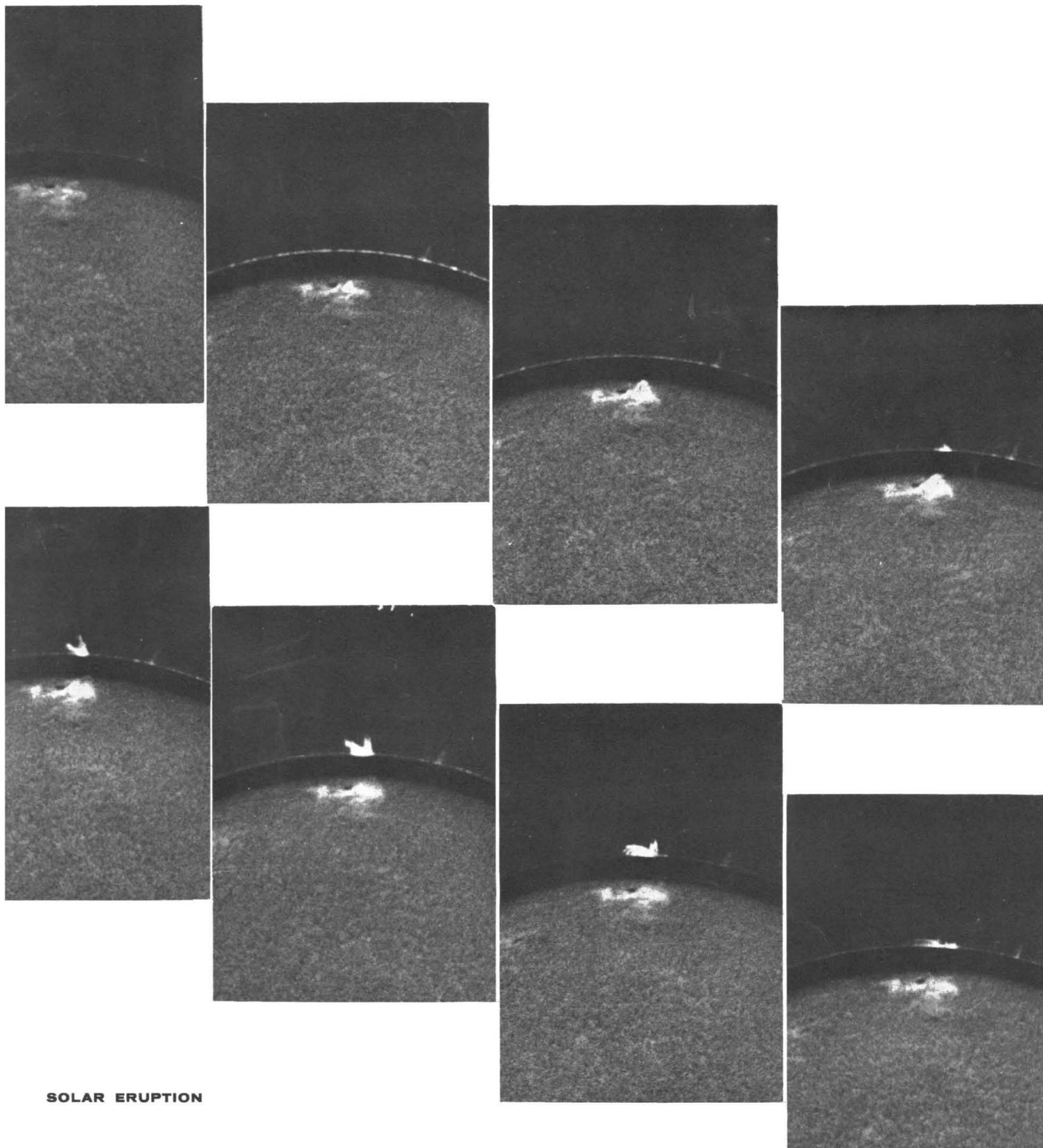


SCIENCE

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.



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FARMINGDALE, LONG ISLAND, NEW YORK

