept. of Geophysical Sciences, Univ. of Colorado, Boulder 80302)

2-6. **Greater New York Dental Mtg.**, 44th, New York, N.Y. (M. Purdy, Room 106A, Statler-Hilton, New York 10001)

3. **American Soc. of Therapeutic Radiologists**, Chicago, Ill. (J. A. del Regato, Penrose Cancer Hospital, 2215 N. Cascade, Colorado Springs, Colo. 80907)

3-4. **Vehicular Technology Conf.**, San Francisco, Calif. (W. G. Chaney, Lenkurt Electric, 1105 Country Rd., San Carlos, Calif. 94070)

3-5. **Entry Vehicle Systems and Technology Conf.**, Williamsburg, Va. (M. H. Bloom, Polytechnic Inst. of Brooklyn, Graduate Center, Route 110, Farmingdale, N.Y. 11735)

4-6. **Optical Character Recognition in Computerized Management of Information in the Next Decade**, Hollywood, Fla. (International Business Forms Industries, 20 Chevy Chase Circle, NW, Washington, D.C. 20015)

4-6. **Academy of Psychosomatic Medicine**, Miami Beach, Fla. (E. Dunlop, 150 Emory St., Attleboro, Mass. 02703)

4-7. **American Assoc. of Physicists in Medicine**, Chicago, Ill. (R. O. Gorsop, Stein Research Center, Jefferson Medical College, 920 Chancellor St., Philadelphia, Pa. 19107)

5-6. **American Rheumatism Assoc.**, Tucson, Ariz. (M. M. Walsh, 1212 Avenue of the Americas, New York 10036)

6-7. **American Federation for Clinical Research**, Boston, Mass. (H. J. Levine, New England Medical Center Hospitals, 171 Harrison Ave., Boston 02111)

7-12. **American Acad. of Dermatology and Syphilology**, 27th, Chicago, Ill. (S. E. Huff, 1636 Church St., Evanston, Ill.)

8-13. **American Soc. of Agricultural Engineers**, Chicago, Ill. (P. L. Bellinger, Technical Coordinator, 420 Main St., St. Joseph, Mich. 49085)

8-15. **Symposium of Analogue and Digital Computers in Hydrology**, Tucson, Ariz. (American Federation of Information Processing Societies, 211 E. 43 St., New York 10017)

9-11. **Computer Conf.**, San Francisco,

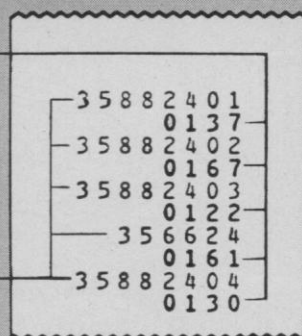


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Cobalt	not detected		(< 0.1 ppm)
	(< 1 ppm)	Magnesium	0.6 ppm
Chromium	not detected	Manganese	not detected
	(< 0.2 ppm)		(< 0.005 ppm)
Copper	not detected	Sodium	1.1 ppm
	0.6 ppm*	Nickel	not detected
Iron	(< 0.02 ppm)		(< 2 ppm)
Mercury	not detected	Lead	5.6 ppm
	(< 10 ppm)	Zinc	0.7 ppm
Potassium	0.8 ppm		

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Calif. (R. H. Glaser, 1968 Joint Computer Conf., P.O. Box 2309, Stanford, Calif. 94305)

9-12. **Electrical Insulation Conf.**, Los Angeles, Calif. (Secretary, 3600 Wilshire Blvd., Los Angeles 90005)

9-12. **National Electronics Conf. and Exhibition**, 24th, Chicago, Ill. (E. C. Jones, Electrical Engineering Dept., Iowa State Univ., Ames)

11-13. **National Oceanography Conf.**, Portland, Ore. (J. H. Jorgenson, National Security Industrial Assoc., Suite 800, 1030 15th St., NW, Washington, D.C. 20005, or K. R. Cannon, Governor's Committee on Natural Resources, State Capitol, Salem, Ore. 97310)

15-17. **New York State Soc. of Anesthesiologists**, New York, N.Y. (E. C. Sinisi, 30 E. 42 St., New York, 10017)

16-18. **Symposium on Adaptive Processes**, 7th, Univ. of California, Los Angeles. (J. M. Mendel, Advance Flight Mechanics, Douglas Aircraft Co., Inc. 3000 Ocean Park Blvd., Santa Monica, Calif. 90406)

