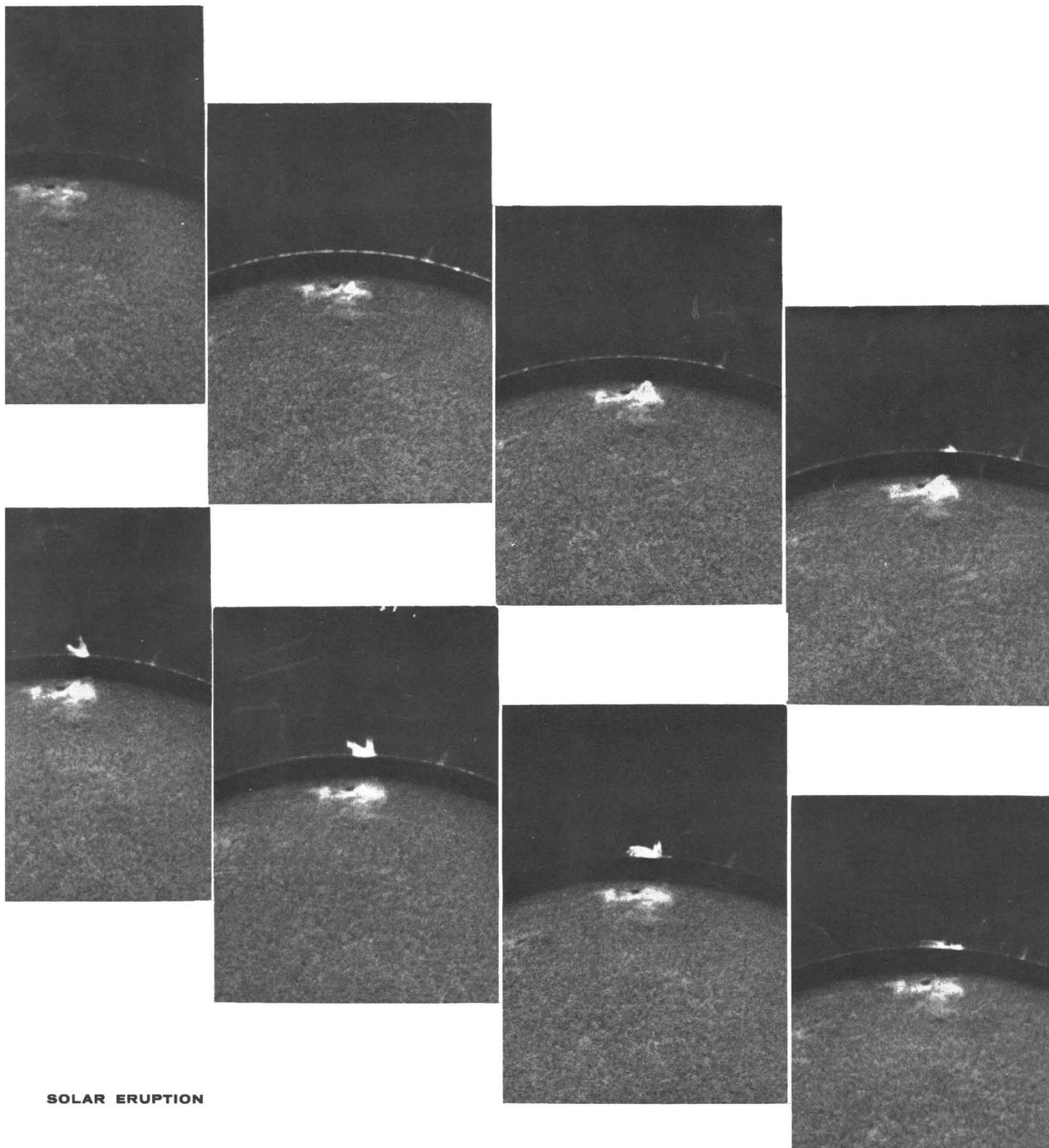


# SCIENCE

29 November 1963

Vol. 142, No. 3596

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



SOLAR ERUPTION



**This is an incandescent ball of gases, plasmas,  
magnetic fields, thermonuclear reactions  
and mysteries.**

But NASA has started to throw some light on it.

After all, the sun does sustain life on earth. It disrupts our communications, pours deadly radiation into space and makes our weather do tricks.

So we need to learn the how and why and when of the sun's phenomena. And in the process pick up some basic facts about the whole universe.

So far the trouble has been that our atmosphere acts as a barrier. It makes optical and photographic and spectrographic images shimmer and scatter. In fact it completely *stops* most

of the sun's radiation spectrum.

Now . . . if we could only put our instruments *outside* the earth's atmosphere . . . in a new and extremely sophisticated satellite . . . pointed precisely at the sun . . .

Today, development work for that satellite—the Advanced Orbiting Solar Observatory—is being performed at Republic, under a prime contract to NASA/Goddard.

The AOSO will orbit 300 miles above the earth. In sunlight uninterrupted for months on end. Carrying about 250 pounds of instruments to

collect, store and transmit data on the sun's gamma-ray, x-ray and ultraviolet activity.

It will be aimed at the sun with an accuracy of five seconds of arc. That's like shooting at a dime one-half mile away. And hitting it.

NASA's Advanced Orbiting Solar Observatory will look something like the model below. Nobody expects it to find *all* the answers that solar physicists and astronomers have sought for 350 years. But after it has studied that incandescent ball for a while, we'll be a lot less in the dark.



**REPUBLIC**  
AVIATION CORPORATION  
FARMINGDALE, LONG ISLAND, NEW YORK

# Low-Activity Sample Reject IN NEW **TRI-CARB®** SPECTROMETERS

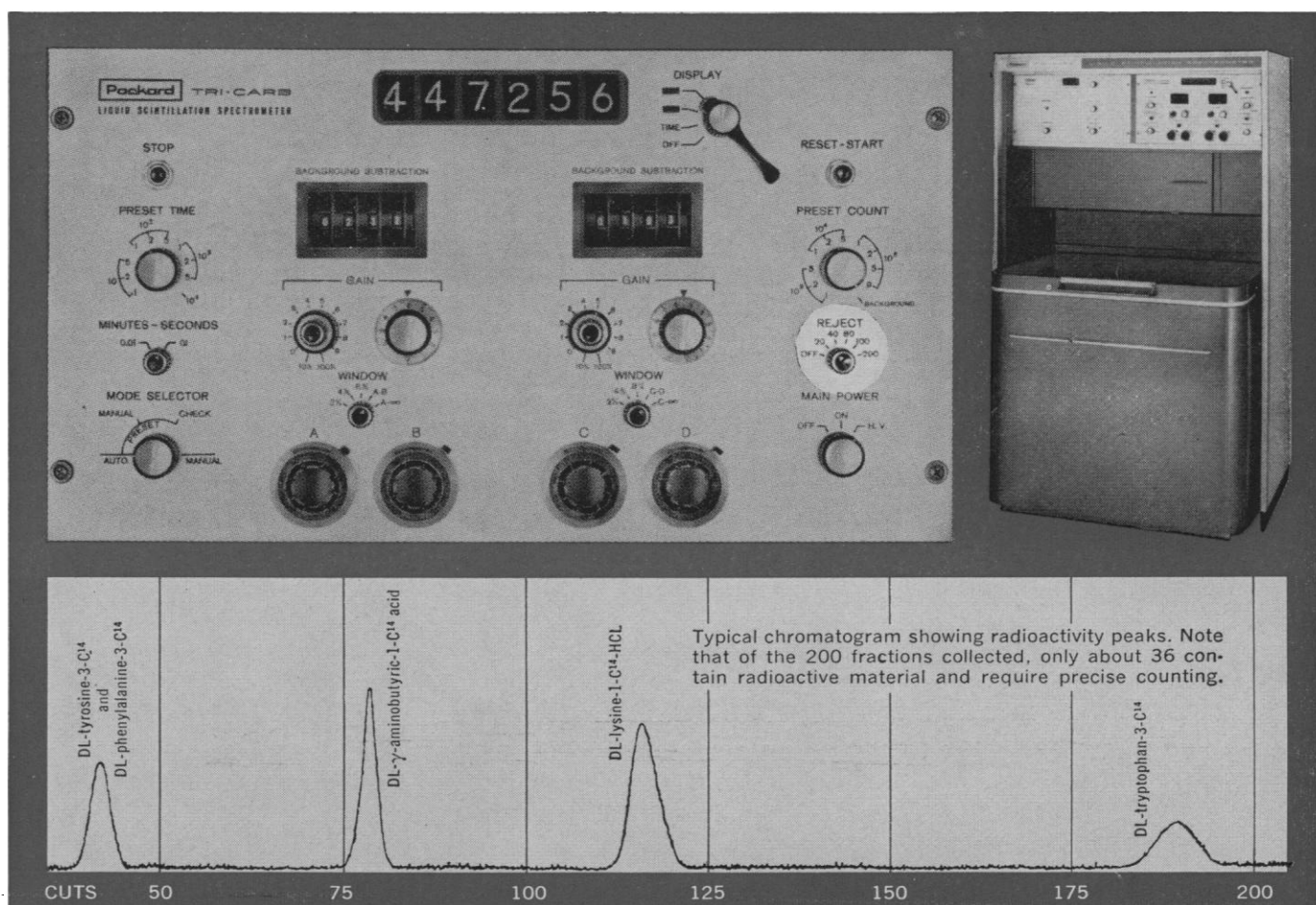
The ability of new Tri-Carb Spectrometers to automatically bypass samples with little or no radioactivity can save hours of valuable counting time. This ability finds application in two commonly-encountered counting situations:

(1) *Identifying and counting only those chromatographic samples which contain material of interest while bypassing those which have little or no activity.* Since a typical chromatographic analysis (see curve below) may be represented by several hundred cuts, of which only a few will contain radioactivity, savings in counting time are substantial.

(2) *Separating samples of low activity from those containing higher levels to ensure allocation of optimum counting time for each.* For example: most of the samples from an experiment may require a 10

minute count to achieve the desired statistical accuracy, but a few low-activity samples need a 100 minute count to achieve the same statistics. These low-activity samples can be screened out (and identified) during the short counts on the majority, and then grouped together for automatic counting to the desired statistical accuracy. Again, important savings in counting time are achieved.

Low-activity Sample Reject increases the utility of new Tri-Carb Spectrometers because it places more instrument counting hours at the disposal of the researcher. It is just one of the many significant new features now available in 3000 and 4000 Series Tri-Carb Spectrometers. Ask your Packard Sales Engineer for complete details, or write for Bulletin 1030.



**Packard**

**PACKARD INSTRUMENT COMPANY, INC.**  
BOX 428 • LA GRANGE, ILLINOIS • AREA CODE 312 • 485-6330

29 November 1963

Vol. 142, No. 3596

# SCIENCE

<b>LETTERS</b>	A Scientist by Several Other Names; Metric Question; Drive Decay and Differential Training; Exobiology .....	1123
<b>EDITORIAL</b>	President Kennedy on Science .....	1129
<b>ARTICLES</b>	Evolutionary and Population Genetics: <i>T. Dobzhansky</i> .....	1131
	Active and intellectually stimulating research is going on in organismic as well as molecular genetics.	
	International Years of the Quiet Sun, 1964-65: <i>M. A. Pomerantz</i> .....	1136
	The program is designed to take the greatest possible advantage of the years of minimum solar activity.	
	Communication and Comprehension of Scientific Knowledge: <i>R. Oppenheimer</i> .....	1143
<b>JOHN F. KENNEDY</b>	A Remembrance: <i>J. B. Wiesner</i> .....	1147
	His respect for science as an instrument of good was one of the Chief Executive's distinctive qualities.	
<b>NEWS AND COMMENT</b>	John F. Kennedy—The Man and His Meaning—Policy and Legacy .....	1151
<b>BOOK REVIEWS</b>	F. Bowles's <i>Access to Higher Education</i> , reviewed by <i>K. E. Clark</i> ; other reviews .....	1154
<b>REPORTS</b>	Tritium Distribution in Ground Water around Large Underground Fusion Explosions: <i>F. W. Stead</i> .....	1163
	Sea Level and Climate of the Past Century: <i>W. L. Donn</i> and <i>D. M. Shaw</i> .....	1166
	Paleontologic Investigations at Big Bone Lick State Park, Kentucky: A Preliminary Report: <i>C. B. Schultz</i> et al. ....	1167
	Bending Waves of the Posterior Flagellum of <i>Ceratium</i> : <i>C. J. Brokaw</i> and <i>L. Wright</i> .....	1169

## EDITORIAL BOARD

DAVID M. BONNER  
MELVIN CALVIN  
ERNEST COURANT

FARRINGTON DANIELS  
JOHN T. EDSALL  
DAVID R. GODDARD

ALEXANDER HOLLAENDER  
ROBERT JASTROW  
KONRAD B. KRAUSKOPF

EDWIN M. LERNER II  
WILLARD F. LIBBY  
NEAL E. MILLER

## EDITORIAL STAFF

Editor  
PHILIP H. ABELSON

Publisher  
DAEL WOLFE

Business Manager  
HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES. Assistant Editor: ELLEN E. MURPHY. Assistant to the Editor: NANCY TEIMOURIAN.  
News and Comment: DANIEL S. GREENBERG, JOHN R. WALSH, ELINOR LANGER, MARION ZEIGER. Book Reviews: SARAH S. DEES.