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

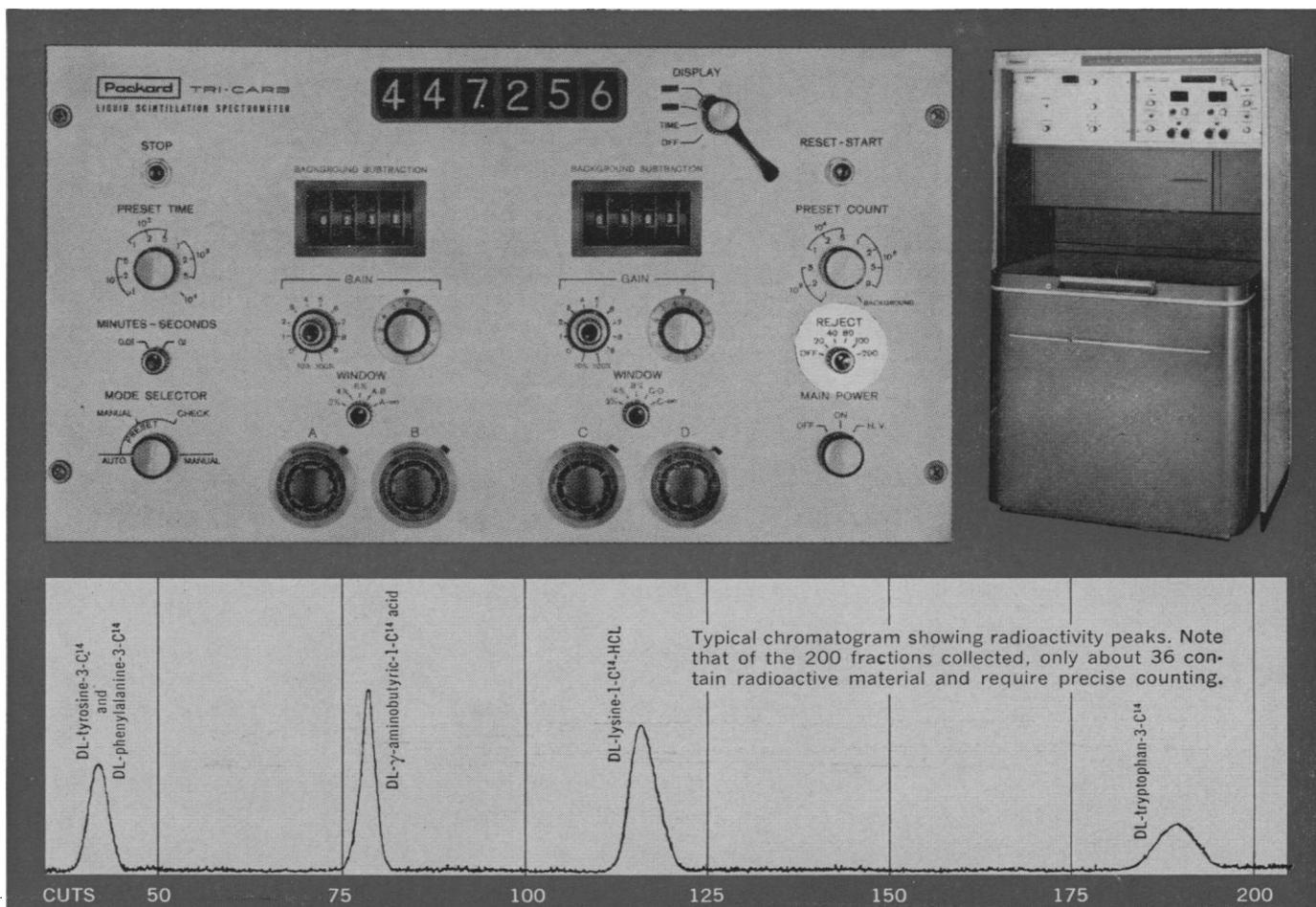
The ability of new Tri-Carb Spectrometers to automatically bypass samples with little or no radioactivity can save hours of valuable counting time. This ability finds application in two commonly-encountered counting situations:

(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.



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29 November 1963

Vol. 142, No. 3596

SCIENCE

LETTERS	A Scientist by Several Other Names; Metric Question; Drive Decay and Differential Training; Exobiology	1123
EDITORIAL	President Kennedy on Science	1129
ARTICLES	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
JOHN F. KENNEDY	<hr/> 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.	
NEWS AND COMMENT	John F. Kennedy—The Man and His Meaning—Policy and Legacy	1151
BOOK REVIEWS	F. Bowles's <i>Access to Higher Education</i> , reviewed by <i>K. E. Clark</i> ; other reviews	1154
REPORTS	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

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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: 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
ASSOCIATION AFFAIRS Cleveland, 130th AAAS Meeting, 26-30 December	1194
MEETINGS Ionic Intermediates and Energy Transfer in Radiation Chemistry; Phenolics of Higher Plants; Forthcoming Events	1196

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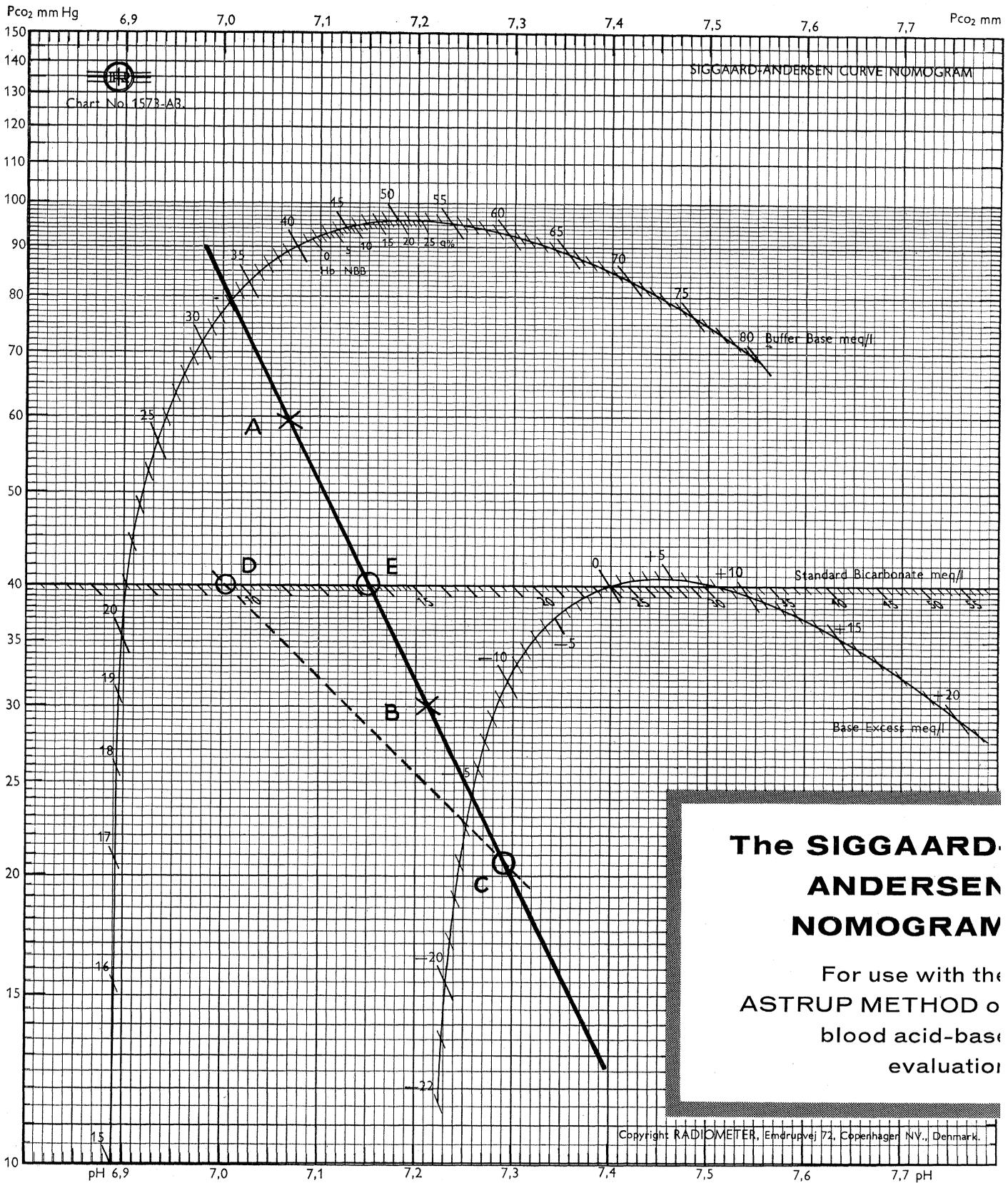
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COVER

