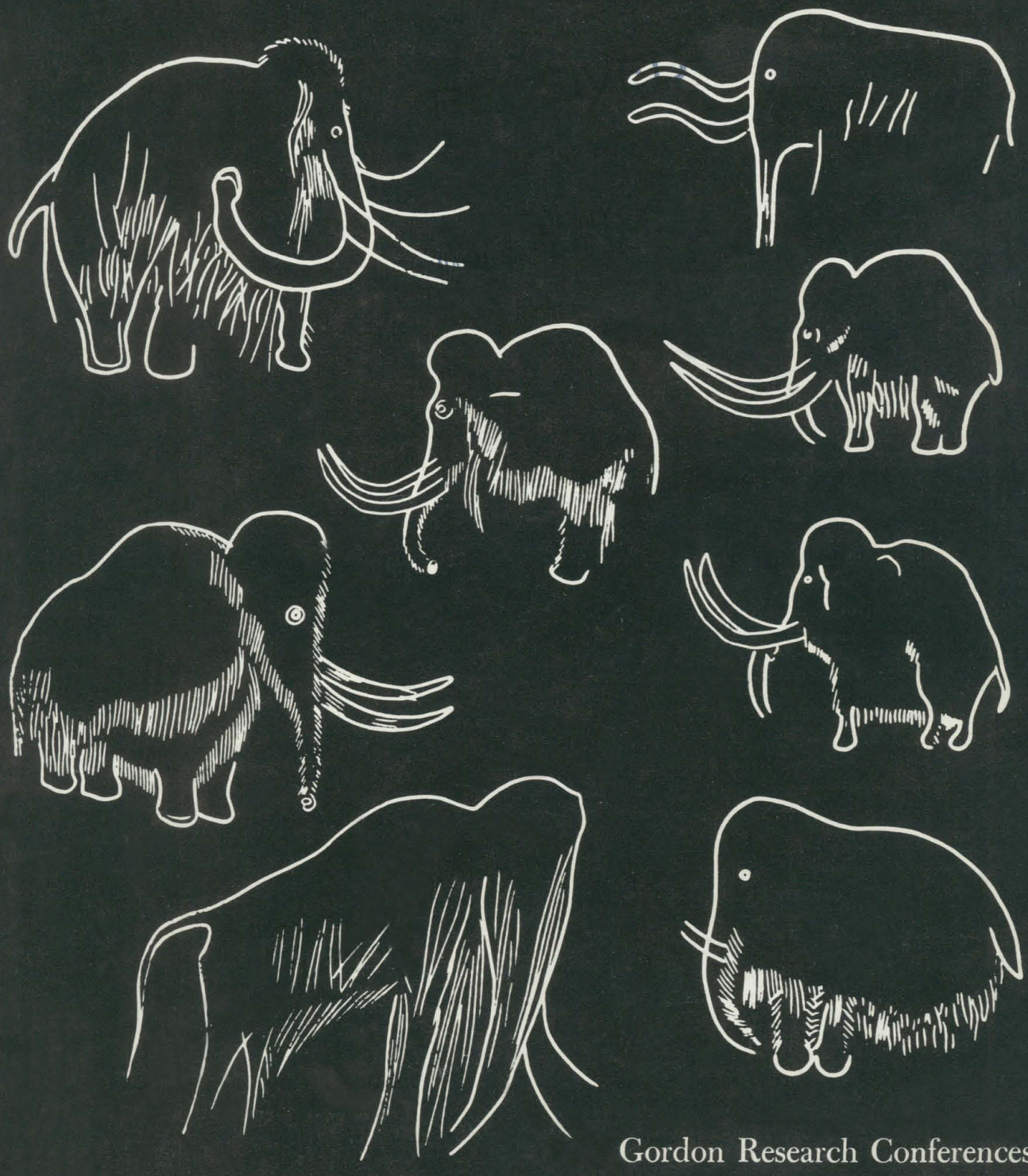
SCIENCE

9 March 1973

Vol. 179, No. 4077

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Gordon Research Conferences

A PLUG FOR OUR β-COUNTER

Anyone on your staff can operate the LKB-Wallac Liquid Scintillation Counter as a routine laboratory instrument. All they have to do is pick out two plug-in boards programmed for the particular samples, plug them in and press the Start button. The counter does the rest, and even gives a confirming printout of the selected parameters.

You avoid repeating all the work of selecting windows and calculating optimum parameters each time you change from one type of sample to another. **Do it only once.** The information is stored on the plug-in boards ready for use on the next occasion.

The LKB-Wallac system can be used both for single and double labelled samples, to give printouts of CPM and true DPM. An extra unit, which plugs in on top of the main control panel, converts the instrument for multi-user and double labelled operation.

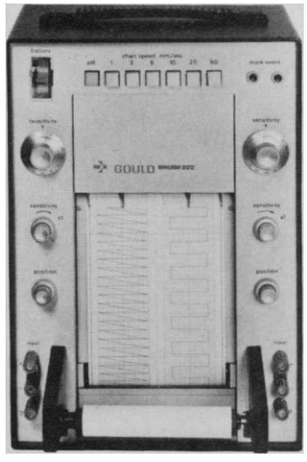
LKB

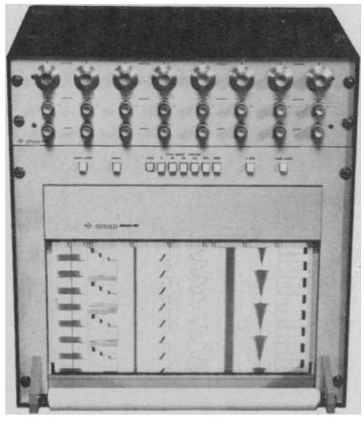
LKB Instruments Inc.

12221 Parklawn Drive, Rockville MD. 20852
11744 Wilshire Blvd. Los Angeles Calif. 90025
6600 West Irving Park Road, Chicago Ill. 60634
260 North Broadway, Hicksville N.Y. 11801

Circle No. 3 on Readers' Service Card

Why we think Brush biomedical recorders are your best choice.





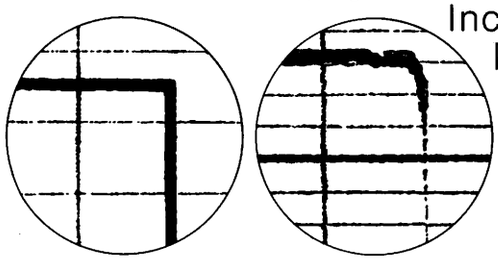
WE HAVE WHAT YOU NEED. Choose from 1 to 8 channels on our high performance direct writing recorders. Or select a special purpose recorder from our complete line. We have an x-y recorder. A lightbeam oscillograph with up to 16 channels. And an 8-channel hi-speed multipoint. All with built-in Brush quality and dependability.

AN ADVANCED PRODUCT. Whichever Brush recorder you choose, you'll have the ability to monitor all the physiological parameters you need.

ACCURACY. It's guaranteed to 99.5% even over an 80mm chart span by our Metrisite® non-contact servo-loop feedback device.

CLEANEST TRACES. Our pressurized inking system eliminates smudges, smears, skips and puddles. Traces are actually forced into the paper, not just laid on top. So they're always crisp and clean.

Send for our 36 page full color catalog. Write Gould Inc., Instrument Systems Division, 3631 Perkins Avenue, Cleveland, Ohio 44114 or Rue Van Boeckel 38, Brussels, 1140, Belgium.



Our traces Thermal traces

Universal Coupler

BRUSH INSTRUMENTS

Circle No. 11 on Readers' Service Card

GOULD

9 March 1973

Volume 179, No. 4077

SCIENCE

BOARD OF DIRECTORS

GLENN T. SEABORG, Retiring President, Chairman
LEONARD M. RIESER, President
ROGER REVELLE, President-Elect
RICHARD H. BOLT, LEWIS M. BRANSCOMB, BARRY COMMONER, EMILIO Q. DADDARIO

CHAIRMEN AND SECRETARIES OF AAAS SECTIONS

MATHEMATICS (A): Lipman Bers, F. A. Ficken
PHYSICS (B): Edwin M. McMillan, Rolf M. Sinclair
CHEMISTRY (C): Thomas E. Taylor, Leo Schubert
ASTRONOMY (D): Frank D. Drake, Arlo U. Landolt
PSYCHOLOGY (J): Carl P. Duncan, William D. Garvey
SOCIAL AND ECONOMIC SCIENCES (K): Robert K. Merton, Harvey Sapolsky
HISTORY AND PHILOSOPHY OF SCIENCE (L): Ernest Nagel, Dudley Shapere
INDUSTRIAL SCIENCE (P): Jacob E. Goldman, Jordan D. Lewis
EDUCATION (Q): Gordon Swanson, Phillip R. Fordyce
DENTISTRY (R): Martin Cattoni, Sholom Pearlman
PHARMACEUTICAL SCIENCES (S): William Heller, John Autian

DIVISIONS

ALASKA DIVISION: Gunter E. Weller, President; Irma Duncan, Executive Secretary
PACIFIC DIVISION: John D. Isaacs, President; Robert T. Orr, Secretary-Treasurer
SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION: J. Linton Gardner, President; Marlowe G. Anderson, Executive Secretary

SCIENCE is published weekly, except the last week in December, but with an extra issue on the fourth Tuesday in November, 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 © 1973 by the American Association for the Advancement of Science. Annual subscription $20; foreign postage: Americas $3; overseas $5; air freight to Europe, North Africa, Near East $16; single copies $1 (back issues, $2) except **Guide to Scientific Instruments** which is $4. School year subscription: 9 months, $15; 10 months, $16.75. 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

WARD H. GOODENOUGH
CARYL P. HASKINS

DANIEL P. MOYNIHAN
PHYLLIS V. PARKINS

WILLIAM T. GOLDEN
Treasurer

WILLIAM BEVAN
Executive Officer

GEOLOGY AND GEOGRAPHY (E)
Helmut Landsberg
Ramon E. Bisque

BIOLOGICAL SCIENCES (G)
Dorothy Bliss
Richard J. Goss

ANTHROPOLOGY (H)
Richard N. Adams
Anthony Leeds

ENGINEERING (M)
Raynor L. Duncombe
C. Towner French

MEDICAL SCIENCES (N)
Robert A. Good
F. Douglas Lawrason

AGRICULTURE (O)
Roy L. Lovvorn
Michael A. Farrell

INFORMATION AND COMMUNICATION (T)
Jordan Baruch
Scott Adams

STATISTICS (U)
Frederick Mosteller
Ezra Glaser

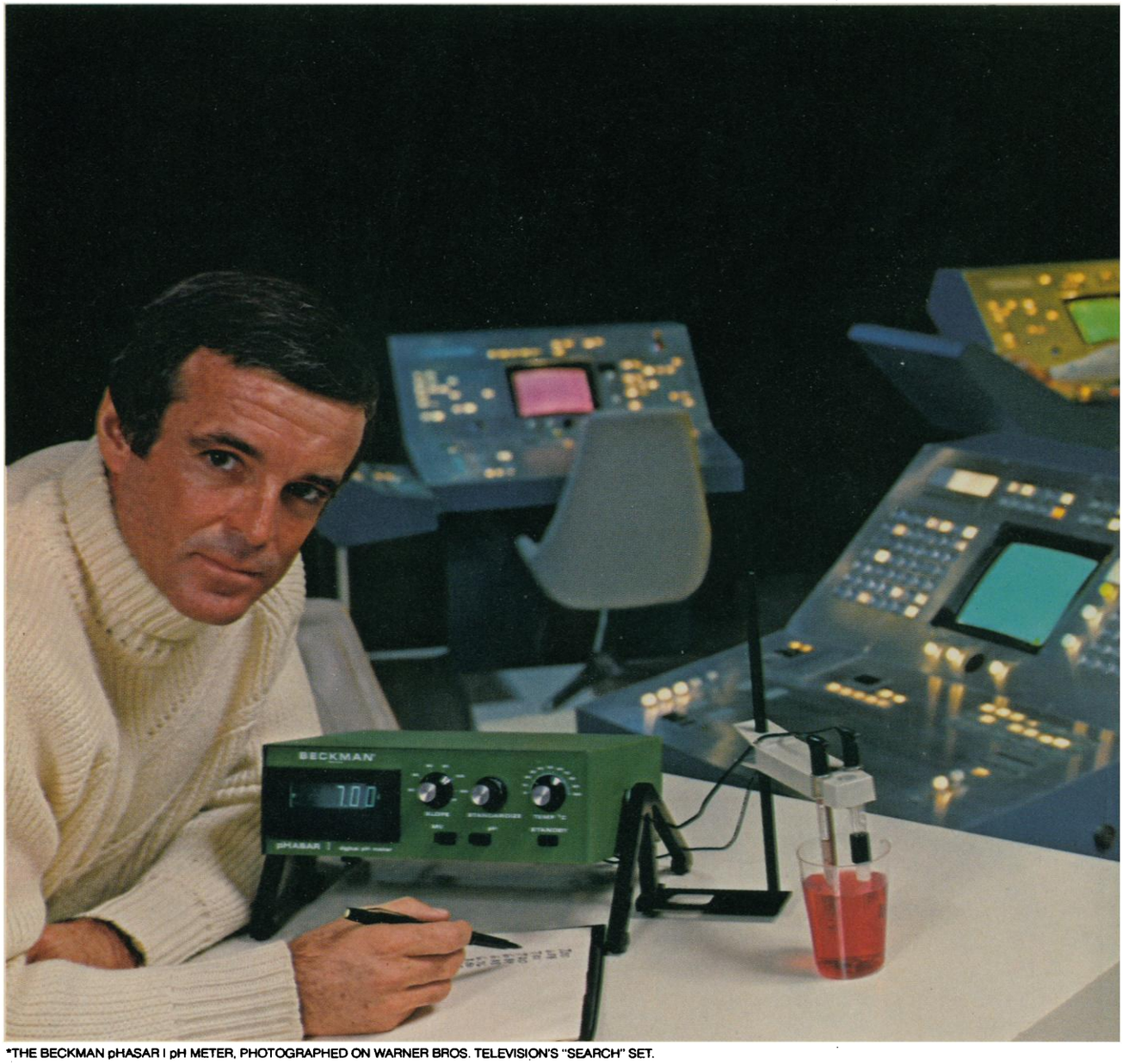
ATMOSPHERIC AND HYDROSPHERIC SCIENCES (W)
Max A. Kohler
Louis J. Battan

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.

COVER

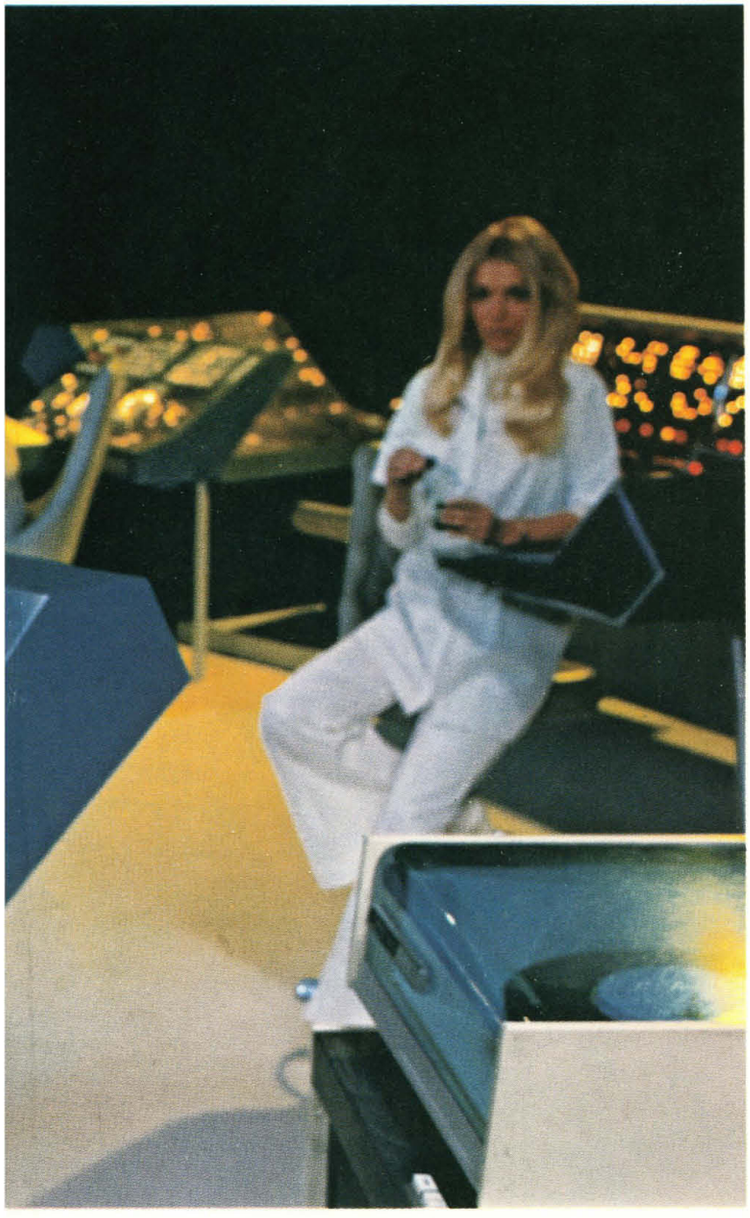
Old world cave drawings of mammoths. See page 969.

MOVE A STEP AHEAD IN TIME



*THE BECKMAN pHASAR I pH METER, PHOTOGRAPHED ON WARNER BROS. TELEVISION'S "SEARCH" SET.

WITH THE NEW pHASAR I*



It's a whole new world in compact, low-cost packages. Advanced design. Advanced operation. Features never before combined in a comparable instrument.

It's the new Beckman pHASAR I pH meter.

With all-new liquid crystal readout. The world's first in the pH field. This two-decimal readout (to 0.01 pH) is brighter, clearer than the commonly used digital technique. And far easier to read.

With slope control for readout correction (which you wouldn't expect at the price). And that means greater accuracy and capability, especially with troublesome samples.

With a new self-test switch. If you suspect a problem in a reading, you flick the switch and instantly know whether your electrodes need replacement. No need to call for service help to settle that question.

With a standardizing lock switch that holds calibration so well that you won't have to calibrate nearly as often as with other instruments.

Finally, this excellently designed meter is available with standard analog recorder output and optional BCD output, so you can interface with virtually any recorder or printer by direct connection.

And all this capability comes at a handsome price. For a demonstration or more data on this ahead-of-time meter, contact your local Beckman representative or write for Data File 29, Scientific Instruments Division, 2500 Harbor Blvd., Fullerton, Calif. 92634.

Beckman®
INSTRUMENTS, INC.

Circle No. 8 on Readers' Service Card

The new Polaroid MP-4 Multipurpose Camera.

Polaroid®

We designed it to take any kind of picture you ever needed.

And deliver it in seconds.

This may be the most versatile recording camera ever invented.

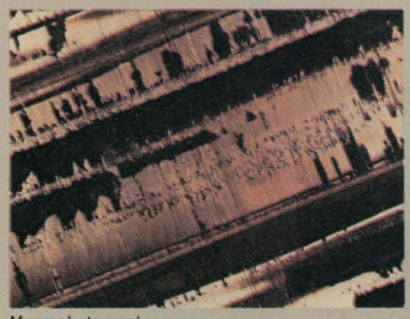
The new MP-4 has more things that do more things than any other camera made.

Copy prints, laboratory and studio pictures, photomicrographs, macrophotographs. In full color. Or as black-and-white prints, transparencies, or simultaneous positive and negative. All with Polaroid instant photography, using any of 13 different self-developing films (or with many conventional films).

You never saw a system so flexible. You can shift its lamps to any position, to get any level of light on the most awkward shapes. Rotate both column and camera to take any shot at any angle, anywhere. Remove the camera for tripod use. Even convert the system to a high-quality enlarger.