## ADVERTISING STAFF

Director: EARL J. SCHERAGO  
Sales: New York, N.Y., 11 W. 42 St.: RICHARD L. CHARLES, ROBERT S. BUGBEE (212-PE-6-1858)  
Scotch Plains, N.J., 12 Unami Lane: C. RICHARD CALLIS (201-889-4873)  
Production Manager: RAYMONDE SALAMA

SCIENCE is published weekly by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D. C. 20005. Now combined with *The Scientific Monthly* ®. Second-class postage paid at Washington, D.C. Copyright © 1963 by the American Association for the Advancement of Science. Annual subscriptions \$8.50; foreign postage, \$1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, \$7; 10 months, \$7.50. Provide 4 weeks' notice for change of address, giving new and old address and zone numbers. Send a recent address label. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. Indexed in the *Reader's Guide to Periodical Literature*.

# AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Contamination of Commercial Rabbit Albumin Preparations by Bovine Albumin: <i>W. D. Linscott</i> .....	1170
Homograft Rejection in the Fetal Lamb: The Role of Circulating Antibody: <i>A. M. Silverstein, R. A. Prendergast, K. L. Kraner</i> .....	1172
X-ray Diffraction Pattern of Nerve Myelin: A Method for Determining the Phases: <i>M. F. Moody</i> .....	1173
Inhibition of Evoked Potentials by Striatal Stimulation and Its Blockage by Strychnine: <i>G. M. Krauthamer</i> .....	1175
Cytochrome Function in Relation to Inner Membrane Structure of Mitochondria: <i>B. Chance and D. F. Parsons</i> .....	1176
Separation of Transducer and Impulse-Generating Processes in Sensory Receptors: <i>W. R. Loewenstein, C. A. Terzuolo, Y. Washizu</i> .....	1180
Mitomycin C: Chemical and Biological Studies on Alkylation: <i>H. S. Schwartz,</i> <i>J. E. Sodergren, F. S. Philips</i> .....	1181
Continuous Recording of Cell Number in Logarithmic and Synchronized Cultures: <i>T. W. James and N. G. Anderson</i> .....	1183
Immune Response and Mitosis of Human Peripheral Blood Lymphocytes in vitro: <i>K. Hirschhorn et al.</i> .....	1185
Bipolar Planarians in a Stock Culture: <i>M. M. Jenkins</i> .....	1187
Double-Stranded Ribonucleic Acid Formation in vitro by MS 2 Phage-Induced RNA Synthetase: <i>C. Weissmann and P. Borst</i> .....	1188
Aflatoxin B <sub>2</sub> : Chemical Identity and Biological Activity: <i>S. B. Chang et al.</i> .....	1191
Behavior of Adult Rats Is Modified by the Experiences Their Mothers Had as Infants: <i>V. H. Denenberg and A. E. Whimbey</i> .....	1192
<b>ASSOCIATION AFFAIRS</b> Cleveland, 130th AAAS Meeting, 26-30 December .....	1194
<b>MEETINGS</b> Ionic Intermediates and Energy Transfer in Radiation Chemistry; Phenolics of Higher Plants; Forthcoming Events .....	1196

PHILIP M. MORSE	DeWITT STETTEN, JR.	JOHN R. WINCKLER
COLIN S. PITTENDRIGH	WILLIAM L. STRAUS, JR.	CLARENCE M. ZENER
KENNETH S. PITZER	EDWARD L. TATUM	

Editorial Assistants: ISABELLA S. BOULDIN, ELEANORE J. BUTZ, GRAYCE A. FINGER, GARY O. GOLD-SMITH, NANCY S. HAMILTON, OLIVER W. HEATWOLE, ANNE D. HOLDSWORTH, MARCIA ISAAK, RUTH M. KINGERLEE, HOWARD NATHENSON, EDGAR C. RICH, JOHN E. RINGLE.

Staff Assistants: VIRLINDA M. GIBSON, LILLIAN HSU, EILEEN M. KELLY, BARBARA J. SHEFFER.

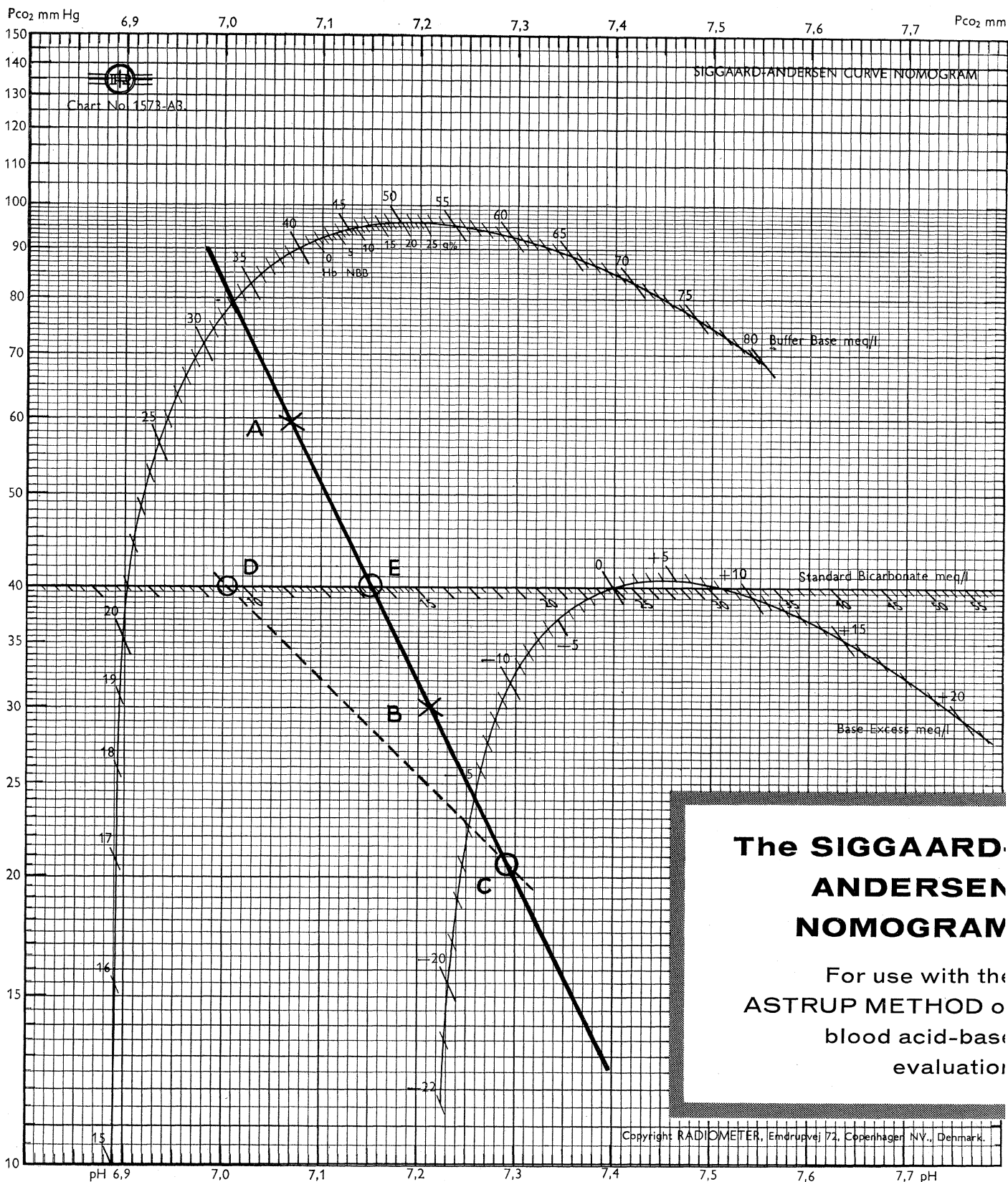
Chicago, Ill., 6 W. Ontario St.: HERBERT BURKLUND (312-DE7-4973)  
Los Angeles 45, Calif., 8255 Beverly Blvd.: WINN NANCE (213-653-9817)

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C., 20005. Phone: 202-DU 7-7171. Cable: Advancesci, Washington. Manuscripts should be submitted in triplicate, double-spaced throughout. The AAAS assumes no responsibility for the safety of manuscripts. Copies of "Instructions for Contributors" can be obtained from the editorial office.

ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone 212-PE 6-1858.

## COVER

Rapid sequence photographs, in H $\alpha$  light, showing development of a solar flare over an active sunspot (5 July 1962). Separate telescopes simultaneously produce images of the disk and of the extensions of the flare above the artificially eclipsed sun. Faint limb features, otherwise invisible, are detected by this technique. See page 1136. [G. E. Moreton, Lockheed Solar Observatory]



Patient's name: <i>John W. Smith</i>		Barometric pressure: <i>764</i> mm Hg	READINGS		RESULTS	
Dept: <i>1st B.</i>	Sample No.: <i>4</i>	CO <sub>2</sub> percentage: Cylinder No 1: <i>8.25</i> % Cylinder No 2: <i>4.20</i> %	Before equilibration	Actual pH: <i>7.293</i>	Actual PCO <sub>2</sub> : <i>20.5</i> mm Hg	
Date: <i>28/10/63</i>		CO <sub>2</sub> partial pressure: Cylinder No 1: <i>58.9</i> mm Hg Cylinder No 2: <i>30</i> mm Hg	After equilibration	high PCO <sub>2</sub> : pH: <i>7.066</i> low PCO <sub>2</sub> : pH: <i>7.212</i>	Base Excess: <i>-15</i> meq/l blood	
Hour of Sampling: <i>8:00 A.M.</i>		Hemoglobin: <i>15</i> g/100 ml	Readings made by: <i>H. N. M.</i>		Buffer Base: <i>33</i> meq/l blood	
Remarks: <i>NONE</i>		Oxygen Saturation: <i>100</i> percent	Signature: <i>[Signature]</i>		Standard Bicarb.: <i>13.4</i> meq/l plasma	
					Actual Bicarb.: <i>9.6</i> meq/l plasma	
					Total CO <sub>2</sub> : <i>10.2</i> meq/l plasma	

# THE ASTRUP METHOD

## FOR BLOOD ACID-BASE EVALUATION

If one of your laboratory or research problems is the evaluation of the acid-base status of blood samples—the Astrup Method has much to offer. Not just a measurement of blood gas tensions, it is a complete system for clinical blood sampling, storage, and measurement on an ultra-micro basis. With instrumentation by **RADIOMETER**—3 simple pH values plotted on the Siggaard-Andersen nomogram expose instantly all the acid-base values—both respiratory and metabolic.

A few drops of capillary blood from an ear lobe puncture—a few moments of a technician's time and you have the actual blood pH, the respiratory  $\text{CO}_2$  tension, and if you wish, the oxygen tension. On the metabolic side you have the choice of the value best suited to your diagnostic technique—Actual Plasma Bicarbonate Concentration, Standard Bicarbonate (at 40 mm Hg  $\text{CO}_2$ ), Base Excess (Astrup), Buffer Base (Singer & Hastings), or Total  $\text{CO}_2$  Content—all on less than 150  $\mu\text{l}$  of blood.

Illustrated is a typical determination. The actual pH is read directly from an anaerobic blood sample. The sample is then equilibrated in a micro-tonometer to two artificial

levels of  $\text{Pco}_2$  derived from calibrated gas sources—and the resultant pH values measured. On the nomogram these pH values are plotted against their corresponding  $\text{CO}_2$  tank tensions, points (A) and (B), and a line drawn between these points. Using the *actual* anaerobic pH value as an entry, the *actual* value of  $\text{CO}_2$  tension can be read out from the line just drawn, at point (C).

From the same line the values of Buffer Base, *Standard* Bicarbonate, and Base Excess (the actual net accumulation of fixed acids or bases in the system) are noted from the intersection with their respective scales. *Actual* Bicarbonate Concentration is revealed by drawing a  $-45^\circ$  line from point (C) to intersect the bicarbonate scale—and Total  $\text{CO}_2$  Content by adding the value of Actual Bicarbonate to  $\text{Pco}_2 \times 0.03$ .

Try it yourself on the nomogram illustrated and note the results obtained. Also note the ease with which one can anticipate new levels of pH should  $\text{Pco}_2$  change. Fixed acid changes move the line to the right or left in equal increments on both Base Excess and Buffer Base scales—establishing new relative values of pH and  $\text{Pco}_2$ .

