

SCIENCE

11 April 1969
Vol. 164, No. 3876

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



meet the new PDP-12



Talk to a computer? How?

JUST GIVE ME ENGLISH THROUGH THE
KEYBOARD, I'LL TALK BACK THROUGH MY
7" x 9" SCOPE.

O.K. Now, tell me about yourself.

I'M A COMPLETE LABORATORY SYSTEM WITH
A BIG NEW DISPLAY, 16-CHANNEL A/D
CONVERTER, 2 TAPE UNITS, AND A 1.6 μ SEC
COMPUTER WITH 43 BASIC INSTRUCTIONS.

What can you do?

CONTROL EXPERIMENTS. ACQUIRE, ANALYZE,
STORE, AND DISPLAY DATA IN ANY FORMAT
YOU WANT.

Haven't I met you somewhere before?

I'M BRAND NEW. YOU MUST BE THINKING OF
MY PREDECESSOR, LINC-8.

What makes you different from the LINC-8?

I'M FASTER AND MORE POWERFUL, YET \$10,600
LESS. I HAVE COMPLETELY BUFFERED I/O,
INCLUDING AN ALL-NEW MAG-TAPE
PROCESSOR. AND MY NEW DISPLAY-BASED
PROGRAMMING SYSTEM IS A CINCH TO USE.
FOR YOUR OWN PROGRAMS, FOR LINC-8
PROGRAMS, FOR PDP-8 PROGRAMS, AND
THEN SOME.

You're too much, PDP-12.

NO. JUST \$27,900.



digital

Maynard, Mass.

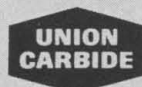


New cryogenic refrigerator...square cornered, flat topped to fit in with any lab counter

This is our new LR-310 refrigerator — medium-size cryogenic storage for any temperature, from a relatively warm -100°C (actually within the range of some mechanical refrigerators) all the way down to -196°C . There is room for 8 cu. ft. of vapor-phase storage deep down inside it, with better

than 8 days' normal holding time. The Super Insulated storage cylinder provides truly economical service. A wide variety of racking systems and accessories customize the unit to many different laboratory requirements.

For further information, contact Union Carbide Corporation, Linde Division, Cryogenic Products Department, 270 Park Avenue, New York, N.Y. 10017
LINDE and UNION CARBIDE are registered trademarks of Union Carbide Corporation.



**CRYOGENIC
PRODUCTS**

11 April 1969

Vol. 164, No. 3876

SCIENCE

LETTERS	SST's Bag of Mischief: <i>W. A. Shurcliff; W. D. Lynn</i> ; Population and Famine: <i>J. C. Cobb; M. M. Ketchel</i> ; Pharmacology Institute Proposed: <i>P. Lowinger</i> ; Overhead Costs during Austerity: <i>E. C. Pollard</i> ; What Makes Oysters Grow?: <i>R. J. Benoit, E. A. Zuraw, D. E. Leone; C. Adler</i>	129
EDITORIAL	The Generation Gap: <i>M. Mead</i>	135
ARTICLES	Electronic Materials and Applications: <i>H. C. Gatos</i>	137
	D-Amino Acids in Animals: <i>J. J. Corrigan</i>	142
	Photoperiod, Endocrinology and the Crustacean Molt Cycle: <i>D. E. Aiken</i>	149
	Mental Retardation Due to Germinal Matrix Infarction: <i>A. Towbin</i>	156
NEWS AND COMMENT	Campus Unrest: Riot Brings Danger of Punitive Backlash	161
	National Academy of Engineering Selects New Members	162
	NIH: Another Tight Budget, Fewer Friends in High Places	165
BOOK REVIEWS	<i>The Big Machine</i> , reviewed by <i>L. M. Lederman</i> ; other reviews by <i>B. J. Thompson, R. H. Shaw, L. E. Moses, R. W. Kiser, T. Page, P. F. Davison</i> ; Books Received ..	169
REPORTS	Bentonite Debris Flows in Northern Alaska: <i>D. M. Anderson, R. C. Reynolds, J. Brown</i>	173
	Scanning Electron Microscopy of Evaporating Ice: <i>J. D. Cross</i>	174

BOARD OF DIRECTORS	WALTER ORR ROBERTS Retiring President, Chairman	H. BENTLEY GLASS President	ATHELSTAN SPILHAUS President-Elect	RICHARD H. BOLT BARRY COMMONER	HUDSON HOAGLAND GERALD HOLTON
VICE PRESIDENTS AND SECTION SECRETARIES	MATHEMATICS (A) Mark Kac F. A. Ficken	PHYSICS (B) Nathaniel H. Frank Albert M. Stone	CHEMISTRY (C) Charles G. Overberger Leo Schubert	ASTRONOMY (D) John W. Fidor Frank Bradshaw Wood	
	ANTHROPOLOGY (H) Jesse D. Jennings Anthony Leeds	PSYCHOLOGY (I) Wendell R. Garner William D. Garvey	SOCIAL AND ECONOMIC SCIENCES (K) Sheldon and Eleanor Glueck Harvey Sapolsky	HISTORY AND PHILOSOPHY OF SCIENCE (L) Loren C. Eiseley Raymond J. Seeger	
	PHARMACEUTICAL SCIENCES (Np) Joseph P. Buckley Joseph A. Oddis	AGRICULTURE (O) T. C. Byerly Michael A. Farrell	INDUSTRIAL SCIENCE (P) Gordon K. Teal Burton V. Dean	EDUCATION (Q) R. Will Burnett J. Myron Atkin	
DIVISIONS	ALASKA DIVISION Victor Fischer President Irma Duncan Executive Secretary	PACIFIC DIVISION William C. Snyder President Robert C. Miller Secretary	SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION Terah L. Smiley President Marlowe G. Anderson Executive Secretary		

SCIENCE is published weekly on Friday and on the fourth Tuesday in September 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 © 1969 by the American Association for the Advancement of Science. Annual subscriptions: \$12; foreign postage: Americas \$3; overseas \$5; single copies, 50¢ (back issues, \$1) except *Guide to Scientific Instruments*, which is \$2. School year subscriptions: 9 months, \$9; 10 months, \$10. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Mars: Correlation of Optical and Radar Observations: <i>J. C. Robinson</i>	176
Fauna of Çatal Hüyük: Evidence for Early Cattle Domestication in Anatolia: <i>D. Perkins, Jr.</i>	177
Adsorption of Alkyl Trimethylammonium Chlorides at a Porous Glass-Potassium Chloride Solution Interface: <i>L. S. Hersh</i>	179
Vitamin K and Coumarin Anticoagulants: Dependence of Anticoagulant Effect on Inhibition of Vitamin K Transport: <i>J. Lowenthal</i> and <i>H. Birnbaum</i>	181
Crystal and Molecular Structure of a Thymine-Thymine Adduct: <i>I. L. Karle,</i> <i>S. Y. Wang, A. J. Varghese</i>	183
Mosquitoes Feeding on Insect Larvae: <i>P. Harris, D. F. Riordan, D. Cooke</i>	184
Linkage of Lactate Dehydrogenase <i>B</i> and <i>C</i> Loci in Pigeons: <i>W. H. Zinkham,</i> <i>H. Isensee, J. H. Renwick</i>	185
Carbon Dioxide Compensation Points in Related Plant Species: <i>D. N. Moss,</i> <i>E. G. Krenzer, Jr., W. A. Brun</i>	187
Immunological Detection of Single Amino Acid Substitutions in Alkaline Phosphatase: <i>G. T. Cocks</i> and <i>A. C. Wilson</i>	188
Mitochondrial Autonomy: Incorporation of Monosaccharides into Glycoprotein by Isolated Mitochondria: <i>H. B. Bosmann</i> and <i>S. S. Martin</i>	190
Homing in the Ant <i>Cataglyphis bicolor</i> : <i>R. Wehner</i> and <i>R. Menzel</i>	192
Athetoid and Choreiform Hyperkinesias Produced by Caudate Lesions in the Cat: <i>S. L. Liles</i> and <i>G. D. Davis</i>	195
Technical Comments: The "Co-" in Coevolution: <i>C. H. Muller</i> ; Discriminative Control of "Attention": <i>R. M. Gilbert</i> ; <i>E. G. Heinemann, S. Chase, C. Mandell</i> ; Protein Synthesis during Learning: <i>R. E. Bowman</i> and <i>G. Harding</i> ; <i>H. Hydén</i> and <i>P. W. Lange</i> ; Stratigraphic Data and Length of the Synodic Month: <i>J. E. Hazel</i> and <i>T. R. Waller</i> ; <i>G. Pannella</i> and <i>C. MacClintock</i> ; Bird Feathers and Radiation: <i>F. H. Heppner</i>	197
MEETINGS Pest Control: <i>D. L. Wood, R. M. Silverstein, M. Nakajima</i> ; Calendar of Events	203

MINA S. REES
LEONARD M. RIESER

H. BURR STEINBACH
KENNETH V. THIMANN

PAUL E. KLOPSTEG
Treasurer

DAEL WOLFLE
Executive Officer

GEOLOGY AND GEOGRAPHY (E)
Richard H. Mahard
William E. Benson

ZOOLOGICAL SCIENCES (F)
David Bishop
David E. Davis

BOTANICAL SCIENCES (G)
William A. Jensen
Arthur W. Cooper

ENGINEERING (M)
Paul Rosenberg
Newman A. Hall

MEDICAL SCIENCES (N)
Allan D. Bass
F. Douglas Lawrason

DENTISTRY (Nd)
Robert S. Harris
Richard S. Manly

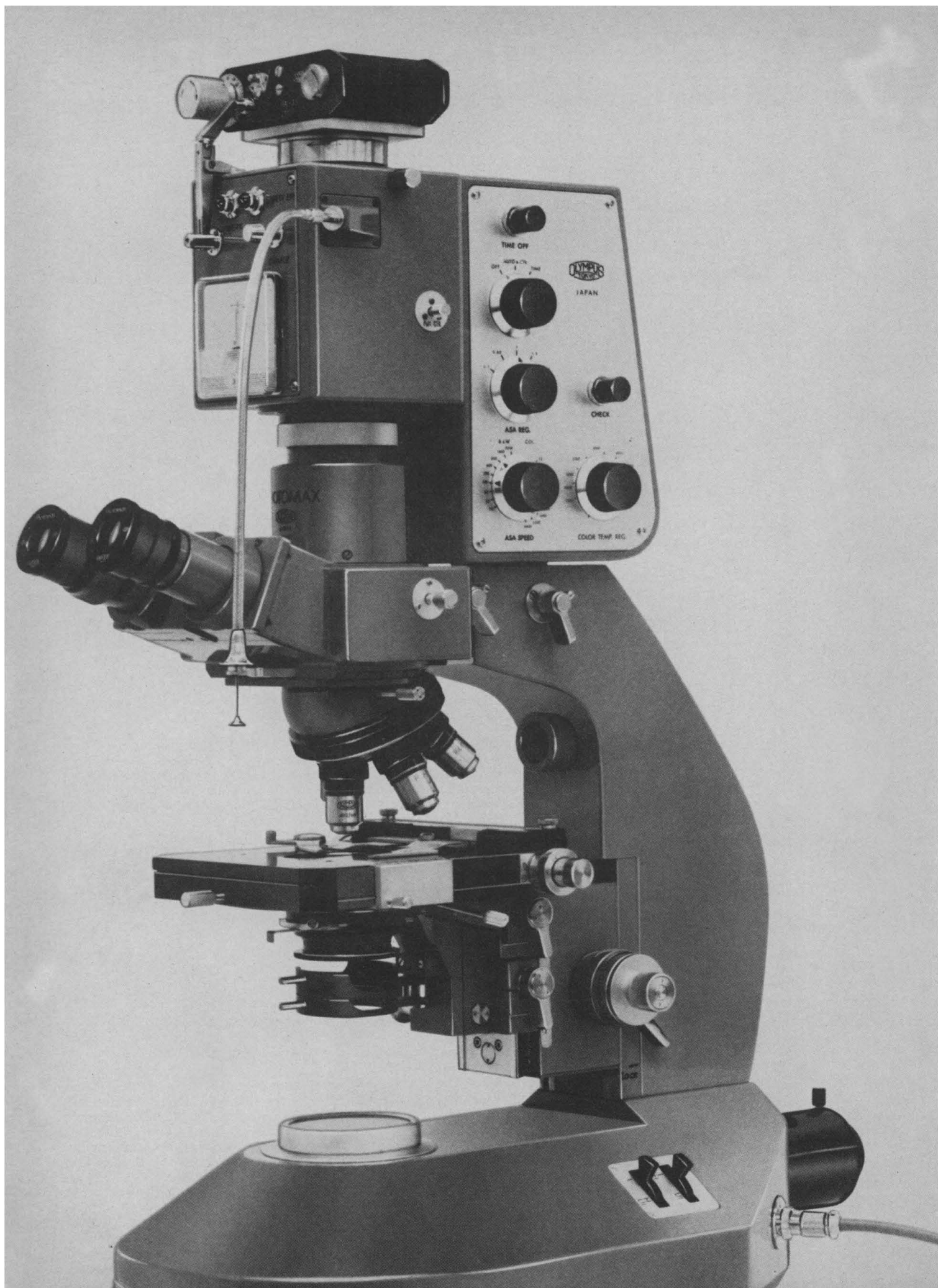
INFORMATION AND COMMUNICATION (T)
Dale B. Baker
Ileen E. Stewart

STATISTICS (U)
Ezra Glaser
Rosedith Sitgreaves

COVER

Bentonite debris flows near Umiat, Alaska. These flows, developed on the banks of the Colville River, are a typical form of slope failure in the bentonitic shale that outcrops in a broad belt between the Brooks Range and the Arctic Ocean. The frequency of occurrence and the distinctive channel morphology are thought to be sufficiently unique to differentiate bentonite debris flows from other types of earth flow with high reliability. See page 173. [T. Marlar, with assistance of the Naval Arctic Research Labora-

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.



If the color on your film doesn't match the color of your specimen, you might as well have shot in black and white.

Look at any color photomicrograph. If the white background around the specimen is not pure white, then the colors aren't accurate. If the white is pure, and the colors are accurate—you probably shot it on a Photomax.

The Olympus Photomax is the only photo-microscope that ensures accurate color, because only the Photomax meters the light and tells you, *before you shoot* whether your illumination is too red, too blue, or matched precisely to the color film you're using. No test rolls, no wasted shots.

The color and exposure meters read a spot covering only 5% of the picture area so you don't have to remove your specimen slide to measure illumination color—just frame a portion of the specimen background in the meter crosshair frame.

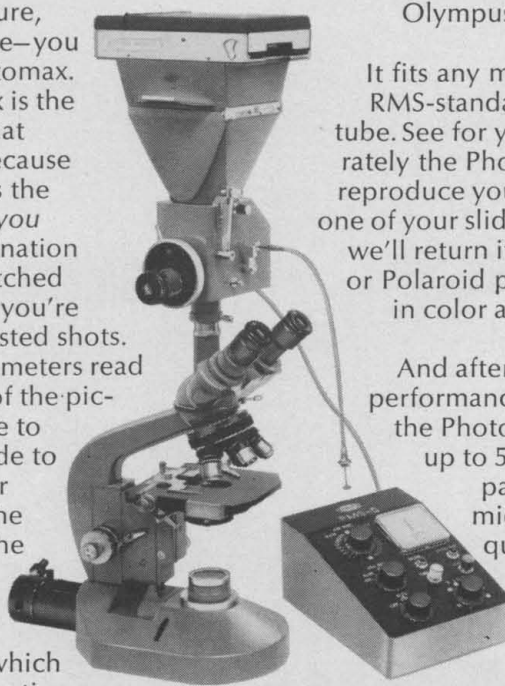
Photomax sets your exposure automatically, too. And you can choose which specimen details receive optimum exposure: just center one such detail in the meter frame, and press the trigger.

The heavy microscope frame with built-in Köhler base illuminator makes an ultra-stable camera platform. It's a versatile microscope, too: adaptable to dark-field and polarizing observations, its interchangeable nosepieces let you switch from Planachromat to phase contrast objectives sets in seconds.

For many applications, you can also add Photomax automation to your current research microscope, with the Olympus PMS-II automatic color camera.

It fits any microscope with an RMS-standard, upright photo tube. See for yourself how accurately the Photomax system will reproduce your specimens. Mail one of your slides to us today, and we'll return it with a free 35mm or Polaroid photomicrograph—in color as accurate as color film permits.

And after you've compared performance, compare price: the Photomax can save you up to 50% of what you'd pay for other photomicroscopes of equal quality—but without our exclusive color regulation.



Olympus Photomax



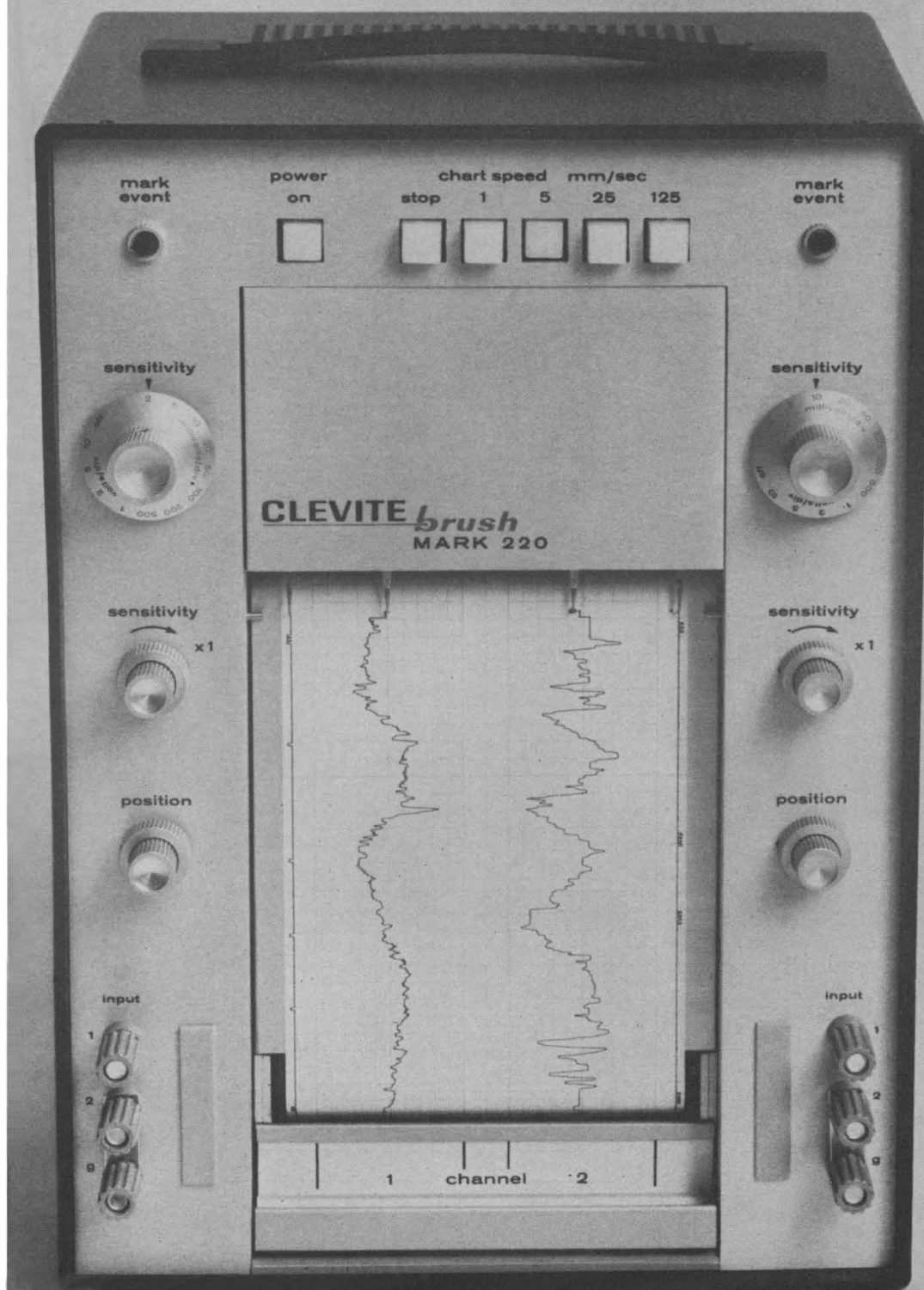
OLYMPUS CORPORATION OF AMERICA
PRECISION INSTRUMENT DIVISION/Dept. S.
2 Nevada Drive, New Hyde Park, N. Y. 11040.

Please send information on the ☐ Olympus Photomax recording microscope, ☐ PMS-II camera.

☐ I enclose one of my slides. Please photograph it in ☐ 35mm ☐ Polaroid color, and return it to me free of charge. ☐ Or have my nearest Olympus dealer demonstrate the Photomax in my own lab.

Name _____
Title _____
Organization _____
Address _____
City _____
State _____ Zip _____

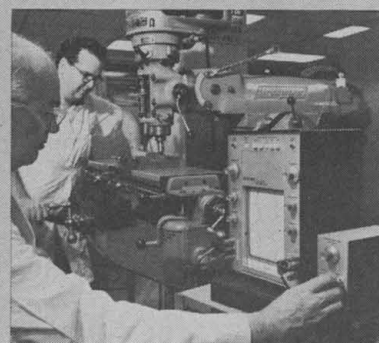
**This portable will record
more facts in less time, at less cost
than any other 2-channel recorder
on the market.**



We call it the Mark 220.

And once we put it through its paces for you, you'll call it the most amazing piece of recording gear around.

To begin with, we *guarantee* the Mark 220 to be 99½% accurate. Which is a good deal better than almost anything else on the market... regardless of size or price. The pressurized ink-writing system is the same one you'll find in our six and eight channel systems. Instead of laying the trace *on* the



paper, it forces it *in*. Run your finger over it. There's no smear, no smudge. And trace crispness and uniformity is in a class by itself.

Built-in preamplifiers give you measurement range from 1 mV per division to 500 V full scale — and you never have to re-calibrate. Pushbutton controlled chart speeds. Two handy event markers. Ink supply is a disposable cartridge, good for a year.

Yes, for a 25 pound portable that's no bigger than a breadbox, the Mark 220 is quite a recorder. Ask your Brush representative for a demonstration. Or, write for complete details. Clevite Corporation, Brush Instruments Division, 37th and Perkins, Cleveland, Ohio 44114. We'll include our informative booklet "Elimination of Noise in Low-Level Circuits".

CLEVITE BRUSH

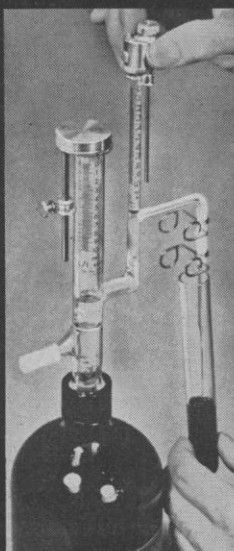
Why Use Ordinary Pipets?

USE

THE

ERROR ELIMINATORS!

L/I automatic REPIPETS® and Dilutors eliminate the many sources of error inherent in manual techniques. These unique instruments pipet, dilute and dispense with a *guaranteed* accuracy of 1% and a reproducibility of 0.1%. With the LAMBDA-DIAL® accessory for any 1 ml Repipet or Dilutor, accuracy soars to a phenomenal 1% at 10 lambdas!



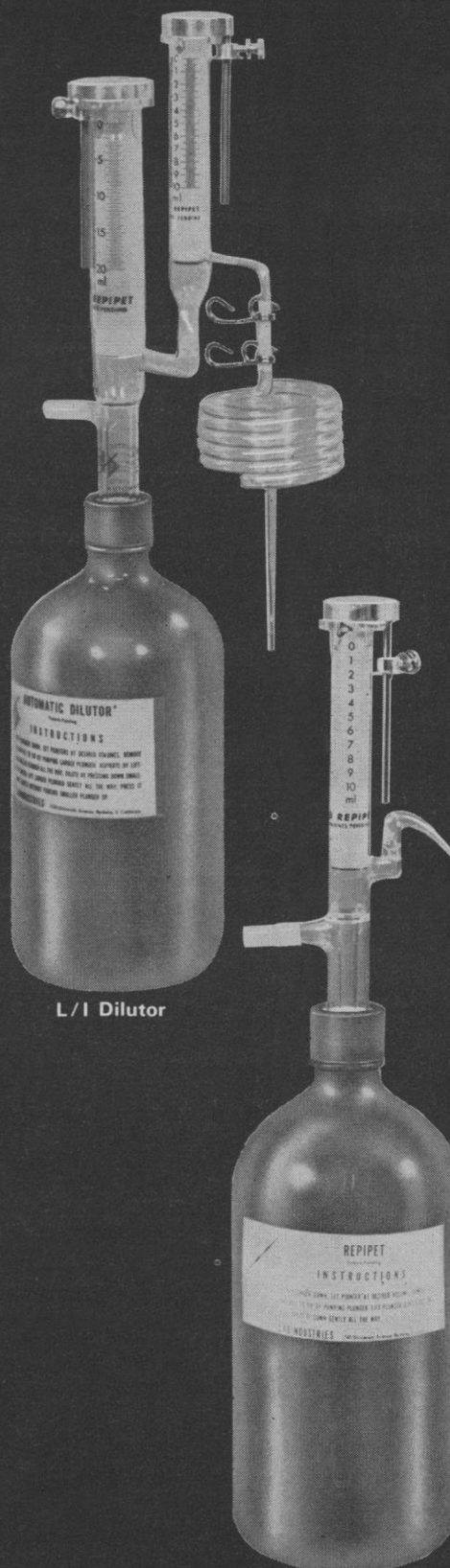
L/I Dilutor
with LAMBDA-DIAL
accessory

As shown, L/I instruments fit *directly* on your reagent bottles, ½-ounce and larger. (L/I will supply bottle if desired.) To operate, simply set volume with knife-edge pointer, lift plunger to aspirate, and depress plunger to deliver. In effect, you've automated your reagent bottle! You not only save valuable analysis time, you get more results and more dependable results.

PYREX L/I instruments handle any reagent, including concentrated acids, concentrated alkalis, chlorinated hydrocarbons, etc. Integral air filters keep reagents pure. All-amber instruments are supplied for labile reagents. L/I stocks REPIPETS and Dilutors in ½, 1, 5, 10, 20 and 50 ml sizes. Each instrument is adjustable and accurate over its entire scale. Micro and macro Teflon tips included. Prices: REPIPETS \$52.50; Dilutors \$99.50; LAMBDA-DIALS \$49.50. Write to L/I at 1802M Second Street, Berkeley, California 94710, or contact your distributor. L/I Phone: (415) 843-0220. Cable: GATE-MERC, Los Angeles.

LABINDUSTRIES

The Error Eliminators



L/I Dilutor

L/I REPIPET

Introducing GEMSAEC:

A radically new approach to fast, automatic, simultaneous analysis of multiple samples.

GEMSAEC evolved from the work of Dr. Norman G. Anderson and his co-workers in the Molecular Anatomy Program* at Oak Ridge National Laboratory. It represents a complete and exciting departure from the existing mechanically complex analytical systems.

How does GEMSAEC work?

Samples and reagents are held in pairs of adjacent measuring wells concentrically arranged on a rotor. Each sample and its corresponding reagent are moved—by centrifugal force—into a cuvette on the perimeter of the rotor. Momentary air injection mixes the sample and reagent. The rotating cuvettes are then instantly scanned by an integral spectrophotometer. The transmittance data is simultaneously displayed on an oscilloscope and fed to a computer for data reduction to yield a printout in standard concentration units. Since

standards and blanks can be run with each set of samples, GEMSAEC provides simultaneous measurement, standardization, and blanking.

What are GEMSAEC's other advantages?

Briefly: simple mechanism, simple procedures, discrete micro samples, speed, precision, no calibration, fast "turn-around" time.

What are GEMSAEC's potential uses?

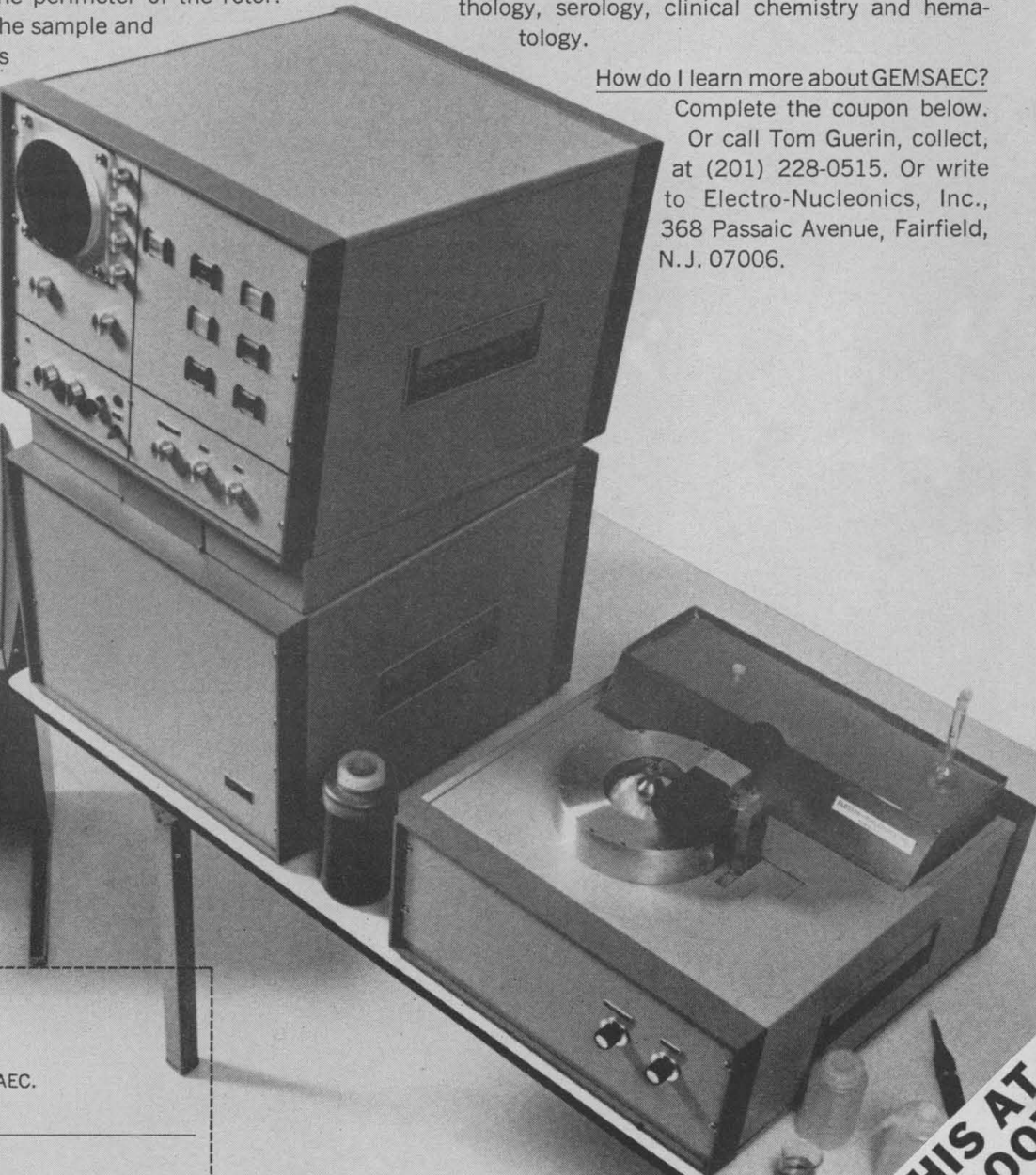
Enzyme kinetics, immunochemistry, experimental pathology, serology, clinical chemistry and hematology.

How do I learn more about GEMSAEC?

Complete the coupon below.

Or call Tom Guerin, collect, at (201) 228-0515. Or write to Electro-Nucleonics, Inc., 368 Passaic Avenue, Fairfield, N.J. 07006.

*Supported by
NIH General Medical Sciences and AEC.



Electro-Nucleonics, Inc.
368 Passaic Avenue
Fairfield, N.J. 07006

Please send detailed information on GEMSAEC.