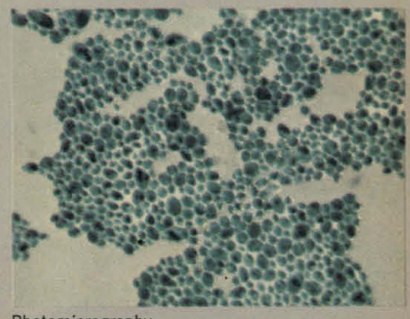
If records are important to you, we think this is the fastest—and best—way to make them. For information on the MP-4—or on any Polaroid photographic product or application—write or call collect: Polaroid Corporation, Dept. 26-252, Cambridge, Mass. 02139. Phone (617) 547-5176. (In Canada: 350 Carlingview Dr., Rexdale, Ont. In Puerto Rico: P.O. Box 2032, Ceramica Annex, Carolina 00630.)

Polaroid Laboratory Cameras



Macrophotography.
Damaged transformer coil.

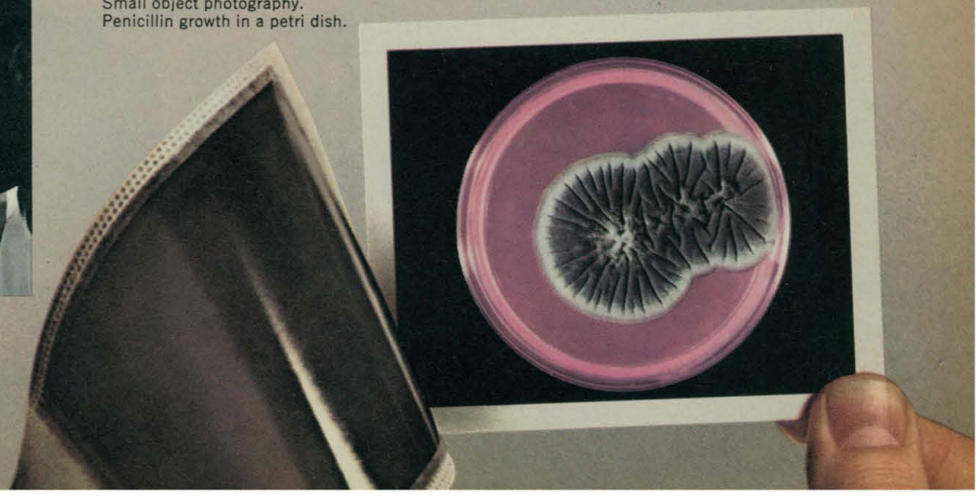
Copying.
Photocopy record of a venogram.



Photomicrography.
Yeast magnified X1000.

Studio photography (camera on tripod).
Record of a laboratory set-up.

Small object photography.
Penicillin growth in a petri dish.



Circle No. 18 on Readers' Service Card

Rudolf Partsch wanted to repeal Murphy's Law. Thus, the world's easiest-to-operate Electron Microscope.

"What I want," said Rudolf Partsch of Carl Zeiss, Inc. to the designers in Oberkochen, West Germany, "is a totally reliable, extremely easy-to-operate, compact electron microscope with good resolution (7Å) in the 0-60,000x range. And I want it at a low price." He wanted an electron microscope for researchers and teachers interested in electron microscopic studies, not electron microscopes—an instrument designed for everyday use.

The Zeiss EM9S-2 with fully automatic camera system, foolproof airlock, and fingertip controls is what he got. And it looks as though Mr. Partsch really had a keen insight into the needs of a large section of the American scientific community . . . judging both by the reception this instrument has had, and by the numerous attempts to copy it. The copies never catch up, because Partsch keeps in regular contact with users, to find out what kind of modifications can be made to keep abreast of research's ever-changing requirements. When he finds one, he gets it incorporated *post haste* into the design. And, what's more, makes it available for incorporation into previously sold instruments. Because ease-of-modification is a feature inherent in the original uncomplicated design, a Zeiss Electron Microscope never gets old.

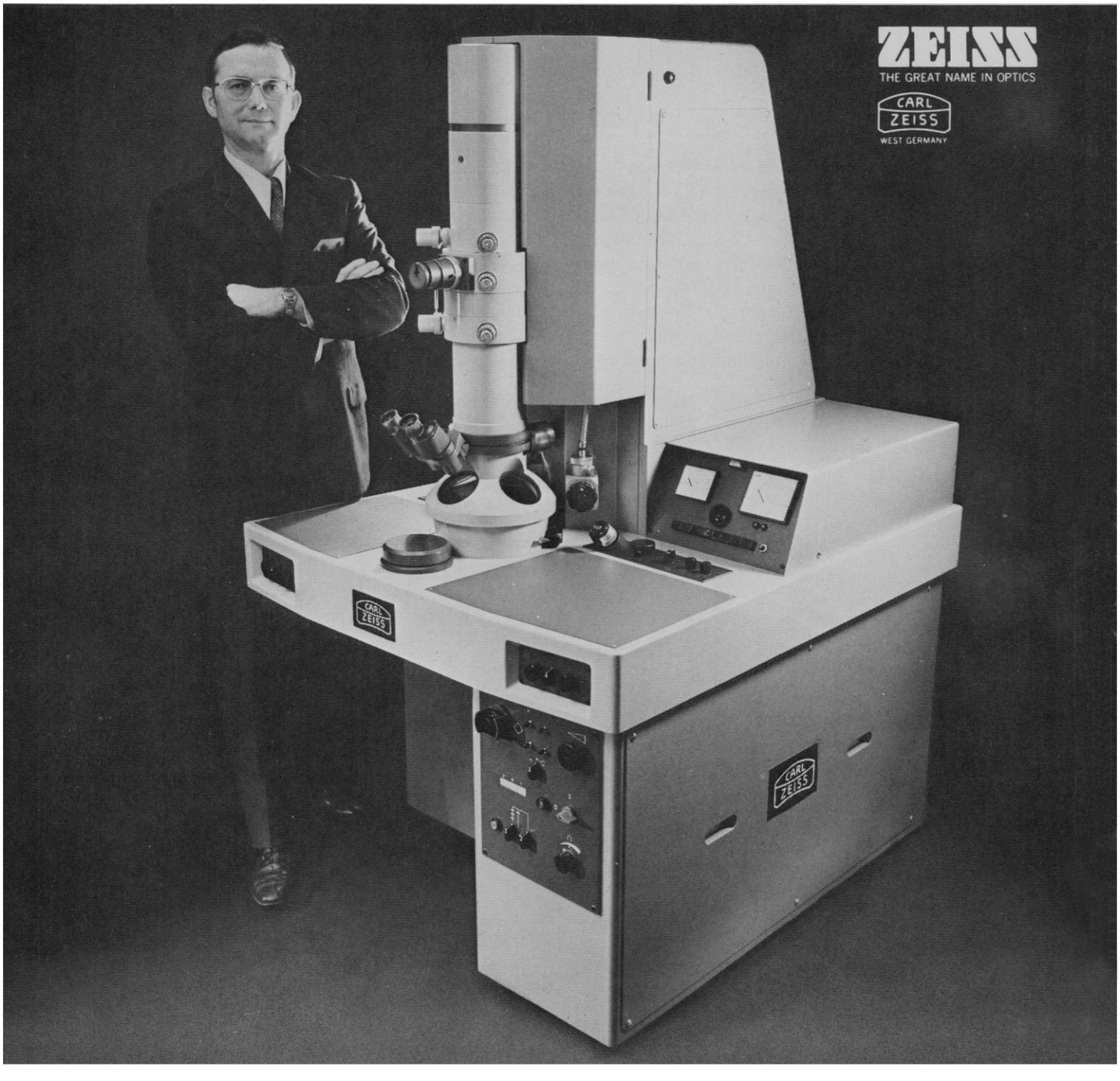
For the whole story, contact Partsch. He'll send you complete specifications and the illustrated brochure "How to Operate the World's Easiest-to-Operate Electron Microscope."

You can reach him by phone at: (212) 736-6070. Or write Carl Zeiss, Inc., 444 5th Ave., New York, N.Y. 10018. Canada: 45 Valleybrook Drive, Don Mills 405, Ontario.

Ask for leasing and time payment terms.

Nationwide service. Circle No. 7 on Readers' Service Card

ATLANTA, BOSTON, CHICAGO, COLUMBUS, DALLAS, DENVER, FORT LAUDERDALE, HOUSTON, KANSAS CITY, LOS ANGELES, PHILADELPHIA, PHOENIX, SAN FRANCISCO, SEATTLE, WASHINGTON, D.C.



The Portable Cryogenic Container you need is here.

Check appropriate ☐ for more information.

LABORATORY DEWARS:
two complete lines from Union Carbide.

One line provides a considerably lower evaporation rate than the other. Select the one that's best for your lab job; they're priced accordingly. Rugged, lightweight, made to quality specifications.

☐ ☐

Evaporation rate (liters per day)	0.42	1.24
Capacity (liters)		

Circle No. 22 on Readers' Service Card

CRYOGENIC REFRIGERATORS:
for dependable storage

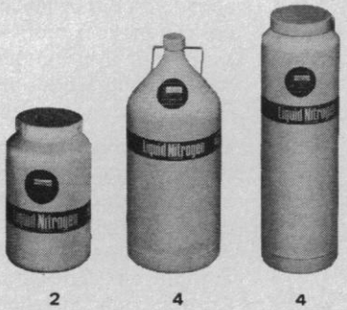
There are LINDE refrigerators for every need, including portable ones ranging in size from 10 to 50 liters. Specimens can be refrigerated up to 60 days without a liquid nitrogen refill. Also available: larger stationary units for immersion storage or vapor-phase refrigeration. ☐

Circle No. 23 on Readers' Service Card

HEAVY DUTY LABORATORY VACUUM VESSELS:
won't break or explode

These ruggedly constructed, metal-walled vessels are ideal for handling small quantities of liquid nitrogen in the lab. Unlike glass-walled dewars, they cannot explode during use. No need to wrap them with cloth to protect against flying glass. Cost? No more than comparable glass dewars.

☐



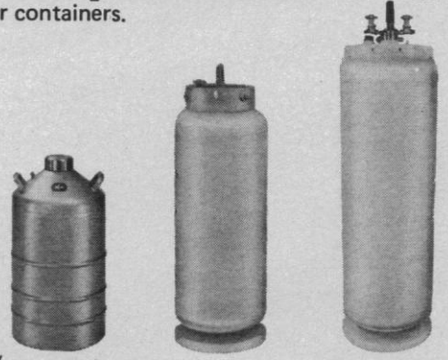
Capacity (liters)	2	4	4

Circle No. 24 on Readers' Service Card

STORAGE AND TRANSFER CONTAINERS:
large, portable

Available in three convenient sizes for storing, transporting, refilling, or dispensing liquid nitrogen. All can be easily moved by one person with dolly or cylinder truck. Two larger containers equipped for withdrawal of LN_2; withdrawal accessories available for smaller containers.

☐



Capacity (liters)	50	160	210
Filled Weight (pounds)	130	503	625

Circle No. 25 on Readers' Service Card

Check boxes for more information and mail this page to:

UNION CARBIDE CORPORATION
LINDE DIVISION
DEPT. S-3, P.O. BOX 766
RADIO CITY STATION
NEW YORK, N.Y. 10019

Name _____

Title _____

Company _____

Address _____

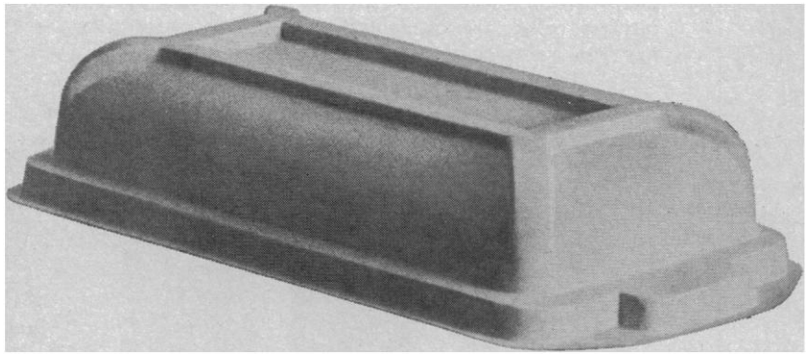
City _____ State _____ Zip _____

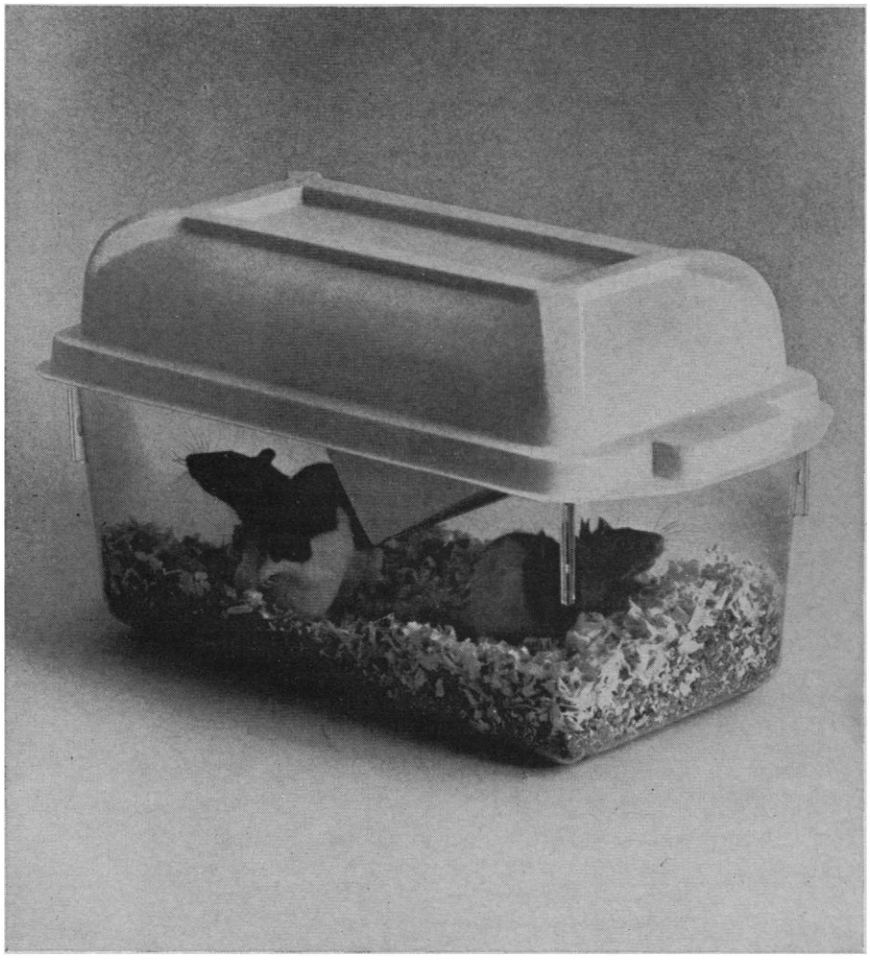
Telephone _____

UNION CARBIDE
CRYOGENIC PRODUCTS

LINDE and UNION CARBIDE are registered trademarks of Union Carbide Corporation.

New Econo-Filter Covers improve animal production, protect long-term experiments





Improved breeding rates; greater protection for long-term experiments; generally healthier animals. These are some of the benefits you get by using Econo-Filter Covers on your animal cages. Molded in one piece from non-woven spun polyester, they are the simplest, most effective way to protect animals against airborne infection, cross contamination and environmental stress. Econo-Filter Covers meet all published standards for porosity, air-permeability, and filtration of air-borne organisms, dust and other contaminants. They are available for all standard Econo-Cages and are reusable.

Positive Filtration. Econo-Filter Covers effectively remove air-borne contaminants without inhibiting the proper exchange of air. They can measureably reduce the incidence of contamination and diseases such as infantile diarrhea. This means that now both short-term and long-term programs can maintain a "clean" cage environment without instituting new lab procedures.

Environmental Control. Environmental stability promotes animal health. Econo-Filter Covers reduce fluctuations in temperature and humidity, eliminate drafts and minimize CO_2 and ammonia buildup.

Increased Animal Production. Healthier animals produce stronger litters and show greater fertility. Econo-Filter Covers can make a profitable difference in production by promoting more successful breeding while, at the same time, reducing infant mortality.

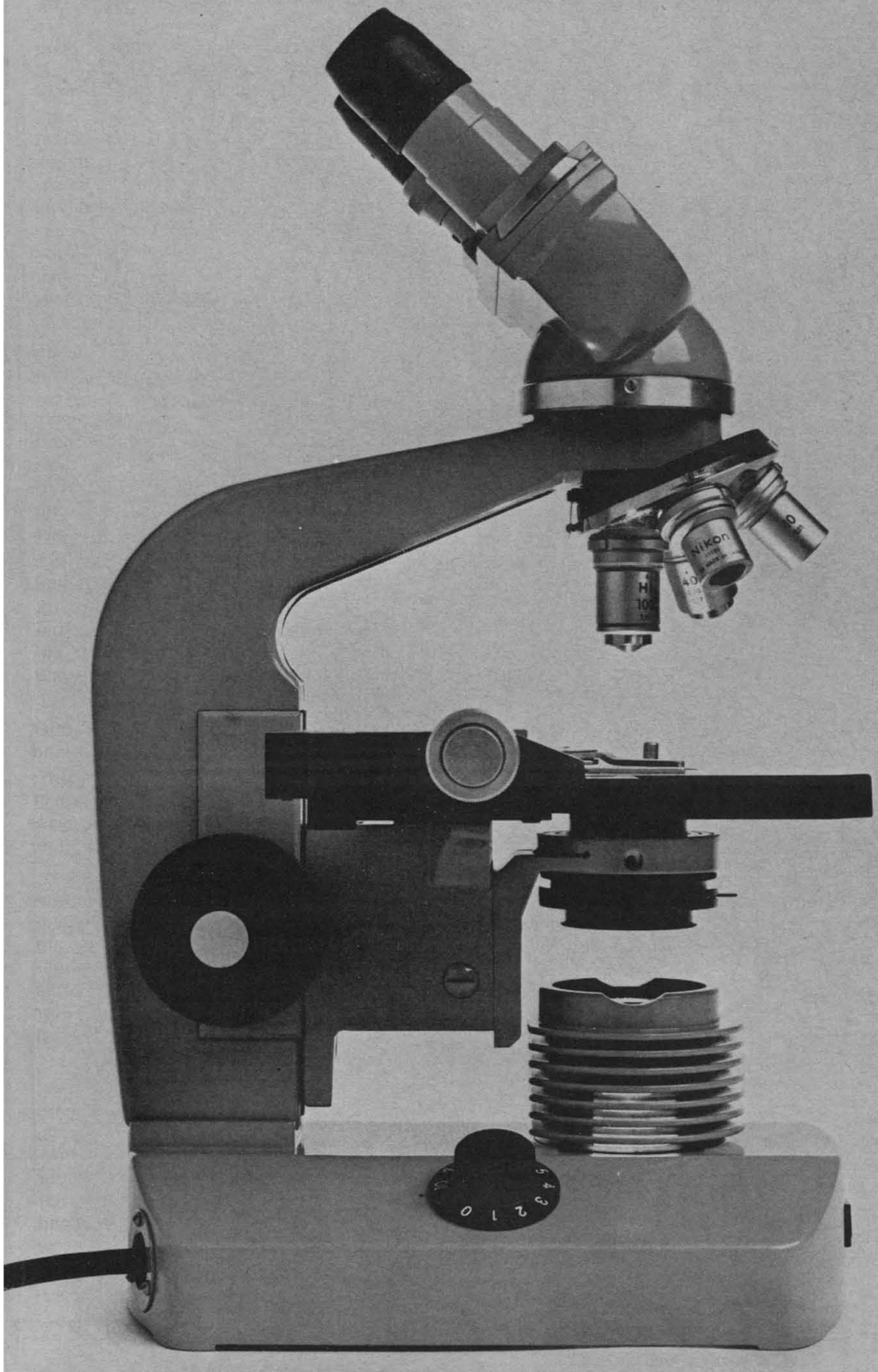
Economy and Efficiency. Few filter systems of equal efficiency are as economical as Econo-Filter Covers. They are reuseable; withstanding normal sterilization cycles in both steam and gas autoclaves. One-piece Econo-Filter Covers can be installed without special attachments or adapters.