...makes the following factors available  
in *one* determination:

Actual pH  
Actual Plasma Bicarbonate  
Base Excess (Astrup)  
Total  $\text{CO}_2$  Content  
Actual  $\text{CO}_2$  Tension  
Standard Plasma Bicarbonate (Astrup)  
Buffer Base (Singer & Hastings)  
Hemoglobin Concentration

INSTRUMENTATION BY **RADIOMETER**



If you'd like a glossy finished — full size (17" x 21") copy of this nomogram in a wall hanger form, complete with illustrations of typical acid-base determinations and a host of other useful laboratory data relating to blood chemistry, standard terminology, sampling & storage data, blood value certified buffers etc., just write the factory representative closest to you. You'll find it useful.

Please refer to this publication, using your professional letterhead.

### MODEL AME-1

Radiometer manufactures a complete range of instruments adapted to the Astrup techniques — their reliability amply proven in clinical service.

For those interested only in the respiratory parameters, blood gas monitors and electrodes are also available.

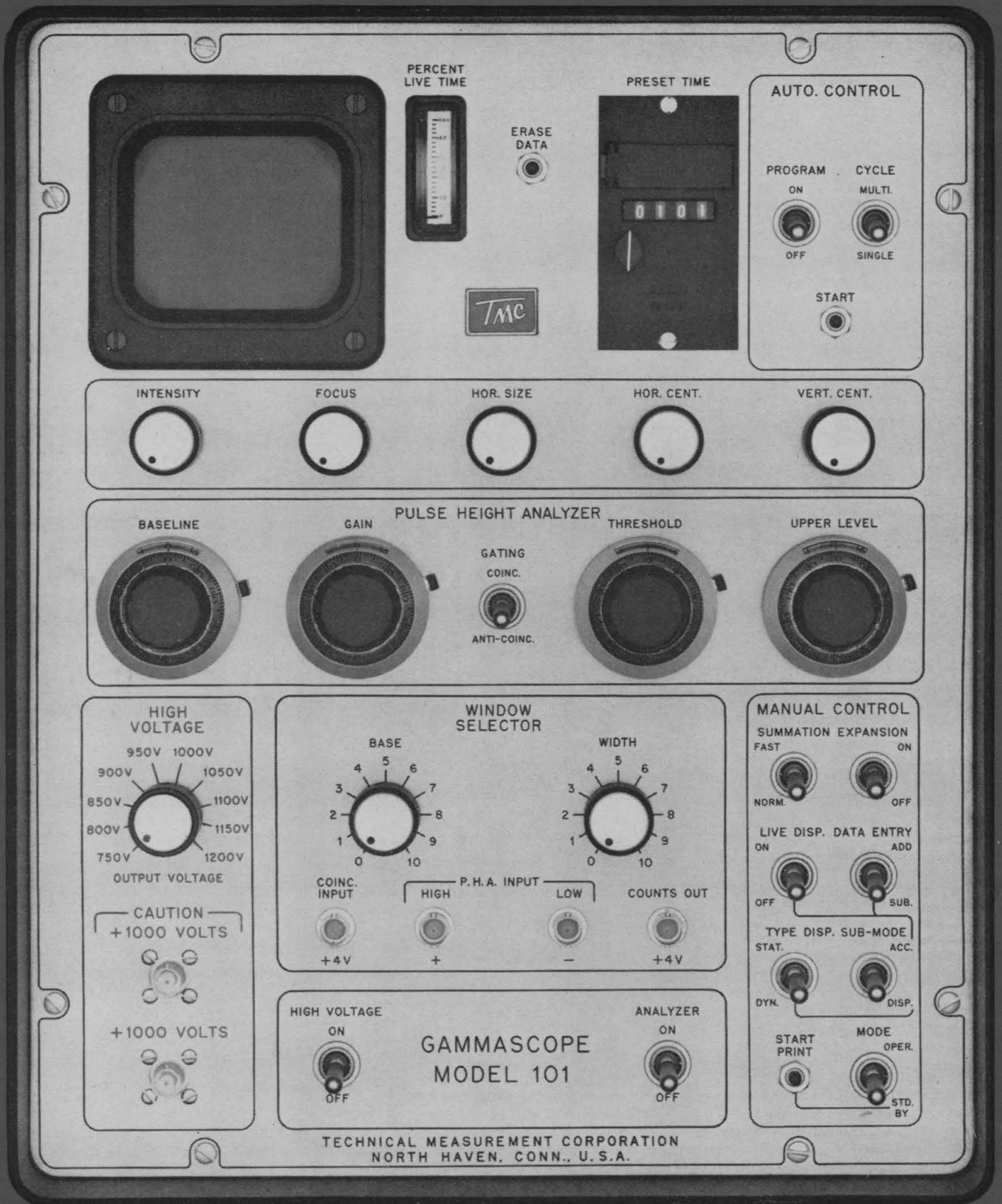


MANUFACTURERS OF FINE ELECTROCHEMICAL AND ELECTROMEDICAL INSTRUMENTS

Factory Representatives—U.S.A.; **THE LONDON COMPANY**, P.O. Box G, 811 Sharon Drive, Westlake, Ohio.

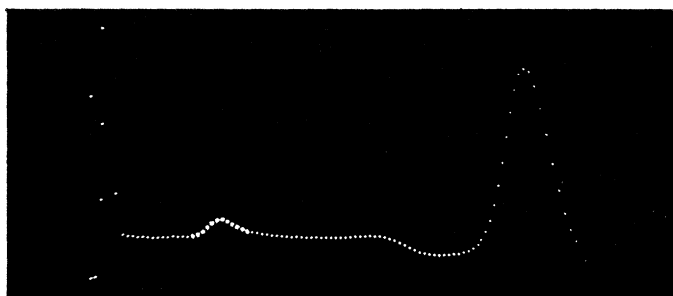
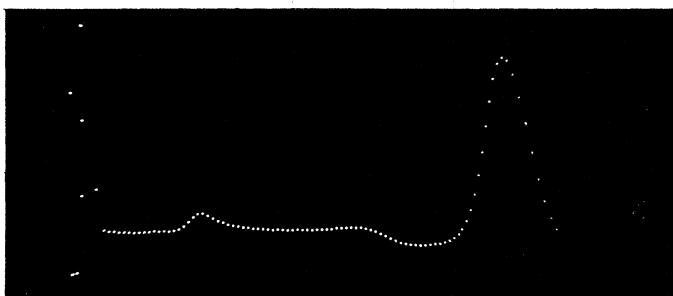
Factory Representatives—Canada & Mexico; **BACH-SIMPSON LTD.**, P.O. Box 2484, London, Ont.

In Canada: Canadian Laboratory Supplies. In Mexico: Curtin de Mexico, S.A. Mexico D.F.



# Gammascopes<sup>TM</sup>

## 100-channel pulse height analyzer with visual single-channel window



**\$5990 (including digital printer)**

• high voltage supply • linear amplifier • live timer • live time meter • add/subtract logic • output for totalizing counts • static or dynamic display • digital print-out

Here is a 100-channel analyzer with all the advantages of multi-channel operation yet it is comparable in price to single-channel scanning spectrometers. The GAMMASCOPE will complete a spectrum analysis much faster — with less difficulty in set-up and calibration — than any single-channel system. The GAMMASCOPE measures gamma rays, beta particles, high energy protons, charged particles, and fission products. Typical applications are neutron activation analysis, "singles spectra" monitoring, experiment set-up, medical studies, nuclear physics education and health physics monitoring.

The variable single-channel window enables the experimenter to integrate the counts stored within any selected area of the displayed spectrum. The selected area is intensified on the spectrum display. The advantage is accurate study of peaks or any other segment of the over-all spectrum. For laboratories now using single-channel scanning systems the advantages of a GAMMASCOPE are these:

**Time-saved** — The GAMMASCOPE, with automatic operation and 100-channel storage capacity, will analyze and display a complete spectrum in a small part of the time required when manual operation or auxiliary scanning equipment such as motor drives, stepping motors and electronic sweeps are used.

**Size** — The GAMMASCOPE and its digital printer will essentially replace an entire rack of equipment.

**Accuracy** — The GAMMASCOPE with digital printer read-out provides more accurate results than the normal analog read-out of single-channel spectrometer systems.

**Energy calibration** — In the GAMMASCOPE, energy calibration is simplified by a visual representation of the energy spectrum.

**Short-lived isotopes** — The GAMMASCOPE will effectively handle analysis of short-lived emitters whereas single-channel systems often require counting times that exceed the isotope's half-life.

**\$5990 including digital printer f.o.b. North Haven  
slightly higher overseas**

The GAMMASCOPE is fully described in a new brochure that is available from your nearest TMC office or from the main office of Technical Measurement Corporation, 441 Washington Ave., North Haven, Connecticut — Telephone: 203-239-2501.



**TECHNICAL MEASUREMENT CORPORATION**



Displays

## Through a Glass, Clearly

Looking at a display is rather like holding up a magnifying glass to one small bit of information from among a vast tonnage of data. When the computer has isolated the data essential to the moment, the display must then bring it up to the human eye with utmost clarity of meaning. And as a mass of programmed information increases, more and more flexibility will be demanded of both the systems and the display. Thus many important "software" questions about displayed information must be asked and answered. Where, for example, is that fine line between too little information and too much? How can rapidly changing data best be exhibited so that eye and brain quickly get the messages? When should facts and figures be shown in an ordinary manner, when in more dramatic fashion? How can displays anticipate the answering of unanticipated questions? Much of the work of SDC scientists and engineers is and has been linked together by the

common denominator of displays, which in turn are the vital interaction link between machine and man...between computer and decision maker. The broad experience base being built by SDC men and women is, in turn, helping to shape the information systems of the future. If you are interested in shaping your own future in the science of systems, SDC offers opportunities of unusual scope and challenge. Human factors scientists, operations research scientists, systems-oriented engineers, and computer programmers are invited to write Mr. A. K. Granville, Jr., SDC, 2407 Colorado Ave., Santa Monica, California. Positions are open at SDC facilities in Santa Monica; Washington, D.C.; Lexington, Massachusetts; Paramus, New Jersey; and Dayton, Ohio. "An equal opportunity employer."

**System Development Corporation**





## How hostile is the moon?

One day man may learn to harness the resources of the moon in order to fashion a self-sustaining environment. But when he first journeys there, he will have to do so in a simulated earth environment. Air, food, water, temperature control—these and many other features of terrestrial life must be engineered into the mission. Problems such as this are part of Bellcomm's daily work for NASA. ⬆ Highly qualified men can assist in planning and evaluating systems for this ambitious, far-reaching project. Fields of interest include computing and programming, physics, mathematics, engineering, flight mechanics, aerodynamics and aeronautical engineering in general. ⬆ It is not easy work, but it is rewarding for men capable of doing it. If you believe you are such a man, your résumé would be welcomed by Mr. W. W. Braunwarth, Personnel Director, Bellcomm, Inc., Room 1115S, 1100 17th St., N. W., Washington 6, D. C. Bellcomm, newest company of the Bell System, is an equal opportunity employer.



**BELLCOMM, INC.**  
A Bell Telephone System Company

## HIGH VOLTAGE ENGINEERING CORPORATION ... "CHARGED PARTICLES"

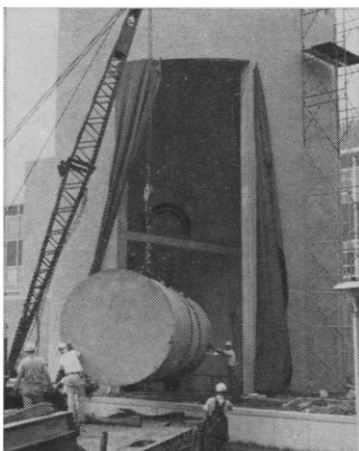
### State Sponsored Nuclear Research

State governments are rapidly expanding their financial sponsorship of nuclear research and training programs, thus moving into an area traditionally supported by federal or national agencies.

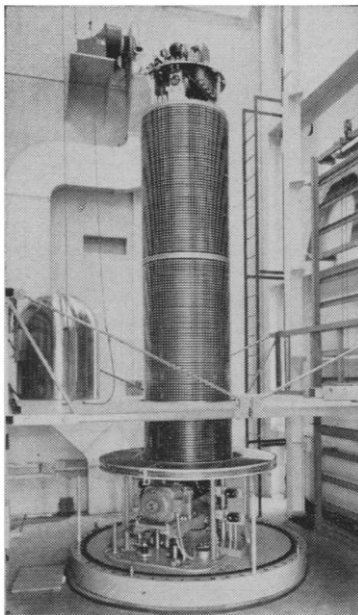
Modern experimental facilities create an atmosphere that attracts, and holds, the scientists and engineers needed to sustain academic excellence. Such technical leadership also provides a firm base for new industrial enterprise.