Name _____

Institution _____

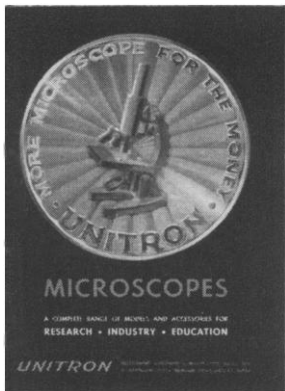
Address _____ street _____

city _____ state _____ zip _____

ELECTRO-NUCLEONICS

Circle No. 44 on Readers' Service Card

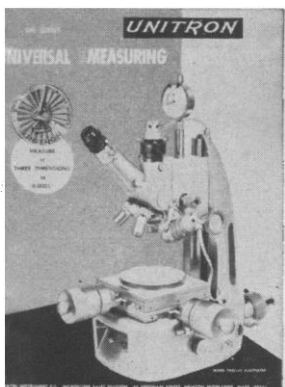
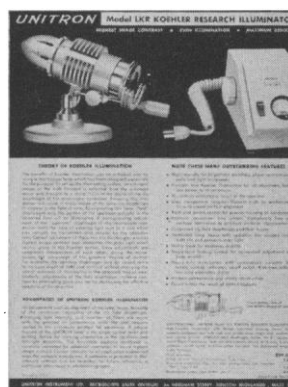
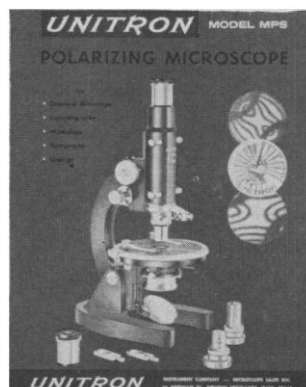
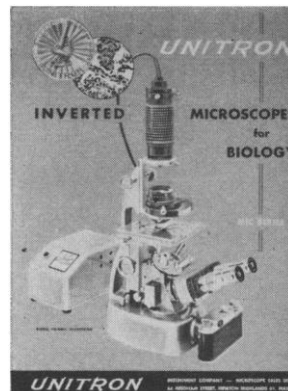
**SEE THIS AT
BASE BOOTH
H 130**



FREE MICROSCOPE BUYING GUIDE

Shown here in miniature are just some of the informative brochures which comprise the UNITRON Catalog . . . your buying guide to quality microscopes at prices within your budget. Whether your application is routine laboratory analysis, advanced biological research, or industrial quality control, you will find the instrument you need in UNITRON's complete line.

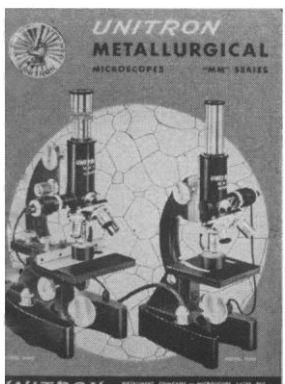
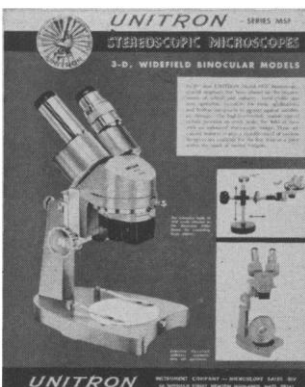
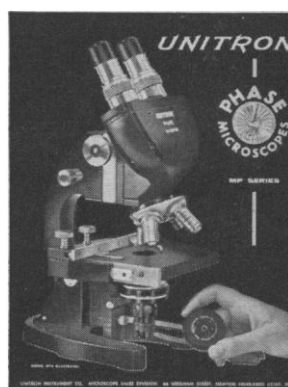
A UNITRON MICROSCOPE CATALOG is Yours for the Asking.



TRY ANY UNITRON MICROSCOPE FREE FOR 10 DAYS

A salesman's demonstration gives you only about 30 minutes to examine a microscope, hardly the best conditions for a critical appraisal. But UNITRON's Free 10 Day Trial gives you the opportunity to evaluate any model in your own laboratory and prove its value in your own application before you decide to purchase. See for yourself, as have thousands of other buyers, why . . .

UNITRON Means More Microscope for the Money.



Please send UNITRON's Microscope Catalog No. G-4

Name _____

Company _____

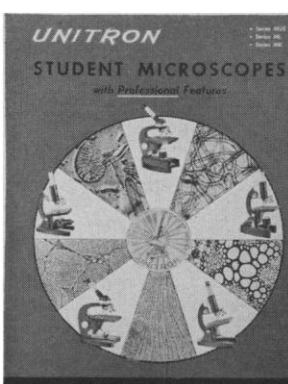
Address _____

City _____ State _____ Zip _____

Circle No. 6 on Readers' Service Card

UNITRON
INSTRUMENT COMPANY

MICROSCOPE SALES DIVISION
66 NEEDHAM STREET
NEWTON HIGHLANDS
MASSACHUSETTS 02161



The things we left out* lowered the price, but not the performance.

With the Liquimat® 220 you do get a 100 sample automatic liquid scintillation counter with an analytical capability akin to the highest-priced instruments, but with a price comparable to that of the lowest.

With the Liquimat 220 you do get ambient temperature operation that gives you better sample solubility and simpler and less expensive cocktail preparation.

With the Liquimat 220 you do get four independent analysis channels, two for beta counting and two for external standardization.

With the Liquimat 220 you do get the most flexible and useful automatic standardization system available.

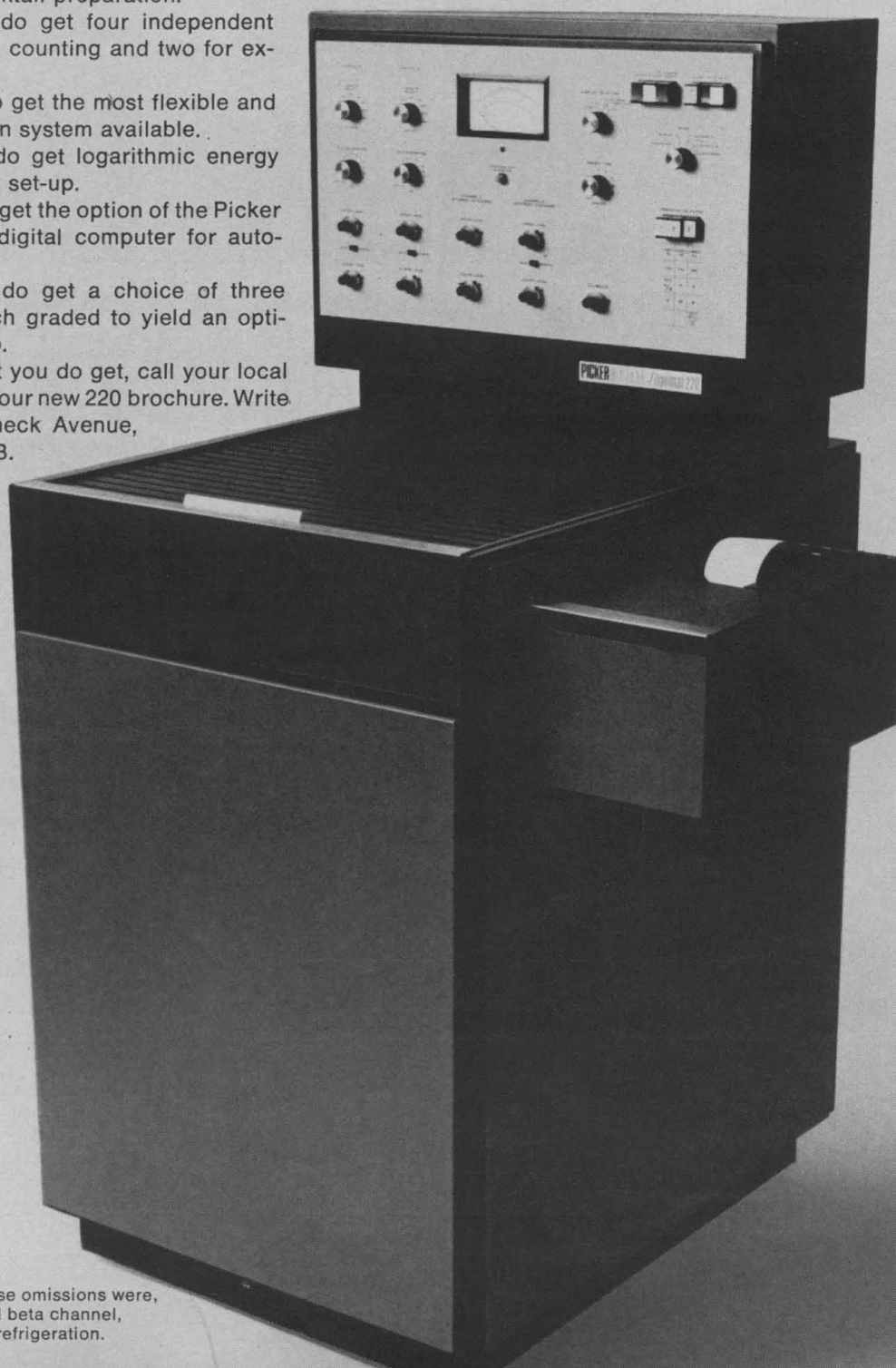
With the Liquimat 220 you do get logarithmic energy response to simplify instrument set-up.

With the Liquimat 220 you do get the option of the Picker Nuclear DAC stored-program digital computer for automatic data reduction.

With the Liquimat 220 you do get a choice of three differently priced versions, each graded to yield an optimum performance-to-price ratio.

Now for a better look at what you do get, call your local Picker representative or ask for our new 220 brochure. Write Picker Nuclear, 1275 Mamaroneck Avenue, White Plains, N.Y. 10605. Dept. B.

PICKER



*If you're curious as to what some of these omissions were, here are examples: a seldom-used third beta channel, expensive digital display, unnecessary refrigeration.

AUDIOTAPES OF AAAS ANNUAL MEETING SYMPOSIA AND PANEL DISCUSSIONS

Dallas, Texas, 26-31 December 1968

Through a cooperative arrangement between AAAS and Science Service, tape recordings of 15 symposia and panel discussions, presented at the Annual Meeting of the AAAS, are now being released at cost for general distribution. The objective of this undertaking is to make the proceedings of these meetings rapidly available to a wide public. Discussions and comments are included whenever it was possible to record them. A limited amount of editing has been done to remove technical defects but no part of the presentations has been altered or eliminated.

In a number of sessions, some information was presented on slides. Authors should be contacted directly for copies. Because of a serious epidemic of influenza at the time of the Dallas meeting, a few of the contributions were not given by the originally announced authors.

Tapes are sold as self-contained, half-day sessions. They can be purchased as conventional open reels (3¾ inches per second speed) that can be played back on any conventional audiotape player, or as cassettes for playback on a cartridge player. Each half-day session is identified, for ordering purposes, by a number ("1/68," "2/68," and so on). An order form is on the last page of this notice.

Acknowledgment is made to Ampex Corp. for assistance in recording and distribution and to WAMU, American University, for aid in editing.

AAAS INVITED LECTURES AND DISCUSSIONS

The Scientific Research Society of America (RESA) Annual Address and Discussion

• 1/68, 3 hours, \$7.00 •

Chairman: CHAUNCEY STARR (*Dean, College of Engineering, University of California, Los Angeles*)

Speaker: ATHELSTAN SPILHAUS (*President, Franklin Institute, Philadelphia*)

Technology, Living Cities, and Human Environment

Discussants:

T. F. ROGERS (*Department of Housing and Urban Development*)

R. G. STUDER (*Pennsylvania State University*)

J. ERIK JONSSON (*Mayor of Dallas*)

The Financial Crisis in Science

• 2/68, 3 hours, \$7.00 •

Panel:

Chairman: H. BENTLEY GLASS (*Academic Vice President and Professor of Biology, State University of New York, Stony Brook*)

PHILIP H. ABELSON (*Editor, Science*)

JAMES A. SHANNON (*National Academy of Sciences*)

Review of United States Science Policy

• 3/68, 3 hours, \$7.00 •

Chairman: J. HERBERT HOLLOMAN (*President, University of Oklahoma, Norman*)

CONRAD H. WADDINGTON (*Institute of Animal Genetics, Edinburgh University, Scotland*)

P. D. McTAGGART-COWAN (*Science Council of Canada*)

ALEXANDER KING (*Director for Scientific Affairs, O.E.C.D., Paris, France*)

• 4/68, 3½ hours, \$8.50 •

Chairman: DON K. PRICE (*Dean, John Fitzgerald Kennedy School of Government, Harvard University*)

DONALD F. HORNIG (*Special Assistant to the President for Science and Technology*)

Panel discussion with questions from the floor

Science, Technology, and Latin American Development

• 5/68, 3 hours, \$7.00 •

Chairman: HARRISON BROWN (*California Institute of Technology*)

Prospects for Food Production

H. F. ROBINSON (*National Academy of Sciences*)

Demographic Problems

HARLEY BROWNING (*Director, Population Research Center, University of Texas, Austin*)

The Social-Political Problems of Development

RICHARD N. ADAMS (*Professor of Anthropology, University of Texas, Austin*)

Round Table Discussion

• 6/68, 3 hours, \$7.00 •

Chairman: HARRISON BROWN

Bilateral and Regional Scientific-Technological Development

THERESA TELLEZ (*Head, Latin American Affairs, Office of the Foreign Secretary, National Academy of Sciences*)

International Transmission of Technology by Means of Private Investment

DWIGHT BROTHERS (*Associate Director, Harvard Development Advisory Service, Harvard University*)

Science Policy and National Economic Development in Latin America

VICTOR URQUIDI (*Presidente del Colegio de México, Guanajuato, México*)

Round Table Discussion

AAAS ANNUAL MEETING AUDIOTAPES

AAAS COMMITTEE SYMPOSIA

Unanticipated Environmental Hazards Resulting from Technological Intrusions

• 7/68, 3 hours, \$7.00 •

Chairman: BARRY COMMONER (*Director, Center for the Biology of Natural Systems, Washington University*)

Introductory Remarks

MARGARET MEAD (*American Museum of Natural History*)

Geological Problems Related to the Storage of Chemical Wastes in Deep Wells

DAVID EVANS (*Mineral Resources Institute, Colorado School of Mines*)

An Ecological Assessment of the Use of Herbicides in Vietnam

FRED TSCHIRLEY (*Deputy Chief, Crops Protection Branch, Agricultural Research Service, USDA*)

Possible Ecological Consequences of the Widespread Use of Herbicides: Two Views

BOYSIE E. DAY (*College of Biological and Agricultural Sciences, University of California, Riverside*)

ARTHUR GALSTON (*Department of Biology, Yale University*)

Discussion and Audience Questions

• 8/68, 3 hours, \$7.00 •

Torrey Canyon Pollution and Marine Life

J. E. SMITH (*Director, Plymouth Laboratory, Marine Biological Association of the United Kingdom*)

Widening Spectrum of Asbestos Disease

I. J. SELIKOFF (*Chairman, Division of Environmental Medicine, Mount Sinai School of Medicine, New York*)

Attitudes toward the Environment: A Nearly Fatal Illusion

BARRY COMMONER

• 9/68, 3 hours, \$7.00 •

Chairman: WALTER MODELL (*Cornell University Medical College*)

Interactions among Different Drugs

ALBERT SJOERDSMA (*Experimental Therapy Branch, National Heart Institute, National Institutes of Health*)

Environmental Contaminants and Drugs

ALLAN H. CONNEY (*Head, Biochemical and Pharmacological Sections, Burroughs Wellcome Laboratories*)

Discussion and Audience Questions

Summary Remarks

MARGARET MEAD

Water Importation into Arid Lands

• 10/68, 3 hours, \$7.00 •

Chairman: JAY M. BAGLEY (*Utah State University*)

Historical Background and Philosophic Basis of Regional Water Transfer

CALVIN WARNICK (*Director, Water Resources Research Institute, University of Idaho*)

Intrastate, Interstate, and International Legal and Administrative Problems of Large-Scale Water Transfer

EDWARD WEINBURG (*Solicitor, Solicitors Office, Department of the Interior, Washington, D.C.*)

Physical Implications (Equilibrium Changes in Hydrologic, Climatologic, Water Quality, etc.)

P. H. MCGAUHEY (*Director, Sanitary Engineering Research Laboratory, Richmond Field Station, Richmond, California*)

Social and Ecological Implications

GERALD W. THOMAS (*Dean of Agriculture, Texas Technological College*)

• 11/68, 3 hours, \$7.00 •

Moderator: HENRY P. CAULFIELD, JR. (*Executive Director, Water Resources Council, Washington, D.C.*)

Panel:

E. ROY TINNEY (*Chief, Water Resources Planning, Department of Energy, Mines, and Resources, Ottawa, Canada*)

BRUCE R. BEATTIE (*Oregon State University*)

SOL RESNICK (*Associate Director, Water Resources Research Center, University of Arizona*)

HARVEY O. BANKS (*President, Leeds, Hill, & Jewett, Inc., San Francisco, California*)

AAAS GENERAL SYMPOSIA

Genetic Technology: Some Public Considerations

• 12/68, 3 hours, \$7.00 •

Possibilities, Purposes, and Problems of Genetic Manipulation

Moderator: ROBERT L. SINSHEIMER (*Professor of Biophysics, California Institute of Technology*)

Panel:

THEODORE FRIEDMANN (*National Institutes of Health*)

ANTHONY BLACKLER (*Professor of Zoology, Cornell University*)

Discussants:

MARSHALL W. NIRENBERG (*National Institutes of Health*)

DAVID SCHWARZ (*President, Schwarz BioResearch*)

DAVID DAUBE (*Regius Professor of Law, All Souls College, Oxford University, England*)

• 13/68, 3 hours, \$7.00 •

Public Policy for Genetic Manipulation

Moderator: J. E. RALL (*Director of Intramural Research, National Institute of Arthritis and Metabolic Diseases, NIH*)

Panel:

HAROLD P. GREEN (*Professor of Law, National Law Center, George Washington University*)

EUGENE B. SKOLNIKOFF (*Professor of Political Science, Massachusetts Institute of Technology*)

Discussants:

DAVID L. BAZELON (*Chief Judge, U.S. Court of Appeals for the District of Columbia Circuit*)

ROLLIN D. HOTCHKISS (*Professor, Rockefeller University*)

GORDON M. TOMKINS (*National Institutes of Health*)

Global Effects of Environmental Pollution

• 14/68, 3 hours, \$7.00 •

The Oxygen and Carbon Dioxide Balance in the Earth's Atmosphere

FRANCIS S. JOHNSON (*Director, Earth and Planetary Sciences Laboratory, Southwest Center for Advanced Studies, Dallas*)

Discussants:

ROGER REVELLE (*Director, Center for Population Studies, Harvard University*)

WILLARD F. LIBBY (*Director, Institute of Geophysics, University of California, Los Angeles*)

S. MANABE (*Geophysics Fluid Laboratory, Princeton University*)

LAURISTON MARSHALL (*Department of Physics, Southern Illinois University, Carbondale*)

Nitrogen Compounds in Soil, Water, Atmosphere, and Precipitation

BARRY COMMONER (*Director, Center for the Biology of Natural Systems, Washington University*)

Discussants:

THEODORE C. BYERLY (*Administrator, Cooperative State Research Service, U.S. Department of Agriculture*)

VINCENT J. SCHAEFER (*Director, Atmospheric Sciences Research Center, State University of New York, Albany*)

ARTHUR D. HASLER (*Laboratory of Limnology, University of Wisconsin*)

• 15/68, 4 hours, \$10.00 •

Effects of Atmospheric Pollution on Climate

REID A. BRYSON (*Center for Climatic Research, Department of Meteorology, University of Wisconsin, Madison*)

Discussants:

VINCENT J. SCHAEFER (*Director, Atmospheric Sciences Research Center, State University of New York, Albany*)

S. MANABE (*Princeton University*)

MURRAY MITCHELL (*Environmental Data Service, Environmental Science Services Administration, Silver Spring, Maryland*)

Worldwide Ocean Pollution by Toxic Wastes

EDWARD GOLDBERG (*Scripps Institution of Oceanography, University of California at San Diego, La Jolla*)

Discussants:

GEORGE WOODWELL (*Brookhaven National Laboratory*)

BOSTWICK H. KETCHUM (*Environmental and Systematic Biology, National Science Foundation*)

BENGT LUNDHOLM (*Swedish Ecological Research Commission, Natural Science Research Council, Stockholm*)

• 16/68, 3 hours, \$7.00 •

Panel:

Chairman: ATHELSTAN SPILHAUS (*Franklin Institute, Philadelphia*)

HARRISON BROWN (*Foreign Secretary, National Academy of Sciences*)

JOHN L. BUCKLEY (*Office of Science and Technology, Washington, D.C.*)

WILLARD F. LIBBY (*University of California, Los Angeles*)

BENGT LUNDHOLM (*Natural Science Research Council, Stockholm, Sweden*)

ROGER REVELLE (*Harvard University*)

WALTER ORR ROBERTS (*President, University Corporation for Atmospheric Research, Boulder, Colorado*)

S. FRED SINGER (*Deputy Assistant Secretary, Department of the Interior, Washington, D.C.*)

Space Applications: Earth Oriented Applications of Unmanned Earth Satellites

• 17/68, 3 hours, \$7.00 •

Summary and Panel Discussion

Panel:

Chairman: W. DEMING LEWIS (*President, Lehigh University*)

BEARDSLEY GRAHAM (*Columbia Plaza, Washington, D.C.*)

HOMER NEWELL (*NASA, Washington*)

ALLEN E. PUCKETT (*Hughes Aircraft Co., Culver City, California*)

PAUL ROSENBERG (*Paul Rosenberg Associates, Pelham, New York*)

J. RALPH SHAY (*Oregon State University, Corvallis*)

ERIC A. WALKER (*President, National Academy of Engineering; President, Pennsylvania State University*)

SYMPOSIA OF AAAS SECTIONS AND AFFILIATED SOCIETIES

MATHEMATICS

The Direction of Programming Languages for the Scientist

• 18/68, 3½ hours, \$8.50 •

Chairman: STAN SHANNON (*Goddard Computer Science Institute, Dallas*)

Moderator: ROBERT M. MCCLURE (*Associate Professor, Computer Science Center, Southern Methodist University*)

Panel:

R. F. ROSIN (*Associate Professor of Computer Science, State University of New York, Buffalo*)

J. C. BROWNE (*Professor of Physics & Computer Science, University of Texas, Austin*)

CHRISTOPHER SHAW (*Systems Development Corp.*)

RICHARD HAMMING (*Bell Telephone Laboratories*)

JEAN SAMMET (*Boston Programming Center, IBM*)

PHYSICS

The Social Relevance of Physics

• 19/68, 3 hours, \$7.00 •

Chairman: RALPH E. GIBSON (*Director, Applied Physics Laboratory, Johns Hopkins University*)

Panel:

HARVEY WHEELER (*Fellow, Center for the Study of Democratic Institutions, Santa Barbara, California*)

LEWIS M. BRANSCOMB (*Chairman, Joint Institute for Laboratory Astrophysics of the National Bureau of Standards and the University of Colorado, Boulder*)

RAYMOND BOWERS (*Associate Professor of Physics, Cornell University*)

J. HERBERT HOLLOMON (*President, University of Oklahoma, Norman*)

ASTRONOMY

Pulsars

• 20/68, 4 hours, \$10.00 •

Chairman: F. D. DRAKE (*Center for Radiophysics and Space Research, Cornell University*)

Introduction

F. D. DRAKE

Observational Characteristics of Pulsars

H. D. CRAFT, JR. (*Arecibo Ionospheric Observatory, Arecibo, Puerto Rico*)

Pulsation and Rotation of Superdense Stars

K. S. THORNE (*Kellogg Radiation Laboratory, California Institute of Technology*)

Possible Mechanisms of Pulsar Radiation

T. GOLD (*Director, Center for Radiophysics and Space Research, Cornell University*)

Discussion

ZOOLOGICAL SCIENCES

The Use of Space by Animals and Men

• 21/68, 3 hours, \$7.00 •

General Chairman: ARISTIDE H. ESSER (*Rockland State Hospital, Orangeburg, New York*)

Relation of Territoriality to Dominance

Introduction: The Importance of Defining Spatial Behavioral Parameters

ARISTIDE H. ESSER

Ten Phases of the Animal Path

FRED FISCHER (*Zurich Zoological Gardens, Switzerland*)

Dominance and Territoriality as Complements in the Evolution of Social Structure in Mammals

PAUL LEYHAUSEN (*Max-Planck-Institut für Verhaltensphysiologie, Wuppertal, Germany*)

Discussion:

Chairman: CHARLES C. CARPENTER (*Department of Zoology, University of Oklahoma, Norman*)

ROBERT ARDERY (*Piazza dei Mercanti 25, 00153 Roma, Italia*)

KYLE R. BARBEHENN (*Center for the Biology of Natural Systems, Washington University*)

JOHN LE GAY BRERETON (*Department of Zoology, University of New England, Australia*)

JOHN H. KAUFMANN (*Department of Zoology, University of Florida*)

KENNETH P. KINSEY (*Bowling Green, Ohio*)

RICHARD S. PETERSON (*Division of Natural Sciences, University of California, Santa Cruz*)

• 22/68, 3 hours, \$7.00 •

Factors Influencing Intraspecific Contact

Theories of Animal Spacing: The Role of Flight, Fight, and Social Distance

GLEN MCBRIDE (*Department of Psychology, University of Queensland, Australia*)

Inter-Animal Control of Space: The Role of Rank Order, Parent-Offspring Relations, and Peer-Play

JOHN LE GAY BRERETON

The Links between Territorial Behavior, Intraspecific Strife, Population Density, and the Environment

ADAM WATSON (*The Nature Conservancy, Scotland*)

Discussion:

Chairman: JAMES A. LLOYD (*Albert Einstein Medical Center, Philadelphia*)

STUART A. ALTMANN (*Yerkes Regional Primate Research Center, Emory University*)

EDWIN M. BANKS (*Department of Zoology, University of Illinois*)

HALSEY M. MARSDEN (*Primate Ecology, Lajas, Puerto Rico*)

EMIL W. MENZEL, JR. (*Delta Regional Primate Research Center, Tulane University*)

WALTER SHEPPE (*Department of Biology, University of Akron, Ohio*)

JOHN G. VANDENBERGH (*North Carolina Department of Mental Health, Raleigh*)

• 23/68, 3 hours, \$7.00 •

Population Density and Crowding

Effects of Density and Space on Sociality and Health in Mammals

KENNETH MYERS (*Commonwealth Scientific and Industrial Research Organization, Australia*)

Physiological Aspects of Continued Crowding

DAVID E. DAVIS (*Department of Zoology, North Carolina State University*)

Behavior under Involuntary Confinement

HENRI F. ELLENBERGER (*University of Montreal, Canada*)

Discussion:

Chairman: CHARLES H. SOUTHWICK (*School of Hygiene, Johns Hopkins University*)

JOHN B. CALHOUN (*Unit for Research on Behavioral Systems, NIH*)

FREDERICK R. GEHLBACH (*Department of Biology, Baylor University*)

ULLA OLIN (*United Nations Development Programme*)

DELBERT D. THIESSEN (*Department of Psychology, University of Texas, Austin*)

• 24/68, 3 hours, \$7.00 •

The Role of Distance in the Evolution of Communication

The Role of Orienting Behavior in Communication

MARIO VON CRANACH (*Max-Planck-Institut für Psychiatrie, Munich*)

The Facilitation of Communication in a Cultural Environment

EDWARD T. HALL (*Department of Anthropology, Northwestern University*)

**Trans-Cultural Patterns of Ritualized Contact Behavior:
Illustrated by Filmed Ceremonial Sequences**

IRENAUS EIBL-EIBESFELDT (*Max-Planck-Institut für Verhaltensphysiologie, Seewiesen, Germany*)

Discussion:

Chairman: WILLIAM A. MASON (*Delta Primate Research Center, Tulane University*)

CHARLES C. CARPENTER (*Department of Zoology, University of Oklahoma, Norman*)

DANIEL CARSON (*Mental Health Research Institute, University of Michigan*)

ARISTIDE H. ESSER (*Rockland State Hospital*)

JAMES MARSTON FITCH (*School of Architecture, Columbia University*)

DAVID LOWENTHAL (*American Geographical Society, New York*)

GLEN MCBRIDE (*Department of Psychology, University of Queensland, Australia*)

• 25/68, 3 hours, \$7.00 •

Environmental Conditions and Human Behavior

An Evolutionary Background to Human Behavior

V. C. WYNNE-EDWARDS (*Natural History Department, University of Aberdeen, Scotland*)

Ecological Aspects of Interpersonal Relationships

IRWIN ALTMAN (*Naval Medical Research Institute, Bethesda, Maryland*)

Spatial Parameters in Naturalistic Social Behavior Research

ROBERT SOMMER (*Department of Psychology, University of California, Davis*)

Discussion:

Chairman: DAVID LOWENTHAL (*American Geographical Society*)

JOHN B. CALHOUN (*NIH*)

KENNETH H. CRAIK (*University of California, Berkeley*)

JAMES MARSTON FITCH (*Columbia University*)

GILBERT GOTTLIEB (*North Carolina Department of Mental Health*)

ULLA OLIN (*U.N. Development Programme*)

RAYMOND G. STUDER (*Pennsylvania State University*)

HISTORY AND PHILOSOPHY OF SCIENCE

Technology and Values

• 26/68, 3 hours, \$7.00 •

Chairman: EMMANUEL G. MESTHENE (*Harvard University Program on Technology and Society*)

The Nature of the Relationship and the Mechanism of Change

EMMANUEL G. MESTHENE

The Religious Dimension

HARVEY COX (*Department of Divinity, Harvard University*)

The Mediating Role of the Economy

NATHAN ROSENBERG (*Visiting Professor, Economics Department, Harvard University*)

The How and What of Value Change in Contemporary American Society

IRENE TAVISS (*Harvard University Program on Technology and Society*)

Discussant:

MELVIN KRANZBERG (*Division of Special Interdisciplinary Studies, Case Western Reserve University*)

AGRICULTURE

Research for the World Food Crisis

• 27/68, 3 hours, \$7.00 •

Progress of Research and Technology on Food Supply and Population Control

Chairman: DANIEL G. ALDRICH, JR. (*University of California, Irvine*)

World Food-Population Problem, an Overview

WILL M. MYERS (*Vice President for Science, Rockefeller Foundation*)

Africa

A. H. BUNTING (*Professor, Department of Agricultural Botany, University of Reading, England*)

Europe

ROBERT BEST (*State Agricultural School, Wageningen, Netherlands*)

• 28/68, 3 hours, \$7.00 •

Chairman: NYLE C. BRADY (*Director, Agricultural Experimental Station, Cornell University*)

India, South Asia

D. L. UMALI (*Vice President for Agricultural and Forestry Affairs, University of the Philippines*)

Latin America

JOSÉ MARULL (*Dean of the Graduate School, Director, Turrialba Education and Research Center, Inter-American Institute of Agricultural Sciences, Costa Rica*)

United States

SYLVAN H. WITTWER (*Director, Agricultural Experiment Station, Michigan State University*)

Use form below to order reels or cassettes. Enclose payment by check or money order. Do not send cash.

SCIENCE AND ENGINEERING TAPES, SCIENCE SERVICE,
1719 N St., N.W., Washington, D.C. 20036

I enclose \$ _____.

Please send the following ☐ reel(s) ☐ cassette(s)

Encircle number(s) you want. Tapes are \$7.00 each unless indicated otherwise.

1/68 2/68 3/68 4/68 (\$8.50) 5/68 6/68 7/68 8/68 9/68 10/68
11/68 12/68 13/68 14/68 15/68 (\$10.00) 16/68 17/68 18/68 (\$8.50)
19/68 20/68 (\$10.00) 21/68 22/68 23/68 24/68 25/68 26/68 27/68 28/68

Name _____

Address _____

City _____

State _____ Zip _____

Here's our new Model 402 ultraviolet-visible spectrophotometer. It's your best buy anywhere!

Our new Model 402 is designed for a high level of automation where many samples must be accurately measured during the day with minimum operator attention. You'll find it equally versatile for scanning spectra quickly when monitoring a reaction, a titration, a liquid chromatography separation (often using a flow cell), or for tracing a kinetic reaction on one wavelength with time.