What do you want? Healthier animals; increased animal production; or more protection for long-term experiments. You get them all with Econo-Filter Covers. For all the facts, contact your Econo-Cage/Econo-Filter Distributor or write the Scientific Division, Maryland Plastics, Inc., 9 East 37th Street, New York, New York 10016.

MP

Circle No. 6 on Readers' Service Card

The Nikon CL Classic Everything a student microscope should be.



A student microscope should be rugged, durable, tamper-proof, and optically flawless. The Nikon CL Classic is all of that, and more.

From top to bottom, it's designed for classroom use. Furthermore, the emphasis is on simplicity. Widefield 10x eyepieces, easily manipulated high-resolution objectives, bright even illumination and built-in solid state light intensity control — all guarantee trouble-free, simple operation for the student microscopist.

It's priced right, too — without any sacrifice of optical quality or workmanship. You'll find it fits easily into the institution budget. What's more, the CL Classic will accept a variety of accessories, giving you the versatility of an advanced microscope when you need it.

It's optically exceptional.
The high quality, high resolution optics meet the matchless standards that Nikon requires of all its microscopes. Comes with four achromat, color coded objectives, mounted on a four-place multiple ball-bearing nosepiece, 4x, 10x and retractable 40x and 100x (oil immersion.) Also has an n.a. 1.25 condenser in rack and pinion focusing mount.

It's tamper-proof.
Nikon designers have solved the problem of tampering, pilferage and accidental loss by locking in the eyepieces, body tube, condenser and objectives in a special way and giving you the key.

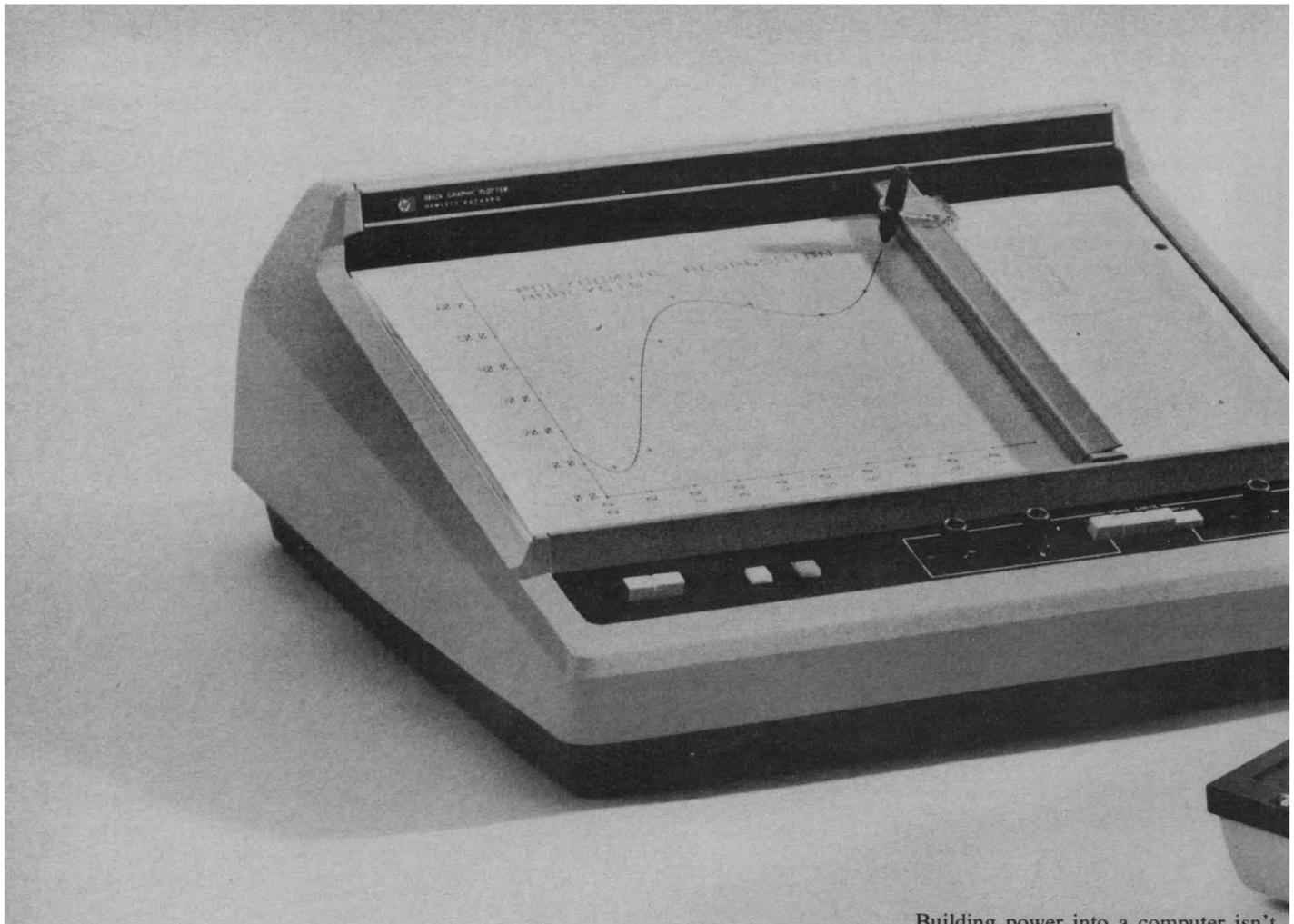
It's damage-proof.
Damage to specimens, slides and objectives is virtually impossible because of the jam-proof, slip-clutch safety feature in the harmonic drive focusing mechanism. The unusually smooth and sensitive, pre-set focusing controls will not break down even when forced.

It's rugged and durable.
The stand is full-sized, broad-based, sturdy and resistant to chemicals. This makes for maximum stability and protection against the rigors of daily classroom use.

Student or teacher, the Nikon CL Classic is the ideal classroom microscope. Prove it to yourself. Arrange for a free demonstration. Call or write: Nikon, Inc., Instrument Division, Ehrenreich Photo-Optical Industries, Inc. 623 Stewart Avenue, Garden City, N.Y. 11530.

EPI

Circle No. 19 on Readers' Service Card



Hewlett-Packard Series 9800 Model 30. The Name And Number Bridge The Computing Gap.

Building power into a computer isn't much trouble, these days. The task is to make that power respond to the demands of you scientists and engineers who don't pretend to be computer experts. That's a feat we've accomplished with our new Series 9800/Model 30.

It joins the accessibility and easy operation of a programmable calculator with the power and overall capability of a minicomputer. The result? Significantly reduced turn-around time for those complex research and design problems you're now sending to a programmer or outside computing service.

Conversation guides you to the best solution. The secret to the Model 30's problem-solving efficiency is its ability to communicate with you on a very human level. Its language is BASIC, a standard language that gives you simple, straightforward programming.

In practice, you solve a problem by setting up a dialogue with the Model 30. You talk to it through the typewriter keyboard. It talks to you through the alphanumeric display.

Once you've entered your instructions in English words and Algebraic formulas, the Model 30 does all the rest, under the automatic control of its hard-wired executive system. It'll even

show you where you've made a mistake —so you can quickly correct anything from one character to an entire block of text with just a few quick strokes on the editing keys.

Powerful memory for solutions to big problems. Despite its apparent simplicity and small size, the Model 30 is an extremely powerful computing tool. Significant features include the executive system software implemented by built-in ROM (read-only-memory); the large MOS-LSI read/write memory for programs and data, and the built-in tape cassette operating system for mass storage. Adding it all up, the *basic* Model 30 gives you problem-solving power equivalent to a minicomputer system with 10K sixteen-bit words of memory. And that's just for starters, because the Model 30's modular design lets you add capacity any time your usage demands.

You can add programming and systems versatility with plug-in ROMs. You can increase your data and program storage with read/write memory modules. And you can plug in up to nine additional tape cassettes for whopping mass storage.

New Series 9800 Line Printer gives you fast formatted output. If your work calls for formatted hard copy, you'll be happy to know you no longer need suffer the tedium and noise of slow, mechanical output writers. Our new Series 9800/Model 66 Line Printer mounts atop your Model 30 to give you a fast output of 250 lines per minute. (That's equivalent to typing 3,600 words per minute.)

Series 9800 Peripherals let you handle data in any format. As a member of the Series 9800, the Model 30 is fully compatible with all 15 of the Series 9800 Peripherals—ranging from high-speed Tape Readers to Instrument Interfaces. Illustrated above is our unique X-Y Plotter that not only draws histograms, linear, log-log, semi-log, or polar plots—but writes alphanumerics as well.

Put the Series 9800/Model 30 through its paces on some of your problems. We're already shipping production units. Prices start at $5,975 for the basic Model 30. Add $2,975 for the Model 66 Line Printer.

For more information or a hands-on demonstration, call one of our 172 worldwide sales offices. Or write: Hewlett-Packard, P.O. Box 301, Loveland, Colorado 80537.

093/2

HEWLETT hp PACKARD

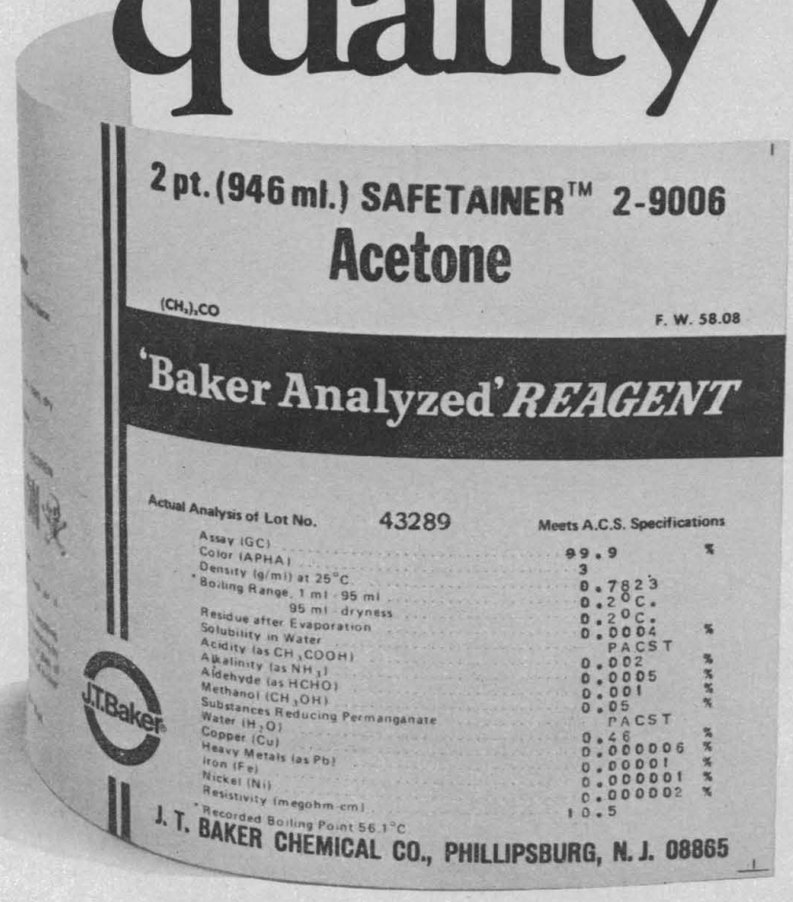
HP Sales, Services, and Support in 172 Cities in 65 Countries

Circle No. 12 on Readers' Service Card for Information

Circle No. 13 on Readers' Service Card for Demonstration

Circle No. 14 on Readers' Service Card for Information on HP-35

Proof of J.T.Baker quality



It's easy for you to prove the consistently high quality in 'Baker Analyzed'® Reagents. Just look at the labels on reagents in your own lab.

For 'Baker Analyzed' Reagents, you'll see an actual lot analysis on each bottle . . . with precise numerical values for significant impurities, usually lower and with more points of test than required to meet official standards. The label on 'Baker Analyzed' Reagent grade acetone reports 17 values you need for your critical work.

Now look at the labels on the other brands in your lab. You'll find fewer points of test . . . for example, only 10 for ACS reagent grade acetone. Frequently, only maximum limits are provided, not actual values.

The actual analysis of impurities in reagents is more critical than ever for today's sophisticated analytical techniques such as trace metal analysis, gas chromatography, nuclear magnetic resonance and scintillation counting.

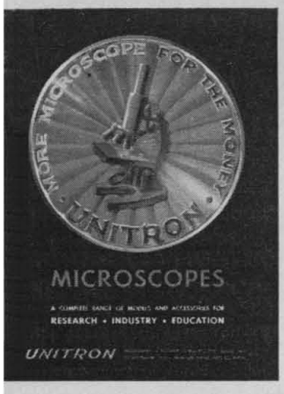
No one is going to label laboratory products like Baker does unless he's sure of the integrity of his products, bottle after bottle, year after year. Reliability of Baker laboratory products is 99.99%. Baker has provided 5 million packages of reagent acetone and 4 million bottles of hydrochloric acid since the last product complaint. And that's a total of 149 million analytical values reported on the labels of just these two products.

Specify 'Baker Analyzed' Reagents for their high quality—and you'll get a bonus in fast service. There are over 15 million dollars worth of Baker laboratory chemicals ready for immediate shipment to you through our network of more than 100 distributor locations across the country.

J.T.Baker

J. T. BAKER CHEMICAL COMPANY, 222 RED SCHOOL LANE, PHILLIPSBURG, NEW JERSEY 08865

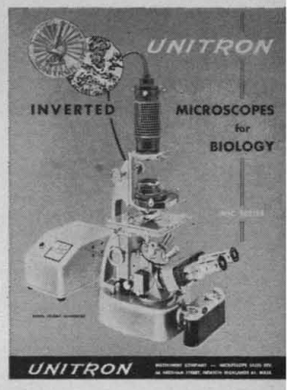
Circle No. 20 on Readers' Service Card

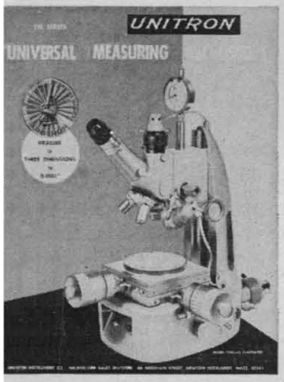


FREE MICROSCOPE BUYING GUIDE

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.

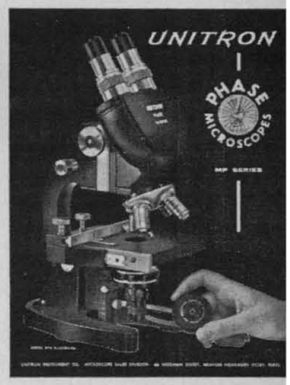




TRY ANY UNITRON MICROSCOPE FREE FOR 10 DAYS

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. B-4

Name _____

Company _____

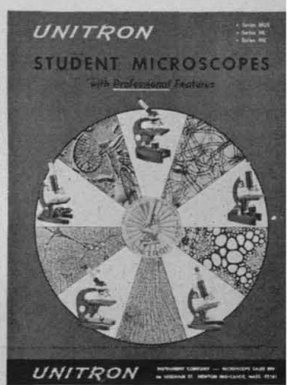
Address _____

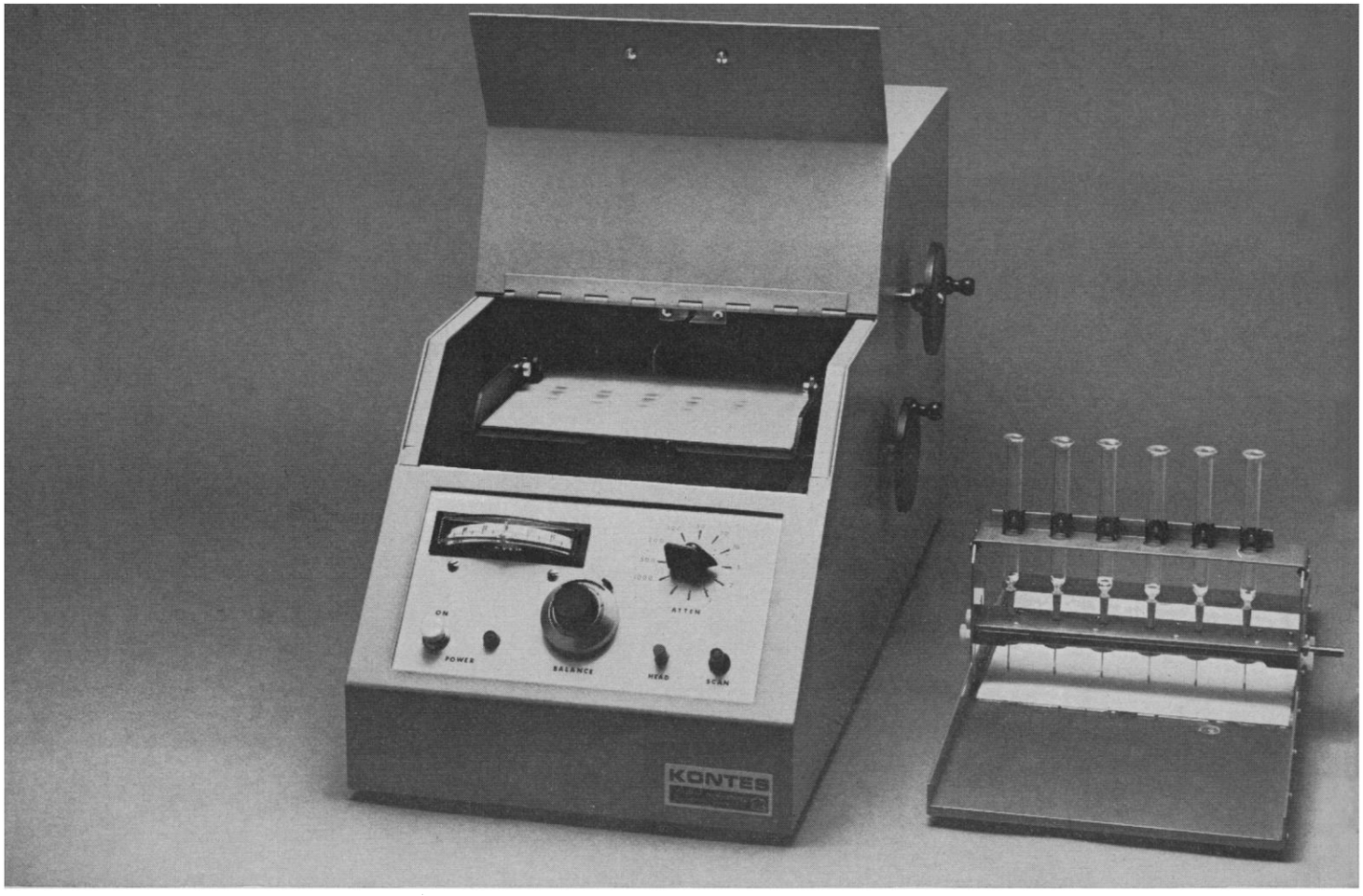
City _____ State _____ Zip _____

Circle No. 9 on Readers' Service Card

UNITRON
INSTRUMENT COMPANY

MICROSCOPE SALES DIVISION
66 NEEDHAM STREET
NEWTON HIGHLANDS
MASSACHUSETTS 02161





Introducing low-cost, quantitative TLC.