16-20. **Texas Symp. of Relativistic Astrophysics**, 4th, Dallas. (I. Robinson, South West Center for Advanced Studies, P.O. Box 30365, Dallas 75230)

18-20. **American Physical Soc.**, San Diego, Calif. (W. Whaling, California Inst. of Technology, 1201 East California St., Pasadena 91109)

20-22. **American Psychoanalytic Assoc.**, New York, N.Y. (American Psychoanalytic Assoc., 1 E. 57 St., New York 10022)

23-25. **International Electron Devices Mtg.**, Washington, D.C. (D. A. Chisholm, Bell Telephone Labs., Murray Hill, N.J. 07974)

26-31. **American Assoc. for the Advancement of Science**, 135th, Dallas, Texas. (Secretary, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

26-31. **Society for General Systems Research**, Dallas, Texas. (M. D. Rubin, Mitre Corp., Bedford, Mass. 01730)

27-30. **Institute of Mathematical Statistics**, Washington, D.C. (J. R. Rosenblatt, 337 Administration Bldg., Gaithersburg, National Bureau of Standards, Washington, D.C. 20234)

28-30. **History of Science Soc.**, Dallas, Texas. (J. C. Greene, Dept. of History, Univ. of Connecticut, Storrs 06268)

## January

9-11. **Society for Historical Archaeology**, 2nd, Tucson, Ariz. (B. L. Fontana, Arizona State Museum, Arizona Univ., Tucson 85721)

12-17. **Brain Research**, Snowmass-at-Aspen, Colo. (J. E. Swett, Dept. of Anatomy, Univ. of Colorado Medical Center, Denver 80220)

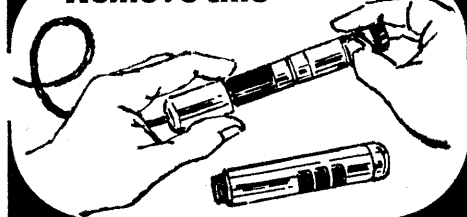
13-14. **Applications of Sea-Going Computers**, La Jolla, Calif. (C. B. Jackson, MTS Data Engineering Committee, P.O. Box 2158, La Jolla 92037)

13-15. **Agricultural Waste Management Conf.**, Syracuse, N.Y. (Agricultural Waste Management Conf., 400 Roberts Hall, Cornell Univ., Ithaca, N.Y. 14850)

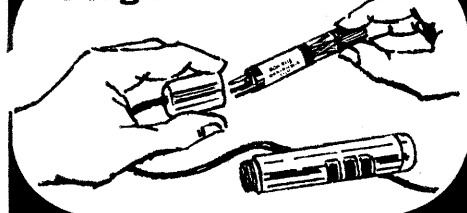
13-15. **Animal Waste Management**, Syracuse, N.Y. (R. C. Locher, 208 Riley-Robb Hall, Cornell Univ., Ithaca, N.Y.)

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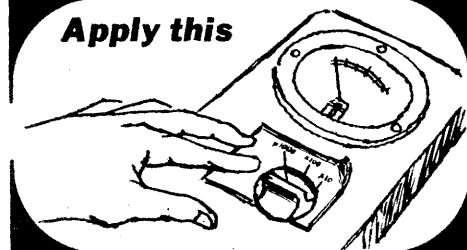
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13-17. Society of Automotive Engineers, Inc., Detroit, Mich. (Manager, Meetings Div., 485 Lexington Ave., New York 10017)

15-18. National Soc. of Professional Engineers, Las Vegas, Nev. (K. E. Trombley, Natl. Soc. of Professional Engineers, 2029 K St., NW, Washington, D.C. 20006)

17-18. Symposium on Blood, Detroit, Mich. (E. F. Mammen, Dept. of Physiology and Pharmacology, Wayne State Univ., 1400 Chrysler Freeway, Detroit 48207)

17-18. American Soc. for Surgery of the Hand, New York, N.Y. (L. Milford, 869 Madison Ave., Memphis, Tenn. 38104)

18-23. American Acad. of Orthopaedic Surgeons, New York, N.Y. (J. K. Hart, 29 E. Madison, Chicago, Ill. 60602)

19-21. American Soc. for Engineering Education, Flint, Mich. (E. H. Wright, American Soc. for Engineering Education, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

