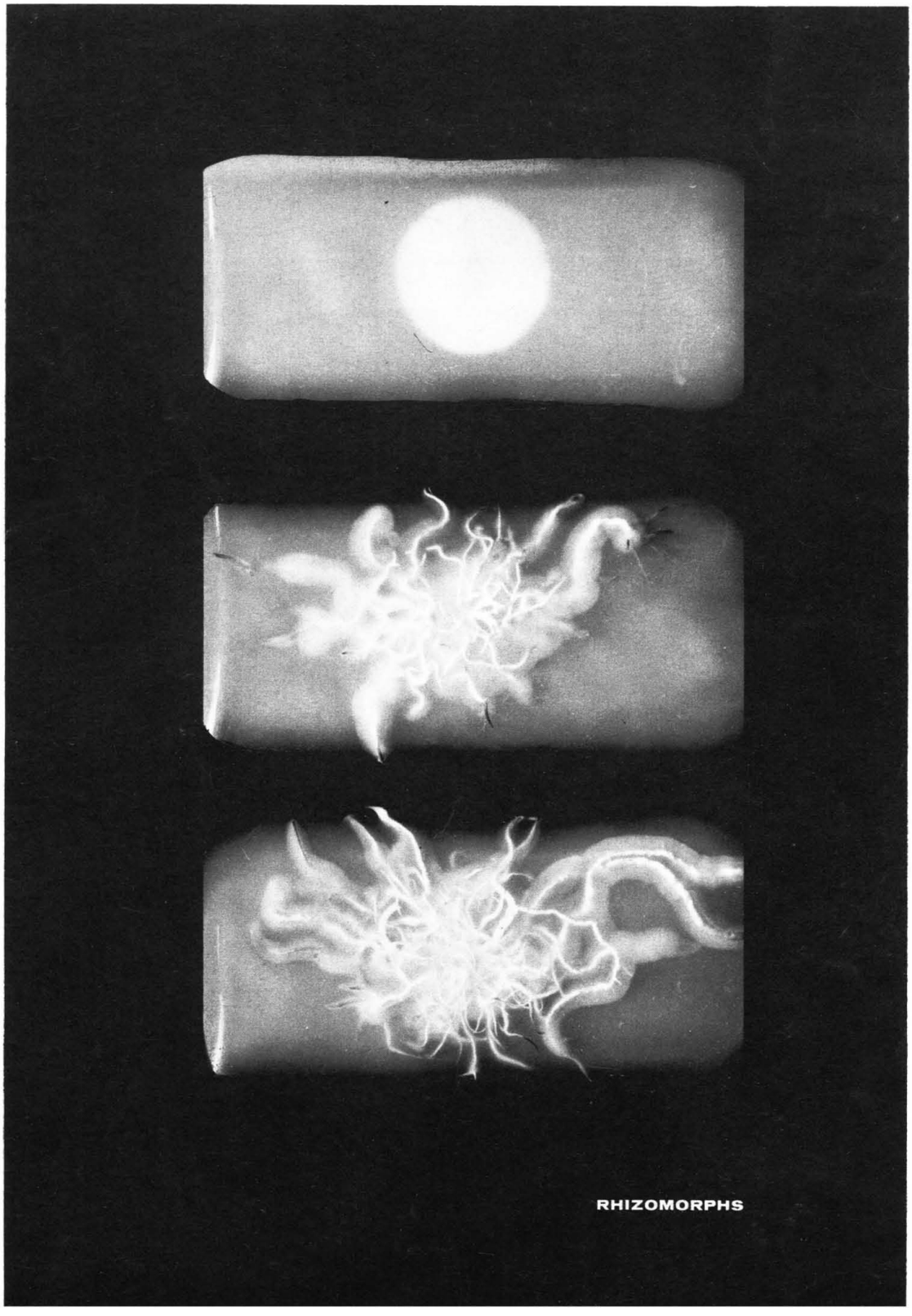
SCIENCE 22 November 1963
Vol. 142, No. 3595
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



RHIZOMORPHS

Here is an advanced instrument for preparative centrifugation. More sophisticated than our Model L, the new L-2 has a substantially larger rotor chamber which holds not only every Model L rotor, but bigger swinging-bucket and fixed-angle rotors with far larger sample volumes. It has a convenient system to control rotor temperature, and it has a stabilizer to prevent rotor wobble during deceleration, helping to keep fractions from remixing.

If your research calls for an advanced preparative instrument, we'd like to send you more information on our new Model L-2. Ask for Data File L2-5.

The new Type SW 25.2 Rotor

Holds nearly twice as much sample (180 ml) as the next biggest swinging-bucket rotor, yet generates even more force (106,900 g)!

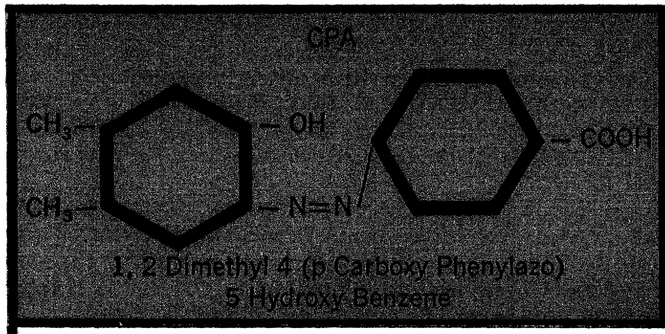
The new Type 19 Rotor

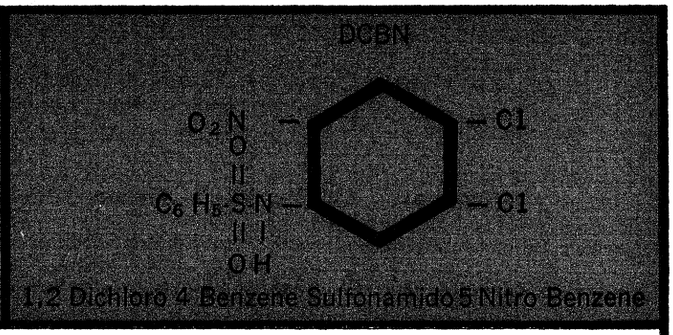
Spins 1.5 liters at 53,700 g! Caps for the six 250 ml bottles screw on and off easily by hand.

Beckman® INSTRUMENTS, INC.
SPINCO DIVISION
PALO ALTO, CALIFORNIA

International Subsidiaries: Geneva, Switzerland; Munich, Germany; Glenrothes, Scotland; Paris, France; Tokyo, Japan; Capetown, South Africa.

ANTI-CANCER AGENTS





A mixture of 1, 2 Dimethyl 4 (p carboxy phenylazo) 5 Hydroxy Benzene (CPA) and 1, 2 Dichloro 4 Benzene Sulfonamido 5 Nitro Benzene (DCBN) when fed to mice of the SPFS strain bearing spontaneous mammary cancers, cured permanently about one third of the animals.

The investigators adjudged the permanency of the cure of the cancers when the neoplasm decreased in size, disappeared and remained undetectable for at least 5 months.(1).

The maximal number of cures was obtained with 6 grams of CPA and 0.5 grams of DCBN per kilo of ration. This represents the first case of the cure of such cancers by any chemical agent.

These biochemicals were conceived on the basis of a demonstration that spontaneous cancer differed from normal host tissues in that they synthesized vitamin B_{12}.

Previously it was demonstrated that certain spontaneous mammary cancers of mice differed from normal mouse tissues in that cancer cells synthesized Vitamin B_{12} (2) (3). This metabolic difference allowed the prediction and the realization of antimetabolites poisonous to the cancers that are harmless to the host mice (4) (5).

These new anti-cancer agents, (CPA) and (DCBN) are members of a series of antimetabolites which have been shown to inhibit biosynthesis of Vitamin B_{12} in microorganisms. It was reported that these biochemicals demonstrated no detectable harmful effects on the host mice as the dosage used to bring about the desired results.

CPA and DCBN are available on 24-hour delivery basis anywhere in continental USA. Call 216-662-0212 or write Nutritional Biochemicals Corporation, 21010 Miles Avenue, Cleveland 28, Ohio.

All chemicals described are for chemical and investigational use only. They are not offered for clinical or drug use. The literature reference should not be interpreted as either an endorsement or disapproval of the biochemical by the cited investigator.

(1) D. W. Woolley and J. M. Stewart, Biochem. Pharm. 11, 1163, (1962). (2) D. W. Woolley, Proc. Nat. Acad. Sci. Wash. 39, 6, (1953). (3) D. W. Woolley, Ibid, 41, 111, (1955). (4) D. W. Woolley, Cancer Res. 13, 327, (1953). (5) D. W. Woolley and G. Schaffner, Ibid, 14, 802, (1954).

CPA	DCBN
100 gram bottle, gram $ .95	100 gram bottle, gram $1.25
50 gram bottle, gram $1.03	50 gram bottle, gram $1.35
10 gram bottle, gram $1.10	10 gram bottle, gram $1.45
5 gram bottle, gram $1.20	5 gram bottle, gram $1.60

22 November 1963
Vol. 142, No. 3595

SCIENCE

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. 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.**

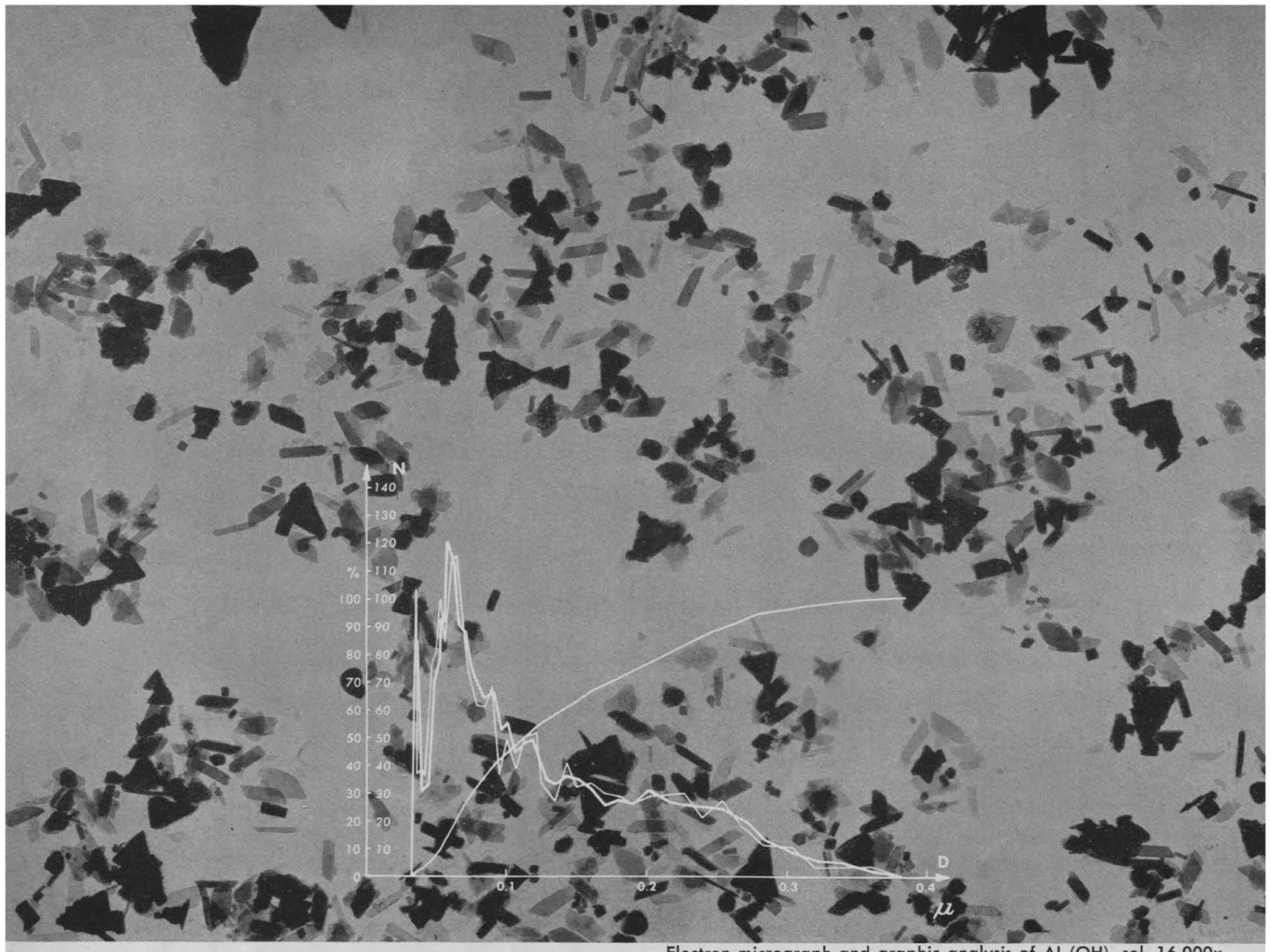
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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

Rhizomorphs of the soil-borne plant pathogen *Armillaria mellea* (Vahl) Quel in a chemically defined medium. Formation was stimulated by addition of ethanol to the medium. These structures show a high degree of organization. Under natural conditions they function in the pathogen's penetration of the roots of the host. See page 1065.