Here is a new Kontes system that offers high resolution, quantitative TLC analysis at low cost.

The brain of the system is the unique and patented Kontes Densitometer* which automatically scans by diffuse reflectance and measures the density of migrated spots against a reference value. It utilizes a rugged and highly reliable fiber optic scanner to create outputs compatible with existing chart recorders, digital readout devices, or other EPD hardware. The densitometer sells for $1850.

Our air-manifold Chromaflex® Spotter** is the heart of the system. It consistently makes uniformly-sized spots on all standard TLC plates. The Chromaflex Spotter was specifically conceived to enhance the accuracy of densitometric analysis by precisely controlling the spot size—up to 2 ml of solvent extract can be spotted to a controlled diameter of 6mm or less with a reproducibility of ±2%. The Chromaflex Spotter sells for $130.

In combination, our densitometer and spotter afford reproducible, quantitative analysis at a cost unmatched by other methods. The practicality of the Kontes system is documented by a bibliography of applications and a comprehensive manual.

To round out the system, our TLC line also includes an unusually high-performance chart recorder, precoated plates, developing tanks, and other accessories.

For further information contact your Kontes man or send for our detailed brochure.

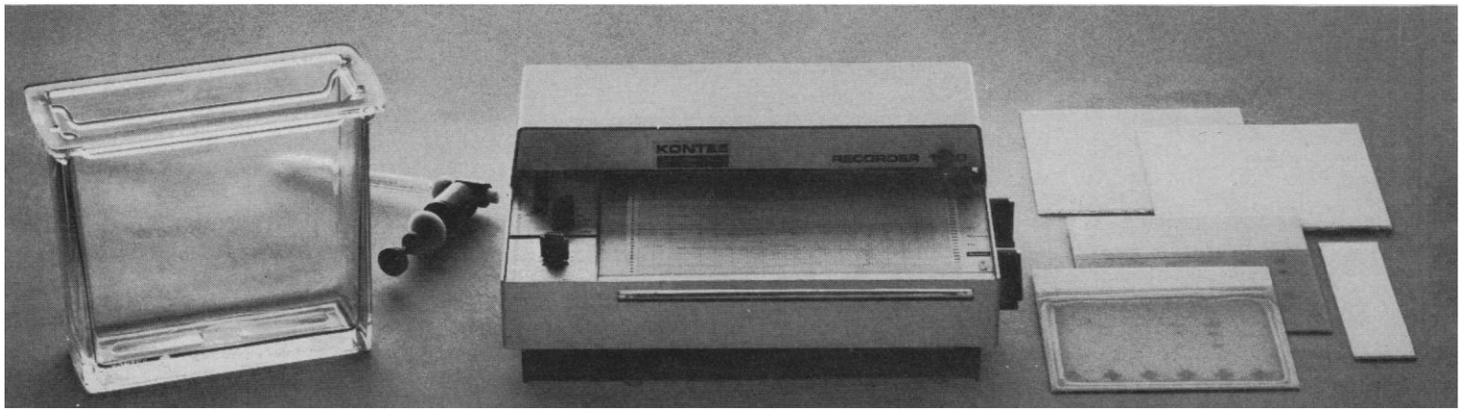
*"Determination of Reflectance of Pesticide Spots on Thin-Layer Chromatograms Using Fiber Optics", Morton Beroza, K. R. Hill, Karl H. Norris, ANALYTICAL CHEMISTRY, September 1968, U.S. Patent 3,562,539. Other patents pending.

**"Automatic Spotting of Pesticide Extracts on Thin-Layer Plates", Morton Beroza, Melvin E. Getz, C. W. Collier, Bulletin of Environmental Contamination & Toxicology, Vol. 3, No. 1, 1968. Patent Pending.

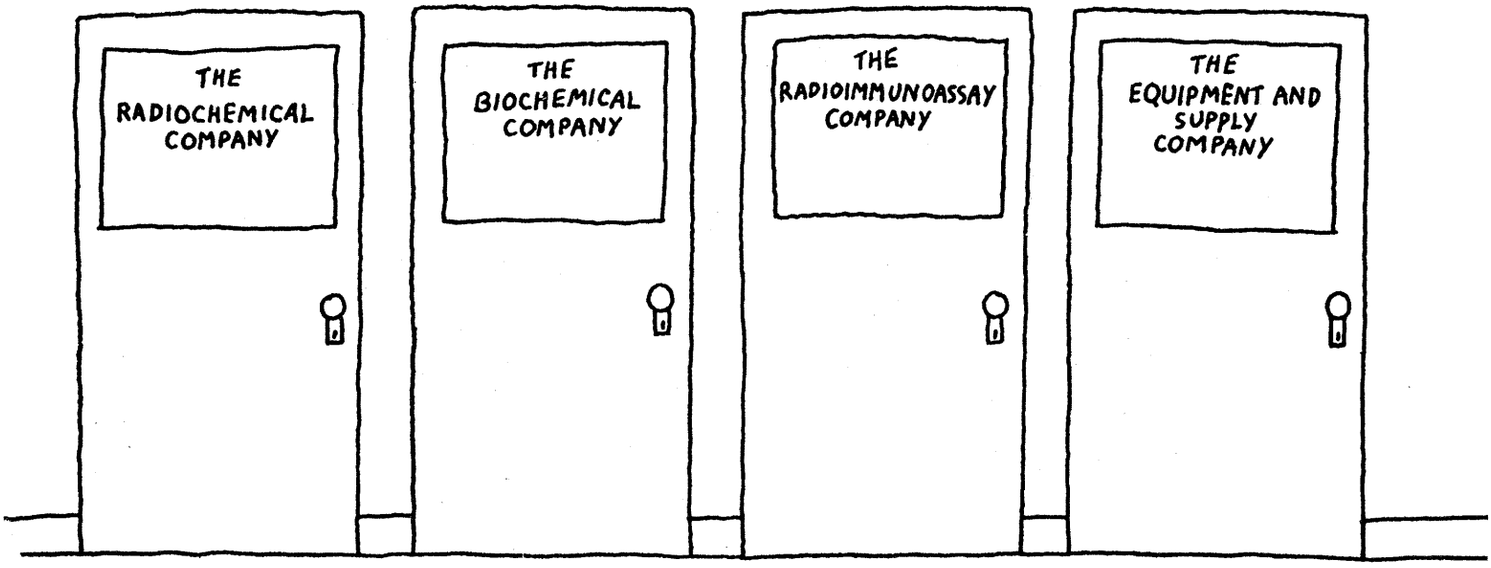
KONTES
Vineland, N.J. 08360

Circle No. 4 on Readers' Service Card

Regional Distributors: **KONTES OF ILLINOIS,** Evanston, Illinois • **KONTES OF CALIFORNIA,** Berkeley, California



Schwarz/Mann: Know us for what we really are.



A RADIOCHEMICAL COMPANY

With approximately 900 radiochemicals in stock, we're one of the biggest. We supply a wide range of isotopically-labeled nucleic acids and derivatives, amino acids, peptides and peptide-precursors . . . to name a few. Deoxynucleotides, nucleotides, nucleosides (e.g., thymidine and uridine, both ^{3}H and ^{14}C labeled). Expect high specific activities. Be protected by our periodic re-assay program. Enjoy shipment from three distribution points in Continental U.S.A. and numerous foreign dealers.

A BIOCHEMICAL COMPANY

Amino acids and related compounds, carbohydrates, antimetabolites, enzymes, nucleic acids and derivatives, steroids . . . and many etceteras. We're featuring certain things too: over 40 new synthetic peptides of high biological activity (e.g., secretin, angiotensin I, oxytocin); compounds for peptide synthesis (e.g., t-boc amino acids and related compounds); and custom synthesis of a diversity of compounds.

A RADIOIMMUNOASSAY COMPANY

The simple—though immodest—truth is that we're the world's leading supplier of radioimmunoassay kits. We offer the following kits for research and diagnostic purposes: cyclic AMP, digoxin and digitoxin (both ^{3}H and ^{125}I), plasma cortisol, human placental lactogen, renin activity, human growth hormone, and insulin. New Kit: vitamin B_{12}. These simple-to-use kits include all necessary reagents. And more are coming.

AN EQUIPMENT AND SUPPLY COMPANY

Schwarz/Mann is very much in the equipment/supply business and can simplify your life with our specialty products. Note: two Biopette automatic pipettes, an automated peptide synthesizer (the first commercially available), liquid scintillation vials, a new TLC plate with 19 channels (!), CPK atomic models. And others.

Schwarz/Mann
Division of Becton, Dickinson and Company B·D

Circle No. 21 on Readers' Service Card

FOR A CLOSER LOOK . . .

Write for our brand new 1973 catalog. Speak to our salesman, give us a call, drop us a line, use the Reader Service Card if there is one, or fill in this coupon. Know us for what we *really* are.

THE RADIOCHEMICAL COMPANY
THE BIOCHEMICAL COMPANY
THE RADIOIMMUNOASSAY COMPANY
THE EQUIPMENT AND SUPPLY COMPANY

SCHWARZ/MANN
Orangeburg, New York 10962

Please send your brand new 1973 catalog.

Name _____

Title _____

Department _____

Organization _____

Address _____

_____ Zip _____

Forma glassware cleaning systems offer more for less money.

A generation ago, Forma began to put together a line of quality laboratory glassware cleaning systems. It's still unmatched. If there's glass to be cleaned and money to be saved, check the line, and then check with Forma.

The fully automatic Forma Fury glassware washer features five cycle operation, a distilled water reservoir, automatic detergent injection, steam elimination, and a safety cutoff switch. A hydro drive rotary spray system provides for up to 150 water passes per minute. Forma's unique Auto-Valve Header allows roll-in insertion of the spindle rack header.

The portable spindle header provides high power jet action to volumetrics and odd shapes.

The matching Forma Fury dryer provides fast, complete drying in temperatures ranging to 200°C. Forma manufactures compatible glassware dryers for all washer types.

The Forma countertop spindle-spray washer takes just a little space where you can spare it most —on top of something else. Both rotary arm and spindle-spray action, with five rinses, including a final distilled water rinse. A built-in distilled water reservoir and pumping system allows for a final demineralized rinse.

Used as a table for loading and unloading racks and headers, the durable roll-in transfer cart eliminates lifting.

A hydro-drive mechanism eliminates the need for moving parts in the rotary arm. 4 to 6 times as much exposure to water as in mechanical systems.

The Forma Undercounter 100 washer includes as standard many features usually regarded as options —five cycle operation, automatic distilled water rinsing, adjustable cycle control and all stainless steel interior and exterior. Easily installed, the UC 100 occupies only 4 sq. ft. of floor space, and is adjustable to virtually all laboratory counter heights.

Forma Scientific

BOX 649 • MARIETTA, OHIO 45750 • AREA CODE 614/373-4763

Circle No. 2 on Readers' Service Card

Our 22 PhDs talk to each other—
about their problems, about your problems.

Purest radioactive chemicals for research.

NEN New England Nuclear

575 Albany St., Boston, Mass.; NEN Canada Ltd, Dorval, Quebec; NEN Chemicals GmbH, Dreieichenhain, Germany

Circle No. 17 on Readers' Service Card

given to the ideas professed by the ancient Greeks. If this is done, children could be brought to understand that many peoples have thought about the problem, and that the Judeo-Christian tradition is only one amid several others. This would allow a perspective in which to better present the scientific attempts which are made to explore this matter.

J. M. BURGERS
4622 Knox Road,
College Park, Maryland 20740

Nicholas Wade mentions the charge that the creationist movement is a "closely coordinated, nationwide campaign supported by rich and powerful backers." This charge is certainly not true. I have been secretary of the Creation Research Society since its founding in 1963 and have not known a single rich or powerful patron. We maintain a fund for research expenses and another for publication, both of them small. The dues of $7 a year pay for the *Creation Research Quarterly*. We support no executive secretary, no officer receives pay, and articles in the *Quarterly* are not paid for, although their preparation requires much time.

Personally, I am convinced that discussion of beginnings, although interesting to many people, is not science but philosophy. Science consists of facts that must be organized and interpreted; without a body of observed facts you can have no science. It is evident that there was no one to observe the beginning of the world, hence there can be no *science* of beginnings.

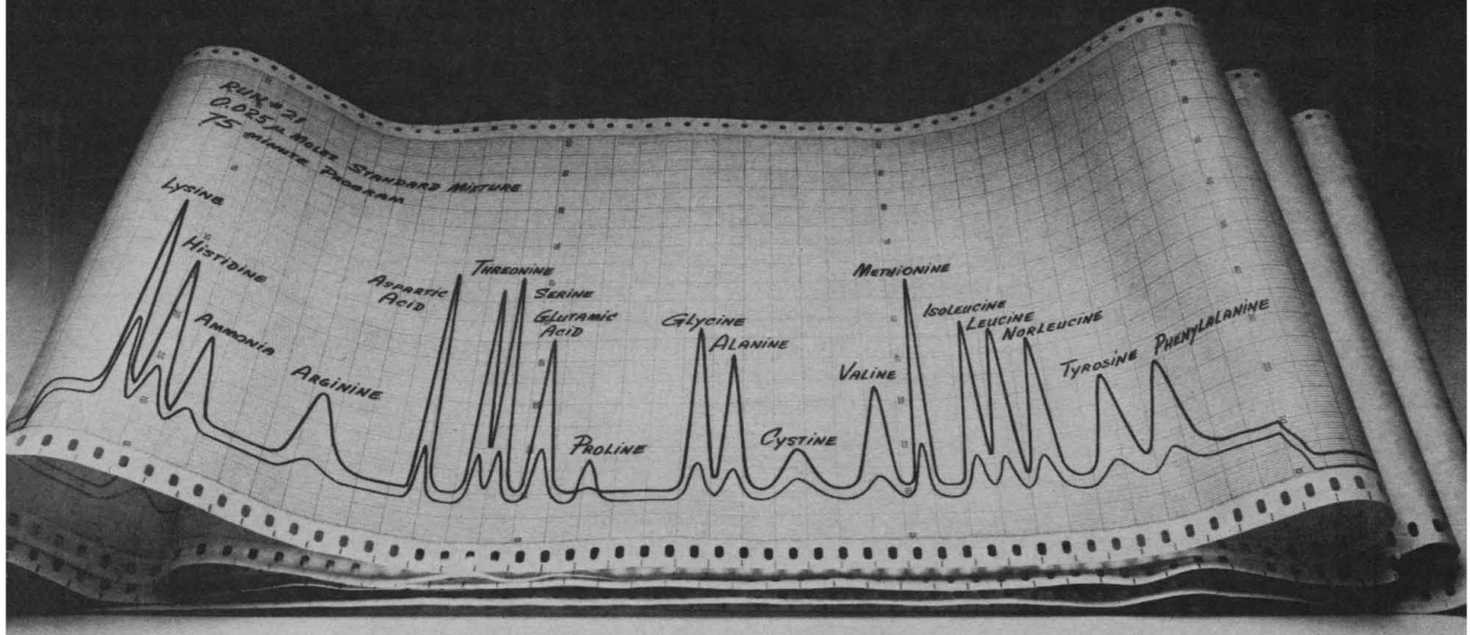
We can study present life processes and make inferences about past developments. We creationists do not object to teaching the inferences of the evolutionists, but as careful scientists we ask to be excused from teaching these ideas as scientific truth.

Vernon L. Grose makes a correct summary when he calls evolution "the case for chance" and creation, "the case for design."

WILLIAM J. TINKLE
118 West South Street,
Eaton, Indiana 47338

The report by Nicholas Wade concerning the current debate between the creationists and the evolutionists over the California State Board of Education elementary school science guidelines clearly delineates serious issues that confront the academic and educational community in California. However, because of the tangled web that this controversy is generating, it is important to attempt to keep the record straight on one rather simple point.

Our amino acid analyzer offers speed, sensitivity, and outstanding resolution. We think that's what you need.



The Technicon® Sequential Multi-Sample (TSM®) Analyzer is a fully automated liquid chromatography system for amino acid analyses. It will process protein hydrolysates in just 75 minutes, and physiologic samples in 5½ hours. The TSM Analyzer is sensitive enough to detect and analyze quantities as small as 2-5 nM of each amino acid with unprecedented resolution of each peak. Samples may be stored in pairs of sealed TSM cartridges, safe from diffusion loss. As many as 40 pairs of samples may be held ready for analysis at one time, for great operating convenience.

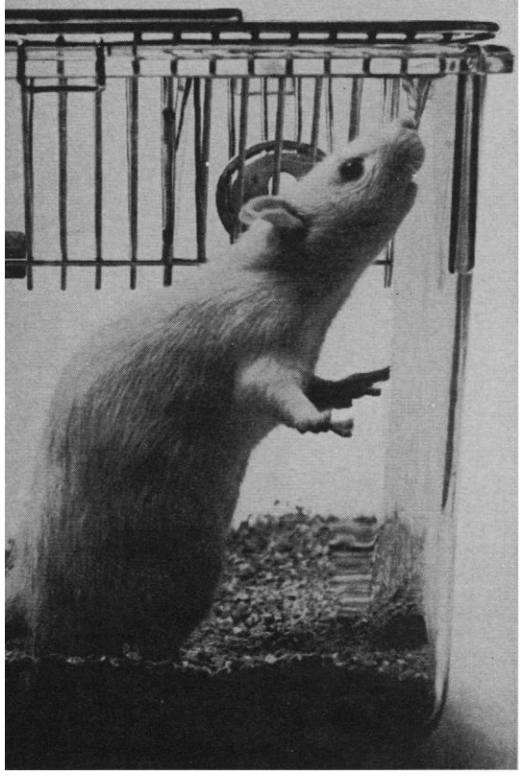
The system's modular flexibility assures simple maintenance and service. Air-stable ninhydrin reagent is mixed with hydrazine sulfate within the system, eliminating stringent reagent preparation and storage requirements, while ensuring maximum reproducibility of reactions.

If we're right about what you need for amino acid analyses, we think you'll want to know more about our TSM Analyzer. Please write Dept. 175,

Technicon Industrial Systems,
Tarrytown, New York 10591

Circle No. 5 on Readers' Service Card

see how clearly you can see how deep our new cage is?



You're looking through our new deep plastic cage for rodents. It clearly anticipates new public law requirements. It all adds up to new convenience for you: More room under the feed hopper. More usable floor space for your research animals. Or more room for additional animals.

We offer a broad-line of plastic cages, accessories, bedding (e.g., ab-sorb-dri®), and special animal care systems.

From Lab Products, Inc., a new company of experienced people in small lab animal care. For a copy of our catalog, write or call Lab Products, Inc., 635 Midland Avenue, Garfield, N. J. 07026. Phone 201 478-2535.

lab products inc

Circle No. 88 on Readers' Service Card

a Bio-Medic company

Wade alludes to the role of Seventh-Day Adventists. He notes that one of the conservative members of the state board of education pushing the creationists' position is John R. Ford, identified as a Seventh-Day Adventist. Also, a consultant at the California Department of Education is quoted as stating that "it seems evident the Seventh-Day Adventists . . . have embarked upon a plan to exert considerable pressure" on the creationist side.

These statements standing alone may create the illusion that Seventh-Day Adventists in general support attempts to impose sectarian philosophical positions in science materials. While it is true that, traditionally and historically, the Seventh-Day Adventist Church has supported creationistic views, many younger, professionally trained members of the church are increasingly attempting to move their church's views from a fundamentalistic ethos to what they consider a more mature position.

R. E. TAYLOR
Department of Anthropology, University of California, Riverside 92502

Joint Effort

An account is given by William D. Metz (Research News, 10 Nov. 1972, p. 600) of new data on the expansion rate of the universe, the distances to galaxies, and the time scale of creation. The work is attributed to me, but has, in fact, been the result of a long and close collaboration with Gustav A. Tammann over the past 10 years. Tammann's immense contribution was fundamental in devising methods by which to measure the distances from nearby galaxies to more remote parts of the expanding universe, where the expansion rate must be calibrated. The results are to be published jointly.