Rapid sequence photographs, in H α 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: 764 mm Hg	READINGS		RESULTS	
Dept: <i>1st B.</i>	Sample No.: <i>4</i>	CO ₂ 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 ₂ : <i>20.5</i> mm Hg	Base Excess: <i>-15</i> meq/l blood
Date: <i>28/10/63</i>	Hour of Sampling: <i>8:00 A.M.</i>	CO ₂ partial pressure: Cylinder No 1: <i>58.9</i> mm Hg Cylinder No 2: <i>30</i> mm Hg	After equilibration	high Pco ₂ pH: <i>7.066</i> low Pco ₂ pH: <i>7.212</i>	Buffer Base: <i>33</i> meq/l blood	Standard Bicarb.: <i>13.4</i> meq/l plasma
Remarks: <i>NONE</i>		Hemoglobin: <i>15</i> g/100 ml	Readings made by: <i>H. N. M.</i>		Actual Bicarb.: <i>9.6</i> meq/l plasma	Total CO ₂ : <i>10.2</i> meq/l plasma
		Oxygen Saturation: <i>100</i> percent	Signature: <i>[Signature]</i>			

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levels of Pco_2 derived from calibrated gas sources—and the resultant pH values measured. On the nomogram these pH values are plotted against their corresponding 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 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° line from point (C) to intersect the bicarbonate scale—and Total 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 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 Pco_2 .

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Actual Plasma Bicarbonate
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Actual 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.

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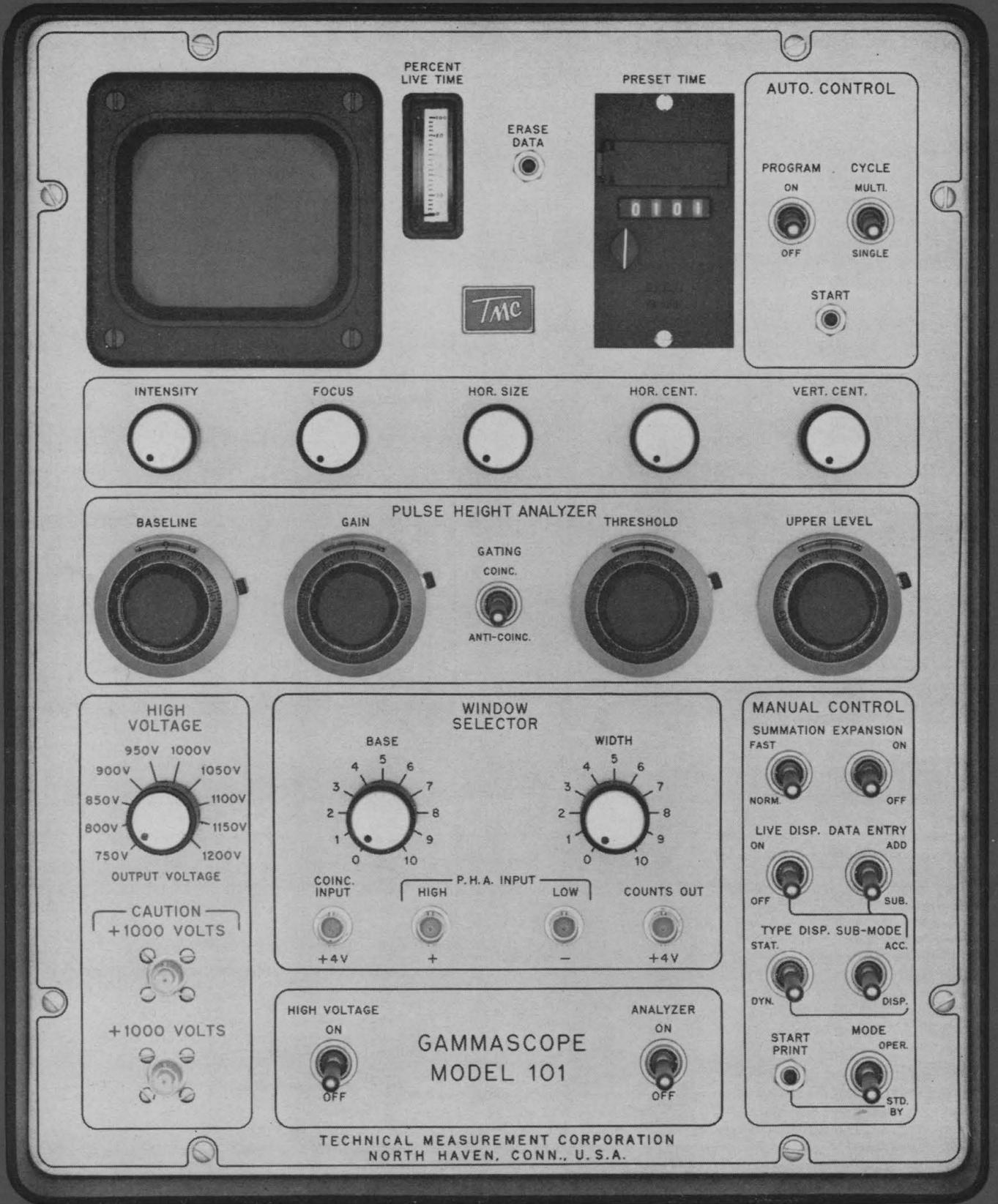
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900V 1050V
850V 1100V
800V 1150V
750V 1200V
OUTPUT VOLTAGE

CAUTION
+1000 VOLTS

+1000 VOLTS

WINDOW
SELECTOR

BASE

WIDTH

4 5 6
3 7
2 8
1 9
0 10

4 5 6
3 7
2 8
1 9
0 10

COINC.
INPUT

+4V

P.H.A. INPUT

HIGH

+

LOW

-

COUNTS OUT

+4V

HIGH VOLTAGE

ON

OFF

GAMMASCOPE
MODEL 101

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ON

OFF

MANUAL CONTROL

SUMMATION EXPANSION

FAST

NORM.

