

SCIENCE

28 February 1964

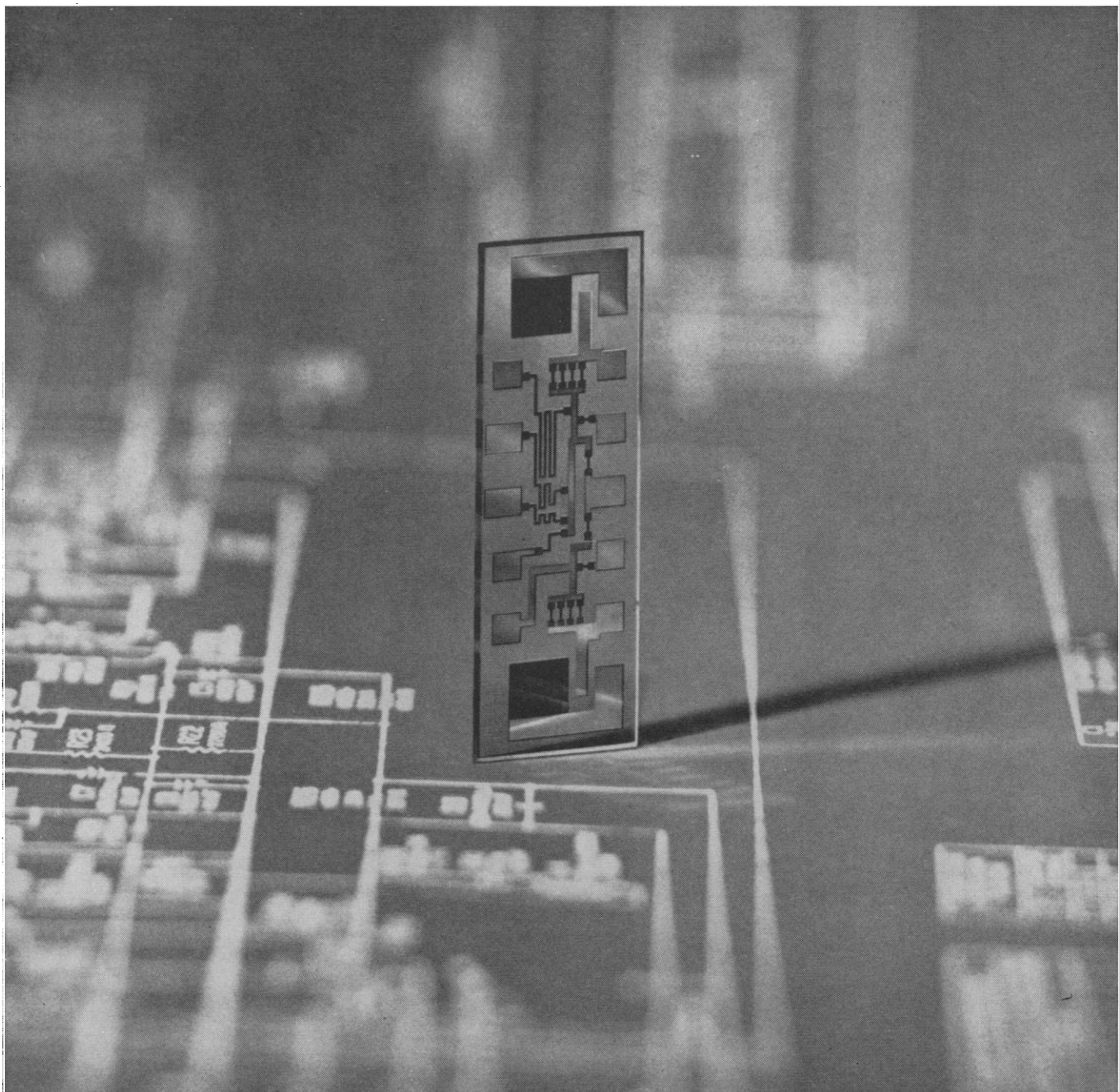
Vol. 143, No. 3609

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

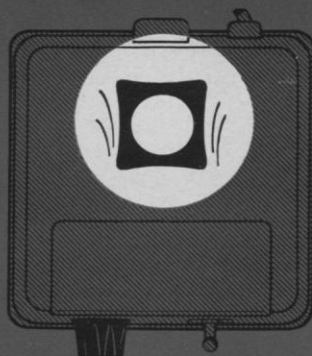


REGENERATING LEG

PROCESSES. Thin film circuits, a major step forward in miniaturized electronics, are now replacing capacitors and resistors in the Bell telephone network. Western Electric had the unique and difficult job of mechanizing the vacuum operations required for thin film deposits of tantalum and other metals. From our Engineering Research Center at Princeton came the answer: A machine that continuously moves a glass or ceramic substrate through chambers with vacuums lower than a hundredth of a millionth of the earth's atmosphere. The machine passes substrates through separate zones for out-gassing, preheating and metal-sputtering. This makes thin film production economical and practical—producing high-quality, uniform metal deposits as thin as 4 millionths of an inch. Whether making thin film circuits or Princess telephones, coming up with new and better manufacturing techniques is a Western Electric habit that helps bring Americans the finest communications in the world. **WESTERN ELECTRIC**



THE MIXER WITH THE "SQUAROID" HEAD



stirs, agitates, mixes... in seconds!

THE NEW LAB-LINE

SUPER-MIXER

with exclusive variable mixing control

Positive mixing of contents in flasks, beakers, square or odd-shaped tubes... even micro size tubes



Single-hand control with Touch Plate Switch

Easily handles two or more tubes simultaneously



"What could be easier?"... is the first reaction when you see the Super-Mixer in action. The exclusive "Squaroid" mixing head—molded of durable Neoprene—provides quick, positive mixing action in test tubes, flasks, or other vehicles. Easy, convenient operation will convince you that this mixer has superior features:

- Built-in rheostat control, gives smooth, stepless action; provides gentle, moderate or violent mixing
- Exclusive "Squaroid" mixing head handles micro size tubes, standard tubes, flasks and beakers
- "Squaroid" design of mixing head handles two or more tubes simultaneously
- Even square or odd-shaped tubes and flasks can be touched to the mixing head for positive stirring of contents

- Unique "Touch Plate" switch permits one-hand operation; mixing head stops instantly with release of pressure
- No springs used in the mixing mechanism
- Requires no stoppers, no capping of test tubes
- Housing of die-cast aluminum... 5" square base is cushioned with sponge rubber, will not creep
- Efficient, yet inexpensive (Order one for each lab table)

Cat. No. 1290 LAB-LINE SUPER-MIXER. Complete with built-in rheostat control, exclusive "Squaroid" Neoprene mixing head and unique "Touch Plate". 115 Volts, 50/60 Cycles. Net wt. 6 lbs. Price... **\$59.50**

Cat. No. 1404 FOOT SWITCH for SUPER-MIXER. Price... \$20.00

Write for Bulletin 385



LAB-LINE INSTRUMENTS, Inc.

