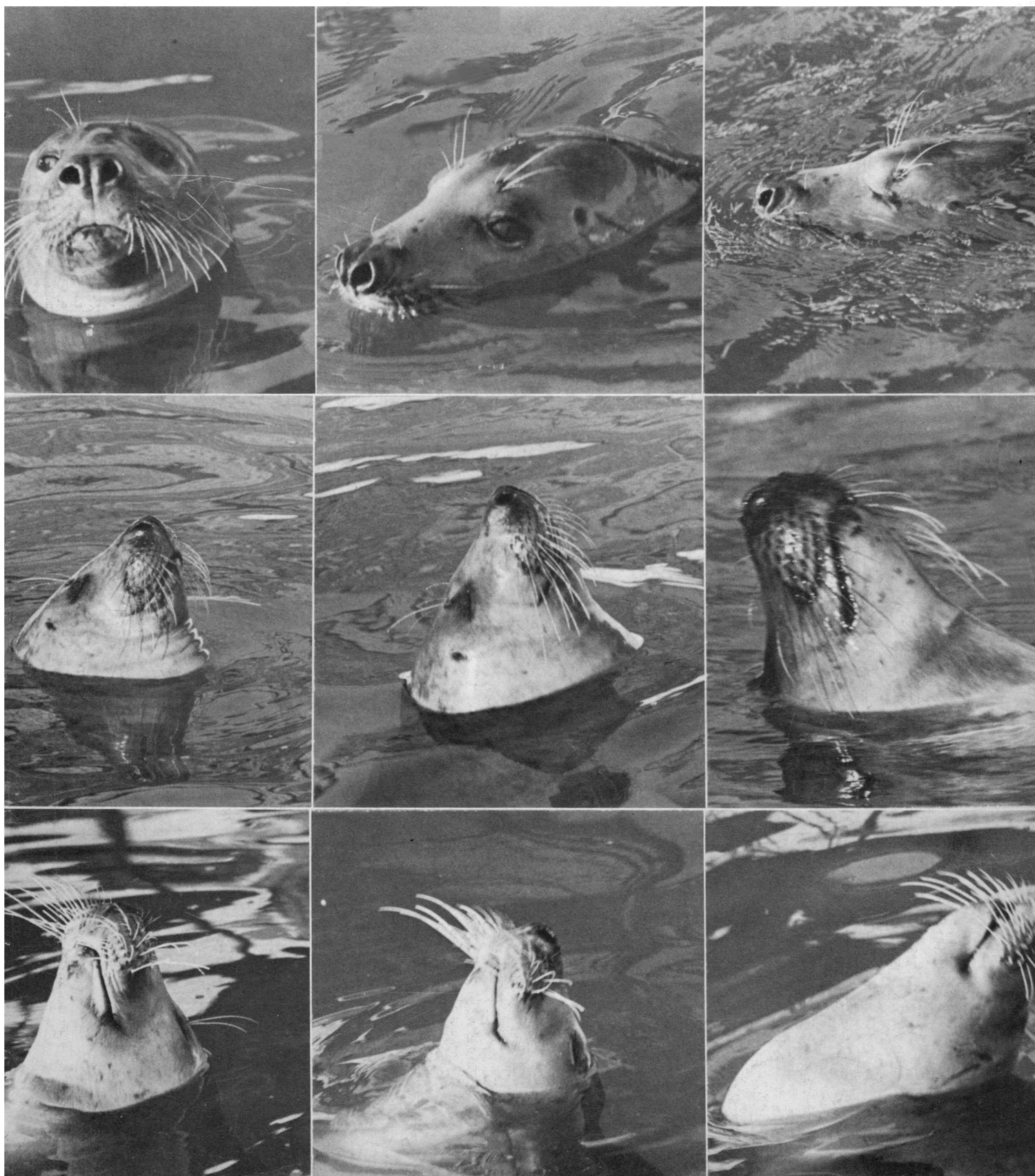


SCIENCE

14 February 1975

Vol. 187, No. 4176

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



ANALYZE 16 PROTEINS IN 2 HOURS

Analytical electrofocusing is a simple and straightforward method, with the new LKB Multiphor. You can analyze as many as 16 different protein mixtures simultaneously—under identical conditions. Comparisons are far more accurate.

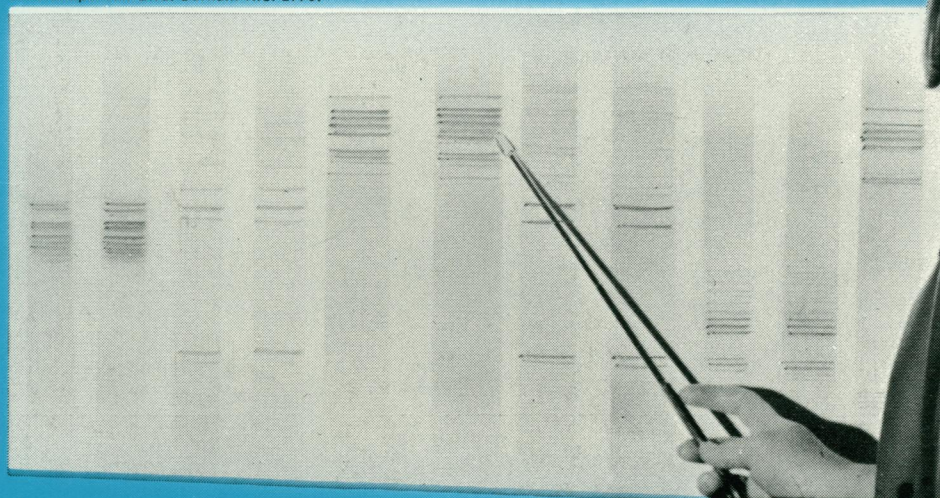
It is easy to optimize and standardize. You can select the pH range you need from the wide choice of LKB Ampholine® carrier ampholytes. There are 10 different ranges, both broad and narrow, covering pH 2.5 to 11.

High resolution is a unique feature of electrofocusing. Zones become focused and concentrated as the separation proceeds. And with the Multiphor the complete separation is finished in less than 2 hours. For more information, contact LKB, the leaders in this field for many years.

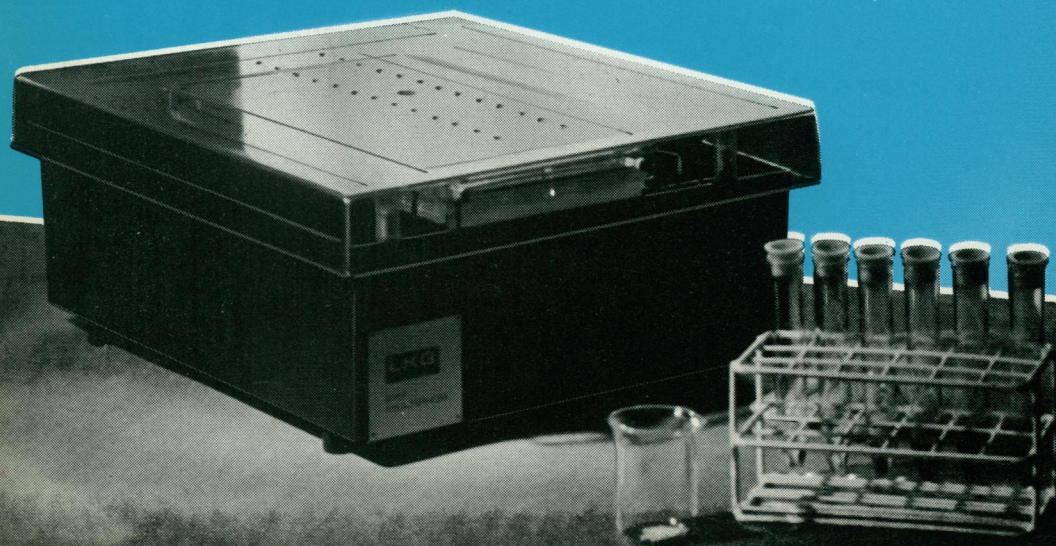
LKB

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
3700 Chapel Hill Blvd. Durham N.C. 27707



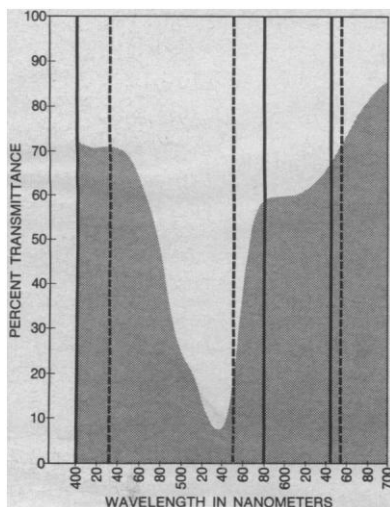
Circle No. 305 on Readers' Service Card



Make better color photomicrographs with film that fits the job

Making photomicrographs is not like making pictures of landscapes or people. Different films are needed.

Conventional films are designed for pleasing the average "eye." But film which does well in rendering grass, sky, and flesh tones may not perform so admirably with the hues of hematoxylin and eosin. As the chart indicates, the green sensitivity



A comparison of film sensitivities with the spectral transmittance of H & E stain. Vertical lines are peak-wavelength sensitivities of KODACHROME II Professional Film (Type A [solid lines]) and KODAK Photomicrography Color Film 2483 (dashed lines). The spectral-absorption curve is from hematoxylin and eosin stain on a 5-micrometer section of adult guinea pig liver, read on a General Electric Recording Spectrophotometer.

of KODAK Photomicrography Color Film 2483 is a good match for the peak transmittance of the common H & E stain.