Electron micrograph and graphic analysis of AL $(OH)_3$ sol. 16,000x.

How to get an accurate picture of particle size distribution quickly

The Carl Zeiss Particle Size Analyzer TGZ3 is basically a combination projector and electrical counting device. It is easy to operate: Place the enlarged photomicrograph or electron micrograph on the stage of the instrument. Turn a knob until the round, bright spot of light has the same area as the selected particle. Then press a foot pedal. A signal pulses to one of the 48 counters, determined by the size of the image of the iris diaphragm forming the spot. At the same time a punch descends and puts a minute hole in the counted particle to prevent repetition of a count.

With this instrument you can count and classify approximately 1000 particles in less than 15 minutes. Fatigue is reduced and accuracy improved.

The circular shape of the bright spot makes it easy to estimate sizes, also length and width of rod-shaped particles. Step widths can be recorded as absolutely constant or exponentially increasing and as either a distribution or summation curve.

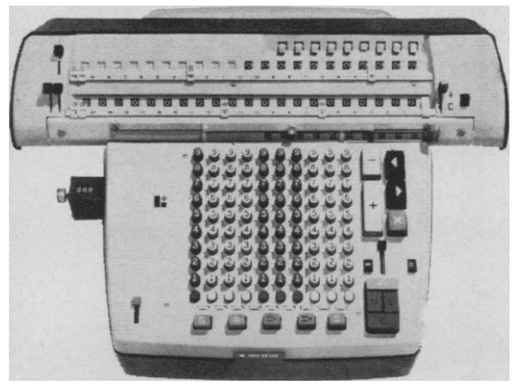
The Analyzer is about the size and weight of a typewriter. It offers two particle-image measuring ranges: 1.0 to 9.2mm and 1.2 to 27.7mm. Since it is semi-automatic you can also count agglomerations of particles. A knob allows you to adjust background light for comfortable contrast. Fields in which this instrument is successfully used are: rubber, pigments, films, abrasives, etc. Write Dept. SC for further details. **Complete service facilities available.**

CARL ZEISS
WEST GERMANY

The Symbol of World Famous Optics

Carl Zeiss, Inc., 444 Fifth Ave., New York 18, N.Y.

IN CANADA: CARL ZEISS CANADA LTD., 60 OVERLEA BLVD., TORONTO 17, ONTARIO



Know-it-all!

The Monro-Matic® 8F-1 statistical calculator trusts you not a whit. Insists, instead, on double checking you throughout every statistics problem. It uses its own Veeder Counter, for instance, to keep track of precisely how many multiplications you've made. Automatically retains the multiplicand you've entered to be used as the multiplier in squaring. (All you do is press the multiplication key.) Won't even trust you to work with a dollar and cents keyboard—provides you, instead, with a statistical color-coded keyboard. It even demands that you use its exclusive proof dials to double check accuracy. (In squaring, this second set of dials records the last number squared. In division, it provides you with individual answers while the larger dials are simultaneously accumulating.) The fastest, simplest, most accurate standard calculator ever devised for statistics, the 8F-1 is priced more competitively than less disciplined machines. Ask your local Monroe representative to demonstrate how it can give you five simultaneous answers to a correlation problem. Or, if you prefer, write directly to us. Monroe Calculating Machine Company, Inc., Orange, New Jersey.

MONROE

A DIVISION OF THE BUSINESS MACHINES GROUP OF LITTON INDUSTRIES

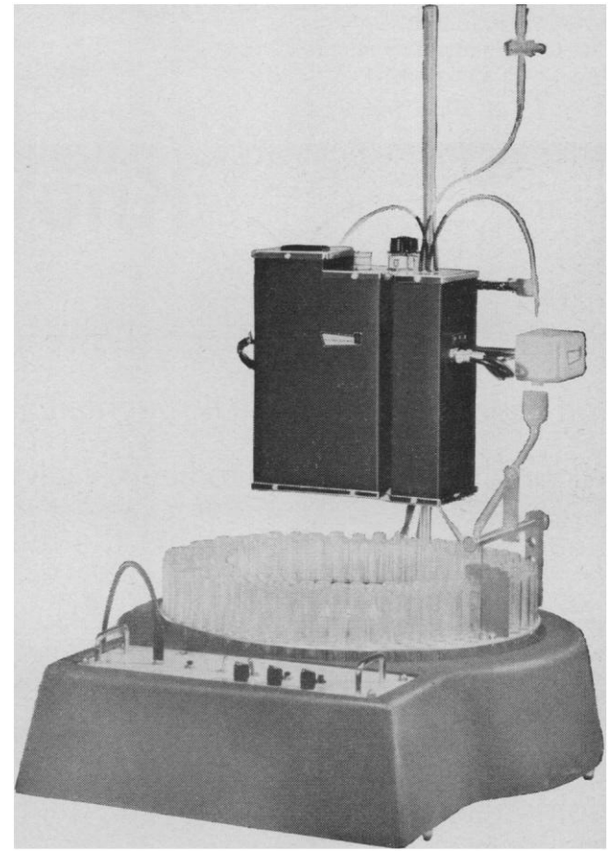
VANGUARD

the leader in compact, precision instrumentation for research

OFFERS NEW UV ANALYZER

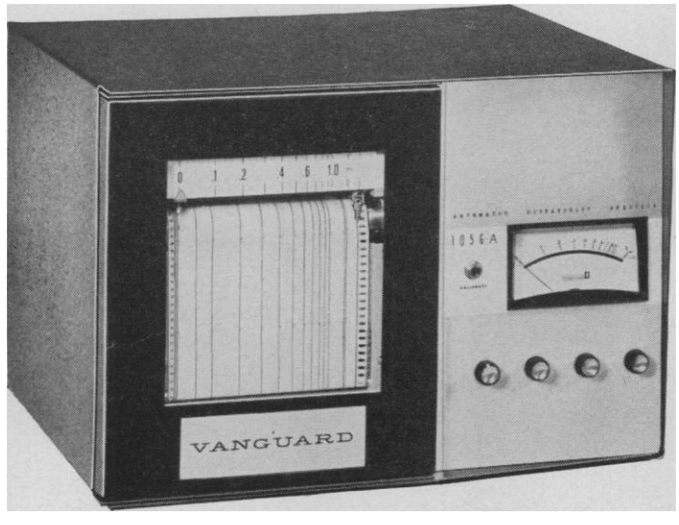
FEATURES EASE OF OPERATION . . . REQUIRES LESS LABORATORY SPACE . . . CONTINUOUSLY VARIABLE FROM 200 mu TO OVER 400 mu

Now Vanguard introduces another innovation in instrumentation, offering the new model 1056-A, the most compact, space-saving, easy-to-operate UV Analyzer available today with variable wave length control. Monochrometer-coupled broad emission UV light source allows selection of any wave length from 200 to over 400 millimicrons with a turn of a dial. Dual-beam operation utilizing sample and reference cuvettes provides continuous base line compensation for gradient elutions and for other applications where the optical density of the eluent may change. The 1056-A operates with minimum supervision and is compatible with all fraction collectors. Automatic chart recorder marking system speeds location and identification of test tubes containing UV absorbing materials. Completely transistorized, for long, maintenance-free operation. Write for complete information.



NEW MODEL 1056-A

2166 cu. in. SMALLER



VANGUARD

VANGUARD INSTRUMENT COMPANY

Designers and Manufacturers of Precision Instrumentation for Research

P. O. Box 244, LaGrange, Illinois 60525, FLeetwood 2-1600 • Regional Offices: New York, N. Y., 520 Fifth Avenue, TN 7-1998
San Francisco, Calif., 115 New Montgomery Street, EXbrook 2-0511 • Baltimore 2, Maryland, 217 North Calvert Street, 301-727-3666

lew NAPCO 1000 Series! "What's so new about it?"

ere's what's new

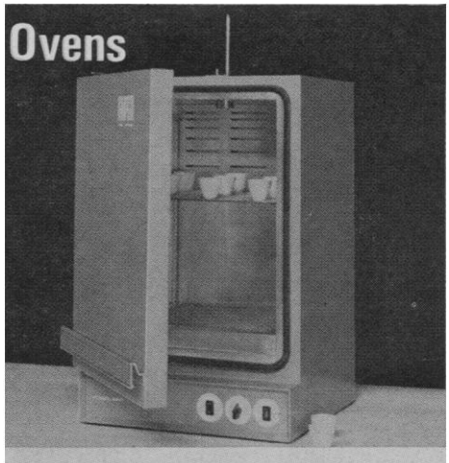
More work space in less lab space.
Sensible, easy to use controls.
Convenient door handles and card holder.
Self opening and closing latchless doors.
Clean, uncluttered interiors.
Adjustable glides for leveling.

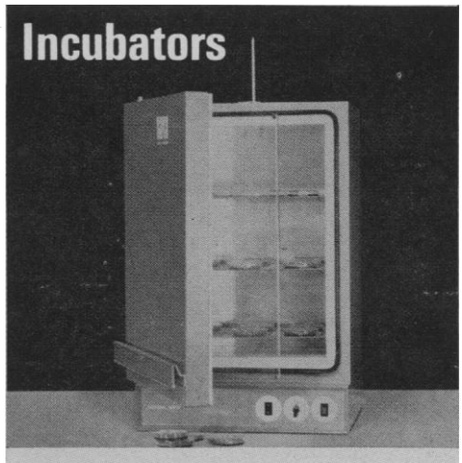
efreshing design features and ıpressive performance show you that ıe NAPCO 1000 series is not just ıother line of laboratory apparatus. It's esigned with a number of advantages that are well worth remembering. You might call them common sense . . . we call them the reason why the NAPCO 1000 series is truly new. Here's a solution to so many of the problems you have possibly had with other lab equipment, and yet the price is modest ($90.00 to $485.00). We think you're going to find it hard to forget NAPCO 1000.

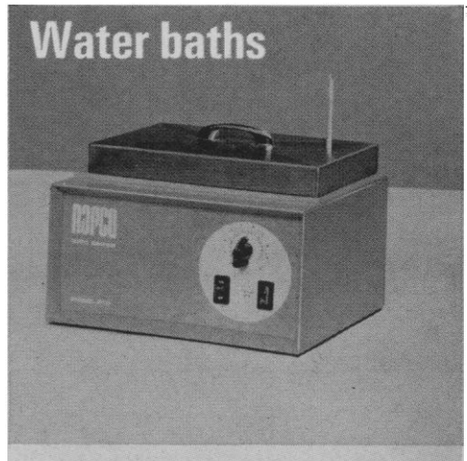
Why not tear this ad out and save it? Or better yet, we'll be glad to supply you with the name of our nearest representative or send you a copy of our brochure 6319.