Manufacturers and Designers

LAB-LINE PLAZA • MELROSE PARK, ILL. 60160

28 February 1964

Vol. 143, No. 3609

SCIENCE

LETTERS	Science and the Race Problem: <i>H. E. Garrett, W. C. George, AAAS Committee on Science in the Promotion of Human Welfare</i> ; Who Should Teach Engineering?: <i>M. B. Richardson</i> ; Population Problems and Infectious Diseases: <i>T. A. Cockburn</i> ; Cigarettes: Polonium-210: <i>I. Michelson</i> ; Freedom in Large Laboratories: <i>H. H. Claassen</i>	913
EDITORIAL	New Goals for Science in Britain	919
ARTICLES	The Deep Structure of Continents: <i>G. J. F. MacDonald</i>	921
	Heat-flow and gravity observations and satellite data shed light on the origin of continents and oceans.	
	Lactic Dehydrogenases: Functions of the Two Types: <i>D. M. Dawson, T. L. Goodfriend, N. O. Kaplan</i>	929
	Rates of synthesis of the two major forms can be correlated with metabolic differentiation.	
	Mathematicians in Industry—The First 75 Years: <i>T. C. Fry</i>	934
	They have increased 12-fold each 25 years, and their relation to management is changing.	
NEWS AND COMMENT	LBJ and Science: Continuity and Some Hints for the Future—Conservation: Politics and Prospects	939
BOOK REVIEWS	On the Science of Comparative Sociology: <i>J. P. Scott</i>	944
	Land and Life, reviewed by <i>W. A. D. Jackson</i> ; other reviews by <i>S. C. Creasey, R. O. Kehle, B. J. Zwolinski, J. B. Irwin, I. Amdur, L. H. Snyder</i>	945
REPORTS	Radio Observation of the Electromagnetic Emission from Warm Clouds: <i>J. D. Sartor</i>	948
	Harappa Culture: New Evidence for a Shorter Chronology: <i>D. P. Agrawal</i>	950
	High-Pressure Phase Transition in Tin Telluride: <i>J. A. Kafalas and A. N. Mariano</i>	952

EDITORIAL BOARD

DAVID M. BONNER
MELVIN CALVIN
ERNEST COURANT

FARRINGTON DANIELS
JOHN T. EDSALL
DAVID R. GODDARD

ALEXANDER HOLLAENDER
ROBERT JASTROW
KONRAD B. KRAUSKOPF

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

EDITORIAL STAFF

Editor
PHILIP H. ABELSON

Publisher
DAEL WOLFE

Business Manager
HANS NUSSBAUM

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

ADVERTISING STAFF

Director: EARL J. SCHERAGO

Production Manager: RAYMONDE SALAMA

Sales: New York, N.Y., 11 W. 42 St.: RICHARD L. CHARLES, ROBERT S. BUGBEE (212-PE-6-1858)

Scotch Plains, N.J., 12 Unami Lane: C. RICHARD CALLIS (201-889-4873)

SCIENCE is published weekly by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D. C. 20005. Now combined with *The Scientific Monthly* ®. Second-class postage paid at Washington, D.C. Copyright © 1964 by the American Association for the Advancement of Science. Annual subscriptions \$8.50; foreign postage, \$1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, \$7; 10 months, \$7.50. Provide 4 weeks' notice for change of address, giving new and old address and zone numbers. Send a recent address label. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. Indexed in the *Reader's Guide to Periodical Literature*.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Radioactive Myoinositol: Incorporation into Streptomycin: <i>H. Heding</i>	953
Conversion of Leucoanthocyanins into the Corresponding Anthocyanidins: <i>M. A. Joslyn and J. L. Goldstein</i>	954
Phospholipid-Sugar Complexes in Relation to Cell Membrane Monosaccharide Transport: <i>P. G. LeFevre et al.</i>	955
Detection and Quantitation of Fallout Particles in a Human Lung: <i>A. V. Wegst, C. A. Pelletier, G. H. Whipple</i>	957
Intercellular Diffusion: <i>Y. Kanno and W. R. Loewenstein</i>	959
Thermal Denaturation of Collagen in the Dispersed and Solid State: <i>J. Gross</i>	960
Regenerating Tissues from the Cockroach Leg: A System for Studying in vitro: <i>E. P. Marks and J. P. Reinecke</i>	961
Pure Maple Syrup: Nutritive Value: <i>A. L. Leaf</i>	963
Cytoplasmic Interaction between Macrophages and Lymphocytic Cells in Antibody Synthesis: <i>M. D. Schoenberg et al.</i>	964
Wasting Disease Induced in Young Mice by Administration of Cortisol Acetate: <i>M. Schlesinger and R. Mark</i>	965
Taste of Sodium Chloride Solutions after Adaptation to Sodium Chloride: Implications for the "Water Taste": <i>L. M. Bartoshuk, D. H. McBurney, C. Pfaffmann</i>	967
Behavior of Infant Monkeys: Differences Attributable to Mode of Birth: <i>G. W. Meier</i>	968
Vigilance: The Importance of the Elicited Observing Rate: <i>H. J. Jerison and R. M. Pickett</i>	970
Behavior: Persistence of Shock-Induced Aggression: <i>R. E. Ulrich and W. H. Craine</i> ..	971
<i>Comments on Reports</i> —Hormonal Control of Egg Development in Calliphora: <i>E. Thomsen</i> ; Retrograde Amnesia from Electronconvulsive Shock: <i>C. J. Dye</i> ..	973
MEETINGS Weights and Measures: <i>A. V. Astin</i> ; Human Diploid Cell Strains: <i>L. Hayflick, F. Perkins, R. E. Stevenson</i> ; Forthcoming Events	974
DEPARTMENTS New Products	980

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

Editorial Assistants: ISABELLA BOULDIN, ELEANORE BUTZ, SYLVIA EBERHART, GRAYCE FINGER,
NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, MARCIA ISAAK,
RUTH KINGERLEE, HOWARD NATHENSON, EDGAR RICH, JOHN RINGLE.