The contrast of ordinary color films is not really adequate for faintly stained or low-contrast subjects. In short, films excellent for routine photography may have serious shortcomings in the specialized world of photomicrography. But KODAK Photomicrography Color Film 2483 is a film fit for the job.

It has very high resolving power (200 lines per mm); extremely fine grain; green sensitivity which fits biological stains, as shown in the chart; and high contrast and color saturation.

Combined, these features make 2483 Film capable of producing sharp, brilliant, beautiful photomicrographs. It brings out fine detail and faint color with excellent clarity.

Of course, all high-contrast materials demand precise exposure. For best results with 2483 Film, uniform illumination of the field is essential, and bracketing exposures is recommended.

To try the film yourself, go to your usual source of Kodak products and ask for KODAK Photomicrography Color Film 2483. It comes in 36-exposure 135 magazines, 35 mm x 125-foot rolls, and 4 x 5-inch sheets. If your dealer doesn't have it on his shelf, he can order it.

He probably *will* have chemical kits for Process E-4, so you can process the film yourself in about an hour. Or you can have it done by any commercial processing laboratory that processes KODAK Ektachrome Films.

Or for prepaid processing, choose Kodak mailer PK36, and send the film to us.

More information? Just fill in and mail the coupon.

A better b/w film, too.

Excellent though color photomicrographs may be, there are times when black-and-white is preferable. The use of black-and-white may provide optimum visualization of detail via contrast control and color filtration. Or it may simply reflect the economics of reproduction in journals and monographs.

In such cases, the film of choice may well be KODAK Photomicrography Monochrome Film SO-410. To find out more, use the coupon.



Eastman Kodak Company
Scientific Photography Markets
Dept. 412L-26
Rochester, N. Y. 14650

- ☐ Please send Publication P-302 on KODAK Photomicrography Color Film 2483.
☐ Please send Publication P-304 on KODAK Photomicrography Monochrome Film SO-410.
☐ Add my name to your mailing list.

Name _____

Organization _____

Address _____

City _____

State _____

Zip _____

Circle No. 536 on Readers' Service Card

14 February 1975

Volume 187, No. 4176

SCIENCE

LETTERS	NIH Management: <i>K. A. Piez</i> ; Vigorous Vitamins: <i>J. T. Vilček</i> ; <i>M. H. Light</i> ; Particle Physics Race: <i>E. M. Dickson</i> ; Organic Cations: <i>H. Desser</i> ; Photocopying and Purchasing Practices of Libraries: <i>B. Stuart-Stubbs</i>	486
EDITORIAL	Students, Careers, and the Recession: <i>A. B. Grobman</i>	495
ARTICLES	Global Increase in Quaternary Explosive Volcanism: <i>J. P. Kennett</i> and <i>R. C. Thunell</i>	497
	Environmental Mutagenic Hazards	503
	Infectious Diseases in Primitive Societies: <i>F. L. Black</i>	515
NEWS AND COMMENT	Ford's First Budget: DOD, Energy R & D Up, Health Is Ailing	518
	Phage in Live Virus Vaccines: Are They Harmful to People?	522
	Quiet AAAS Meeting Dominated by Science Policy Talk	523
	The CIA: Transportation Study Stirs New Charge of Impropriety	524
RESEARCH NEWS	Crystal-Growing in Space: Significance Still Up in the Air	527
	Mass Spectroscopy: Adaptation for Nonvolatile Samples	529
BOOK REVIEWS	The Behaviour of Ungulates and Its Relation to Management, reviewed by <i>E. O. Wilson</i> ; The Pituitary Gland, <i>M. P. Schreibman</i> ; Free Radical Telomerization, <i>E. S. Huyser</i> ; The Biology of the Oceanic Pacific, <i>G. T. Rowe</i> ; Science and Civilisation in China, <i>C. S. Smith</i> ; Books Received	530

BOARD OF DIRECTORS	ROGER REVELLE Retiring President, Chairman	MARGARET MEAD President	WILLIAM D. MC ELROY President-Elect	RICHARD H. BOLT KENNETH B. CLARK	EMILIO Q. DADDARIO EDWARD E. DAVID, JR.
CHAIRMEN AND SECRETARIES OF AAAS SECTIONS	MATHEMATICS (A) Victor L. Klee Truman A. Botts	PHYSICS (B) Victor F. Weisskopf Rolf M. Sinclair	CHEMISTRY (C) William E. Hanford Leo Schubert	ASTRONOMY (D) Carl Sagan Arlo U. Landolt	ENGINEERING (M) Edward Wenk, Jr. Paul H. Robbins
	PSYCHOLOGY (J) Richard C. Atkinson Edwin P. Hollander	SOCIAL AND ECONOMIC SCIENCES (K) Seymour M. Lipset Daniel Rich	HISTORY AND PHILOSOPHY OF SCIENCE (L) Roger C. Buck George Basalla	INFORMATION, COMPUTING, AND COMMUNICATION (T) Martin Greenberger Joseph Becker	
	EDUCATION (Q) F. James Rutherford Phillip R. Fordyce	DENTISTRY (R) Clifton O. Dummett Sholom Pearlman	PHARMACEUTICAL SCIENCES (S) James T. Doluisio Raymond Jang		
DIVISIONS	ALASKA DIVISION		PACIFIC DIVISION		SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION
	William E. Davis Chairman, Executive Committee	Irma Duncan Executive Secretary	George A. Zentmyer President	Robert T. Orr Secretary-Treasurer	Joseph A. Schuffe President Max P. Dunford Executive Officer

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 © 1975 by the American Association for the Advancement of Science. Member rates on request. Annual subscription \$40; foreign postage: Americas \$6, overseas \$8, air lift to Europe \$20. Single copies \$1 (back issues \$2) except *Guide to Scientific Instruments* which is \$4. School year subscription: 9 months \$30; 10 months \$33.50. Provide 6 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

REPORTS	Freon Consumption: Implications for Atmospheric Ozone: <i>S. C. Wofsy, M. B. McElroy, N. D. Sze</i>	535
	Earthquake Prediction: Modeling the Anomalous V_P/V_S Source Region: <i>D. T. Griggs et al.</i>	537
	Folate Transport by the Choroid Plexus in vitro: <i>R. Spector and A. V. Lorenzo</i>	540
	Toxicology and Pharmacological Action of <i>Anabaena flos-aquae</i> Toxin: <i>W. W. Carmichael, D. F. Biggs, P. R. Gorham</i>	542
	Glucagon: Role in the Hyperglycemia of Diabetes Mellitus: <i>R. Dobbs et al.</i>	544
	Increased Lever Pressing for Amphetamine after Pimozide in Rats: Implications for a Dopamine Theory of Reward: <i>R. A. Yokel and R. A. Wise</i> . .	547
	Myogenic Defect in Acetylcholinesterase Regulation in Muscular Dystrophy of the Chicken: <i>T. A. Linkhart, G. W. Yee, B. W. Wilson</i>	549
	Nitrogen Fixation in Marine Shipworms: <i>E. J. Carpenter and J. L. Culliney</i>	551
	Pregnancy in Cactus Mice: Effects of Prolonged Copulation: <i>D. A. Dewsbury and D. Q. Estep</i>	552
	Sleep and Cardiac Rhythm in the Gray Seal: <i>S. H. Ridgway, R. J. Harrison, P. L. Joyce</i>	553
	<i>Technical Comments:</i> Student Evaluation: <i>M. Rodin; P. W. Frey; P. K. Gessner;</i> Food Production and the Energy Crisis: A Comment: <i>V. W. Ruttan; D. Pimentel</i>	555
PRODUCTS AND MATERIALS	Liquid Dispensers; Incubator; Digital Timers; Photon Counter; Programmable Pocket Calculator; Magnetic Fluid Design Kit; Fluorescence Spectrophotometer; Inkless Chart Recorder; Video Disk Recording System; Cartridge Tape System; Scanning Polarograph; Holography System; Literature	562

RUTH M. DAVIS WARD H. GOODENOUGH	FREDERICK MOSTELLER CHAUNCEY STARR	WILLIAM T. GOLDEN Treasurer	WILLIAM D. CAREY Executive Officer
GEOLOGY AND GEOGRAPHY (E) William E. Benson Ramon E. Bisque	BIOLOGICAL SCIENCES (G) Hans Laufer Jane C. Kaltenbach	ANTHROPOLOGY (H) Ruth L. Bunzel Philleo Nash	
MEDICAL SCIENCES (N) Robert Austrian Richard J. Johns	AGRICULTURE (O) Paul E. Waggoner J. Lawrence Apple	INDUSTRIAL SCIENCE (P) Jordan D. Lewis Robert L. Stern	
STATISTICS (U) Carl A. Bennett Ezra Glaser	ATMOSPHERIC AND HYDROSPHERIC SCIENCES (W) Charles E. Anderson Stanley A. Changnon, Jr.	GENERAL (X) Atheistan F. Spilhaus Joseph F. Coates	