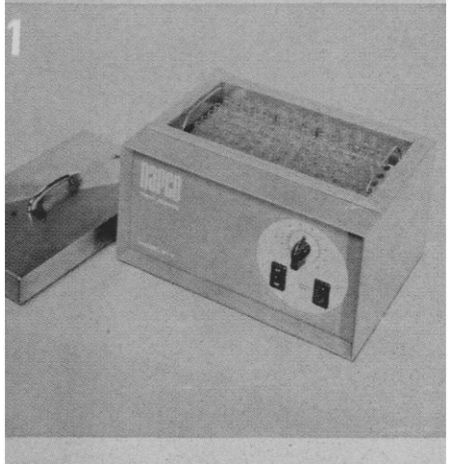
NATIONAL APPLIANCE CO.
P.O. Box 6408
Portland, Oregon 97223
Phone: Area Code 503,
ME 9-3161

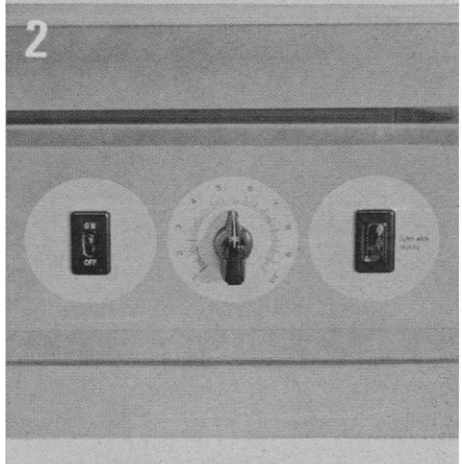
napco
1000 SERIES

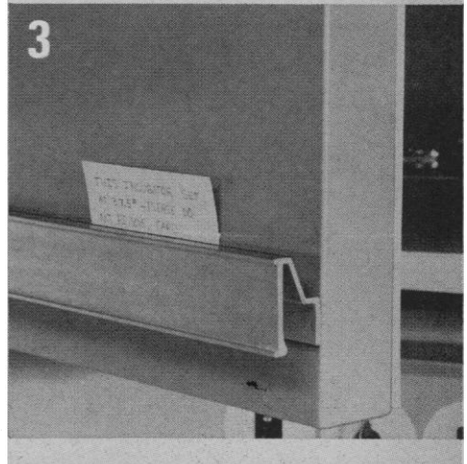


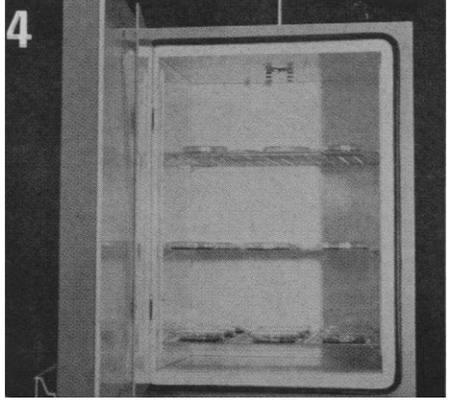


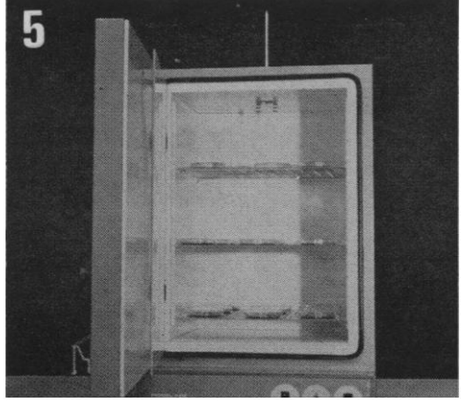


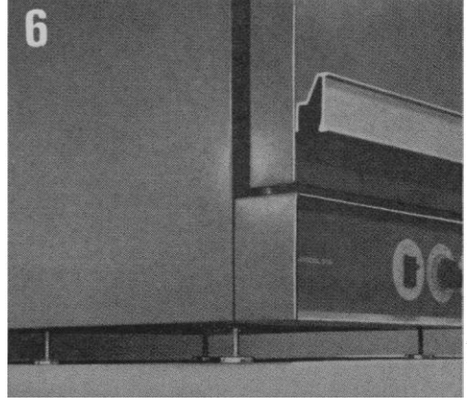


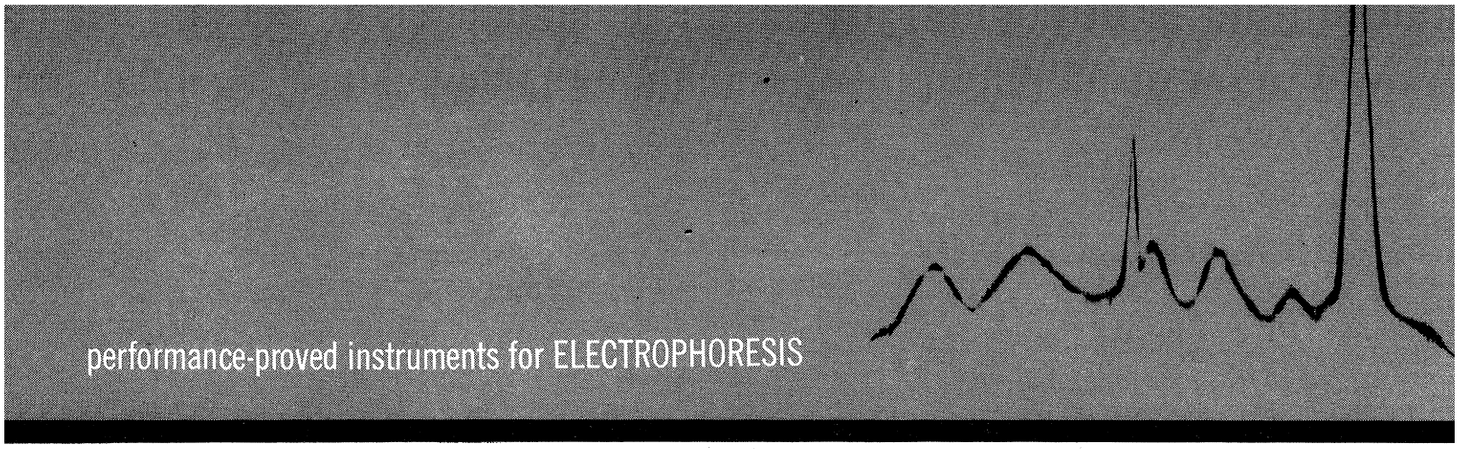












Electrophoresis diagram (above) from a descending limb obtained by using the half-wave phaseplate as the schlieren diaphragm. Electrophoresis diagram (lower left) of same serum as that represented above, but made by combining interference and phaseplate schlieren optics. Another electrophoresis diagram (lower right) of the same serum, made by using an 0.35 mm diagonal slit as the schlieren diaphragm.

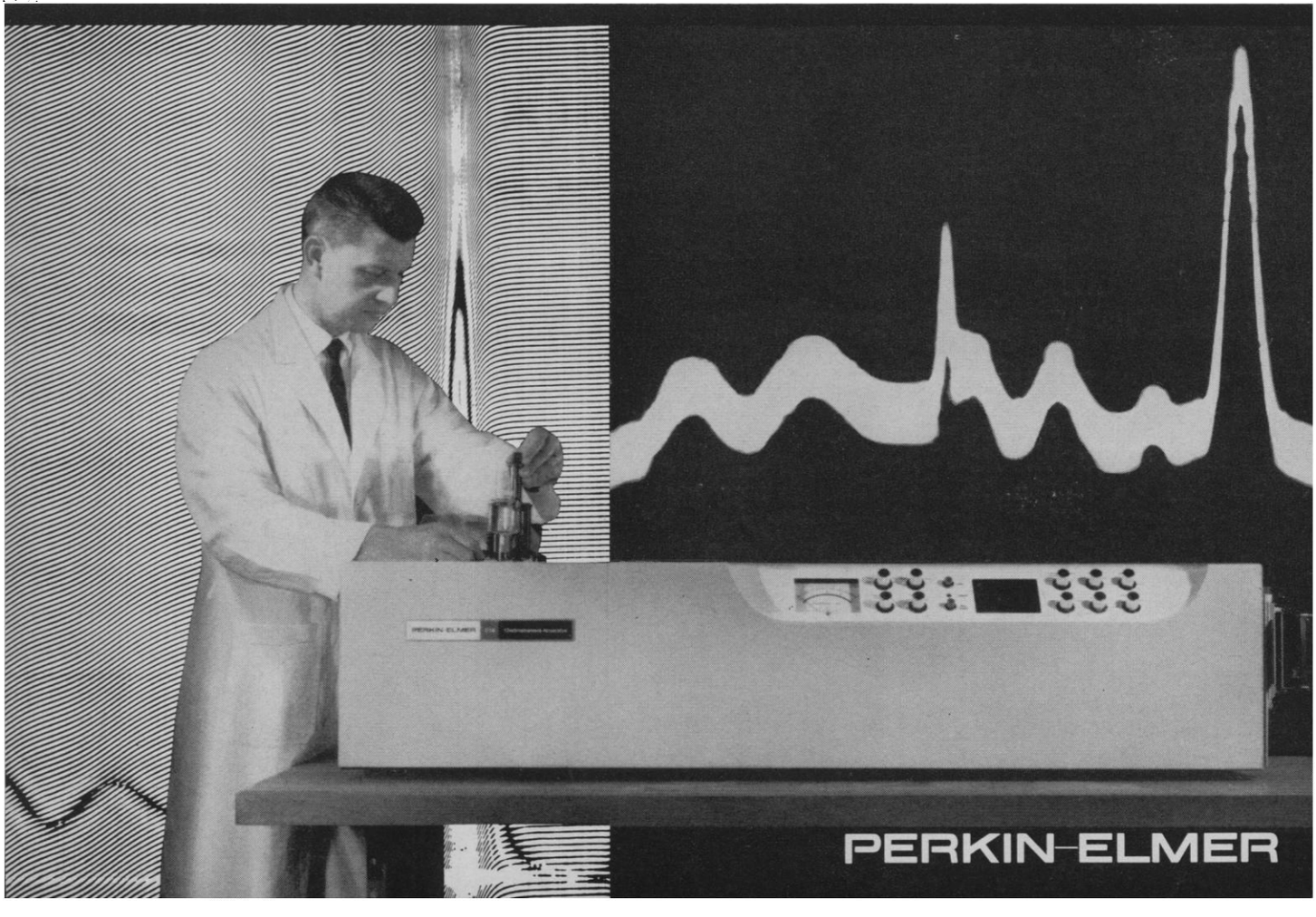
NEW LOW-COST ELECTROPHORESIS UNIT PROVIDES HIGH RESOLUTION WITH UNIQUE THERMOELECTRIC COOLING

Here is an electrophoresis instrument that has everything *plus* automatic 0°C temperature stabilization. Cooling is thermoelectric and trouble-free – no ice baths to bother with and no mechanical refrigeration equipment to wear out or require maintenance.

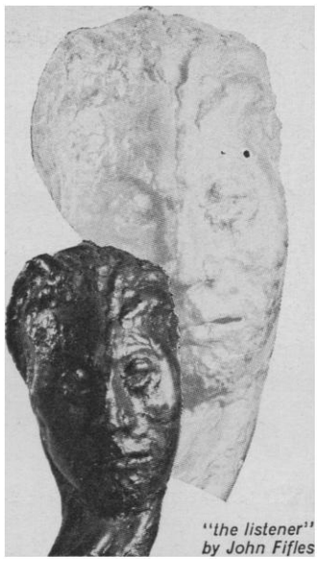
Model 238 utilizes the superior, free-boundary method of electrophoresis; can handle either *schlieren* or *Rayleigh fringe* measurements at the click of a selector switch; has a top viewing screen for continuous observation of changing patterns as analysis progresses... and provision for use of either standard or Polaroid film.

Applicable to a broad variety of assignments, particularly medical and pharmaceutical analyses, this instrument can perform extra jobs such as separating components of a mixture or measuring interactions between a solvent and substance or between particles of a substance.

Wouldn't now be a good time to consider up-dating your electrophoresis facilities? For further Model 238 information, write to Instrument Division, Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Connecticut.



Britannica Schools
the first new approach to learning at home in 50 years


"the listener" by John Fifles

Knowledge obsolescence is a hard fact of the 20th century. The person who was considered well educated only 5 years ago may be sadly left behind today. In this era of the "knowledge explosion" Britannica Schools has become a unique answer to the educational needs of modern men and women.

Utilizing "programmed" teaching methodology—considered by educators the first truly new approach to learning in generations, Britannica Schools is first to offer you "teaching machine" courses in mathematics; first to PROGRAM in science, history, social studies—in fact the entire secondary school curriculum. And **first** to bring the experience and wisdom of the internationally renowned Iowa Writers' Workshop into home study for the creative writer interested in poetry and fiction.

For the first time, outside of a school system, here is an approach to learning at home which combines the historic tutor-student relationship with new, easy to assimilate "programmed" materials.

38 new courses now available

IOWA WRITERS' WORKSHOP
Fiction Writing; Advanced Fiction Writing;
Writing Poetry; Advanced Poetry Writing

Exclusively through Britannica Schools, four courses specially created and handled by the Iowa Writers' Workshop staff.

FOUR COMMUNICATION COURSES

WRITING IS FOR READERS: A language skills course stressing expository writing. A must for the college-bound student.

COMMUNICATION IN BUSINESS AND INDUSTRY: A course that deals with the No. 1 problem, from assembly line orders to the president's report—how to communicate clearly and concisely.

TECHNICAL WRITING: 1. Introductory. 2. Advanced. The case approach to writing for a multi-billion dollar space-age industry—an industry crying for trained writers. Simplifies acquiring a normally difficult skill.

FIFTEEN PROGRAMMED MATHEMATICS COURSES

The "second language" of modern man—a complete series of secondary and a major portion of university mathematics plus management-level courses taught by Britannica's exclusive "teaching machine" method:

Seventh Grade Mathematics • Whole Numbers and Numerals • An Introduction to Verbal Problems in Algebra • Basic Mathematics • Algebra I • Plane Geometry • Algebra II • Solid Geometry • Trigonometry • Analytic Trigonometry • Introduction to Sets: Inequalities and Functions • The Language of Algebra • Introductory Calculus I and II.

DESCRIPTIVE STATISTICS: Learn the mathematical basis of the descriptive and inferential statistician. Use informative statistical data more effectively in your business and social life.

MATHEMATICAL BASES FOR MANAGEMENT DECISION MAKING: Learn the language of the men who talk to the computers. Acquire the ability to make management decisions by objectifying all the variables in mathematical terms.