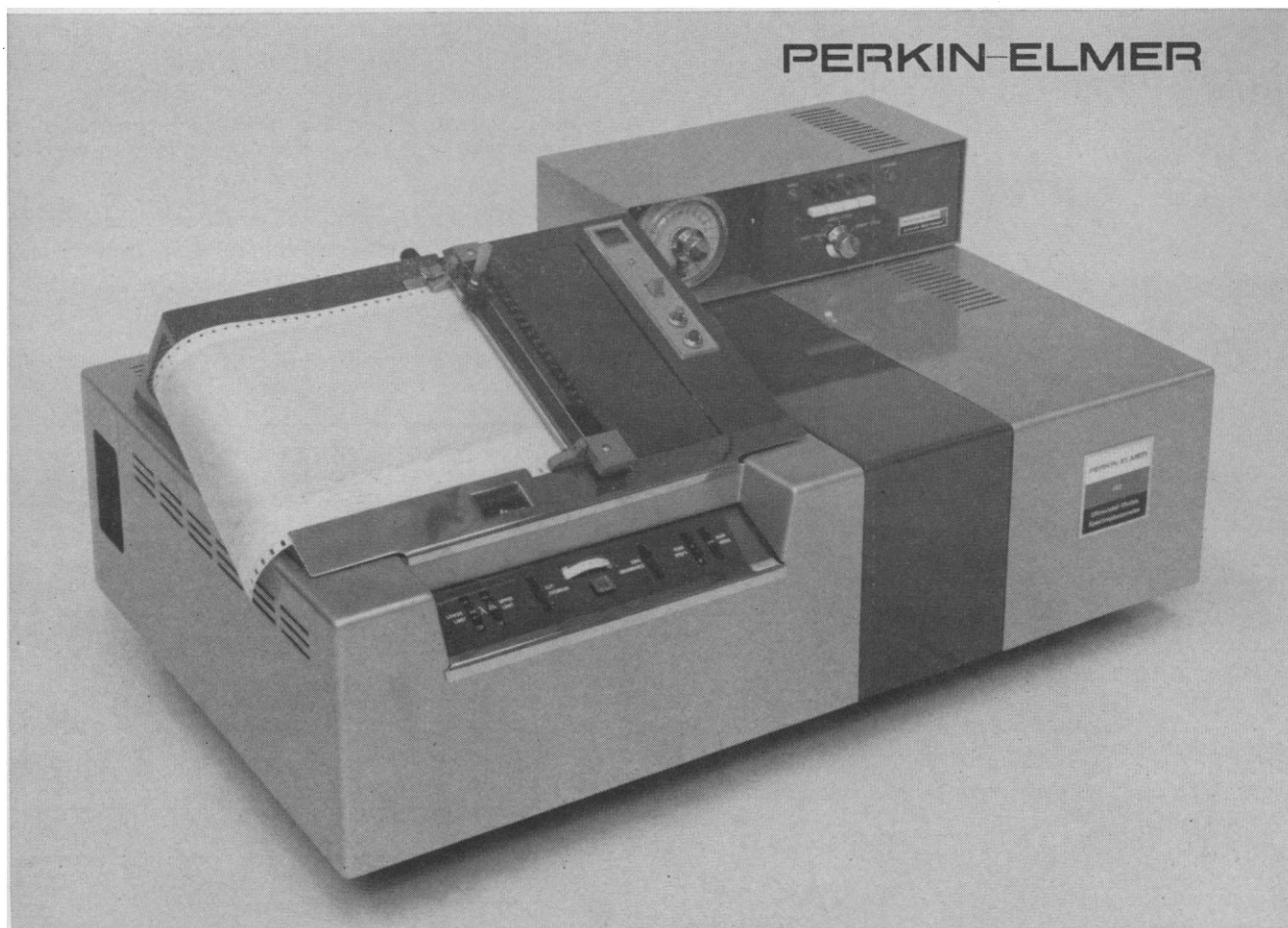
The 402 has a unique Flowchart recording system (Pat. Nos. 3363259, 3396403) using preprinted roll charts for precise, simplified data handling. Any 0.3 absorbance units can be expanded 5X to cover the full ordinate scale with a precision of 0.002 absorbance units.

You can do single, repetitive, or superimposed scans of one to four samples sequentially or at chosen time intervals over the range of 190-850 $m\mu$. You can select any 40 millimicron wavelength interval (or multiples of 40 $m\mu$). You can stop or start scans in any of these wavelength regions at three selected scanning rates.

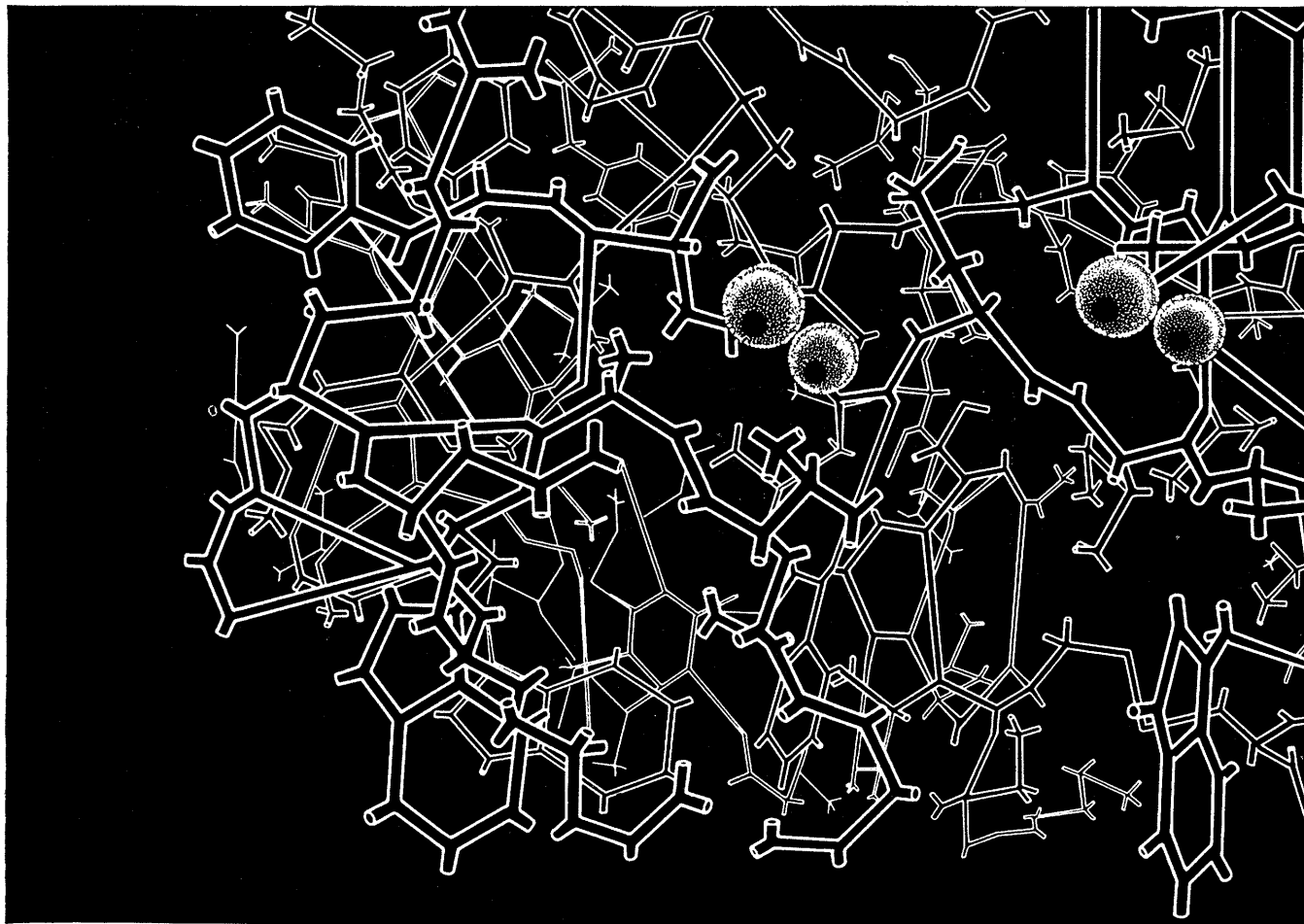
For time rate analysis (enzyme assays) you can automatically follow a kinetic reaction in each of four sample cells at controlled temperatures and print out a chart of reaction rates for each sample.

You get all this automation, speed, and convenience at moderate cost. It

will pay you to come to Perkin-Elmer for your spectrophotometer needs. We offer the broadest line of ultraviolet and fluorescence instruments in the world. For example, our economical Model 202 gives you a range of 190 to 390 and 350 to 750 $m\mu$ recorded on notebook size (8½ x 11) chart paper, the same high photometric accuracy as the Model 402, 1 to 10X ordinate scale expansion with an external recorder and a wide range of accessories including multiple sampling units. For further information on the new Model 402 or the Model 202 write Instrument Division, Perkin-Elmer Corporation, 723 Main Avenue, Norwalk, Connecticut 06852.



Assay your way smoothly through the enzyme maze. With radiochemicals.



First—to those of you already performing enzyme assays—a summary of the advantages of the *radiochemical* methods of assay.

Speed. Sampling and separation techniques are rapid, simple, easily performed.

Specificity. With the proper substrate, interference reactions can be avoided. The radiochemical method of assay is thus eminently suitable for enzymes in crude extracts, and for studying effects of inhibitors, activators, and pH.

Sensitivity. Which permits radiochemical assays of crude-tissue extracts

at high dilution, of low levels of enzyme activity, of microgram quantities of tissue, of enzymes in the presence of inhibitors such as drugs.

Secondly—if you are now using the radiochemical method of enzyme assay—a word or two about the Amersham/Searle labelled substrates especially prepared for enzyme assay.

Accurately measured specific activities. A critical, documented characteristic of the labelled substrates from Amersham/Searle.

Low specific activity. Insuring high chemical and radiochemical purity. Further, low specific activity gives Amer-

sham/Searle labelled substrates long shelf-life.

Low cost. A large number of enzyme assays can be performed with a small amount of labelled substrate.

Detailed technical information. Ranging from the precise analytical results accompanying each Amersham/Searle compound to the objective discussion contained in the publication "Radiochemical Methods of Enzyme Assay," copies of which are furnished on request.

Call or write for specific information on labelled substrates for enzyme assay. (Do you have your copy of our 69/70 Radiochemical Catalog?)

9-213

2000 NUCLEAR DRIVE DES PLAINES, ILLINOIS 60018 TELEPHONE: (312) 296-1055

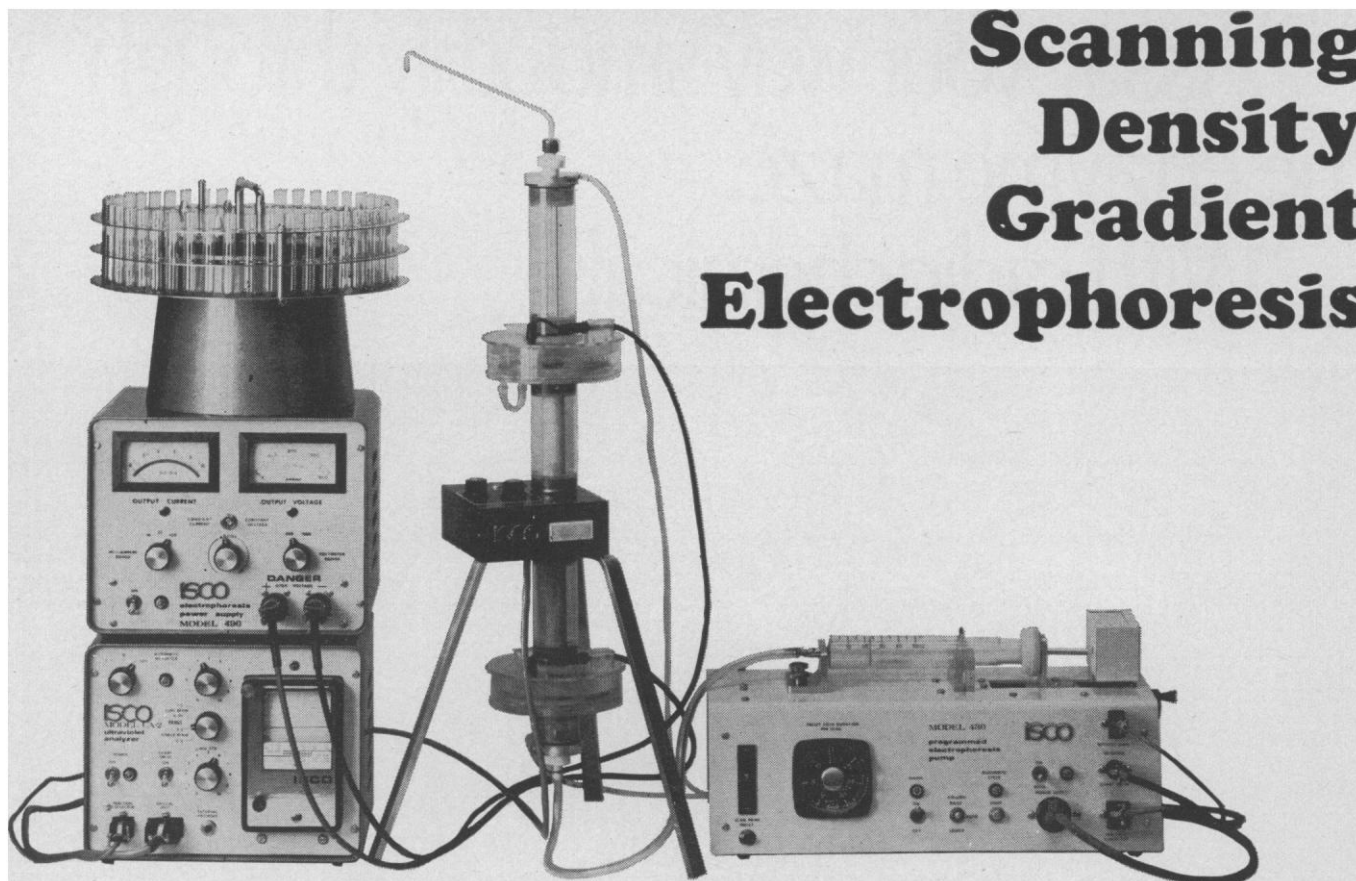


Amersham/Searle

AMERSHAM/SEARLE CORPORATION:
AN ACTIVITY OF G. D. SEARLE & CO. AND THE RADIOCHEMICAL CENTRE

Circle No. 24 on Readers' Service Card

Scanning Density Gradient Electrophoresis



Top: Model 270 Fraction Collector
Center: Electrophoresis Power Supply
Bottom: Model UA-2 UV Monitor

Model 210 Density Gradient
Electrophoresis Apparatus

Model 430 Programmed Electrophoresis Pump

Accurate analysis and fractionation of mixtures has been possible for some time with conventional density gradient electrophoresis equipment. Now easy determination of electrophoretic mobilities as well as physical separation of mixtures and quantitative microanalytical results can be obtained with the new ISCO Model 210 Density Gradient Electrophoresis apparatus. Microgram size samples can readily be separated. Low sample concentration permits the use of dilute buffers, resulting in a wide operational temperature range of from 0 to 25° C.

The Model 210 makes repeated scans of zones during migration through a density gradient column. A water-jacketed Teflon central tube contains a gradient which is raised and lowered past a narrow-bandwidth UV-absorbance (O.D.) monitor at programmed intervals. Recorded scans during migration pro-

vide data to confirm uniform migration rates or to plot changing migration rates for the purpose of determining electrophoretic mobilities. Quantitative results can be obtained from these scans or from a final chart record made automatically at the conclusion of migration as separated specimen components are discharged into a fraction collector for further assay. Figure 1 is a profile of a typical run showing the relative positions of the same peak during the first and eighth scans. Note that repeated scans have not resulted in loss of resolution.

Semipermeable membranes between the buffer and electrode chambers and the gradient column eliminate the difficulties normally associated with loading density gradient electrophoresis equipment. There is no need to maintain hydrostatic equilibrium; the gradient may be pipetted directly into the column. The separating membranes also prevent pH changes at the electrodes from reaching the gradient column.

The Model 430 programmed electrophoresis pump controls the number and timing of scans, the timing of electric field applications, and finally discharges the entire gradient column into a fraction collector. The apparatus need not be attended after setup.

A similar preparative apparatus which has a larger capacity but can monitor the gradient only during discharge is also available. Much of this electrophoresis apparatus can also be used for monitoring column chromatographic eluants or for fractionating centrifuged density gradients.

For more information, please request brochure E121.

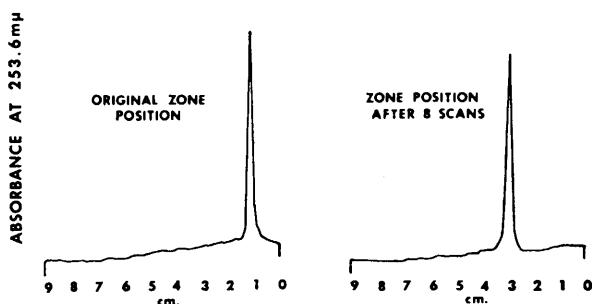


FIGURE 1. ZONE POSITION IN GRADIENT COLUMN



INSTRUMENTATION SPECIALTIES COMPANY, INC.

4700 SUPERIOR • LINCOLN, NEBRASKA 68504 • PHONE (402) 434-0231 • CABLE ADDRESS: ISCOLAB LINCOLN

See Us at Booths H114, 115 and I114, 115 at the FEDERATION MEETING

Circle No. 2 on Readers' Service Card

Patent Pending

Once you have a Thelco Bath you may never need another

It is not unusual for Thelco Constant Temperature Baths to give regular (and quiet!) service for 20 years and more. One big reason for this long service is the gentle and predictable mixing afforded by gravity convection. Mechanical stress is avoided as there are no moving parts to wear, vibrate or make noise.

And you can depend on the Thelco name—with a half-century leadership in constant temperature equipment—to give you unsurpassed uniformity. Always within $\pm 0.3^\circ\text{C}$ at 37°C , $\pm 0.4^\circ\text{C}$ at 56°C .

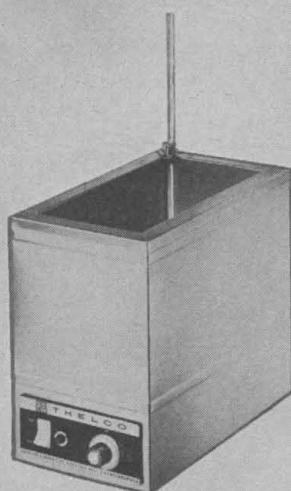
Rapid heat-up and recovery keep waiting time at a minimum—warm-up to 37°C in as little as 6 minutes. Lo-Drift heaters respond promptly, and fast, efficient

heat transfer insures long heater life. You get corrosion-free performance and easy maintenance through the double wall, all-stainless-steel construction. Inner wall seams are welded for strength, then soldered for leak-proof insurance!

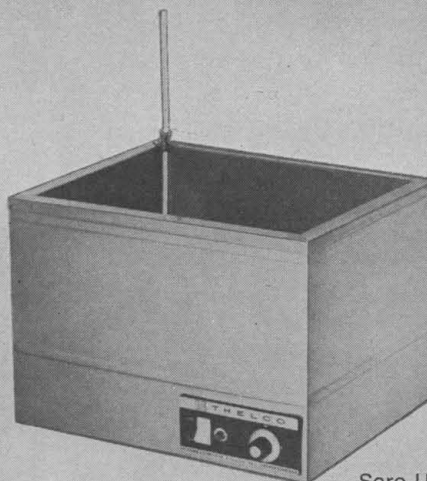
With a choice of three sizes, all with an adjustable shelf of 5 or 7 inches, Thelco Constant Temperature Baths can cover a variety of applications. They are as much at home in petroleum testing as in serological work. Get complete information on these versatile baths from your Precision Scientific Dealer, or write us for Bulletin 617. Precision Scientific Company, 3737 W. Cortland Street, Chicago, Illinois 60647.

PRECISION
PS
SCIENTIFIC

SUBSIDIARY OF
GCA
CORPORATION



Sero-Utility Bath
Small, Model 82



Sero-Utility Bath
Medium, Model 83



Sero-Utility Bath
Large, Model 84

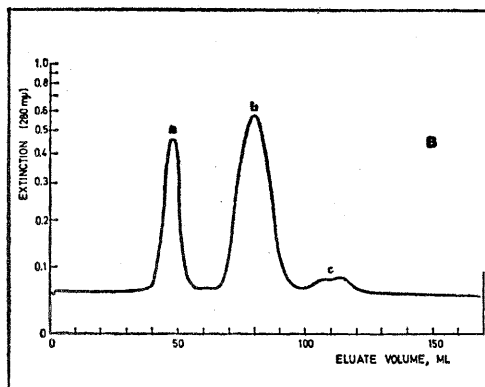
SEPARATION ON POLYACRYLAMIDE GEL
 Column stabilised with 5 % polyacrylamide. Cross circulation of buffer.
 Continuous elution 10 ml/hr. Temperature 4°C.
 SAMPLE: 0.25 ml 20 % albumin solution 0.04-M with respect to acetyl-
 tryptophane+0.75 ml electrode buffer.



IN THE SERVICE OF SCIENCE

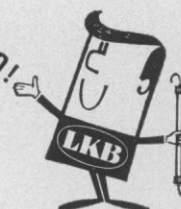
LKB INSTRUMENTS INC. • 12221 PARKLAWN DRIVE • ROCKVILLE Md. 20852

SALES AND SERVICE THROUGHOUT THE WORLD: STOCKHOLM, THE HAGUE, COPENHAGEN, ROME, VIENNA, LONDON



One Instrument for Four — UNIPHOR

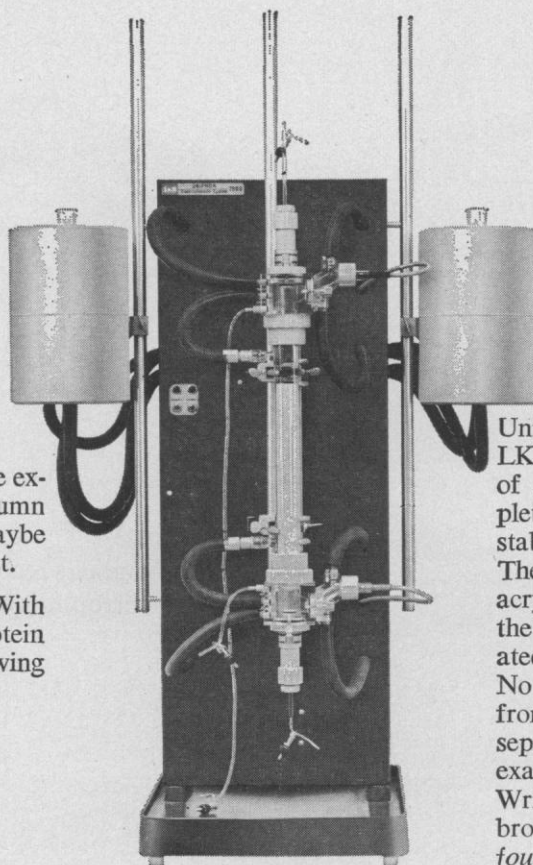
POLYACRYLAMIDE SEPARATIONS TOO!



The LKB Uniphor can save the expense of four other sets of column electrophoresis apparatus, maybe more, but we don't want to boast.

Consider the convenience too. With one piece of LKB apparatus protein chemists can now use the following techniques:

- Powder stabilization
- Sucrose Density Gradient
- Isoelectric Focusing
- Polyacrylamide Gel
- Agarose Gel
- Sephadex



Unique on the market today, the LKB Uniphor permits a free choice of method and provides a completely flexible system in which any stabilization medium can be used. The Elution Stopper, for Polyacrylamide Gel separations, enables the continuous removal of fractionated zones.

No need to remove the gel column from the Uniphor and cut out the separated components for further examination.

Write or phone LKB today for *one* brochure telling you in detail about *four*, and more, methods that you can use with the Uniphor.

Circle No. 42 on Readers' Service Card

NEW DATA PRINTER

from Coleman
prints concentration
directly on
your record
form

Model 43



Attach to spectrophotometer or other analytical instrument by means of a connecting cable.



Operation is simple. Adjustments are minimal. Insert known sample, turn Printer to concentration mode, and adjust for digital reading of known concentration.



Printout is quick and easy. Simply insert card or record form into printing area and push PRINT button. Readout is recorded anywhere you want it on form and carbons. Print same results on several cards if you wish.

Only the new COLEMAN Data Printer gives you direct concentration printout on your medical records. And it's priced below \$1900. Can be connected to spectrophotometers, pH meters, or flame photometers in seconds. Saves time, increases accuracy. Eliminates 3 major sources of error: 1. Reading; 2. Converting the reading to concentration; 3. Recording concentration on your record.

Provides precise, permanent, clearly printed records. Prints results of transmittance or pH, absorbance or concentration determinations.

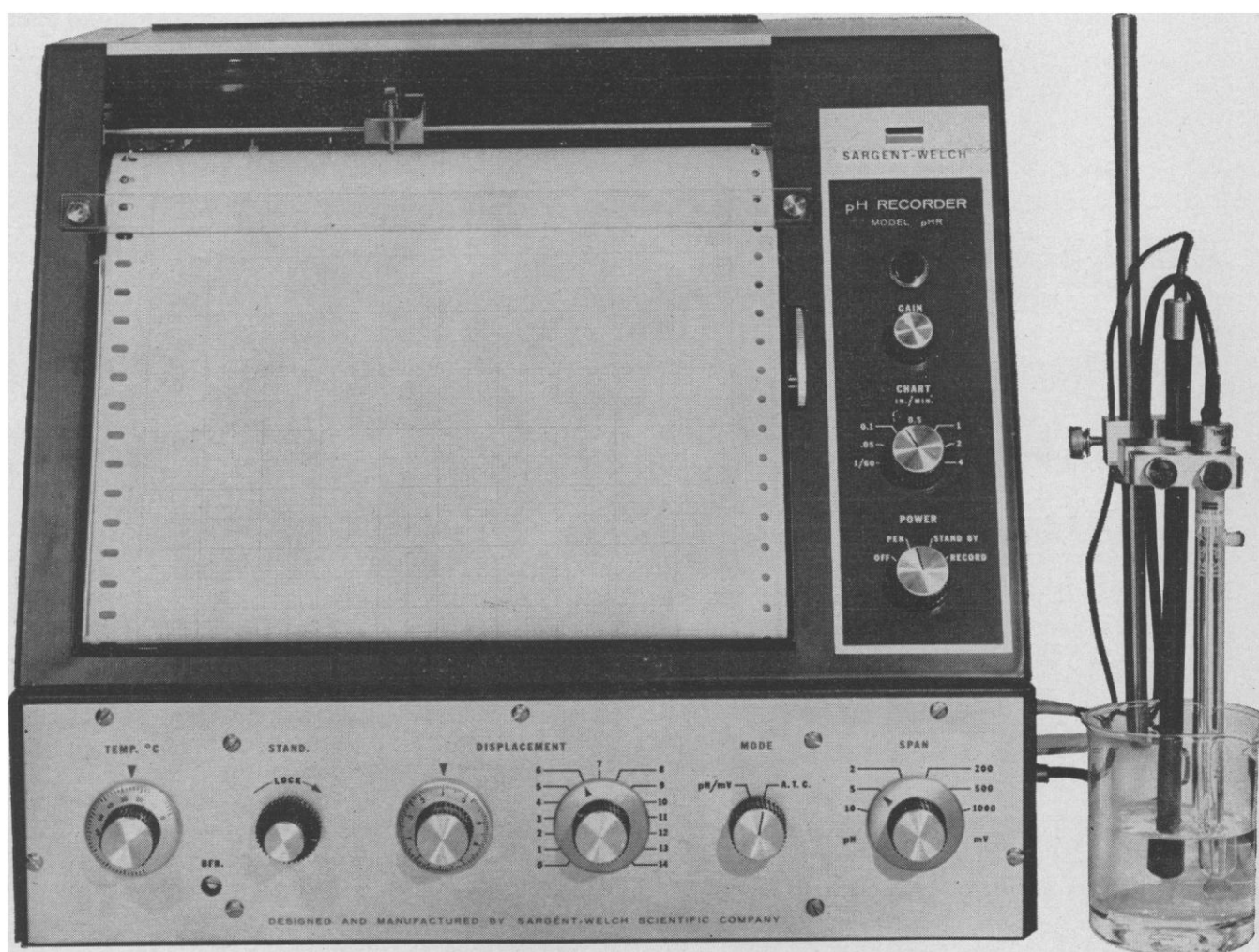
Send for Bulletin S-322

**Write to Coleman Instruments Division, The Perkin-Elmer Corporation,
42 Madison Street, Maywood, Illinois 60153**

PERKIN-ELMER

We ask you:

Is this the face of an ordinary pH meter?



Even a good, "ordinary" pH meter can have an expanded reading range of any 2, 5, or 10 pH span between 0 and 14 pH.

But how many pH meters can also *record* these same spans — at 7 different chart speeds from 1/60 to 4 inches per minute?

This one can. Because it's a pH recorder. Our new Model pHR.

And, when optionally equipped, it can also perform as an electrometric titrator, or a pH-stat, or a pH/emf-actuated controller.

The multi-duty pHR does it all with all the accuracy you could ask for. Its basic price: \$1250.

There are a lot more performance specifications for the Model pHR that you'll want to get your hands on.

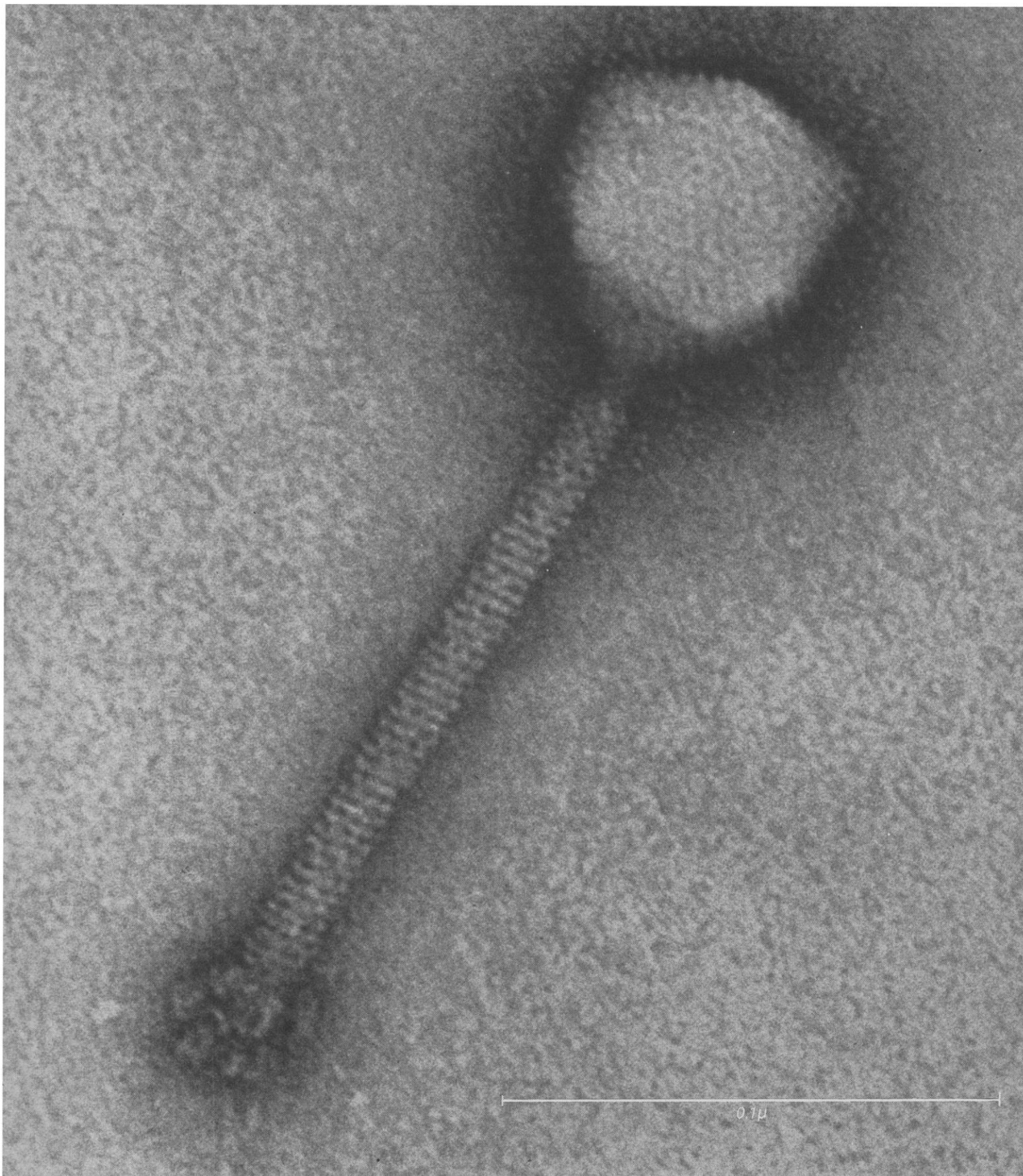
Just call your Sargent-Welch representative or write to us.

9-213

SARGENT-WELCH

Scientific instruments, apparatus, chemicals.
Sargent-Welch Scientific Company
4647 Foster Ave.; Chicago, Ill. 60630

Chicago/Anaheim/Birmingham/Cincinnati
Cleveland/Dallas/Denver/Detroit
Springfield, N.J./Toronto/Montreal/Vancouver



SP50-B Subtilis bacteriophage; photographed at 80,000x in a Siemens-Elmiskop electron microscope; enlarged to 1,500,000x with a Durst S-45EM* (Courtesy of Dr. A. K. Kleinschmidt, New York University School of Medicine, Dept. of Biochemistry.)