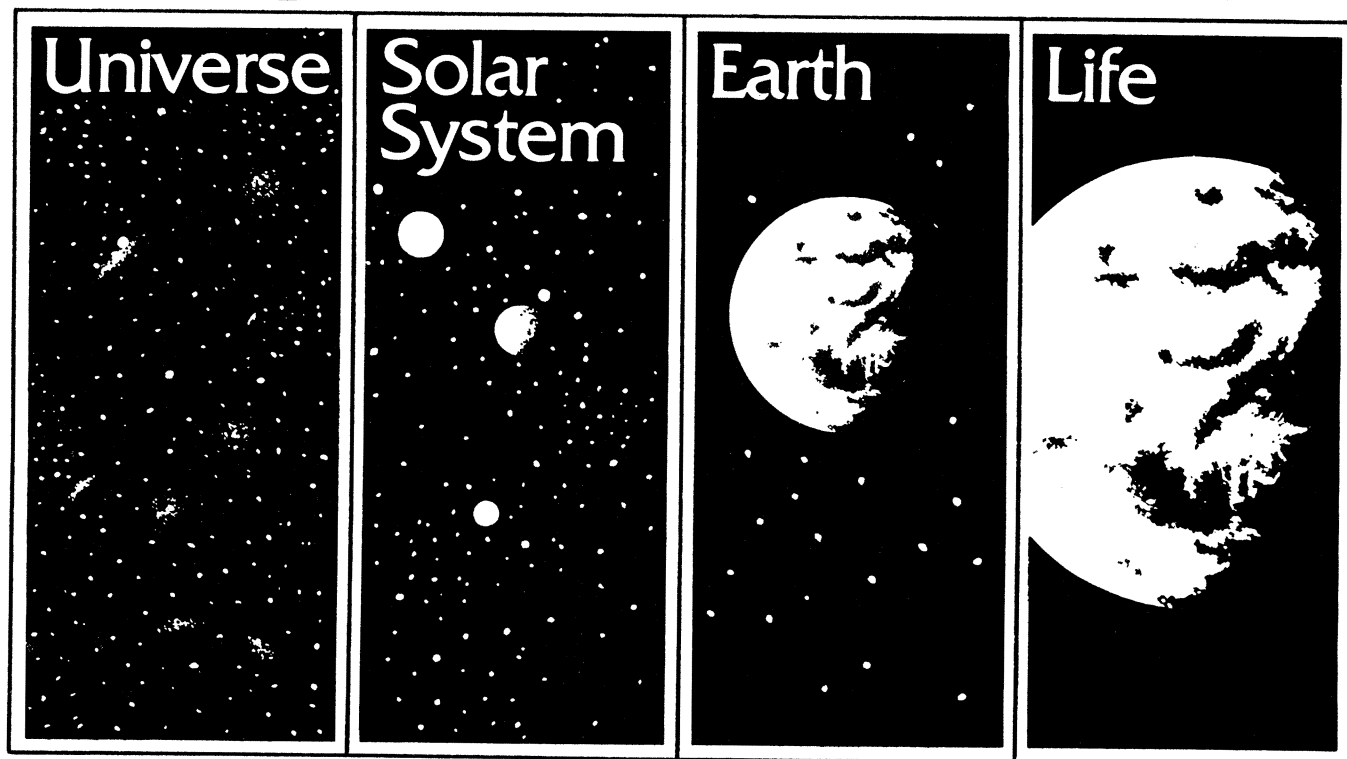
COVER

Gray seal (*Halichoerus grypus*) spends most of its life in the sea and can sleep on the surface, underwater, and on land. The seal proceeds from active waking (upper left) to quiescent waking (upper center) to rapid eye movement sleep (upper right) to slow-wave sleep (lower six views). See page 553. [S. H. Ridgway and P. L. Romano, U.S. Navy, San Diego, California]

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. Postmaster: Send Form 3547 to SCIENCE, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005.

Origins:

Speculations and facts on the sources of planets,
Earth, and life by Robert Jastrow, Philip Morrison,
Cyril Ponnampерuma, George Wald.



What is man's deepest mystery? Perhaps it is his own origin and that of his world. How did life begin? Where? ... How did primitive life evolve into man? ... How did the earth form? ... How was the universe created? ... What of the genesis, life, and death of stars? ... What do pulsars and quasars signify? How were elements created?

Four of the world's leading scientists probe these questions in ORIGINS. They talk of experiments that recreate the conditions for life ... speculations on the forces of evolution ... clues to life origins found in meteorites ... the underlying order in the chaotic formation of stars and solar systems ... the search for the true age of the earth.

The quest to understand our beginnings is an eternal one. We've used our intuition, our reasoning ability, and the steady accumulation of scientific tools to follow that quest. Through these four

talks, the listener learns how far we've come, what we now understand, and where we have to go.

ORIGINS is an attractive album with four 50-minute cassettes and an accompanying booklet. Ideas, facts, and speculations are given in layman's language—just as they were originally given in public lectures in Washington, D.C.

This album is ideal for the inquisitive mind that wants to understand the nature of stars, the universe, the earth, and life. For the science student, ORIGINS shows how scientific method and tools—those of chemistry, physics, astronomy and geology—can be applied to this basic mystery. And for everyone, ORIGINS is the opportunity to listen to scientific work-in-progress.

Price: \$34.95 to AAAS members.
\$39.95 to nonmembers.

DESIGN IN THE UNIVERSE
George Wald, Harvard University

TO THE THRESHOLD OF LIFE
Robert Jastrow, NASA Institute for Space Studies

THE ORIGIN OF LIFE
Cyril Ponnampерuma, University of Maryland

INTELLIGENT LIFE BEYOND THE UNIVERSE
Philip Morrison, Massachusetts Institute of Technology



AMERICAN ASSOCIATION for the ADVANCEMENT OF SCIENCE
Department O-2
1515 Massachusetts Avenue, N.W., Washington, D. C. 20005

Please send me _____ albums of ORIGINS at \$39.95 each (\$34.95 for AAAS members).

☐ Check enclosed ☐ Please bill me later
(Member orders must be accompanied by remittance.)

Name _____
Address _____
City _____ State _____ Zip _____



What makes a CalComp tape drive better?

- 1.** CalComp costs less.
- 2.** CalComp has sales and service offices in over 30 countries around the world.
- 3.** CalComp drives are compatible with IBM 360/30, 360/40, 360/50 computers and above. They're plug compatible with all IBM Systems 370 tape drives. And they're compatible with UNIVAC Series 9400

and 1100 computers.

- 4.** All CalComp tape drives are self-loading and feature soft tape handling. (Only 5 rotating elements in the tape path.)

For a complete analysis of our ability to supply your tape drive needs, call your nearest CalComp office or contact: California Computer Products,

Inc., SM-M2-75, 2411 West La Palma Avenue, Anaheim, California 92801, Telephone (714) 821-2011.

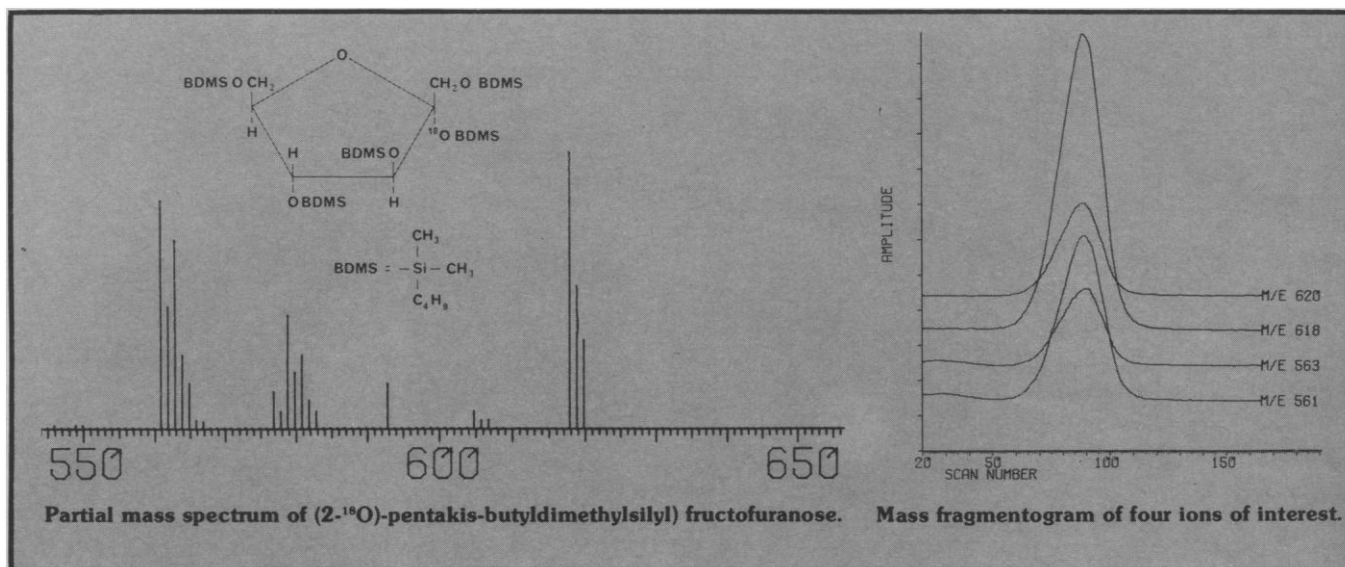


Circle No. 486 on Readers' Service Card

CALCOMP

Finnigan GC/MS

Makes Quantitative Mass Fragmentography Practical



Stable isotope labeling is entering an era of even greater usefulness because Finnigan GC/MS systems have made precise isotope measurements a practical tool. The technique of mass fragmentography provides sensitivity, specificity, and quantitation at levels never before achieved. Measurements of labeled compounds in biological fluids and tissues can be made at levels of 10^{-9} to 10^{-12} g, even if relatively impure samples are isolated. This cannot be easily accomplished by any other technique.