### State of Kentucky Pledged \$100,000 for Accelerator

At the University of Kentucky a Van de Graaff 5.5-million-volt Model CN particle accelerator was purchased after the Governor of Kentucky pledged \$100,000 from his capital building fund and the Kentucky Research Foundation made \$75,000 available. The balance of the expenditure came from other resources available to the university.



The University of Kentucky Van de Graaff will be housed in a special cylindrical structure — part of the university's impressive new Chemistry-Physics building.



New 5.5-million-volt Model CN particle accelerator was purchased by the University of Kentucky with the help of state agencies.

### Most Widely Used Accelerator Type

The 5.5-MeV Van de Graaff now is the university's and the state's largest and most powerful physics research tool. It can produce intense monoenergetic beams of both electrons and positive ions, as well as neutrons and x-rays in a continuous beam or in bursts as short as four nanoseconds.

At first, the accelerator will be used by the university to accelerate protons, deuterons, or Alpha particles. With pulsed beam, the physics department will carry out time-of-flight measurements and study neutron-induced reactions.

### Facility Expected To Attract More Research Grants

While the Van de Graaff will be used mainly for investigation of nuclear structure physics, it will also be at the disposal of all the university's departments engaged

in scientific studies under research grants or contracts from federal and industrial agencies. It will be operated by the faculty and graduate students on an estimated yearly budget of \$150,000 when at full capacity.

### New Product Line Available from ARCO

High Voltage Engineering's ARCO Division, Walnut Creek, Calif., has introduced a new line of products designed for use in the high vacuum, microwave, and particle accelerator industries.

The products, which are being offered as standard items, have been developed and tested by ARCO during the past ten years, and are a direct result of extensive effort associated with advanced high power accelerators. Included in this group are:

- 1½" all-metal straight-through or right-angle high vacuum valves
- An oil diffusion pump system for high vacuums rated at 40 liters/sec. The package includes a roughing pump, traps, valves, and electrical control. (Base vacuum rating 10<sup>-8</sup> Torr.)
- X-ray and neutron producing tungsten and uranium-clad targets for use with 5-150 MeV high power electron beams
- Pulsed 200 kV electron guns
- 10-100 MeV electron beam analyzing and deflecting systems for use with high power accelerators

For further information, write **Manager, Special Products, ARCO Division, High Voltage Engineering Corporation, Walnut Creek, Calif.**



## HIGH VOLTAGE ENGINEERING

## American Association for the Advancement of Science

### BOARD OF DIRECTORS

Paul M. Gross, *Retiring President, Chairman*  
 Alan T. Waterman, *President*  
 Laurence M. Gould, *President Elect*  
 Henry Eyring  
 John W. Gardner  
 H. Bentley Glass  
 Don K. Price  
 Paul E. Klopsteg  
*Treasurer*  
 Mina Rees  
 Walter Orr Roberts  
 Alfred S. Romer  
 H. Burr Steinbach  
 Dael Wolfe  
*Executive Officer*

### VICE PRESIDENTS AND SECRETARIES OF SECTIONS

MATHEMATICS (A)  
 Magnus R. Hestenes  
 Wallace Givens  
 PHYSICS (B)  
 Elmer Hutchisson  
 Stanley S. Ballard  
 CHEMISTRY (C)  
 Milton Orchin  
 S. L. Meisel  
 ASTRONOMY (D)  
 Paul Herget  
 Frank Bradshaw Wood  
 GEOLOGY AND GEOGRAPHY (E)  
 John C. Reed  
 Richard H. Mahard  
 ZOOLOGICAL SCIENCES (F)  
 Dietrich Bodenstein  
 David W. Bishop  
 BOTANICAL SCIENCES (G)  
 Aaron J. Sharp  
 Harriet B. Creighton  
 ANTHROPOLOGY (H)  
 David A. Baerreis  
 Eleanor Leacock  
 PSYCHOLOGY (I)  
 Lloyd G. Humphreys  
 Frank W. Finger  
 SOCIAL AND ECONOMIC SCIENCES (K)  
 Kingsley Davis  
 Ithiel de Sola Pool  
 HISTORY AND PHILOSOPHY OF SCIENCE (L)  
 Adolph Grünbaum  
 N. Russell Hanson  
 ENGINEERING (M)  
 Clarence E. Davies  
 Leroy K. Wheelock  
 MEDICAL SCIENCES (N)  
 Francis D. Moore  
 Oscar Touster  
 DENTISTRY (Nd)  
 Paul E. Boyle  
 S. J. Kreshover  
 PHARMACEUTICAL SCIENCES (Np)  
 Don E. Francke  
 Joseph P. Buckley  
 AGRICULTURE (O)  
 A. H. Moseman  
 Howard B. Sprague  
 INDUSTRIAL SCIENCE (P)  
 Alfred T. Waidelich  
 Allen T. Bonnell  
 EDUCATION (Q)  
 H. E. Wise  
 Herbert A. Smith  
 INFORMATION AND COMMUNICATION (T)  
 Foster E. Mohrhardt  
 Phyllis V. Parkins  
 STATISTICS (U)  
 Harold Hotelling  
 Morris B. Ullman

### PACIFIC DIVISION

Phil E. Church  
*President*  
 Robert C. Miller  
*Secretary*

### SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

Edwin R. Helwig  
*President*  
 Marlowe G. Anderson  
*Executive Secretary*

### ALASKA DIVISION

Allan H. Mick  
*President*  
 George Dahlgren  
*Executive Secretary*

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.

## President Kennedy on Science

*Excerpts from an address by President John F. Kennedy at the presidential convocation on 22 October 1963 honoring the centennial of the National Academy of Sciences.*

... If science is to press ahead ... if it is to continue to grow in effectiveness and productivity, our society must provide scientific inquiry the necessary means of sustenance. We must, in short, support it. Military and space needs, for example, offer little justification for much work in what Joseph Henry called abstract science. Though such fundamental inquiry is essential to the future technological vitality of industry and government alike, it is usually more difficult to comprehend than applied activity, and, as a consequence, often seems harder to justify to the Congress, to the Executive Branch, and to the people.

But if basic research is to be properly regarded, it must be better understood. I ask you to reflect on this problem and on the means by which, in the years to come, our society can assure continuing backing to fundamental research in the life sciences, the physical sciences, the social sciences, on natural resources, on agriculture, on protection against pollution and erosion. Together, the scientific community, the government, industry, and education must work out the way to nourish American science in all its power and vitality. ...

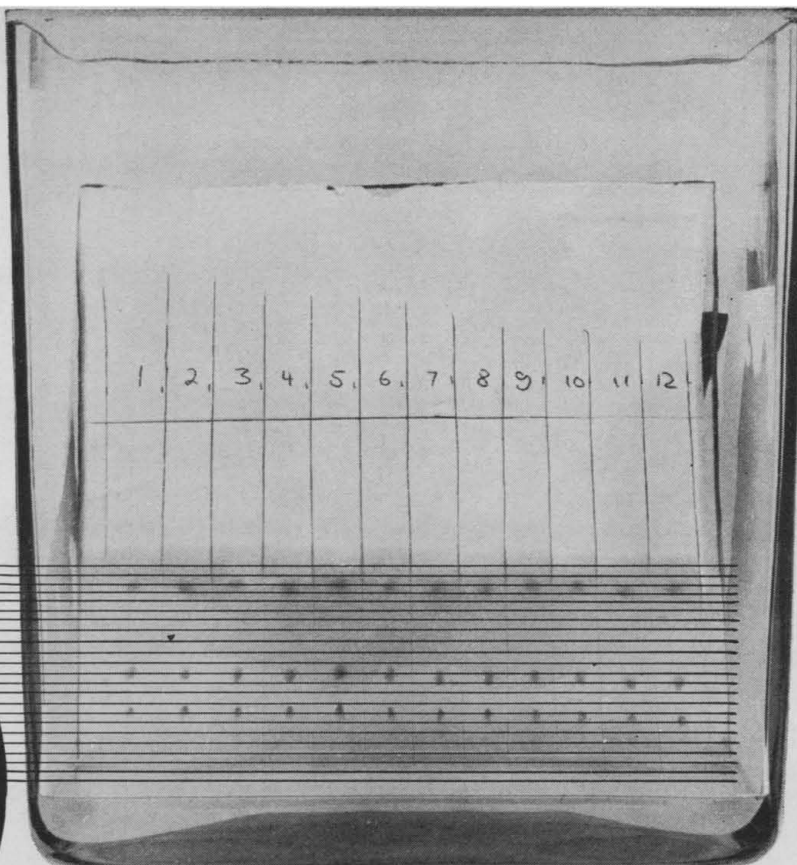
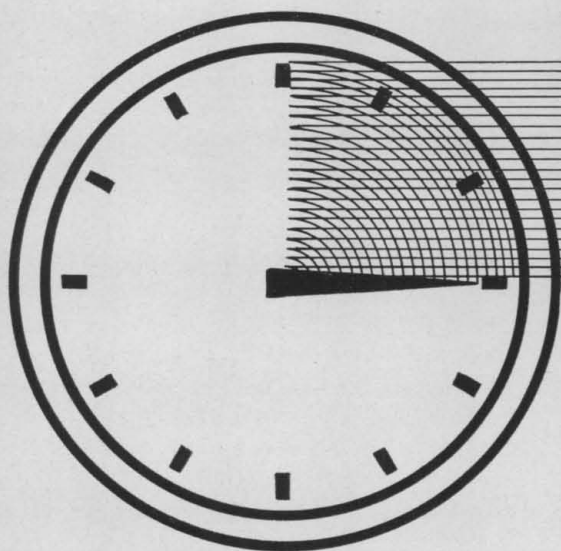
I would not close, however, on a gloomy note, for ours is a century of scientific conquest and scientific triumph. If scientific discovery has not been an unalloyed blessing, if it has conferred on mankind the power not only to create, but also to annihilate, it has at the same time provided humanity with a supreme challenge and a supreme testing. If the challenge and the testing are too much for humanity, then we are all doomed, but I believe that the future can be bright, and I believe it can be certain. Man is still the master of his own fate, and I believe that the power of science and the responsibility of science have offered mankind a new opportunity not only for intellectual growth, but for moral discipline, not only for the acquisition of knowledge but for the strengthening of our nerve and our will.

We are bound to grope for a time as we grapple with problems without precedent in human history, but wisdom is the child of experience. In the years since man unlocked the power stored within the atom, the world has made progress, halting but effective, toward bringing that power under human control. The challenge, in short, may be our salvation. As we begin to master the potentialities of modern science we move toward a new era in which science can fulfill its creative promise and help bring into existence the happiest society the world has ever known. ...

... I think that never in the ... history of science has the time been brighter, the need been greater, for cooperation between those of us who work in government and those of you who work in far distant laboratories on subjects almost wholly unrelated to the problems we now face. ...

... I hope that the people of the United States will continue to sustain all of you in your work and make it possible for us to encourage other gifted young men and women to move into these high fields which require so much from them and which have so much to give to all of our people. ...