FIFTEEN SECONDARY LEVEL "PROGRAMMED" SUBJECTS FOR SELF-ENRICHMENT OR REVIEW

HUMANITIES—English Composition; English Literature; American Literature; Spanish 1 and 2.

SOCIAL STUDIES—Economics; Sociology; Civics; Modern History; U. S. History; World Geography.

SCIENCE—General Science; Chemistry; Biology; Physics.

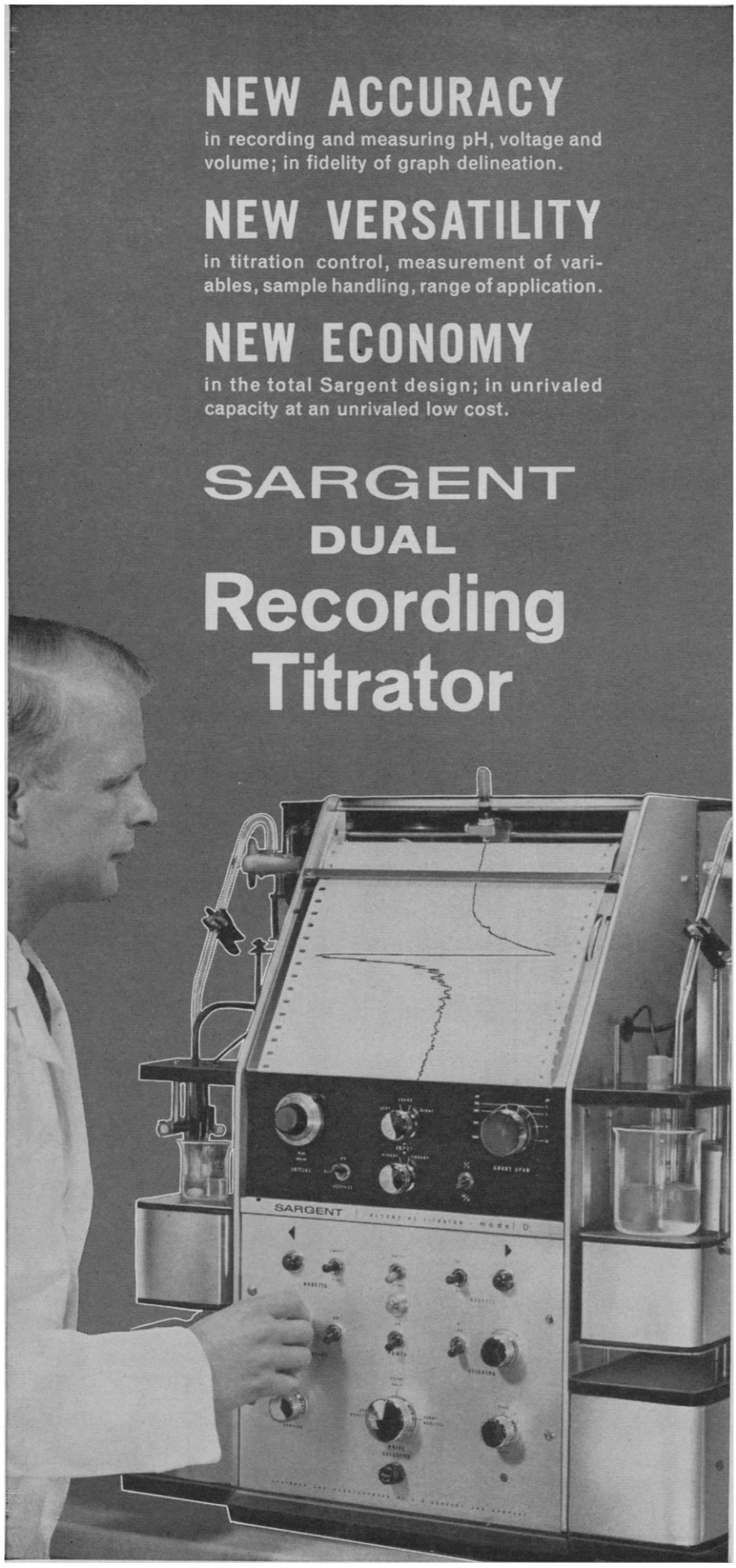
Find out why Britannica Schools is the unique home study answer for you. Return this coupon today.

DEPT. S-113
Please send me additional information on the courses checked. I understand that this in no way obligates me.

- ☐ Iowa Writers' Workshop Writing Courses
- ☐ Communication Courses
- ☐ Mathematics including Descriptive Statistics and Management Decision Making
- ☐ Humanities ☐ Social Studies ☐ Science

NAME_____
ADDRESS_____
CITY_____ ZONE____ STATE_____
AGE____ OCCUPATION_____

Britannica Schools
A Division of Encyclopaedia Britannica Press, Inc.
14 East Jackson Boulevard, Chicago, Illinois 60604



SPECIFICATIONS:

Scale span: 1, 2, 5, 10 pH units and 100, 200, 500, 1000 millivolts.

Scale accuracy: ¼ percent.

Bridge power: mercury batteries.

Scale width: 240 mm, graduated in 100 units.

Displacement: continuously adjustable, direct reading to 10 pH units or 1000 millivolts plus and minus.

Input: direct potentiometric or pre-amp with 1:1 feedback stabilized electrometer.

Drive speeds: controlled automatic, fast constant and slow constant. Charts and burettes synchronized.

Burettes: motorized, precision, glass, displacement type with interchangeable 50 ml and 10 ml plungers and barrels, with fast refilling and flushing motors and automatic safety switches.

Delivery rates: approximately 10 ml per minute maximum, 1/15 ml per minute minimum.

Burette accuracy: 1/10 percent.

Stirring: magnetic variable speed.

Balancing speed: 3⅓ seconds full scale.

Automatic stop: precisely adjustable, cam actuated with ¼ scale overrun, restarting, repeating.

Polarizing adapters: interchangeable, plug in, mercury battery powered.

Burette fittings: interchangeable, duplicate for either flexible tubing or all glass interconnection, the latter with standard taper and ball joint unions and Teflon stopcock plugs.

Speed controller: derivative actuated, proportional to rate of change of signal.

Beaker supports: swinging, height adjustable, with self-contained stirring motors.

Recorded functions: fundamental signal or first derivative.

Structural materials: polished 18-8 stainless steel, aluminum and Bakelite.

Dimensions: height, 26 inches; width, 22 inches; depth, 15 inches.

Net weight: 95 pounds.

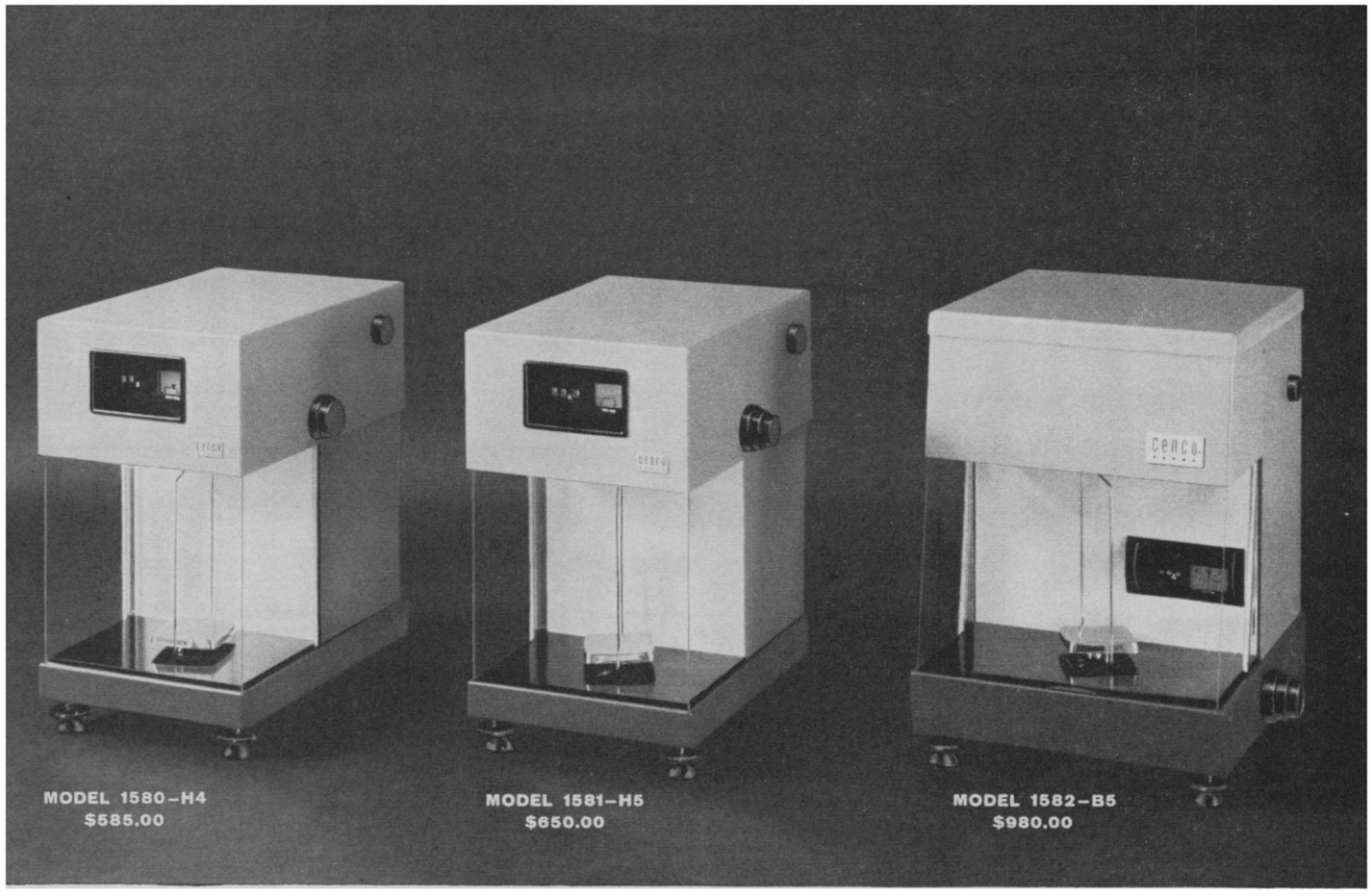
Power requirement: 115 volt, 60 cycle A. C.; 150 watts. Available on special order for operation from 50 cycle current.

S-29685 TITRATOR—Dual, Recording, Potentiometric, Automatic Rate Controlling, Glass or Metal Electrode, Sargent, Model D (Pat. No. 2,931,964); with standard equipment, without electrodes Price.....$2,850.00

For complete information, contact your nearest Sargent representative—or write for Bulletin D.

E. H. SARGENT & CO., 4647 W. FOSTER AVE., CHICAGO 30, ILLINOIS
Detroit 4, Mich. · Dallas 35, Texas · Birmingham 4, Ala.
Springfield, New Jersey · Anaheim, California

SARGENT®
Scientific Laboratory Instruments
Apparatus · Supplies · Chemicals

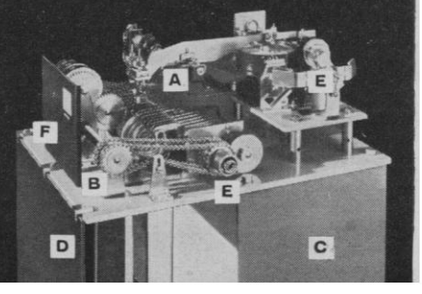


CENCO'S NEW ANALYTICAL BALANCES

A. SOLID TITANIUM BEAM / JEWELED MECHANISM: beam surfaces can't flake—lose weight—as do plated beams. Synthetic ruby knife on synthetic sapphire plane, jeweled bearings at all critical points for long-term accuracy. **B. POSITIVE, CHAIN-DRIVEN WEIGHT CONTROL:** stainless steel chain not affected by environment or age, no cord-and-pulley drive to slip. Ring weights are stainless steel, corrosion resistant, non-magnetic, precisely calibrated. NBS Class "S" weights used in models 1581 and 1582; "S-1" in model 1580. **C. ALL-METAL HOUSING:** durable, rugged, minimum dust attraction. Heavy, multiple-coat baked enamel finish. **D. EASY-VIEW WEIGHING CHAMBER:** non-corroding base impervious to chemical attack. Crystal clear glass walls highly resistant to scratching, will not discolor. **E. EFFICIENT, NON-FATIGUING CONTROLS:** simple, speedy operation through natural, straight-line movement of operator's hands from side loading of sample to controls manipulation. With hands off to side, operator always has clear view of readout. **F. EASIER, MORE ACCURATE READOUT:** fixed vernier with cursor for quick, accurate readout.