ALLAN SANDAGE
Hale Observatories, 813 Santa Barbara Street, Pasadena, California 91101

DDT in British Rain

The widely publicized figure of "73 to 210 ppm" of DDT in British rain (10 Dec. 1971, p. 1101) has now been reduced to one one-millionth of that amount by Woodwell *et al.* (Letters, 3 Nov. 1972, p. 450). In support of those figures, Woodwell cites in his reference 45 two articles, one by Tarrant and Tatton (*1*) and another by Wheatley and Hardman (*2*). Each sample of rainwater analyzed by Tarrant and Tatton consisted of a total 3-month sample from a collecting station. They did not say how the water was collected, but one sample "contained two insects," indicating a possible source of contamination. In their samples, the highest DDT residue was 190 parts per *trillion* (ppt), and the mean for the year at that station was 66 ppt in the 3-month samples. At their other six stations the means were only 53, 30, 46, 61, 49, and 18 ppt, respectively. The analyses reported by Wheatley and Hardman were even lower, the amounts of DDT averaging 3 ppt over areas of agricultural England. These two references were cited by Woodwell *et al.* to confirm high levels of DDT in England's rain and "similar concentrations" in rainfall in the United States. The references, however, did *not* indicate the high residues alleged by Woodwell *et al.* and did not even contain any data for the United States.

J. GORDON EDWARDS
Department of Biological Sciences, California State University, San Jose 95192

References

1. K. R. Tarrant and J. O'G. Tatton, *Nature* **219**, 725 (1968).
2. G. A. Wheatley and J. A. Hardman, *ibid.* **207**, 486 (1965).

The context of our original article made the use of "ppm" in association with the DDT content of rain in Britain an obvious typographical error. In the sentence following the error there was a reference to 40 parts of DDT residues per trillion parts of water in the meltwaters of Antarctic snows. In the next paragraph we assumed 60 ppt for use in our model. A perceptive reader would have difficulty being misled for long. Our earlier letter corrected the typographical error to parts per trillion, which we stated explicitly to mean parts per 10^{12}. Edwards' purpose leaves us puzzled.

The concentrations we cited are from Tarrant and Tatton (*1*). The earlier data of Wheatley and Hardman (*2*) showed that residues could be detected in rainwater and provided the basis for Tarrant and Tatton's more comprehensive study. We used total residues, as is commonly done, not simply the data on *p,p'*-DDT cited by Edwards. The 73 ppt we used is the mean of four 3-

month samples spanning a year at Lerwick, Shetland Islands, the northernmost and most remote sampling station. We used that station because it was remote and seemed to offer the best possibility of representing precipitation over a large area. The decision is certainly open to further interpretation.

The 210 ppt we cited is the highest 3-month sample. It occurred in Camborne, Cornwall, in the period November–January, not a period when large quantities of DDT would normally be used locally. Edwards' assertion that the highest DDT residues reported totaled 190 ppt is wrong.

The literature citation with which Edwards takes issue was originally in mid-sentence and applied only to the British data. It was moved in editing to the end, where it appeared to apply as well to the U.S. data we mentioned. The U.S. data are summarized in reference 13 of our original paper (*3*). Mean DDT concentrations at three sites in Ohio were 75, 180, and 360 ppt (*4*). We considered this range sufficiently coincident with the British data to write "similar concentrations have been reported in the United States." The maximum concentrations reported in the U.S. study were considerably higher than those observed in Britain; the maximum at one sampling point was in excess of 1300 ppt. The British study was more comprehensive, and we considered it a better sampling for our purposes.

DDT use in the United States has been reduced more rapidly than we had guessed possible. The abrupt cessation of use makes this an unusually good time to examine the behavior of a worldwide pollutant. We hope that a sufficiently comprehensive program will be initiated to resolve the questions of world circulation, which attempts at modeling such as ours set forth so sharply.

G. M. WOODWELL
Brookhaven National Laboratory, Upton, New York 11973

P. P. CRAIG
National Science Foundation, Washington, D.C. 20550

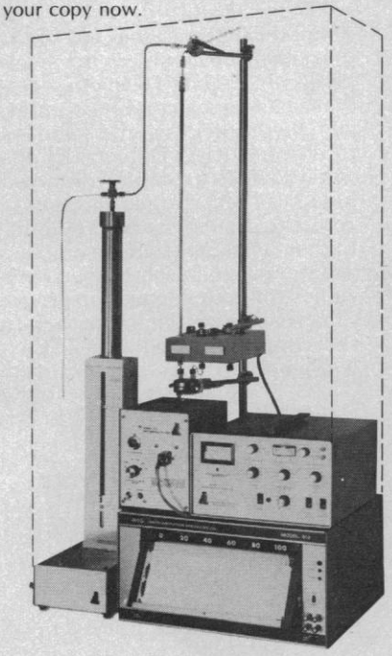
H. A. JOHNSON
Indiana University Medical Center, Indianapolis, Indiana 46202

References

1. K. R. Tarrant and J. O'G. Tatton, *Nature* **219**, 725 (1968).
2. G. A. Wheatley and J. A. Hardman, *ibid.* **207**, 486 (1965).
3. J. Frost, *Environment* **11**, 14 (1969).
4. J. M. Cohen and C. Pinkerton, *Advan. Chem. Ser.* **60**, 163 (1966).

L/C buyer's tip:
Don't pay $5000 for the cabinet.

A $4,000 ISCO high pressure liquid chromatograph can give you separations and operating convenience identical to practically any $9,000 fancy cabinet competitor. ISCO constant flow 2,000 psi gradient or metering pumps have absolutely pulseless, vibration-free single stroke piston construction. You don't have to settle for a gas pressure system (with you supplying the gas), or septum injection. The 6 port sample injection valve permits rapid and reproducible sample introduction. Stainless steel columns have non-clogging supports and fittings with no dead volume or mixing. The dual beam, high sensitivity UV photometer has seven absorbance ranges from 0.02A to 2.0A full scale, and instant wavelength selection of 254nm or 280nm. The whole chromatograph as pictured—pump, column (unpacked), photometer, 10" recorder, sample injection valve, degasser, and other hardware, costs under $4,200. Plug your present recorder into the photometer and save $820; or add less than $2,500 more to include a fraction collector and electronic digital integrator. Many additional features and options are available, all described in our current catalog. Send for your copy now.



ISCO

BOX 5347 LINCOLN, NEBRASKA 68505
PHONE (402) 434-0231 TELEX 48-6453

Circle No. 87 on Readers' Service Card

Measuring Cyclic AMP, Cyclic GMP, HPL, HGH, or LSD?
Collaborative Research, Inc. gives you RIA reagents PLUS

One phone call to 617-899-1133 lets you place your order PLUS gets you expert answers from our scientists to your technical questions.

If you're measuring 3'-5' Cyclic AMP, 3'-5' Cyclic GMP, HPL, HGH, or detecting LSD, Collaborative Research radioimmunoassays provide you specific, reliable and extremely sensitive determinations. For example, you can measure as little as 0.05 pmole of Cyclic AMP and Cyclic GMP, or as little as 0.1 nanogram of HPL and HGH, or detect less than 0.1 pmole of LSD—all in small volumes of serum, urine, plasma and tissue homogenates.

We'll supply all the necessary reagents and protocols for the assays so you can perform the determinations in your own lab. Or, we'll perform the assays for you.

But, either way, Collaborative Research gives you a big PLUS—the chance to discuss any technical question you may have directly with our staff.

And this technical collaboration between our scientists and our customers is the whole idea behind our name: Collaborative Research.

For more information about our RIA reagents for Cyclic AMP and Cyclic GMP, HPL, HGH and LSD, and our radioimmunoassay service, just call us at 617-899-1133, Ext. 33. Or, use the handy coupon, or write us at Dept. SM-5.

Research Products Division SM-5
Collaborative Research, Inc.
1365 Main St., Waltham, Mass. 02154
Gentlemen:
Please send me more information about
☐ Reagents ☐ Assay service for ☐ Cyclic AMP
☐ Cyclic GMP ☐ HPL ☐ HGH ☐ LSD
☐ Contract assay service
Name_____
Affiliation_____
Position_____
Address_____
City_____ State_____ Zip_____

CR Research Products Division
Collaborative Research, Inc.
1365 Main Street
Waltham, Mass. 02154

Original and sole source for many advanced research products.

Circle No. 83 on Readers' Service Card

957

IEC ZONAL CENTRIFUGATION

The Systems Approach to your needs

Zonal centrifugation is one of the most exciting advances in modern research. With the proper system you can shorten run times, enlarge sample-gradient volumes and improve resolution. Damon/IEC Division provides a complete family of advanced centrifuges and zonal rotors to assure gradient stability, higher concentration of sample, greater speed, resolution and efficiency for your separation program. Choose your systems approach from the comprehensive line of IEC equipment:

THE IEC ULTRACENTRIFUGE B-60

The B-60 provides a total approach to ultracentrifugation in a unit quiet enough for operation in office or laboratory. Features include flexible drive system, precise temperature control, positive speed control, advanced vacuum system, automatic rotor protection, complete instrument protection and master control knob. With a selection of three zonal rotors, the B-60 offers zonal capacities ranging from 570 to 1674 ml, speeds from 8,000 to 50,000 rpm and forces from 9100 to 186,500 x g. Thirteen swinging bucket and fixed angle rotors serve "routine" needs to 2,000 ml, 60,000 rpm and 405,900 x g.

THE IEC HIGH-SPEED REFRIGERATED CENTRIFUGE B-20A

This versatile, intermediate system serves both research and routine applications. Engineered to reduce the possibility of operator error and to allow accurate duplication of experiments, the B-20A features programmed operation. Once operating parameters have been selected, a single master control knob initiates the run which continues automatically to completion. Three interchangeable zonal rotors permit speeds from 8,000 to 19,500 rpm, forces from 9100 to 28,300 x g and volumes consistent with those of the B-60 system. Eight ultra (fixed angle) rotors may also be used in the B-20A.

THE IEC GENERAL PURPOSE REFRIGERATED CENTRIFUGE PR-6000

The newest, most advanced general purpose refrigerated centrifuge available, the PR-6000 reaches speeds of 6,000 rpm with gravities to 7900 x g. An unusually broad selection of general and specialty accessories make the PR-6000 your logical choice for virtually any biochemical separation requirement. And with the CF-6 Continuous Flow Zonal Rotor, the PR-6000 can deliver many ultracentrifuge capabilities at only 6,000 rpm.

IEC ZONAL ROTORS

Z-15 Zonal Rotor: Interchangeable in the B-20A and B-60 systems, this rotor provides excellent separations of chloroplasts, mitochondria and large viruses such as tobacco mosaic virus (TMV). The large starting radius of the Z-15 increases efficiency of separation almost 300% and allows subcellular particle separations for most cell systems to be completed in less than four hours. Constructed of Plexiglass and aluminum, the Z-15 simplifies protocol design and permits observation of the separation as it takes place. While providing an excellent educational tool, this design also permits parametric corrections while an experiment is in progress.

B-29 and B-30 Zonal Rotors: Also for use in the B-20A and B-60 centrifuges, these advanced design IEC zonal rotors have the additional feature of edge loading and unloading. Constructed from specially coated aluminum, inserts are easily removable and autoclavable. The septa in each rotor is made from a special plastic, also removable and autoclavable.

The B-29 rotor has proved to be an excellent choice for purification of hepatitis antigen. The B-30 rotor is capable of separating serum proteins and other dissolved macro-molecules. When used in a B-20A high speed centrifuge, either rotor is ideal for particle studies with sedimentation coefficient to 200s such as viruses, clay minerals, mitochondria, bacteria and lysosomes. In the B-60 ultracentrifuge, applications include isolation of bacterial RNA, ribosomes, proteins and subunits from alkali disrupted adenovirus.

IEC zonal rotors can be used with one common removable effluent and feed seal. This removable seal eliminates most leakage problems and permits removal of fragile active parts of the system while the rotor is spinning. Hence, runs need not be lost to repair the seal.

CF-6 Continuous Flow Zonal Rotor: Designed specifically for use with the IEC Model PR-6000 or PR-J refrigerated centrifuges, the CF-6 provides many ultracentrifuge capabilities at low speed. The CF-6 will process such particles as mitochondria, nuclei, protozoa, unicelled algae, chloroplasts, bacteria, yeast, spores, blood cells, polyhedral insect viruses and latex. Further, it provides an ideal environment for biological organelles such as phyto-plankton, allowing such life processes as respiration and photosynthesis to continue unimpaired during centrifugation.

IEC zonal centrifugation systems are available world-wide. For complete and detailed information, contact:

DAMON/IEC DIVISION
300 SECOND AVE., NEEDHAM HTS., MASS. 02194, TEL: (617) 449-0800

Circle No. 27 on Readers' Service Card

9 March 1973, Volume 179, Number 4077

SCIENCE

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

1973

H. S. GUTOWSKY, ARTHUR D. HASLER, RUDOLF KOMPFNER, DANIEL E. KOSHLAND, JR., GARDNER LINDZEY, RAYMOND H. THOMPSON, EDWARD O. WILSON

1974

ALFRED BROWN, JAMES F. CROW, SEYMOUR S. KETY, FRANK PRESS, FRANK W. PUTNAM, MAXINE SINGER, GORDON WOLMAN

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher: WILLIAM BEVAN

Business Manager: HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

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

Assistant to the Editor: NANCY TEIMOURIAN

News and Comment: JOHN WALSH, LUTHER J. CARTER, DEBORAH SHAPLEY, ROBERT GILLETTE, NICHOLAS WADE, CONSTANCE HOLDEN, BARBARA J. CULLITON, SCHERRAINE MACK

Research News: ALLEN L. HAMMOND, WILLIAM D METZ, THOMAS H. MAUGH II, JEAN L. MARX

Book Reviews: SYLVIA EBERHART, KATHERINE LIVINGSTON, ANN SELTZ-PETRASH

Cover Editor: GRAYCE FINGER

Editorial Assistants: MARGARET ALLEN, ISABELLA BOULDIN, BLAIR BURNS, ELEANORE BUTZ, MARY DORFMAN, JUDITH GIVELBER, CORRINE HARRIS, NANCY HARTNAGEL, OLIVER HEATWOLE, CHRISTINE KARLIK, MARSHALL KATHAN, MARGARET LLOYD, DANIEL RABOVSKY, JEAN ROCKWOOD, PATRICIA ROWE, LEAH RYAN, JOHN SCHAUER, LOIS SCHMITT, YA LI SWIGART

Guide to Scientific Instruments: RICHARD SOMMER

Membership Recruitment: LEONARD WRAY; *Subscriptions*: BETTE SEEMUND; *Addressing*: THOMAS BAZAN

Advertising Staff

Director: EARL J. SCHERAGO

Production Manager: PATTY WELLS

Advertising Sales Manager: RICHARD L. CHARLES

Sales: NEW YORK, N.Y. 10036: Herbert L. Burklund, 11 W. 42 St. (212-PE-6-1858); SCOTCH PLAINS, N.J. 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); CHICAGO, ILL. 60611: John P. Cahill, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772)

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phones: (Area code 202) Central Office: 467-4350; Book Reviews: 467-4367; Business Office: 467-4411; Circulation: 467-4417; Guide to Scientific Instruments: 467-4480; News and Comment: 467-4430; Reprints and Permissions: 467-4483; Research News: 467-4321; Reviewing: 467-4440. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. See also page xv, *Science*, 29 September 1972. ADVERTISING CORRESPONDENCE: Room 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

Humane Technology

In cocktail party sociology, where slogans serve as substitutes for thinking, technology is often depicted as anathema to a humane, just, "liberated" society. The defense made by the friends of technology is equally simplistic: "Technology is a set of neutral means; whether it is used to good or evil purposes is not determined by the technology itself."

Both of these viewpoints are as valid as half-truths usually are. In fact, most technologies do have fairly specific uses; no one has yet been killed by a cable television. And, while some technological developments do promote an impersonal, efficiency-minded, mass-production society, other technologies are essential for a more humane society.

Some recent technological developments take over routine and repetitive jobs, freeing people from the drudgery of counting, calculating, remembering numerous dull details. It is also true that these same technologies, those of the computer for instance, generate such routine work as key punching. But they eliminate more drudgery than they impose. Automatic switchboards of telephones do routine work which would require several million people, while generating little menial work. And, the way to combat remaining and newly created routines is to advance technology—to create, for example, computers that understand spoken English—surely not to condemn the machines.

Beyond this, new technological developments contribute to the solution of societal problems very close to the hearts of the deriders of technology, often making progress precisely where nontechnological attempts have failed. Thus, one of the barriers to arms limitation was the demand for human, on-site inspection, a demand quite unacceptable to the U.S.S.R. and unattractive to U.S. corporations worried about their trade secrets. The development of powerful inspection satellites made this issue obsolete. Another example: a cost-effectiveness study made by the Department of Health, Education, and Welfare shows that it is much more economical to avert a death by means of seat belts, a technological innovation, than driver education. The birth control pill, a chemical technology, is much more potent in reducing family size than are efforts to educate people to have smaller families. Instructional television saves teachers the time often used to repeat exercises to their classes ad nauseum; it allows pupils to view the lesson when they choose, as often as they need to, and, soon, at the pace they wish; and it is as effective as or more effective than live teaching—tune in "Sesame Street" some time.

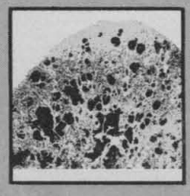
As for the future, pollution will be reduced through the development of less polluting, substitute technologies, not by a return to the pretechnological age. Distance and isolation will be further bridged through technological means such as two-way cable television and more suitable housing patterns. More and more people will be able to enjoy increased free time, culture, education, and each other because more of their chores will be done by machines and supervised by machines, whose excesses are corrected largely by other machines.

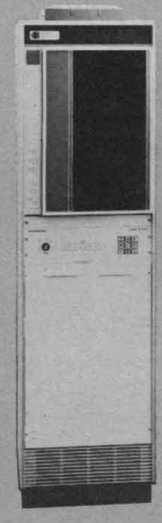
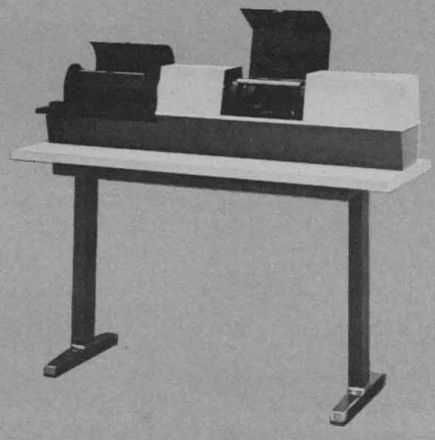
All of this is surely less romantic than the world depicted by the advocates of a return to nature, but it is also more likely to be realized, and it promises a *more* livable world, by practically any humane standard, than our Stone Age past. The task before us is to marshal more of technology to the service of human purposes, not to put technology into a self-destruct, reverse-thyself gear. This will not be achieved by a blind, wholistic approval of technology, but by carefully developing those tools which can be geared to advance our true values.—AMITAI ETZIONI, *Professor of Sociology, Columbia University*, and *Director, Center for Policy Research, 475 Riverside Drive, New York 10027.*

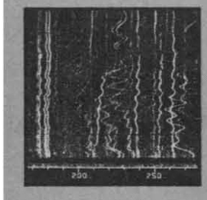
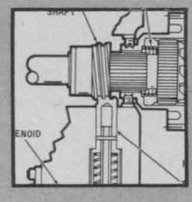
Photomation Mark II

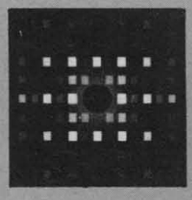
Gets the information into and out of photographic emulsions digitally, quickly, accurately and with camera–like quality.