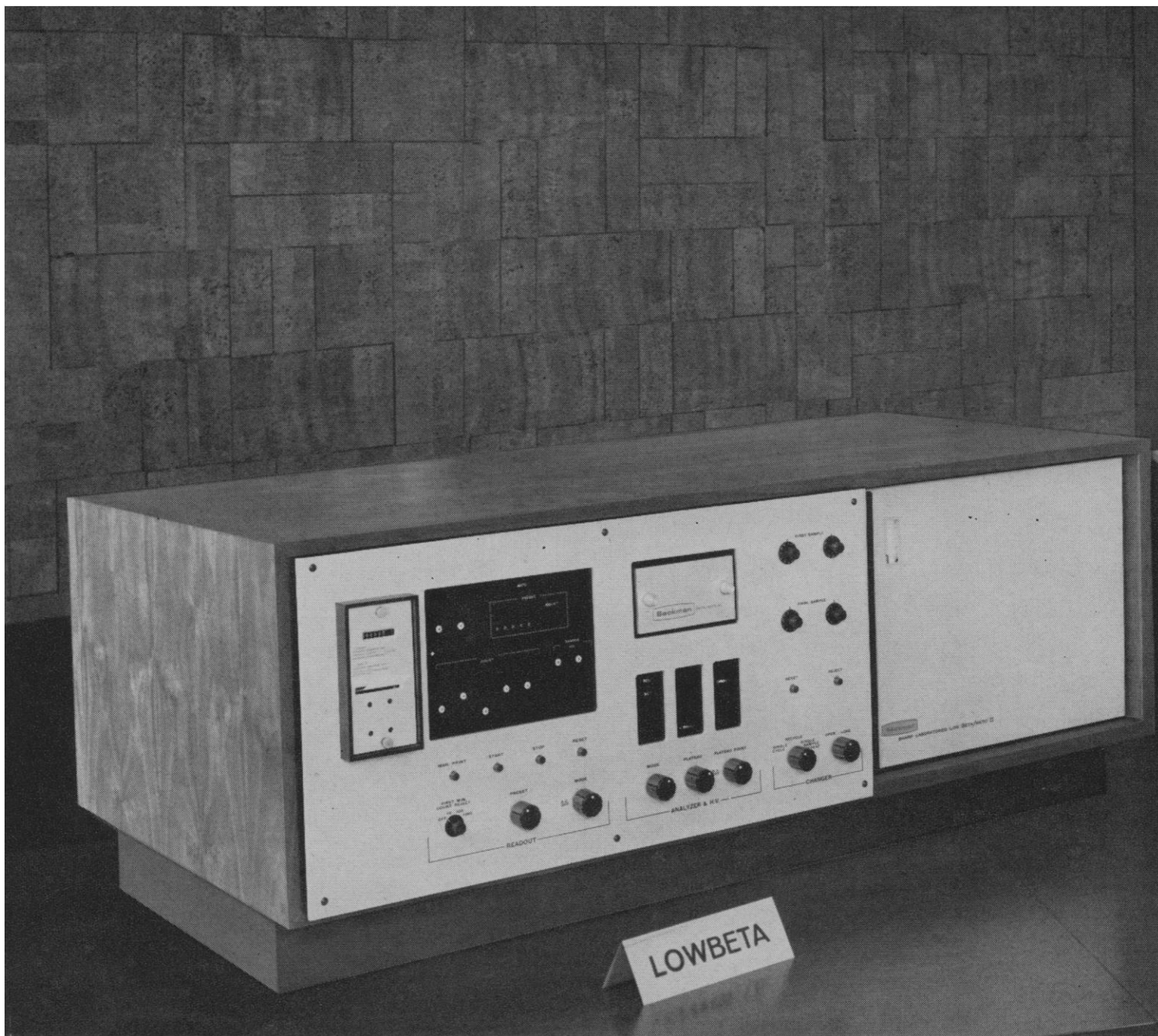
Staff Assistants: VIRLINDA M. GIBSON, LILLIAN HSU, BARBARA J. SHEFFER.

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

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C., 20005. Phone: 202-
DU 7-7171. Cable: Advancesci, Washington. Manuscripts should be submitted in triplicate, double-
spaced throughout. The AAAS assumes no responsibility for the safety of manuscripts. Copies of
"Instructions for Contributors" can be obtained from the editorial office.
ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone 212-PE 6-1858.

COVER

The regenerating leg of a nymphal cockroach has taken on definite form. The trachea are clearly visible and the cuticle has already been secreted. This leg regenerate was removed from the coxal stump 43 days after the original leg had been removed; it was then placed in a tissue culture chamber. After 3 days in vitro (when this photograph was taken), the muscles were still contracting vigorously ($\times 65$). See page 961. [John P. Reinecke, Washburn University]



We first asked ourselves, "Do they have the proper background?"

(The question came up just before the Sharp Radioactivity Counting Systems joined the Beckman family. The answer...yes, the lowest background available and fully reproducible too.)

Be sure to see Beckman at the Pittsburgh Conference



LOWBETA® II is a definite breakthrough in moderately priced planchet counting systems.

Its background is the lowest at any price. And it's the first to guarantee that 95% of all given background measurements in a 24 hour period will be within ± 2 standard deviations of the average background counting rate. This assures you precise, error-free sample counting. Sensitivity over the entire planchet area is uniform. New overlapping detectors see to that.

A new 100 sample automatic changer allows you to select individual samples as well as any sample grouping. You may also start the cycle with any sample and end up with any other.

You may select from 12 different **LOWBETA II** systems depending upon your requirements. Visual and printed read-outs. Either geiger or proportional gas operation. Manual or automatic versions. And with three different detector sizes (including the new 5" size).

WIDEBETA is the most advanced planchet counting system in the world.

It combines the lowest background and full reproducibility with the widest counting range of any system. **WIDEBETA** performs equally well at a few counts per hour or over one million counts per minute. And with a loss of less than 1% at one million. Live timing is behind this.

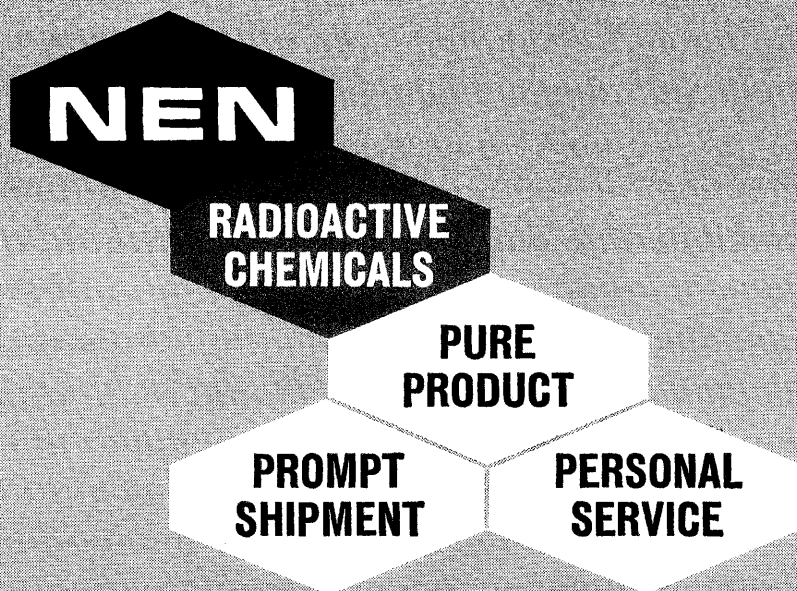
WIDEBETA offers full automation. Automatic sample changer handles up to 100 samples. Automatic pulse height sorting and blanking allows simultaneous alpha-beta counting as well as energy separation of mixed beta emitters. Automatic background subtraction provides net count information directly. Digitally presettable timing decades permit automatic normalization of data to percentage of a standard. A wide choice of detectors and optional features makes **WIDEBETA** the most versatile as well. For more information about these two systems, call your Beckman Sales Engineer or write for Data File LWB-38-164.