SUPERIOR CONSTRUCTION, GREATER CONVENIENCE AND PRECISION

INTRODUCTORY 10% DISCOUNT



Model No.	1580-H4	1581-H5	1582-B5
Capacity	160g	160g	200g
Sensitivity	1.0mg	0.1mg	0.1mg
Precision	±0.3mg	±0.05mg	±0.03mg
List Price	$585.00	$650.00	$980.00

CENTRAL SCIENTIFIC
a division of Cenco Instruments Corporation
1700 Irving Park Road
Chicago, Illinois, 60613
offices in principal cities

I'd like to know more about Cenco's new single-pan analytical balances, and the introductory 10% discount offer which expires on December 31, 1963.

☐ Please send literature
☐ Please call to arrange a demonstration

Name _____

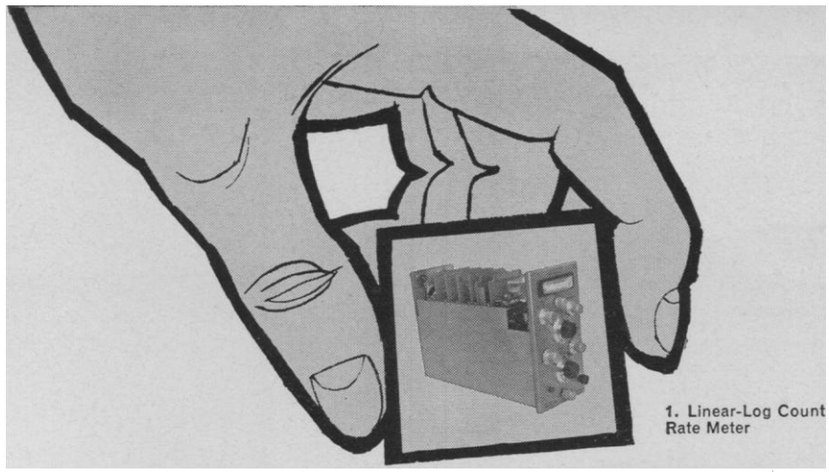
Title _____

Company or Institution _____

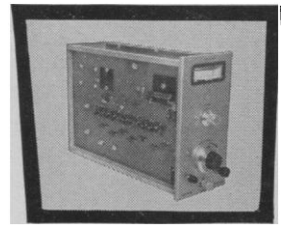
Street _____

City _____ State _____ Zip Code _____

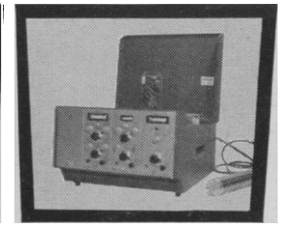
CEN-3-215



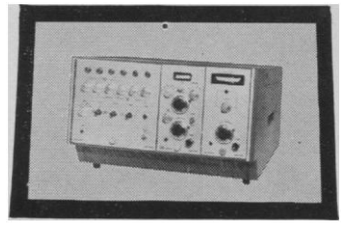
1. Linear-Log Count Rate Meter



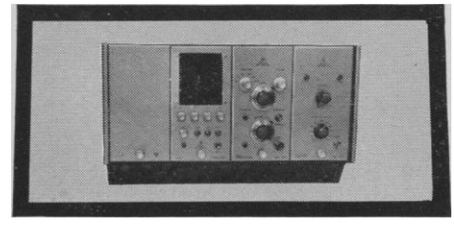
2. High Voltage Power Supply



3. Blank Panel, Linear Count Rate Meter, Single Channel Analyzer, High Voltage Power Supply



4. Printing Scaler-Timer, Single Channel Analyzer High Voltage Power Supply



5. Blank Panel, Scaler Single Channel Analyzer, High Voltage Power Supply

BUILD YOUR INSTRUMENTATION SYSTEM AS YOUR BUDGET PERMITS

With transistorized building-block modules available individually or in combinations

PROGRESS REPORT: Start with a simple module (linear amplifier, single channel analyzer, or count ratemeter) add the power supply, detector and read-out device and you have the simplest of spectrometer systems. As funds permit, you can add another module (quickly substituted for the blank panel in the chassis) and perform the additional experiments you desire.

When you are ready for automatic scaling or counting of your spectra, the double module scaler-timer can be added. You can simultaneously add a print-out facility to integrate the total energy under a peak automatically or to record this energy as a digital output. Depending upon the selection of the read-out device, simultaneous chart recording is also possible.

The widest possible choice of input and output devices is available. G-M or Scintillation detectors can be accommodated by simply reversing the printed circuit card in one of the modules.

Each instrument features transistorized reliability; modular construction; built-in electronic gating circuits; and plug-in etched circuit boards. Individual modules may be interchanged or combined to provide unsurpassed measurement capability. In addition, etched circuit boards may be substituted within individual modules to produce extreme flexibility and versatility of application.

Free Demonstration & Complete Specifications, Write;

RCL

RADIATION COUNTER LABORATORIES, INC.

5121 West Grove Street, Skokie, Illinois, U.S.A., TWX: 9675150, Cable Address: RACOLAB / Phone YOrktown 6-8700

Terminal Tower

CLEVELAND • 130th AAAS

Order Your General Program

It provides complete, detailed information about all the sessions and symposia scheduled, the Annual Exposition of Science and Industry, and the Science Theatre.

Program Highlights

Moving Frontiers of Science A. M. Gleason on the evolution of an active mathematical theory; Gordon J. F. MacDonald on deep structure of continents; A. L. Schawlow on infrared and optical masers; V. G. Dethier on microscopic brains.

Interdisciplinary Symposia AAAS day: Uses of lasers and masers; philosophical aspects of present-day cosmogony and cosmology; developmental aspects of immunity; biological and sociological research on the effects of human reproduction control; the federal government, science, and the universities.

Special Sessions AAAS Presidential Address by Paul Gross; the AAAS Distinguished Lecture on ideology and income by J. K. Galbraith; the Joint Address of Sigma Xi and Phi Beta Kappa by Paul Sears; the George Sarton Memorial Lecture by Hudson Hoagland; and the National Geographic Society Illustrated Lecture on Mozambique by Volkmar Wentzel.

Other General Events Three-session symposium on the sciences in Japan sponsored jointly by the Science Council of Japan and the AAAS. Two symposia sponsored by the Office of Economic and Statistical Studies of the National Science Foundation: Planning and administration of scientific research programs, and the role of instruments and equipment use in research program planning.

AAAS Committees Joint symposium of the Committee on Meetings and the Committee on Science in the Promotion of Human Welfare on chemical control of heredity, arranged by Barry Commoner and David R. Goddard.

Sections and Societies The 20 AAAS Sections and some 70 participating societies are scheduling specialized symposia, and many have sessions for contributed papers.

Science Theatre The latest foreign and domestic films.

Exposition The Annual Exposition of Science and Industry is conveniently located adjacent to the Ballroom on the mezzanine of the Sheraton-Cleveland.

Advance Registration By registering in advance, you avoid delay at the Registration Center on arrival, you receive the *General Program* in time to plan your days at the meeting, and your name is posted in the Visible Directory of Registrants when the meeting opens.

Use the coupon below for advance registration or to order your advance copy of the *General Program*.

AAAS
1515 Massachusetts Ave., NW
Washington, D.C., 20005

(Check 1a or 1b)

1a. ☐ Enclosed is $5.00 for Advance Registration, including the **General Program** and Convention Badge.

1b. ☐ Enclosed is $3.00 for the **General Program** only. (If I attend the meeting, the badge, which I need to obtain the privileges of the meeting, will cost me $2.00 more.)

2. FULL NAME (Dr., Miss, etc.) .....
(Please print or typewrite) (Last) (First) (Initial)

3. OFFICE ☐ OR HOME ☐ ADDRESS .....
(For receipt of General Program)

4. ACADEMIC, PROFESSIONAL, OR BUSINESS CONNECTION .....

CITY ..... STATE ..... ZIP CODE .....

5. FIELD OF INTEREST .....

6. CONVENTION ADDRESS .....
(May be added later, after arrival)

Please mail this coupon and your check or money order for the total amount to the AAAS.

MEETING • 26-30 DECEMBER

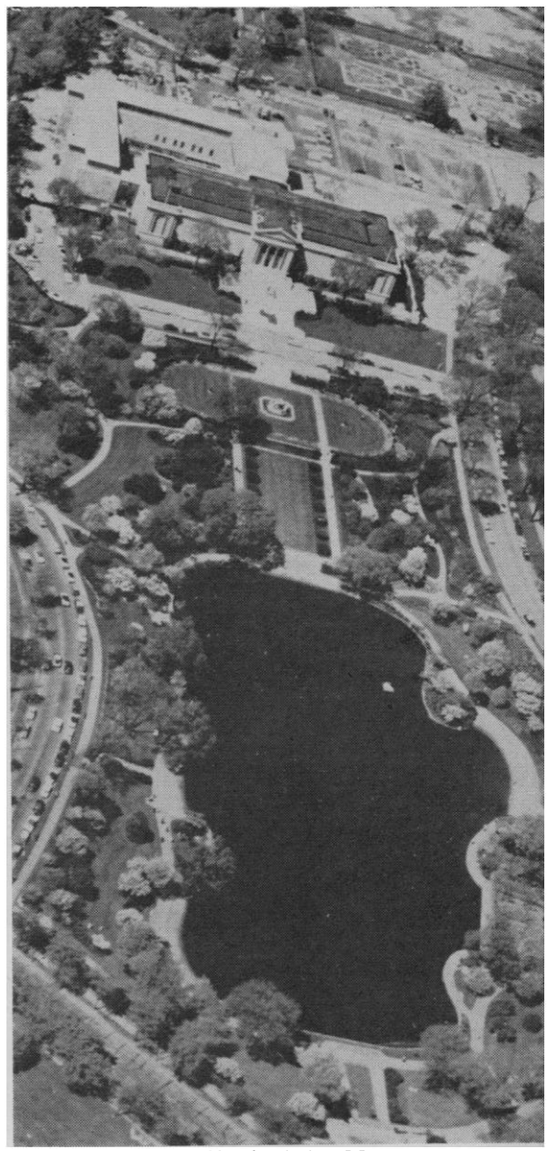
Reserve Your Hotel Room

Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 280, 19 July, SCIENCE. The AAAS headquarters is the Sheraton-Cleveland.

The hotels for the AAAS Cleveland meeting have established special, low flat rates and have reserved large blocks of rooms for the meeting.

Use the coupon below to make your hotel reservation in Cleveland. Send your application to the AAAS Housing Bureau in Cleveland, not to any hotel. Give a definite date and estimated hour of arrival, and also probable date of departure. The Housing Bureau will make the assignment and send you a confirmation in two weeks or less.

A rollaway bed can be added to any room at $3.00 per night. Mail your application now to secure your first choice of accommodations.



Cleveland Art Museum

HOTEL RATES*
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

For a list of the headquarters of each participating society and section, see page 280, *Science*, 19 July.

Hotel	Single Bed	Double Bed	Twin Beds	Suites
Sheraton-Cleveland	$8.50	$14.00	$15.50	$33.00—$60.00
Statler-Hilton	8.50	14.00	15.50	28.00— 59.00
Manger	7.50	13.00	14.50	25.00— 35.00
Pick-Carter	7.50	13.00	14.50	32.50— 60.00
Auditorium	5.50—10.50	8.50—12.50	12.50—13.50	

* All rooms are subject to a 3% Ohio state sales tax.

AAAS Housing Bureau
511 Terminal Tower
Cleveland, Ohio, 44113

Date of Application .....

Please reserve the following accommodations for the 130th Meeting of the AAAS in Cleveland, 26–30 December 1963

First Choice Hotel ..... **Second Choice Hotel** ..... **Third Choice Hotel** .....

Type of room: Single ☐ Double ☐ Double, twin beds ☐ Suite ☐ Rates: Desired ..... Maximum .....

Number in party..... Sharing this room will be: .....

(List name and address of each person, including yourself. Attach list if space is insufficient.)

.....

.....

DATES: ARRIVAL ..... A.M. .....P.M.....DEPARTURE .....
(These must be indicated—add approximate hour, A.M. or P.M.)

NAME .....
(Individual requesting reservation) (Please print or type)

ADDRESS .....
(Street) (City) (State) (ZIP Code)

Mail this coupon now to the Housing Bureau. Rooms will be assigned and confirmed in order of receipt of reservation.

*Autoclear...THE NEW LOOK IN PLASTIC TUBES

The Autoclear tube — a new development by IEC — can substantially cut your laboratory tube costs. It's absolutely clear. Clear as glass. But it won't break. It's made of a special high impact polycarbonate plastic. You can drop it. Step on it. Hit it with a hammer — it just won't shatter. You can centrifuge it to 100,000 XG. Autoclave it at 285° F. Re-use it over and over again. Autoclear tubes are resistant to most laboratory chemicals.

And they're cheap — not just economical — cheap. When you consider their low initial cost and long life, you can easily see the favorable impact they'll make on your lab budget.