ON

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LIVE DISP. DATA ENTRY

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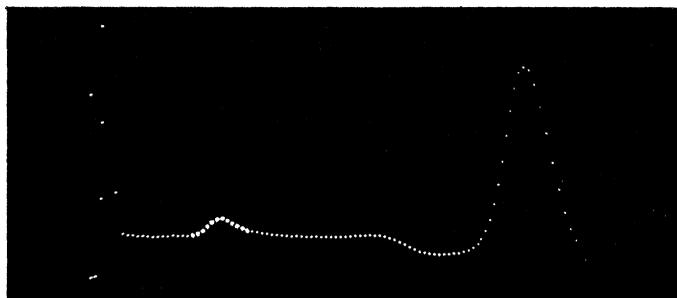
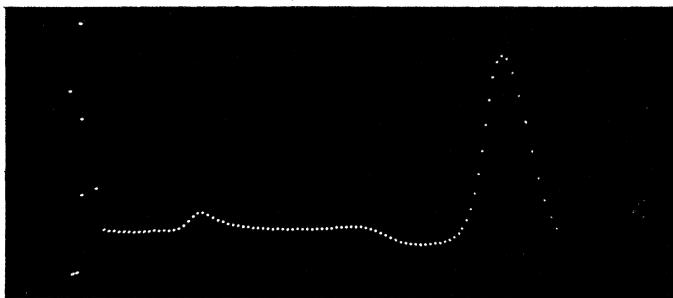
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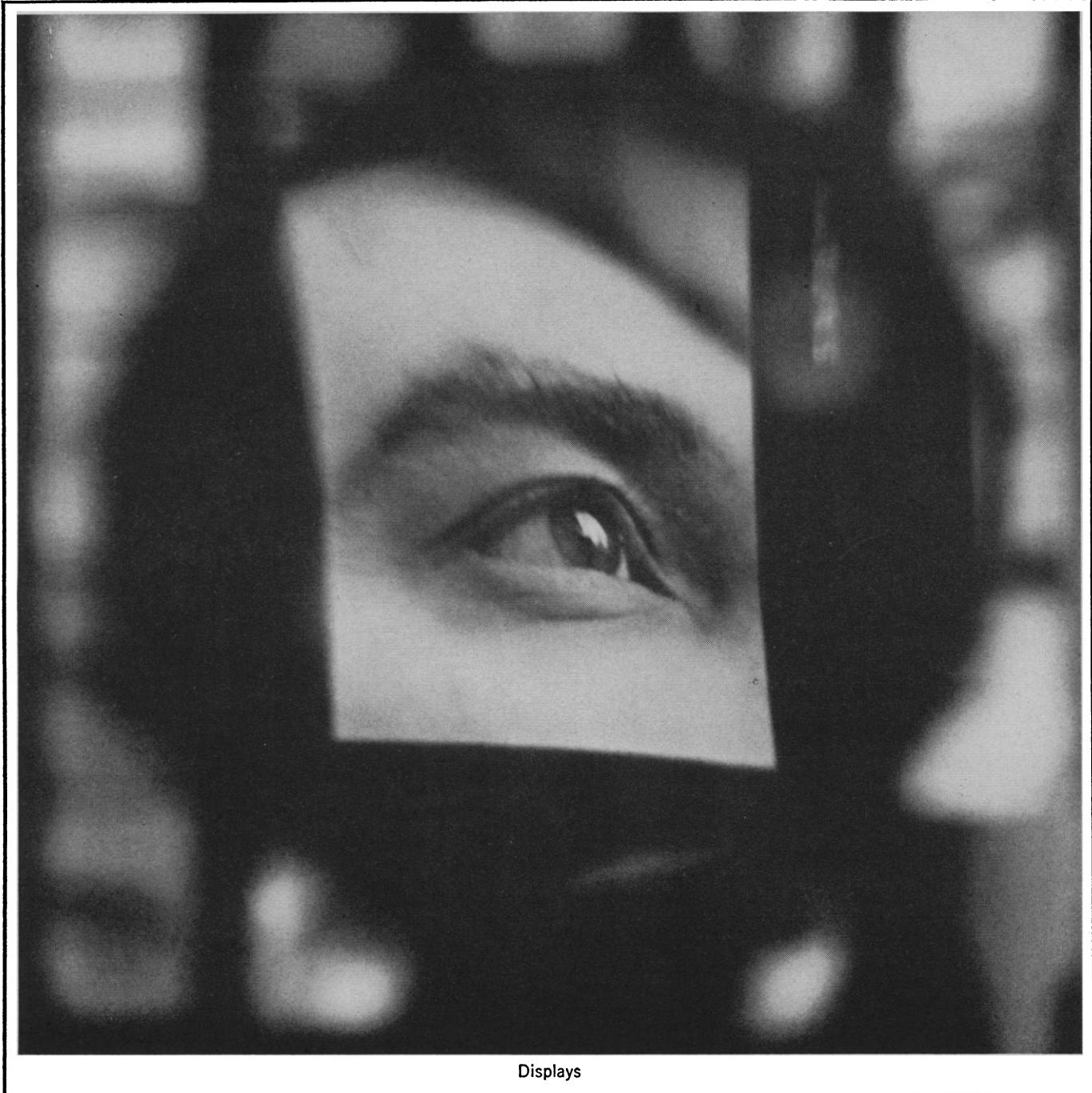
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HIGH VOLTAGE ENGINEERING CORPORATION . . . "CHARGED PARTICLES"

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.