# TLC SAVES TIME



## JUST 15 MINUTES

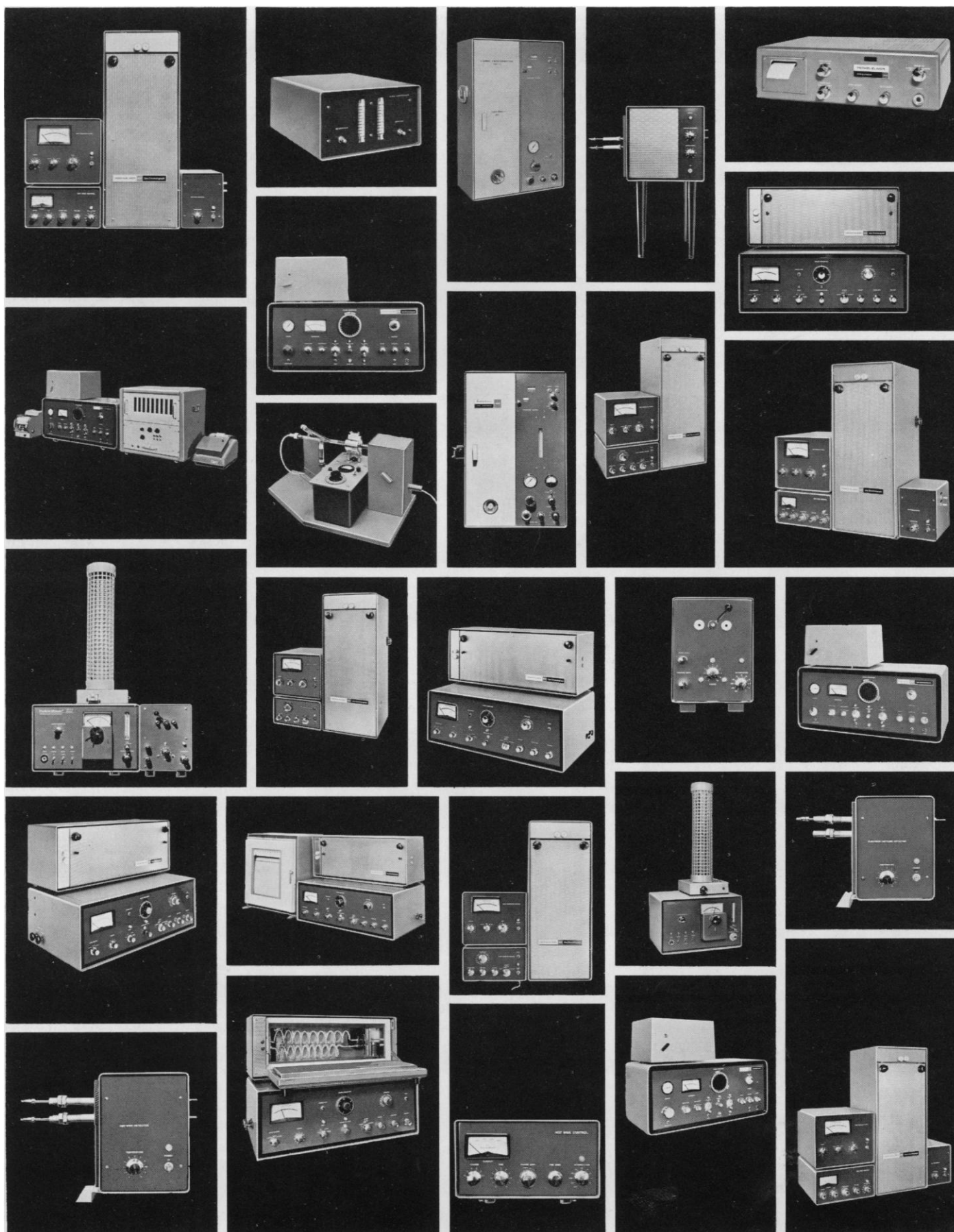
is often enough for a complete  
separation by Thin Layer Chromatography.

And, the horizons of the technique continue to expand. New accessories and new adsorbents are being added regularly to the DESAGA/BRINKMANN Apparatus. Do you know about our stainless-steel applicator for silver nitrate slurries? Our stainless-steel mounting board? Our new preparative dosing system? Our new labeling template for antioxidants? Our new inexpensive assembly for schools? Do you know about Silica Gel H which is fast becoming THE standard adsorbent, and is better for everyone?

If you have any doubts about being on our mailing list, just drop us a card. We'll be glad to send you up-to-date information.

**B** **BRINKMANN**  
CANTIAGUE ROAD, WESTBURY, N.Y. 11590  
ST. LOUIS • CHICAGO • HOUSTON • CLEVELAND • PHILADELPHIA • SAN FRANCISCO  
**INSTRUMENTS**

**PERKIN-ELMER GAS CHROMATOGRAPHS THE BROADEST SELECTION—  
WITH THE MOST ADVANCED FEATURES—OFFERED BY ANY MANUFACTURER**



# PERKIN-ELMER GAS CHROMATOGRAPHS

DESIGNED AND BUILT—SOLD AND SERVICED—BY THE WORLD'S LARGEST PRODUCERS OF GAS CHROMATOGRAPHIC EQUIPMENT

## MODEL 226

BASIC UNIT \$4500

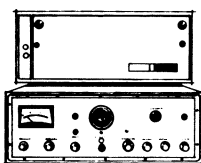
This sophisticated gas chromatograph combines the most modern advances in instrument design and performance with utmost simplicity of operation. Whether you use it in the research laboratory for precise retention time measurements, or in the routine control laboratory for dozens of daily automatic analyses, its unmatched speed, resolution, reliability and precision open new areas of information on virtually any organic mixture amenable to gas chromatographic separation. It adds automatic reset and programming features to an unparalleled accuracy of temperature control, to provide—for the first time—dependable untended operation.



## MODEL 800

SERIES

BASIC UNIT \$3195



**800 DIFFERENTIAL FLAME.** The basic instrument in this series features the Dynathermal oven design with fully proportional temperature control and Perkin-Elmer's exclusive Differential Flame Ionization Detector. For dual or single column, packed or capillary operation, precise linear temperature programming, sample collection—the ultimate in versatility.

**800 DIFFERENTIAL FLAME/HOT WIRE.** The Hot Wire Detector in this combination is installed in a separate temperature-controlled oven, and may be used independently of, or in parallel with, the basic Differential Flame Ionization Detector.

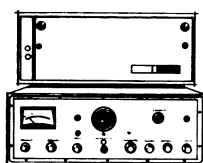
**800 DIFFERENTIAL FLAME/ELECTRON CAPTURE.** In this version, both the basic Differential Flame Ionization Detector and the Electron Capture Detector—in its separate thermostatted oven—are mounted at the same time. Pulser power supply is optional.

**800 DIFFERENTIAL FLAME/MICRO CROSS-SECTION.** The newest Perkin-Elmer detector system, the Micro Cross-Section Detector, is mounted in a separate thermostatted oven, in addition to the Differential Flame Detector. It may be interchanged with either the Hot Wire or the Electron Capture Detector described above.

## MODEL 801

SERIES

BASIC UNIT \$3195



**801 DIFFERENTIAL FLAME.** Designed to meet the needs of medical, biomedical and pesticide residue applications, this instrument retains all the control advantages of the Model 800, but features an all-glass system, including "on column" injection in either of the dual columns. A major breakthrough is the new all-glass removable injection block, which permits the analysis of "dirty" samples: i.e., anaesthesia gases in blood, pesticide residue extracts.

**801 DIFFERENTIAL FLAME/HOT WIRE.** As with the standard Model 800, the Model 801 can be equipped with an accessory Hot Wire Detector installed in a separate temperature-controlled oven, to permit dual-column thermal conductivity operation.

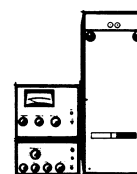
**801 DIFFERENTIAL FLAME/ELECTRON CAPTURE.** Particularly useful for pesticide residue analysis and silyl ether derivatives of steroids. The Electron Capture Detector can be installed at the same time as the dual Flame Ionization Detector. Again, pulser power supply is optional.

**801 DIFFERENTIAL FLAME/MICRO CROSS-SECTION.** Also available with this version is our newest detector system, the Micro Cross-Section Detector, mounted in a separate thermostatted oven.

## MODEL 810

SERIES

BASIC UNIT \$1695



**810 DIFFERENTIAL FLAME.** This new series, of modular design, offers—for the first time—dual column operation, with the high-sensitivity Differential Flame Ionization Detector, at an extremely low price. Included in the basic instrument, in addition to the Flame Detector, are the "ballistic" temperature programmer, and separate temperature control for the dual injection blocks, with the proven Dynathermal oven concept.

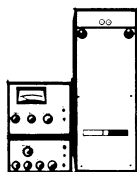
**810 DIFFERENTIAL FLAME/HOT WIRE.** The Hot Wire Detector in this combination is installed in a separate temperature-controlled oven, and may be used independently of, or in parallel with, the Differential Flame Ionization Detector.

**810 DIFFERENTIAL FLAME/ELECTRON CAPTURE.** In this version, both the additional Electron Capture Detector—in its separate thermostatted oven—and the Differential Flame Detector of the basic instrument are mounted at the same time. A pulser power supply is optional.

**810 DIFFERENTIAL FLAME/MICRO CROSS-SECTION.** The Micro Cross-Section Detector is mounted in a separate modular thermostatted oven, and is installed at the same time as the Differential Flame Ionization Detector which is basic to the instrument. It may be readily interchanged with the Electron Capture and Hot Wire Detectors described above.

## MODEL 811 SERIES

BASIC UNIT \$1695



**811 DIFFERENTIAL FLAME.** The low-cost way to achieve outstanding performance in *medical, biomedical and pesticide residue studies* where glass columns are specified. As in the Model 801, this unit features an all-glass injection and column system, coupled with modular design and Differential Flame Ionization Detector in the basic instrument.

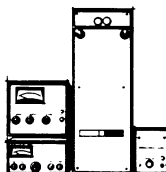
**811 DIFFERENTIAL FLAME/HOT WIRE.** Like the Model 810, the Model 811 permits the attachment of a modular, accessory Hot Wire Detector, complete in its own separate temperature-controlled oven, permitting dual-column thermal conductivity operation.

**811 DIFFERENTIAL FLAME/ELECTRON CAPTURE.** In critical pesticide residue analyses, as well as bio-medical determinations of the silyl ether derivatives of steroids, the Model 811 provides low-cost proficiency. The Electron Capture Detector can be installed at the same time as the basic Differential Flame Ionization Detector.

**811 DIFFERENTIAL FLAME/MICRO CROSS-SECTION.** Also available with this version is our newest detector system, the Micro Cross-Section Detector, mounted in a separate thermostatted oven. It is interchangeable with the Hot Wire and Electron Capture Detectors described in the two paragraphs above.

## MODEL 820 SERIES

BASIC UNIT \$1495



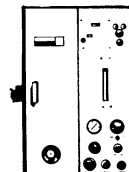
**820 HOT WIRE.** This instrument has the same features as the Model 810. The principal difference is that the Model 820 is equipped with the Dual Hot Wire Detector and control unit. Separate temperature control for dual injection block, columns and detector.

**820 ELECTRON CAPTURE.** The Electron Capture Detector module is interchanged with the basic Hot Wire Detector module. The addition of the Ionization Detector Electrometer Amplifier module completes this unit.

**820 MICRO CROSS-SECTION.** The Micro Cross-Section Detector is interchanged with the Hot Wire Detector module.

## MODEL 154D SERIES

BASIC UNIT \$1950



**154D THERMISTOR.** Here is the world standard for gas chromatography. The reliability of this model has been proved by the thousands of instruments installed and operating in the field today. The Model 154D features a precisely-thermostatted, circulating air bath oven, and thermistor thermal conductivity detector.

**154D THERMISTOR/FLAME.** With the thermistor detector and the flame ionization detector usable independently, in series, or in parallel.

**154D THERMISTOR/COLUMN SWITCHING.** Three columns may be installed in the instrument and used independently or in series. Columns may be switched in and out while operating, and all columns may be backflushed.

## MODEL 154L SERIES

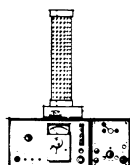
BASIC UNIT \$950

**154L THERMISTOR.** The lowest-cost precision-engineered gas chromatograph on the market today. Of the same oven design as the Model 154D and with the same thermistor detector, the Model 154L is ideal for routine analysis.

**154L THERMISTOR/COLUMN SWITCHING.** Ideal for Natural Gas Analysis where columns must be switched during analysis and heavy ends backflushed.

## MODEL 222P

BASIC UNIT \$2800



**A Preparative Gas Chromatograph** with linear temperature programming. The temperature of the up-to-one-inch diameter columns may be controlled precisely by direct resistance heating. You can collect sufficient sample with one run, without setting timers. Complete with collection system and columns.



USE THIS REPLY CARD to get free subscription to the Perkin-Elmer Gas Chromatography Newsletter and further information on products.