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

Beckman

INSTRUMENTS, INC.

SCIENTIFIC AND PROCESS INSTRUMENTS DIVISION
FULLERTON, CALIFORNIA



PROMISES PROMISES PROMISES

(everyone makes them, NENC keeps them)

Every manufacturer of labeled chemicals makes the same promises. NENC has attained its position as the leading producer of radioactive chemicals for research by keeping promises to a greater degree than others.

The words . . . Pure Product . . . Prompt Shipment . . . and Personal Service mean more when you do business with NENC.



NEW ENGLAND NUCLEAR CORP.

575 ALBANY STREET, BOSTON 18, MASSACHUSETTS

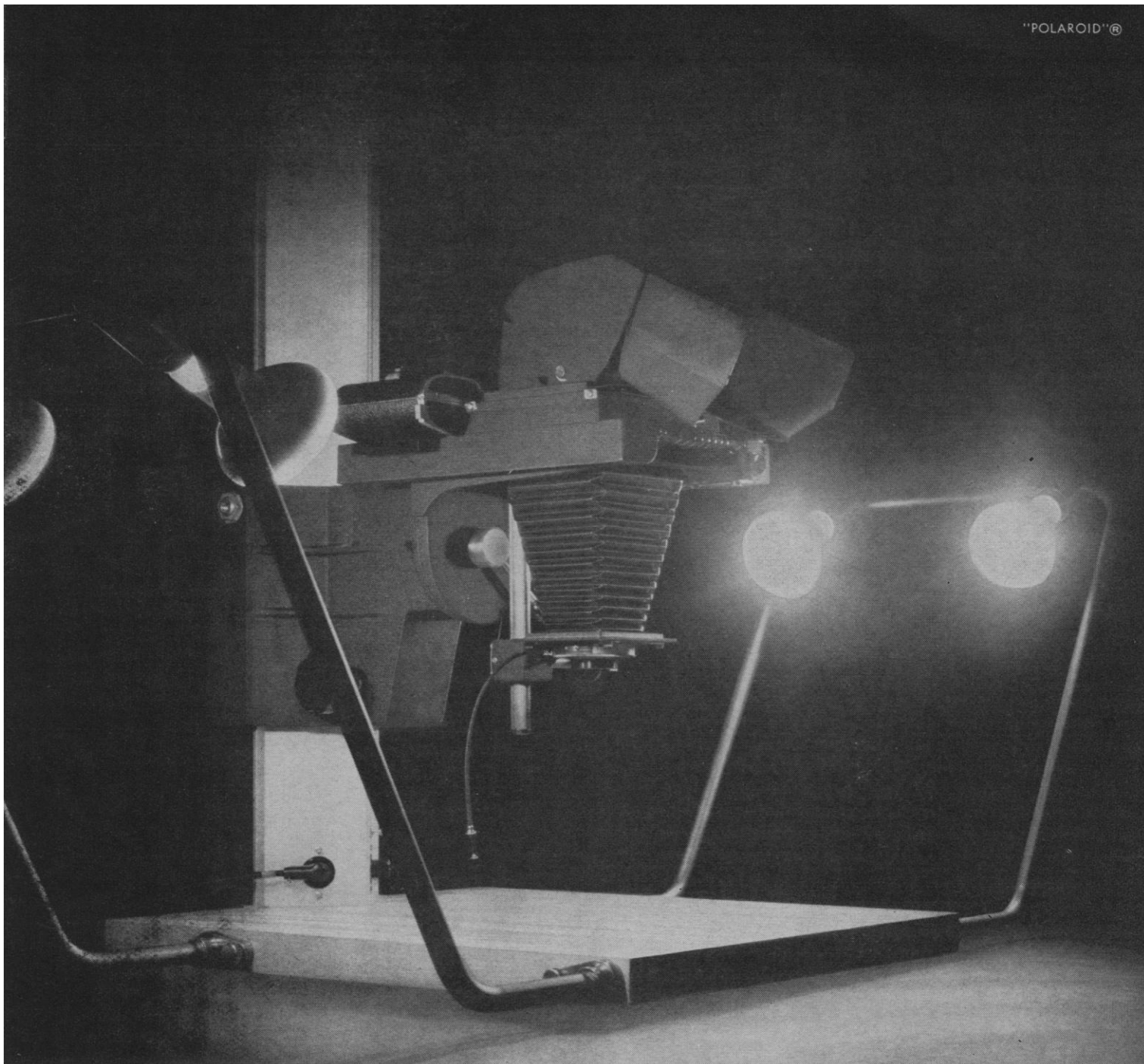
TEL. 426-7311 | AREA CODE 617



LOOK TO CLAY-ADAMS FOR THE WORLD'S MOST COMPLETE LINE OF TABLE MODEL CENTRIFUGES. MODELS TO MEET EVERY NEED IN HOSPITAL, CLINICAL, INDUSTRIAL, CHEMICAL AND UNIVERSITY LABS. ALL ARE PRECISION INSTRUMENTS...ENGINEERED AND MANUFACTURED TO ASSURE YEARS OF TOP PERFORMANCE.

available from your dealer





The MP-3 is virtually an industrial studio in itself.

If you need a picture of an assembly, for instance, you can put it on the lighted base, click the shutter and peel out a finished picture 10 seconds later. If you need a macrophotograph of a small part you can make a 4 x 5 print in 10 seconds. If you need a photomicrograph put a microscope under the camera. If you need any of these in *color*, you can get them in 50 seconds. If you want to make a black and white slide of a wall chart, you can swing the camera head 90°, and with transparency film, get one in 90 seconds. If you want a negative you can make one in 20 seconds. If you need multiple records,

make multiple originals. And finally, if you aren't in a hurry, use any conventional roll or sheet film.

The MP-3 does all this with interchangeable camera backs. With them, you can use any of eleven different Polaroid Land films plus conventional films.