An Example

The (2-¹⁸O)-pentakis-(butyldimethylsilyl) fructofuranose is being used in isotope labeling studies of intact cells. This analysis was performed to verify the position of the ¹⁸O isotope and to measure its enrichment at that position. The isotope ratios were obtained by comparing the integrated areas of the specific ion chromatograms of the (2-¹⁸O) fructose. These specific mass ions are chosen because they are the diagnostic ions of the (2-¹⁸O) fructose. The ion at m/e 561 ($M^+ - 189$) contains 31.3 atom % excess ¹⁸O measured at 0.36% precision. Combustion techniques were used to show that this was the total amount of ¹⁸O in the (2-¹⁸O) fructose. Thus, the ion at m/e 561 contains all of the C-2 oxygen atom and measurement of the m/e 563/561 ratio can be used to calculate the ¹⁸O enrichment in this oxygen atom. This provides meaningful data in the metabolism studies of fructose in intact cells. The 0.36% figure is typical of

the precision and accuracy obtainable by mass fragmentography.

The New vs The Old

Up to now the life scientist has been faced by a choice of two extremes—the combustion technique provided necessary precision but no structural information; the conventional GC/MS technique provided a wealth of structural information but poor precision. Mass fragmentography bridges the gap between the two.

Only Finnigan Quadrupole MS Can Do It

Only a quadrupole mass spectrometer can perform quantitative mass fragmentography over the complete mass range of the mass spectrometer. And only Finnigan quadrupole mass spectrometers have the high performance required to make precise quantitative measurements of trace level samples derived from biological systems. Precision of 0.2 to 0.4% and accuracy of 0.3 to 0.6% have been reported in the literature.

Here Are The Reasons

In a Finnigan MS, the mass-set voltages applied to the quadrupole for selection of the specific masses to be measured can be sequentially switched in less than 1 msec. With a 100-msec sampling time, the dead time becomes less than 1%. The instrument is therefore collecting the ions of interest virtually all the time, which provides maximum signal-to-noise ratio.

Rapid switching, especially between ions of widely different masses, poses a real challenge to the stability of the mass spectrometer electronics. Mass-set voltages must be maintained within 0.01% (i.e., better than 0.1 amu precision), even when switching between widely different masses. The RF-to-DC voltage ratio must also be maintained to 1 ppm in order to maintain 0.5% ion peak height stability. Only Finnigan GC/MS systems have demonstrated this level of performance in users laboratories.

Ions in a particular isotope series may be collected for widely different amounts of time, depending on their relative abundances. This provides for equalizing the S/N ratio for each ion, no matter how greatly the relative ion intensities differ.

Any ions in the spectrum, no matter their mass difference, may be measured in a particular analysis. They need not lie within a restricted percentage of the mass range, as with the conventional magnetic sector type mass spectrometer.

To make quantitative mass fragmentography even easier, the Finnigan data system automatically calculates the peak areas or peak heights, allowing for subtraction of background signal, and reports the isotope ratios of any selected isotopes.

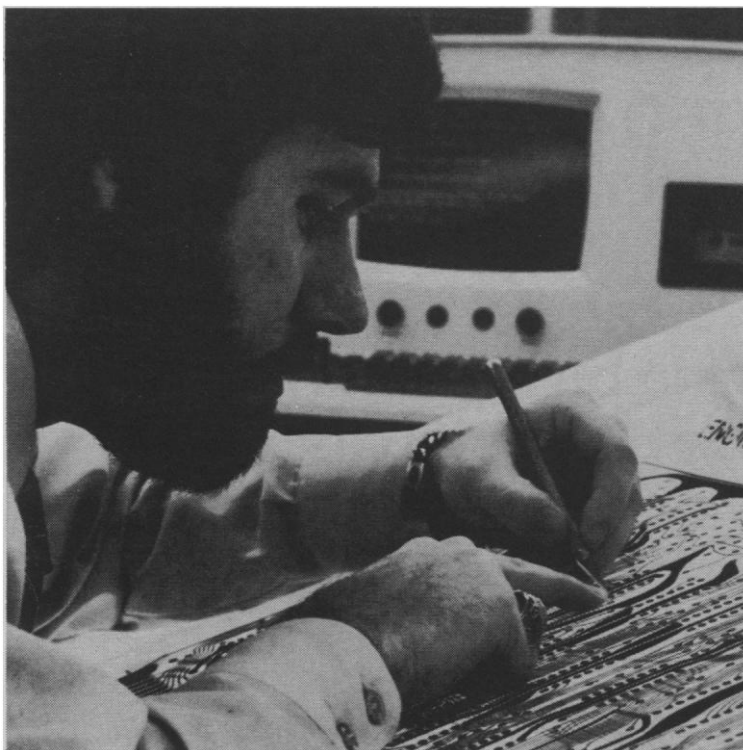
For a free subscription to *Finnigan Spectra* and for more information about this powerful new technique and its applications to your analytical problems, write to Finnigan at the address below.

finnigan

845 W. Maude Avenue, Sunnyvale, CA 94086
408-732-0940

Munich ■ Basel ■ Hemel Hempstead (U.K.)

Circle No. 336 on Readers' Service Card



When did you last have a meaningful conversation with your computer?

It is easy to talk to the Wang 2200S, the computer with a difference.

The Wang System 2200S is built for the engineer, for the research specialist, for the statistician, for the mathematician, for the educator, who needs an economical yet powerful computing system, accessible when he needs it, where he needs it.

Touch, see, converse.

The Wang 2200S responds to you at the touch of a key. You converse with it through a TV-like screen. In BASIC, an almost literal computer language. Powerful yet simple to use, BASIC and the "touch a key" approach give you the convenience of a calculator and the performance of a computer.

You will find the Wang 2200S completely interactive, with absolute simplicity of programming, editing and debugging. Renumber a program in increments you determine. Alter, insert, delete as you choose. Pinpoint and identify syntax errors. Automatically.

Buy computer power at calculator price.

Pick your Wang 2200S system with the memory size you need. Buy now what you need now and add later what you need later. And most important: The Wang 2200S gives you computer power at the price of a programmable calculator.

You can trust us.

Wang developed the small computers and has installed thousands of them, all over the world. Wang has more than 150 offices in the U.S. and 50 foreign countries.

WANG Laboratories, Inc.,

836 North St., Tewksbury, Ma. 01876, Tel. (617) 851-4111

WANG Europe S.A.,

Buurtweg 13, 9412 Ottergem, Belgium, Tel. 053/704514

Our business is to provide solutions where they are needed.

WANG

WANG Laboratories, Inc.,

836 North St., Tewksbury, Ma. 01876, Tel. (617) 851-4111

I am interested in computer power at calculator price.
☐ Please send your sales representative.
☐ Please send me information.
 Name _____ Title _____
 Tel. No. _____
 Company _____
 Address _____
 City _____ State _____ Zip _____

S2/DP2

The IEC B-60

The ultimate ultracentrifugation system that features a full selection of swinging bucket, fixed angle, and zonal rotors that never have to be derated, ever.

That's dependability!

And it's quiet enough to operate in a busy office or lab.

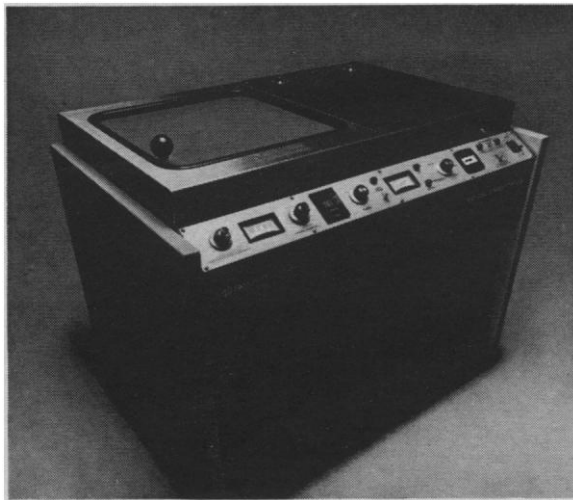
Routine applications include the preparation of subcellular fractions such as mitochondria, microsomes, ribosomes, phage, bacterial RNA and viruses. As well as special studies like dissolved proteins and other macromolecules.

The B-60 offers speeds to 60,000 rpm, gravities to 405,900 xg, volumes to 2000 ml . . . that's performance you can depend on.

For complete facts call (800) 225-8856, toll free. Or write
Damon/IEC Division,
300 Second Avenue,
Needham Heights,
Massachusetts 02194.



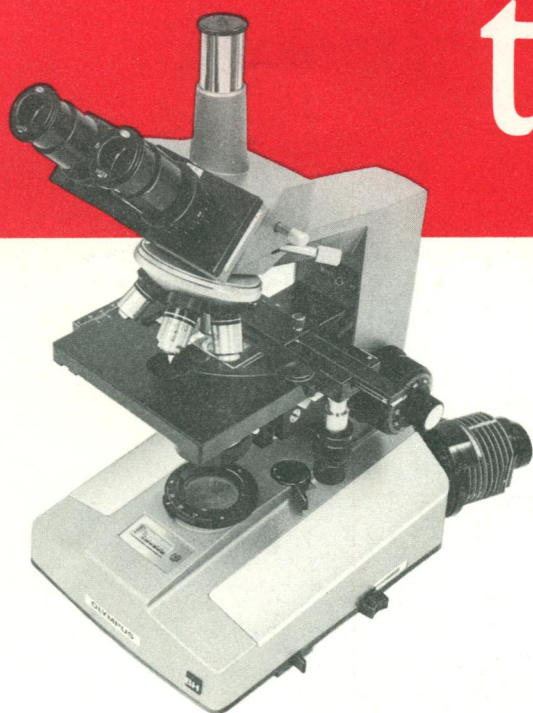
Available from
Scientific Products.