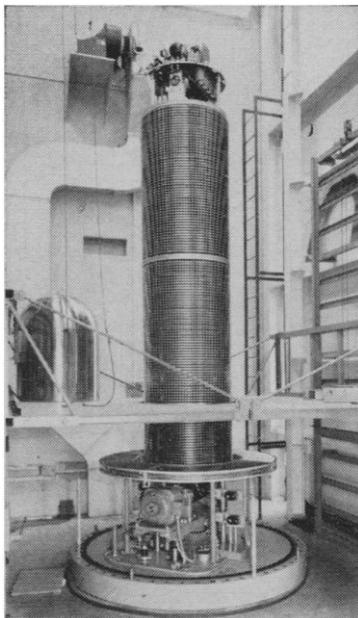
Modern experimental facilities create an atmosphere that attracts, and holds, the scientists and engineers needed to sustain academic excellence. Such technical leadership also provides a firm base for new industrial enterprise.

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.

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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.

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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. . . .

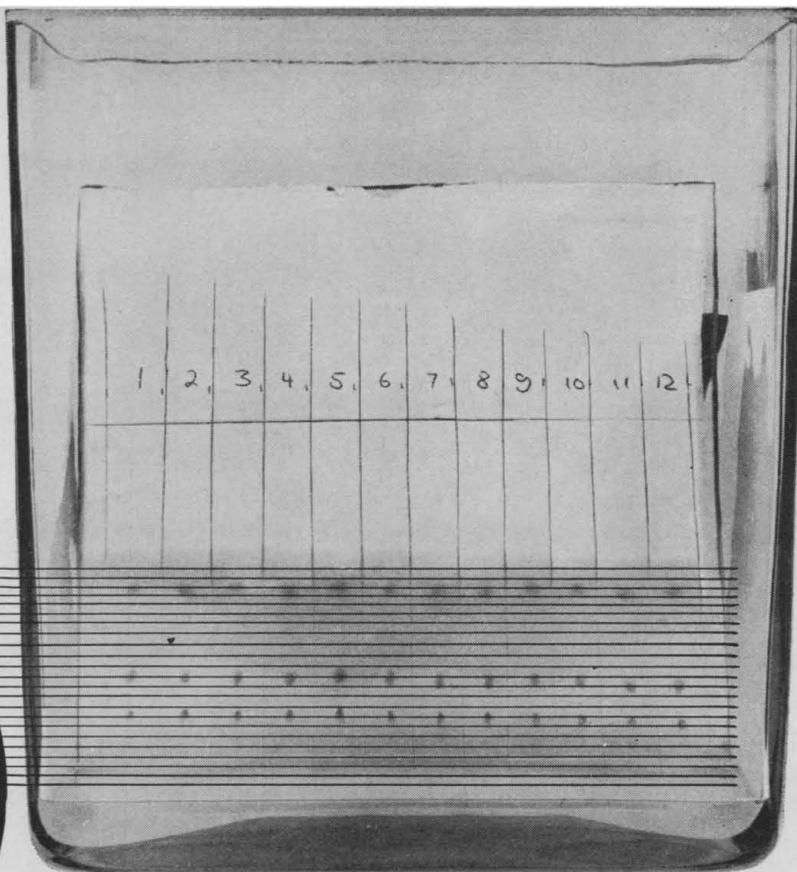
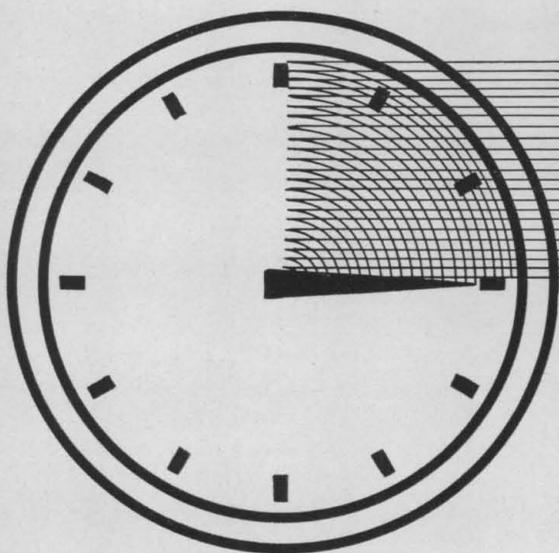
I would not close, however, on a gloomy note, for ours is a century of scientific conquest and scientific triumph. If scientific discovery has not been an unalloyed blessing, if it has conferred on mankind the power not only to create, but also to annihilate, it has at the same time provided humanity 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. . . .

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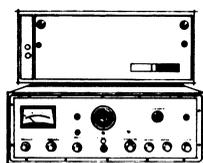
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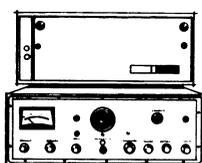
800 DIFFERENTIAL FLAME/HOT WIRE. The Hot Wire Detector in this combination is installed in a separate temperature-controlled oven, and may be used independently of, or in parallel with, the basic Differential Flame Ionization Detector.

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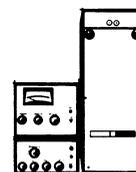
801 DIFFERENTIAL FLAME/HOT WIRE. As with the standard Model 800, the Model 801 can be equipped with an accessory Hot Wire Detector installed in a separate temperature-controlled oven, to permit dual-column thermal conductivity operation.

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.

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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.

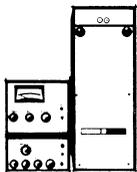
810 DIFFERENTIAL FLAME/HOT WIRE. The Hot Wire Detector in this combination is installed in a separate temperature-controlled oven, and may be used independently of, or in parallel with, the Differential Flame Ionization Detector.

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.