20-21. Symposium on Control Mechanisms in Intermediary Metabolism, Miami, Fla. (Dept. of Biochemistry, Univ. of Miami Medical School, P.O. Box 875, Biscayne Annex, Miami 33152)

20-22. American Inst. of Aeronautics and Astronautics, New York, N.Y. (AIAA, 1290 Sixth Avenue, New York 10019)

20-22. Society of Thoracic Surgeons, San Diego, Calif. (F. C. Byron, City of Hope Medical Center, 1500 E. Duarte Rd., Duarte, Calif. 91010)

21-24. Physiological Aspects of Crop Yield, Lincoln, Neb. (F. A. Haskins, Dept. of Agronomy, Univ. of Nebraska, Lincoln 68503)

22-24. Symposium on Membrane Function and Electron Transfer to Oxygen, Miami, Fla. (Dept. of Biochemistry, Univ. of Miami Medical School, P.O. Box 875, Biscayne Annex, Miami 33152)

23-25. American Soc. for Engineering Education, Baton Rouge, La. (E. H. Wright, American Soc. for Engineering Education, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

23-25. Radiotherapy Symp., Miami, Fla. (M. Vuksanovic, Radiation Therapy Div., Univ. of Miami Medical School, 1700 NW Tenth Ave., Miami 33136)

23-27. American Mathematical Soc., 75th, New Orleans, La. (H. M. Geham, Univ. of Buffalo, Buffalo, N.Y. 14214)

24-27. American Group Psychotherapy Assoc., New York, N.Y. (M. Schiff, Room 702, 1790 Broadway, New York 10019)

26-28. Conference of Immunologists, Pasadena, Calif. (J. S. Garvey, Div. of Chemistry and Chemical Engineering, California Inst. of Technology, Pasadena)

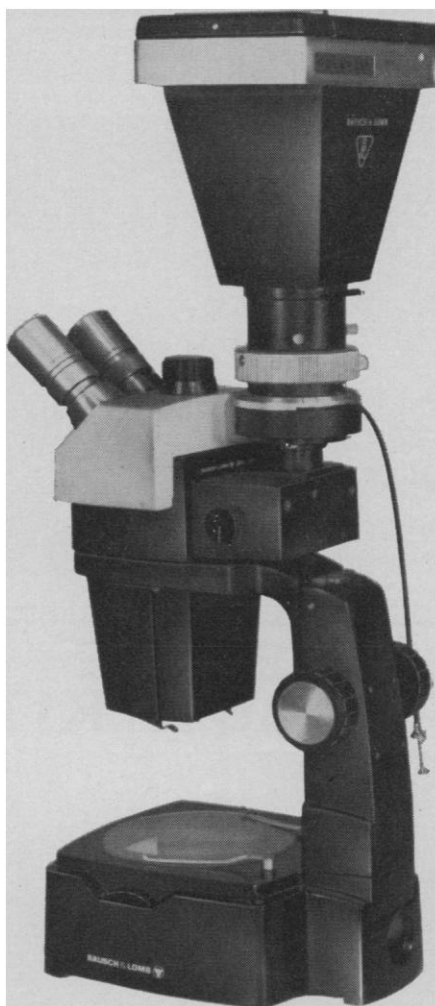
26-31. Modern Dispatch Techniques of Interconnected Power Systems, New York N.Y. (Inst. of Electrical and Electronics Engineers, Inc., 345 E. 47 St., New York 10017)

27-30. American Soc. of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Chicago, Ill. (J. H. Cansdale, American Soc. of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 345 E. 47 St., New York 10017)

28-30. Fast Burst Reactor, Albuquerque, N.M. (G. R. Keepin, Box 1663, Los Alamos, N.M. 87544)

29. New York Heart Assoc., New York, N.Y. (New York Heart Assoc., Inc., Heart House, 2 E. 64 St., New York 10021)

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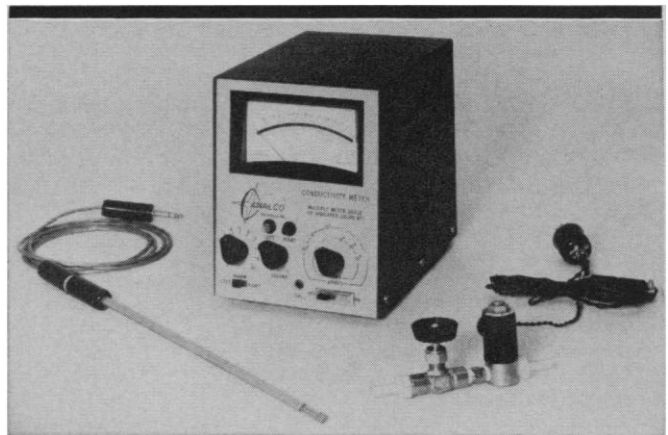