For all its flexibility, the MP-3 is extremely simple to use. Controls are almost self-explanatory. You set up your shot and focus at eye level on a bright ground glass screen. And if you don't get exactly the picture you want the first time, you can take another on the spot.

May we send you more details? Write Polaroid Corporation, Technical Sales Dept., Cambridge 39, Mass

**This MP-3 does the work of a view camera, micro/macro camera, copy camera, slide maker, enlarger and darkroom
And does the job in 90 seconds or less.**



Why should a medical student own a LEITZ SM microscope?

■ It meets the highest professional standards. ■ There are hundreds in hospital laboratories all over the world.

Microscopy has an "either—or" quality for the student, as well as for the laboratory. Accuracy is not a matter for compromise in either case. That's why the Leitz SM actually has such fine optical and mechanical quality and such a wide range of accessories that it is regularly purchased for hospital laboratories. And, because it meets these professional standards, the student can be sure he's making a worthwhile lifetime investment when he chooses Leitz SM. Examine and compare these features:

- Convenient single-knob coarse/fine focusing.
- Focusing mechanism requires no lubricants; permanently maintenance-free.
- Superior Leitz optics—compare their resolution to any others.
- Mechanical stage—for all standard slides; both 3" x 1" and 3" x 2", coaxial or separate motion.

- Spring-loaded, retractable mounts on high-powered objectives prevent damage to slides or front element.
- Anti-reflection coating throughout—tubes, condenser and optics.
- Extra-wide range magnification of 35 to 1250X.
- Monocular, binocular or trinocular bodies; 360° rotation; one-step body interchange and one-step lock-in at any point.
- Selection of attachable illuminators, with or without transformer.
- Periplanatic, wide-field eyepieces.
- Contour-fitted carry-case with foam-rubber fittings.

MAIL TODAY...FOR ALL DETAILS

E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK 16, N.Y.
Gentlemen:

— Please send complete information on SM Microscope.
— Kindly have representative _____ Phone _____ Write
for appointment to demonstrate SM Microscope at no
obligation.

Name _____

Address _____

City _____ Zone _____ State _____

Telephone _____

LEITZ TECHNICAL SERVICE is unique in the United States, providing one of the most extensive information, service and repair facilities in the field of scientific instruments. 49063



E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK 16, N.Y.
Distributors of the world-famous products of
Ernst Leitz G.m.b.H. Wetzlar, Germany—Ernst Leitz Canada Ltd.
LEICA AND LEICINA CAMERAS · LENSES · PROJECTORS · MICROSCOPES

American Association for the Advancement of Science

BOARD OF DIRECTORS

Alan T. Waterman, <i>Retiring President, Chairman</i>	
Laurence M. Gould, <i>President</i>	
Henry Eyring, <i>President Elect</i>	
John W. Gardner	Mina Rees
H. Bentley Glass	Walter Orr Roberts
David R. Goddard	Athelstan F. Spilhaus
Don K. Price	H. Burr Steinbach
Paul E. Klopsteg <i>Treasurer</i>	Dael Wolfe <i>Executive Officer</i>

VICE PRESIDENTS AND SECRETARIES OF SECTIONS

MATHEMATICS (A)	
R. W. Hamming	Wallace Givens
PHYSICS (B)	
Ralph A. Sawyer	Stanley S. Ballard
CHEMISTRY (C)	
Roland Rivest	S. L. Meisel
ASTRONOMY (D)	
Walter Orr Roberts	Frank Bradshaw Wood
GEOLOGY AND GEOGRAPHY (E)	
Trevor Lloyd	Richard H. Mahard
ZOOLOGICAL SCIENCES (F)	
Arthur D. Hasler	David W. Bishop
BOTANICAL SCIENCES (G)	
Harriet B. Creighton	Warren H. Wagner
ANTHROPOLOGY (H)	
Anthony F. C. Wallace	Eleanor Leacock
PSYCHOLOGY (I)	
Lorin A. Riggs	Frank W. Finger
SOCIAL AND ECONOMIC SCIENCES (K)	
Harold D. Lasswell	Ithiel de Sola Pool
HISTORY AND PHILOSOPHY OF SCIENCE (L)	
John Murdoch	N. Russell Hanson
ENGINEERING (M)	
Charles F. Savage	Leroy K. Wheelock
MEDICAL SCIENCES (N)	
James Ebert	Oscar Touster
DENTISTRY (Nd)	
James A. English	S. J. Kreshover
PHARMACEUTICAL SCIENCES (Np)	
Lee H. MacDonald	Joseph P. Buckley
AGRICULTURE (O)	
Edward F. Knipling	Howard B. Sprague
INDUSTRIAL SCIENCE (P)	
	Allen T. Bonnell
EDUCATION (Q)	
Herbert S. Conrad	Frederic B. Dutton
INFORMATION AND COMMUNICATION (T)	
Wallace R. Brode	Phyllis V. Parkins
STATISTICS (U)	
Samuel S. Wilks	Morris B. Ullman

PACIFIC DIVISION

Phil E. Church <i>President</i>	Robert C. Miller <i>Secretary</i>
------------------------------------	--------------------------------------

SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION

Edwin R. Helwig <i>President</i>	Marlowe G. Anderson <i>Executive Secretary</i>
-------------------------------------	---

ALASKA DIVISION

Allan H. Mick <i>President</i>	George Dahlgren <i>Executive Secretary</i>
-----------------------------------	---

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

New Goals for Science in Britain

During the past seven years I have visited London five times. On the first four occasions I came away depressed. I felt there was a refusal to face reality and a worship of tradition that could lead only to further decay. On a recent visit I found a completely different atmosphere, a sense of urgency almost like that of wartime. In talking with a score of scientists, journalists, and politicians I found them unanimous in desiring change and in feeling that science and technology are Britain's hope for the future. Both major political parties have, to differing degrees, adopted this view, and science is to be one of the major issues of the forthcoming General Election.

Mr. Harold Wilson, leader of the Labour Party, expressed some of his views on science in Parliament last November 19:

... whatever differences there may be in priorities, there should be no differences about objectives, the vital need to mobilise the talents of this nation, its skill and science, its ingenuity and its power of innovation, not only to enhance our economic strength, but to strengthen the voice of this country in the world. . . . We live, or we perish, on our skill and our science. This means, quite simply, that we have to have more trained people and that we have to use them more efficiently.

Mr. Wilson pointed out four problems: "the training of scientists, holding them in this country, using them more intelligently, and ensuring a greater success in applying the results of scientific research to industry."

In the matter of training more scientists, the two political parties are not far apart. The government initiated in 1961 a study of needs in higher education. This study was conducted by a committee headed by Lord Robbins. Some of the resultant drastic recommendations already have been implemented.