The above illustration was reproduced from a 16x20" print — a 19.5x enlarged section of a 3¼x4 EM plate — made with a Durst S-45EM enlarger. The specular point-light source and condenser system used in this enlarger are analogous to Koehler illumination as applied to opti-

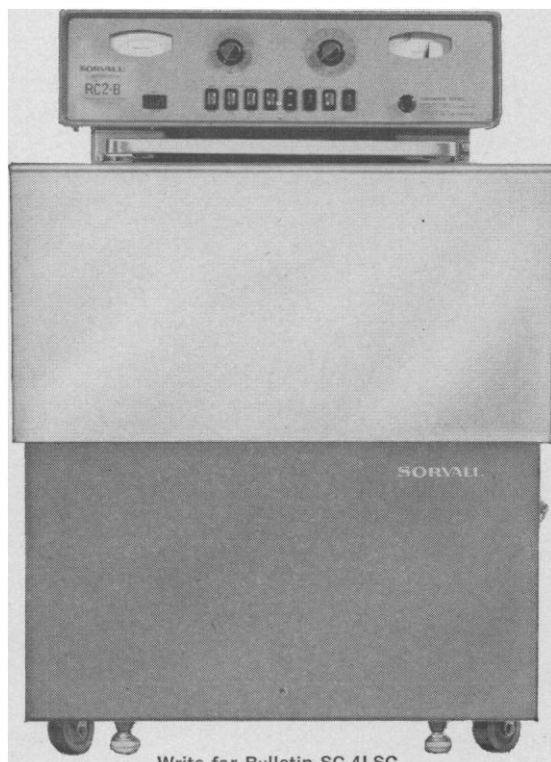
cal microscopes, and is responsible for the extremely high resolution and contrast obtained, so essential to retaining definition in electron micrograph prints.

A qualified Durst dealer near you will be glad to demonstrate the capabilities of the Durst S-45EM enlarger, without

obligation, and at your convenience. For his name, and other information, write: Durst (USA) Inc., Photo-Technical Products Division, Garden City, N.Y. 11530 Subsidiary of Ehrenreich Photo-Optical Industries, Inc. (In Canada: Braun Electric of Canada Ltd., Ontario)

Circle No. 17 on Reader's Service Card

Let's separate centrifuges

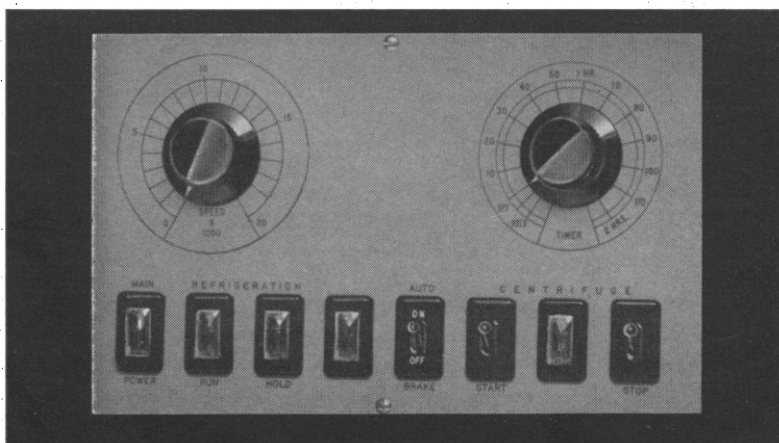
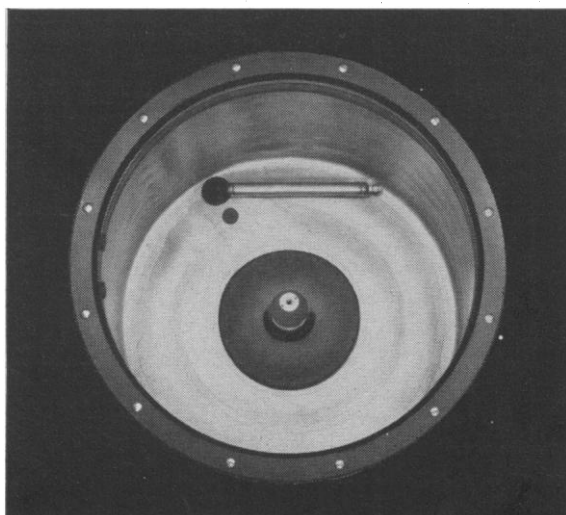
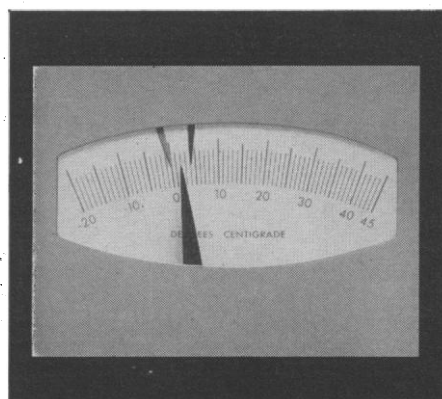
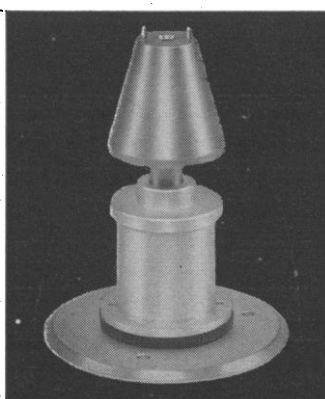
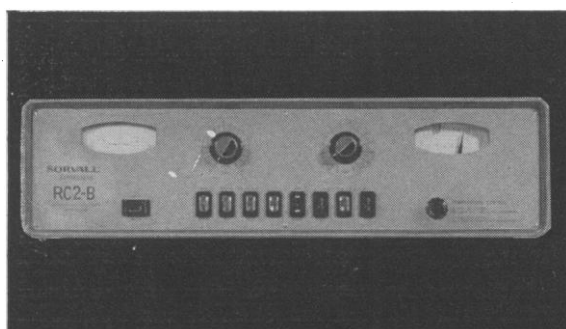


Write for Bulletin SC-4LSC

It is just as important when looking for reliable sample separation to look for a reliable "separator." That's why we say "Let's separate centrifuges." All centrifuges are not alike, and it *does* make a difference which one you choose. The SORVALL RC2-B Automatic Refrigerated Superspeed Centrifuge has set the standard in its range for automatic programming, Gyro-Action Self-Centering Direct Drive, control accuracy, big, smooth-wall stainless steel chamber and reliability of performance. Eight angle and horizontal rotors are offered currently. If your need is for low-temperature centrifugation, buy the reliable one — buy the RC2-B. You'll also get personal service! From Ivan Sorvall, Inc., Norwalk, Connecticut 06856.

SORVALL®

**RC2-B Automatic
Superspeed Refrigerated
Centrifuge**
20,000 rpm up to 49,500 x g



New Publications in Biomedical Science

Bloom & Fawcett: A TEXTBOOK OF HISTOLOGY

By WILLIAM BLOOM (*Emeritus*), *University of Chicago*, and DON W. FAWCETT, *Harvard Medical School*.

Internationally known for its thorough, authoritative coverage of microanatomy, this lavishly illustrated medical text describes the minute structure, composition, and function of all human tissues and organs. The New (9th) Edition reflects recent advances in the basic sciences and includes nearly 400 new photomicrographs, electron micrographs, and schematic drawings.

858 pages with 818 figures. \$17.50. Ninth Edition published January, 1968.

Rubin & Casarett: CLINICAL RADIATION PATHOLOGY

By PHILIP RUBIN and GEORGE CASARETT, *both of the University of Rochester School of Medicine*.

This two-volume reference systematically describes the adverse effects of therapeutic radiation on every tissue of the human body. The differential sensitivity to radiation of cells is related to their proliferation, differentiation, and individual life span, and the symptoms, diagnosis, treatment, and prognosis of radiation reactions in each part of the body are presented in detail.

1057 pages with 457 figures. \$45.00. Published May, 1968.

Davidsohn & Henry: TODD SANFORD CLINICAL DIAGNOSIS BY LABORATORY METHODS

Edited by ISRAEL DAVIDSOHN, *The Chicago Medical School*, and JOHN BERNARD HENRY, *State University of New York Upstate Medical Center*, with 27 contributors.

Now in a thoroughly revised New (14th) Edition, this classic work in clinical pathology includes unusually complete discussions of immunohematology and of blood groups, and entire chapter on blood coagulation, and extensive new articles on quality control and statistics, enzymes, hormones, lipoproteins, and immunoglobulins. Such new techniques as atomic absorption spectrophotometry, immunoelectrophoresis, thin-layer chromatography, and instant thin-layer chromatography are included.

1308 pages with 698 figures, 94 in color. \$24.00. Fourteenth Edition published January, 1969.

Andrews: THE RADIOBIOLOGY OF HUMAN CANCER RADIOTHERAPY

By J. ROBERT ANDREWS, *Georgetown University*.

Although plentiful, information on the biophysical mechanisms of radiation effects has been difficult to locate. Dr. Andrews has correlated and evaluated a vast literature and related it to the central problem of human cancer radiotherapy, in a book that will be valuable to radiologists and researchers.

271 pages with 70 figures. \$19.00. Published May, 1968.

Felson: ROENTGEN TECHNIQUES IN LABORATORY ANIMALS

Edited by BENJAMIN FELSON, *Cincinnati General Hospital*.

This handbook brings together previously scattered information on the radiography of dogs and other experimental animals—from anesthesia and contrast media to positioning and radiation protection. It will be of value to researchers who work with animals and to veterinary medical practitioners.

245 pages with 215 illustrations. \$17.50. Published October, 1968.

Masoro: PHYSIOLOGICAL CHEMISTRY OF LIPIDS IN MAMMALS

By EDWARD J. MASORO, *Woman's Medical College of Pa.*

The first of a series designed to bridge the gap between modern biochemistry and mammalian physiology, this monograph describes the lipids found in mammals, their chemistry, metabolism, and role in physiological and pathological processes. Biologists, physicians, and medical students will find valuable information in this series.

304 pages, illustrated. \$7.75. Published September, 1968.

Fox: ABNORMAL BEHAVIOR IN ANIMALS

Edited by MICHAEL W. FOX, *Washington University*.

In this unusual new book, 22 authorities from seven countries discuss the recognition, etiology, and possible treatment of behavior disorders in domesticated animals. Comparative psychology experiments and Pavlovian and ethological principles are reviewed in relation to the authors' findings.

563 pages, illustrated. \$19.50. Published October, 1968.

W. B. SAUNDERS COMPANY West Washington Square, Philadelphia, Pa. 19105

Please send and bill me (discount to teaching faculty):

Author _____ Book Title _____

Name _____

Address _____ Zip _____

Sci 4-11-69





Dial collect.
617-444-6700.

Try the direct approach. Call Ultra Service.

Meet IEC's Ultra Service. A one of its kind team of molecular biologists and ultracentrifuge applications engineers. Specialists who talk your language. Specialists who give you first-hand access to state-of-the-art ultra knowledge. To help you im-

prove procedures. Help you set up a new system or perfect an existing one. Help you use your staff and equipment most efficiently. Help you cut costs. Help provide specialized follow-up assistance. Service, in short, to help you enjoy optimum

centrifugation efficiency. The cost? Forget it. It's on IEC. First call, first served. Your direct contact is Tom Mulvihill at (617) 444-6700, collect.

IEC **INTERNATIONAL
EQUIPMENT CO.**

300 SECOND AVENUE • NEEDHAM HEIGHTS, MASSACHUSETTS 02194

GOT A MINUTE? AUTOMATE YOUR LABWASHING

Patent 3,316,925



The CRC Labwasher

CRC LABWASHER®

In one minute, you can automate your lab glassware washing with the Mobile CRC Labwasher. Without costly installation charges. Without inconvenience. Just plug it in, and add water by connecting to any faucet. (We even provide adapters to fit various faucets)

The Mobile model will clean and dry 90% of your most commonly-used glass labware. With 50% less breakage than handwashing. 15 auxiliary stainless steel racks available for volume washing.

In a short time, the Mobile CRC Labwasher pays for itself in man-hours saved. It's 12 Cu. Ft. of pure convenience.

Bulletin A-94 and in-the-field user reports available upon request.

Find out more. Write to:



Dept. A-94 • 18901 Cranwood Parkway
Cleveland, Ohio 44128

Circle No. 82 on Readers' Service Card

130

make the point that involuntary methods of population control, which are now considered unacceptable, may become acceptable when society realizes that the alternative is mass starvation. If we wait until massive starvation is upon us to begin to develop such methods, millions of people will suffer and die unnecessarily while the effective methods are being developed. As scientists, we should provide society as soon as possible with adequate means to cope with the problem, even though such methods would not be used at this time. As informed citizens, we should try to make society aware of the consequences of inaction in reducing the birth rate. Ultimately, whether or not involuntary methods are used is a decision which should be made by society, not by scientists; but if scientists wait to develop effective involuntary methods until they are acceptable to society, the time lost may result in an enormous amount of avoidable death and suffering.

MELVIN M. KETCHEL

Department of Physiology,
Tufts University School of Medicine,
Boston, Massachusetts 02111

References

1. J. Bonner, *Science* 157, 914 (1967).
2. M. M. Ketchel, *Perspect. Biol. Med.* 11, 687 (1968).

Pharmacology Institute Proposed

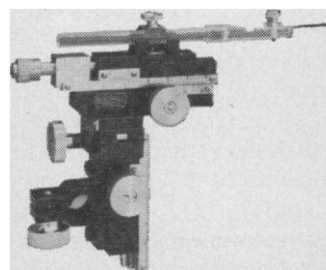
Rockliff's comments (Letters, 20 Dec.) on the Food and Drug Administration requirements for filing toxicity reports by pharmaceutical companies and his reply to my letter (16 Aug.) call for some explanation. . . . The Kefauver-Harris amendments requiring that drugs be both safe and *efficacious* became effective 1 June 1963. Since that time, we have made four studies, two of which were not submitted to the FDA. The legal status of toxicity data of a specific drug at a certain time and place is for government and industry attorneys to determine in court. This is a legal ambiguity that needs clarification. In the meantime, who protects the drug consumer? The seriousness of the problem to the patient and doctor is illustrated in a drug surveillance study by Borda (1) which showed that 35 percent of hospital patients on a medical service have adverse drug reactions. Prevention of drug reactions begins with the original evaluation of a new drug.

It appears to me that the coordina-

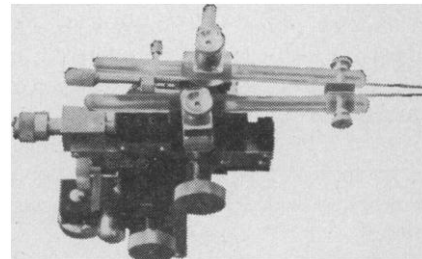


MINIATURE NARISHIGE MICRO- MANIPULATORS

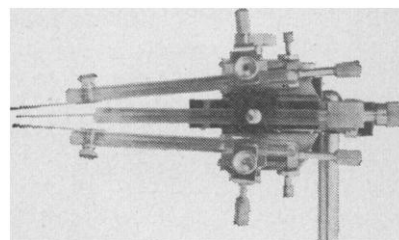
Compact and lightweight (only 1/2 lb.), these precision-manufactured micromanipulators offer smooth, accurate adjustment in all three dimensions. Ideal where only limited space is available!



Model #MM-3 — with plastic electrode holder and metal mounting-rod assembly \$150



Model #MD-4 — similar to MM-3, but with two independent electrode holders, and mounting rod assembly\$210



Model #MT-5 — similar to MM-3 but with three independent electrode holders, and mounting rod assembly \$275

eric sobotka
company, inc.

112 Flinn Ct., Farmingdale, N.Y. 11735 (516) 293-9272



Circle No. 93 on Readers' Service Card

SCIENCE, VOL. 164

tion of clinical drug evaluation is beyond the capacity of the investigator, the university, the government, and the pharmaceutical industry. A National Institute of Pharmacology with legal and scientific responsibility is essential. This would be a federally sponsored institute which would stimulate and supervise basic and clinical drug research with an emphasis on new drug investigation. The primary involvement of the FDA with food, cosmetics, manufacturing, and advertising indicates that new drug investigation should be in a separate program patterned on the National Institutes of Health. The work of such an Institute of Pharmacology should be conducted by universities and research facilities which conform to the highest standards of personnel, equipment, and research design. The pharmaceutical industry would not be relieved of its obligation to demonstrate the effectiveness and safety of its products and to underwrite the cost of this work but there would be a federal capability which would set standards and enforce them. Such a program would insure the badly needed financial support of new drug research. It would also require complete and prompt reports of new drugs which would be available to the investigators as well as to the government.

PAUL LOWINGER

*School of Medicine,
Wayne State University, 951 East
Lafayette, Detroit, Michigan 48207*

Reference

1. I. T. Borda, D. Stone, H. Jick, *J. Amer. Med. Ass.* 205, 645 (1968).

Overhead Costs during Austerity

The austerity program for scientific research is requiring some adaptations. For example, in our department the cost of publication page charges for a 12-man faculty was \$15,000 last year. This means that page charges cost as much as an additional faculty member. We have been wondering whether the actual scientific communication achieved by the present method is worth the cost. Because we are skeptical, we are trying the following method. Work which is supplementary to an existing key publication will not be published per se but will be written up with no regard to saving space, then will be multilithed, and made available as a numbered "Supplemental Publication"

11 APRIL 1969

Bausch & Lomb Breaks the Cost Barrier to Laser Science Teaching

Now, every high school and college physics department can have a dependable helium-neon gas laser... to demonstrate optical principles, such as interference and diffraction patterns and to perform experiments in making and reconstructing holograms.

\$9950

is its
incredibly
low cost

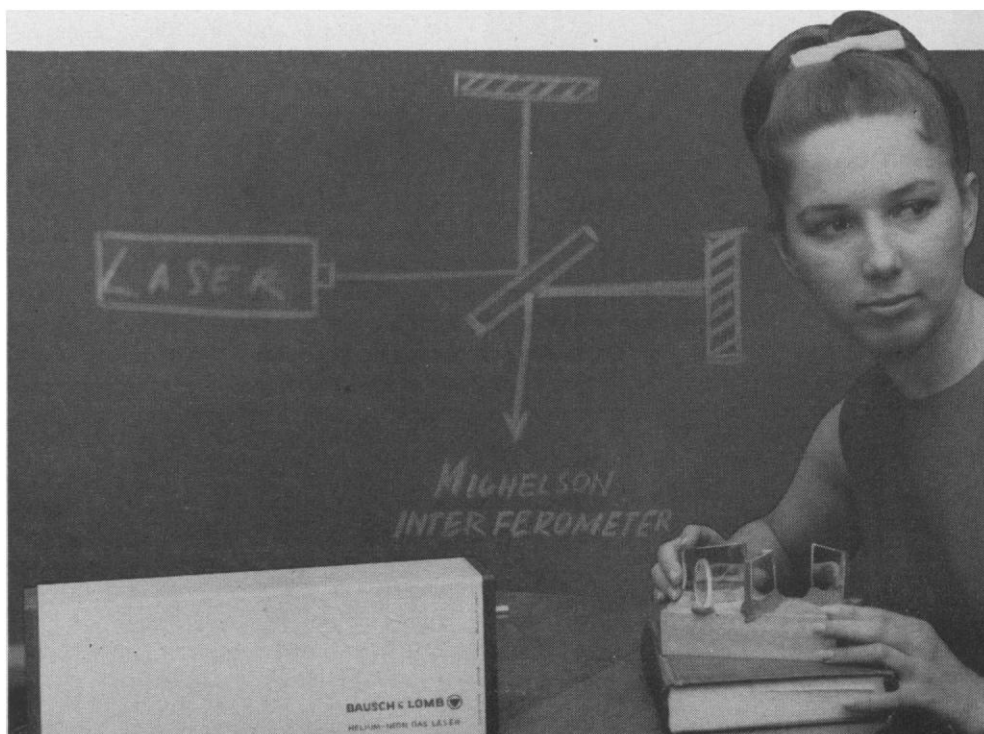
This revolutionary, low-cost laser is designed to be used routinely in classroom experiments. Operation is simple and dependable. Just plug it in and it begins to lase. Its .1mw power output is ideal for classroom use. Produces a monochromatic beam at 6328 Angstroms. Power requirement is standard 115-v, AC, 50-60 cycles.

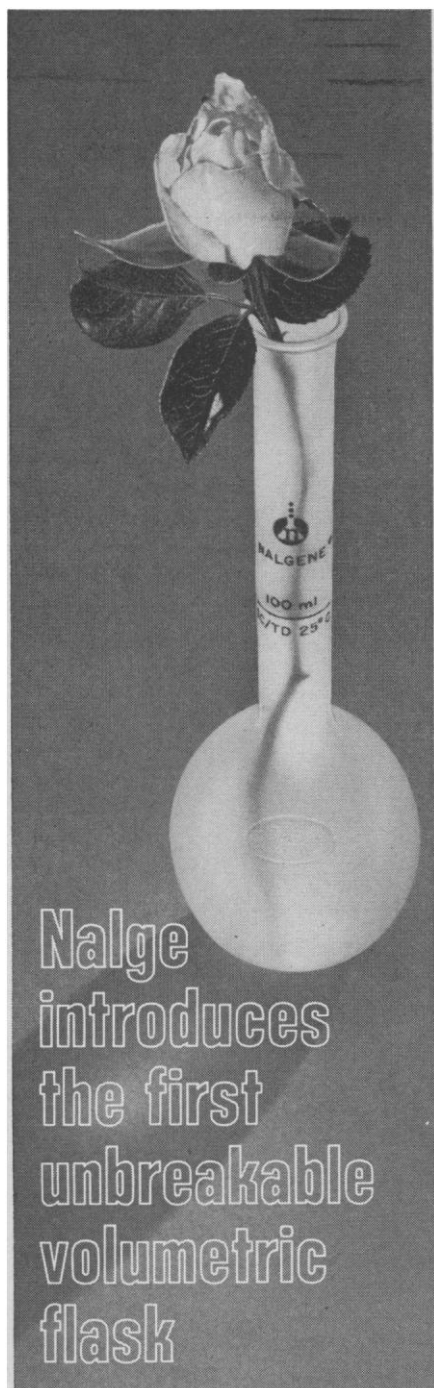
Ask for catalog 41-2306. Or better still, place your order now. Bausch & Lomb, Scientific Instrument Division, 87816 Bausch Street, Rochester, New York 14602.

BAUSCH & LOMB 

SCIENTIFIC INSTRUMENT DIVISION

Circle No. 33 on Readers' Service Card





Precision molded and precision calibrated, the Nalgene® Volumetric Flask is in a class by itself. It won't etch, contaminate or break. Repeated autoclaving won't affect its accuracy. Each flask is individually calibrated to better than $\pm 1\%$.

100 ml size now in stock, 250, 500, and 1000 ml sizes coming soon. Order from your lab supply dealer . . . and specify Nalgene Labware. Ask for our 1968 Catalog or write Dept. 2104, Nalgene Labware Division, Rochester, N.Y. 14602.



VISIT OUR BOOTH AT THE FASEB CONVENTION

Circle No. 85 on Readers' Service Card

of our department. We intend to deposit two bound volumes of these in the university library each year so that Xerox copies can be sent to anyone for the normal cost. In this way we can provide the information whenever it is needed and we can publish the key parts of the research with more brevity. We would also welcome two new avenues of publication: 1000-word summaries and current reviews covering about 10 to 15 papers in one area. We feel this latter exercise would serve to advance the faculty, rather than produce an inchoate mass of publications whose usefulness is in question. This threefold method of publication would save costs, reduce the mass of literature on the shelves, and appreciably increase scientific communication.

Our second area of adaptation causes more concern. It has been our practice to employ undergraduates and high school students in the laboratory. Many of these have become first-rate scientists: all have benefited in increased maturity and responsibility. Now we have to cut them off. If funds from an appropriate agency, such as the Office of Education, could be added to each research grant for this purpose, a real human value would be retained.

In the atmosphere of austerity the overhead which is incurred becomes of real importance and forms a strong point of division between scientists in the laboratory and administrators. Fairman's recent remarks (Letters, 27 Dec., 1968) are pertinent. I suggest that granting agencies require that the use of overhead be explained by the institution to the principal investigators, that discussion of the manner of its use be permitted, and that the agency be aware of what takes place in such discussion.

ERNEST C. POLLARD

Department of Biophysics,
Pennsylvania State University,
University Park 16802

What Makes Oysters Grow?

A letter from Adler (29 Nov.) comments on Bardach's article "Aquaculture" (13 Sept., p. 1098). It is Adler's opinion that Bardach created a wrong impression in a statement to the effect that oyster larvae need flagellate algae for food. Adler says further that "Good larval growth has even been achieved with some nonliving substitute food like corn flour." We are not familiar with

any success at rearing larvae with non-living foods. Either Adler has created a wrong impression of the state of marine animal husbandry, or he knows of a very important breakthrough not generally known to practitioners and scientists in aquaculture. . . .

RICHARD J. BENOIT

EDWARD A. ZURAW

DONALD E. LEONE

Marine Sciences Research and
Development, General Dynamics,
Groton, Connecticut 06340

The search for artificial foods for marine bivalves and their larvae began in the early 1930's (1). In 1940 Bruce *et al.* (2) showed that live, naked flagellates were superior to some other algae for rearing larvae and spat. These studies have been confirmed many times during the past 28 years and laid the foundations for present-day hatchery techniques. Investigators have continued to search for other algae or substances which would give better results. Walne (3), evaluating the food value of seven algal species for oyster larvae, found that the diatom *Phaeodactylum tricornutum* promoted growth comparable to that of flagellates, while Imaya (4) indicated that both *Cyclotella nana* and *Chaetoceros* spp. are well utilized. Somewhat questionable results were obtained by Loosanoff and his co-workers (5) by feeding dried powdered *Ulva* and *Laminaria* to larvae, but when freeze-dried *Schedesmas obliquus* was used, Hidu and Ukeles (6) reported excellent results. Corn starch and corn meal or both were employed in oyster feeding experiments by Haven and an enthusiastic evaluation of its successful application was published by Ingle (7). Benoit and his co-workers might discover additional references by consulting the literature or the researchers mentioned above.

CYRUS ADLER

Offshore/Sea Development
Corporation, 99 Nassau Street,
New York 10038

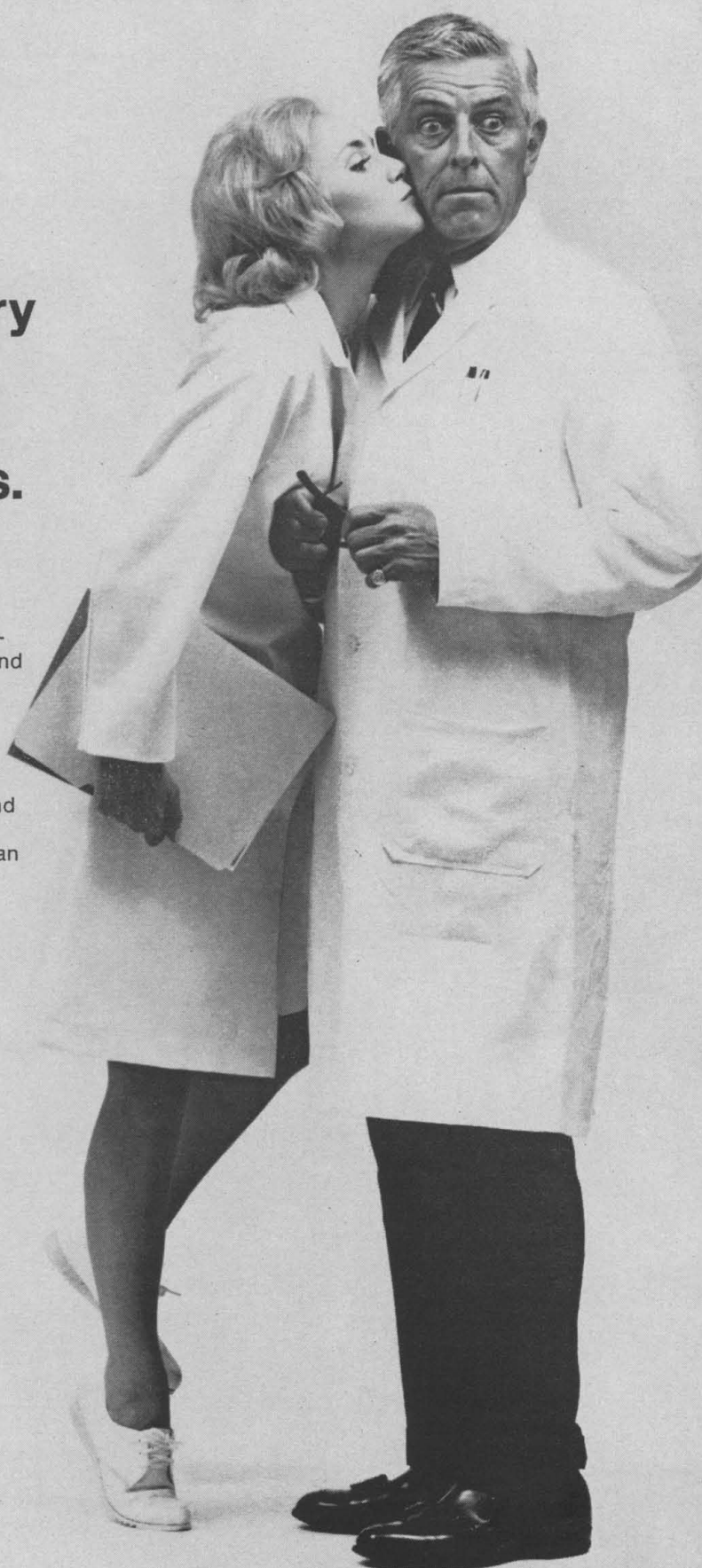
References

1. H. A. Cole, *Fish Invest.* London, ser. 2, 15, 4 (1937).
2. J. R. Bruce, M. Knight, M. Parke, *J. Mar. Biol. Ass. U.K.* 24, 337 (1940).
3. P. R. Walne, *ibid.* 43, 767 (1963).
4. H. Imaya, personal communication; G. C. Matthiessen and R. C. Toner, *Mar. Res. Found. Inc., Martha's Vineyard* (1966), p. 136.
5. V. L. Loosanoff and H. C. Davis, *Commer. Fish. Rev.* 25 (1), 1 (1963); V. L. Loosanoff, *Trans. 29th N. Amer. Wildlife Natur. Resour. Conf.* (1964), p. 332.
6. H. Hidu and R. Ukeles, *Proc. Nat. Shellfish. Ass.* 53, 85 (1962).
7. R. M. Ingle, *Sea Front.* 13 (5), 296 (1967).

Circle No. 40 on Readers' Service Card →

Bringing automated lipid analysis to the laboratory will give you some startling results.

Not the least of which is the gratitude of your technologist for eliminating the tedium usually associated with manual methods of lipid analysis. The Technicon® AutoAnalyzer® simultaneously quantitates triglycerides and cholesterol from one plasma extract at the rate of 40 samples per hour (80 determinations). The system is fast, versatile and fully automatic. It provides the means for performing a great number of analyses rapidly and accurately with a minimal amount of effort. Of course, if you already have an AutoAnalyzer, this capability is available through a modest addition of equipment. For more information, write Department 56, Technicon Corporation, Tarrytown, New York 10591





Fossil remains of Coccolithophorids from the Tropical Indian Ocean. Water depth 5,140m. • Electron Microscope Preparation: W. R. Riedel and Annika San Filippo, Scripps Institution of Oceanography.

Zeiss plumbs the oceans' past

From Jurassic times to Recent the oceans have been gathering the skeletons of Coccolithophorids, the golden-brown algae.

Though only a few microns in diameter, they are so numerous they make up about 30% of the ooze of the sea's floor from 3,000 to 10,000 feet and sometimes deeper. From study of such small evidences can be constructed to a great degree the history of our oceans.

But to see and study them they must be magnified 600 to 25,000 times. This electron micrograph shows an enlargement of 5,400x.

It was taken using the Zeiss EM 9A Electron Microscope. Instruments for plumbing the past or building the future are of concern to Zeiss engineers. Wherever optics are important...in science and industry, in research and application...you can count on...