SYSTEM FEATURES

- Operation in ambient light
- No special environmental conditions
- Large format size to 10" x 10"
- Integral processing unit
- Operational software
- High–speed operation – 30,000 pixels/sec
- High resolution – 12.5 microns
- Correction for film characteristics
- Programmed transfer function
- Low geometric distortion
- Large number of gray levels – 256
- Wide dynamic range

For further information write to Dept. SMB

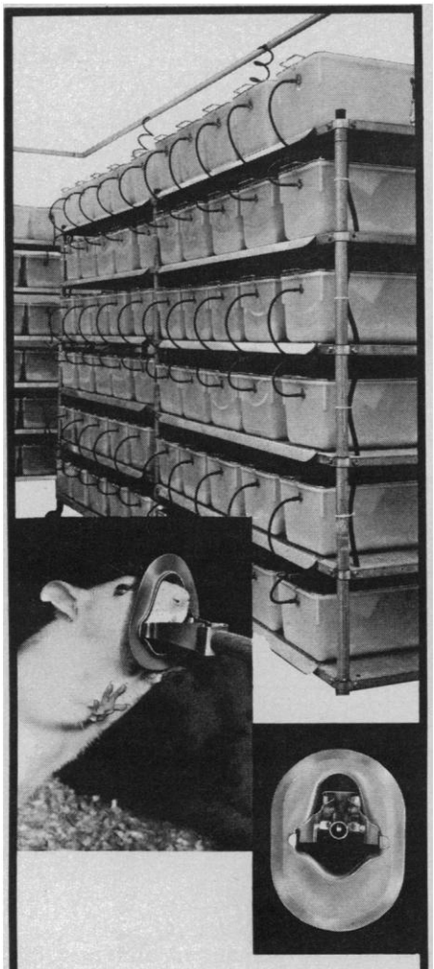
Circle No. 15 on Readers' Service Card

The Leader in Computer-Oriented Image Processing Instrumentation

OPTRONICS INTERNATIONAL INC.

7 STUART ROAD, CHELMSFORD, MASS. 01824 USA (617) 256-4511 TLX 94-7443

Offices and Representatives Around the World



LIFEGUARD®

"Outside-of-Cage" Automatic Watering Systems...

For dependable, low-cost watering of mice, rats, hamsters, rabbits, guinea pigs and other small animals

LIFEGUARD "outside" watering with quick-change cage attachment gives immediate improvement in small animal care . . . *Total dryness, positive safety, superior sanitation and reduced work load.* Indeed, better animal care at lower cost. Guaranteed satisfactory performance. Write or call.

SE systems engineering
A Div. of Atco Mfg. Co., Inc.
461 Walnut St., Napa CA 94558
Telephone: (707) 252-1622

Circle No. 65 on Readers' Service Card

mers"; R. Ullman and J. E. Anderson, "Mechanism of desalination by neutral polymer membranes."

2 August. (A. R. Shultz presiding): Turner Alfrey, "Properties of multilayer polymer films"; I. M. Krieger, "Studies on monodisperse latices." (J. K. Stille presiding): H. J. Harwood, "Radiotracer and spectroscopic studies of polymer reactivity."

3 August. (C. Schuerch presiding): G. Scott, "Additives for the acceleration of polymer photodegradation"; T. Takekoshi, "Electrophilic substitution polymerization."

Proteins

New Hampton School

John A. Schellman, co-chairman; Russell F. Doolittle, co-chairman; Gordon G. Hammes, co-vice chairman; Gregorio Weber, co-vice chairman.

18 June. Ribosomal proteins (M. Nomura, chairman): H. Wittmann, G. Craven and C. Cantor. Predictive schemes for determining protein structure (C. Schellman, chairman): B. Robson, H. Scheraga, T. T. Wu and E. A. Kabat.

19 June. NMR and protein structure (A. G. Redfield, chairman): V. Hruby, M. Raftery and H. Sternlicht. Non-enzyme precursor proteins (P. Bornstein, chairman): J. Habener, J. Maizel and J. Potts.

20 June. Protein structure and evolution (V. Ingram, chairman): G. Koch, F. Morgan, H. Gray and R. Doolittle. Protein folding, kinetics and mechanism (R. Baldwin, chairman): W. Kauzmann, C. Matthews and A. Schechter.

21 June. Three concurrent mini-sessions dealing with various aspects of the conference. Special lecture.

22 June. Conference summation (C. Anfinsen, chairman): F. Richards.

Quantum Solids and Fluids, Dynamics of

Brewster Academy

T. M. Sanders, chairman; R. C. Richardson, vice chairman.

16–20 July. Lectures and ample discussion time will be provided for discussion of recent experimental and theoretical work on liquid and solid helium. Topics to be discussed include: "Low-temperature magnetic properties of solid He^3"; "Recent work on 'sounds' in liquid He^4"; "Experimental and theoretical developments in He^3-He^4 mixtures"; "Interacting Fermi systems in astrophysics." Particular emphasis will be placed on research indicating new phases of liquid He^3.

Radiation Chemistry

New Hampton School

Richard Holroyd, chairman; Larry Kevan, vice chairman.

23 July. (R. H. Schuler, discussion leader): Arnim Henglein, "Pulse polarography of radicals in aqueous solution." (G. Scholes, discussion leader): L. S. Myers, Jr., "Radiation chemistry of nucleic acids."

24 July. (G. Czapski, discussion leader): Max S. Matheson and Charles D. Jonah, "Radiation chemistry of water, 100 psec-100 nsec." (R. C. Jarnagin, discussion leader): H. Ted Davis, "Transport of thermal electrons in non-polar hydrocarbons."

25 July. (C. Greenstock, discussion leader): A. John Swallow, "One-electron processes in biochemical systems"; Benon H. J. Bielski, "Study of peroxidase mechanisms by pulse radiolysis." (D. R. Smith, discussion leader): Richard W. Fessenden, "Time resolved detection of radicals by ESR in pulse radiolysis."

26 July. (P. Ludwig, discussion leader): Martin L. West, "Fluorescence excitation and quenching under pulsed proton irradiation"; Andries Hummel, "Ionization in some liquid hydrocarbons." (L. Kevan, discussion leader): Contributed papers.

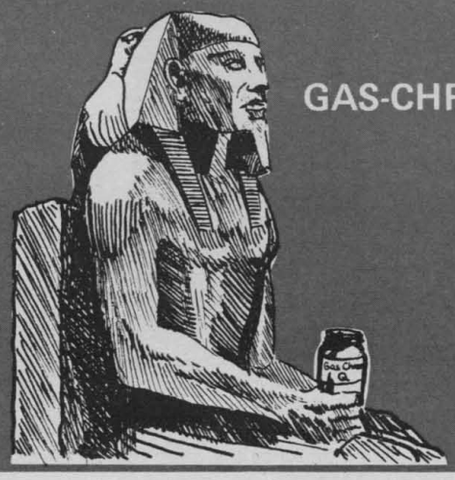
27 July. (C. J. Hochanadel, discussion leader): Wayne Sieck, "Significance of ion-molecule collision complexes in radiolysis."

Regulatory Mechanisms in Photosynthesis

Tilton School

Anthony San Pietro, chairman; R. K. Clayton, vice chairman.

13–17 August. Quantum level: Absorption and distribution (C. S. French, chairman): W. Arnold, J. Myers, speakers; D. Fleischman, J. C. Goodheer, Govindgee, G. Hoch, A. Krasnovskii, D. Mauzerall, J. Pickett, E. Rabinowitch, K. Sauer, discussants. Energy coupling and transduction (M. Avron, chairman): B. Chance, D. L. Keister, speakers; H. Baltscheffsky, D. DeVault, R. A. Dilley, L. Packer, W. W. Parsons. B. Rumberg, discussants.



GAS-CHROM Q

The silane-treated support for gas chromatography that is:

...A LEADER

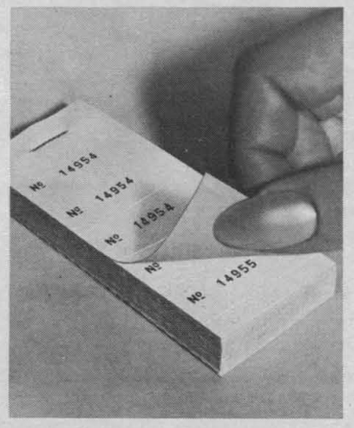
Send for free Technical Bulletin No. 5 with application chromatograms

Applied Science Laboratories Inc.
P.O. Box 440 / State College, Penna. 16801 / 814 238-2406

Circle No. 109 on Readers' Service Card

Your Lab is More Efficient with

TIME CONSECUTIVE NUMBERING SYSTEMS



Use to Number:
Test Tubes . . .
Requisition Forms . . .
Containers . . .
Control Lots . . .

There are many ways a **Time Consecutive Numbering System** can save you time through increased efficency. Inexpensive and easy-to-use, Time Consecutive Number Labels are self-sticking — adhere to any surface in temperatures ranging from —70°F. to +250°F. Numbers can be repeated from 1 to 10 times on a choice of seven different color stocks. Available in handy pre-cut tablet or clinically safe BACTERIOSTATIC roll form.

Adaptable to any numbering system you develop, these labels are supplied with a standard "No." prefix or any of 5 other prefixes. Think of the efficient, economical systems you can develop using Time Consecutive Numbers.

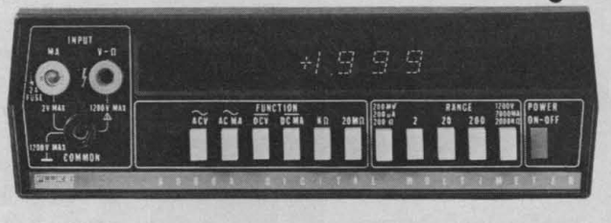
Write today for free samples, and more information on Time Consecutive Numbers and other TIME Products for the Laboratory. We will also send the name of your nearest dealer.

NOTE: NEW ADDRESS. We have recently moved into new facilities; enlarged and automated to serve you better.

TIME® products

PROFESSIONAL TAPE COMPANY, INC.
DEPARTMENT 12
144 TOWER DR., BURR RIDGE (HINSDALE), ILL. 60521

Circle No. 106 on Readers' Service Card



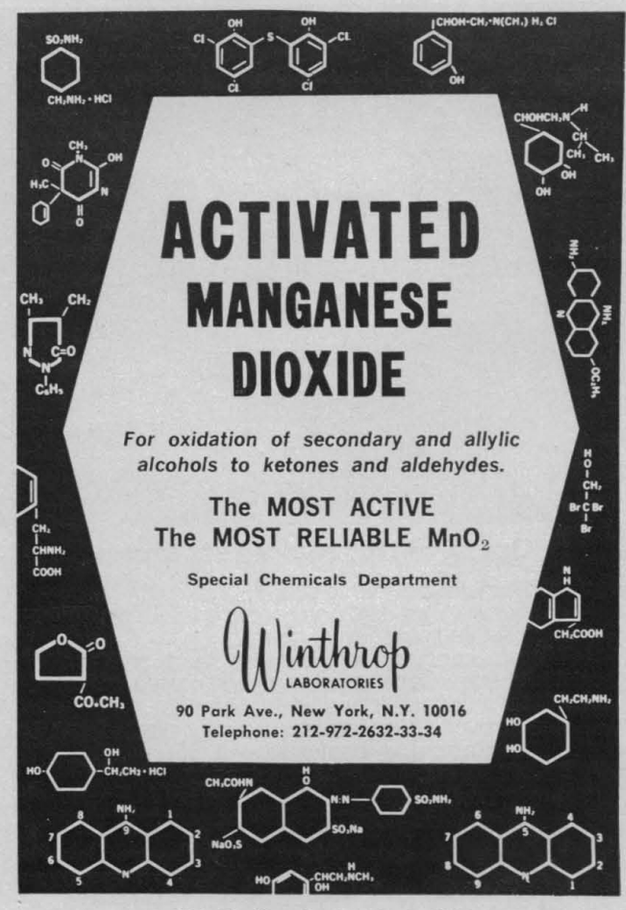
✻New low cost digital multimeter $299

● 26 ranges to measure ac/dc voltages from 100 microvolts to 1200 V, ac/dc currents from 100 nanoamperes to 2 amperes and resistance from 100 milliohms to 20 megohms. ● Guaranteed to stay within specifications for one full year. Fluke gives you the best specs and strongest warranty on the market today for the lowest cost of ownership ever. ● Wide choice of options including rechargeable battery pack, digital printer output, deluxe test leads, high-voltage probe, RF probe, 200-amp ac current probe, carrying case, dust cover and rack mounts. ● Unique self-zero feature eliminates offset errors. ● Rugged high-impact case with securely mounted internal electronics. ● Service centers throughout U.S., Canada, Europe and Far East for 48-hour turnaround repairs.

FLUKE P.O. Box 7428, Seattle, Washington 98133.

Get all the details from your nearest Fluke sales office. Dial toll-free 800-426-0361 for address of office nearest you.

Circle No. 105 on Readers' Service Card



ACTIVATED MANGANESE DIOXIDE

For oxidation of secondary and allylic alcohols to ketones and aldehydes.

The MOST ACTIVE
The MOST RELIABLE MnO_2

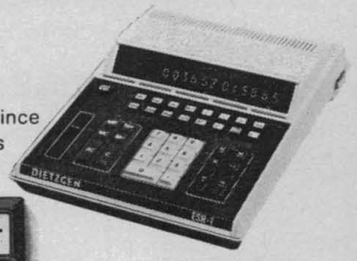
Special Chemicals Department

Winthrop LABORATORIES

90 Park Ave., New York, N.Y. 10016
Telephone: 212-972-2632-33-34

Circle No. 98 on Readers' Service Card

The Electronic Slide Rule



Here's the most exciting scientific/engineering tool since we introduced the log-log slide rule in 1884. It does everything your slide rule does, and then some. Hyperbolics, for example. It's fast, convenient, and has large, bright, 12-digit readout.

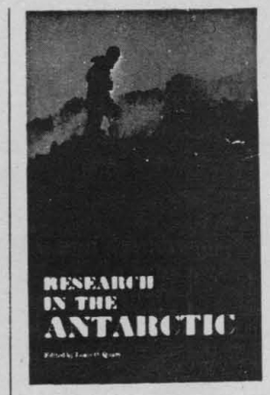
Direct entry makes complex calculations easy. Automatic sine of a number by entering the number and pressing [sin]. Convert degrees, minutes, seconds to decimal equivalent by entering angle and pressing [d°'"]. Calculate the natural log of a number by entering the number and pressing [ln]. Read hyperbolic, trigonometric and exponential functions; convert radians to degrees or degrees to radians; all with a single function key that really fits your finger.

Put this slim, trim, 16-function electronic slide rule on your desk, right at your fingertips, and make life easy. From Dietzgen, the slide rule people. Who else? See it at your Dietzgen dealer today.

Use just the CD scale on your slide rule? (+, −, ×, ÷) Get a Dietzgen CD-1. Dietzgen Corporation, 2425 North Sheffield Avenue, Chicago 60614

DIETZGEN

Circle No. 89 on Readers' Service Page



Research in the Antarctic

Edited by
Louis O. Quam

The first single-volume report of the extensive research conducted in the Antarctic since the International Geophysical Year.

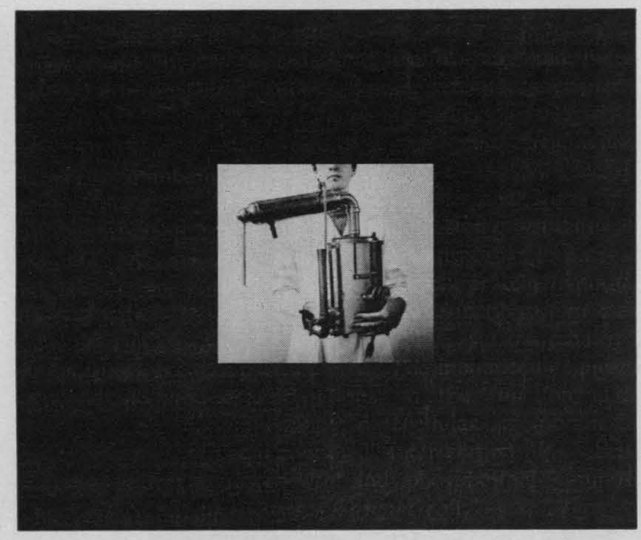
700 pages, hundreds of illustrations and tables, a comprehensive index. Full color wall map of Antarctica.

Member's price (with check accompanying order): **$19.95.** Regular price **$24.95.**

Send orders to Department R1.

AAAS

AMERICAN ASSOCIATION for the ADVANCEMENT of SCIENCE
1515 Massachusetts Avenue, N.W.
Washington, D. C. 20005



Our small still really gets around.

The Barnstead portable still.

Put it down. Plug it in. And produce 1.8 liters of high-quality distilled water every hour.

All-metal construction means it's sturdy and won't shatter. Condenser and delivery tube coated with pure tin to prevent metallic contamination.

UL-approved. Plugs into any ordinary electric outlet.

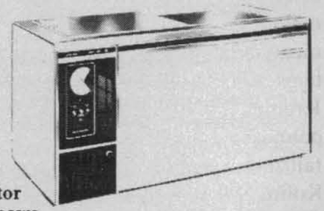
Ask your lab supply dealer about it.

Barnstead. The people who know everything you need to know about water.

BARNSTEAD
SYBRON CORPORATION
225 Rivermoor Street, Boston, Mass. 02132

1046 Circle No. 107 on Readers' Service Card

−76°C Ultra-Cold. −96°C Ultra-Colder.



Both from Kelvinator Commercial. Upright drops to −76°C. Ultra-cold. Chest model dips to −96°C. Ultra-colder. Upright's six French doors open individually. And you can label each door to know what's inside. Easy labeling for what's under the chest's stainless steel sliding lids, too. Want more? Automatic alarm systems? 2" portholes for recorders? The Kelvinator Commercial name? You got them. Don't be caught in the cold without ultra-cold. Contact J. E. Hirssig at Kelvinator Commercial, the company that knows how to give you 12 cubic feet of the best cold you ever had.

Upright UC-105 (−76°C/−105°F) Chest UC-520 (−85°C/−120°F)
Chest UC-540 (−96°C/−140°F)

Kelvinator

621 Quay Street • Manitowoc, Wisc. 54220 • (414) 682-0156

One of the White Consolidated Industries

WCI

Circle No. 90 on Readers' Service Card

Energy coupling and transduction (continued) (M. D. Kamen, chairman): P. Mitchell, E. Racker, speakers; M. Avron, A. Crofts, G. Forti, A. Jagendorf, S. Lien, B. A. Melandri, E. Moudrianakis, R. McCarty, discussants. Reaction center and membrane components (physical) (R. K. Clayton, chairman); B. Ke, H. T. Witt, speakers; D. I. Arnon, W. Butler, W. A. Cramer, P. L. Dutton, R. C. Fuller, G. Gingras, A. A. Shlyk, C. Sybesma, discussants. Reaction center and membrane components (biochemical) (D. I. Arnon, chairman): N. K. Boardman, R. K. Clayton, speakers; J. M. Briantais, H. Huzisige; S. Kaplan, D. W. Krogmann, P. Loach, J. M. Michel, N. Nelson, J. Neumann, J. P. Thornber, A. Trebst, L. P. Vernon, discussants. Oxygen evolution: multi-quantum cooperation (H. Gaffron, chairman): P. Joliot, B. Kok, speakers; G. Chenaie, B. Diner, G. Hind, P. Homann, S. Katoh, B. C. Mayne, G. Schmid, K. L. Zankel, discussants. Carbon metabolism (D. A. Walker, chairman): M. Gibbs, M. D. Hatch, speakers; J. Bassham, C. C. Black, M. L. Champigny, J. M. Galmiche, R. Jensen, W. Kowalik, E. Latzko, S. Miyachi, D. A. Walker, discussants. Genetic analysis (R. P. Levine, chairman): N. I. Bishop, H. Gest, speakers; B. Epel, H. Lyman, B. Marrs, J. A. Schiff, R. Smillie, S. Surzycki, R. K. Togasaki, discussants. Experimental approaches (A. San Pietro, chairman): (discussants to be announced). Special evening lecture, Robin Hill.