		LIST PRICE/100 TUBE CASE		
CAT. NO.	DESCRIPTION	1-4	5-19	20+
1648	15 ml, 16 mm x 114 mm	25.20	23.80	22.40
2810*	15 ml, 15 mm x 119 mm	29.70	28.05	26.40
1650	50 ml, 29 mm x 104 mm	31.50	29.75	28.00
2809*	50 ml, 29 mm x 133 mm	36.00	34.00	32.00

*Conical Style

Thirteen other sizes are available ranging from 3 to 125 ml. Have your IEC dealer deliver a trial case. You will see what we mean — clearly!

Write for 12-page brochure on IEC plastic ware.

INTERNATIONAL (IEC) EQUIPMENT CO.

300 SECOND AVENUE • NEEDHAM HEIGHTS 94, MASS.

A TOUCH OF GENIUS
[The Visible Storage Register]

THE NEW MARCHANT VSR LETS YOU SEE WHAT'S IN STORAGE, USE WHAT'S IN STORAGE, CHECK EVERY STEP OF YOUR CALCULATION VISIBLY

This new type of Marchant calculator is research-oriented. It has five visible dials o proof, including an exclusive visible storage register. You can keep a constant check or your work and see what's in storage—all at a glance. Best of all, you can transfer accumulated totals from the visible storage register back to the keyboard for reprocessing—automatically: you can't make a mistake jotting down or re-entering intermediate figures Decimals are set automatically. For RESEARCH, STATISTICAL AND ENGINEERING applications, it's the next best thing to a computer. Call your SCM representative today

SCM CORPORATION, 410 PARK AVENUE, NEW YORK 22, N.Y.

Smith-Corona Typewriters · Marchant Calculators · Photocopiers · Adding Machines
Cash Registers · Data Processing Systems · Telecommunication Systems · Office Supplies

SCM®

22 November 1963, Volume 142, Number 3595 **SCIENCE**

The President's Science Adviser

Announcement of the retirement of Jerome B. Wiesner as the President's Science Adviser is an event which calls for stocktaking. Wiesner has served simultaneously in many roles—President's Science Adviser, chairman of the President's Science Advisory Committee, director of the Office of Science and Technology, and chairman of the Federal Council on Science and Technology. In addition he has been de facto director of the Bureau of the Budget for research and development and personnel procurement officer for scientific posts. He has had at his disposal perhaps more power than that enjoyed collectively by all other scientists connected with government. The principal sources of this authority have been access to the President, and control in budgetary matters.

In his many roles Wiesner has been required to present at least three differing visages to the world. As the President's adviser, his appropriate function has been that of self-effacing, impartial judge, often acting under tightest security. As director of OST, it has been in the public interest for him to wield authority as openly as possible. His power also implicitly has required him to be a Statesman of Science—a deep thinker—with long-term views of evolving patterns in science and technology and of the relations among society, science, and education.

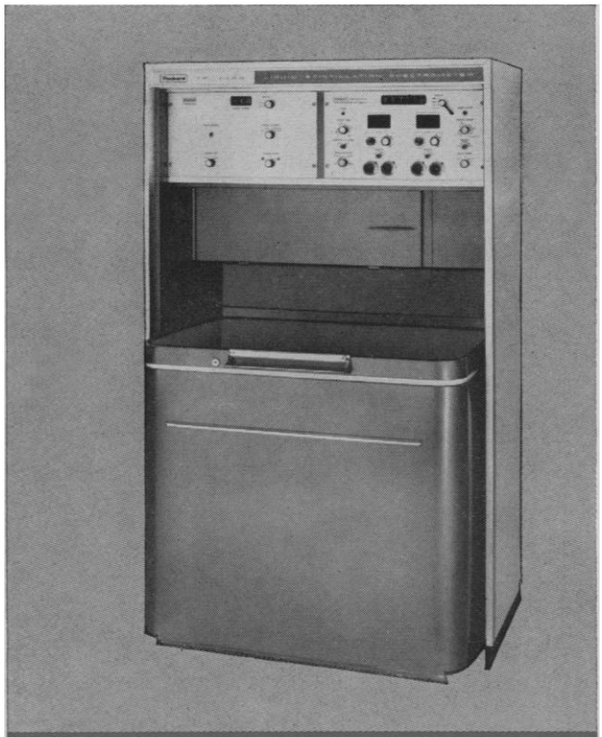
The realities of politics and power dictate that the role of President's Science Adviser and its needs should transcend all other functions. Almost inevitably the secrecy necessary to that office has been carried over into the Office of Science and Technology, which attempts to keep secret even the identity of its employees and consultants. The realities of human behavior also dictate that immediate operating decisions take priority over long-term thinking.

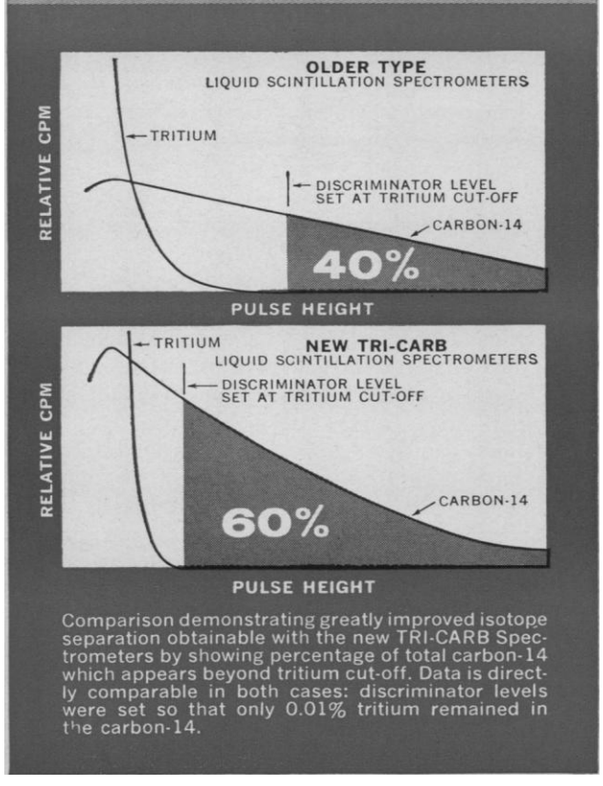
Wiesner has served the nation during a very difficult period. He has been among the most conscientious, hard-working individuals who have held high position in Washington. By tradition, comment at this time should consist of fulsome praise of his policies and accomplishments. Yet such comment would necessarily be an exercise in creative prose. After almost 3 years in which Wiesner has participated in countless decisions, there is little in the public domain to indicate the quality of his judgments or actions. For instance, the last annual report of the Federal Council for Science and Technology conveys the information that various studies are in progress.

When power is exercised, someone gets pushed around, and other executive agencies have been the resentful victims. In addition, the fate of the OST budget indicates misgivings in the minds of members of Congress. Thus, the PSAC–OST complex faces potential hostility on the part of Congress and government agencies, and it has provided almost no intellectual basis for support by the scientific community. To repair the situation will probably require more than changing the guard. It will certainly necessitate a less arrogant mode of operation. Means should be found to separate functions of the PSAC–OST complex into logical packages, with no one man asked to perform more than is humanly possible. The job of President's Science Adviser is a big one which merits full-time effort. A full-time director should head OST, and he should have a far better staff—one of high scientific stature. Finally, we need a Planning Office headed by a man who can think and who can marshal the wisdom of this nation in attempting to give guidance for the future.

—P.H.A.

Better Isotope Separation IN NEW TRI-CARB® SPECTROMETERS





Comparison demonstrating greatly improved isotope separation obtainable with the new TRI-CARB Spectrometers by showing percentage of total carbon-14 which appears beyond tritium cut-off. Data is directly comparable in both cases: discriminator levels were set so that only 0.01% tritium remained in the carbon-14.

The capability of a liquid scintillation spectrometer to separate isotopes in a double-labeled sample can be measured by its ability to screen the weaker isotope out of the spectrum of the more energetic one while maintaining optimum counting efficiency for each. At the same time, the instrument must be capable of accepting and amplifying linearly pulses of different magnitudes to permit simultaneous counting of isotopes with widely varying energies. New Tri-Carb Liquid Scintillation Spectrometers provide unequalled isotope separation in a broad range of counting situations because they incorporate:

(a) *Pulse Summation—which provides a more precise reproduction of the spectral shapes of low energy isotopes.*

(b) *Precisely adjustable channels of pulse-height analysis with separate, non-overloading amplifiers for each channel.*

PULSE SUMMATION

Pulse Summation is an exclusive Packard development for utilizing essentially all of the light energy produced in liquid scintillation solutions, instead of only half of the light as in older coincidence-type liquid scintillation spectrometers. In the liquid scintillation process, the total number of photons emitted for each low energy beta particle is very small. Even with the best light collection and photocathode conversion efficiencies, only one or two photoelectrons are produced in each photomultiplier tube from an average 6 kev tritium particle. By doubling the number of photoelectrons analyzed through the full use of *both* photomultiplier tubes for pulse summation and subsequent pulse-height analysis, a substantial advantage can be achieved in the statistics of photon collection and photoelectron utilization. **The more precise spectral curves achieved in new Tri-Carb Spectrometers as a result of better statistics, provide unequalled separation of low energy isotopes such as tritium and carbon-14.**

SEPARATE CHANNELS OF ANALYSIS

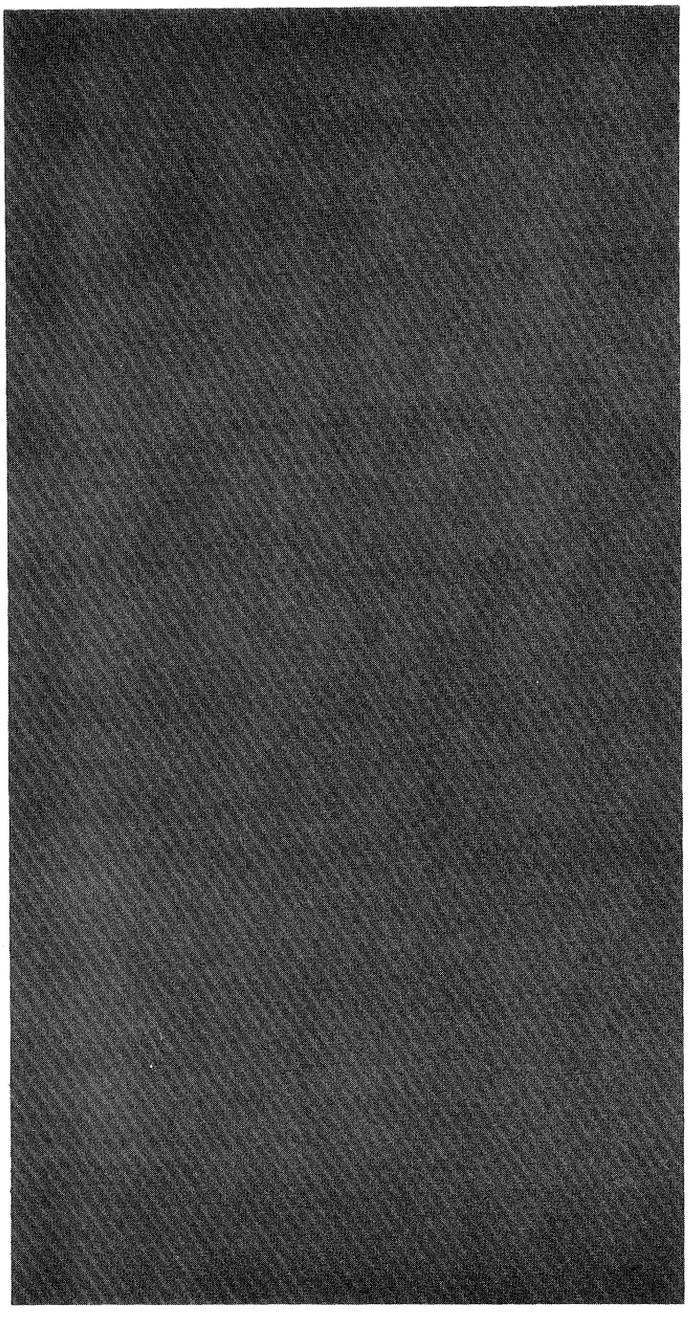
New Tri-Carb Spectrometers provide truly separate channels of pulse-height analysis with adjustable upper and lower discriminator levels on each channel. Three interacting gain controls for each channel permit precise adjustment of pulse attenuation, without distortion, even when handling isotopes with maximum energies varying as much as 100:1. Circuit design limits amplifier overload to approximately 400X; recovery time at this overload is only 0.4 μsec. **This allows highly accurate selection of optimum counting conditions for each channel of analysis, and permits routine measurement of isotope mixtures such as tritium and phosphorous-32.**

Better isotope separation is just one of many significant new features now available in Packard Tri-Carb Spectrometers. Ask your Packard Sales Engineer for complete details, or write for Bulletin.