ZEISS
THE GREAT NAME IN OPTICS



Circle No. 5 on Readers' Service Card

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Science serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

Editorial Board

1969

EMIL HAURY	KENNETH S. PITZER
WILLARD F. LIBBY	ALEXANDER RICH
EVERETT I. MENDELSON	CLARENCE M. ZENER
JOHN R. PIERCE	

1970

GUSTAF O. ARRHENIUS	RICHARD C. LEWONTIN
FRED R. EGGAN	ALFRED O. C. NIER
HARRY F. HARLOW	FRANK W. PUTNAM
MILTON HARRIS	

Editorial Staff

Editor

PHILIP H. ABELSON

<i>Publisher</i>	<i>Business Manager</i>
DAEL WOLFLE	HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

Assistant Editors: ELLEN E. MURPHY, JOHN E. RINGLE

Assistant to the Editor: NANCY TEIMOURIAN

News Editor: JOHN WALSH

Foreign Editor: DANIEL S. GREENBERG*

News and Comment: LUTHER J. CARTER, BRYCE NELSON, PHILIP M. BOFFEY, MARTI MUELLER, SCHERRAINE MACK

Book Reviews: SYLVIA EBERHART

Editorial Assistants: JOANNE BELK, ISABELLA BOULDIN, ELEANORE BUTZ, HELEN CARTER, GRACE FINGER, NANCY HAMILTON, OLIVER HEATWOLE, ANNE HOLDSWORTH, PAULA LECKY, KATHERINE LIVINGSTON, CAROLE MENDOZA, VIRGINIA NUSSLE, LEAH RYAN, LOIS SCHMITT, BARBARA SHEFFER, RICHARD SOMMER, YA LI SWIGART, ALICE THEILE

* *European Office:* 22 Mulberry Walk, London, S.W. 3, England (Telephone: 352-9749)

Advertising Staff

<i>Director</i>	<i>Production Manager</i>
EARL J. SCHERAGO	KAY GOLDSTEIN

Advertising Sales Manager: RICHARD L. CHARLES

Sales: New York, N.Y., 11 W. 42 St. (212-PE-6-1858), ROBERT S. BUGBEE; Scotch Plains, N.J., 12 Unami Lane (201-889-4873), C. RICHARD CALLIS; Medfield, Mass. 02052, 4 Rolling Lane (617-359-2370), RICHARD M. EZEQUELLE; Chicago, Ill. 60611, 919 N. Michigan Ave., Room 426 (312-DE-7-4973), HERBERT L. BURKLUND; Los Angeles 45, Calif., 8255 Beverly Blvd. (213-653-9817), WINN NANCE.

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page 1709, *Science*, 29 December 1967. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

The Generation Gap

The young people who are rebelling all around the world, rebelling against whatever form the governmental and educational systems take, are like the first generation born in a new country listening to their parents' tales of the old country and watching their parents grapple, often clumsily, often unsuccessfully, with the new conditions. They have no firsthand knowledge of the way their parents lived far across the seas, of how differently wood responded to tools, or land to the hoe. They see the tasks which their unaccustomed elders are performing as poorly done; they feel that there must be a better way, and that they must find it.

For now, nowhere in the whole world are there any elders who know what the children know, no matter how remote and simple the societies in which the children live. In the past there were always some elders who knew more—in terms of experience, of having grown up within a system—than any children. Today there are none. It is not only that parents are no longer a guide, but that there are no guides, in the older sense of the term, whether one seeks them in one's own country, or in China, or in India. There are no elders who know what those who have been reared in the last 20 years know about what the next 20 years will be.

All of us who grew up before the war are immigrants in time, immigrants from an earlier world, living in an age essentially different from anything we knew before. We still hold the seats of power and command the resources and the skills which have been used in the past to keep order and organize large societies. We control the educational systems, the apprenticeship systems, the career ladders up which the young are required to climb, step by step.

The elders are separated from the young by the fact that they too are a strangely isolated generation. No generation has ever known, experienced, and incorporated such rapid changes, watched the sources of power, the means of communication, the definition of humanity, the limits of their explorable universe, the certainties of a known and limited world, the fundamental imperatives of life and death—all change before their eyes. They know more about change than any generation has ever known and so stand, over, against, and vastly alienated from the young, who, by the very nature of their position, have had to reject their elders' past. Just as the early Americans had to teach themselves not to daydream of the past but to concentrate on the present, and so in turn taught their children not to daydream but to act, so today's elders have treated their own pasts as incommunicable, and teach their children, even in the midst of lamenting that it is so, not to ask, because they can never understand. We have to realize that no other generation will ever experience what we have experienced. In this sense we have no descendants. At this breaking point between two radically different and closely related groups, both are inevitably very lonely, as we face each other knowing that they will never experience what we have experienced and that we can never experience what they have experienced.

As long as any adult thinks that he, like the parents and teachers of old, can become introspective, invoke his own youth to understand the youth before him, he is lost. But once the fact of a deep, new, unprecedented, worldwide generation gap is firmly established, in the minds of both the young and the old, communication can be established again.

—MARGARET MEAD

Adapted from lecture III, "Culture and Commitment," of the American Museum of Natural History's "Man and Nature Lectures, Series V."

COOL IT!

With a compact
refrigerated circulator.



Any little 12½" x 19" area in your lab is large enough for the new Lauda K-2/R all-stainless steel refrigerated constant temperature circulator to do its job.

And what a job it does.

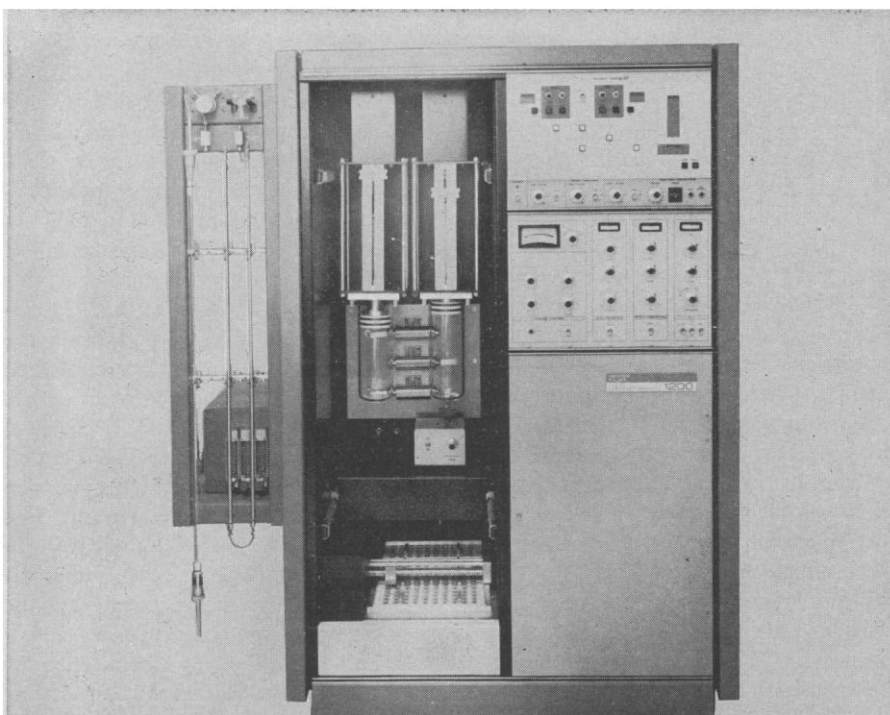
It's ideal for tempering accurately many types of jacketed laboratory appliances at temperatures down to -10°C . Don't let the word "refrigerated" fool you though—the Lauda K-2/R also heats to 150°C . Here are some of its outstanding features: Tecumseh compressor eliminates the need for auxiliary cooling systems such as tap water or dry ice. Reservoir tank, pump, heater, cooling coil and circulating lines (everything that comes in contact with the liquid) are stainless steel. Solid-state electronic control with an exclusive new type of extra-sensitive thermoregulator. Flow control and drain valves facilitate operating and emptying. Top opens for easy filling and immersion of samples. Control accuracy is ± 0.01 to $\pm 0.02^{\circ}\text{C}$. Yet this compact instrument costs only \$595.

Hard to believe?

Why not write for a copy of our new 32-page catalog. It provides information on all of our constant temperature baths and circulators for control from -120 to $+330^{\circ}\text{C}$.

LAUDA Circulators

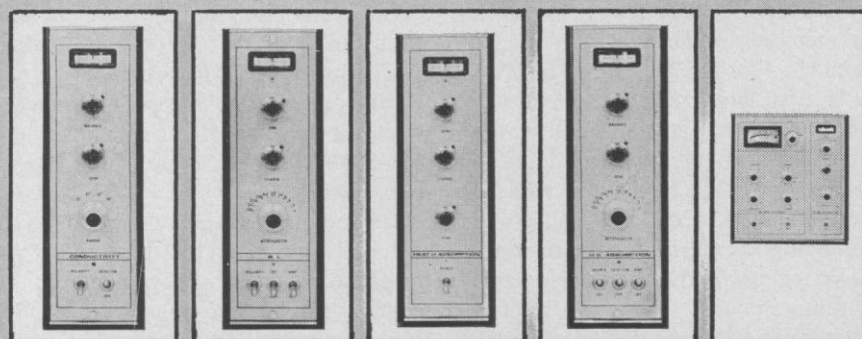
Division of Brinkmann Instruments
Cantiague Rd., Westbury, New York 11590



**YOU CAN BUY
FLAME IONIZATION,
U. V. ABSORPTION,
HEAT OF ADSORPTION,
REFRACTIVE INDEX
AND ELECTRICAL
CONDUCTIVITY
DETECTORS WITH
OUR LIQUID
CHROMATOGRAPH.**

HERE'S WHY.

Nester/Faust's 1200 Liquid Chromatograph is designed to eliminate the tedium and to speed the time required to perform every type of liquid chromatography. This is why our basic chromatograph gives a choice of three methods for sample injection; manual or automatic solvent transport systems; solvent storage; 200-tube X-Y fraction collector; presaturator; debubbler and many column capacities. But to help you do the complete job, you may need to analyze the effluent and solvent for U.V. absorption, refractive index, conductivity, ion current and heat generation. These detectors plug-in for immediate use with 1200... and all you'll ever need for liquid chromatography. See for yourself, ask us for a demonstration. Nester/Faust Mfg. Corp., 2401 Ogle-town Rd., Newark, Del. 19711, (302) 737-6330.



Electrical
Conductivity

Refractive Index

Heat of Adsorption

U.V. Absorption

Flame Ionization



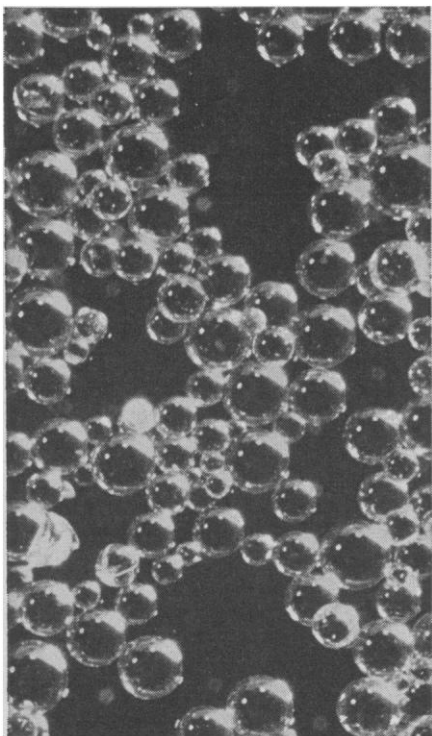
ful attraction of methyl disulfide for the female black blowfly, *Phormia regina*, and allyl isothiocyanate for a flea beetle, *Phyllotreta cruciferae*. Twenty-seven sulfur compounds, including sulfides, disulfides, and mercaptans, attracted the newly hatched larvae of the onion maggot.

Houseflies, especially *Musca domestica*, have long been known to be attracted to mushrooms belonging to the Tricholomataceae and Amanitaceae. T. Muto (Tokyo University of Education) and co-workers extracted the attractive components from the fruiting bodies of *Amanita muscaria* and isolated one of them as a colorless, crystalline substance with the molecular formula $C_{39}H_{72}O_6$ and a melting point of 22° to 23°C, which coincides well with 1,3-diolein. Some related compounds were prepared and 1-monoolein was found to be much more attractive than 1,3-diolein. Ethylene glycol monooleate and monolaurate were the most active compounds tested.

Extracts of the plant *Actinidia polygama* has long been of interest because of its peculiar excitatory effect on both vertebrates (Felidae) and invertebrates (Chrysopidae). T. Sakan (Osaka City University) and co-workers isolated several components from the neutral fraction of both leaves and galls that were attractive to lacewing species. These compounds were identified as neo- and isoneomatatabiol, matatabiol, dehydroiridodiol, iridodiol, 5-hydroxymatatabiether, 7-hydroxymatatabiether, and allo-metatabiol. It was remarkable that these cyclopentanoid monoterpene alcohols were found to be attractive only to the male adults of *Chrysopa septempunctata* and *C. japonica*. Only 10^{-6} µg of neo- and isoneomatatabiol, and 10^{-3} µg of matatabiol and dehydroiridodiol were needed to evoke a response.

K. Munakata (Nagoya University) reported on his interesting studies of insect antifeeding compounds contained in plant leaves. Extracts of *Cocculus trilobus*, *Clerodendron tricotomum*, and *Parabenzoin trilobum* produced strong antifeeding activity for the larvae of *Prodenia litura* when applied to sweet-potato leaves. A known alkaloid, isoboldine, was identified from *C. trilobus*; two new terpene crystals, clerodendrin A, $C_{31}H_{42}O_{12}$ and clerodendrin B, $C_{31}H_{44}O_{12}$ were identified from *C. tricotomum*; and a new sesquiterpene, $C_{19}H_{30}O_5$ (tentative structure, shiromodiol diacetate) was identified from *P. trilobum*.

How do you get the highest resolution consistently in ion exchange chromatography?



Only by using Bio-Rad AG® resins!

BIO-RAD AG resins represent the highest level of purity available for ion exchange chromatography.

AG resins are exhaustively purified and sized to specific ranges to assure sharp resolution and highest reproducibility. For example, the maximum iron content in AG-1 anion resin is 0.00005%.

For the full story on BIO-RAD and its role in ion exchange technology—including valuable data on Bio-Rex resins, specialty resins, resin selection, regeneration and applications—send for our general catalog, Price List T.

BIO-RAD Laboratories

Dept. S-4 • 32nd and Griffin Ave.
Richmond, California 94804

See us at FASEB Booth #O-40-5
Circle No. 80 on Readers' Service Card

11 APRIL 1969

The contributions of the American scientists emphasized insect pheromones. M. Jacobson (U.S. Department of Agriculture, Beltsville) reviewed his pioneering research with the moth pheromones. The first insect sex pheromone was identified and synthesized in 1960 and was isolated from the virgin female gypsy moth, *Porthetria dispar*. The structure of the attractant was shown to be (+)-10-acetoxy-*cis*-7-hexadecen-1-ol, as determined by ultraviolet and infrared spectra, hydrogenation, and oxidation. Also synthesized was an active homolog, (+)-12-acetoxy-*cis*-9-octadecen-1-ol, designated "gyplure," which is used as a field survey tool. Also isolated, identified, and synthesized (by Jacobsen and others) were the sex pheromones produced by female cabbage looper moths (*Trichoplusia ni*), fall armyworm moths (*Spodoptera frugiperda*), and pink bollworm moths (*Pectinophora gossypiella*), shown to be the acetates of *cis*-7-dodecen-1-ol, *cis*-9-tetradecen-1-ol, and 10-propyl-*trans*-5,9-tridecadien-1-ol, respectively.

H. Shorey (University of California, Riverside) discussed the importance of sex pheromone research in providing basic information that may be useful in the design of behavioral control programs. Quantitative bioassays are used to assess male responsiveness to pheromones and other chemicals under various environmental and physiological conditions. They require the establishment of concentration-response curves, that is, the number or proportion of males responding plotted against the logarithmic series of concentrations tested. Essentially all quantitative bioassays to date have been based on the known amount of chemical or extract placed on the substrate for evaporation, with the actual rate of evaporation unknown. Since various substrates and assay techniques are used by different laboratories, results cannot be compared. The ideal quantity is the amount of pheromone per unit volume of air required to induce the specified behavioral response among a specified proportion of males. A consideration of the chemical evolution of lepidopteran sex pheromones suggests that a mechanism is available for the insects to become resistant to such compounds utilized in a control program. More research is necessary to fully elucidate the mechanisms by which male moths orient upwind toward pheromone sources. Control techniques may be based on the use of pheromone-baited traps or on a pheromone-permeated

You don't have to handle personally 673 journals to know what's current in the behavioral, social and management sciences



Now you find out what's in the literature of these disciplines by thumbing through your weekly copy of a new, unique pocket-size journal. **CURRENT CONTENTS/Behavioral, Social, and Management Sciences** reproduces the table of contents of 673 United States and foreign journals covering these and important ancillary fields.

Now, because you can cut the time needed to check on what's being published, you have more time for actual reading. More time for other productive activities, too.

Write for complete information on how **CURRENT CONTENTS/Behavioral, Social, and Management Sciences** can serve as your personal research librarian. We'll include data on the advantages of using our Original Article Tear Sheet service (OATS)® in connection with **CURRENT CONTENTS**®.

ISI®

Institute for Scientific Information

In Philadelphia: ISI, 325 Chestnut St., Phila., Pa. 19106. In Washington, D. C.: ISI, 7315 Wisconsin Ave., Bethesda, Md. 20014. In Europe: A. E. Cawkill, 132 High St., Uxbridge, Middlesex, England or P. Aborn, 6 Square Moncey, Paris 9, France. In Japan: T. Yamakawa, Tsutsumi Bldg., 13-12 1-chome, Shimbashi Minato-Ku, Tokyo, Japan.

©1969 ISI

Circle No. 78 on Readers' Service Card

You can* ignore the all-new, all different **BRAUN FRACTIONATOR SIMPLEX**

* If you have more bench space than you need, (The Fractionator needs less than one square foot for 102 fractions.)

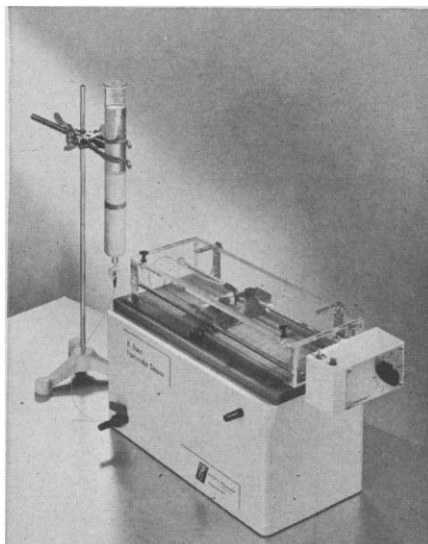
* If you have an empty refrigerator for holding a fraction collector, (The Fractionator has integral cooling.)

* If you have lots of time to analyze your fractions, (The Fractionator can give you **instant analysis**.)

* If you don't mind occasional repairs, (The Fractionator has no on-off cycle, no contacts, no mechanical relays.)

* And if you have a very big budget . . . (The Fractionator costs only \$795.00.)

* To this, add the features of most conventional fraction collectors, a totally new design concept, and a company that's anxious to serve you. The FRACTIONATOR SIMPLEX . . . not to be ignored.



Write for Catalog 7F68 or a demonstration. An exclusive product of Quigley-Rochester, Inc.

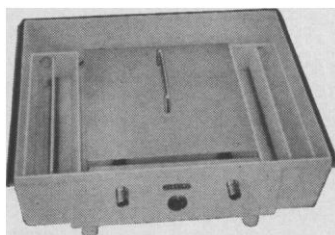
Dept. 66, 250 N. Goodman Street, Rochester, New York 14607.



Circle No. 79 on Readers' Service Card

1000V Electrophoresis Apparatus

**with cooled platen
...ideal for two-
dimensional TLC/TLE**



Take the fullest advantage of high voltage TLE techniques which can produce separations of complex mixtures in less than one hour with very small amounts of samples. This Shandon apparatus is particularly useful in two-dimensional TLC/TLE for the separation of peptide "maps" or "fingerprints." Features include cooled aluminum platen and a safety micro switch current cut-off actuated when the transparent lid is removed.

A 1000-volt, 100 mA power supply is available. For two-dimensional work a wide selection of flat-bottom Chromatanks® and accessories are offered. Write for complete catalog of Shandon TLC/TLE equipment to Shandon Scientific Company, Inc., 515 Broad Street, Sewickley, Pa. 15143 (Pittsburgh District).



PITTSBURGH • LONDON • FRANKFURT

Circle No. 90 on Readers' Service Card

atmosphere to prevent orientation of males to wild females.

The methodology for isolation and identification of insect pheromones with examples from the Coleoptera was presented by R. M. Silverstein (Stanford Research Institute, Menlo Park, California). A mixture of three terpene alcohols constitutes the sex attractant in the frass of male *Ips confusus*; they are compound I—(—)-2-methyl-6-methylene-7-octen-4-ol; compound II—(+)-*cis*-verbenol; and compound III—(+)-2-methyl-6-methylene-2,7-octadien-4-ol. Exo-7-ethyl-5-methyl-6-8-dioxabicyclo [3.2.1]octane is the major component of the sex attractant in the frass of female *Dendroctonus brevicomis*. The synthesized compound is active by itself in laboratory tests, but its activity is enhanced by the terpene hydrocarbon, myrcene, and other components not yet identified. The acid, *trans*-3,*cis*-5-tetradecadienoic, is the sex attractant of female *Attagenus megatoma*.

Laboratory and field bioassay methods utilized in identifying the attractants of *Ips confusus* and *Dendroctonus brevicomis* (see above) were described by D. Wood (University of California, Berkeley). The individual compounds were not active in the laboratory, but the combinations of compound I with either II or III, and the ternary mixture were attractive to both sexes at the submicrogram level. In nature the ternary synthetic mixture was the most potent, and compound I + III was slightly active. Surprisingly, *Ips latidens* was attracted by compound I alone and by I + II. In the laboratory, compound III added to the mixture of I + II eliminated or masked the attraction for *I. latidens*. Two predators of these bark beetles, *Enoclerus lecontei* and *Temnochila virescens chlorodia*, also responded. Attractants produced by sympatric species of *Ips* from different species groups are species-specific while the closely related and allopatric *I. montanus*, *I. lecontei*, and a new species from the same species group are cross-responsive. These species respond to the synthetic compounds at higher concentrations and in different combinations than *I. confusus*.

W. Burkholder (U.S. Department of Agriculture, Madison, Wisconsin) presented his research on the response of the male black carpet beetle, *Attagenus megatoma*, to the synthetic sex attractant (see above). Bioassay conditions for this insect in the laboratory closely approximate those under natural conditions. Preliminary trapping studies with

STIRRED REACTORS

PARR
Series
4500



- Convenient bench-scale units provide complete facilities for applying heat and pressure to any chemical reaction.
- One and two liter sizes.
- Pressures to 2000 psig.
- Temperatures to 350° C.
- Automatic temp. control.
- Available in all principal corrosion resistant alloys.

Ask for Specification 4500

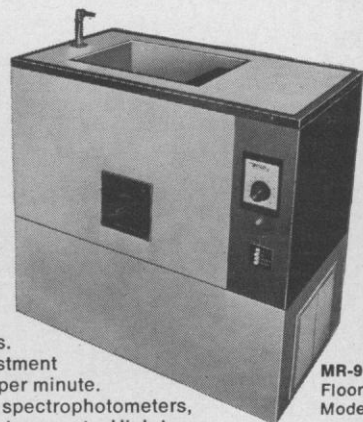
PARR INSTRUMENT COMPANY
211 Fifty-Third St. Moline, Illinois 61265

Circle No. 103 on Readers' Service Card

±0.01°C temperature control stability

Relialab precision temperature baths, circulators and air incubators

You get all three in Relialab Lami-Flow units. Each offers these basic capabilities. Low and high temperature (from -73.3° C to +120° C) baths for use in biological and biochemical applications. Circulators with infinite adjustment of liquid flow up to 450 gals. per minute. Supplies constant coolant to spectrophotometers, refractometers, distillation columns, etc. High-low temperature incubator for a multiplicity of biological and other uses. Transistorized, solid state SCR output. "Automatic reset" proportional controller.



MR-9
Floor
Model



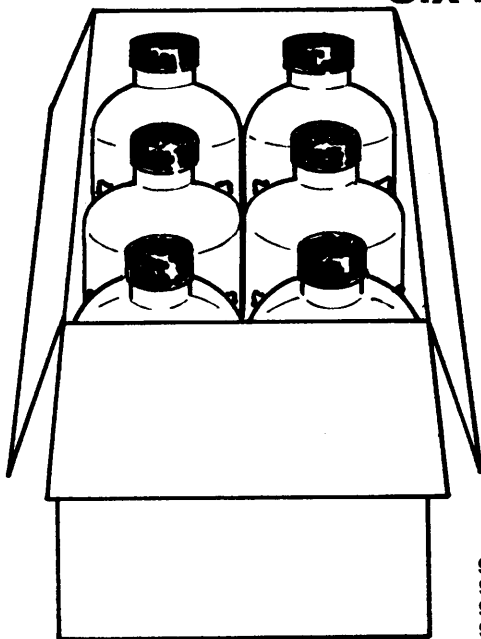
Relialab
by **Tenney**
ENGINEERING, INC.

1090 Springfield Rd., Union, N. J. 07083 • (201) 686-7870

Circle No. 105 on Readers' Service Card

Curtin Buffer 6-Pak

Six bottles for the price of five!



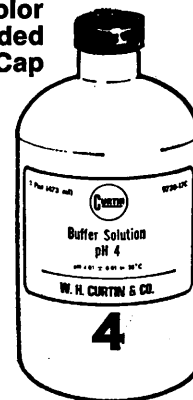
That's right! Buy 5 pint bottles of any Curtin Buffer Solution and you get one more FREE! Curtin Buffers are packaged in polyethylene bottles with color-coded labels and caps to facilitate identification and avoid errors. And each 6-Pak also includes 2 color-coded plastic beakers for your convenience. Curtin Buffers are standardized against primary standards of the National Bureau of Standards. The pH of each is certified accurate to ±0.01. Safety seals protect contents from contamination during storage.

	Buffer pH	Color Code	Pint	6-Pak
9730-16C	7.00	Yellow	2.75	13.75
9730-16D	7.00 Conc.	Yellow	6.50	32.50
9730-17C	4.00	Red	2.75	13.75
9730-18C	10.00	Blue	2.75	13.75

Color
Coded
Plastic
Beaker



Color
Coded
Cap



Color
Coded
Label



CURTIN SCIENTIFIC COMPANY

SCIENTIFIC APPARATUS • CHEMICALS • LABORATORY FURNITURE
HOUSTON • TULSA • LOS ANGELES • NEW ORLEANS • ATLANTA • SAN FRANCISCO • DALLAS
MIDLAND, MICH. • JACKSONVILLE • WASHINGTON • WAYNE, N. J. • MEXICO CITY • MONTERREY
GEO. T. WALKER & CO. DIVISION • MINNEAPOLIS, MINNESOTA

**You mean I can get
\$50,000 of TIAA Life insurance
for less than \$100?**

That's what an Assistant Professor asked us when he heard about TIAA's low life insurance costs.

It's true. At his age 30 the annual premium for a 20-Year Home Protection policy providing \$50,000 initial amount of insurance is \$159.00. The first-year dividend, based on our current dividend scale, is \$61.00, making a net payment of \$98.00. Dividends, of course, are not guaranteed.

The Home Protection plan is level premium Term insurance providing its largest amount of protection initially, reducing by schedule each year to recognize decreasing insurance needs. This is just one example of the many low-cost TIAA plans available. If you need more protection for your family, ask us to mail you a personal illustration with figures for a policy issued at your age. We'll also send the Life Insurance Guide describing other TIAA policies.

ELIGIBILITY

Eligibility to apply for this or other TIAA life insurance is limited to persons employed at the time of application by a college, university, private school, or other nonprofit educational or scientific institution that qualifies for TIAA eligibility.

tiaa ei

TEACHERS INSURANCE AND ANNUITY ASSOCIATION
730 Third Avenue, New York, N. Y. 10017

Please mail the new Life Insurance Guide and a personal illustration.

Name _____ Your Date of Birth _____
Address _____ ZIP _____
Dependents' Ages _____
Nonprofit Employer _____
college, university, or other educational or scientific institution

the synthetic attractant have been successful. The sex pheromones of several stored-product species in this genus are apparently not species-specific. The production of the pheromone generally begins 1 day after metamorphosis to the adult and increases with age. Females gradually lose their attractiveness following mating.

Studies of the sex pheromones of moths that infest stored grains were reported by M. Nakajima (Kyoto University). The whole bodies of 94,000 female almond moths, *Cadra cautella*, were extracted with methylene chloride, and after separations of the inactive fractions by precipitation from cold methanol and from cold *n*-hexane, 7.3 grams of a yellow oil were obtained. This was further purified by chromatography on silicic acid. The colorless oil thus obtained (about 240 mg) was active to male moths at a concentration of 0.1 μ g/ml. Functional group tests and gas chromatographic behavior of the oil suggested that the pheromone may be an acetate of a C_{14} unsaturated alcohol. The species specificity for sex pheromones of the closely related stored grain moths was also discussed. The male moths of *C. cautella*, *Plodia interpunctella*, and *Anagasta kuehniella* exhibited sexual excitement to the pheromone extracted from the female moths of not only their own species but also the other species. However, these species failed to respond to the extracted pheromone of *Phralis farinaria*.

Newly emerged nymphs of the german cockroach, *Blattella germanica*, exhibit strong aggregation behavior (S. Ishii, Kyoto University). Nymphs reared individually are delayed in their growth and development. The active principle(s) was found in the feces and in an ether wash of the body surface, especially the posterior portion of the abdomen. Histological studies show that the epithelium of the anterior rectum consists of six rectal pads. The active principle appears to be secreted from the cells lining these pads into the lumen of the rectum and is excreted with feces. Isolation studies of this aggregation pheromone are in progress.

Pheromone systems have reached their highest development in the social insects where they trigger many complex behavior patterns. Best known are the "alarm" substances typified by 4-methyl-3-heptanone, which is coded to release several types of behavior in *Atta texana* (J. Moser, U.S. Forest Service, Alexandria, Louisiana). In the laboratory bioassay, workers are attracted by a

concentration of 27×10^6 molecules per cubic centimeter, but alarm is released at 270×10^6 molecules per cubic centimeter. In the field low concentrations attract and alarm, and high concentrations repel and alarm. The same pheromone compound can be utilized by diverse groups of insects. Citral repels *A. texana* but is a powerful attractant for honeybees. Inquilines whose biologies are closely tied to those of social insects may use the host's pheromones. Roaches, silverfish, millipedes, and beetles following odor-trail substances of their host ants are good examples.

In honeybees, the behavioral interactions that facilitate social organization are coordinated by a complex pheromone system (N. Gary, University of California, Davis). The enclosed nest, characterized by a high population density and precisely regulated environment, enhances the communication potential of pheromones. Certain aspects of intranest behavior were considered, including defense, food acquisition, exchange, and storage, nest construction, and dominance hierarchies and social organization. Alarm pheromones, isopentyl acetate from the sting gland, and 2-heptanone from mandibular glands, elicit aggression. Attractive pheromones (geraniol, citral, and nerolic and geranic acids) are released by foragers near rich food sources. Queen pheromones, primarily 9-oxo-dec-trans-2-enoic acid, released inside the hive inhibit ovary development in workers and queen cell construction. Outside the hive, queen pheromones attract drones during mating flights and stabilize swarm clusters.