The second need mentioned by Mr. Wilson—holding scientists in Britain—has provided the Labour Party with what may be its most politically potent slogan, "The Brain Drain" (see "News and Comment," 21 February). Each occasion on which a scientist emigrates from Britain is headline news. The flow is continuing, and the Government is destined to experience an additional series of blows between now and the election. Even then, the problem seems unlikely to disappear.

Mr. Wilson's third point—using scientists more intelligently—involves another hard problem. The expression "using" scientists is not felicitous and does not take into account the free spirit essential to the creative process. If government is to support science on a large scale, scientists must be responsive to the needs of society, but the terms under which the response is elicited must be carefully delineated.

Mr. Wilson's fourth point—ensuring greater success in applying the results of research—requires a change in national attitudes. British contributions in fundamental research are unsurpassed, particularly when viewed on a population basis. To a substantial degree this success is due to emphasis on values of scholarship. The reverse side of the coin, however, has been a downgrading in the status of those who apply the results of research. In some circles engineers are regarded as being not much above common laborers.

The British have entered on an important new phase in their history. They face difficult problems in their determination to use science and technology to achieve national goals. When aroused, they have tremendous capacities. Their performance at this time will be worth watching.—P.H.A.

VERSATILE NEW PACKARD RADIOCHROMATOGRAM SCANNER



FEATURES:

- Completely automatic operation
- 4 pi counting geometry
- May be quickly converted for TLC scanning
- Automatic shut-off of gas and power
- Handle chromatograms ½ to 2 inches wide and lengths to 150 ft; also accommodates thick paper (such as Whatman 3M) without damage
- Automatic indication of origin, solvent fronts, etc.
- 16 scanning speeds, 8 time constants, 9 linear count ranges
- Analog or digital data presentation
- Linear and Logarithmic display
- Quickly demountable components for decontamination

Packard 7200 Series Chromatogram Scanning Systems provide accurate, automatic assay of low energy beta-emitting activity deposited on paper strips or TLC glass plates. Analog data presentation is provided in Model 7201; Model 7211 provides digital display.

The new 7200 Series instruments incorporate many features designed to provide optimum detection accuracy, greater instrument utility, and time-saving user convenience. Ultra-sensitive detection is ensured by two windowless gas flow Geiger detectors arranged in 4 pi configuration to scan simultaneously both sides of a paper chromatogram. 2 pi scanning with either upper or lower detector may also be selected with a front panel switch.

Quick, precise positional resolution of activity is achieved by collimators containing slit widths of 2½, 5, 7, and 10mm. Sixteen scanning speeds may be selected by depressing push-button selector switches which are illuminated when they are actuated. A push-button cam on the detector shield permits quick separation of the collimators for fast, easy front loading of the paper strip. Because the chromatogram strip enters the detector at a constant horizontal angle, thick paper (such as Whatman 3M) may be scanned without chromatogram damage.

Collected data are presented on a Packard Model 380 Recording Ratemeter. The Ratemeter offers 8 time constants and 9 linear count ranges. The interrelated Ratemeter and Recorder may be operated in either LINEAR or LOG modes. In the Linear mode, both the Ratemeter and Recorder display cpm on a linear scale; in the Log mode, they display cpm on a logarithmic scale from 10 to 10⁶ cpm. Logarithmic presentation of data permits the user to prepare a preliminary run to establish settings for a final linear run or to accurately compare peak values in a minimum of time.

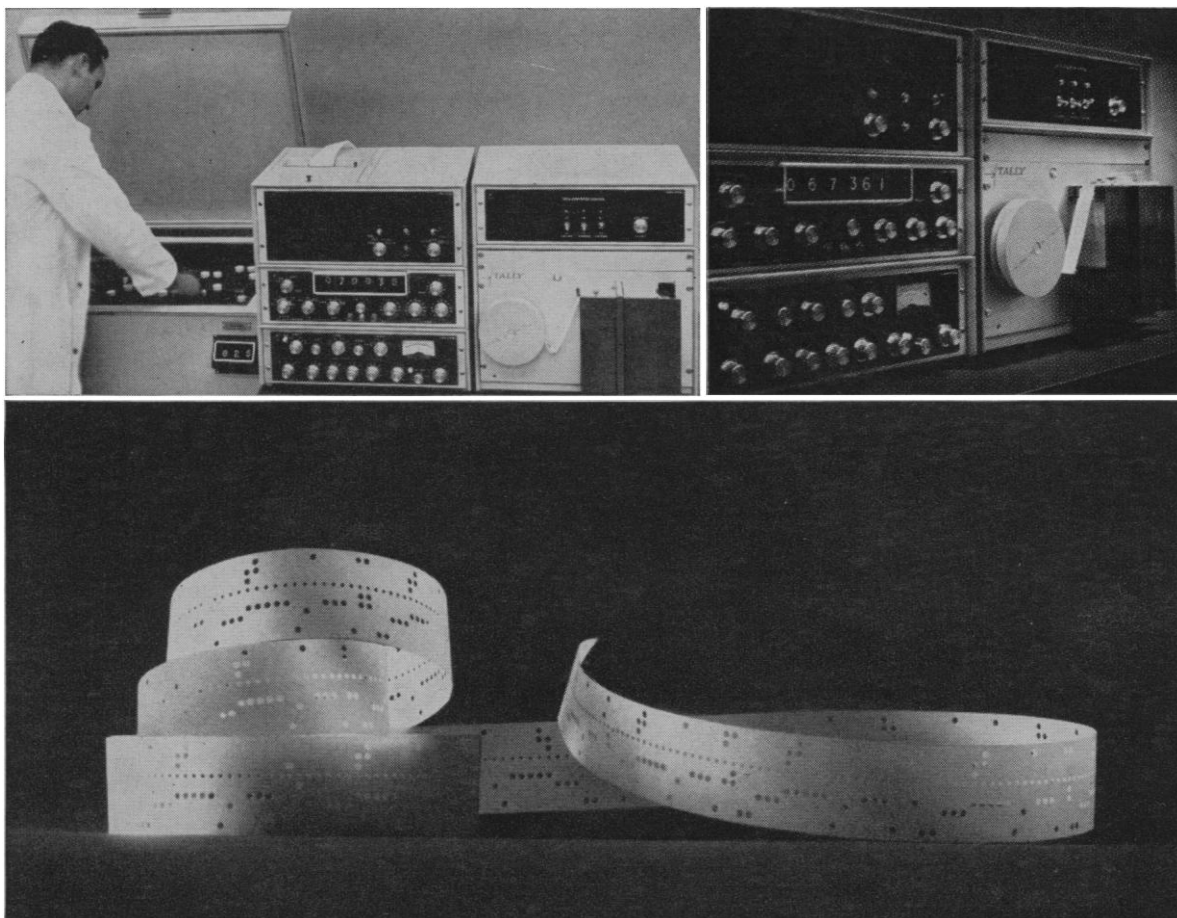
A valuable feature incorporated in this system is precise maintenance of a 1:1 speed ratio between the paper being scanned and the recording chart, enabling the user to quickly compare the strip and chart for precise activity location upon completion of a run. Another time and labor saving feature provided in the 7200 Series instruments is automatic chart indication of origin, solvent fronts, and other areas of interest.