Packard

PACKARD INSTRUMENT COMPANY, INC.

BOX 428 • LA GRANGE, ILLINOIS • AREA CODE 312 • 485-6330



moduline

a new Aerograph series

Hy-Fl$_2$ • 202 • 1520

Will your next gas chromatograph be driveable?

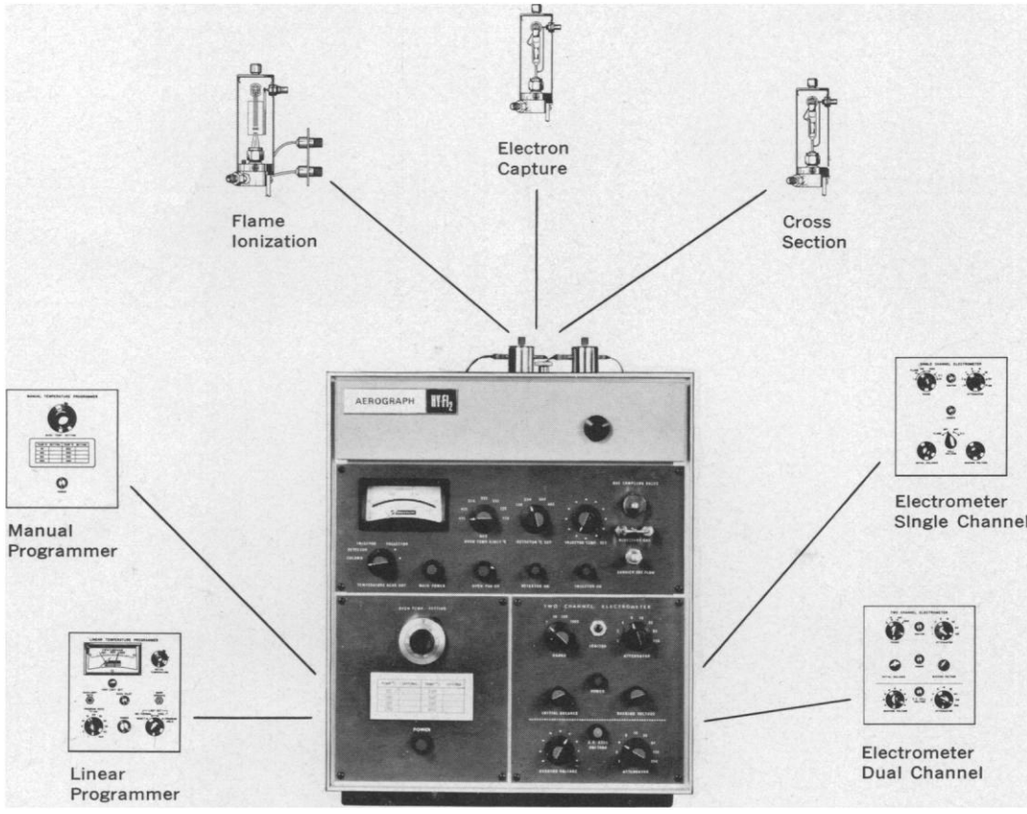
The law requires that all new cars sold must be sufficiently complete to allow them to be driven. No such law protects the unwary gas chromatograph buyer.

You may need to buy, for instance, a storage battery, or for a small additional fee of $150 —a built-in power supply. Flow controllers for two-column instruments will be provided for only $300. There are other little items which you can also dig up here and there, such as gas connecting tubes, filters, flow meters, septums, transformers, restrictors, etc.

As a sales inducement, Aerograph instruments are provided with those accessories necessary for its operation. A display of accessory items for the new Aerograph Hy-Fl$_2$ is shown on page 4.

The question is—who should take care of these little things?

The Hy-Fl$_2$
with a single column and multiple detectors

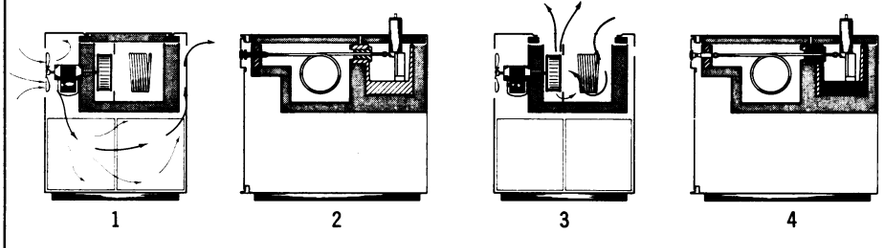


A modular concept provides the option to use and to interchange functional components.

The Hy-Fl$_2$, a single column gas chromatograph fulfills this requirement.

It may be used with any of the four common detectors or as a two-channel instrument with combination electron capture and flame detector. Either a manual or linear programming module may be selected.

Electrometers, single or dual channel, are interchangeable. Many accessories are available.



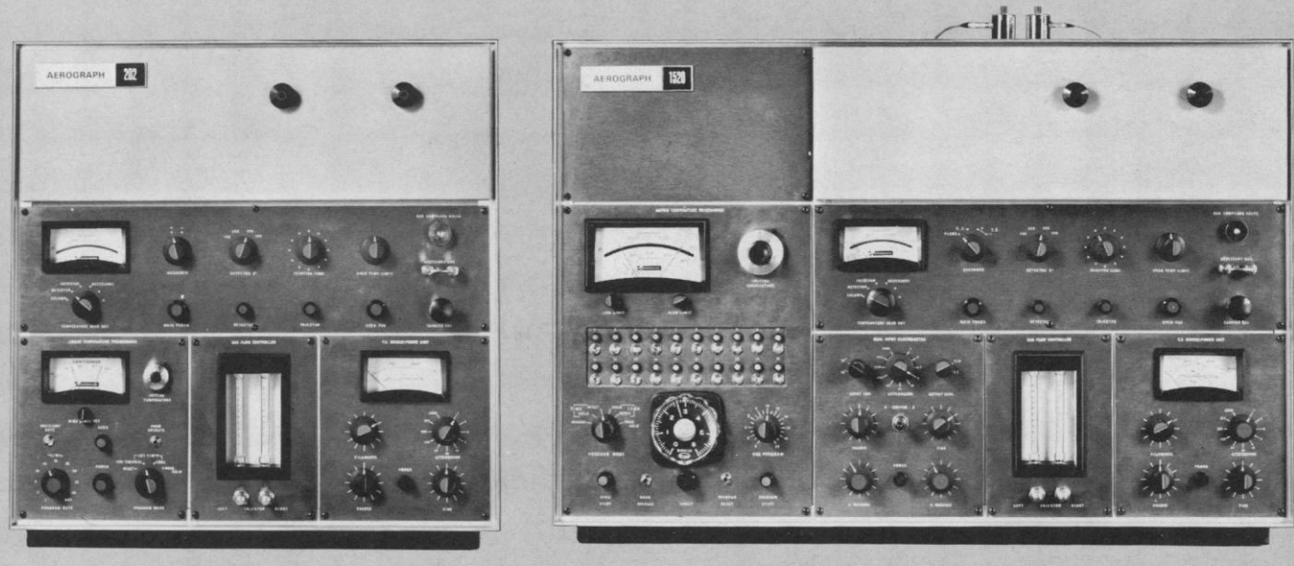
Single Cabinet Construction

1. Harmful heat from the ovens in the unitized cabinet is dissipated with a separate cabinet fan.
2. The short stainless steel injector permits on-column or vaporized injections to be made with standard Hamilton syringes with 2″ needles.
3. The same motor circulates column oven air and also rapidly cools the column when the door is opened.
4. The column and detector ovens are thermally isolated from each other by glass wool and a moving air current.

Single cabinet construction saves valuable bench space, and allows permanent electrical connection to be made without cumbersome electrical cords and plugs necessary with the common multi- cabinet design.

The 202 & 1520

with dual columns, and dual flame & TC detectors



Both the Aerograph 202 and 1520 Moduline instruments contain dual columns with proportional flow controllers and flow meters. The separate detector oven is precisely held at any temperature with full proportional heat control.

The all stainless column oven, heated by an 800 watt coil, will program at 30°C/min to 400°C and will cool from 400 to 100°C in four minutes.

The injectors are heated separately. Temperature readout on an accurate pyrometer reads column oven, injectors, detector oven, collector, and one auxiliary plug. An upper oven temperature limit control on all Moduline instruments protects columns and equipment from accidental overheating.

202

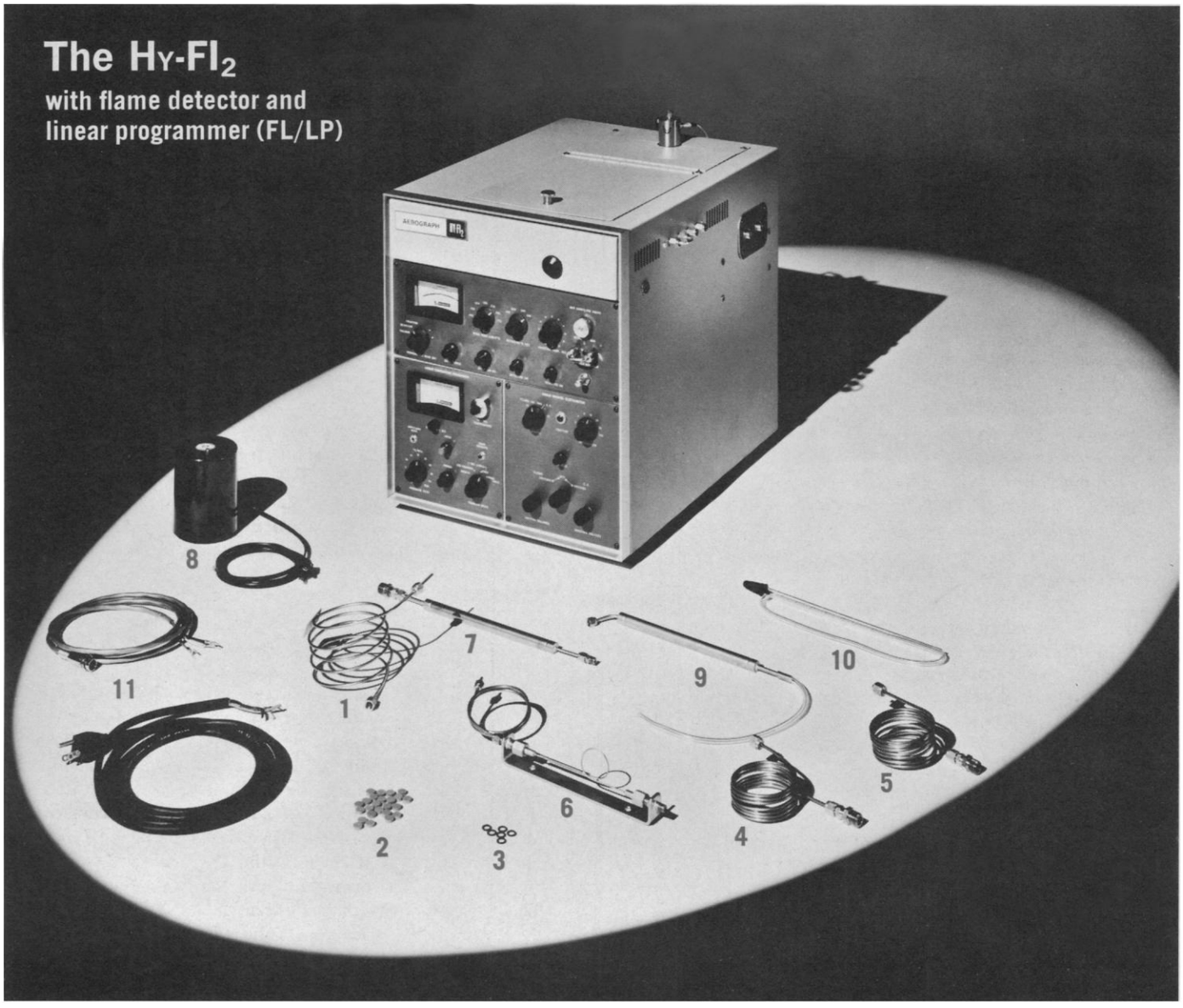
The Aerograph 202 incorporates either dual flame or dual input TC detectors. It may be used with the manual temperature programmer or the linear programmer (LP) modules. The LP is electronic without gears, motor, or clutch. A switch and matrix plug provide any programming rate desired.

1520

The 1520 is a more deluxe version of the 202. It contains both the dual flame and thermal conductivity detectors. The detector choice is made by re-connecting the downstream ends of the columns. The exclusive Aerograph matrix temperature programmer is standard. This deluxe programmer not only gives complete flexibility in pre-setting temperature programming rates but automatically closes the oven door after cool-down and re-establishes the start temperature.