Three scientists reported on their electrophysiological studies of insect chemoreception. The reaction of an insect to the chemicals in its environment may be immediate or delayed (V. Dethier, Princeton University, New Jersey). Delayed reactions include symptoms of toxicity, growth responses, hormonal changes, reproductive variation, and responses mediated through internal feedback systems operating through the agency of interoceptors. Immediate reactions are overt behavioral responses triggered by extroceptive sense organs. The resulting behavior falls into a number of well-defined categories. Plant chemicals are capable of evoking any or all kinds of these behavior patterns. Most of the reactions are related to feeding. Understanding of the relationship is hampered by an almost total lack of knowledge of

Circle No. 32 on Readers' Service Card →

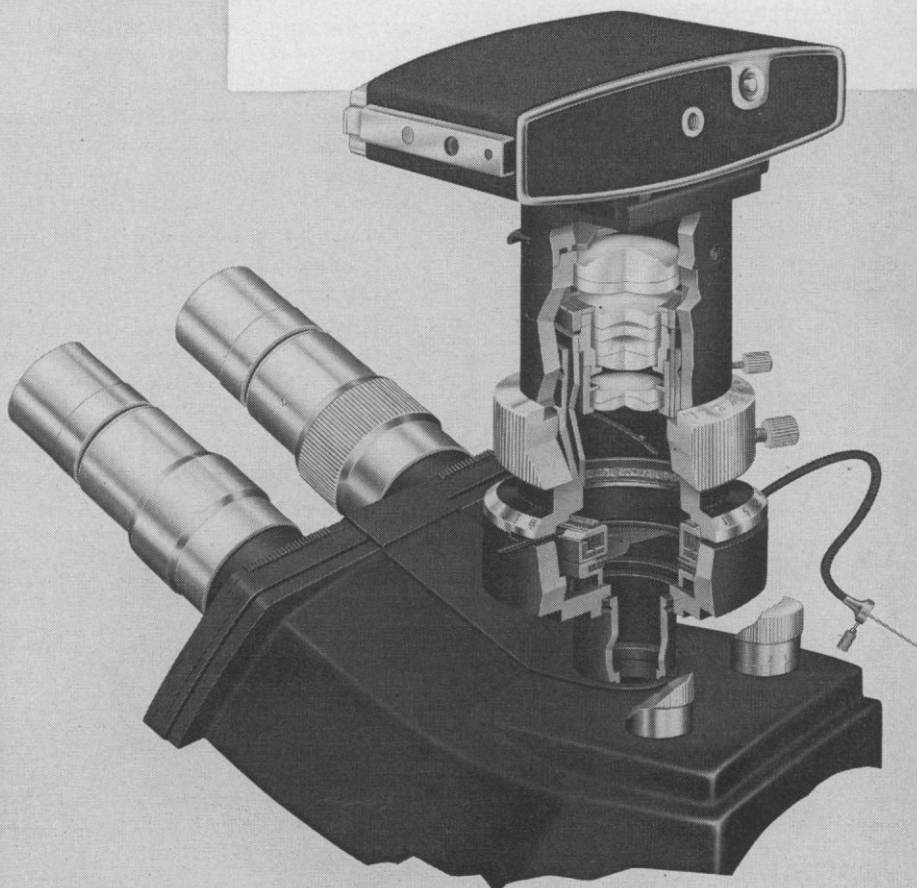


BAUSCH & LOMB 
SCIENTIFIC INSTRUMENT DIVISION

full fidelity flat field to film

Bausch & Lomb's DynaZoom® Microscope with amplifier and interchangeable camera backs assure you the finest possible photomicrographs. The negative amplifier optical system is tailored to that of the DynaZoom/Flat Field optics to give you truly full fidelity recording of the image detail on the film. Highly resolved, curvature-free images stand out bright and clear. Such performance cannot be matched for anywhere near Bausch & Lomb's price. But, seeing is believing. We can arrange for you to try a DynaZoom Microscope with camera in your own laboratory.

Meanwhile, we will send you the deluxe Laboratory Microscope brochure, 31-185. Write Bausch & Lomb, 20816 Bausch St., Rochester, New York 14602.



See inimitable quality in microvision...
See a demonstration of DynaZoom/Flat Field

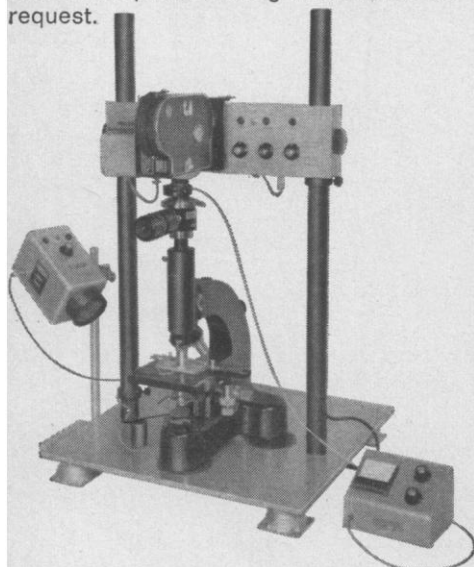
Still using still photos to study living materials?

Time Lapse And 'Normal Speed Motion Pictures Make A Living Record!

Time lapse and normal speed motion pictures record and permit detailed study of every happening... even when you're away from the microscope. Time lapse cinemicrography records the activity of slow-moving living materials, phenomena that would never be seen by an observer working with his eyes and still photos alone. Normal speed permits recording blood flow and other relatively fast moving phenomena.

Sage offers three complete systems at prices ranging from \$1,650. These are units designed to work with any microscope with a phototube. They produce sharp, clear pictures with maximum resolution. Systems feature camera, timing controls, viewing, vibration-isolation, temperature control (optional).

If your work is vital—study and record it with Sage cinemicrography apparatus. Complete catalog information on request.



SAGE INSTRUMENTS, INC.
Subsidiary of Orion Research Incorporated
230 Ferris Ave., White Plains, N.Y. 10603
914 949-4121

Circle No. 87 on Readers' Service Card

the relevant plant chemistry. The operation of the sensory systems involved is becoming increasingly clear as a result of electrophysiological studies. The stimuli that shape feeding are predominantly gustatory and olfactory. The best understood case is that of Cruciferae-feeders. New evidence indicates that marked modification of innate feeding behavior can be brought about by experience.

The chemoreceptors of insects which feed on specific host plants have been studied electrophysiologically by a number of workers (F. Hanson, University of Texas, Austin). As shown by Schoonhoven, some insects have receptors sensitive to phagostimulants which are secondary plant substances. However, no evidence of such was found in *Bombyx mori* by Ishikawa and co-workers; the receptors appear to be stimulated only by nutrients. Recent electrophysiological evidence indicates that the larvae of *Manduca sexta*, the tobacco hornworm, detects volatile secondary plant substances by way of antennal receptors, but may not require specific gustatory phagostimulants other than nutrients.

Antennae of the fruit-piercing moth, *Oraesia excavata*, gave very similar EAG responses to their food attractants and to their repellents (M. Yamada, Nagoya University). Single olfactory receptor cells of this species responded to both materials with an increase in impulse frequency. The single unit activity was extracellularly recorded from the brain of the American cockroach, *Periplaneta americana*. The crude extract of the sex attractant from the female elicited an electrical response from extremely specialized neurons in the brain of the male and female of this species. Many other odorous substances did not excite these neurons.

The papers presented at this seminar will be published early in 1969 by Academic Press, Inc. We recognize the criticism that such symposium volumes are often outdated by the time they are published. Therefore, we have elected to update these articles as of 1 July 1968.

DAVID L. WOOD

Department of Entomology and
Parasitology, University of
California, Berkeley

ROBERT M. SILVERSTEIN

Stanford Research Institute,
Menlo Park, California

MINORU NAKAJIMA

Faculty of Agriculture,
Kyoto University, Japan

Calendar of Events

May

2-3. **Laser**, 2nd conf., New York, N.Y. (L. Goldman, Laser Lab., Children's Hospital Research Foundation, Elland Ave. and Bethesda, Cincinnati, Ohio 45229)

2-3. **Soc. for Pediatric Research**, Atlantic City, N.J. (R. E. Greenberg, Dept. of Pediatrics, Stanford Medical Center, Stanford, Calif. 94305)

2-3. **American Assoc. of University Professors**, Minneapolis, Minn. (B. H. Davis, The Association, 1785 Massachusetts Ave, NW, Washington, D.C. 20036)

2-4. **Soc. of Biological Psychiatry**, Miami Beach, Fla. (G. N. Thompson, 2010 Wilshire Blvd. Los Angeles, Calif. 90057)

2-4. **Wisconsin Acad. of Sciences, Arts and Letters**, Whitewater, Wis. (W. Sarles, Dept. of Bacteriology, Univ. of Wisconsin, Madison 53706)

2-5. **American Psychoanalytic Assoc.**, Miami Beach, Fla. (H. Fisher, 1 E. 57 St., New York 10022)

3. **American Soc. for Clinical Nutrition**, Atlantic City, N.J. (A. B. Eisenstein, 818 S. Meramec Ave., St. Louis, Mo. 63105)

3. **American College of Psychiatrists**, Bal Harbour, Fla. (M. Sabshin, P.O. Box 6998, Chicago, Ill. 60680)

3-8. **American Ceramic Soc.**, 71st., Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

4-5. **American Soc. for Clinical Investigation**, Atlantic City, N.J. (D. H. Nelson, Latter-Day Saints Hospital, Salt Lake City, Utah 84103)

4-6. **American Soc. for Adolescent Psychiatry**, Miami Beach, Fla. (H. D. Staples, 24 Green Valley Rd., Wallingford, Pa. 19086)

4-7. **American Inst. of Chemical Engineers**, 65th natl. mtg., Cleveland Ohio. (The Institute, 345 E. 47 St., New York 10017)

4-7. **American Mining Congr.**, Pittsburgh, Pa. (The Congress, 1100 Ring Building, Washington, D.C. 20036)

4-8. **American Soc. of Brewing Chemists**, Baltimore, Md. (Executive Secretary, The Society, 501 N. Walnut St., Madison, Wis.)

4-8. **Soc. of Plastics Engineers**, 27th, Chicago, Ill. (Director, Member Activities, The Society, 65 Prospect St., Stamford, Conn.)

4-9. **Electrochemical Soc.**, New York, N.Y. (The Society, 30 E. 42 St., New York 10017)

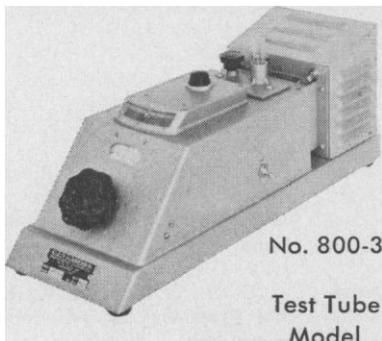
5. **Aerospace Dynamic Balancing**, 2nd symp., San Francisco, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5-6. **Theory of Computing Symp.**, Marina del Ray, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5-7. **Instrumentation Soc. of America, Aerospace Instrumentation Symp.**, Las Vegas, Nev. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

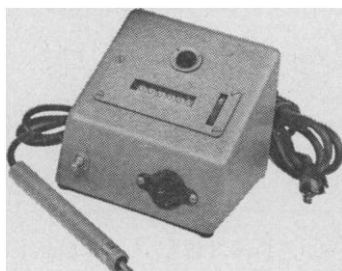
5-7. **American Gynecological Soc.**, New

Klett Summerson Photoelectric Colorimeter



KLETT COLONY MARKER and TALLY

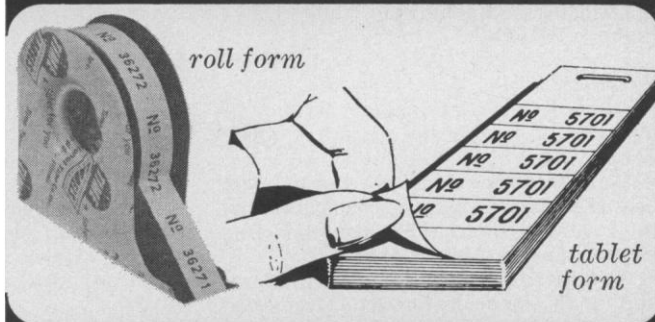
This instrument takes the drudgery and error out of the counting of bacterial colonies.



Klett MANUFACTURING CO., INC.,
179 East 87th Street, New York, 28, N.Y.

Circle No. 101 on Readers' Service Card

TIME CONSECUTIVE NUMBER LABELS



self-sticking numbers for use on test tubes, requisition forms, specimen containers.

Available in roll or tablet form, Time Consecutive Number Labels stick to any surface in temperatures ranging from -70°F to $+250^{\circ}\text{F}$. Numbers can be repeated from 1 to 8 times in roll form, up to 10 times in tablet form. Supplied with standard "No." prefix or your choice of 5 special prefixes. Write for free literature and order instructions.



All Time Tape products are Bacteriostatic for your Safety

AVAILABLE THROUGH LABORATORY
AND HOSPITAL DEALERS

PROFESSIONAL TAPE CO., INC.
365 EAST BURLINGTON ROAD
RIVERSIDE, ILLINOIS 60546

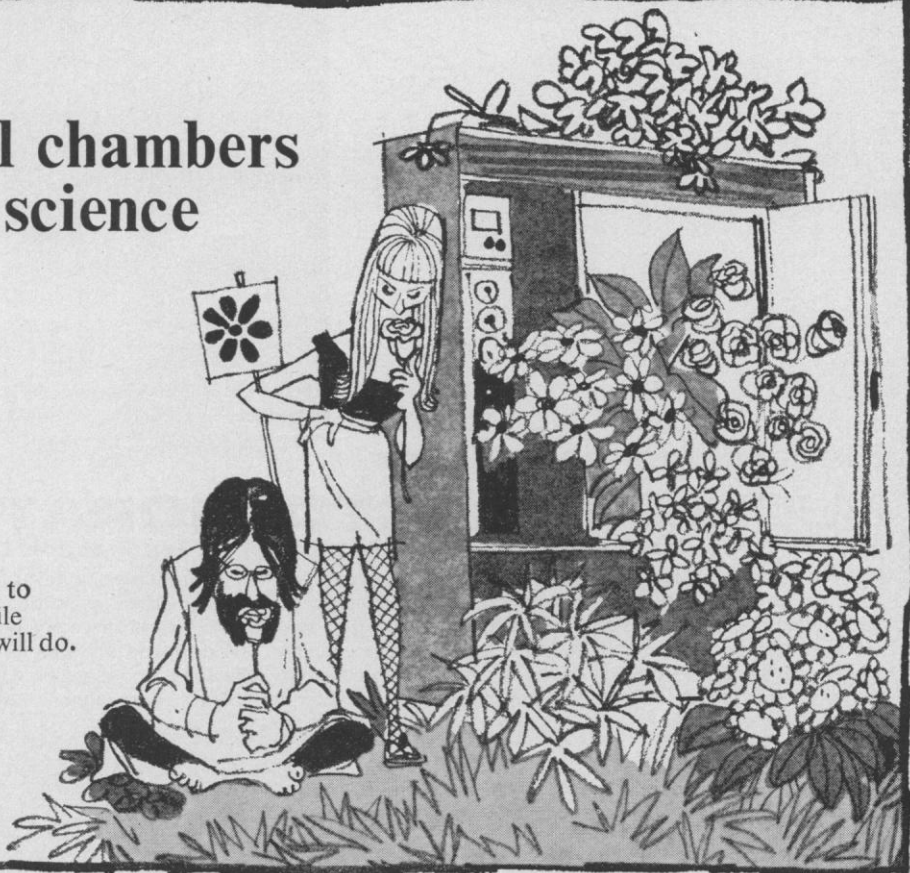
Circle No. 104 on Readers' Service Card

Sherer builds environmental chambers to fit any life science project

Tell us about yours!
We'll recommend a Sherer
environmental chamber or room to
fit it—and send you a ready-to-file
specification packet. A post card will do.



ENVIRONMENTAL DIVISION
SHERER-GILLET COMPANY
Marshall 3, Michigan 49068



Circle No. 51 on Readers' Service Card

Orleans, La. (D. J. Lund, Univ. of Rochester Medical Center, 260 Crittenden Blvd., Rochester, N.Y. 14620)

5-7. **Practical Applications of Radioisotopes to Industry**, Pullman, Wash. (R. M. Chatters, Washington State Univ., Pullman 99163)

5-8. **Society of Aeronautical Weight Engineers**, 28th, San Francisco, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5-8. **Aerospace Medical Assoc.**, 40th, San Francisco, Calif. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

5-8. **Metal Powder Industrial Federation and American Powder Metallurgy**, Inst., 25th, New York, N.Y. (P. K. Johnson, Metal Powder Industries Federation, 201 E. 42 St., New York 10017)

5-8. **Radiation Biology of the Fetal and Juvenile Mammal Symp.**, Richland, Wash. (M. R. Sikov, Biology Dept., Battelle-Northwest, P.O. Box 999, Richland 99352)

5-9. **American Psychiatric Assoc.**, 125th, Bal Harbour, Fla. (Public Information Officer, 1700 18th St., NW, Washington, D.C. 20009)

6-7. **Conference on Waste Management and Disposal for the Food Processing Industry**, University Park, Pa. (J. O. Keller Conf. Center, Pennsylvania State Univ., University Park 16802)

6-8. **Frequency Control Symp.**, Atlantic City, N.J. (Director, Electronic Compo-

nents Lab., U.S. Army Electronics Command, Fort Monmouth, N.J. 07703)

6-8. **Industrial Waste Conf.**, Lafayette, Ind. (D. E. Bloodgood, Sanitary Engineering, Purdue Univ., Lafayette 47907)

6-8. **Microfilm Assoc.**, 18th natl., Boston, Mass. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

7-9. **American Assoc. of Genito-Urinary Surgeons**, Pebble Beach, Calif. (H. M. Spence, 4105 Live Oak St., Dallas, Tex. 75221)

7-10. **American Assoc. for Child Care in Hospitals**, Ann Arbor, Mich. (D. E. Lidgard, University Hospital, Univ. of Michigan Medical Center, Ann Arbor 48104)

7-10. **Association of University Radiologists**, San Francisco, Calif. (A. Gottschalk, 950 E. 59 St., Chicago, Ill. 60037)

8-10. **Breast Cancer**, natl. conf., Washington, D.C. (R. N. Grant, The Conference, 219 E. 42 St., New York 10017)

8-10. **American Assoc. for the History of Medicine**, Baltimore, Md. (C. W. Bodermer, Biomedical History Dept., Univ. of Washington Medical School, Seattle 98105)

8-9. **Military History**, 3rd symp., U.S. Air Force Academy, Colo. (Lt. Col. W. Geffen, Dept. of History, U.S. Air Force Academy, Colo. 80840)

9-10. **Arthritis Seminar**, Roanoke, Va. (R. H. Brumfield, Jr., P.O. Box 1531, Roanoke, 24007)

9-10. **American Natl. Red Cross**, 2nd

research symp., Washington, D.C. (G. A. Jamieson, American Natl. Red Cross, Washington, D.C. 20006)

11-14. **Fluid Controls Inst., Inc.**, Sea Island, Ga. (P.O. Box 1485, Pompano Beach, Fla. 33061)

11-15. **Institute of Food Technologists**, 29th, Chicago, Ill. (C. L. Willey, 221 N. Lasalle St., Chicago 60601)

12-14. **American Soc. for Gastrointestinal Endoscopy**, Washington, D.C. (V. M. Smith, 301 St. Paul Pl., Baltimore, Md. 21202)

12-14. **Workshop on Computer Stimulation of Microbial Processes**, Clemson, S.C. (Office of Industrial and Municipal Relations, College of Engineering, 109 Riggs Hall, Clemson 29631)

12-15. **Seminar on Physical and Chemical Properties of Woodpulp Fibers**, Appleton, Wis. (Technical Assoc. of the Pulp and Paper Industry, 360 Lexington Ave., New York, N.Y.)

12-15. **Mid-America Symp. on Spectroscopy**, 20th, Chicago, Ill. (Illinois Inst. of Technology Research Inst., 10 W. 35 St., Chicago, 60616)

12-15. **American Urological Assoc., Inc.**, San Francisco, Calif. (W. P. Didusch, 1120 N. Charles St., Baltimore, Md.)

12-16. **American Industrial Hygiene Conf.**, Denver, Colo. (The Association, 14125 Prevost, Detroit, Mich. 48227)

12-16. **Soc. of Photographic Scientists and Engineers**, Los Angeles, Calif. (The Society, 1330 Massachusetts Ave., NW, Washington, D.C. 20005)

For
Preparative
Electrophoresis
on Gels...

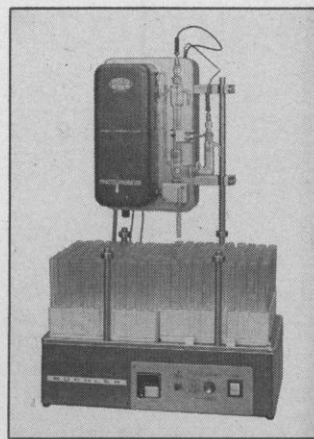
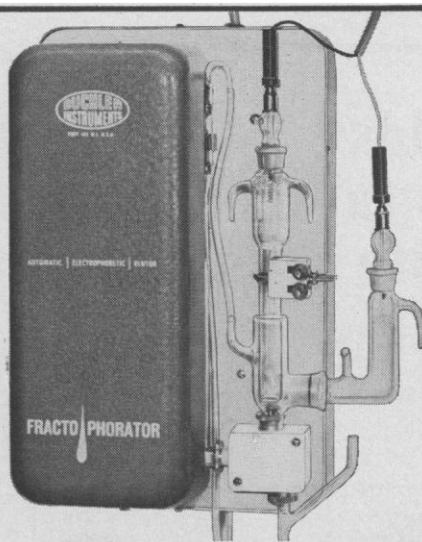
New Automatic
Electrophoretic Elutor

BUCHLER FRACTOPHORATOR™

Now You Can Use Almost Any Gel... Any Buffer... Any Fraction Collector!

The Fractophorator, for disc electrophoresis, is designed for the separation of proteins, hemoglobin, albumin, enzymes and other compounds, using polyacrylamide or any other supporting medium. It automatically elutes in pre-determined amounts of buffer solution, individual bands emerging from the electrophoretic column and delivers the fractions to a collector. The complete unit can be attached to any electrically driven fraction collector and is activated by the collector's timing system. Load capacity is from a few micrograms to 25 mgm in a 13mm diameter by 130mm long column. Price: \$570.00

For further information write for Technical Bulletin S3-1800



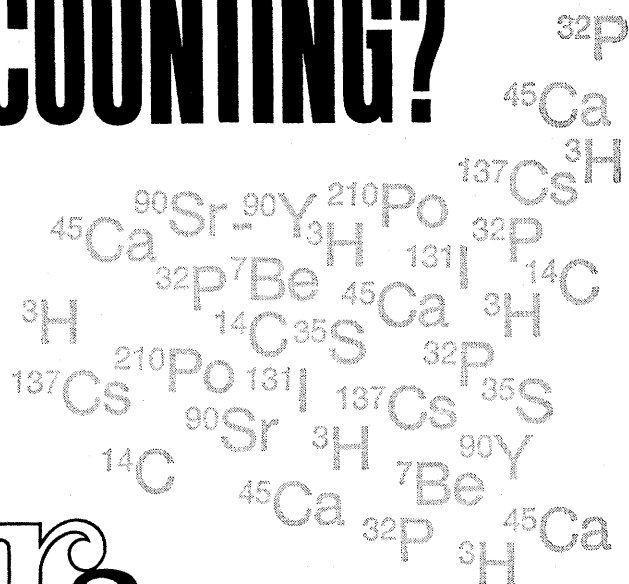
Fractophorator is shown with Buehler Fractomette 200 Fraction Collector.



LABORATORY APPARATUS • PRECISION INSTRUMENTS
BUCHLER INSTRUMENTS, INC.
1327 16TH STREET, FORT LEE, NEW JERSEY 07024

Circle No. 58 on Readers' Service Card

SCINTILLATION COUNTING?



Reeve angel GLASS FIBER PAPERS

In liquid scintillation counting of filtered materials, all filtration media may look alike, but only Reeve Angel Glass Fiber Filter Papers allow high counting efficiency, by eliminating quenching of the radiation or absorption of the scintillation encountered with other filtration media. Glass Fiber Papers also have the ability to absorb twice as much material, letting you work with larger samples... at one-fifth the cost of other filtration media.

Reeve Angel Glass Fiber Filter Papers offer a unique combination of properties: fast flow rate, finer particle retention, high resistance to chemical attack, and temperature stability... making them ideal for water and sewage analysis... cell harvesting... bacterial filtration... clinical sampling... dust sampling and gas testing. They are made entirely from borosilicate glass microfibers, without the addition of organic fibers or binders of any kind.

For further information, call or write for our free Glass Fiber Filter Paper Data Sheet.

Reeve angel

H. Reeve Angel & Co., Inc.
9 Bridewell Place, Clifton, New Jersey 07014
Phone: (201) 773-5800

Circle No. 53 on Readers' Service Card

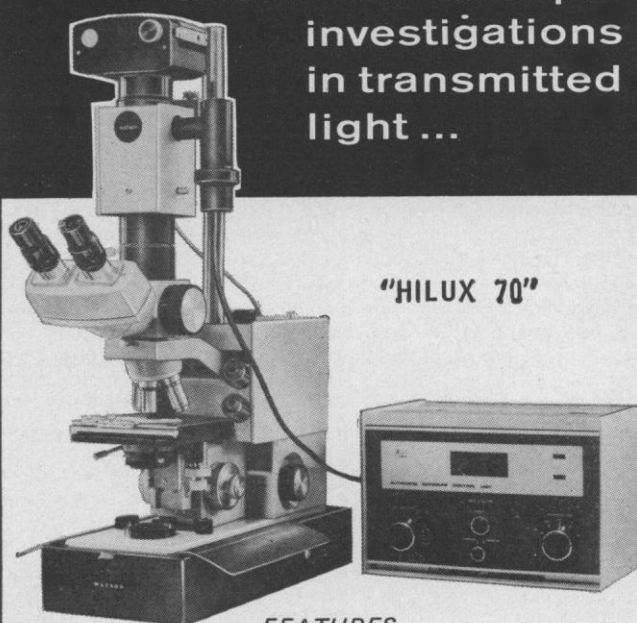
11 APRIL 1969

perfect photos
automatically...

new modern biological
camera microscope
designed for
easy, vibration-free

photomicrography
and projection

and all microscopic
investigations
in transmitted
light...



FEATURES...

- Interchangeable 35mm and Polaroid cameras for manual, semi-automatic and fully automatic operations.
- Fully automatic 35mm camera operates shutter, computes exposures and advances film.
- Beam splitter with choice to direct: 100% of light to camera or observation tubes - 50% to camera and 50% to observation tubes.
- Built-in high intensity halogen lamp illumination system.
- Instant conversion into efficient microprojector.
- Bright and darkfield, phase contrast, polarized light, blue light fluorescence microscopy, etc.
- Wide range of parachromatic, plane, fluorite and apochromatic objectives, field flatness corrected.
- Immune to vibration, stage drift and backlash.
- Maximum working comfort, simple to operate.
- Priced - \$ 3,350.00 - Complete!

request brochure or demonstration...

H/I

Hacker Instruments

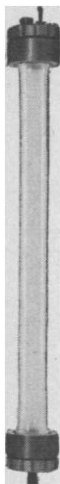
Box 646, West Caldwell, N. J. 07006 (201) 226-8450

Circle No. 56 on Readers' Service Card

213

Now in bead form for chromatography of biologic substances...

Sephadex

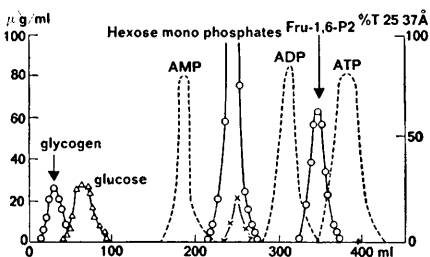


Ion Exchangers

Because of its advantages—stability and inertness—Sephadex has been used to produce a new class of ion exchangers: DEAE-, CM- and SE-Sephadex. Since their introduction they have been used extensively, particularly in the biochemical and clinical field.

In the new bead form they will be more useful both for laboratory and manufacturing scale processes. Their spherical shape gives increased mechanical strength and leads to easier column packing. More uniform particles result in improved hydrodynamic properties.

All Sephadex Ion Exchangers have a high capacity and low nonspecific adsorption. They are available in two types that differ in porosity, thus offering flexibility for your specific requirements. Sephadex Ion Exchangers are of analytic grade purity and are produced under rigorous quality control, thus ensuring uniform products to give accurate and reproducible results.



Model experiment with glycogen, glucose, sugar phosphates and adenosine phosphates on a column of DEAE-Sephadex A-25. (From Biochim. Biophys. Acta 74 (1963) 588, by permission of the author)

Anion Exchangers (Bead Form)

Type	Grade	Ionic Form	Capacity (meq/g)	Bed Volume ¹ (ml/g)
DEAE-Sephadex A-25	40-120 μ	Cl ⁻	3.5 $\pm$ 0.5	5-9
DEAE-Sephadex A-50	40-120 μ	Cl ⁻	3.5 $\pm$ 0.5	25-33

Cation Exchangers (Bead Form)

Type	Grade	Ionic Form	Capacity (meq/g)	Bed Volume ¹ (ml/g)
CM-Sephadex C-25	40-120 μ	Na ⁺	4.5 $\pm$ 0.5	6-10
CM-Sephadex C-50	40-120 μ	Na ⁺	4.5 $\pm$ 0.5	32-40
SE-Sephadex C-25	40-120 μ	Na ⁺	2.3 $\pm$ 0.3	5-9
SE-Sephadex C-50	40-120 μ	Na ⁺	2.3 $\pm$ 0.3	30-38

1. In Tris-HCl buffer, pH = 8.3, ionic strength = 0.05.
2. In sodium phosphate buffer, pH = 6, ionic strength = 0.06.

For additional technical information, including booklet on Sephadex Ion Exchangers, write to:

PHARMACIA FINE CHEMICALS INC.
800 Centennial Avenue, Piscataway, N. J. 08854
Pharmacia (Canada) Ltd., 110 Place Cr  mazie,
Suite 412, Montreal 11, P. Q.

(Inquiries outside U.S.A. and Canada should be directed to PHARMACIA FINE CHEMICALS, Uppsala, Sweden.)

Circle No. 88 on Readers' Service Card

12-17. American Assoc. on Mental Deficiency, San Francisco, Calif. (J. J. Noone, 5201 Connecticut Ave., NW, Washington, D.C. 20015)

13-16. Society for Experimental Stress Analysis, Philadelphia, Pa. (P. Monchamp, 21 Bridge Sq., Westport, Conn. 06880)

14-16. Spring Joint Computer Conf., Boston, Mass. (A. Levine, 105 Newbury St., Boston 02116)

14-16. American Helicopter Soc., 25th, natl. forum, Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

14-17. American Gastroenterological Assoc., Washington, D.C. (D. Cayer, 2240 Cloverdale Ave., Winston-Salem, N.C. 27103)

14-17. Society of Technical Writers and Publishers, 16th, Washington, D.C. (C. T. Youngblood, Suite 421, 1010 Vermont Ave., NW, Washington, D.C. 20005)

15-16. Southern Textile Research Conf., Hilton Head Island, S.C. (G. F. Walz, Proximity Print Works, Greensboro, N.C. 27405)

16. Symp. on Oil Pollution of the Sea, Cambridge, Mass. (J. A. Fay, Room 30246, Massachusetts Inst. of Technology, Cambridge 02139)

16-17. Nature and Function of Peroxisomes, New York, N.Y. (J. F. Hoff, Dept. of Chemistry, Queens College, Flushing, N.Y. 11367)

18-19. Council of Biology Editors, Cambridge, Mass. (R. E. Gordon, Dean's Office, College of Science, Univ. of Notre Dame, Notre Dame, Ind. 46556)

18-21. Institute of Electronic and Electrical Engineers Power Industry Computer Applications Conf., Denver, Colo. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

18-21. Radiation Research Soc., 17th, Cincinnati, Ohio. (F. Smith, Biology Dept. American Univ., Washington, D.C. 20016)

18-21. American Thoracic Soc., Miami Beach, Fla. (Executive Secretary, 1790 Broadway, New York 10019)

18-22. National Tuberculosis Assoc., 65th, Miami Beach, Fla. (J. E. Perkins, 1790 Broadway, New York 10019)

18-23. Conf. on Mass Spectrometry and Applied Topics, 17th, Dallas, Tex. (J. M. McCrea, c/o Applied Research Lab., U.S. Steel Corp., Monroeville, Pa. 15146)

19-20. Rolamite Technology Seminar, Chicago, Ill. (J. Weidman, III, Director of Public Relations, Hamilton Watch Co., Lancaster, Pa. 17604)

19-21. Aerospace Electronics Conf., Dayton, Ohio. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

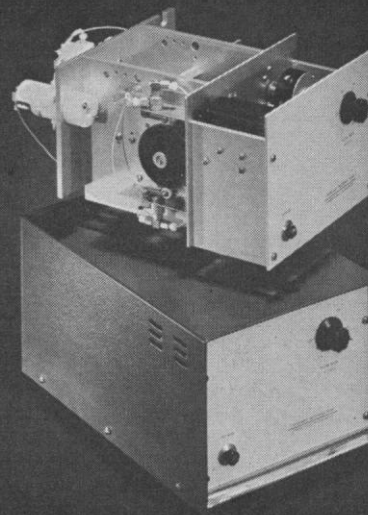
19-21. Interdisciplinary Conf., 1st, Houston, Tex. (M. A. Wright, Humble Oil and Refining Company, Box 2180, Houston 77001)

19-21. New Dimensions in Legal and Ethical Concepts for Human Research, New York, N.Y. (I. Ladimer, Mt. Sinai Medical School, Fifth Ave. and 100 St., New York 10029)

19-23. Western Anesthesiology Conf., Salt Lake City, Utah. (J. Stringham, 11 S. 5th E., Salt Lake City 84106)

19-30. Selected Applications of Computers in Engineering, Ann Arbor, Mich.

Most precise
metering
pump you can
buy—.02%!



This field-proven chemically-inert pump sets pulse-free flows repeatable to .02% at pressures to 500 psi. Two cam-actuated pistons driven through a gear shift by a synchronous motor produce a smooth, constant flow, independent of liquid pressure and viscosity.

Flow rates of 2.4, 6, 12, 24, 60 and 120 ml/hour or 12, 30, 60, 120, 300 and 600 ml/hour are selected by front-panel gear shift with an absolute accuracy of 0.2%. When you set "60 ML/HOUR," you get 60 ml/hour $\pm$ 0.2%. And the rate you get is repeatable from day to day to within 0.02%.