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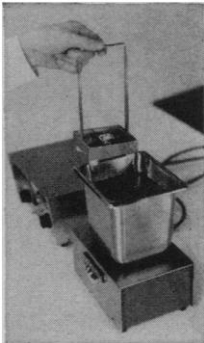
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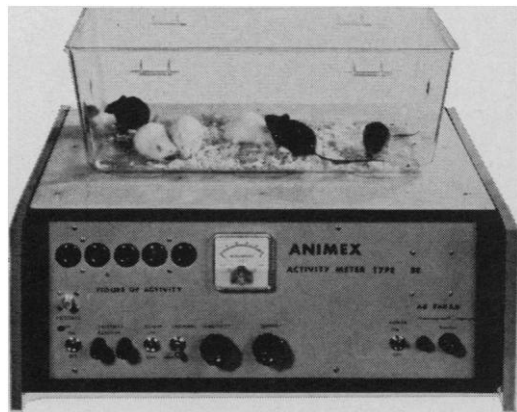
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## BOOKS RECEIVED

(Continued from page 788)

Mich., May-June 1967. John C. Houck, chairman; Bernard K. Forscher, Ed. Pergamon, New York, 1968. xii + 337 pp., illus. \$15.

**Chemical Warfare, Pyrotechnics and the Fireworks Industry.** T. F. Watkins, J. C. Cackett, and R. G. Hall. Pergamon, New York, 1968. viii + 114 pp., illus. Cloth, \$4.50; paper, \$3.50. Commonwealth and International Library: Chemical Industry.

**The Chemistry of the Elements.** Howard Nechamkin. McGraw-Hill, New York, 1968. ix + 270 pp. Paper, \$3.50.

**Circulation in Skeletal Muscle.** Proceedings of an International Symposium, Smolenice, Czechoslovakia, Sept. 1966. O. Hudlická, Ed. Pergamon, New York, 1968. xii + 356 pp., illus. \$15.

**Composers for the American Musical Theatre.** David Ewen. Dodd, Mead, New York, 1968. xii + 270 pp., illus. \$5.

**Comprehensive Analytical Chemistry.** Cecil L. Wilson, David W. Wilson, and C. R. N. Strouts, Eds. Vol. 11B, Physical Separation Methods. Elsevier, New York, 1968. xvi + 445 pp., illus. \$25.

**Comprehensive Biochemistry.** Marcel Florin and Elmer H. Stotz, Eds. Vol. 26, Part A. Extracellular and Supporting Structures. Elsevier, New York, 1968. xvi + 295 pp., illus. \$17.

**The Computer and Chemistry.** An Introduction to Programming and Numerical Methods. T. R. Dickson. Freeman, San Francisco, 1968. xii + 216 pp., illus. \$5.75.

**Concepts in Catalysis.** Eric K. Rideal. Academic Press, New York, 1968. viii + 194 pp., illus.

**A Concise Encyclopedia of Astronomy.** A. Weigert and H. Zimmerman. Translated from the second German edition (Leipzig, 1967) by J. Home Dickson. Elsevier, New York, 1968. v + 367 pp., illus., 20 plates. \$9.

**The Crime Laboratory.** Case Studies of Scientific Criminal Investigation. James W. Osterburg. Indiana University Press, Bloomington, 1968. xx + 330 pp., illus. Paper, \$5.95.

**Cryogenic Properties of Polymers.** Papers presented the NASA-Case conference, April 1967. Tito T. Serafini and Jack L. Koenig, Eds. Dekker, New York, 1968. x + 302 pp., illus. \$13.75.

**Description of the Indies (c. 1620).** Antonio Vazquez de Espinosa. Translated from the Spanish by Charles Upson Clark. Smithsonian Institution Press, Washington, D.C., 1968. xii + 862 pp. \$12.50. Smithsonian Miscellaneous Collections, vol. 102. Reprint of *Compendium and Description of the West Indies* (1942).