Separation and Purification

Colby Junior College

Norman N. Li, chairman; Harold B. Hopfenberg, vice chairman.

20–24 August. V. A. Ettel, "Highly selective solvent extraction in hydrometallurgy"; R. A. Schwind, "Development of two chemical exchange systems for isotope separation,"; R. A. Kremer, "Purification of organic compounds by continuous fractional crystallization from vapor phase"; A. Kolin, "Separation and characterization of molecular and particulate components by endless belt electrophoresis"; E. J. Fuller, "Slurry separations based on molecular shape"; C. Horvath, "High performance liquid chromatography"; J. E. Mitchell, "CO_2 removal from gases by heatless adsorption"; P. R. Rony, "Chemical separations, as seen from the field of catalysis"; G. A. Davies, "Mass transfer

ORION MODEL 601 DIGITAL pH METER

For the first time ever — a digital pH meter that carries a "no lemon" guarantee! Orion is so confident that this pH meter will perform to your entire satisfaction, that if within twelve months of purchase the "601" should fail *for any reason other than abuse*, it will be replaced, *at no charge*, with a brand new meter.

Orion can offer a guarantee like this only because reliability is built in. The new electronic circuitry incorporates many simplifications from existing meters, with all active components 100% pretested (not batch sampled) before being used in production. The digital display design employed is new . . . the same that's used in the cockpit instruments aboard the Boeing 747. *The figures can be read at a glance up to 30 feet away.*

Other features include an adjustable tilt base, buffer slope point control (pH 6-8) which allows you to adjust the slope of the meter on the pH buffer of your choice, an adjustable strip chart recorder output, combination pH electrode, and automatic temperature compensation capability. *For a colorful circular, please write to us.*

Ranges: pH 0.00 to 13.99
−1999 to +1999 mv, automatic sign indication, no polarity switching

Relative Accuracy: ±0.01 pH, ±1 mv or 0.1% of reading, whichever is greater

H-5696X	Model 601 Digital pH Meter with tilt base and combination electrode, for 115/230 volts, 50/60 Hz, 10 watts, each $530.00
H-5696-2X	Model 601 Digital pH Meter with bumper feet and combination electrode, for 115/230 volts, 50/60 Hz, 10 watts, each 495.00

SGA SCIENTIFIC
BLOOMFIELD, N. J. 07003
LABORATORY . . .
♦ APPARATUS
♦ INSTRUMENTS
♦ CHEMICALS
♦ GLASSWARE

Branches: Boston Mass. • Danbury Conn. • Elk Grove Village Ill. • Fullerton Calif. • Philadelphia Penna. • Silver Spring Md. • Syracuse N. Y.

Circle No. 41 on Readers' Service Card

Advanced osmometers for exact measurement of concentration in biological solutions

UNIQUE, SPECIFIC CLINICAL OR RESEARCH INSTRUMENT

CLINICAL APPLICATIONS: fluid therapy in shock and trauma, electrolyte imbalance, renal function and dialysis, ADH secretion, total body water, dehydration and other metabolic disturbances.

RESEARCH APPLICATIONS: water purity, column chromatography, fixative media, molecular weight, and physiological and biological experimentation.

HOT-LINE® INFORMATION: contact us for information or help with your application.

CALL OR WRITE TODAY!

ADVANCED INSTRUMENTS, INC.

1000 Highland Avenue / 617-449-3000
Needham Heights, Massachusetts 02194

Circle No. 97 on Readers' Service Card

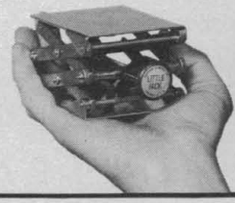
PRECISION SCIENTIFIC — SUBSIDIARY OF GCA CORPORATION

Laboratory Jacks

Steady support

Steady, sturdy, adjustable support for you-name-it laboratory jobs. Big Jack supports up to 100 lbs. at any precise point between 3" and 12". Use it under heavy flasks, heating mantles, baths, etc. Little Jack supports up to 10 lbs. at any precise point between 1½" and 5"—ideal for micro and semi-micro work, microscope sub-stage platform, etc.

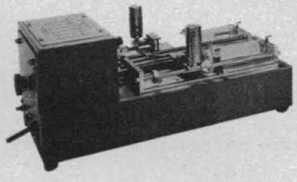
Big Jack and Little Jack are covered in our Bulletin 637, ask your Precision Scientific Dealer or write us. Precision Scientific Company, 3737 W. Cortland St., Chicago, Ill. 60647.



Circle No. 108 on Readers' Service Card

FREE CATALOG Describes world's largest single source of constant flow, precision syringe pumps. 48 Models in eight series: single- to 4-channel, parallel and reciprocal pumping, synchronous and variable speed motors, outputs to 150 psi. For µl to 200 ml. glass, plastic or ss syringes. Extremely wide range of flow rates.

SYRINGE PUMPS



Mail coupon to:
Harvard Apparatus
Dept.B-39, P.O. Box 24,
Millis, Mass. 02054.
Or call (617) 376-2987

Please send Syringe Pumps Bulletin 900 to:

Name_____

Dept._____

Institution_____

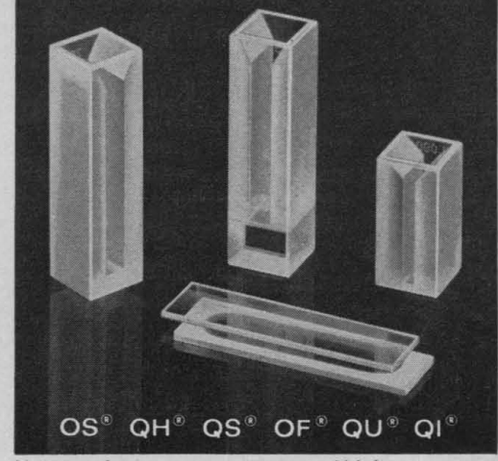
Address_____

City_____ State_____ Zip_____

HARVARD APPARATUS

HELLMA

...tomorrow's designs today!



OS® QH® QS® OF® QU® QI®

Hellma—the largest assortment of highest precision glass and quartz cells.
Standard · Flow-through · Constant-temperature
Anaerobic · Special Designs
Also available—ULTRAVIOLET LIGHT SOURCES
Deuterium Lamps · Mercury Vapor Lamps
Hollow Cathode Lamps · Power Supplies

HELLMA CELLS, INC.

Write for literature
Box 544
Borough Hall Station
Jamaica, New York 11424
Phone (212) 544-9534

Circle No. 91 on Readers' Service Card

Circle No. 96 on Readers' Service Card

during coalescence of droplets and dispersion"; R. B. Grieves, "Precipitate flotation of anionic species with applications to water pollution control." Separations by liquid surfactant membranes: S. W. May and N. N. Li, "Enzyme-liquid membrane systems"; W. J. Asher and H. W. Wallace, "Biomedical applications"; E. L. Cussler, "Transfer of solutes against their concentration gradients"; W. R. Vieth, "Aspects of enzymatic action and semipermeability in enzyme-membrane systems"; T. M. S. Chang, "A new approach to separation using semipermeable microcapsules: combined dialysis, catalysis and absorption"; J. S. Johnson, Jr., "Dynamically-formed membranes in aqueous separations."

Solids, Chemistry and Physics of

Holderness School

J. C. Phillips, chairman; T. Geballe, vice chairman.

New Materials

30 July. B. B. Snavely, R. D. Maurer, "Optical materials"; G. H. Brown, "Liquid crystals."

31 July. H. B. Callen, "Magnetic materials"; T. H. Geballe, "Layer materials."

1 August. A. Kelly, G. Y. Chin, "Macroscopic anisotropy"; C. Overberger, "Polymers."

2 August. A. W. Sleight, "High pressure synthesis"; B. B. Owens, A. Bloch, "Electronic and ionic conductors."

3 August. A. L. Rubin, "Biomaterials."

Statistics in Chemistry and Chemical Engineering

New Hampton School

Otto Dykstra, Jr., chairman; David W. Bacon, vice chairman.

9 July. S. M. Free and John E. Overall, "Prediction of success of new compounds through use of the relationship between lab data and actual clinical response"; Louis Broekhoven, "Spline regression."

10 July. George Tiao and George E. P. Box, "Time series analysis of pollution data"; Gary G. Koch, "Statistical analysis of large data sets."

11 July. Graham N. Wilkinson, "Integrating statistical inference and processing on computers"; David S. Salsburg, "The jackknife and its applications."

12 July. Lalitha Sanathanan, "Visual scanning"; Robert E. Wheeler, "Efficient experimental design."

13 July. Ronal D. Snee, "Shape studies."

Structural Macromolecules

Tilton School

Roger W. Jeanloz, chairman; Victor Ginsburg, vice chairman.

Cell Surface and Membrane Glycoproteins

23 July. R. W. Jeanloz, "Chemical methods of structure identification"; D. M. Carlson, "Biochemical and immunological methods of structure identification."

24 July. V. T. Marchesi, "Molecular orientation of surface glycoproteins"; G. A. Jamieson, "Methods of isolation and characterization.

25 July. H. Schachter, "Biosynthesis of glycoproteins"; R. H. Kornfeld, "Interaction of lectins with cell surface glycoproteins."

26 July. G. Ashwell, "Carbohydrate determinants of cellular recognition"; P. W. R[illegible]bins, "Glycoproteins in normal and transformed cells, I."

27 July. L. Warren, "Glycoproteins in normal and transformed cells, II."

Subsurface Fluid Displacement, Chemistry and Physics of

New Hampton School

R. L. Parsons, chairman; L. L. Handy, vice chairman.

22–31 August. Lincoln Elkins, "Impact of heterogeneity and anisotropy on efficiency of displacement processes"; C. E. Johnson, Jr., "Equivalent relative permeabilities for stratified porous media"; M. L. Jackson, "Origin of shales traced by oxygen isotopic ratio"; Floyd W. Preston, "Identification and prediction of spatial variation in reservoir physical properties"; E. L. Claridge, "Interaction of viscous fingering with other factors influencing sweep efficiency"; L. W. Holm, "Mechanisms of displacement by CO_2"; Charles L. Hearn, "Interpretation of a miscible displacement project"; Joseph J. Taber, "Interfacial tension and flooding rate: combinations which permit displacement of residual oil"; Paul F. Fulton, "Role of wettability in capillary displacement of oil by water"; Michael Prats, "Selected examples of capillarity"; R. K. Knight, "Flow of aqueous polymer solutions in permeable media"; B. B.

Circle No. 86 on Readers' Service Card

BUCHLER INSTRUMENTS
FOR
MONITORING AND COLLECTING
LIQUID EFFLUENT

These components comprise a highly efficient, automatic system for continuous flow, liquid monitoring and collecting. They can, of course, be used separately and in conjunction with other instruments; together they form a Chromatographic system that you can depend on.

(A) **Fractomette:** *compact, 200 tube linear fraction collector*
(B & C) **Fractoscan:** *double-beam UV photometer that permits use of any wave length in the UV range; output linear in optical density.*
(D) **Potentiometric-Servo Recorder:** *A reliable recorder with 5" wide strip chart.*

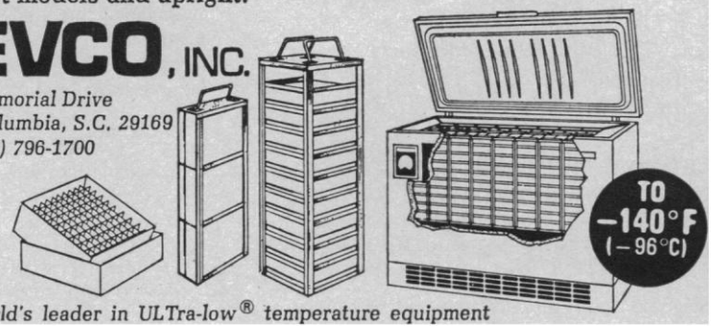
BUCHLER INSTRUMENTS
BUCHLER INSTRUMENTS DIVISION
NUCLEAR-CHICAGO CORP.
A SUBSIDIARY OF G. D. SEARLE & CO.
1327 SIXTEENTH STREET, FORT LEE, NEW JERSEY, 07024

Circle No. 82 on Readers' Service Card

Revco is More than a freezer... It's a System.

You get more than dependable *ULTra-low®* temperature when you buy a Revco freezer. We adapt the freezer to your particular use through the proper accessories from our inventory control systems. Let us show you how Revco provides the total answer to your *ULTra-low®* temperature needs. Available in sizes from 1-1/2 to 25 cubic feet, including the standard 6.5, 9, 12 and 17 cubic foot sizes, in chest models and upright.

REVCO, INC.
1177 Memorial Drive
West Columbia, S.C. 29169
Tel. (803) 796-1700



The world's leader in ULTra-low® temperature equipment

Circle No. 80 on Readers' Service Card

Sandiford, "Modification of profiles with polymers"; S. W. Nicksic, "Adsorption of sulfonates"; P. A. C. Raats, "Unstable wetting fronts in soils"; T. C. Boberg, "Numerical dispersion and history matching"; E. L. Dougherty, "Compositional models"; R. E. Cook, "New developments in black oil compositional models"; G. W. Thomas, "New approaches to reservoir simulation"; F. Sam Johnson, "Chemical fracturing and solvent injection—a field trial"; Marion K. Hubbert, "Basic hydrodynamics of mixed systems"; H. J. Ramey, "New developments in transient well testing"; Jacob Bear, "Flow through porous media at high Reynolds numbers"; D. J. Graue, "Some aspects of oil displacement by steam."

Textiles and Fiber Science

Colby Junior College

Harry R. Billica, chairman; John P. Knudsen, vice chairman.

9 July. A. Peterlin, J. W. S. Hearle, D. C. Prevorsek, W. O. Statton, "Current concepts of synthetic fiber fine structure." (F. Fortess, discussion leader): general discussion.

10 July. P. G. Kassenbeck, "Morphology of cotton fibers and its influence on mechanical properties"; S. P. Rowland, "Chemical finishing of cotton cellulose and its effect upon microstructure and performance qualities"; J. S. Little, "New developments for polyester in tires."

11 July. G. Valk, "New methods for the determination of thermal and mechanical prehistory of polyesters and their application"; H. Herlinger, "Correlation of chemical and physical structure to the properties of elastomeric fiber materials."

12 July. J. J. Willard, "Functional finishes of synthetic fabrics"; F. J. Rizzo, "Electrostatic phenomena in textile materials in clothing"; C. W. Ericson, "Bonding in spunbonded nonwovens."

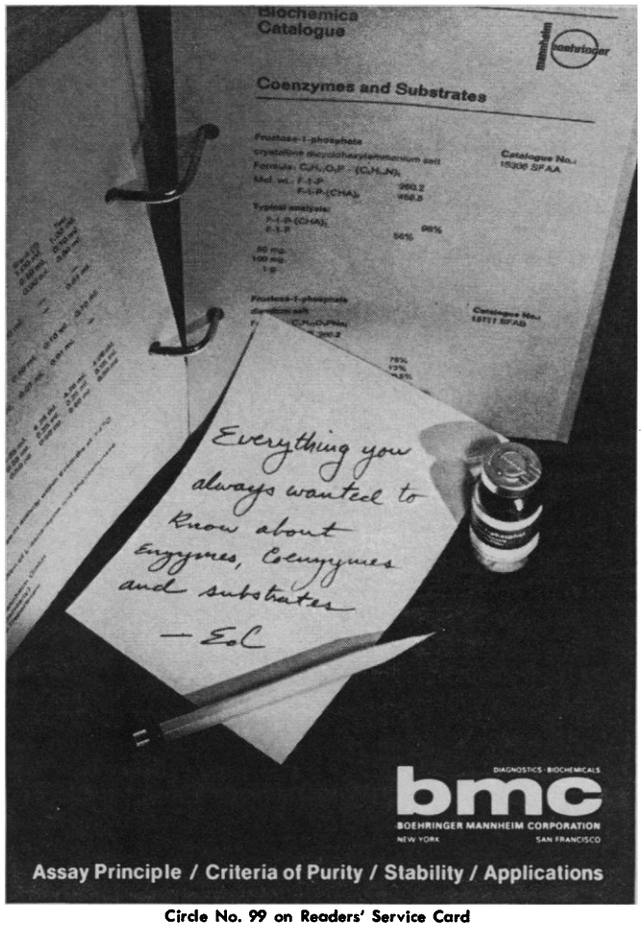
13 July. S. Backer, "Material and machine interactions in false twist texturing."

Toxicology and Safety Evaluations

Kimball Union Academy

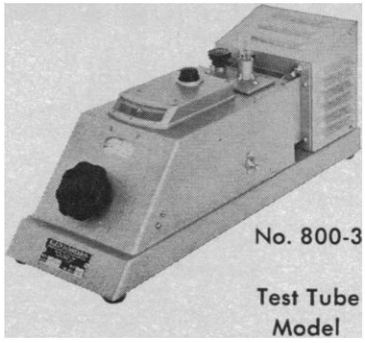
Harold Grice, chairman; Harold M. Peck, vice chairman.

30 July. The heart in toxicology (David Lehr, discussion leader): R. Hamlin, "Electrocardiography in toxi-



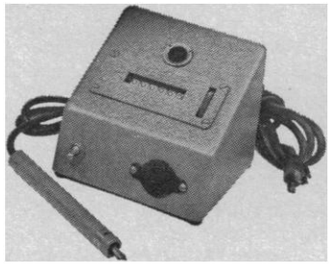
Circle No. 99 on Readers' Service Card

Klett Summerson Photoelectric Colorimeter



KLETT COLONY MARKER and TALLY

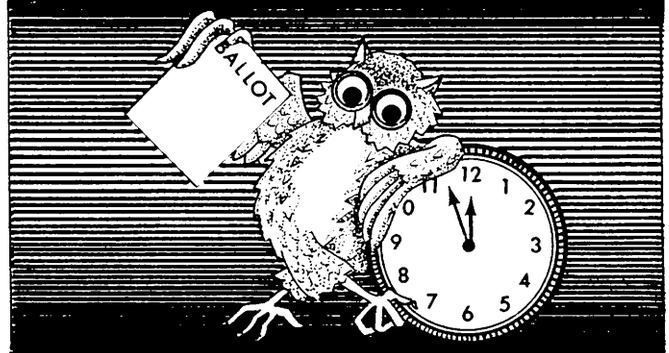
This instrument takes the drudgery and error out of the counting of bacterial colonies.



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

Circle No. 94 on Readers' Service Card

IT'S NEVER TOO LATE....



to nominate your colleagues for membership in the AAAS..

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

1515 Massachusetts Avenue, N.W. Washington, D. C. 20005

I should like to nominate the following for membership in the AAAS:

(Please print or type)

NAME _____

ADDRESS _____

_____

NOMINATED BY _____

NAME _____

ADDRESS _____

_____

NOMINATED BY _____

NAME _____

ADDRESS _____

_____

NOMINATED BY _____

NAME _____

ADDRESS _____

_____

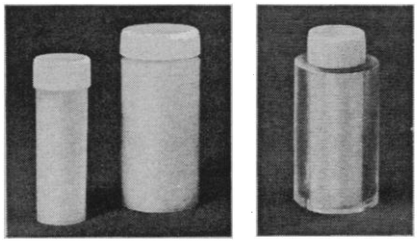
NOMINATED BY _____

How to lower the cost of your Liquid Scintillation Chemicals and Vials up to 50% or more

SWITCH to

MiniVial™

COUNTING VIALS*



40-218 MiniVial | Standard 20-ml Vial | MiniVial in Holder

In routine liquid scintillation counting, a solution of about 15 ml is placed in a 20-ml vial. A very small portion of the solution is radioactive material; most of it is scintillator.