The IEC B-60.

It's something to
think about.

"I want
Michelangelo
to demonstrate
the new
Olympus BH
Microscope
to me."



OLYMPUS CORPORATION OF AMERICA

Two Nevada Drive
New Hyde Park, N.Y. 11040

Gentlemen: Yes, I'm interested in the "*Miniature Masterpieces*". Please reserve mine and call me for an appointment to demonstrate the new BH Series Microscopes.

Name _____

Title _____

Organization _____

Address _____

City _____ State _____ Zip _____

Science

It takes one masterpiece to demonstrate another:

Introducing the new Olympus BH Microscope.

Michelangelo can demonstrate some of the finer points of the new Olympus BH Microscope right in your laboratory or office. And when he's through, Dürer will show you more, and Rembrandt too.

Olympus has made this possible by the creation of our incredible "Miniature Masterpieces." For the first time ever, we have reduced some of the world's finest art to microdots on a special collector's item slide that cannot be purchased or found anywhere else.

We would like to make you a gift of our "Miniature Masterpieces" when our representative demonstrates our new microscope. But there are only a limited number of these interesting conversation pieces, and they will be given away on a first-come, first-served basis.

If you're preparing to make a major microscope purchase, you owe yourself a careful inspection of the new Olympus BH features and prices.

You'll see that the new Olympus BH is a masterpiece in itself, a modular design with a complete spectrum of accessories for any school or laboratory demand from pathology to hematology to cytology.

We'll gladly arrange to have your Olympus distributor call on you, if you simply send us the attached reply card. Send it today!

With the "Miniature Masterpieces" and the new Olympus BH microscope, you'll see one masterpiece through another.

A collector's item you will treasure. Olympus has reduced works of the world's great artists to microdots on a specially prepared slide, labeled and boxed for limited distribution.



LIMITED EDITION
"MINIATURE MASTERPIECES,"
YOUR FREE GIFT
WITH THE DEMONSTRATION OF
THE NEW OLYMPUS BH MICROSCOPE.

Fill out and mail the postage-paid card. We will arrange for a demonstration and delivery of your "Miniature Masterpieces" slide. But don't delay; this is a limited offer, subject to availability, and may be withdrawn at any time.

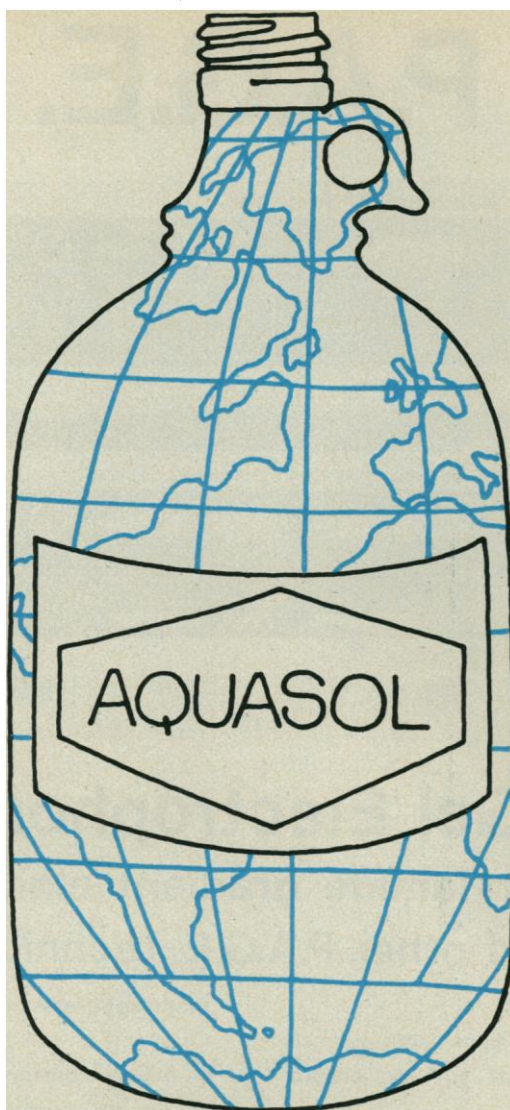
OLYMPUS
SEEING BEYOND MAN'S VISION

FIRST CLASS
PERMIT NO. 203
NEW HYDE PK., N.Y.

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN UNITED STATES

Postage will be paid by

OLYMPUS CORPORATION OF AMERICA
Two Nevada Drive
New Hyde Park, N.Y. 11040



The universal LSC cocktail

Ready-to-use AQUASOL® is compatible with aqueous or organic samples, sucrose and cesium density gradients, acrylamide gels, tissue digests, serum, and TLC fractions. Compatible with large volumes of water, highly quench resistant, highly efficient.

Order AQUASOL Universal LSC Cocktail: NEF-934
\$48/1 x 4 liters, \$173/4 x 4 liters, \$205/1 x 19 liters (5-gallon pail)



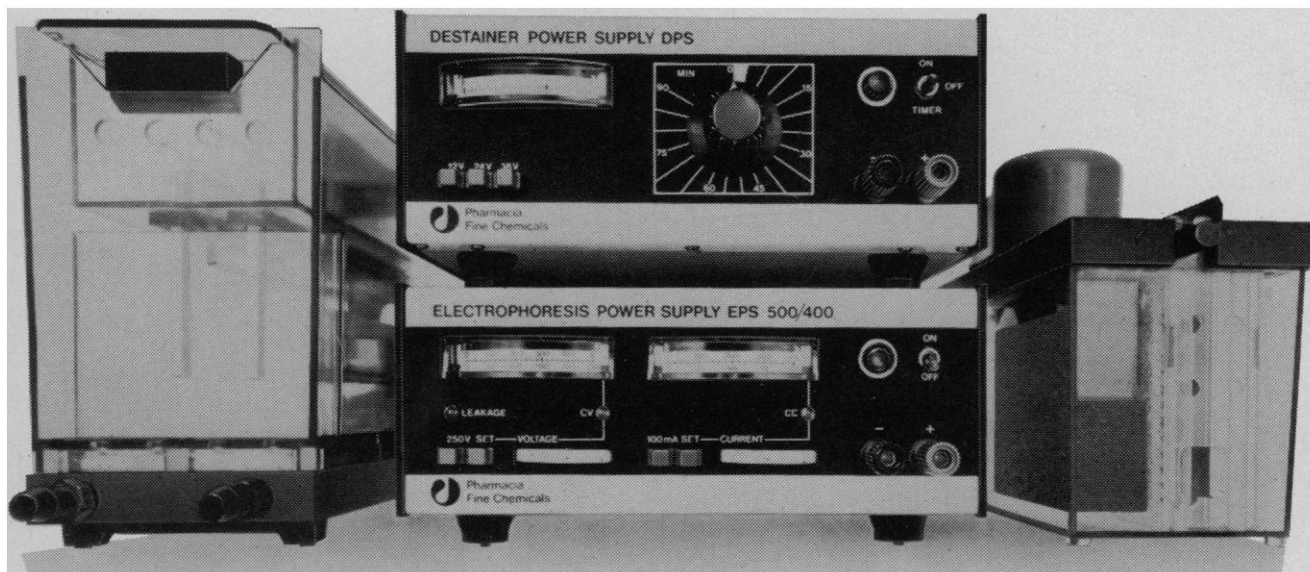
New England Nuclear

575 Albany Street, Boston, Mass. 02118
Customer Service: (617) 482-9595

Canada: NEN Canada Ltd., Dorval, Quebec, H9P-1B3, Tel: (514) 636-4971, Telex: 05-821808
Europe: NEN Chemicals GmbH, D6072 Dreieichenhain, Siemensstrasse 1, W. Germany. Tel: Langen (06103) 85035

Circle No. 395 on Readers' Service Card

This is a new P.A.G.E.



Pharmacia Gel Electrophoresis System for polyacrylamide gradient electrophoresis and other P.A.G.E. techniques

The complete system

Full capabilities for the new pore gradient electrophoresis technique, two dimensional studies, gel rod electrophoresis.

Polyacrylamide gradient gels PAA 4/30

Convenient ready-to-use gradient gel slabs give extreme resolution over the whole range 50,000–2 million MW. Self-limiting migration concentrates the zones after separation by molecular size.

Gel electrophoresis apparatus GE-4

4 gel slabs, 12 samples on each, or 16 gel rod capacity. Robust moulded construction with built-in cooling system. Full range of accessories for all applications.

Electrophoresis power supply EPS 500/400

Compact, all solid state. 0–400 mA constant current, 0–500 V constant voltage with automatic cross-over. Maximum effect 60 W. Full personnel and instrument protection.

Gel destainer GD-4

Electrophoretic or diffusion destaining of slabs or rods in a single operation. Twin cells. Active dye removal and solvent circulation. Results can be inspected at any time.

Destainer power supply DPS

Compact, reliable, all solid state. Push-button selected constant voltages 12, 24, or 36 V. Timer controls electrophoretic destaining up to 90 minutes.

Find out more about the Pharmacia Gel Electrophoresis System from your usual supplier of Sephadex® and Sepharose®.