You can pump nearly any liquid—however reactive—because only Teflon, Kel-F and borosilicate glass touch the stream. No rubber "O" rings or steel parts contact the liquid.

The pulse-free high-pressure model has a unique feature, a third pre-pressuring piston that prevents flow transients when the valves switch from one drive cylinder to the other.

Cost is \$980 to \$1480, depending on maximum flow and pressure ratings.



CHROMATRONIX

Chromatronix, Incorporated, 2743 Eighth St., Berkeley, Calif. 94710. Phone (415) 841-7221

Circle No. 86 on Readers' Service Card

(Engineering Summer Conf., Univ. of Michigan, Chrysler Center, Dept. 58, Ann Arbor 48105)

19-30. **Numerical Methods, Optimization Techniques, and Process Simulation for Engineers**, Ann Arbor, Mich. (Engineers Summer Conf., Univ. of Michigan, Chrysler Center, Dept. 58, Ann Arbor 48105)

20. Association for the Advancement of **Psychoanalysis**, New York, N.Y. (M. Lee, Public Relations Committee, The Association, 329 E. 62 St., New York 10021)

21-23. Symp. on **Electron, Ion, and Laser Beam Technology**, Gaithersburg, Md. (L. Marton, Natl. Bureau of Standards, Washington, D.C. 20234)

21-24. **Acute Medicine**, 3rd symp., Pittsburgh, Pa. (Postgraduate Medical Program, Univ. of Pittsburgh, 1188 Scaife Hall, Pittsburgh 15213)

22-23. IEEE Workshop on **Applied Magnetics**, Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

22-23. **Diseases in Nature Transmissible to Man**, 19th southwestern conf., San Antonio, Tex. (S. S. Kalter, P.O. Box 2296, San Antonio 78206)

24-26. National **Tuberculosis and Respiratory Disease Assoc.**, Miami Beach, Fla. (J. E. Perkins, The Association, 1740 Broadway, New York 10019)

25-27. **Drug Information Assoc.**, Detroit, Mich. (J. J. Harris, Public and Professional Relations Committee, c/o Schering Labs, 1011 Morris Ave., Union, N.J. 07083)

25-29. National Conf. on **Social Welfare**, 96th, New York, N.Y. (B. B. Shepherd, The Conference, 22 West Gay St., Columbus, Ohio 43215)

26-27. **Rheumatoid Factors**, New York, N.Y. (H. Bartfeld, St. Vincent's Hospital, 153 W. 11 St., New York 10011)

26-28. Symp. on Advances in Instrumentation for **Air Pollution Control**, Cincinnati, Ohio. (A. P. Altshuler, Natl. Air Pollution Control Administration, 5710 Wooster Pike, Cincinnati 45227)

26-28. IEEE Conf. on **Laser Engineering and Applications**, Washington, D.C. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

26-28. Advanced **Marine Vehicle and Propulsion Mtg.**, Seattle, Wash. (Technical Mtgs. Information Service, 79 Drumlin Rd., Newton Centre, Mass. 02159)

26-28. American **Ophthalmological Soc.**, Hot Springs, Va. (S. D. McPherson, Jr., 1110 W. Main St., Durham, N.C. 27701)

29-1. Congress on Medical and Related Aspects of **Motor Vehicle Accidents**, New York, N.Y. (Secretariat, Internatl. Assoc. for Accident and Traffic Medicine, 520 First Ave., New York 10016)

International and Foreign Meetings

May

11-18. International Exhibition on **Diagnostics**, Munich, Germany. (Munchener Messe-und Ausstellungs-Gesellschaft MBH, Theresienhohe 13, 8 Munich 12)

15-18. International **Revolving-Shutter Products Fair**, Stuttgart, Germany. (Stutt-

11 APRIL 1969

LOURDES



**BETA-FUGE™ SAYS
"YES"**

TO EVERYTHING YOU EXPECT

CAPACITIES TO 4,000 ml ☆ FORCES TO 41,300 x G

SPEED. CAPACITY. VOLUME. FORCE. AUTOMATION. CONVENIENCE.
For Batch and Continuous Flow procedures from -20°C to $+40^{\circ}\text{C}$, the Lourdes Beta-Fuge Model A-2 offers unparalleled work/economy potential. Seventeen meticulously engineered features make the A-2 your finest centrifuge investment . . . by far. Full factory services. For more details, see Guide to Scientific Instruments. For full information, ask your dealer or write.

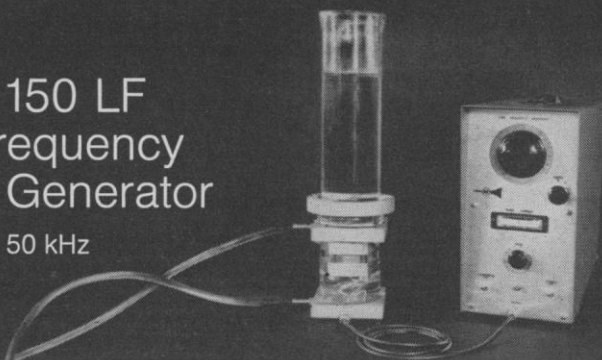
LOURDES INSTRUMENT CORPORATION
OLD BETHPAGE, L. I., NEW YORK 11804 516-694-8686



Circle No. 27 on Readers' Service Card

New... Multisons® 150 LF Variable Frequency Ultrasonic Generator

RANGE . . . 10 TO 50 kHz



Shown driving a 25 kHz oil cooled irradiation cell, other frequencies available

SPECIFICATIONS

Nominal Frequency Range: 10 to 50 kHz.
Line Input: 460 watts.
Generator RF Output: 125 to 150 watts.
Output Impedance: between 200 and 450Ω.
Continuous variable frequency control.
Continuous variable output control.
Line Power Requirements: 110-120 volts, 60 cycles.
Generator Size: 12"H x 6 3/4"W x 19"D.
Generator Weight: 38 lbs.

APPLICATIONS

Cell destruction
Cell extraction
Emulsification of multiphase liquid systems
Cleaning
Sonochemical reactions
Particle dispersion and agglomeration
This new 150 LF Generator fills a growing need for an inexpensive driver which provides a choice of irradiating frequencies in the sonic and lower end of the ultrasonic spectrum. Write for Bulletin 109 which provides complete data on equipment and applications.

Price \$900.



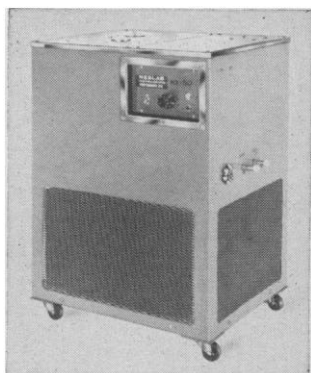
PIONEERS IN APPLIED SONICS AND ULTRASONICS

MACROSONICS CORPORATION

880-884 Elston St. • Rahway, N.J. 07065

FRENCH REPRESENTATIVE: Societe Luziesa, 70 Rue J.P. Timbaud, 75 Paris XI
Tel: 023.48.22

Circle No. 81 on Readers' Service Card



WHY WASTE 3,839,800* gallons of water yearly?

HX-50
Capacity: 1.4 KVA
Flow: 8 gpm (max)
Pressure: 20 psi max
Temp. Control: $\pm 0.3^{\circ}\text{C}$

If you use tap water to cool EPR and NMR magnets, electrophoresis units or other heat producing equipment, you can waste almost 4 million gallons of water a year! You can also suffer from temperature and pressure instability, clogged filters, water shut off and other problems.

A Neslab HX series Refrigerated Recirculating Heat Exchanger will operate with less effort and considerable increase in the reproducibility of results. It saves plenty of water, too . . . a mighty important consideration in this era of water shortages.

We offer several models with cooling capacities from 1.4 to 10 KVA and a variety of output pressures and temperature controls. Priced from \$900.

*Based on 8 gpm 24 hr. operation

NESLAB
Instruments, Inc.



Temperature Controlled
Liquid Systems

871 Islington St., Portsmouth, N.H. 03801

Circle No. 95 on Readers' Service Card

garter Ausstellungs GMBH, Postfach 990, 700 Stuttgart 1)

26-30. **Spectroscopy**, 15th intern. colloquium, Madrid, Spain. (Secretary, XV Colloquium Spectroscopium Internationale, Serrano 119, Madrid 6)

27-31. International Assoc. of **Thalassotherapy**, 14th, Eforie Nord, Roumania. (Prof. Biculescu, Strada Transilvaniei 47, Bucharest, Roumania)

27-1. German Congr. for **Medical Continuation Studies**, 18th, Berlin. (Kongressgesellschaft fur Artliche Fortbildung, Klingsortstr. 21, Berlin 41)

28-7. **Pro Aqua** Congr., 4th, Basel, Switzerland. (O. Jaag, % Secretariat Pro Aqua, Basel 21)

29-3. International Assoc. for **Accident and Traffic Medicine**, 3rd, New York, N.Y. (M. Helpert, % Office of Chief Medical Examiner, 520 First Ave., New York 10016)

29-19. General Assembly of Pan-American Inst. of **Geography and History**, Washington, D.C. (C. A. Forray Rojas, Ex-Arzobispado 29, Mexico, D.F. Mexico)

June

1-12. Symposium on **Non-Destructive Testing of Concrete and Timber**, London, England. (Institution of Civil Engineers, Great George St., London, S.W.1)

2-6. International Symp. on **Yeasts**, Delft and The Hague, Netherlands. (L. Rodrigues de Miranda, Organizing Committee, Julianalaan 67A, Delft)

3-13. International Conf. on **Arid Lands in a Changing World**, Tucson, Ariz. (International Arid Lands Conf., % Dept. of Geochronology, Univ. of Arizona, Tucson 85721)

4-6. **Automated Analysis**, intern. congr., Chicago, Ill. (J. E. Golin, Technicon Corp., Ardsley, N.Y. 10502)

4-7. Union of **Textile Chemists and Colorists**, 21st congr., Baden-Baden, Germany. (The Union, Rohsbacherstr. 78, Heidelberg, Germany)

5. European Federation of International College of **Surgeons**, London, England. (F. P. Fitzgerald, 129 Harley St., London, W.1)

5-7. **Mineralogical** Assoc. of Canada, Montreal, P.Q. (J. Beland, Dept. of Geology, Univ. of Montreal, Montreal)

5-11. **Forensic Sciences**, 5th intern., Toronto, Ont., Canada. (L. Ball, Center of Forensic Sciences, Dept. of Attorney General, 8 Jarvis Street, Toronto 2)

6-9. Canadian **Pediatric Soc.**, Montreal, P.Q. (J. H. V., Marchessault, 14 Green Ave., St. Lambert, Quebec City, P.Q.)

8-14. Canadian **Medical Assoc.**, 102nd, Toronto, Ont., Canada. (The Association, 170 St. George Street, Toronto, Canada)

9-11. International **Communications** Conf., Boulder, Colo. (M. Nesenbergs, Environmental Science Services Administration, Inst. for Telecommunication Sciences, R614, Boulder 80302)

9-12. International **Food** Congr. and Exhibition, 7th, Madrid, Spain. (L. Naranon, % Federacion Nacional de Almacenistas de Alimentacion, Paseo del Prado 18-20, Planta 11, Madrid)

9-13. **Clean Air** Congr. and Exhibition, Dusseldorf, Germany. (V. Deutscher, Postfach 1139, 4 Dusseldorf 1)

TO BE UNVEILED AT THE **FASEB SHOW**

APRIL 14 - 18

**DON'T MISS...
Seeing Our Completely
NEW UNI-THERM LINE**

BOOTH D-22 AND D-23

- LABORATORY
- CLINICAL
- INDUSTRIAL
- REFRIGERATORS ● FRACTION COLLECTORS
- FREEZERS ● INCUBATORS ● BLOOD BANKS

PUFFER-HUBBARD REFRIGERATOR DIVISION

GRAND HAVEN, MICHIGAN 49417
TELEPHONE 616 / 842-2080

Challenge Stamping & Porcelain Co.

Circle No. 59 on Readers' Service Card

*ask for a demonstration
of the new compact...*

DESK MODEL PHYSIOGRAPH[®]

It's a precision engineered life science recorder, capable of accurately measuring and recording up to five physiological parameters simultaneously. In addition to four rectilinear or curvilinear recording channels, it features an optional servo channel for full chart width recording of a fifth parameter. It accepts E & M's complete range of transducers, preamplifiers and accessories.

The Desk Model Physiograph is also rugged, student proof, reliable, flexible, and, in addition to being compact, it is amazingly simple to operate.

Seeing is believing. Call or write for a demonstration in your lab or office . . . at your convenience.

Write for 48 page illustrated catalog No. 107.

E & M INSTRUMENT CO., INC.

P. O. Box 12511F 7651 Airport Blvd. Houston, Texas 77017 USA



Cable: FISIO

Telephone (713) 644-7521

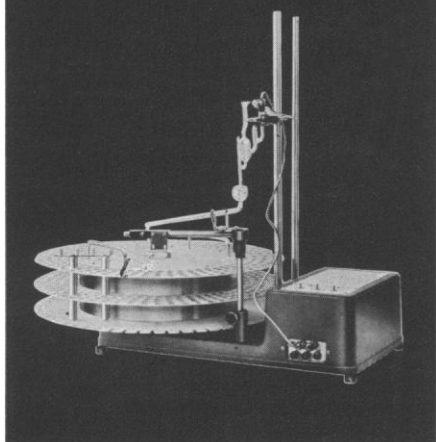


A NARCO COMPANY



*Trademark of
E & M Instrument Co., Inc.

No, it's not
handsome.



But you can
depend upon it
to collect
fractions.

People have
for years!

The AO Automatic Fraction Collector has compiled an impressive record of accurate, reliable, and reproducible performance in thousands of laboratories. Some units have been on the job for 10 years! We could face-lift it, but why? That would just cost **you** more.

This tough old workhorse can collect equal, predetermined, liquid samples by three methods—volumetric siphoning, timed flow, and drop counting. Use test tubes, culture or centrifuge tubes—as many as 240 at once! A variety of accessories permits an exceptional range of applications. For details, contact your distributor or write to us.



**AMERICAN OPTICAL
CORPORATION**

ANALYTICAL INSTRUMENT DIVISION
200 SOUTH GARRARD BLVD. • RICHMOND, CAL., U.S.A. 94804

Circle No. 84 on Readers' Service Card

BOOKS RECEIVED

(Continued from page 172)

Computer Programs for Chemistry. Vol. 1. DeLos F. DeTar, Ed. Benjamin, New York, 1968. xx + 208 pp., illus. \$14.75.

Contributions to Sensory Physiology. Vol. 3. William D. Neff, Ed. Academic Press, New York, 1968. xvi + 240 pp., illus. \$9.50.

Cultural Geography. An Evolutionary Introduction to Our Humanized Earth. J. E. Spencer and William L. Thomas. Cartography by Robert E. Winter. Wiley, New York, 1969. xx + 596 pp., illus. + 5 plates. \$10.95.

Deserts of the World. An Appraisal of Research into Their Physical and Biological Environments. William G. McGinnies, Bram J. Goldman, and Patricia Paylore, Eds. University of Arizona Press, Tucson, 1969. xxviii + 788 pp., illus. \$15.

Designing with Linear Integrated Circuits. Jerry Eimbinder, Ed. Wiley, New York, 1969. xvi + 306 pp., illus. \$10.95.

Development in Human Learning. E. A. Lunzer and J. F. Morris, Eds. Elsevier, New York, 1969. xx + 492 pp., illus. \$10.50. Development in Learning, vol. 2.

Diffuse Matter in Space. Lyman Spitzer, Jr. Interscience (Wiley), New York, 1968. xvi + 272 pp., illus. \$11.50. Interscience Tracts on Physics and Astronomy, No. 28.

Discovery, Invention, Research. Through the Morphological Approach. Fritz Zwicky. Translated from the German edition (Munich, 1966). Macmillan, New York, 1969. xii + 276 pp., illus. \$6.95.

A Discussion on the Origin and Treatment of Noise in Industrial Environments. Organized by E. J. Richards. Royal Society, London, 1968. Illus. Paper, \$14. *Philosophical Transactions of the Royal Society of London, Series A*, No. 1142, vol. 263, pp. 267-482.

The Dream in Psychoanalysis. Leon L. Altman. International Universities Press, New York, 1969. viii + 232 pp. \$7.50.

Dynamics of Thrombus Formation and Dissolution. Shirley A. Johnson and M. Mason Guest, Eds. Lippincott, Philadelphia, 1969. 376 pp., illus. \$15.50.

The Earth Sciences in Canada. A Centennial Appraisal and Forecast. A symposium, Ottawa, 1967. E. R. W. Neale, Ed. University of Toronto Press, Toronto, 1968. xii + 260 pp., illus. \$8.50. Royal Society of Canada Special Publications, No. 11.

Elementary Differential Equations. Earl D. Rainville and Phillip E. Bedient. Macmillan, New York; Collier-Macmillan, London, ed. 4, 1969. xiv + 466 pp., illus. \$8.95.

Elements of Detection and Signal Design. Charles L. Weber. McGraw-Hill, New York, 1968. \$13.50 McGraw-Hill Series in Systems Science.

Encyclopedia of Industrial Chemical Analysis. Foster Dee Snell and Clifford L. Hilton, Eds. Vol. 7, Benzene to Brewery Products. Interscience (Wiley), New York, 1968. xii + 724 pp., illus. \$45.

Energy Systems of Extended Endurance in the 1-100 Kilowatt Range for Undersea Applications. Panel on Energy Sources of the Committee on Undersea Warfare, National Research Council. National

*Rapidly
concentrate
separate
purify*

PROTEINS • ENZYMES • VIRUSES
NUCLEIC ACIDS • POLYPEPTIDES
POLYSACCHARIDES
SERA • PLASMA • C.S.F. • URINE
AMINO ACIDS • ELECTROLYTES

Diaflo
ULTRAFILTRATION

Write for free DIAFLO Catalog

amicon

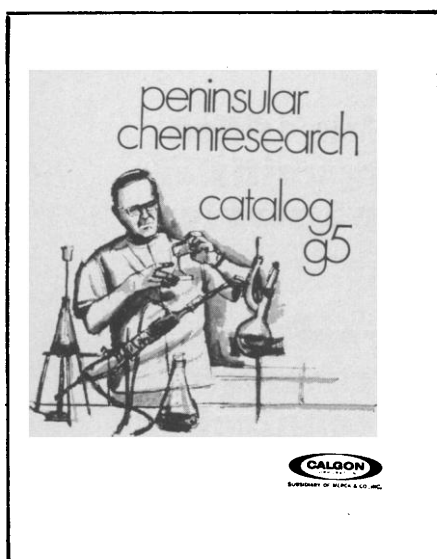
Scientific Systems Div., Dept. C28
AMICON CORPORATION
21 Hartwell Ave., Lexington, Mass. 02173

Circle No. 127 on Readers' Service Card

Advertisers judge their advertising results by the number of responses to their ads. They also pay half the publishing cost of Science. Use the Readers' Service Card to contact manufacturers.

new...
from
pcr

CATALOG G5



organo-fluorine
organo-silicon
scintillators
peptide reagents
liquid crystals
organic intermediates

CALGON
CORPORATION

PENINSULAR CHEMRESEARCH
CALGON CORPORATION
SUBSIDIARY OF MERCK & CO., INC.

FOR YOUR COPY WRITE TO PCR, DEPT. 68-1
P.O. BOX 1466, GAINESVILLE, FLORIDA 32601

Circle No. 76 on Readers' Service Card

Academy of Sciences, Washington, D.C., 1968. viii + 136 pp., illus. Paper, \$4.50. NAS Publication 1702.

Error Correcting Codes. Proceedings of a symposium, Madison, Wis., 1968. Henry B. Mann, Ed. Wiley, New York, 1968. xii + 246 pp., illus. \$7.95. University of Wisconsin Mathematical Research Center Series, No. 21.

Final Report of the Scientific Study of Unidentified Flying Objects. Conducted by the University of Colorado under Contract to the U.S. Air Force. Edward U. Condon, Scientific Director. Daniel S. Gillmor, Ed. Bantam, New York, 1969. xxiv + 968 pp., illus. + 32 plates. Paper, \$1.95.

Flora Europaea. Vol. 2. Rosaceae to Umbelliferae. T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters, and D. A. Webb, Eds. Cambridge University Press, New York, 1968. xxviii + 456 pp. + 5 maps. \$23.50.

Food Goals, Future Structural Changes, and Agricultural Policy. A National Basebook. Iowa State University Center for Agricultural and Economic Development. Iowa State University Press, Ames, 1969. x + 326 pp. \$5.95.

Foundations of Quantum Chemistry. T. E. Peacock. Wiley, New York, 1969. x + 162 pp., illus. \$6.50.

Frontiers of Judicial Research. Joel B. Grossman, Joseph Tanenhaus, and Edward N. Muller, Eds. Wiley, New York, 1969. xx + 49 pp., illus. \$14.95.

Function Theoretic Methods in Partial Differential Equations. Robert P. Gilbert. Academic Press, New York, 1969. xx + 316 pp., illus. \$17.50. Mathematics in Science and Engineering, vol. 54.

Functional Equations in a Single Variable. Marek Kuczma. Polish Scientific Publishers, Warsaw, 1968 (U.S. distributor, Hafner, New York). 384 pp. \$10. Monografie Matematyczne, vol. 46.

Fundamental Problems in Elementary Particle Physics. Proceedings of the 14th Solvay Conference on Physics, Brussels, 1967. Interscience (Wiley), New York, 1968. xii + 252 pp., illus. \$13.50.

Fundamentals of Temperature, Pressure, and Flow Measurements. Robert P. Benedict. Wiley, New York, 1969. xiv + 354 pp., illus. \$14.75.

The Geography of Life. Wilfred T. Neill. Columbia University Press, New York, 1969. xvi + 440 pp., illus. + plates. \$12.95.

Der gerechtfertigte Haeckel. Einblicke in seine Schriften aus Anlass des Erscheinens seines Hauptwerkes "Generelle Morphologie der Organismen" vor 100 Jahren. Gerhard Heberer. Fischer, Stuttgart, 1968 (U.S. distributor, Abel, Portland, Ore.). xii + 588 pp., illus. \$19.50.

The Gold of Ancient America. Catalogue of an exhibition. Allen Wardwell. Museum of Fine Arts, Boston; Art Institute of Chicago, Chicago; Virginia Museum, Richmond, 1968 (distributor, New York Graphic Society, Greenwich, Conn.). 158 pp., illus. \$12.

The Great Alaska Earthquake of 1964. Hydrology. In two parts. Committee on the Alaska Earthquake of the National Research Council. National Academy of Sciences, Washington, D.C., 1968. Part A,



Photovolt has basic pH meters to meet every acid test.

At the top of the scale, Digicord: meticulously made and full-featured, with digital readout, expanded scale precision, solid state circuitry (accuracy, repeatability and stability within ± 0.002 pH). Photovolt's compact, durable new Digicord, priced well below its performance. **\$445.00**

Plus the famous "Set and Forget" meters:

Model 126A, our portable heavy duty blue ribbon workhorse offers sealed waterproof construction to operate under the worst ambient conditions **\$335.00**

Need low cost reliability? Buy 85A, using AC or battery. Single range 0-14, $3\frac{1}{2}$ " scale readable to 0.05 pH. Solid state; fully stabilized. Budget priced: **\$149.00**

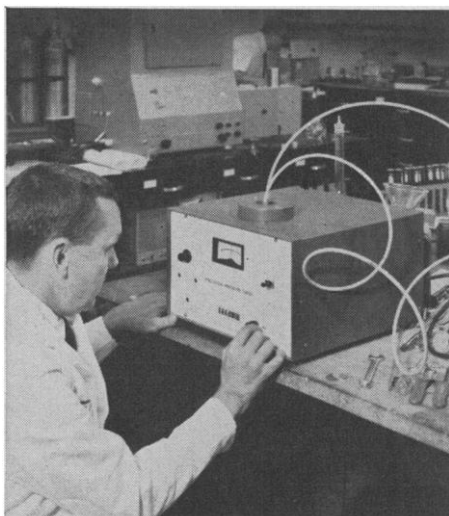
A full line of Photovolt pH meters are available. Send now for complete data

See Photovolt at FASEB
Booths E2 & E3

PHOTOVOLT
1115 Broadway, New York, N.Y. 10010
Phone (212) 989-2900

Circle No. 97 on Readers' Service Card

Can a simple, portable pressure gage have primary-standard accuracy?



TI has the answer.

TI Precision Pressure Gages are compact, convenient and easy to operate . . . a practical, all-around analytical instrument. You'll find them to be ideal for gas-sample mixing, ion-molecular spectroscopy, calibration standards, thermometry, flow measurement, surface-area measurement, microbarometry, or any other routine procedure requiring precision pressure readings.

The unique Bourdon tube is made of fused quartz, assuring hysteresis-free accuracy that is equaled only by some deadweight testers and mercury manometers.

Bourdon tubes are available for measurement of absolute and differential pressures, corrosive gas pressures, high temperature gas pressures and small pressure differentials at high line pressures.

Can a simple, portable pressure gage have primary-standard accuracy? Make us prove it. Call Industrial Products Division of Texas Instruments, (713-526-1411) P.O. Box 66027, Houston, Texas 77006.



TEXAS INSTRUMENTS
INCORPORATED

212

Circle No. 89 on Readers' Service Card

xviii + 446 pp., illus.; Part B, A Portfolio Containing Seven Charts. \$19.75. NAS Publication 1603.

The Great Art. Or The Rules of Algebra. Girolamo Cardano. Translated from the Latin edition (Nuremberg, 1545). T. Richard Witmer, Transl. Ed. M.I.T. Press, Cambridge, 1968. xxvi + 270 pp., illus. \$10.

The Great Orm of Loch Ness. A Practical Inquiry into the Nature and Habits of Water-Monsters. F. W. Holiday. Norton, New York, 1969. xxii + 226 pp., illus. + 8 plates. \$5.95.

Halides of the Lanthanides and Actinides. D. Brown. Interscience (Wiley), New York, 1969. x + 282 pp., illus. \$11. Halides of the Transition Elements.

Handbook of Ocean and Underwater Engineering. John J. Myers, Carl H. Holm, and Raymond F. McAllister, Eds. McGraw-Hill, New York, 1969. xviii + 1100 pp., illus. \$32.50.

Harry Frauca's Book of Insects. Photographs by Harry and Claudy Frauca. Jacaranda Press, Brisbane, Australia, 1968. x + 150 pp. \$4.50.

How Did You Think of That? An Introduction to the Scientific Method. David H. Killeffer. Doubleday, Garden City, N.Y., 1969. xiv + 154 pp. Cloth, \$4.50; paper, \$1.45. Chemistry in Action Series.

How To Know the Grasses. Pictured keys for determining the common and important American grasses with suggestions and aids for their study. Richard W. Pohl. Brown, Dubuque, Iowa, ed. 2, 1968. xii + 244 pp., illus. \$4. Pictured-Key Nature Series.

Human Resources Research Office Bibliography of Publications. As of 30 June 1968. George Washington University, HumRRO, Alexandria, Va., 1968. viii + 290 pp. Paper. No charge.

Ifa Divination. Communication Between Gods and Men in West Africa. William Bascom. Indiana University Press, Bloomington, 1969. xii + 580 pp., illus., + 15 plates. \$20.

The Individual and the System. Personalizing Higher Education. Ninth Annual College and University Self-Study Institute, Berkeley, Calif., 1967. W. John Minter, Ed. Western Interstate Commission for Higher Education, Boulder, Colo., 1967. viii + 188 pp. Paper, \$3.50.

Industrial Hygiene Highlights. Vol. 1. Lester V. Cralley, Lewis J. Cralley, and George D. Clayton, Eds. Industrial Hygiene Foundation of America, Pittsburgh, 1968. xvi + 384 pp., illus. \$20.

Infinite Abelian Groups. Irving Kaplansky. University of Michigan Press, Ann Arbor, ed. 2, 1969. viii + 96 pp. Paper, \$4.

Introduction to the Theory of Categories and Functors. Ion Bucur and Aristide Deleanu, with the collaboration of Peter J. Hilton. Wiley (Interscience), New York, 1969. x + 226 pp., illus. \$13.50. Pure and Applied Mathematics, vol. 19.

Introduction to the Theory of Kinetic Equations. Richard L. Liboff, Wiley, New York, 1969. xiv + 402 pp., illus. \$15.95.

An Invitation to Modern Psychology. Howard F. Gallup. Free Press, New York; Collier-Macmillan, London, 1969. xx + 252 pp., illus. Paper, \$2.95.

Late Somatic Effects of Ionizing Radiation. Charles D. Van Cleave. U.S. Atomic

All the standards you insist on:

**Maximum
purity in
radioactive
compounds**

**prompt, reliable
service with
a personal
touch**

**plus added
capabilities
and services**

**from
Tracerlab
Technical
Products**



**now a
vital division
of a major
U.S. chemical &
pharmaceutical
firm
with strong
research
orientation:**

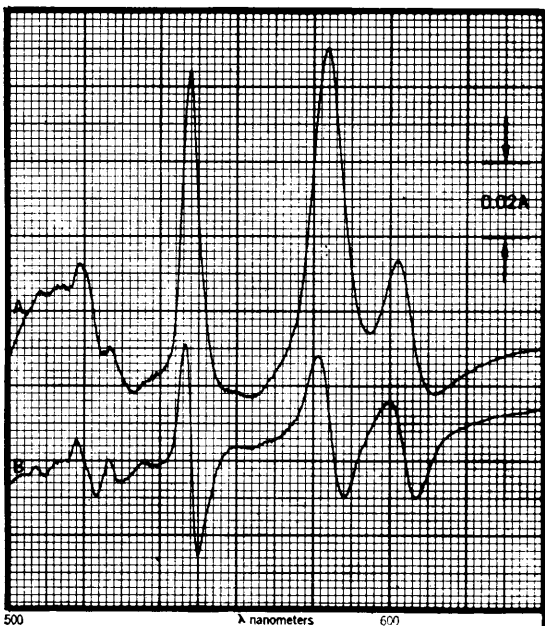
**International
Chemical and
Nuclear Corp.**

TRACERLAB

Div. of International Chemical and Nuclear Corp.
Waltham, Mass. 02154
Tel: (617) 894-6600

Circle No. 96 on Readers' Service Card

SCIENCE, VOL. 164



Low Temperature Difference Spectrum (A) and low temperature Derivative Spectrum (B) of electron transport membranes (1 mg of particle protein per ml) isolated from the chemoautotrophic microorganism *Nitrobacter winogradskyi*. Courtesy of L. A. Kiesow, Naval Medical Research Institute, Bethesda, Md.

Accessories available include: Rapid Mixing Chamber/Fluorescence Attachment/Oxygen Monitor/Anaerobic Cell/Rapid Stirrer/1 x 2 cm Cell Block and Chromatographic Scanner.

THE MULTIPLE ADVANTAGES OF LOW TEMPERATURE AND DERIVATIVE SPECTROSCOPY

With the Aminco-Chance Dual Wavelength/Split Beam Recording Spectrophotometer

The low temperature (liquid N₂) attachment enables the researcher to obtain an increase in sensitivity while using small volumes and low concentrations. There is a concomitant increase in resolution through the sharpening of existing peaks and shoulders, and the exposure of peaks completely hidden at ambient temperature.

One of the modes of operation inherent in the Aminco-Chance Dual Wavelength/Split Beam Recording Spectrophotometer is to record the derivative of an absorption spectrum. The method offers increased resolution. Since only a single sample is utilized the errors which normally occur because of non-homogeneity between the sample and reference are eliminated.

A combination of the two methods offers the results shown in the curves at left.

This instrument can also be operated as either a dual-wavelength or a split-beam spectrophotometer by simple adjustment of three controls. In the dual-wavelength mode, it can detect small transmittance changes superimposed on a highly absorbing, turbid sample. In the split-beam mode, it is able to record the spectra of highly absorbing, turbid materials.

These capabilities will be demonstrated at the FASEB Meeting. A compendium of typical curves is available. Visit Booth U6 at FASEB, or write.

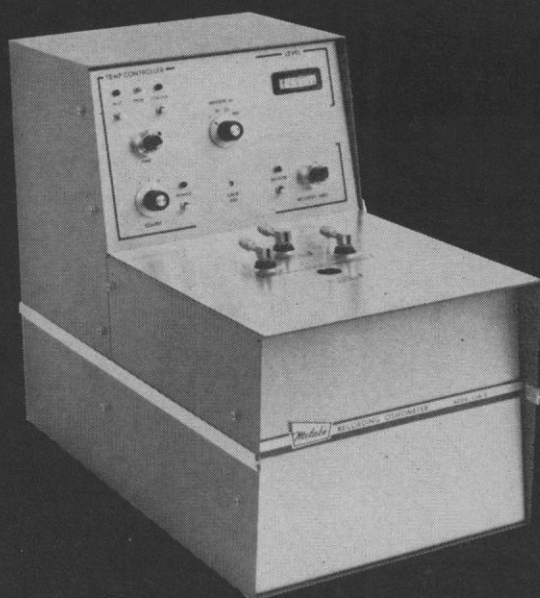


Celebrating Our 50th Year of Service to Science and Industry

AMERICAN INSTRUMENT CO., INC.