With **MiniVials**, you reduce the amount and cost of the scintillator drastically. **MiniVials** have a 7-ml capacity. You insert the same amount of radioactivity as in a 20-ml vial but only about 1/3 to 1/2 of the scintillation chemicals. In addition to these savings, **MiniVials** cost about 30% less than plastic vials and about 50% less than low-background glass. When a **MiniVial** rests in its Vial Holder, the combination has the same configuration as a standard 20-ml vial and is compatible with all scintillation counters.

Vials are packed 1000 per case.

MiniVials	1-4 Cases	60.00M
	5-14 Cases	57.50M
Holders	Tray of 100	$34.50

SPECIAL OFFER

200 MiniVials
12 Holders
$15.00

MiniVials are available from most suppliers of liquid scintillation accessories.

For more details, ask for Catalog 95-T

TM Nuclear Associates Inc. *Patent Pending

NUCLEAR ASSOCIATES, INC.

Subsidiary of
RADIATION-MEDICAL PRODUCTS CORP.
35 URBAN AVENUE, WESTBURY, N.Y. 11590
PHONE (516) 333-9344

Circle No. 81 on Readers' Service Card

cology"; A. Heggtveit, "Pathology of toxic and nutritional cardiomyopathies"; T. Balazs, "Drug induced ischemic myocardial necrosis."

31 July. Computer technology in toxicology (Robert Carlson, discussion leader): Carlton Smith, "Data acquisition and retrieval systems"; Lionel Mawdsley-Thomas, "Automated analysis of cellular change." (C. Middleton, discussion leader): Geoff Lord, "Model diseases in toxicology, congenital and induced."

1 August. Drug adverse reactions (Nelson Irey, discussion leader): Jim Campbell, "Problems and control"; Ian Henderson, "Drug reactions and interactions." (R. Scala, discussion leader): Lionel Rubin, "Ophthalmological toxicology."

2 August. Immunologic technics in toxicology (L. Perelmutter, discussion leader): I. L. Bernstein, "*In vivo* and *in vitro* technics in immediate allergic reactions"; Roger Morrell, "Radioimmunologic assays in toxicology present and potential." (Harold Grice, discussion leader): Robert Kinch, "Contraception through the ages."

3 August. Screening tests for carcinogenicity (Harold Peck, discussion leader): Lionel Poirier, "Screening tests for carcinogenicity."

BOOKS RECEIVED

(Continued from page 993)

A Cost-Effectiveness Study of Clinical Methods of Birth Control. With Special Reference to Puerto Rico. William J. Kelly. Praeger, New York, 1972. xii, 122 pp., illus. $12.50. Praeger Special Studies in Internaticnal Economics and Development.

Critical Variables in Differentiation. Barbara E. Wright. Prentice-Hall, Englewood Cliffs, N.J., 1973. xvi, 110 pp., illus. $7.95. Concepts of Modern Biology Series.

Crop Processes in Controlled Environments. Proceedings of a symposium, Littlehampton, England, July 1971. A. R. Rees, K. E. Cockshull, D. W. Hand, and R. G. Hurd, Eds. Academic Press, New York, 1972. xiv, 392 pp., illus. $19.50. Applied Botany, vol. 2.

Current Topics in Membranes and Transport. Vol. 3. Felix Bronner and Arnost Kleinzeller, Eds. Academic Press, New York, 1972. xii, 436 pp., illus. $24.50.

Cyclotrons—1972. Proceedings of a conference, Vancouver, Canada, July 1972. J. J. Burgerjon and A. Strathdee, Eds. American Institute of Physics, New York, 1972. xiv, 838 pp., illus. $14.75. AIP Conference Proceedings, No. 9.

Data Communications and Business Strategy. A Working Sourcebook for the Modern Manager. A conference, New York, Oct. 1971. John J. Tarrant, Ed. Auerbach, Princeton, N.J., 1972. x, 146 pp. $9.95.

Death and Attitudes toward Death. Proceedings of a symposium, Minneapolis, Jan. 1972. Stacey B. Day, Ed. University of Minnesota Medical School Bell Museum of Pathology, Minneapolis; Batesville Casket Co., Batesville, Ind., 1972. 94 pp. $5.50.

Dictionary of Scientific Biography. Vol. 6, Jean Hachette—Joseph Hyrtl. Charles Coulston Gillispie, Ed. Scribner, New York, 1973. xvi, 620 pp. $35.

Dielectric and Related Molecular Processes. Vol. 1, A Review of Selected Developments in the Period 1966–1971. Mansel Davies, senior reporter. Chemical Society, London, 1972. xvi, 394 pp., illus. £8. Specialist Periodical Report.

Dr. Robert Broom. Palaeontologist and Physician, 1866–1951. A Biography, Appreciation and Bibliography. G. H. Findlay. Balkema, Cape Town, South Africa, 1972. xvi, 158 pp. + plates. R7.50. South African Biographical and Historical Studies, vol. 15.

Dynamics of Health and Disease. Carter L. Marshall and David Pearson. Appleton-Century-Crofts, New York, 1972. xiv, 458 pp., illus. $8.50.

Enzyme, Moleküle, Lebenserscheinungen. F. Brunó Straub. Akadémiai Kiadó, Budapest, 1972. 126 pp., illus. Paper, £1.

The Epidemiology of Posttransfusion Hepatitis. Basic Blood and Plasma Tabulations. J. Garrott Allen. Published by the author, Stanford, Calif., 1972. xvi, 360 pp., illus.

Experimental Meson Spectroscopy—1972. A conference, Philadelphia, Apr. 1972. Arthur H. Rosenfeld and Kwan-Wu Lai, Eds. American Institute of Physics, New York, 1972. xiv, 490 pp., illus. $11. AIP Conference Proceedings, No. 8. Particles and Fields Subseries, No. 3.

Experiments in Physiology and Biochemistry. Vol. 5. G. A. Kerkut, Ed. Academic Press, New York, 1972. xvi, 346 pp., illus. $19.50.

Explorations in Basic Biology. Stanley E. Gunstream and John S. Babel. Burgess, Minneapolis, 1973. xii, 242 pp., illus. Spiral bound, $5.50.

Families of Frequency Distributions. J. K. Ord. Hafner, New York, 1972. viii, 232 pp., illus. Paper, $14.95. Griffin's Statistical Monographs and Courses, No. 30.

Graphic Languages. Proceedings of a conference, Vancouver, Canada, May 1972. F. Nake and A. Rosenfeld, Eds. North-Holland, Amsterdam, 1972 (U.S. distributor, Elsevier, New York). viii, 442 pp., illus. $23.85.

History of Science. An Annual Review of Literature, Research and Teaching. Vol. 10, 1971. A. C. Crombie and M. A. Hoskin, Eds. Heffer, Cambridge, England, 1972 (U.S. distributor, Neale Watson, New York). vi, 138 pp. $11.

Intellectual Functioning in Adults. Psychological and Biological Influences. Two symposia, San Francisco (1968) and Miami (1970). Lissy F. Jarvik, Carl Eisdorfer, and June E. Blum, Eds. Springer, New York, 1973. xiv, 178 pp., illus. $7.50.

Interpersonal Messages of Emotion.

Lectures on
Photomorphogenesis

By Hans Mohr,
Biological Institute II
University of Freiburg, Germany

With 219 illus. xii, 237 pages. 1972.
Soft cover $14.80

One of the outstanding achievements of modern biology has been the physiological discovery of the reversible light red-dark red photoreaction system of morphogenesis in plants and the subsequent identification and isolation of the photoceptor, which was named phytochrome.

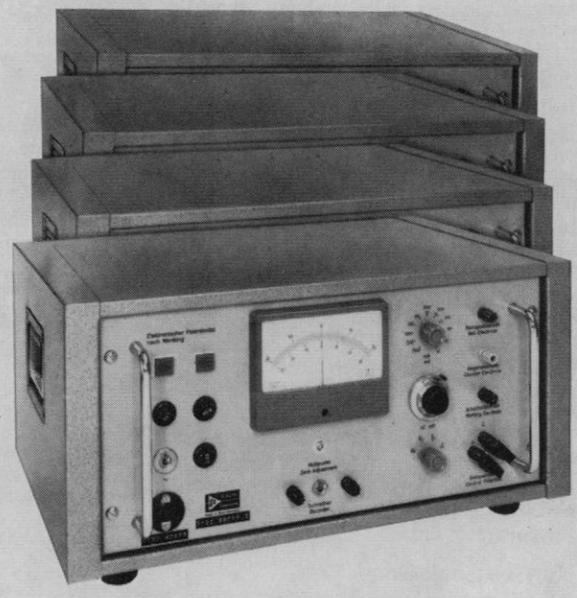
The early work was done mainly by a research team led by H. A. Borthwick and S. B. Hendricks at the Plant Industry Station in Beltsville, Md. The "Beltsville Group" went on to develop the theoretical concept of the phytochrome system which forms the basis of the modern interpretation of photomorphogenesis. The classic phase of phytochrome research (approx. 1952-1960) is described in a series of excellent articles but an adequate compilation of more recent advances in this field has been lacking. The author of the present work undertook to sum up the current state of the art in a series of 24 lectures, omitting the historical aspects unless they were vital to an understanding of the present situation.

The emphasis is on developmental physiology and the significance of phytochrome research within molecular biology in general. The lectures on which the text is based were given at the University of Massachusetts in the fall and winter of 1971.

■ You find more Springer titles in the "Book Store Section" of this issue.

Springer-Verlag
New York Heidelberg Berlin
175 Fifth Avenue, New York, NY 10010

Which of our electronic potentiostats is for you?



A newly expanded line of Wenking Electronic Potentiostats for various electrochemical investigations is now available.

Choose from four basic series: 'fast rise' and/or high output voltage models (with output swing of ±100 V); a 'high current' model (output current to ±10 amps); several standard models, and an inexpensive laboratory model for routine requirements. Accessory systems, including a high precision voltmeter and motor potentiometers, are also available.

Which Wenking is for you? Complete literature describing all Wenking models, the world's most widely used electronic potentiostats, is available free on request to help you decide. Just write: Wenking Division, Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590. In Canada write: Brinkmann Instruments (Canada) Ltd., 50 Galaxy Boulevard, Rexdale (Toronto), Ontario.

Wenking Potentiostats

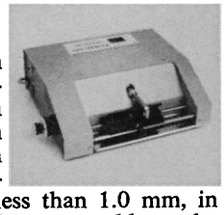
A DIVISION OF BRINKMANN

Circle No. 61 on Readers' Service Card

The Brinkmann Gel Column

Slicing It Pretty Thin

It's a safe bet you won't find one in every household. Or in every laboratory. But if you're moving in the sort of specialized area of electrophoretic analysis of RNA, for example, and you have to serve up slices of polyacrylamide gels, a lot of laboratory types think the MICKLE GEL SLICER is the best thing since delicatessens.



It figures.

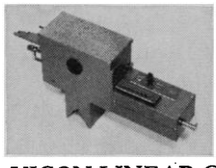
How else can you cut a frozen gel column up to 10 cm long and 1 cm thick into flawless slices of less than 1.0 mm, in increments of 0.1 mm, and leave the rest of the column undisturbed?

Cutting force and blade angle are adjustable for hard-frozen dilute gels, or softer, concentrated cylinders. Slices are easily collected for processing and scintillation counting.

Twenty cuts per minute. Foot switch leaves hands free. Electromagnetic counter keeps score on slices. Write for complete details.

How To Look Good, Fast.

Costs being what they are today, the guy (or gal) who can save a few dollars gets the hero medal. Here's a way to look good while you're looking good and fast (while you're rapidly scanning polyacrylamide gel columns optically, that is).



Be the first to recommend purchase of the VICON LINEAR GEL SCANNER —the attachment that fits right into your Zeiss PMQ II Spec. cell compartment without modification (and avoids costly instrument duplication).

It scans at 6 mm/min—even faster (25 mm/min) for coarser separations —in either direction. Resolution? Slit aperture is 100 u thin to catch those narrow bands. Columns to 10 x 100 mm can be handled. Wavelength is variable from 200 to 750 mu. And there are a host of options available to meet your specific needs. Want to scan fast? Want to look good? Get the details. Write:

Dept. B.G.C.
Brinkmann Instruments, Inc.
Cantiague Road,
Westbury, N.Y. 11590
(516/334-7500)

Brinkmann Instruments (Canada), Ltd.
50 Galaxy Boulevard,
Rexdale (Toronto), Ontario

Circle No. 84 on Readers' Service Card

Allen T. Dittmann. Springer, New York, 1973. viii, 232 pp., illus. $7.95.

Learning to Be. The World of Education Today and Tomorrow. Edgar Faure and six others. Unesco, Paris; Harrap, London, 1972 (U.S. distributor, Unipub, New York). xi, 314 pp. Paper, $6.

Metal-Ammonia Solutions. William L. Jolly, Ed. Dowden, Hutchinson, and Ross, Stroudsburg, Pa., 1972. xvi, 440 pp., illus. $20. Benchmark Papers in Inorganic Chemistry.

Metallurgical Stereographic Projections. J. S. Smaill. Halsted (Wiley), New York, 1972. viii, 262 pp., illus. $22.75.

Microbiology. A Programmed Presentation. William J. Payne and Dean R. Brown. Mosby, St. Louis, Mo., ed. 2, 1972. xii, 284 pp., illus. Spiral bound, $6.75.

The Minor Structures of Deformed Rocks. L. E. Weiss. Springer-Verlag, New York, 1972. viii, 432 pp., illus. $29.80.

The Molecular Basis of Antibiotic Action. E. F. Gale, E. Cundliffe, P. E. Reynolds, M. H. Richmond, and M. J. Waring. Wiley-Interscience, New York, 1972. xviii, 454 pp., illus. $23.50.

Multiple Factors in the Causation of Environmentally Induced Disease. A workshop, Bethesda, Md. Douglas H. K. Lee and Paul Kotin, Eds. Academic Press, New York, 1972. xx, 226 pp., illus. $7.50. Fogarty International Center Proceedings, No. 12. Environmental Sciences.

Natural Ecosystems. W. B. Clapham, Jr. Macmillan, New York, 1973. viii, 248 pp., illus. Paper, $3.95.

Scientific and Technical Books in Print, 1972. Subject Index, Author Index, Title Index. Bowker, New York, 1972. xii, 1576 pp. $28.50.

The Selection of Design. Gordon L. Glegg. Cambridge University Press, New York, 1972. 84 pp., illus. $6.95.

Solar Wind. Proceedings of a conference, Pacific Grove, Calif., Mar. 1971. C. P. Sonett, P. J. Coleman, Jr., and J. M. Wilcox, Eds. National Aeronautics and Space Administration, Washington, D.C., 1972 (available from the Superintendent of Documents, Washington, D.C.). xii, 718 pp., illus. $6. NASA SP-308.

Sonographs of the Sea Floor. A Picture Atlas. R. H. Belderson, N. H. Kenyon, A. H. Stride, and A. R. Stubbs. Elsevier, New York, 1972. viii, 186 pp. $27.75.

Space Physics and Space Astronomy. Michael D. Papagiannis. Gordon and Breach, New York, 1972. xvi, 294 pp., illus. $14.50.

Stålfelt's Plant Ecology. Plants, the Soil and Man. Translated from the Swedish edition (1960) by Margaret S. Jarvis and Paul G. Jarvis. Longman, London, 1972. xii, 592 pp., illus. Paper, £5.50.

Statistical Decomposition Analysis. Henri Theil. North-Holland, Amsterdam; Elsevier, New York, 1972. xvi, 338 pp., illus. $22.50. Studies in Mathematical and Managerial Economics, vol. 14.

Strains of Human Viruses. Mirko Majer and Stanley A. Plotkin, Eds. Karger, Basel, 1972 (U.S. distributor, Phiebig, White Plains, N.Y.). x, 272 pp. $27.45.

The Structure and Function of Muscle. Vol. 1, Structure Part 1. Geoffrey H. Bourne, Ed. Academic Press, New York, ed. 2, 1972. xx, 576 pp., illus. $33.

The Structure and Function of Nervous Tissue. Vol. 6, Structure IV and Physiology IV. Geoffrey H. Bourne, Ed. Academic Press, New York, 1972. xvi, 500 pp., illus. $29.

Victims of Groupthink. A Psychological Study of Foreign-Policy Decisions and Fiascoes. Irving L. Janis. Houghton Mifflin, Boston, 1973. viii, 278 pp., illus. $7.95.

The Vitamins. Chemistry, Physiology, Pathology, Methods. Vol. 5. W. H. Sebrell, Jr., and Robert S. Harris, Eds. Academic Press, New York, ed. 2, 1972. xviii, 468 pp., illus. $27.

The Work of the Science Film Maker. Alex Strasser. Hastings House, New York, 1972. 308 pp., illus. $17.50. Library of Film and Television Practice.

The World Encyclopedia of Animals. Maurice Burton, Ed. World, New York, 1972. 400 pp., illus. $20.

Zinsser Microbiology. Wolfgang K. Joklik and David T. Smith, Eds. Appleton-Century-Crofts, New York, ed. 15, 1972. xx, 1120 pp., illus. $23.75.

New Journals Received

Collective Phenomena. An International Journal of Discussion and Speculation. Vol. 1, No. 1, Aug. 1972. Four issues per volume. American editor: F. Cummings (University of California, Riverside). Gordon and Breach, Inc., 440 Park Ave. South, New York, N.Y. 10016. To individuals, $15; to institutions, $45.

Communications in Statistics. Vol. 1, No. 1, 1973. Six issues a year. Editor: D. B. Owen (Southern Methodist University). Marcel Dekker, Inc., 95 Madison Ave., New York, N.Y. 10016. To individuals, $15; to institutions, $35.

Environmental Affairs. Vol. 1, No. 4, Mar. 1972. Quarterly. Editor: Edward A. Haffer. Environmental Affairs, Inc., Environmental Law Center, Boston College Law School, Brighton, Mass. 02135. $18.

Geometriae Dedicata. Vol. 1, No. 1, Nov. 1972. Quarterly. U.S. members of editorial board: L. Auslander (New York), B. Grünbaum (Seattle), D. G. Higman (Ann Arbor), and J. A. Wolf (Berkeley). D. Reidel Publishing Co., P.O. Box 17, Dordrecht, Holland. To individuals, $24.75; to institutions, $41.25.

International Journal of Environmental Analytical Chemistry. Vol. 1, No. 4, May 1972. Four issues per volume. Editors: Roland W. Frei (Dalhousie University, Halifax, Nova Scotia) and Brian W. Bailey (State of N.Y. Dept. of Health, Albany). Gordon and Breach, Inc., 440 Park Ave. South, New York, N.Y. 10016. To individuals, $14.50; to institutions, $41.50.

Journal of Structural Mechanics. Vol. 1, No. 1, 1972. Four issues a year. Editor: E. F. Masur (University of Illinois, Chicago). Marcel Dekker, Inc., 95 Madison Ave., New York, N.Y. 10016. $55.

Separation and Purification Methods. Supplement 1 of Separation Sciences. Vol. 1, No. 1, 1972. Semiannual. Editors: Edmond S. Perry (Eastman Kodak Co., Rochester, N.Y.), and Carel J. Van Oss (State University of New York at Buffalo). Marcel Dekker, Inc., 95 Madison Ave., New York, N.Y. 10016. $19.50.

Circle No. 84 on Readers' Service Card