Pharmacia Fine Chemicals Inc.
800 Centennial Avenue
PISCATAWAY
New Jersey 08854
Phone (201) 469-1222

Pharmacia (Canada) Ltd.
2044 St. Regis Boulevard
Dorval, Quebec, Canada
(514) 684-8881

 **Pharmacia
Fine Chemicals**

For laboratories weighing costs as well as samples, a precision top-loader for only \$560.

Today more than ever before, cost is a major consideration when purchasing new laboratory equipment. If your lab needs a modern, efficient top-loading balance, the Sartorius 1104 is your best answer from every standpoint, including price.

The 1104 is a precision-made torsion balance with 1,000 g capacity/0.1 g accuracy, ideally suited for a wide variety of student, research and industrial applications. Design-wise, it incorporates many advanced features: all-digital readout, full-range optical scale, built-in mechanical taring, readings in less than 3 seconds, no beam oscillation, and no weights to handle or dial in. A non-fatiguing torsion band system eliminates the need for knife edges.

At only \$560, there is no better balance buy than the 1104. Greater accuracy, if needed, is available with the Sartorius 1106 (200 g capacity/0.015 g accuracy) at \$595.

To find out more about these models, send for our free balance catalog. Just write: Sartorius Division, Brinkmann Instruments, Cantiague Road, Westbury, New York 11590.

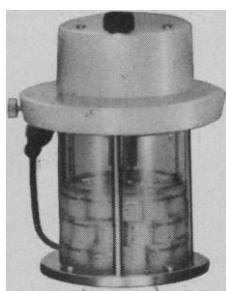
Circle No. 459 on Readers' Service Card

sartorius
balances



Reichert EM Tissue Processor automates specimen preparation for the Electron Microscopy Lab.

The tedious, time-consuming task of preparing specimens for the electron microscopy lab is now easier and more reliable with the

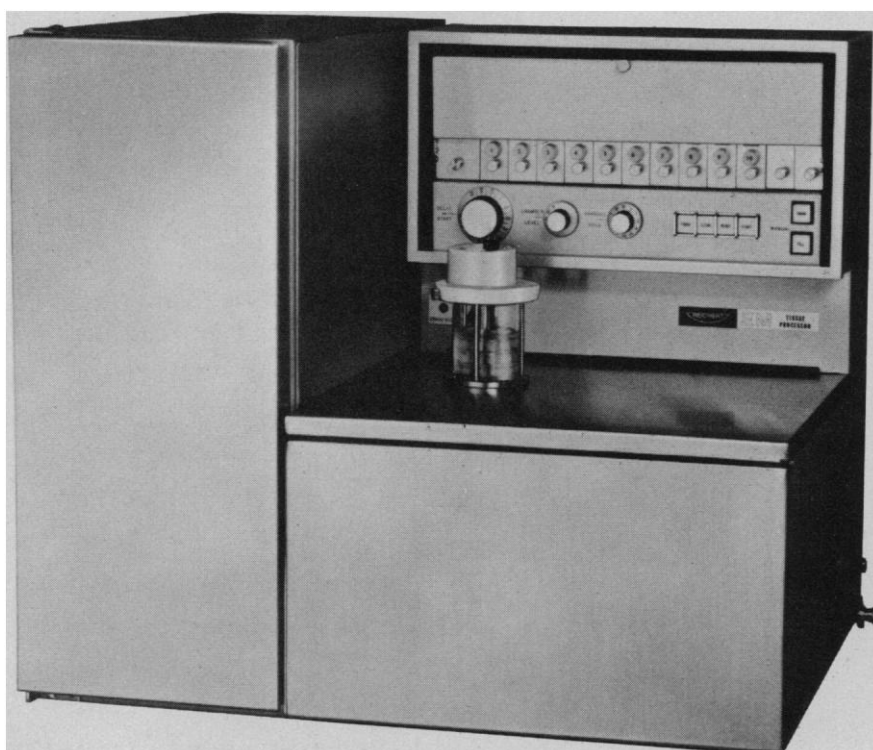
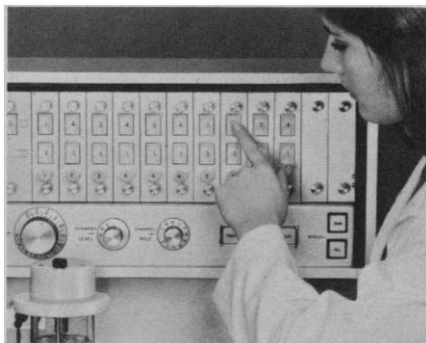


Reichert
EM Tissue
Processor.

All the
necessary
chemical and
physical pro-
cedures re-

quired to prepare specimens for encapsulating are performed with reproducible consistency. And operation is completely automatic.

Up to 46 disposable specimen containers may be processed simultaneously. Ten processing channels are programmed to control the introduction, processing time and disposal of each chemical in sequence. Each may be timed to process from one minute to 8½ hours depending upon the specimen requirements and your preferred technique.



A delay control permits processing to start at a predetermined time, to continue through programmed procedures, and be completed at a specified time, automatically. Processing can thus be run during the night or over a weekend, completely unattended.

The Reichert EMbedder instrument is used to follow-up specimen processing. Gentle vibration provides complete infiltration of the embedding medium into the specimen and "settles" the specimen in the capsule base. Two-stage controlled heat cures the embedding



medium for specified time periods, automatically.

For additional information on the Reichert EM Tissue Processor and EMbedder instrument, write

AMERICAN OPTICAL CORPORATION
SCIENTIFIC INSTRUMENT DIVISION • BUFFALO, N.Y. 14215

Our 31 Programmable Calculator.

Computer capabilities right at your desk.

The 31 rivals the mini for pure problem-solving power. But no mini can match the 31 for ease of use and low-cost operation. Its expandable memory (up to 8192 program steps or 1010 data registers) auxiliary plug-in mag tape, and optional flexible disc provide storage traditionally reserved for mini applications.

The 35 built-in functions and 24 user-definable keys let you tackle complex variables with natural math. No computer languages to learn. And no computer price either: just \$3550, including silent alphanumeric printer.

Circle No. 465 on Readers' Service Card

Use the 31 with other data tools. We have three new interfaces (like the 154 RS-232-C shown) that work with most instrumentation and I/O devices on the market. Then there's our Tektronix peripherals you can interface with. Like our digital plotter, graphic terminals. And software packages you add as you need.

But there's still more to the story on the 31. More interfaces, more peripherals, more power. And information on OEM and quantity discounts. Get it by calling your local Tektronix sales engineer. Or write us.

Tektronix, Inc.
Information Display Division
P.O. Box 500
Beaverton, Oregon 97077

Our programmable calculators. Natural. Powerful. Significantly less expensive.





Update your Zeiss PMQ II

Now you can make a new spectrophotometer of your Zeiss PMQ II, no matter how old it is.

The compact new Digital-Photometer Indicator will let you take full advantage of the PMQ II's great optical system.

You'll get greater versatility and readout accuracy. More convenience in operation. Features like:

4-digit display, 0-3.0 O.D., concentration and transmittance, variable high-voltage and calibrated amplification ranges, zero suppression, scale expansion and variable time-averaging.

Linear analog and BCD outputs for recorders and digital documentation.

Attractively priced around \$2000. Even less with your old analog indicator as trade-in.

Write or call

Carl Zeiss, Inc.,
444 Fifth Ave.,
N.Y., N.Y. 10018.
(212) 736-6070.

Nationwide Service

ZEISS

THE GREAT NAME IN OPTICS
Circle No. 412 on Readers' Service Card

LETTERS

NIH Management

Barbara J. Culliton has reported perceptively on some of the problems at the National Institutes of Health (NIH). I believe, however, that the impressions she gained (News and Comment, 10 Jan., p. 47) from the press conference held by the Federation of American Scientists (FAS), which included the director of the FAS and five leading scientists from the NIH, do not represent a majority view of NIH scientists.

I know of no sizable movement for an independent NIH or of strong feelings that NIH scientists should be "left . . . alone to do their thing." The *Washington Post*, in an editorial published on 27 December 1974, correctly concluded (from some of the same scientists that Culliton talked to) that "scientists agree that they cannot live in splendid isolation . . . [but] they consider themselves qualified to participate in the decisions about the . . . methods . . . their science ought to pursue in order to obtain the most promising results."

That is the nub of the problem. What scientists inside and outside the NIH object to is "targeted" research selected by managers and legislators who are politically motivated and seek advice from scientific entrepreneurs who have power and are articulate, to the exclusion of advice from working scientists. This is partly the fault of the scientists who, as Culliton says, "have a knack for putting [arguments] in ways that sound self-serving." But it is also the fault of managers, legislators, and some reporters who do not make the effort to separate what some scientists say some of the time from what the majority of scientists mean.

Let's continue to have targeted goals, programs, and managers. But let working scientists into the programming and managing processes at the highest levels, appoint managers that have an understanding of how scientific research works, keep the system flexible enough so that serendipitous discoveries and flashes of genius are not suppressed, and above all do not sacrifice scientific quality for perceived program needs.

Finally, don't make the NIH an independent agency. There may be an argument for a separate Department

of Health including the NIH, but biomedical research needs the support of disease-oriented programs. If the *raison d'être* for biomedical research is only intellectual curiosity, it can expect a level of support equivalent, say, to archeology.