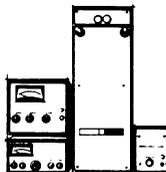
811 DIFFERENTIAL FLAME/HOT WIRE. Like the Model 810, the Model 811 permits the attachment of a modular, accessory Hot Wire Detector, complete in its own separate temperature-controlled oven, permitting dual-column thermal conductivity operation.

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MODEL
820
SERIES

BASIC UNIT \$1495



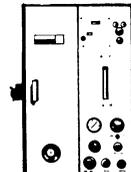
820 HOT WIRE. This instrument has the same features as the Model 810. The principal difference is that the Model 820 is equipped with the Dual Hot Wire Detector and control unit. Separate temperature control for dual injection block, columns and detector.

820 ELECTRON CAPTURE. The Electron Capture Detector module is interchangeable 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 interchangeable with the Hot Wire Detector module.

MODEL
154D
SERIES

BASIC UNIT \$1950



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MODEL
154L
SERIES

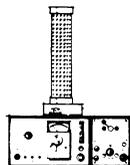
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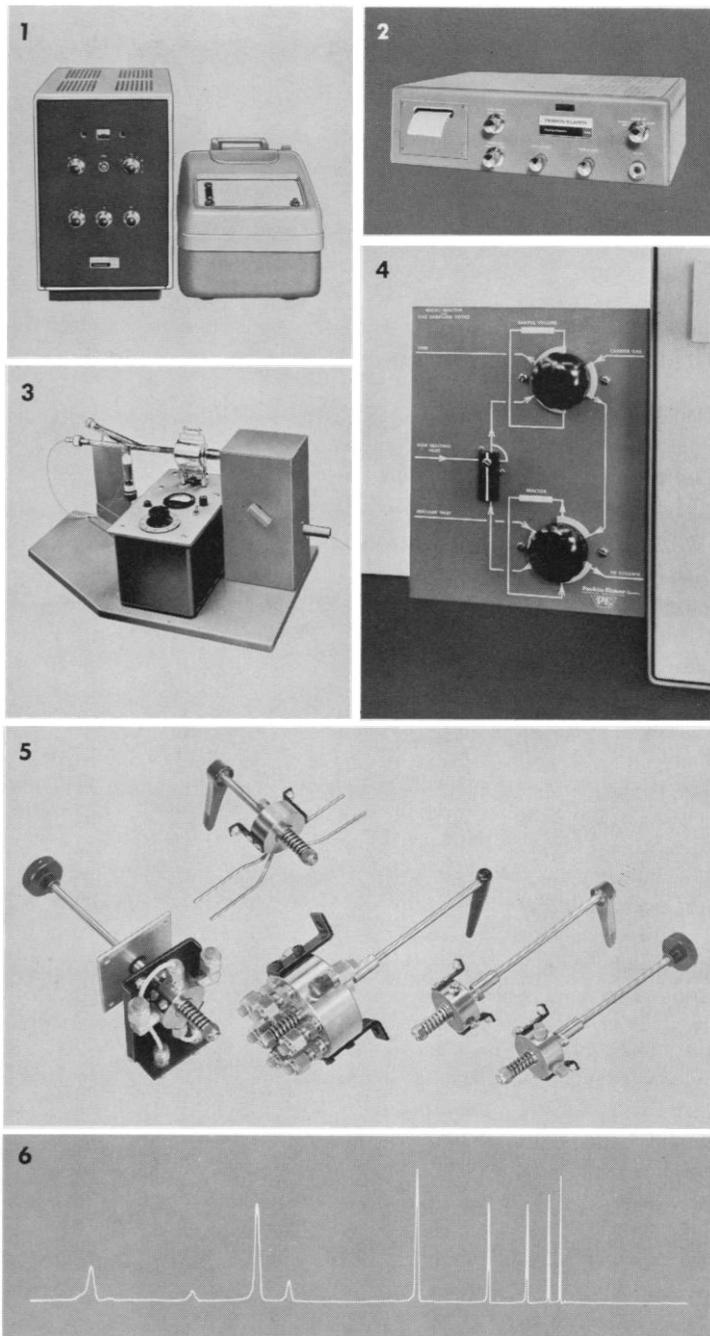
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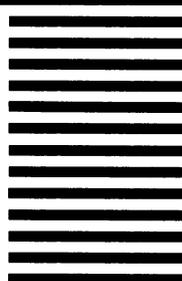