### MAIL IT NOW

S

Please enter my request for the following:

☐ Free subscription to Perkin-Elmer Gas Chromatography Newsletter

☐ Have Perkin-Elmer representative call

☐ Detailed information on Model(s)

☐ Price quotation on the following equipment

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Street or P.O. Box \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

## ACCESSORIES

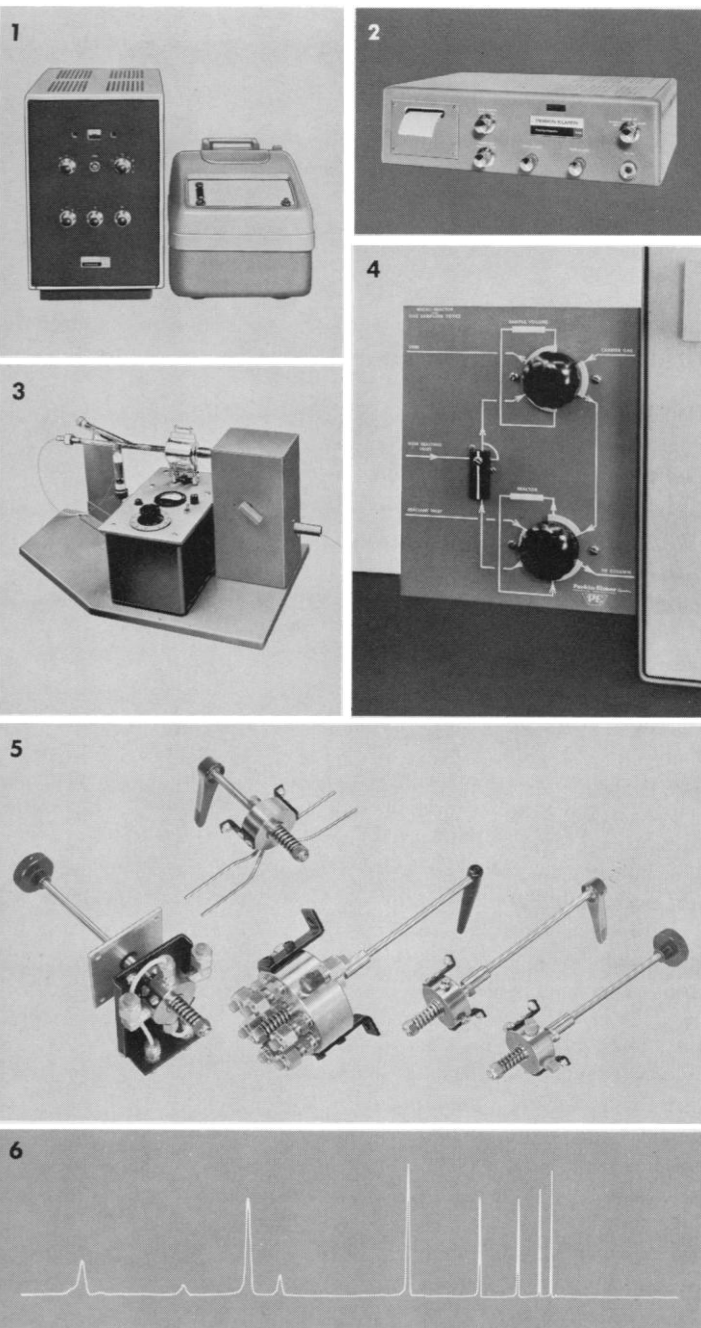
- 1 D2 Integrator.** An all-electronic integrator which combines high speed with automatic operation; 7-digit readout of area with 3-digit readout of both time of beginning of the peak and time of peak maximum.
- 2 194B Printing Integrator.** While low in cost, this integrator performs functions otherwise obtainable only in very high-priced instruments; that is, a printed digital readout at rates up to 6,000 counts per minute, no pen excursions to count or interpolate.
- 3 Pyrolysis Accessory.** Features include capability for handling samples in both solid and liquid states, accurate measurement of the sample and its residue, instantaneous heating of sample to desired temperatures and wide operating temperature range (150–1000°C).
- 4 Micro-Reactor Accessory.** This is essentially a micro-pilot plant with heated reaction chamber and direct introduction into the gas chromatograph. Particularly useful for surveying activities of catalysts as reflected in the composition of reaction products.
- 5 Column Switching and Sampling Valves.** Gas sampling and liquid sampling valves, switching and reverse flow valves, all made of Teflon and stainless steel to prevent sample contamination.
- 6 Recorders.** Perkin-Elmer's selection includes ten models, all leading makes; also, the correct chart paper for each chromatogram.

## SPECIAL SYSTEMS AND FACILITIES

**Column Facility.** In addition to furnishing standard chromatography columns and related supplies, the Column Facility of Perkin-Elmer can design and build columns and also furnish liquid phases, support materials, adsorbents and special coatings for your specific requirements.

**Computer Data Handling System.** New Computer Data Handling System, licensed from Shell Development Company, ties gas chromatographic output to your computer. Saves time and money, and improves accuracy by eliminating all need for manual computations.

**Gas Chromatograph-Mass Spectrometer Hookup.** We would be happy to discuss your particular problems in mating your gas chromatographic effluent with the inlet of your mass spectrometer even when using small-diameter capillary columns.

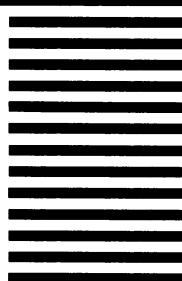


### BUSINESS REPLY MAIL

No postage stamp necessary if mailed in the United States

FIRST CLASS  
PERMIT NO. 12  
NORWALK  
CONNECTICUT

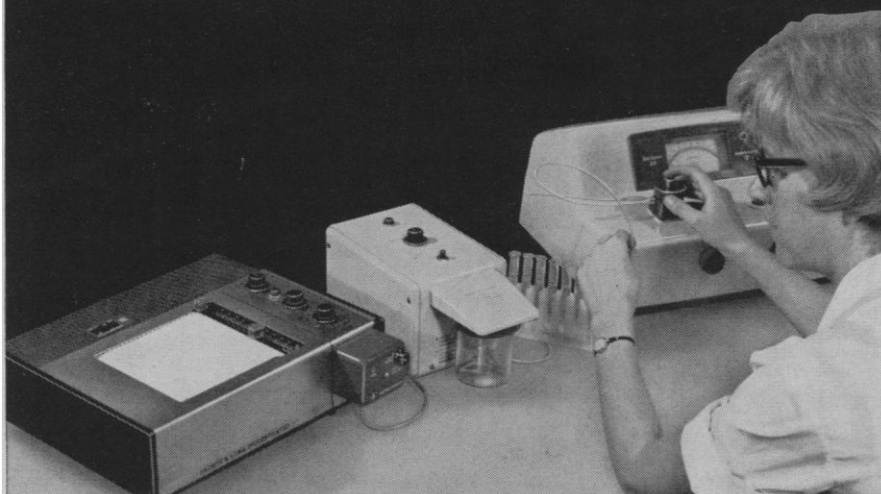
Postage will be paid by  
PERKIN-ELMER CORPORATION  
MAIN AVENUE  
NORWALK, CONNECTICUT



PERKIN-ELMER

# NEW! Bausch & Lomb DATA ACQUISITION SYSTEM

featuring ★ THE FLOW-THRU CUVETTE  
★ V. O. M.-5 RECORDER and the  
★ SPECTRONIC-20 SPECTROPHOTOMETER



Here is a rapid, precise method for producing a permanent, strip-chart record of all spectrophotometer readings . . . at the rate of 4 a minute! This new Bausch & Lomb system offers the widest range of data acquisition and recording . . . at a price well below any comparable system.

The heart of our system is the new FLOW-THRU CUVETTE . . . a quick, simple and convenient means for introducing and removing samples. The SPECTRONIC-20 is the fastest, most accurate spectrophotometer you can buy . . . in its price class. The V.O.M.-5 is a complete 5-inch strip-chart potentiometric recorder.

**It's SPEEDY** . . . 4 samples/minute. Using a vacuum pump probe, a cuvette fills in as little as 4 seconds and empties almost as quickly.

**It's PRECISE** . . . the rigidity of the Flow-Thru in the optical path reproduces readings to less than 1/2% (depending on the operator's skill and the nature of the solution).

**It's SUPERIOR** . . . to meter readings, because it has "recorder-accuracy." The strip-chart can be analyzed at leisure.

**It's ECONOMICAL** . . . in low original cost and virtual freedom from maintenance. No test tube changing is required (cuvette is easily cleaned and brought to a contamination-free state).

**It has SUPERB OVERALL QUALITY** . . . because of excellent design, superior workmanship and finest quality materials.

Use of the complete system is recommended for the best possible accuracy. However, any component in the system may be ordered for use with your present Spectronic 20.

Write Bausch & Lomb Incorporated, 75947 Bausch St., Rochester 2, N. Y., for Catalog D-2051.

**B&L COMPLETE DATA ACQUISITION SYSTEM . . . \$1275\***

*Bausch & Lomb sells through leading reputable dealers to assure you prompt, efficient sales assistance and service.*

\*Suggested List Price.

★ Bausch & Lomb trademark

**BAUSCH & LOMB**

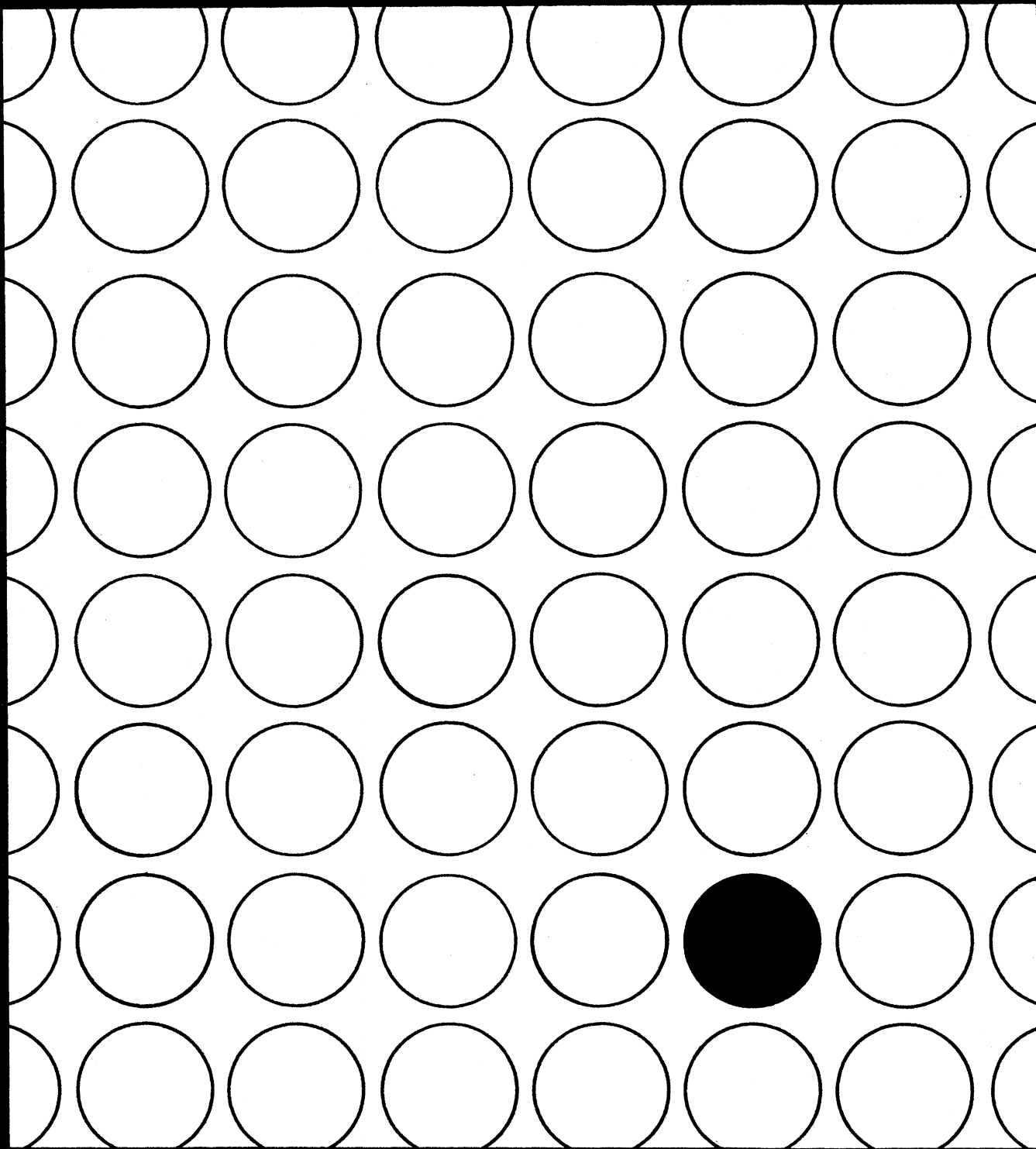


In Canada, write Bausch & Lomb Optical Co., Ltd., Dept. 759, Scientific Instrument Division, 16 Grosvenor St., Toronto 5, Canada

structures been elucidated. They are characterized by conversion to red pigments on heating with mineral acid. An important place in this class is occupied by the flavan-3,4-diols, which have been implicated in astringency and (in studies by Roux, Hillis, and others) in the biosynthesis of condensed tannins. A new group of leucoanthocyanins is the proanthocyanins, whose aglycones are oligomeric in nature and have monomers joined by various linkages. An example is the dimer composed of cyanidin and (+)-catechin, isolated in 1962 by Freudenberg and Weinges, in which a ketal linkage is involved. Geissman and Dittmar have isolated from the avocado seed a condensation product of flavan-3-ol and flavan-3,4-diol, which appear to be joined by a carbon-carbon linkage.