**Diagnostic Cytology and Its Histopathologic Bases.** Leopold G. Koss. Lippincott, Philadelphia, ed. 2, 1968. xx + 653 pp., illus. \$27.50.

**The Dimensions of Community Psychiatry.** Formulated by the Committee on Preventive Psychiatry. Group for the Advancement of Psychiatry, New York, 1968. 48 pp. Paper, \$1. GAP Report No. 69.

**Direct Analog Computers.** Victor Paschik and Frederick L. Ryder. With contributions by J. A. Harder, S. H. Unger, and Y. Paker. Interscience (Wiley), New York, 1968. xiv + 400 pp., illus. \$17.

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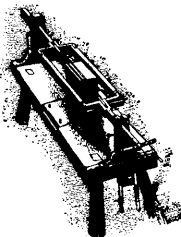
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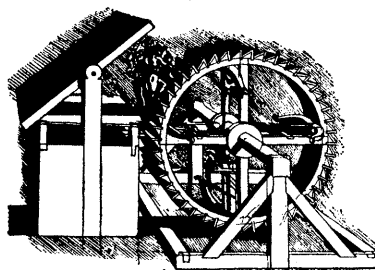
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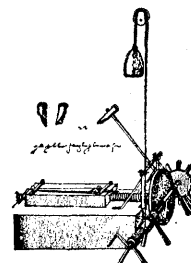
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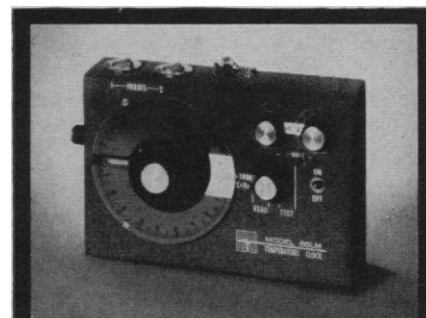
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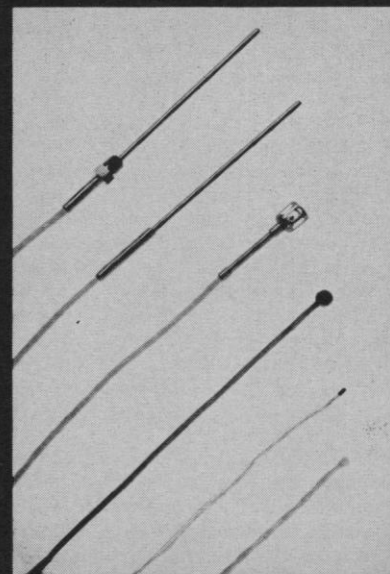
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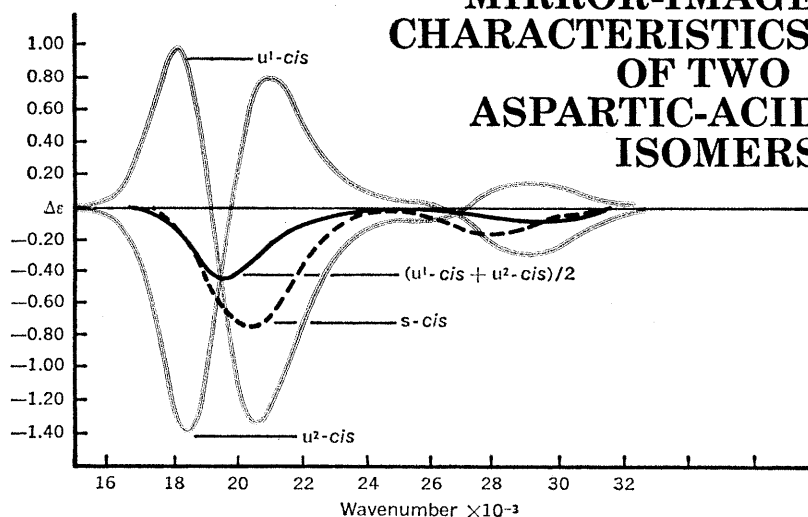
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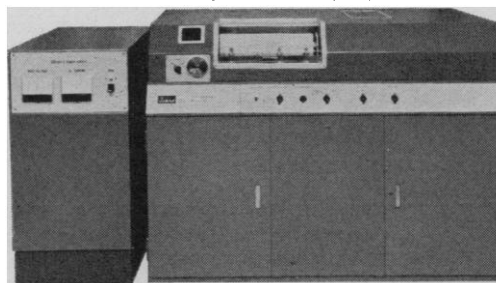


Aspartic acid, with its three donor sites, can form a variety of hard-to-identify chelate isomers. The circular-dichroism profiles drawn here, plotted from data gathered by a Durrum-Jasco CD recorder, are typical of the molecular detective work\* that can be achieved with this versatile instrument.