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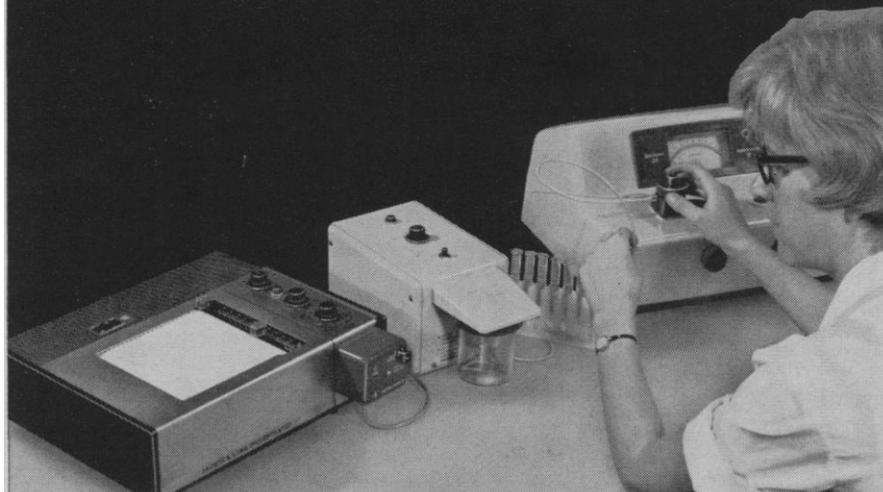
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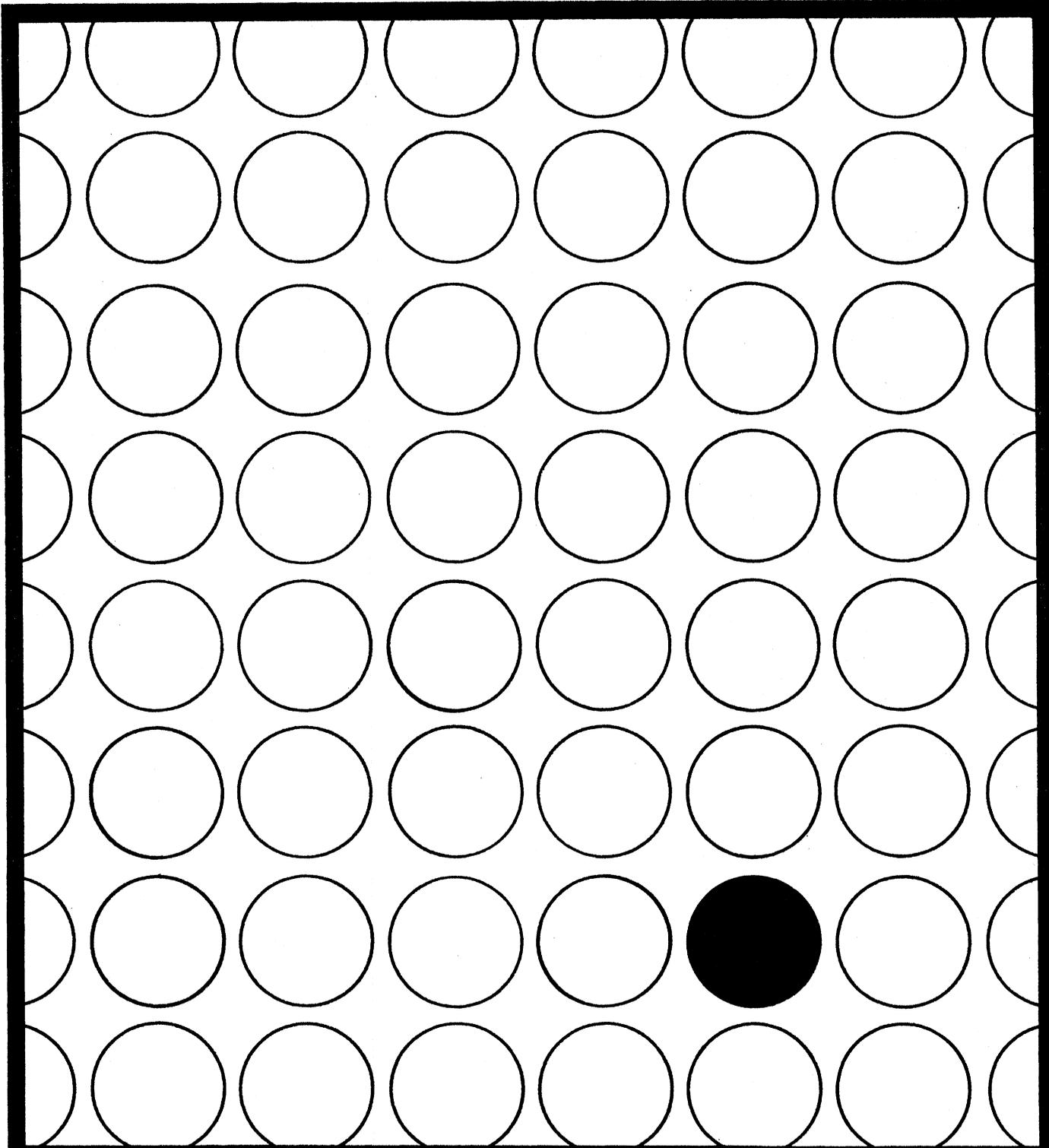


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structures been elucidated. They are characterized by conversion to red pigments on heating with mineral acid. An important place in this class is occupied by the flavan-3,4-diols, which have been implicated in astringency and (in studies by Roux, 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...

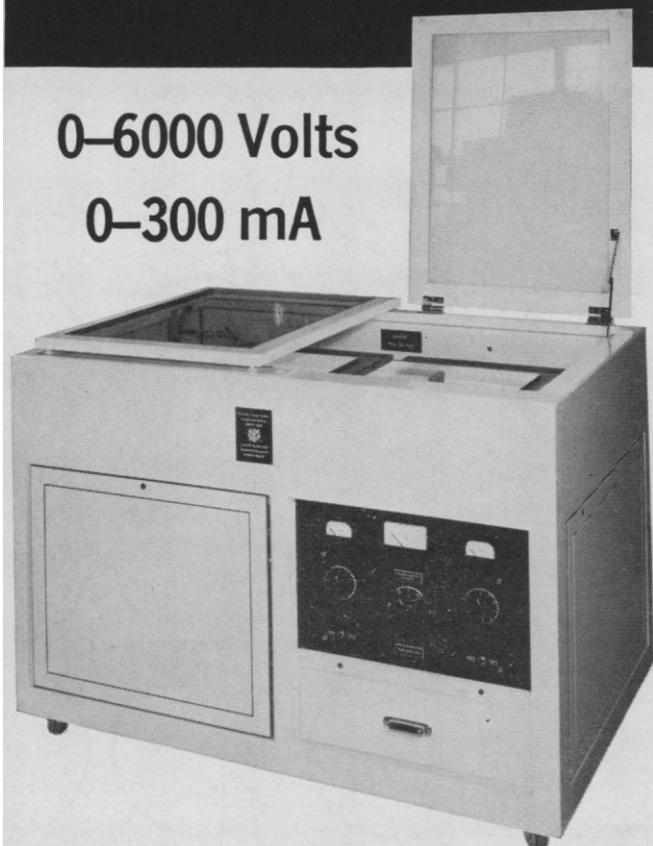
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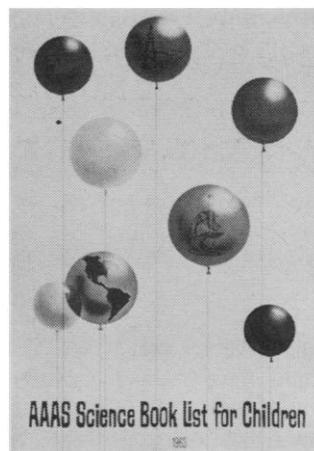
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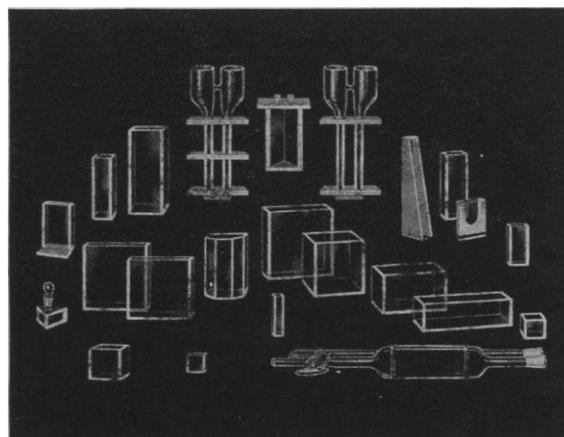
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of the new aglycones, 2'-methoxy-5,7-dihydroxyflavone, (-)-5,6,7-trihydroxyflavone, and 5,7,8-trihydroxyflavone, have been identified in this species. A very active glucuronidase found in this plant has also been partially purified. Watkin's studies 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- α -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.