KARL A. PIEZ

National Institutes of Health,
Bethesda, Maryland 20014

Vigorous Vitamins

Reports that vitamin A may be endowed with Antitumor activities (Research News, 27 Dec. 1974, p. 1198) follow the announcement that vitamin E promotes Eternal youth (Research News, 20 Dec. 1974, p. 1105) and the already notorious claim that vitamin C prevents Colds. It is to be expected that new activities for some of the other vitamins will be discovered shortly. Thus vitamin B might cure Baldness (or Botulism), vitamin D could work miraculously against Dengue, and vitamin K is very possibly an excellent agent for Kleptomania.

Has anybody got a few milligrams of vitamin S (for Skeptics)?

JAN T. VILČEK

Department of Microbiology,
New York University
School of Medicine, New York 10016

Thomas H. Maugh's report on vitamin A and its relation to carcinogens presents several provocative points, the most significant of which is the observation that the primary thrust of cancer therapy has been toward treatment after the development of malignancy.

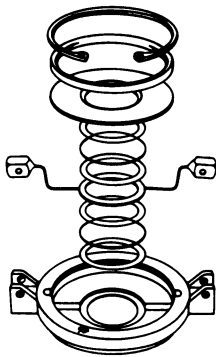
The *Ten-State Nutrition Survey (1)* brought to light the marked incidence of vitamin A deficiency in this country. Further, Jennings (2) has reviewed at length the interrelation of vitamin A metabolism and various endocrine abnormalities. For instance, it has been noted in humans with diabetes or hypothyroidism that conversion of dietary sources of carotene to vitamin A is almost completely blocked. Diabetes has long been noted as a disease in which neoplasm incidence is excessive. Further, mild depletion of vitamin A has been shown to inhibit synthesis of deoxycorticosterone to corticosterone. Severe depletion of vitamin A has been demonstrated to inhibit glucocorticoid synthesis, which amounts to "chemical

Zeiss can help you keep things lively, but under control.

In the study of live specimens, an invaluable new tool is the Dvorak-Stotler Controlled Environment Culture Chamber. Its unique construction permits the use of the full range of Zeiss objectives and condensers to obtain the highest possible resolution and magnification.

Polarized light, Nomarski Differential Interference Contrast, Phase Contrast, Double-beam Interference, Quantitative Microspectrophotometry—all can be carried out without limitations of any kind. Shown here with the Zeiss Invertoscope, it can be used with any Zeiss Microscope, upright or inverted.

It's a completely closed yet perfusable system,



ideal for the culture of human pathogens or other hazardous materials.

The Air Stream Incubator with Time-Proportional Control works with the culture chamber to ensure the maintenance of physiological temperatures. Temperature control of the biological specimen is better than $\pm 0.2^{\circ}\text{C}$. in the culture chamber.

For complete details, write Carl Zeiss, Inc., 444 Fifth Ave., New York, N.Y. 10018. Call (212) 736-6070.

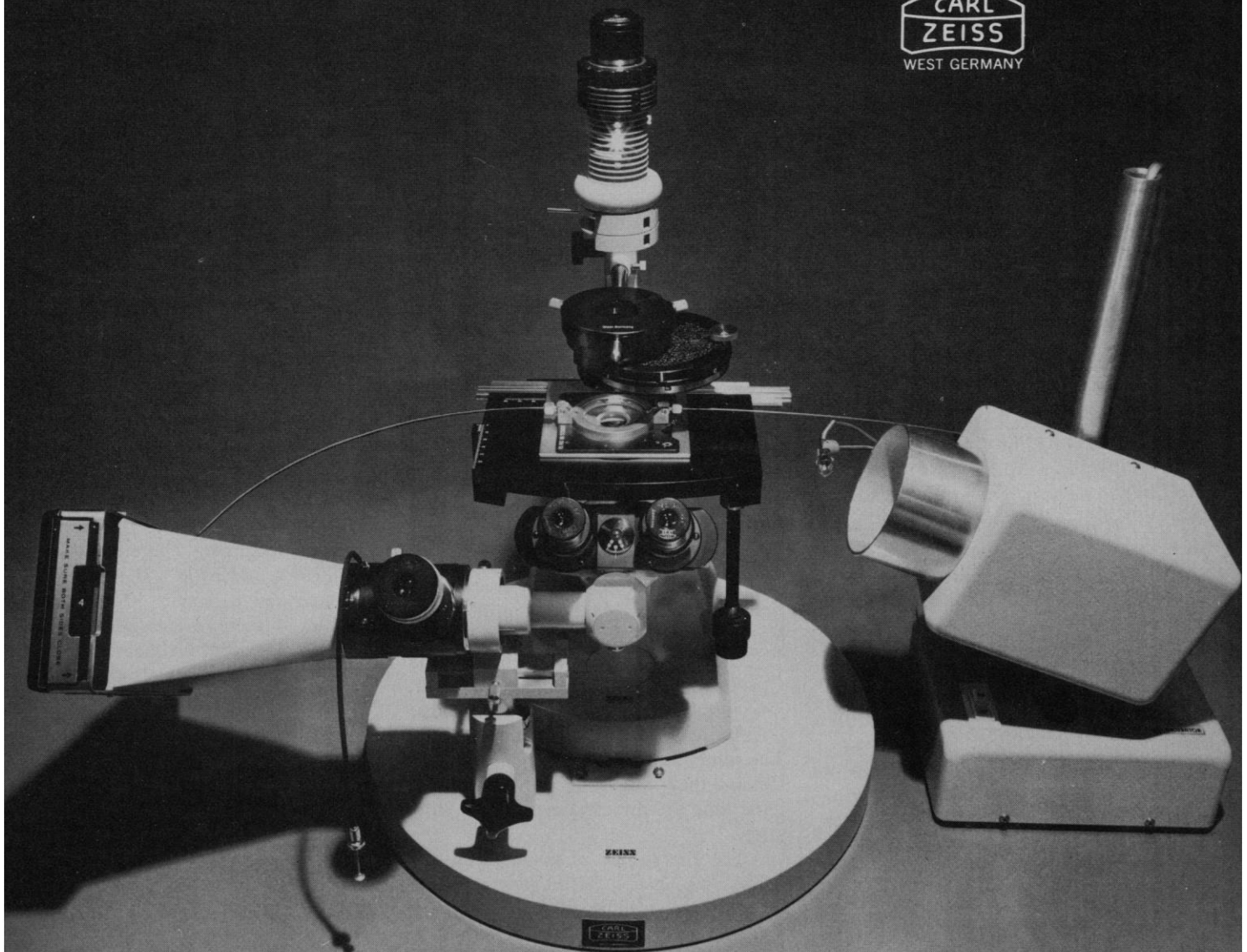
In Canada: 45 Valleybrook Drive, Don Mills, Ont., M3B 2S6. Or call 449-4660.

Nationwide Service.

BRANCH OFFICES: BOSTON, CHICAGO, COLUMBUS, HOUSTON, LOS ANGELES, SAN FRANCISCO, WASHINGTON, D.C.

ZEISS

THE GREAT NAME IN OPTICS



Circle No. 411 on Readers' Service Card

The Polytron® homogenizer.

BACK IN STOCK!

If it can be done, we can probably do it.

The Willems Polytron® homogenizer is unlike any mixer you've ever used. It works on a unique principle—kinetic plus ultrasonic energy. And it often succeeds where other instruments fail.

Homogenization by sound waves means that tissues are broken down quickly to sub-cellular level without destruction of enzyme activity. You'd be hard-pressed to do that with other kinds of mixers.

In the applications field, the Polytron has proved so effective in inducing physical and chemical change that it has already revolutionized many procedures. Whether it be for dispersing, homogenizing, emulsifying or disrupting, a Polytron is available in the size to meet your specific requirements.

Contact us if you have any questions. Both literature and a demonstration are available on request.



Brinkmann Instruments, Inc.
Cantiague Road,
Westbury, L. I., N.Y. 11590
Brinkmann Instruments
(Canada), Ltd.
50 Galaxy Boulevard,
Rexdale (Toronto), Ontario.



adrenalectomy" (3). Defective adrenal cortical hormone synthesis has been demonstrated to have a carcinogenic effect.

Preventive programs might well embrace investigation of the relation between dietary deficiency and endocrine abnormalities of subtle or gross natures. Studies thus far indicate that such an interrelation creates fertile circumstances for the development of neoplasms.

Maugh comments that there is a distressing potential for a faddist approach in this entire matter. This approach could be averted if the usefulness and protectiveness of dietary sources of all nutrients, including sources of vitamin A, were to be outlined in public educational programs. Inappropriate medication with large amounts of vitamin A in capsule form is not suggested. Rather, attention to diet with consideration of existing endocrine defects is the reasonable approach based on the findings thus far.

MARILYN HAMILTON LIGHT
*Adrenal Metabolic Research Society
of the Hypoglycemia Foundation, Inc.,
Post Office Box 98, Fleetwood,
Mount Vernon, New York 10552*

References

1. *Ten-State Nutrition Survey, 1968-1970* (Center for Disease Control, Department of Health, Education, and Welfare, Atlanta, Ga., 1972).
2. I. W. Jennings, *Vitamins in Endocrine Metabolism* (Thomas, Springfield, Ill., 1970).
3. S. Levine, D. Glick, P. K. Nakane, *Endocrinology* 80, 910 (1967); H. S. Junega, S. K. Murthy, J. Ganguly, *Biochem. J.* 99, 138 (1960).

Particle Physics Race

Never before have I seen the absurd competition in high energy physics made so clear as in William D. Metz's articles (Research News, 6 Dec. 1974, pp. 909 and 910) about the discovery of the new particles.