8030 Georgia Avenue, Silver Spring, Maryland 20910 U.S.A.

Circle No. 60 on Readers' Service Card



**Perhaps somebody
could build a better
membrane osmometer.
So far nobody has.**

Two years ago Melabs introduced a significantly-improved instrument for measuring the osmotic pressures of large molecules (10,000 to 1,000,000 number average). Today, the Melabs osmometer still offers more advantages than any other instrument for molecular weight determinations—from proteins to polymers. For example:

Simplified Design. Easier to operate and maintain. Direct-reading strain gauge detection system eliminates servo systems and air bubbles. Both sides of membrane may be flushed with solvent without disassembly.

Wide Pressure Ranges. Four selectable ranges, 0-5 cm solvent; 0-10 cm solvent; 0-50 cm solvent; 0-100 cm solvent.

Wide Temperature Ranges. 5°C to 130°C in Model CSM-2; 40°C to 130°C in Model CSM-1. Built-in variable temperature control.

Water or Organic Solvents. Performs equally well using either. Only stainless steel, Teflon®, and membrane contact sample.

Competitive Pricing. In most cases, Melabs will be lower-priced than competing instrumentation.

To learn more about these well-accepted instruments, write to Melabs, Scientific Instruments Department, 3300 Hillview Avenue, Palo Alto, California 94304.



In Europe, contact Melabs S.A., 393 Chaussée de Stockel, Brussels, Belgium.

Circle No. 55 on Readers' Service Card

See Us At FASEB, Booth B-122



BIOLOGY OF THE REPTILIA

edited by **CARL GANS**

*State University of New York, Buffalo,
New York*

This multi-volume treatise will present a comprehensive review of the class Reptilia, with different co-editors participating in the production of each volume. It will be divided into the sub-areas of morphology; embryology and physiology; and behavior and ecology. Since the chapters have been grouped to place organ systems of related topics into immediate juxtaposition, each volume has a place independent of the series as a whole. Volume 1 introduces the general area of morphology. The second and third volumes will deal with the morphology of blood and haematopoietic tissues, the endocrines and the sense organs.

VOLUME 1. MORPHOLOGY A

edited by **A. d'A. BELLAIRS**, *St. Mary's Hospital Medical School, London, England* and **THOMAS S. PARSONS**, *University of Toronto, Ontario, Canada*

CONTENTS: ROBERT L. CARROLL, Origin of Reptiles. DONALD H. ENLOW, The Bone of Reptiles. R. WHEELER HAINES, Epiphyses and Sesamoids. A. G. EDMOND, Dentition. ROBERT HOFFSTETTER and JEAN-PIERRE GASC, Vertebrae and Ribs of Modern Reptiles. RAINER ZANGERL, The Turtle Shell. Author Index. Subject Index.

1969, 390 pp.

CONTENTS: VOLUME 2

T. S. PARSONS, The Nose. I. L. BAIRD, The Ear. G. L. UNDERWOOD, The Eye. R. BARRETT, Pit Organs.

1969, in preparation

CONTENTS: VOLUME 3

H. C. DESSAUER, Blood Chemistry. R. DUGUY, Cyclic Changes in the Blood. Mme. M. C. SAINT GIRONS, Cellular Constituents of the Blood. G. OTTAVIANI, The Lymphatic System. W. G. LYNN, The Thyroid. N. B. CLARK, The Parathyroid. H. SAINT GIRONS, The Pituitary. M. R. MILLER, The Pancreas. M. GABE, The Adrenals. D. E. BOCKMAN, The Thymus.

1969, in preparation



ACADEMIC PRESS

NEW YORK AND LONDON
111 FIFTH AVENUE, NEW YORK, N. Y. 10003

Circle No. 92 on Readers' Service Card

Energy Commission, Oak Ridge, Tenn., 1968 (available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.). viii + 312 pp., illus. Paper, \$3.

Lectures in Theoretical High Energy Physics. H. H. Aly, Ed. Interscience (Wiley), New York, 1968. xii + 440 pp., illus. \$17.50.

Les Leucoses Animales. Charles Lombard. Institut National de la Recherche Agronomique, Paris, 1968. iv + 220 pp., illus. Paper, 25 F.

Leukocyte Chemistry and Morphology Correlated with Chromosome Anomalies. Proceedings of a conference, New York, 1966. Arnold R. Kaplan and Margaret A. Kelsall, Eds. New York Academy of Sciences, New York, 1968. Illus. Paper, \$18. *Annals of the New York Academy of Sciences*, vol. 155, article 3, pp. 657-1032.

The Life of the Spirit in the World of Today. Gordon S. Wakefield. Macmillan, New York, 1969. xii + 180 pp. \$4.95.

The Logic of Relationship. Frederick S. Johnston, Jr. Philosophical Library, New York, 1968. viii + 120 pp. \$4.

Man: His First Two Million Years. A Brief Introduction to Anthropology. Ashley Montagu. Columbia University Press, New York, 1969. x + 262 pp., illus. \$6.95. Reprint of the 1962 edition, *Man: His First Million Years*.

A Manual of Style. For Authors, Editors, and Copywriters. University of Chicago Press, Chicago, ed. 12, 1969. x + 550 pp., illus. Until 30 June 1969. \$7.50; thereafter, \$10.

Material and Energy Balance Computations. Ernest J. Henley and Edward M. Rosen. Wiley, New York, 1969. xxx + 578 pp., illus. \$14.95.

Mathematical Ideas in Biology. J. Maynard Smith. Cambridge University Press, New York, 1968. viii + 152 pp., illus. Cloth, \$5; paper, \$1.95.

Mechanics in Sixteenth-Century Italy. Selections from Tartaglia, Benedetti, Guido Ubaldo, and Galileo. Translated and annotated by Stillman Drake and I. E. Drabkin. University of Wisconsin Press, Madison, 1969. xii + 432 pp., illus. \$12.50. University of Wisconsin Publications in Medieval Science.

Medical and Veterinary Chemicals. R. Slack and A. W. Nineham. Pergamon, New York, 1968. Vol. 1, parts 1 and 2 (xvi + 256 pp., illus.); vol. 2, part 3 (vi + 210 pp., illus.). \$17.50. The Commonwealth and International Library.

Memory and Attention. An Introduction to Human Information Processing. Donald A. Norman. Wiley, New York, 1969. xii + 212 pp., illus. Cloth, \$8.95; paper, \$4.95. Wiley Series in Psychology.

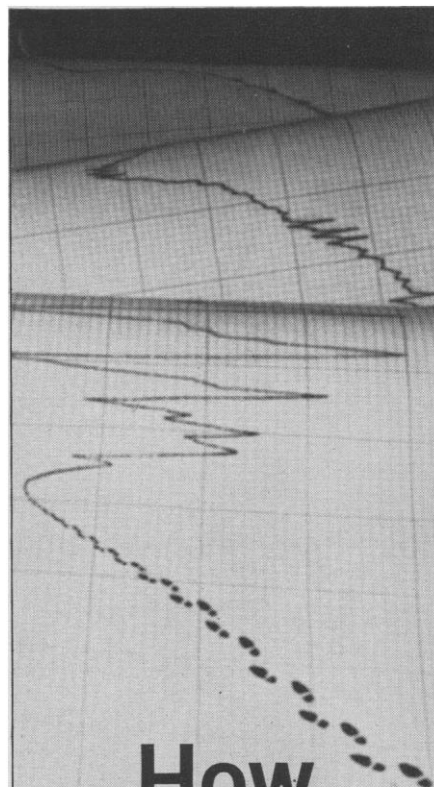
Metal Fatigue: Theory and Design. Angel F. Madayag, Ed. Wiley, New York, 1969. xii + 428 pp., illus. \$15.95.

Methods in Cell Physiology. Vol. 3. David M. Prescott, Ed. Academic Press, New York, 1968. xvi + 392 pp., illus. \$18.

Methods of Animal Experimentation. Vol. 3. William I. Gay, Ed. Academic Press, New York, 1968. xiv + 474 pp., illus. \$19.50.

Microbiology and Pathology. Alice Lorraine Smith. Mosby, St. Louis, ed. 9, 1968. xii + 726 pp., illus. \$10.75.

Microeconomic Analysis. Allan J.



How to track down a free radical

Capture it on paper with a Magnion EPR (ESR) spectrometer. You'll have the elusive electron under close scrutiny when other instruments can barely find a trace. Evidence of Magnion's unsurpassed performance already exists. Consider the extensive experience we've had with many types of electromagnetic systems and instruments. Consider also our capabilities for practical application of advanced technology and our deep commitment to quality and reliability.

Why not investigate?



VENTRON

MAGNION DIVISION

154 Middlesex Turnpike
Burlington, Mass. 01803
Tel: (617) 272-5200

Circle No. 91 on Readers' Service Card

Braff. Wiley, New York, 1969. xvi + 304 pp., illus. \$7.95.

Micropower Circuits. James D. Meindl. Wiley, New York, 1969. xii + 260 pp., illus. \$10.95.

Molecular Spectroscopy of the Triplet State. S. P. McGlynn, T. Azumi, and M. Konoshita. Prentice-Hall, Englewood Cliffs, N.J., 1969. xiv + 434 pp., illus. \$16.95. Prentice-Hall International Series in Chemistry.

The Native Polity of Ponape. Saul H. Riesenbergh. Smithsonian Institution Press, Washington, D.C., 1968 (available from the Superintendent of Documents, Washington, D.C.). x + 118 pp. + 12 plates. \$4.25. Smithsonian Contributions to Anthropology, vol. 10.

A Naturalistic View of Man. The Importance of Early Training in Learning, Living, and the Organization of Society. George Crile, Jr. World, New York, 1969. xiv + 178 pp. \$4.95.

The New Cosmos. Albrecht Unsöld. Translated from the German edition (Berlin, 1967) by William H. McCrea. Springer-Verlag, New York, 1969. xii + 376 pp., illus. Paper, \$6.50. Heidelberg Science Library, vol. 5/6.

Noble-Gas Chemistry. John H. Holloway. Methuen, London, 1968 (U.S. distributor, Barnes and Noble, New York). viii + 216 pp., illus. \$6.75.

Noise and Acoustic Fatigue in Aeronautics. E. J. Richards and D. J. Mead, Eds. Wiley, New York, 1968. xii + 512 pp., illus. \$19.95.

On the Cretaceous Age of the So-Called Jurassic Cheilostomatous Polyzoa (Bryozoa). A Contribution to the Knowledge of the Polyzoa-Fauna of the Maastrichtian in the Cotentin (Manche). Ehrhard Voigt. British Museum, London, 1968. Illus. Paper, £2. *Bulletin of the British Museum (Natural History)*, Geology, vol. 17, No. 1, 46 pp. + 8 plates.

1001 Questions Answered about Aviation History. C. H. Hildreth and Bernard C. Nalty. Dodd, Mead, New York, 1969. xvi + 424 pp., illus. + 16 plates. \$8.50. 1001 Questions Answered Series.

1001 Questions Answered about Natural Land Disasters. Barbara Tufty. Dodd, Mead, New York, 1969. xviii + 350 pp., illus. + 16 plates. \$7.50. 1001 Questions Answered Series.

Optical Fundamentals of Underwater Photography. Gomer T. McNeil. Photogrammetry, Rockville, Md., 1968. vi + 116 pp., illus. Spiral bound, \$5.

Optimization by Vector Space Methods. David G. Luenberger. Wiley, New York, 1969. xviii + 326 pp., illus. \$13.95. Series in Decision and Control.

Organic Reaction Mechanisms, 1967. An Annual Survey Covering the Literature Dated December 1966 through November 1967. B. Capon, M. J. Perkins, and C. W. Rees. Interscience (Wiley), New York, 1968. xii + 516 pp., illus. \$17.50.

Organic Reactions in Electrical Discharges. N. S. Pechuro, Ed. Translated, with revisions by the author, from the Russian edition (Moscow, 1966). Consultants Bureau (Plenum), New York, 1968. x + 138 pp., illus. \$17.50.

Overcoming World Hunger. American Assembly. Prentice-Hall, Englewood Cliffs,

11 APRIL 1969

who ever heard of a customer designed stereomicroscope



Customer designed power? With easily interchangeable eyepieces and attachment objectives, you can choose the power range you need, from 2x to 200x.

Customer designed versatility? Specify your requirements in light sources, stages, stands, polarizing, measuring and photographic attachments.

Customer designed flexibility? Change your field of investigation, research, or observation method tomorrow. The M-5 can quickly change, and grow, with your needs. Just one example as illustrated: Your work takes you to dissection. You need adjustable depth of focus to keep specimen, scalpel or forceps in clear focus. You add the new double iris diaphragm, get greatly increased depth of focus, and retain maximum resolving power with a turn of the control ring.

Want to design your own stereomicroscope? Write for Booklet M-5, or for a demonstration.

WILD®
HEERBRUGG

WILD HEERBRUGG INSTRUMENTS, INC.
FARMINGDALE, NEW YORK 11735

WILD OF CANADA, LTD., 881 LADY ELLEN PLACE, OTTAWA 3, ONTARIO
WILD DE MEXICO, SA, LONDRES 258, MEXICO 6, D.F.

Circle No. 26 on Readers' Service Card

N.J., 1969. xii + 180 pp. Cloth, \$4.95; paper, \$1.95.

The Pathogenic Anaerobic Bacteria. Louis D. Smith and Lillian V. Holdeman. Thomas, Springfield, Ill., 1968. xx + 428 pp., illus. + 4 plates. \$18.50. American Lecture Note Series, No. 719.

Permutation Groups. Donald Passman. Benjamin, New York, 1968. x + 310 pp. Cloth, \$9.50; paper, \$4.95. Mathematics Lecture Note Series.

Perspective in Structural Chemistry. Vol. 2. J. D. Dunitz and J. A. Ibers, Eds. Wiley, New York, 1968. x + 182 pp., illus. \$10.95.

Perspectives of Modern Physics. Arthur Beiser. McGraw-Hill, New York, 1969. x + 614 pp., illus. \$12.50. McGraw-Hill Series in Fundamental Physics.

Petrochemicals. The New World of Synthetics. Ray T. Wendland. Doubleday, Garden City, N.Y., 1969. xii + 300 pp., illus. \$5.95. Chemistry in Action Series.

Phase-Space Dynamics of Particles. Allan J. Lichtenberg. Wiley, New York, 1969. xvi + 336 pp., illus. \$16. Wiley Series in Plasma Physics.

The Physical Basis of Ultrahigh Vacuum. P. A. Redhead, J. P. Hobson, and E. V. Kornelsen. Chapman and Hall, London, 1968 (U.S. distributor, Barnes and Noble, New York). xii + 500 pp., illus. \$16.75. High Vacuum Series.

Physical Geology. Chester R. Longwell, Richard Foster Flint, and John E. Sanders. Wiley, New York, 1969. xiv + 694 pp., illus. \$10.95.

The Physics of Vibrations and Waves.

H. J. Pain. Wiley, New York, 1969. xiv + 242 pp., illus. Paper, \$5.95.

Physiology in the Space Environment. Vol. 1, Circulation. Report of a Study Conducted by the Space Science Board of the National Academy of Sciences, 1966-67. National Academy of Sciences, Washington, D.C., 1968. x + 190 pp., illus. Paper, \$5.50. NAS-NRC Publication No. 1485-A.

Pictorial Anatomy of the Cat. Stephen G. Gilbert. University of Washington Press, Seattle, 1968. viii + 120 pp., illus. Paper, \$4.95.

The Pineal. Richard J. Wurtman, Julius Axelrod, and Douglas E. Kelly. Academic Press, New York, 1968. xii + 204 pp., illus. \$11.50.

Plasma Physics. Vol. 2, Weakly Ionized Gases. J. L. Delcroix. Wiley, New York, 1968. x + 188 pp., illus. \$9.95. Reprint of the 1966 edition.

Plasma Spectroscopy. Geoffrey V. Marr. Elsevier, New York, 1968. xii + 316 pp., illus. \$21.50.

Plastics in the Modern World. E. G. Couzens and V. E. Yarsley. Penguin, Baltimore, 1968. 386 pp., illus. + 8 plates. Paper, \$1.65. Pelican Book A1016. Revised edition of *Plastics in the Service of Man*.

The Pocket Encyclopaedia of Plant Galls in Colour. Arnold Darlington. Illustrated by M. J. D. Hiron. Philosophical Library, New York, 1968. 192 pp. \$7.50.

Principles of Natural Lighting. J. A. Lynes. Elsevier, New York, 1968. viii + 216 pp., illus. \$7.50. Elsevier Architectural Science Series.

A Psychologist of Sorts. The Autobiography and Publications of the Inventor of the Porteus Maze Tests. Stanley D. Porteus. Pacific Books, Palo Alto, Calif., 1969. x + 326 pp., illus. \$7.50.

Psychology: A Social Approach. David F. Wrench. McGraw-Hill, New York, 1969. xvi + 400 pp., illus. \$7.95.

The Psychology of College Success. A Dynamic Approach. Henry Clay Lindgren. Wiley, New York, 1969. xviii + 142 pp. Cloth, \$4.95; paper, \$2.45.

Pulsating Stars. A "Nature" Reprint. With introductions by F. G. Smith and A. Hewish. Macmillan, London, 1968. xii + 87 pp., illus. \$12.

Quantitative Geography. Techniques and Theories in Geography. John P. Cole and Cuchlaine A. M. King. Wiley, New York, 1969. xii + 692 pp., illus. Cloth, \$12.75; paper, \$7.50.

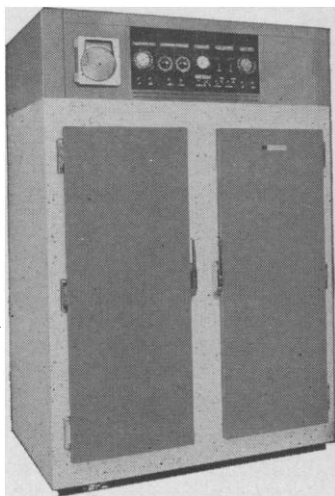
Quantum Mechanics. A. Rubinowicz. Elsevier, New York; Polish Scientific Publishers, Warsaw, 1968. x + 584 pp., illus. \$15.

Relativistic Plasmas. The Coral Gables Conference, 1968. Oscar Buneman and William B. Pardo, Eds. Benjamin, New York, 1968. xii + 252 pp., illus. \$13.50.

Replication and Recombination of Genetic Material. W. J. Peacock and R. D. Brock, Eds. Australian Academy of Science, Canberra, 1968. vi + 278 pp., illus. Paper, \$5.50.

A Revision of the Ground Beetles Belonging to Scaphinotus, Subgenus Brennus (Coleoptera, Carabidae). Tatiana Gidas-pow. American Museum of Natural His-

NEW! Refrigerator Incubator Growth Chamber



Economical! Versatile! Available in three models providing 18, 24 or 49 square feet of usable area on removable shelves. Self-contained, ready to operate. KMH color co-ordinated. NSF approved. Choice of controls gives you a chamber tailored to your needs at an economical price.

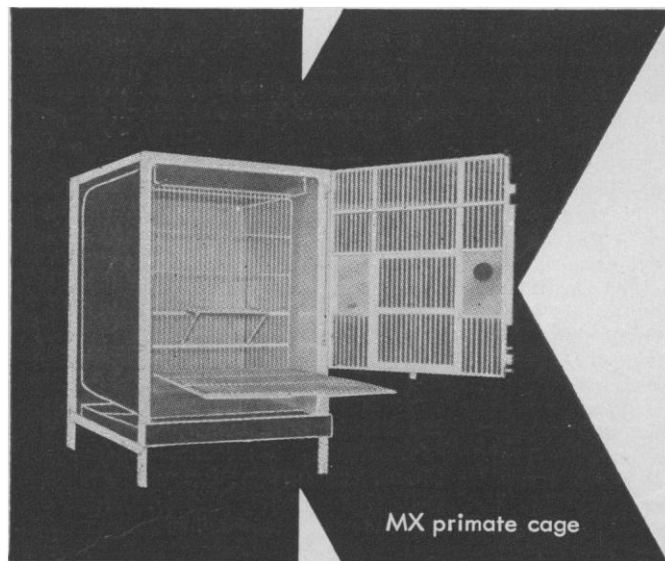
Write for detailed specifications.



SHERER

ENVIRONMENTAL DIVISION
SHERER-GILLET COMPANY
Marshall 3A, Michigan 49068

Circle No. 102 on Readers' Service Card



dog & primate cages

Molded seamless construction of rugged fiber glass reinforced plastics... minimum effort required to clean and disinfect...maximum animal comfort... extremely strong doors with fool proof catches...economical to purchase and maintain....For further information

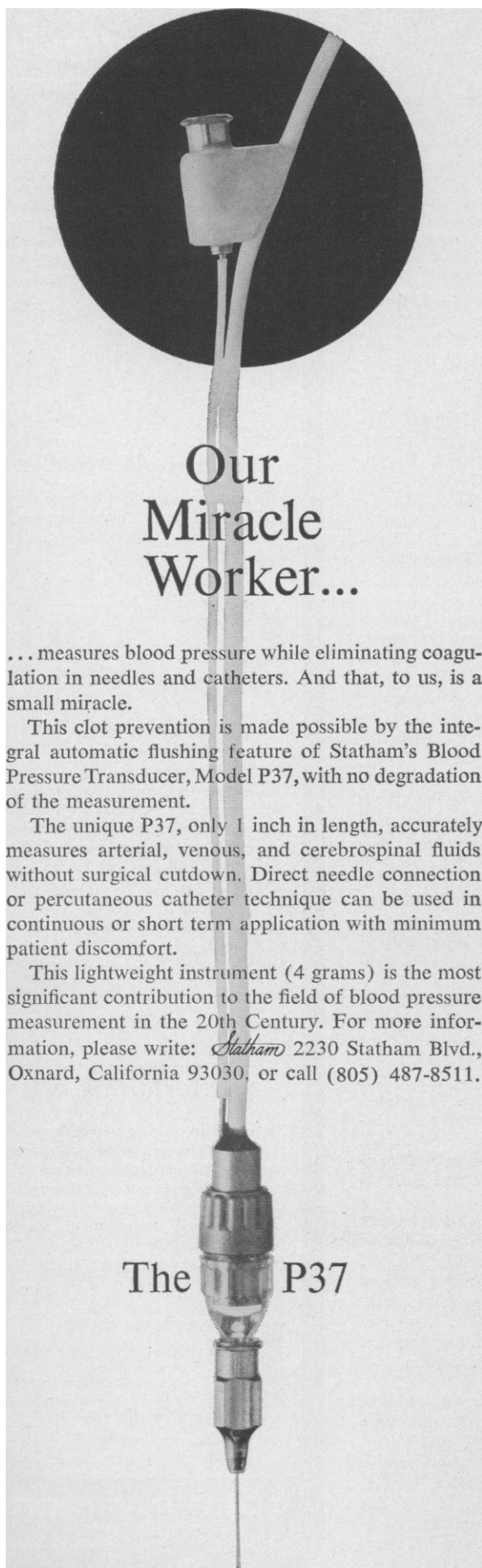
write:

Department KS

Kirschner
MANUFACTURING COMPANY

Vashon, Washington

Circle No. 106 on Readers' Service Card



Our Miracle Worker...

...measures blood pressure while eliminating coagulation in needles and catheters. And that, to us, is a small miracle.

This clot prevention is made possible by the integral automatic flushing feature of Statham's Blood Pressure Transducer, Model P37, with no degradation of the measurement.

The unique P37, only 1 inch in length, accurately measures arterial, venous, and cerebrospinal fluids without surgical cutdown. Direct needle connection or percutaneous catheter technique can be used in continuous or short term application with minimum patient discomfort.

This lightweight instrument (4 grams) is the most significant contribution to the field of blood pressure measurement in the 20th Century. For more information, please write: *Statham* 2230 Statham Blvd., Oxnard, California 93030, or call (805) 487-8511.

The P37



SIGMA OFFERS:

HIGH PURITY RIBULOSE SUGAR PHOSPHATES

Prepared By SIGMA

D-RIBULOSE-1,5-DIPHOSPHORIC ACID

Enzymatically analyzed, using
RUDP-Carboxylase

Substantially free of extraneous sugars

TETRASODIUM SALT	5 mg	\$ 18.00
Soluble in water	10 mg	27.00
Anhydrous Mol. Wt. = 398	25 mg	54.00
	100 mg	150.00
	250 mg	300.00

DIBARIUM SALT	5 mg	\$ 9.00
Soluble in dilute acid	10 mg	14.00
Anhydrous Mol. Wt. = 580	25 mg	28.00
	100 mg	78.00
	250 mg	159.00

D-RIBULOSE-5-PHOSPHORIC ACID

Substantially free of Ribose-5-Phosphate and
6-Phosphogluconate. Balance of impurities
are probably buffer salts.

Ref.: J.B.C. 237, 643 (1962)

DISODIUM SALT	5 mg	\$ 16.20
Approx. 75% pure	25 mg	54.00
	100 mg	150.00

DIBARIUM SALT	5 mg	\$ 6.00
Approx. 70% pure	25 mg	25.00
	100 mg	70.00

ORDER DIRECT **TELEPHONE COLLECT**
from **ANYWHERE** in the **WORLD**

Day, Station to Station, 314/771-5750

Night, Person to Person,

Dan Broida, 314/993-6418



TWX (Teletype) Day or Night: COLLECT-314-556-0594

TELEGRAM: SIGMACHEM, St. Louis, Missouri

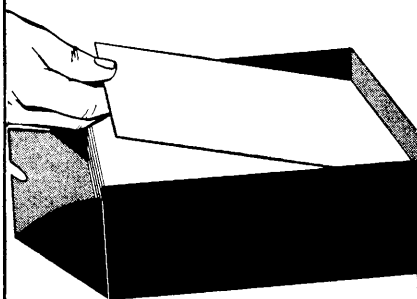
SIGMA The Research Laboratories of
CHEMICAL COMPANY

3500 DE KALB ST. • ST. LOUIS, MO. 63118 • U.S.A.

MANUFACTURERS OF THE FINEST BIOCHEMICALS AVAILABLE

Distributed in the United Kingdom through
SIGMA LONDON Chem. Co. Ltd., 12, Lettice St., London, S.W.6, Eng.
Phone RENown 5823 (Reverse Charges)

new from S&S **TLC** Ready Plates



Extremely uniform coating on glass plates. 10 x 20 cm (50 per package). 20 x 20 cm (25 per package). Ready Plates individually wrapped in polyethylene bags.

Media offered as cellulose powder or silica gel with or without binder of starch or gypsum. Special polyamid, acetylated and ion exchange plates. Working instructions available for Ready Plate separation of the following groups.*

Alkaloids	Lipophilic dyes
Alpha amino acids	Carcinogenic hydrocarbons
Bleaching agents	Amines
Carotinoids	Insecticides
Cations: Ca, Mg, Al, Fe	Gasoline with test dyes
Monoazo dyes	Seed oils
Oligosaccharides	Fish oils
Reactive dyes	Sugars
Addictive drugs	Test dyes
Chlorophylls and related natural colors	

*Available with orders totaling \$19.00 or more.



The first name in filtration
SCHLEICHER & SCHUELL
(603) 352-3810

Schleicher & Schuell, Inc.
Keene, New Hampshire 03431

Please send free Bulletin No. 51
on S&S Powders and Ready Plates.

Name _____
Address _____
City _____
State _____ Zip _____

Circle No. 83 on Readers' Service Card

tory, New York, 1968. Illus. Paper, \$2. Bulletin of the American Museum of Natural History, vol. 140, article 3, pp. 135-194.

Rings of Operators. Irving Kaplansky. Benjamin, New York, 1968. viii + 152 pp. Cloth, \$8.50; paper, \$3.95. Mathematics Lecture Note Series.

The Roots of Individuality. Normal Patterns of Development in Infancy. Sibylle K. Escalona. Aldine, Chicago, 1968. x + 550 pp., illus. \$14.75. Modern Applications in Psychology.

The Science of Wine. Cedric Austin. Elsevier, New York, 1968. vi + 218 pp., illus. \$6.75.

Scientific Writing. Lester S. King and Charles G. Roland. American Medical Association, Chicago, 1968. x + 134 pp. Paper, \$1.

Shock Metamorphism of Natural Materials. Proceedings of a conference, Greenbelt, Md., 1966. Bevan M. French and Nicholas M. Short, Eds. Mono, Baltimore, 1968. xii + 644 pp., illus. \$25.

Single-Cell Protein. An international conference, Cambridge, Mass., 1967. Richard I. Mateles and Steven R. Tannenbaum, Eds. M.I.T. Press, Cambridge, 1968. x + 486 pp., illus. \$16.

Sound Production in Man. A conference, New York, 1966. Arend Bouhuys, Ed. New York Academy of Sciences, New York, 1968. Illus. Paper, \$15.75. *Annals of the New York Academy of Sciences*, vol. 155, article 1, pp. 1-384.

Sources of Tritium and Its Behavior upon Release to the Environment. D. G. Jacobs. U.S. Atomic Energy Commission, Oak Ridge, Tenn., 1968 (available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.). vi + 90 pp., illus. Paper, \$3. AEC Critical Review Series.

The Special Functions and Their Approximations. Vol. 1. Yudell L. Luke. Academic Press, New York, 1969. xxii + 354 pp. \$19.50. Mathematics in Science and Engineering, vol. 53.

The Structure of the Universe. E. L. Schatzman. Translated from the French by Patrick Moore. McGraw-Hill, New York, 1969. 256 pp., illus. Paper, \$2.45. World University Library.

Supernovae. I. S. Shklovsky. Translated from the Russian by Literaturprojekt. Interscience (Wiley), New York, 1969. viii + 444 pp., illus. \$20. Interscience Monographs and Texts in Physics and Astronomy, vol. 21.

Studies in the Structure, Physiology and Ecology of Molluscs. Proceedings of a symposium, London, 1967. Vera Fretter, Ed. Published for the Zoological Society of London by Academic Press, New York, 1968. xx + 378 pp., illus. \$15. Symposia of the Zoological Society of London and the Malacological Society of London, No. 22.

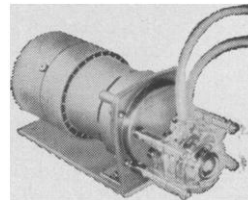
Sweet Madness. A Study of Humor. William F. Fry, Jr. Pacific Books, Palo Alto, Calif., 1968. x + 182 pp. Paper, \$1.95.

The Teaching of Mathematics. Essays. A. Ya. Khinchin. B. V. Gnedenko, Ed. Translated from the Russian edition (Moscow, 1963) by W. Cochrane and D. Vere-Jones. Elsevier, New York, 1968. xx + 172 pp. \$9.50.

COLE-PARMER

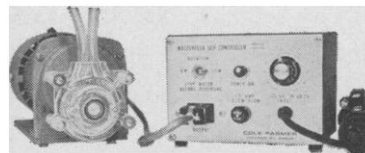
Masterflex® TUBING PUMPS

4 interchangeable pump heads for each model • pump heads of clear plastic for full visibility • long tubing life • pressures up to 40 psi • pulseless flow • metering accuracy • for liquids or gases • wide range of flow rates • with vinyl, silicone or Viton* tubing



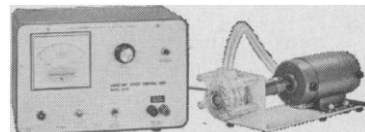
SINGLE SPEED Masterflex

Driven by a high torque, gear head motor at 550 RPM. Interchangeable, clear plastic pump heads provide four different flow rates.



VARIABLE SPEED Masterflex

Solid state electronic speed controller for variable flow rate with metering accuracy. Choice of four interchangeable pump heads provide flow rates from as low as 1.8 ml per minute.



ULTRA VARIABLE SPEED Masterflex

Designed to deliver constant output at any speed regardless of system pressure. Direct-reading speed indication with system monitoring facilities. 7 gearhead ratios and 4 pump heads permit selection of speeds from 0.03 to 3000 RPM and outputs from less than 1/100 ml/min.



NEW CATALOG

Features over 2500 instruments and equipment for Industrial Research, the Health Sciences, Chemistry, Biology and Agriculture.

*T.M. DuPont

COLE-PARMER
INSTRUMENT COMPANY

7425 N. Oak Park Ave. Chicago, Ill. 60648
(312) 647-0772

Circle No. 77 on Readers' Service Card