Other flavonoid compounds which have been known for many decades but whose structures have been elucidated only recently are the glycoflavonoids, or C-glycosylflavonoids. These were reviewed by Margaret K. Seikel (U.S. Forest Products Laboratory, Madison, Wisconsin). Although vitexin, an 8-glycosylapigenin, was discovered in 1898 by Perkin, the structure of the hydroxylated side chain was fully worked out only 6 years ago and is still questioned. During the past decade this field has developed rapidly to the point where almost two dozen compounds, mostly flavones, are now recognized to have widespread distribution among plants. The existence of a carbon-linked sugar chain can be recognized by the great resistance to hydrolysis under conditions in which glycosidic cleavage normally occurs. Although the nature of the flavonoid is readily determined, the major stumbling block thus far in making structural determinations has been to establish the nature and the point of attachment of the side chain, which are known unequivocally only for vitexin and its 5-deoxy derivative. *Vitex lucens*, the classical source of vitexin, has been shown by Seikel to contain additional glycoflavonoids, among which luteolin derivatives possibly containing two side chains are of greatest interest.

Flavonoid glucosides of a North American native skullcap (*Scutellaria epilobifolia*) were discussed by J. E. Watkin (National Research Council of Canada, Saskatoon), whose prime interest has been biosynthetic relationships. In addition to the 7-glucuronide of 5,6,7-trihydroxyflavone (baicalein), a known compound, the 7-glucuronides

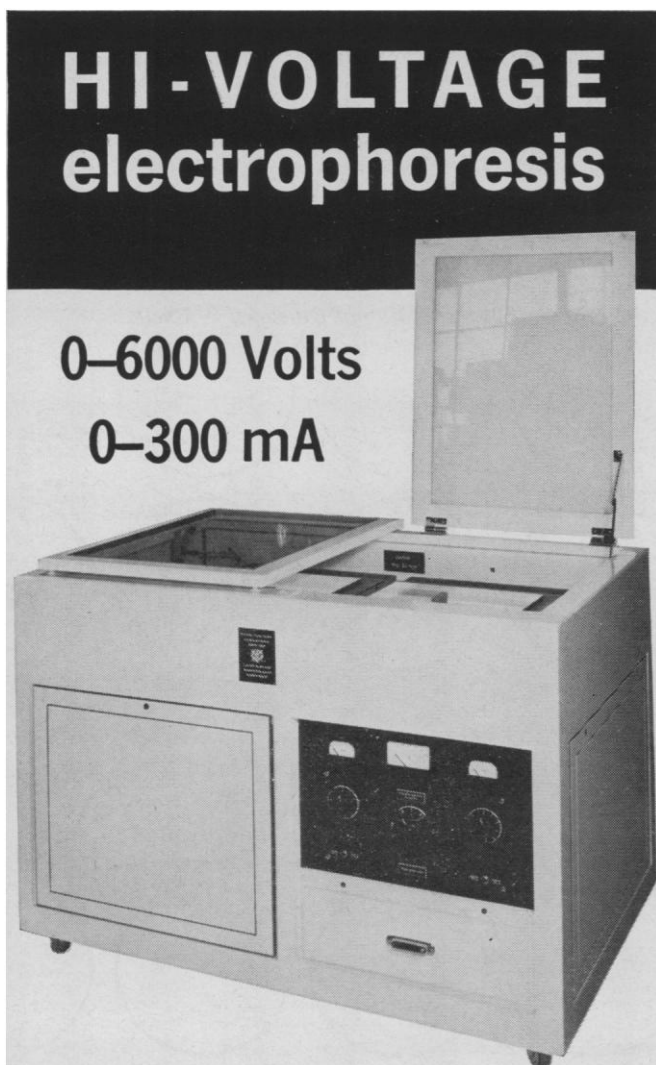


### ***Out of the ordinary...***

This is the type of sterilization problem being solved by Castle. Practical solutions are engineered for customers' requirements, based on our experience in sterilization. Our know-how and equipment have provided positive sterilization for thousands of different items. We have standard models or furnish special designs to accommodate the load—whatever the problem. Our systems have been engineered for many applications. Remember, sterilization ideas

start with Castle. And, many industries are reaping the benefits of Castle custom-designed sterilization programs. If you have a sterilization problem, take advantage of our experience. For complete information on this exclusive Castle service, write to Wilmot Castle Company, 1735 E. Henrietta Rd., Rochester 2, N. Y.

***Castle*** Subsidiary of Ritter Co. Inc.



# HI-VOLTAGE electrophoresis

0-6000 Volts  
0-300 mA

☐ In this field, the critical factor for maximum resolution and versatility is the "current" which can actually be used—not the theoretical voltage range.

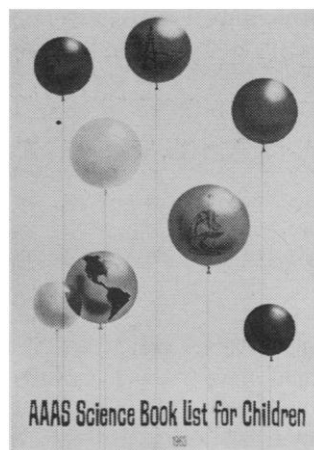
☐ The design of the Pherograph, with its efficient, built-in refrigeration system permits the use of currents to 300 mA.

☐ The only system which can be used with all carriers—including paper, starch, cellulose and cardboard.

☐ A unique design in which the paper does not have to be immersed in solvent.

☐ Two chambers are provided—for separate or simultaneous operation.

**BRINKMANN**  
CANTIAGUE ROAD, WESTBURY, N.Y. 11590  
**INSTRUMENTS**



## EACH AAAS MEMBER

(and there are  
87,000+  
members)

should know at  
least one place  
that would profit  
from the pur-  
chase of

### THE AAAS SCIENCE BOOK LIST FOR CHILDREN

second, revised edition, November, 1963

220 pp., \$1.50

a selected, annotated, graded list of more than  
1200 titles in the pure and applied sciences.

You can be a tremendous influence for the improvement of  
elementary libraries and collections if you call this announce-  
ment to the attention of

your local elementary school librarian, principal,  
or science specialist;

your public librarian;  
your own family book-buyer.

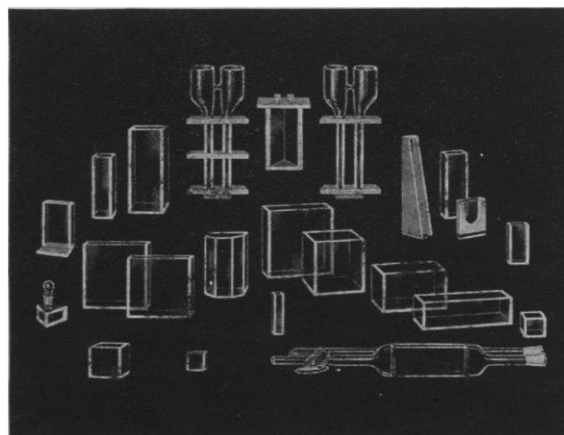
Now available from

**American Association for the Advancement of Science**

1515 Massachusetts Avenue, NW

Washington, D.C. 20005

## GLASS ABSORPTION CELLS made by **KLETT**



### SCIENTIFIC APPARATUS

Klett-Summerson Photoelectric Colorimeters—  
Colorimeters — Nephelometers — Fluorimeters—  
Bio-Colorimeters — Comparators — Glass Stand-  
ards—Klett Reagents.

**Klett Manufacturing Co., Inc.**

179 East 87 Street, New York, New York

of the new aglycones, 2'-methoxy-5,7-dihydroxyflavone, (-)-5,6,7-trihydroxyflavone, and 5,7,8-trihydroxyflavone, have been identified in this species. A very active glucuronidase found in this plant has also been partially purified. Watkin's studies at the enzyme level have not yet contributed positive results to answer the puzzling question of what additional intermediates are concerned in the formation of flavonoids from cinnamic acids and acetate.

During the second session, several groups of phenolics other than flavonoids were considered. Although chlorogenic acid has been known since 1837, and other hydroxycinnamoyl-quinic acids have been known for many years, the analogous shikimic acid esters, which are closely related biosynthetically, were unknown until the recent work of Goldschmid and Hergert on western hemlock. V. P. Maier (U.S. Department of Agriculture, Pasadena) dealt with the occurrence, isolation, structural chemistry, and chemical synthesis of these esters. Three new compounds which he isolated from dates—dactylifric acid, isodactylifric acid, and neodactylifric acid—were considered in detail. Crystalline dactylifric acid was shown, by degradation and synthesis, to be 3-O-caffeoylshikimic acid, while iso- and neo-dactylifric acids appear, from their periodate reactivities, to be 4-O- and 5-O-caffeoylshikimic acids, respectively. All are enzymic browning substrates. Maier emphasized the susceptibility of these compounds to acyl migration and the potential complexities due to the possible presence of multi- or mixed hydroxycinnamoyl residues. Important advances, which may extend to the biochemical field, can be expected in this area.

The fungi were considered during a contribution by T. J. Sproston (University of Vermont, Burlington) on the isolation and characterization of 1,4-naphthoquinones. Although quinonoid compounds are also formed by lichens and green plants, they are most readily recovered from fungal cultures, where they sometimes separate in crystalline form. A detailed report on the isolation and characterization of lambertellin, a new hydroxy-1,4-naphthoquinone from *Lambertella hicoloriae* Whet., was presented. Existing evidence points to its identity with 2,3-(2-keto-methyl- $\alpha$ -pyrano)-5 hydroxy-1,4-naphthoquinone, there being still some doubt about the position of the methyl substituent.

W. L. Stanley (U.S. Department of Agriculture, Albany, California) re-

viewed recent developments in the chemistry of coumarins and discussed methods for recovering, separating, identifying, and synthesizing natural coumarins. He showed representative spectra from a large collection which he has accumulated. He discussed in detail his own work on the identification of coumarins and furanocoumarins from cold-pressed lemon, grapefruit, and lime peel oils. With the aid of column and chromatostrip chromatography, 12 of these compounds have been positively identified and several

others have been tentatively identified. In lime oil were found at least five such compounds previously unreported from that source, and in bergamot oil, two. The structure of a new coumarin, auraptanol, from Seville orange oil, has been established to be 7-methoxy-8-(2-hydroxy-3-methyl-3-butenyl) coumarin.

The Plant Phenolics Group of North America plans to publish the proceedings of the symposium.

STEWART A. BROWN  
National Research Council,  
Saskatoon, Saskatchewan

## GET READY FOR THE SPACE and SCIENCE ERA! SEE SATELLITES, MOON ROCKETS **AMAZING SCIENCE BUYS** for FUN, STUDY or PROFIT



### AUTOMATICALLY SHOWS TIME, TIDES, POSITION OF SUN, MOON, STARS **NEW SPILHAUS SPACE CLOCK**

**19 DIFFERENT READINGS AT A GLANCE**  
Startling scientific achievement, yet completely practical and functional. Designed for the space age by world renowned scientist, Dr. Athelstan Spilhaus, Dean of Technology, University of Minnesota. Handsome conversation piece—constantly up-to-date encyclopedia of the sky. The Spilhaus Space Clock has beautiful fruitwood case and 3-sky-blue dials. Blends with decor of any home, office, club room, classroom, museum, display window, hotel, etc. Large dial shows sun position, daily sun rise and set, moon position, moon rise and set, phase of moon, low and high tide time, current stage of tide, day and month of year, current position of stars in sky, time of star rise and star set, relationships of sun, moon and stars, sidereal or star time. Left dial shows local time. Right dial shows world time including major U.S. cities and Universal (Greenwich) time. Operates on house current—requires only one simple setting for any geographic location. Measures 16" high x 11 1/2" wide x 4 1/4" deep. Presentation plaques available. Complete satisfaction guaranteed or money refunded.

Stock No. 1201-W.....\$150.00



### **HOME WEATHER STATION**

New "Weather Station" is highly sensitive to weather changes. Consistently accurate thermometer to  $\pm 2\%$ ; barometer accurate to  $\pm .25\%$  and hygrometer to  $\pm 5\%$ . Foretells weather changes from 12 to 24 hours in advance. Hygrometer calibrated in percent relative humidity. Excellent for teaching weather phenomena and meteorological hobby work. Instrument mounted on handsome wood-grained wall panel 15 1/2" x 5 1/2". Meter cases heavily metalized—combines beauty and protection. Dials, in etched aluminum, of high precision. Full instructions.

Stock No. 70,607-W.....\$9.95 Postpaid

### **Bargain 3" Astronomical Telescope**



See the stars, moon, phases of Venus, planets close up! 60 to 180 power—famous Mt. Palomar Reflecting type. Unusual Buy! Equipped with Equatorial mount; finder telescope; hardwood tripod. Included FREE: "STAR CHART"—272-page "HANDBOOK OF HEAVENS"—"HOW TO USE YOUR TELESCOPE" book.

Stock No. 85,050-W.....\$29.95 Pstpd.  
4 1/4" Astronomical Reflector Telescope  
Stock No. 85,105-W.....\$79.50 F.O.B.