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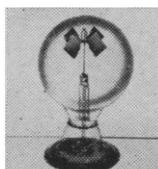
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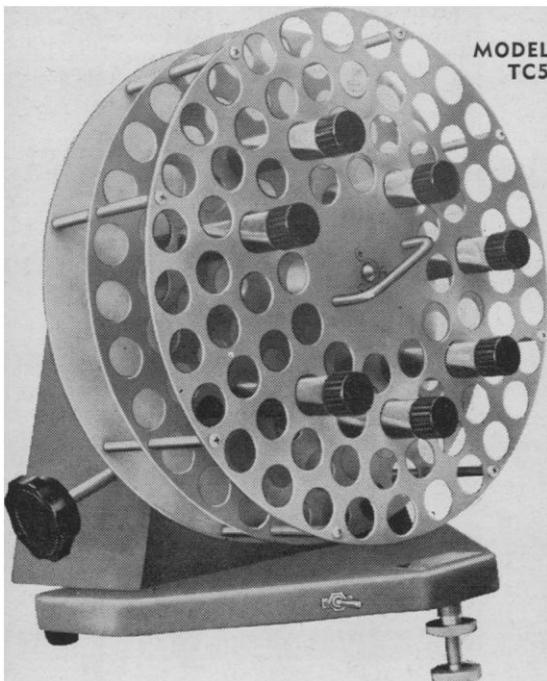
338th Volume
80th birthday of

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Prof. Dr. Otto Warburg

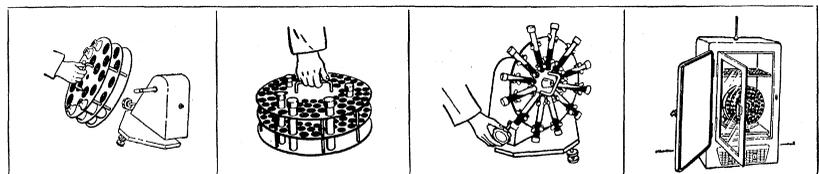
With 314 illustrations and 1 portrait. VI, 915 pages. 8 vo. 1963.
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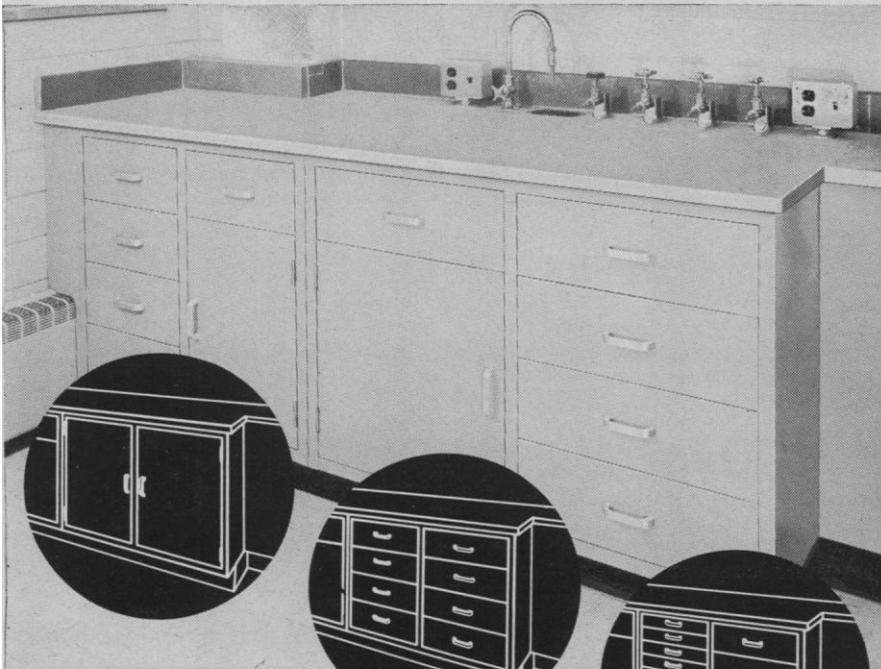
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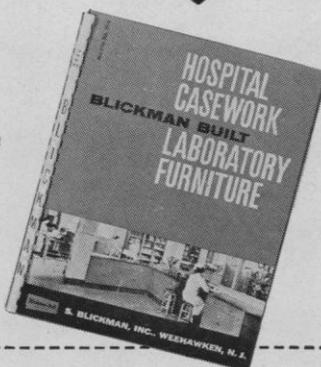


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Forthcoming Events

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^e)

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., Endeveco Corp., 801 S. Arroyo Pkwy., Pasadena, Calif.)