The Hy-Fl$_2$

with flame detector and
linear programmer (FL/LP)



WILKENS INSTRUMENT & RESEARCH, INC.

Main Office

P. O BOX 313 • WALNUT CREEK, CALIF.
PHONE: AREA CODE 415-284-7166

DOMESTIC REGIONAL OFFICES

Eastern

591 North Ave., Door 2
Wakefield, Massachusetts
Phone: 617-245-9494

42 Willow Grove Way
Englishtown, N. J.
201-462-2656

Midwest

5151 N. Harlem
Chicago 31, Illinois
Phone: 312-631-8776

Southwest

2510 Broad Street
Houston 17, Texas
Phone: 713-MI 5-3244

Southeast

1847 Brocade Drive
Baton Rouge, Louisiana
Phone: 504-924-7627

INTERNATIONAL DIVISION

Main Office

Wilkens Instrument & Research, AG
P. O. Box 734 • Basel 2, Switzerland
Phone: 061-35 57 00

Sales & Services Offices

Aerograph France, SA
91 bis, Avenue Pierre Curie
Saint Cyr L'Ecole (S&O) FRANCE

Wilkens Instrument & Research, AG
Kontackt und Serviceburo
Bismarckstrasse 39
Darmstadt, WESTDEUTSCHLAND

Wilkens Instrument & Research, Ltd.
Hale Top—Wythenshawe Civic Center
Manchester, ENGLAND

Represented all over the world

This beautiful instrument comes with the accessory items shown above.

1. Stainless steel column (substrate optional)
2. 24 injection gaskets
3. 6 extra O-rings for flame tip
4. Hydrogen tank line, ⅛" copper, with fittings
5. Nitrogen tank line, ⅛" copper, with fittings
6. Restrictor, for regulating hydrogen flow rate
7. Nitrogen filter, stainless steel with molecular sieve
8. Air pump for air supply to flame
9. Air filter, stainless steel, molecular sieve
10. Soap bubble gas flow meter
11. Electrical cords for AC and recorder

You will also be interested in these bonus features standard with Moduline instruments.

- Separate detector oven, full proportional control
- 2" injector adaptable to Pyrex inserts and columns
- Special thermocouple and variable power plug for auxiliary equipment
- Capillary tube sample collection—with flame and EC detectors
- Differential flow controllers for carrier gas
- Many accessories, including hydrogen generator available

These new instruments are being described in current house publications, Aerograph Research Notes and Previews and Reviews. Write for your free subscription.

PRINTED IN U.S.A.

older ones of the natural belt. This was rather simple because the "inner" Van Allen belt is predominately composed of protons. The bomb ejected electrons into the belt. While the inner belt also contains electrons, they have much less energy than those from the bomb.

Satellites were launched to watch what happened as the new electrons decayed or lost their energy, because the electrons would follow the same laws as the protons would under natural circumstances. In this manner it was discovered that the life of an electron varies from 4 months at the equator to 10 seconds at the poles. Data from three Russian test explosions were also included.

Hess discussed a similar "tagging" mechanism for exploring the behavior of particles in the outer Van Allen belt that extends as far as 4000 miles or more above the earth. Radioactive pieces of copper, positioned by satellites at an altitude of 16,000 miles, could inject an atomic particle called the positron into the outer belt. The outer belt is thought to contain no positrons, so there should be no difficulty in identifying them as newcomers to the area. According to Hess, some things which could be studied in this manner include any movement of the belt up or down, whether it ever changes its thickness, or whether acceleration forces ever act upon it.

Gerald S. Hawkins (Boston College Observatory) discussed the hazards of micrometeorites on future space voyages. The rate of bombardment of meteors, meteorites, and micrometeorites is the same for the moon as it is for the earth. However, due to the absence of a lunar atmosphere, there are more of these particles striking the surface of the moon than of the earth. Meteors burn up in the earth's atmosphere and meteorites and micrometeorites are stopped or slowed down.

Meteors normally are large objects resulting from the breakup of comets; the smaller meteorites are believed to have been created by the collision of asteroids in space. Many meteorites have been found on earth. Micrometeorites are best described as space dust, a mixture of solid fragments and fluffy objects. Some may be described as having the consistency of a cigar ash.

Hawkins said that if the U.S. Apollo moonship collided with a 1-ton meteor in space, there would be no chance of survival by the three pilots. But he said that on a 10-day round-trip to the moon, the chances of such a collision are only one in 100 billion.

The first concrete information about micrometeorites was obtained in 1961 in the "Venus fly trap" experiment which was conducted 100 miles above White Sands, New Mexico. A rocket fired a device which opened in the same manner as the petals of a flower and collected millions of these dust-like particles before closing. The device was then parachuted to the ground and recovered.

As an example of the effect of micrometeorites, Hawkins related a hypothetical situation of an astronaut walking about the surface of the moon for one week. At the end of the week every square inch of his space suit would be bombarded by more than a million tiny, fast-moving micrometeorites. A suit only .04 inch thick would protect him for that period, but the visor of his helmet would be so pitted that he probably would not be able to see through it. Eventually, the suit itself would erode under the sandblast effect of the nearly invisible space particles. Thus, space men planning long-term exploration of the moon will require protec-

tive shelters, which also must be fortified to withstand the eroding effect of micrometeorites, radiation, and the hot and cold temperature extremes of lunar days and nights.

Talbot A. Chubb (U.S. Naval Research Laboratory) discussed a relatively new branch of science called x-ray astronomy which is actually an additional tool for examining objects in interstellar space. X-ray astronomy had a rather firm beginning only a few months ago when a rocket was launched from White Sands, New Mexico, carrying aboard a "soft x-ray" detector. Soft x-rays are produced by low-energy electrons of about 1500 volts, whereas the x-rays used by medical doctors are produced by electrons with 40,000 volts of energy.

It has been only in the past year that an instrument capable of recording soft x-rays in space has been developed and used. The soft x-ray detector was developed by two scientists at the American Science and Engineering Company, Ricardi Giacconi and Bruno Rossi. The problem, Chubb said, was to build a detector that could be sensitive enough to distinguish between incoming x-rays and the cosmic ray background, yet having narrow enough view of space so that soft x-ray sources could be pin-pointed with reasonable accuracy. The first detector, an array of geiger counters, was flown by its developers a year ago last spring in an attempt to make x-ray studies of the moon. As the rocket tumbled through space, the detector picked up a source which Giacconi and Rossi later said was the center of the galaxy. The detector used by Chubb was a refinement of the first one and had a tighter field of view, thus allowing a greater accuracy in locating the source.

In Chubb's experiment, the soft x-ray detector made observations for 5 to 6 minutes at points 60 to 100 miles above the earth's surface. During six successive sweeps of the detector, six blips appeared on the graph-paper recording. Chubb said that this graph shows a source roughly 15 degrees from the center of the galaxy, near the Milky Way, which is emitting soft x-rays. If a second rocket flight confirms the location, then scientists can be sure that they are viewing an object which cannot be "seen" by conventional telescopes or by radiowave "telescopes" which listen to the noise caused by the activity of stars and other matter in space. However, the field of view of the detector in space still has not been

sufficiently defined to give scientists the certainty that they would like to have on the location of the unknown x-ray source.

"If this star is seen again in the same location by another x-ray detector, then we can expect that the location of the source has been confirmed," Chubb said. It is planned to check this observation with another rocket flight, probably next February. Verification will mean the start of x-ray astronomy which Chubb predicted would be similar to radioastronomy in that graphs rather than photographic techniques would be used.

It is possible that the source may be a star which has exploded only a short time ago, as astronomical time is measured. The closest known object to the supposed location of the x-ray source is Kepler's star, a supernova discovered in the 17th century. Even if the mysterious x-rays' source should be linked to a star which has been observed by a conventional method, the usefulness of x-ray astronomy would still have been proven.

Nancy Roman (NASA) related that observations made by a U.S. satellite indicate that it may be possible to predict flare eruption on the sun and thus schedule manned space flights around the period of intense solar activity. She said that x-ray detector devices aboard the Orbiting Solar Observatory are limited but very promising. The solar observatory showed that small microflares seem to occur in series with increasing or decreasing strength and with a predictable relation between both the intensity and time lag of each succeeding flare. "If this holds up during future information," she said, "it will be the first time we have been successfully able to predict any facets of flare activity." She reported, "With OSO we watch the birth and death of a series of small flares in the soft x-ray region. They occurred at equal space periods and we were able to predict when the next one would occur within one minute. Whether this orderliness also will apply to larger flares which are of importance to manned flight we can't tell now. But the initial OSO findings are certainly encouraging."

The next period of extreme activity will occur from 1967 to 1969 when the United States plans to send three-man Apollo spaceships around and to the moon.

Roman reported a second solar observatory is scheduled for launching later this year and will carry a corono-

graph, a device to produce an artificial eclipse of the sun. Roman also outlined space agency plans to launch a series of orbiting astronomical observatories to study the stars and other celestial bodies above the disturbing influence of the earth's atmosphere.

The chief of the Manned Spacecraft Center of NASA, Chris Kraft, related that one of the first steps in the upcoming Gemini space projects will be a rendezvous of a manned satellite with an unmanned satellite in outer space. The unmanned vehicle will rendezvous with a satellite containing two astronauts and will be used to alter the orbit of the manned craft. Both satellites will be launched from Cape Canaveral.

The Gemini project, which will get under way next year, will be followed by project Apollo which has as its end result a manned landing on the moon probably around 1970. However, Kraft said that no definite date could be set for a moon shot: "We'll land on the moon when we see it is feasible." At present, Kraft said, "we know all that is necessary to go to the moon," with one exception, a "knowledge of the surface of the moon." This information will probably not be learned until an actual lunar landing is performed. Two men will go on the moon trip and either or both will be able to walk from the space ship and explore the moon's surface.

Kraft noted that the actual purpose for making a moon shot is for its value in further space probes. The moon is "the first step to outer space," a "jumping off place" which will be the "key to open the door to planetary exploration."

Richard B. Kershner (Applied Physics Laboratory, Johns Hopkins University) reported that information received from the satellite Anna has confirmed earlier observations that the earth is shaped like a pear with its stem at the north pole, and that the earth's equator is elliptical instead of circular in shape. Anna has measured the true shape of the earth more accurately and faster than any previous observation. For example, three days of data from Anna could have confirmed the pear-like shape of the earth with greater accuracy than the original calculations which required 1½ years. Kershner added, "We get a fantastic amount of data compared to that which is available from optical observations." He also said that Anna has shown that the earth's ocean areas are farther from

the center of the planet than the land areas; the calculations were made from deviations from the satellite's orbit.

Satellite Anna is equipped with five winking lights. "The behavior of this light system has been a little odd," Kershner said. "They worked fine the first two months, then they cut to four, then we had three, and finally none." It appeared as though part of the electrical system had shorted out and the lights would wink no more. Then about 2½ weeks ago, the lights started flashing beautifully. This sort of thing is extremely hard to believe. The short must have burnt itself out. Kershner related that Anna was another example of a satellite that fixed itself while humans stood by helplessly on the ground. He went on to cite an occasion when Mariner II, on its journey to the vicinity of Venus, was struck by a tiny meteorite which apparently ripped some wires from the power supply. The records show a jolt to the spacecraft as if some object had struck it and show a corresponding power cut-off at the same time, he said. Yet the power eventually returned, meaning the wires must have soldered themselves back to their proper connections.

Both Telstar communication satellites have had mysterious trouble. Telstar I refused to obey commands from the ground on two occasions. The first time, Bell Telephone scientists fixed the satellite by remote control but the second time, in February, the situation looked hopeless until the satellite spontaneously began functioning again. In a humorous vein Kershner suggested, "Maybe it's space gremlins."

The conference was sponsored by Virginia Polytechnic Institute in cooperation with the National Science Foundation and the Langley Research Center, NASA.

ROBERT WERLWAS
Virginia Polytechnic Institute, Blacksburg

Forthcoming Events

November

26–30. **Endocrinology**, 16th meeting, Paris, France. (Secrétariat du Service du Dr. Albeaux-Fernet, Hopital Laënnec, 42, rue de Sévres, Paris 17)

29–30. **Biomagnetics**, intern. symp., Chicago, Ill. (J. F. Barnothy, Biomagnetic Research Foundation, 833 Lincoln St., Evanston, Ill.)

29–30. American **Mathematical** Soc., Cleveland, Ohio. (AMS, 190 Hope St., Providence 6, R.I.)

31–1. American College of **Chest Physicians**, Portland, Ore. (M. Kornfeld, 112 E. Chestnut, Chicago 11, Ill.)

31–2. **Paint Technology**, Federation of Societies, 41st annual, Philadelphia, Pa. (The Society, 121 S. Broad St., Philadelphia 7)

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, Phillippines. (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 7e)

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. 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. 08903)