### **WOODEN SOLID PUZZLES**

12 Different puzzles that will stimulate your ability to think and reason. Here is a fascinating assortment of wood puzzles that will provide hours of pleasure. Twelve different puzzles, animals and geometric forms to take apart and reassemble, give a chance for all the family, young or old, to test skill, patience and, best of all, to stimulate ability to think and reason while having lots of fun. Order yours now.

Stock No. 70,205-W.....\$3.00 Postpaid



### **WHIRLING WONDER WHEELS**

Here's a new adventure in optical impressions—created by the magical effect of these fascinating rotating discs. In addition to weird shapes and fantastic "after images", the kit demonstrates "stop motion" stroboscopic principles—"off center" focus and hypnosis. Kit includes 13 discs, approx. 5" in dia, battery holder, theostat, small motor mounted on bracket, bulb, socket, plug and instruction.

Stock No. 70,414-W.....\$9.95 Postpaid  
Order by Stock No. • Send Check or M.O. • Satisfaction Guaranteed

**EDMUND SCIENTIFIC CO.**  
BARRINGTON, NEW JERSEY



### **SCIENCE TREASURE CHESTS** For Boys—Girls—Adults!

Science Treasure Chest—Extra-powerful magnets, polarizing filters, compass, one-way-mirror film, prism, diffraction grating, and lots of other items for hundreds of thrilling experiments, plus a Ten-Lens Kit for making telescopes, microscopes, etc. Full instructions. Stock No. 70,342-W.....\$5.00 Postpaid  
Science Treasure Chest DeLuxe—Everything in Chest above plus exciting additional items for more advanced experiments including crystal-growing kit, electric motor, molecular models set, first-surface mirrors, and lots more. Stock No. 70,343-W.....\$10.00 Postpaid



### **Shimmering Rainbow of Gem-Like Color DAZZLING DIFFRACTION JEWELRY FOR MEN AND WOMEN NOW AVAILABLE IN GOLD**

This science-inspired jewelry glows with the twinkling magic of rainbows. It uses circular patterns of 1" DIFFRACTION GRATING REPLICAS to break up light into all the rich, deep colors of nature's grandest phenomenon. Incorporated into beautiful jewelry, these exquisite new fashion accessories are now available in lustrous gold as well as silver. Other items available. Write for complete list.

ITEM	GOLD	SILVER	PRICE Postpaid
EARRINGS	No. 1814-W	No. 1704-W	\$2.20
CUFF LINKS	1827-W	1714-W	2.20
PENDANT	1818-W	1729-W	2.20
3/4" Tie Clasp	1831-W	1743-W	3.85
& Cuff Link Set			
BRACELET	1816-W	1735-W	7.70
(Six 3/4" gratings)			



### **Make Your Own Astronomical Telescope**

#### **GRIND YOUR OWN ASTRONOMICAL MIRROR**

Kits contain mirror blank, tool, abrasives, diagonal mirror and eyepiece lenses. You build instruments ranging in value from \$75.00 to hundreds of dollars.

Stock #	Diam.	Mirror Thickness	Price
70,003-W	4 1/4"	3/4"	\$ 7.50 ppd.
70,004-W	6"	1"	11.95 ppd.
70,005-W	8"	1 1/8"	19.50 ppd.
70,006-W	10"	1 3/8"	30.75 f.o.b.
70,007-W	12 1/2"	2 1/8"	59.95 Barrington



### **SOLAR MOTOR RUNS AT ASTONISHING 3000 R.P.M.**

Powered by light only. Radiometer (solar motor) rotates at up to 3000 R.P.M. in bright sunlight. Also operates with invisible blacklight, even moves from glow of cigarette. 5" high. 3" dia. vacuum glass globe with 4 rotating vanes.

Stock No. 60,082-W.....\$1.25 Ppd.

### **MAIL COUPON for FREE CATALOG "W"**

EDMUND SCIENTIFIC CO.,  
Barrington, New Jersey

Completely New and Enlarged  
148 pages—Nearly 4000 Bargains

Please rush Free Giant Catalog-W

Name .....  
Address .....  
City ..... Zone ..... State .....





SPRINGER-VERLAG  
Berlin · Göttingen · Heidelberg

# Biochemische Zeitschrift

Founded by C. Neuberg

Edited by Th. Bücher, B. Hess, H. Holzer, M. Kiese, K. Lang,

F. Lynen, C. Martius, F. Turba, K. Wallenfels, O. Westphal, Th. Wieland

Editorial management: K. Lang

338th Volume  
80th birthday of

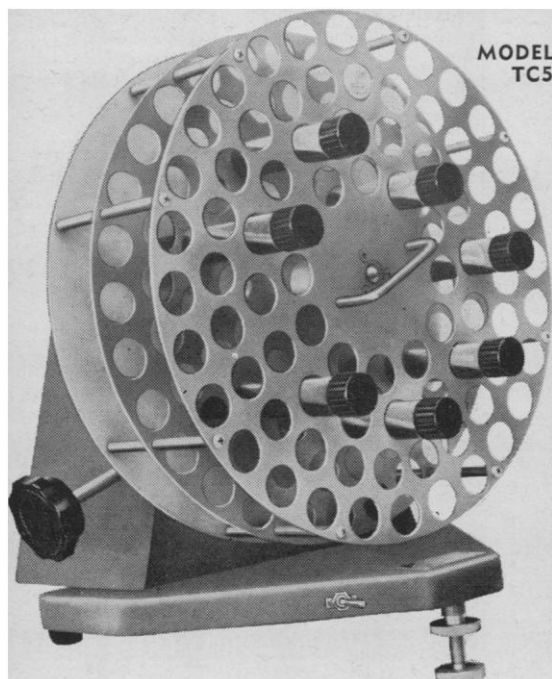
*Published as dedication volume for*  
Prof. Dr. Otto Warburg

With 314 illustrations and 1 portrait. VI, 915 pages. 8 vo. 1963.

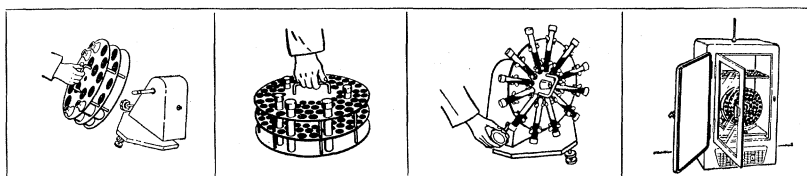
Stiff paper bound \$14.50.

Professor Dr. Otto Warburg, Berlin was 80 years old in October. He has laid the foundations in many fields of modern biochemistry, and most of his older classical works have been published in the "Biochemische Zeitschrift." Therefore on the occasion of his 80th birthday a large number of the most outstanding biochemists of Europe and the United States have sent in original works to be printed in the "Biochemische Zeitschrift" this making a worthy and substantial dedication volume, which appeared in October 1963.

■ a comprehensive prospectus with indications of single contributions is now available.



## TISSUE CULTURE ROLLORDRUM



For Bottles and Eggs    Used as Carrying Tray    For Tumble-Tube Technique    Designed for Incubator Use

### APPLICATIONS

Growth of tissues and viruses.

Used in cytotoxicity assays.  
Growth of virus in chick embryonic tissue.

Hormone production by selected tissues.

Extraction and dialysis of blood samples for analysis.

**UNCONDITIONAL  
1-YEAR WARRANTY**

The NBS Rollordrum is a rugged instrument for growing tissue cultures by the roller tube method. A choice of operating speeds is offered in several, continuous-duty models: 1/5 rpm, 1 rpm, and 20-60 rpm.

Test tubes, eggs, and centrifuge bottles of various sizes can be accommodated on six interchangeable drums. A tumble-tube turntable is also available for rotating tubes over their vertical axes.

The heavy-duty drive mechanism is quiet in operation, achieving smooth, uniform rotary motion during prolonged investigations. Powered by a heavy-duty, totally enclosed ball-bearing motor, the apparatus gives many years of continuous service under incubation temperatures.



NEW BRUNSWICK SCIENTIFIC CO., INC.

PRECISION LABORATORY APPARATUS

P.O. BOX 606, NEW BRUNSWICK, NEW JERSEY

WRITE FOR  
CATALOG  
TCS/11293

# Re-arrange Conflex\* doors and drawers anytime...

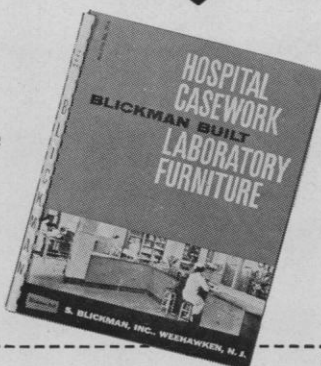


## to meet changing laboratory needs

As laboratory needs change... Conflex storage arrangements can be changed... quickly... easily... without disturbing the cabinet assembly! Versatile Conflex laboratory furniture provides full interchangeability of doors and drawers within the cabinet modules. Investigate the advantages of this equipment. Ask for one of our experienced representatives to call. He'll gladly give helpful engineering assistance on your next project.

\*TRADE MARK

Send for 40-page book on Conflex\* laboratory furniture.



### S. BLICKMAN, INC.

6911 Gregory Ave.,  
Weehawken, N. J.

Please send the following:

- ☐ Laboratory Furniture Catalog
- ☐ Enclosures for safe handling of hazardous materials
- ☐ Please have representative call

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

**Blickman-Built** for Years of Reliable Service

See us at booth #2839—Chemical Show—New York Coliseum, New York, N. Y.—Dec. 2-6

## Forthcoming Events

December

1-3. **Isotopically Labeled Drugs** in Experimental Pharmacology, Chicago, Ill. (Intern. Atomic Energy Agency, 11 Kärntner Ring, Vienna, Austria)

1-3. Association for Research in **Ophthalmology**, annual, Iowa City, Iowa. (The Association, 10515 Carnegie Ave., Cleveland 6, Ohio)

1-4. American Inst. of **Chemical Engineers**, 56th annual, Houston, Tex. (AICE, 25 W. 45 St., New York, N.Y.)

1-4. **American Medical Assoc.**, clinical meeting, Portland, Ore. (R. M. McKeown, 510 Hall Bldg., Coos Bay, Ore.)

1-7. **Anatomical Pathology**, 4th Latin American congr., San Salvador, El Salvador. (R. Masferrer, Latin American Soc. of Anatomical Pathology, Dept. of Pathological Anatomy, Hospital Rosales, San Salvador)

1-7. **Pharmacy and Biochemistry**, 6th Pan American congr., Mexico City, Mexico. (G. B. Griffenhagen, Div. of Communications, American Pharmaceutical Assoc., 2215 Constitution Ave., NW, Washington, D.C.)

1-7. American **Phytopathological Soc.**, 3rd Carribean meeting, San Jose, Costa Rica. (B. H. Waite, c/o United Fruit Co., La Lima, Honduras)

2-5. **Agronomical Research**, 2nd world congr., Rome, Italy. (Intern. Confederation of Technical Agriculturalists, 24 Beethovenstr., Zurich, Switzerland)

2-5. **Entomological Soc. of America**, St. Louis, Mo. (ESA, 4603 Calvert Rd., College Pk., Md.)

2-6. **Chemical Industries**, 29th exposition, New York, N.Y. (Publicity Dept., 480 Lexington Ave., New York, N.Y.)

2-13. **Immunization** in the Control of Communicable Disease, seminar, Manila, Philippines. (World Health Organization, Regional Committee for the Western Pacific, P.O. Box 2932, Manila)

4-6. **Oceanographic Data Exchange**, working group, Intergovernmental Oceanographic Commission, Paris, France. (W. S. Wooster, Office of Oceanography, UNESCO, Place de Fontenoy, Paris 7°)

4-6. **Ultrasonics Engineering**, symp., Washington, D.C. (T. R. Meeker, Bell Telephone Laboratories, Allentown, Pa.)

4-8. Central American **Medical Congr.**, San Salvador, El Salvador. (R. C. Bustamante, 25 Calle Poniente 10-25, San Salvador)

4-10. American Acad. of **Optometry**, Chicago, Ill. (C. C. Koch, 1506-1508 Foshay Tower, Minneapolis 2, Minn.)

5-6. **Forest Genetics**, short course and meeting, Tucson, Ariz. (R. F. Wagle, Dept. of Watershed Management, Univ. of Arizona, Tucson)

5-6. Thermal Stability of **Polymers**, symp., Columbus, Ohio. (P. M. Stickney, Battelle Memorial Inst., 505 King Ave., Columbus, Ohio 43201)

5-6. **Syntagmatic Organization Language**, 2nd seminar, New Brunswick, N.J. (Graduate School of Library Service, Rutgers Univ., New Brunswick, N.J.)

6. Reliability in **Space Vehicles**, 4th seminar, Los Angeles, Calif. (W. H. Bleuel, Jr., Endevco Corp., 801 S. Arroyo Pkwy., Pasadena, Calif.)