Your Packard Sales Engineer can provide complete details on these versatile new Scanning Systems.



PACKARD INSTRUMENT COMPANY, INC.

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



NOW YOU CAN CONVERT CPM TO DPM AUTOMATICALLY

The investigator using a large-capacity liquid scintillation spectrometer seeks to determine the relative counting efficiencies of his many samples. One way to approach this goal has been to employ automatically calculated counts per minute and channels ratio data to measure the effects of sample quenching.

Although this technique represents great savings in counting and calculation time when contrasted with other methods such as internal

standardization, it still requires the manual derivation of efficiency curves.

This problem yields, of course, to computer analysis. And now, Nuclear-Chicago has helped make such analysis a practical reality for liquid scintillation spectrometry.

Our Data Converter module transfers all digital sample data to computer punch tape, punch cards, or standard electric typewriter forms. And of even greater significance, we offer the necessary software to accompany the instrument. We have now prepared a computer program for the analysis of carbon-14 data using the channels ratio technique, and in due course we will announce the availability of programs for other isotopes.

Now, weeks of calculation carried out manually may be performed in a few minutes by a digital computer. With flexible programming, an investigator may feed his data into a computer and let it obtain the results he desires. He is free to concentrate his time and abilities on designing and performing experiments and on interpreting results.

For more information on our Data Converter and computer analysis for liquid scintillation spectrometry, consult your Nuclear-Chicago sales engineer or write directly to us.

NUC:9-3-268

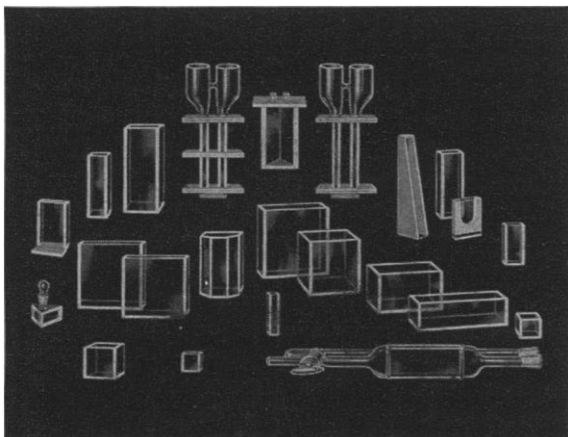


NUCLEAR-CHICAGO

A DIVISION OF NUCLEAR-CHICAGO CORPORATION

349 Howard, Des Plaines, Illinois 60018

GLASS ABSORPTION CELLS made by **KLETT**



SCIENTIFIC APPARATUS

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

Klett Manufacturing Co., Inc.

179 East 87 Street, New York, New York

For both low and high energy nuclear radiation analyses...

Lithium Ion Drift Detectors

Double Diffused Planar Passivated Detectors

These two solid state radiation detectors cover the full range of energy level detection and analysis requirements with extreme sensitivity and resolution.

For example, Lithium Ion Drift Detectors (80 mm² x 3 mm deep) yield less than 19 kev FWHM attainable at room temperature (Spectrum of K and L conversion electrons from Ba¹³⁷). At 195°K, these detectors have yielded as low as 3.8 kev FWHM. Depletion depths are available up to 10 mm. Active areas may be obtained up to 300 mm²

Double Diffused Planar Passivated Detectors have a unique passivation design* that makes them impervious to fingerprints, moisture and other heretofore destructive environmental conditions. These detectors exhibit low leakage currents, and dead layers of less than 0.1 micron. Accordingly, excellent alpha resolution is achieved.

Both detectors are available for "off the shelf" delivery at sensible prices.

For complete details, contact the nearest TMC office or Technical Measurement Corporation, 443 Washington Avenue, North Haven, Connecticut.

*Patent applied for



TECHNICAL MEASUREMENT CORPORATION



PROVOCATIVE PROVOCATIVE

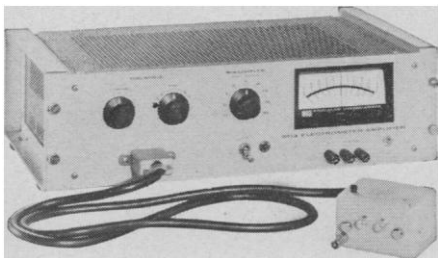


Bulletin 1041, which describes Packard 1024 and 4096 Channel Computer-Memory Units, may just possibly cause you to reassess your thinking about multiparameter analyzers. Want to read it?

Packard

**PACKARD INSTRUMENT
COMPANY, INC.**
BOX 428 • LA GRANGE, ILLINOIS

a differential input electrometer amplifier



KEITHLEY 603

**10¹⁴ ohms input resistance
broad bandwidth**

A useful tool for measuring high impedance voltages and low currents. In current measurements, the Model 603 is extremely fast and has the ability to measure small difference currents. Keithley provides matched sets of shunting resistors for rapid insertion in the input head.

Applications include micro-electrode measurements, pH determinations, and use of pulse techniques to measure solution conductivity or sweep times of minority carriers in semi-conductors. Also useful in studies of piezo-electrics, in measuring photo cell currents, and ion currents in mass spectrometry.

Separable input head permits remote measurements up to 24 feet from the amplifier. Placing the input head close to the signal source simplifies connection and shielding problems, reduces the effective capacitance and increases measuring speed.

- **voltage ranges** from 2.5 mv to 1000 mv in 1x and 3x steps.
- **input impedance** over 10¹⁴ ohms, 10 μ mf.
- **bandwidth** to 10 kc on the 2.5 mv range, rising to 50 kc on the 1000 mv range.
- **zero drift** less than 2 mv per hour decreasing to about 0.5 mv per hour after 3 hours.
- **noise** less than 35 μ v rms at full bandwidth.
- **zero suppression** up to one volt.
- **exact gains** of 4000, 2000, 1000, 400, 200, 100, 40, 20 and 10.
- **accuracy** within 2% fs on all ranges.
- **price \$750.00**



Send for latest catalog

**KEITHLEY
INSTRUMENTS**

12415 Euclid Avenue • Cleveland 6, Ohio

8-12. **Water Resources Engineering**, conf., Mobile, Ala. (American Soc. of Civil Engineers, 345 E. 47 St., New York 10017)

8-15. **North American Clinical Dermatologic Soc.**, Mexico City, Mexico. (E. F. Finnerty, 510 Commonwealth Ave., Boston, Mass.)