The steric requirements of aspartic acid indicate that in a cobalt-diethylenetriamine complex, three isomers will predominate: one *s-cis* (symmetrical), shown as a dashed-line profile in the drawing above, and two *u-cis* (unsymmetrical) isomers, shown in color. The latter are essentially mirror images of each other, and the Durrum-Jasco instrument provides a way to identify one from the other.

The configurational contributions to the CD traces of the two mirror-image isomers should, in theory, cancel out, leaving an "average" trace that approximates that of the *s-cis* isomer where there are no configurational contributions. As seen here, a very close correlation is achieved, proving that the two *u-cis* isomers are indeed pseudo-mirror images and providing clues as to their specific forms.

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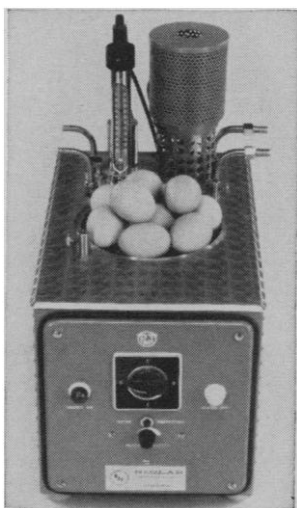
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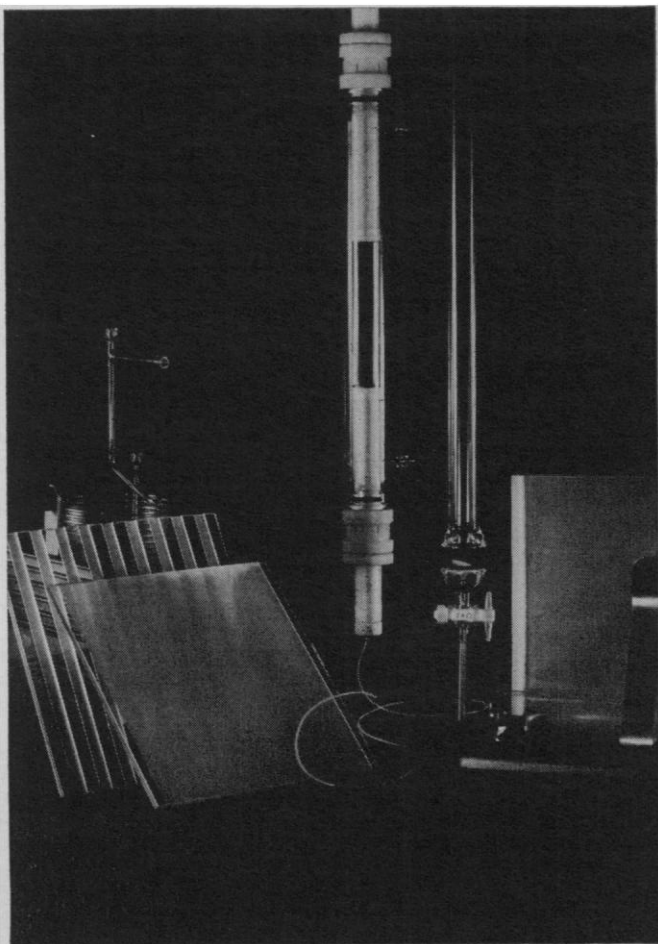
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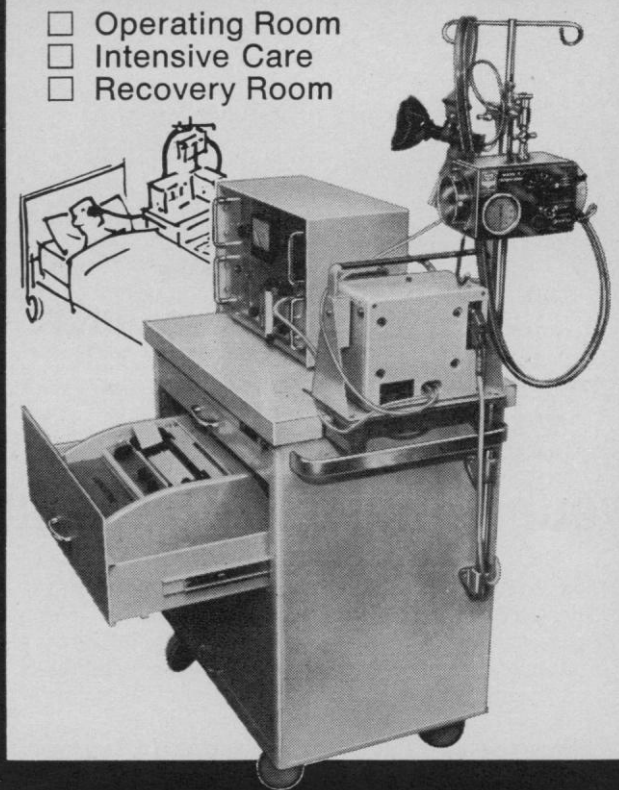
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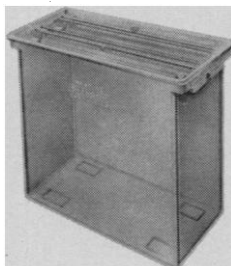
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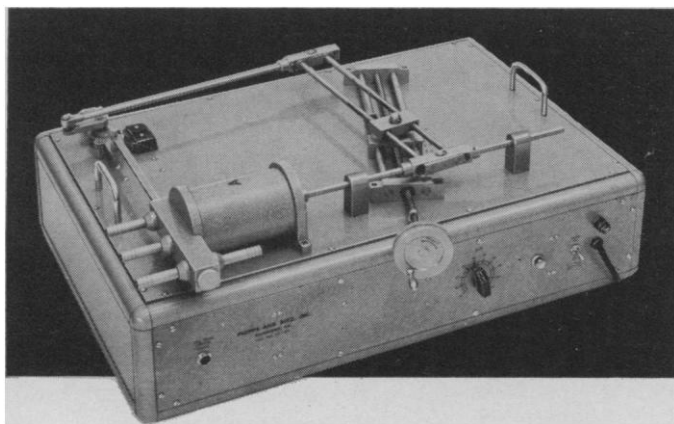
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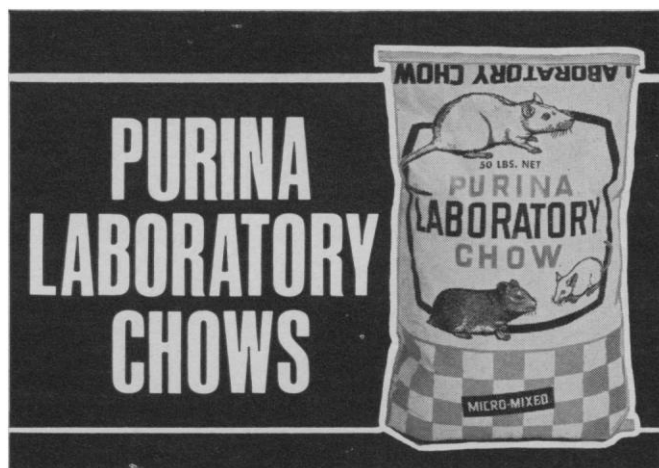
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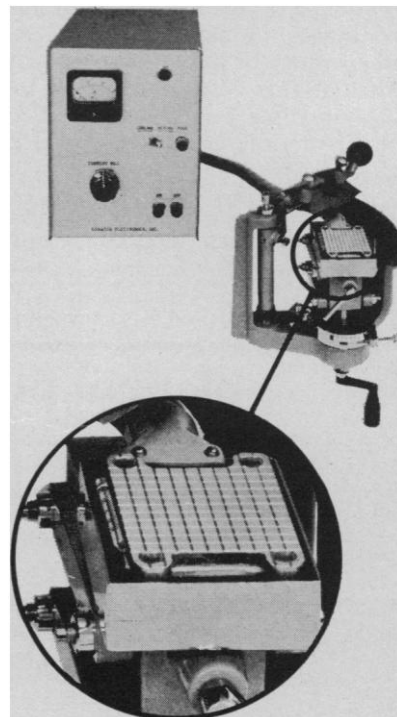


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