9-10. **Aerodynamic Testing Conf.**, American Inst. of Aeronautics and Astronautics, Washington, D.C. (J. N. Fresh. David Taylor Model Basin, Code 630, U.S. Navy, Washington, D.C.)

9-11. **Computers in Education**, conf., Eugene, Ore. (J. W. Loughary, School of Education, Univ. of Oregon, Eugene)

9-11. **North American Wildlife and Natural Resources conf.**, Las Vegas, Nev. (Wildlife Management Inst., 709 Wire Bldg., Washington 5)

9-11. **Society of Toxicology**, annual, Williamsburg, Va. (C. S. Weil, Mellon Inst., 4400 Fifth Ave., Pittsburgh, Pa. 15213)

9-13. **National Assoc. of Corrosion Engineers**, 20th conf., Chicago, Ill. (W. H. Schultz, Dearborn Chemical Corp., Chicago, Ill.)

9-13. **Peaceful Applications of Nuclear Energy**, 5th inter-American symp., Valparaiso, Chile. (J. D. Perkinson, Inter-American Nuclear Energy Commission, Pan American Union, Washington, D.C.)

10. **Wildlife Telemetry**, annual, Las Vegas, Nev. (L. Adams, Univ. of California, Carmel Valley)

10-12. **Exploding Conductor Phenomena**, 3rd conf., Boston, Mass. (W. G. Chace, Air Force Cambridge Research Laboratories, Hanscom Field, Bedford, Mass.)

10-13. **Raman Colloquium**, Freudenstadt/Schwarzwald, Germany. (J. Gobeau, Dept. of Chemistry, Technische Hochschule Stuttgart, 7 Stuttgart, Germany)

10-14. **American Inst. of Chemical Engineers**, New Orleans, La. (AIChE, 345 E. 47 St., New York 17)

11-12. **Instrument Soc. of America**, 14th conf. on **Instrumentation** for the iron and steel industry, Pittsburgh, Pa. (N. F. Simcic, Research Laboratory, Jones and Laughlin Steel Corp., 900 Agnew Rd., Pittsburgh 30)

12. **Interplanetary Monitoring Platform Experiments**, symp., Greenbelt, Md. (C. P. Boyle, Code 207, Goddard Space Flight Center, Greenbelt, Md. 20771)

12-13. **Information Organization**, New Brunswick, N.J. (S. Artandi, Graduate School of Library Service, Rutgers Univ., New Brunswick)

13-14. **Louisiana Acad. of Sciences**, Baton Rouge. (H. J. Bennett, Dept. of Zoology, Louisiana State Univ., Baton Rouge)

13-14. **Institute of Management Sciences**, 11th intern., Pittsburgh, Pa. (IMS, Box 273, Pleasantville, N.Y.)

13-14. **Effects of Shock and Vibration** on the human body, Denver, Colo. (A. E. Paige, Dept. of Electrical Engineering, University of Denver, Denver)

14-15. **Endocrinology**, 2nd annual symp., Salisbury, N.C. (H. Nushan, Medical Service, Veterans Administration Hospital, Salisbury)

14-19. **American Assoc. of Psychiatric Clinics for Children**, annual, Chicago, Ill.

(AAPCC, 250 W. 57 St., New York 19)

15-19. **Microcirculation**, 3rd European conf., Jerusalem, Israel. (E. Davis, Capillary Research Laboratory, Hadassah Univ. Hospital, P.O. Box 499, Jerusalem)

15-21. **American Soc. of Photogrammetry**, congr. on surveying and mapping, Washington, D.C. (American Soc. of Photogrammetry, 44 Leesburg Pike, Falls Church, Va.)

17-18. **Hypervelocity Flight Techniques**, symp., Denver, Colo. (W. G. Howell Denver Research Inst., Univ. of Denver, Denver, Colo. 80210)

17-19. **Society for Nondestructive Testing**, Los Angeles, Calif. (D. E. O'Halloran, Northrop Corp., 1001 E. Broadway, Hawthorne, Calif.)

17-19. **Statistical Assoc. Methods for Mechanized Documentation**, symp., Washington, D.C. (M. E. Stevens, Natl. Bureau of Standards, Washington, D.C. 20234)

17-20. **Society of Biological Chemistry**, Paris, France. (P. Malangeau, Executive Committee, 4, Avenue de l'Observatoire, Paris 6^e)

18-19. **Mycotoxins in Foodstuffs**, intern. symp., Cambridge, Mass. (G. N. Wogan, Rm 16-210-B, Massachusetts Inst. of Technology, Cambridge 02139)

18-20. **Chemurgic Council**, 28th natl. conf., Philadelphia, Pa. (J. W. Ticknor, Chemurgic Council, 350 Fifth Ave., New York 1)

18-21. **Latin Medical Union**, intern. congr., Rome, Italy. (B. Urso, Policlinico Umberto I, Viale Policlinico, Rome)

18-21. **American Orthopsychiatric Assoc.**, Chicago, Ill. (M. F. Langer, 1790 Broadway, New York 19)

19-22. **International Assoc. for Dental Research**, 42nd meeting, Los Angeles, Calif. (J. C. Muhler, 1120 W. Michigan St., Indianapolis, Ind. 46202)

20-24. **National Assoc. for Research in Science Teaching**, Chicago, Ill. (G. G. Mallinson, Western Michigan Univ., Kalamazoo)

20-24. **National Science Teachers Assoc.**, Chicago, Ill. (R. H. Carleton, 1201 16th St., NW, Washington, D.C.)

21-3. **British Computer Soc.**, conf., Edinburgh, Scotland. (Secretariat, I.E.E., Savoy Pl., London, W.C.2, England)

21-23. **Asian-Pacific Dental Federation**, 4th congr., Singapore and Malaya. (B. B. Erafia, Manila Doctors Hospital, Isaac Peral St., P.O. Box 373, Manila, Philippines)

21-24. **Cybernetic Medicine**, 3rd intern. congr., Naples, Italy. (A. DeChiara, 348, Via Roma, Naples)

22-25. **American Assoc. of Dental Schools**, 41st annual, Los Angeles, Calif. (AADS, 840 Lake Shore Dr., Chicago 11, Ill.)

23-24. **Society for Economic Botany**, 5th annual, Chapel Hill, N.C. (D. J. Rogers, New York Botanical Garden, Bronx Park, N.Y.)

23-25. **Federation of European Biochemical Societies**, 1st, London, England. (FEBS, Lister Inst., Chelsea Bridge Rd., London, S.W.1)

23-26. **Institute of Electrical and Electronics Engineers**, intern. conv., New York, N.Y. (IEEE, Box A, Lenox Hill Station, New York 21)