Goldhaber retreated to write the paper announcing the Stanford result when there were only three data points. Only in the second draft could parameters of the resonance be included because they were not fully known at the time the first draft was being written.

The almost-hero of this comedy was Ting, who had sufficient judgment and caution to wonder if his data were correct or even spurious. As a result, he and his colleagues working at Brookhaven engaged in several months of reflection and experimental checking.

Yet, when the threat of a scoop appeared, he too rushed to publish.

I wonder if these scientists also run to the cashier's window the moment the horses in a race leave the starting gate.

EDWARD M. DICKSON
*1015 Mallet Court,
Menlo Park, California 94025*

Organic Cations

The admirable hypothesis of D. McMahon (20 Sept. 1974, p. 1021) that differentiation of embryonic cells is determined by their content of inorganic ions and cyclic nucleotides leads me to consider the possibility that not only are inorganic cations of considerable importance in this connection, but that organic cations, such as putrescine, spermidine, and others, found in all nucleated mammalian cells, could also be of importance. These have been found to substitute and synergistically promote enzymatic activities stimulated by inorganic cations (1). Polyamine biosynthesis can also be stimulated by cyclic nucleotides (2). Furthermore, in addition to having ionic properties, these diamines, being derivatives of aliphatic hydrocarbons, have the ability of conformational adjustment into specific binding sites of macromolecules such as DNA and RNA (3). Because they are subject to enzymatic synthesis and catabolism, their biological activities could also be modulated by endogenic processes causing variation in concentrations of these compounds and resulting in a variety of other metabolites, as for instance conversion of putrescine by diaminoxidase (histaminase) to γ -aminobutyraldehyde and then to Δ^1 -pyrroline and polymers.

With all these events occurring in the cell, I could imagine that they contribute to the mechanisms considered by McMahon.

HANS DESSER
*Institut für Biochemie,
Tierärztliche Hochschule,
Vienna A-1030, Austria*

References

1. A. Kossorotow, H. U. Wolf, N. Seiler, *Biochem. J.* 144, 21 (1974).
2. W. T. Beck and E. S. Canellakis, in *Polyamines in Normal and Neoplastic Growth*, D. H. Russell, Ed. (Raven, New York, 1973), p. 261; B. Hogan, R. Shields, D. Curtis, *Cell* 2, 229 (1974).
3. S. S. Cohen, *Introduction to the Polyamines* (Prentice-Hall, Englewood Cliffs, N.J., 1971), pp. 109-147.

Measure smaller amounts of protein than ever before

New High Specific Activity:

Using one of these three new compounds, virtually any protein can be labeled and counted with greater sensitivity than was possible previously.

³⁵S-Methionine –to 400Ci/mmole

L-Methionine [³⁵S]

Aqueous solution containing 10 μ moles of 2-mercaptoethanol per ml, shipped in dry ice.

NEG-009 10-100 Ci/mmole \$105/1mCi \$276/5mCi

NEG-009H 100-400Ci/mmole \$105/1mCi \$276/5mCi

³⁵S-Cystine –to 60Ci/mmole

L-Cystine [³⁵S]

Aqueous hydrochloric acid solution (pH~2): ethanol, 9:1, shipped in dry ice.

NEG-020 20-60Ci/mmole \$112/1mCi \$280/5mCi

³H-Leucine –to 100Ci/mmole

L-Leucine [3, 4, 5-³H(N)]

0.01N HCl solution.

NET-460 70-100Ci/mmole \$35/250 μ Ci \$70/1mCi \$210/5mCi

Also:

L-Leucine [4, 5-³H(N)]

0.01N HCl solution.

NET-135L 5Ci/mmole **NET-135H** 30-50Ci/mmole
\$30/250 μ Ci \$50/1mCi \$150/5mCi

 **New England Nuclear**

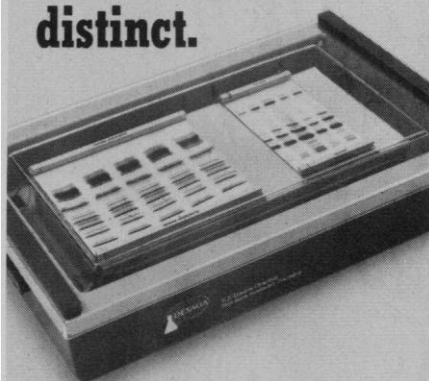
549 Albany Street, Boston, Mass. 02118
Customer Service (617) 482-9595

Canada: NEN Canada Ltd., Dorval, Quebec, H9P-1B3, Tel: (514) 636-4971, Telex: 05-821808
Europe: NEN Chemicals GmbH, D6072 Dreieichenhain, W. Germany, Siemensstrasse 1. Tel: Langen (06103) 85035

Circle No. 396 on Readers' Service Card

TLIEF gives separations of outstanding resolution.

With a Desaga/Brinkmann Double Chamber, they're even more distinct.



Thin Layer Isoelectric Focusing (TLIEF) is a new separation technique offering numerous advantages over conventional isoelectric focusing. These include simultaneous separation of multiple samples with outstanding resolution, accurate and simple pH determinations, and distinct evaluation by paper print technique.

Using a Desaga/Brinkmann TLE Double Chamber offers the added advantage that plates as large as 20x40cm can be utilized, and separations can be run in the 20cm or 40cm direction. (*The longer length permits separations even more distinct!*) The Chamber also accepts two plates 20x20cm, four plates 20x10cm, and up to eight plates 20x5cm. Multiple separations may be run simultaneously using various carrier materials and/or buffer systems.

The unique Desaga Chamber comes with plastic insulated aluminum cooling block, four independent, removable electrode troughs with platinum electrodes, gas-purging port, and a transparent cover equipped with four safety switches. (Use of a fully-stabilized power supply is recommended). For informative literature, write: Desaga Division, Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590.

Desaga/Brinkmann

Photocopying and Purchasing Practices of Libraries

In his reply (10 May 1974, p. 610) to letters from Vernon E. Palmour, W. Kenneth Lowry, and Robert D. Patton regarding library photocopying, Curtis G. Benjamin of McGraw-Hill, Inc., refers to a study of mine (1) and states that I "found that books and periodicals of all kinds were copied in almost equal proportion." This is true. He then says, "My own unscientific but painfully educated guess is that, of all the photocopying done today *at* (not *by*) all college and university libraries, about 65 percent is of books and 35 percent is of periodicals and technical reports." This is a misleading statement, besides being unscientific. It should be examined in the light of my findings, as follows.

Type of material copied	Number of copies	Percent
Book	33,000	21.5
Periodical	34,409	22.4
Government document	6,579	4.3
Thesis	4,713	3.1
Other published material	5,073	3.3
Miscellaneous	69,683	45.4
Total	153,457	100.0

The sample of 153,457 copies was taken at 37 university and college libraries, from both staff-operated and coin-operated machines, so the results take into account copying both *at* and *by* university and college libraries. It represents more than 1 percent of the annual total of photocopying *at* and *by* these libraries, sufficient to guarantee statistical validity. Although all the libraries were located in Canada, I believe that student and faculty requirements are sufficiently similar in our two countries that, if such a study were conducted in the United States, it would yield comparable results.

The category "Other published material" included newspapers, music, and such odds and ends as broadsides and advertisements. The miscellaneous category included for the most part student notes and library reproduction of business forms, catalog cards, and correspondence. On the basis of this evidence, it would be more accurate to say that about a fifth of *all* copying done *at* and *by* college and university libraries is of books.

I was also able to analyze 31,649 book exposures in terms of the imprint date.

Date of publication	Number of exposures
Pre-1899	3,308
1900-1949	3,581
1950-1959	4,746
1960-1964	5,376
1965-1969	10,941
1970-1971	3,697

It is impossible to say how many of the books from which copies were taken were in print. But to be generous, let us assume that every book published before 1960 is now out of print and all thereafter are in print. Then 63 percent of books copied would still be in print. Yet, although book copying is concentrated in the last decade of publishing, this amounted to about 20,000 exposures out of a total of more than 150,000, or about 13 percent.

In the case of Canadian books, I studied the number of pages copied per individual book, by date of imprint. This showed that the copying of long passages and whole books was an exception, unless the books were published before the turn of the century.

Date of publication	Average number of pages copied per book
Pre-1899	55.9
1900-1949	8.3
1950-1959	6.3
1960-1964	10.4
1965-1969	6.6
1970-1971	7.0

Benjamin's argument is that copying of books leads to a decline of sales. Clearly, where libraries are concerned, the copying of up to a dozen pages would be no substitute for the purchase of the whole book. Benjamin says that he does not claim "to have absolute proof" of his thesis, but that he knows "for sure that many large library systems that used to order from two to five copies of a new monograph now order only one copy." He deduces "that the rapid growth of interlibrary loan services, coupled with readily available copying facilities, has been responsible for this change."

I would like to suggest that there are other more important reasons for the decline in the number of copies ordered by libraries. We are ordering fewer copies per title than we did just a few years ago, and the reasons have nothing to do with the copy machine. Our situation is not atypical. First, our enrollment dropped. Class sizes diminished, particularly those of large

The Indispensable Dispenser...\$75.

**It needs
no special bottles,
no special bases,
no special care.**

Adjustable or fixed-volume models.

Available in 3 adjustable-volume models (0.4 - 2ml; 1 - 5ml; 2 - 10ml) and 7 fixed-volume models (0.5, 1.0, 2.0, 2.5, 3.0, 5.0 and 10.0ml).

Easy to sterilize.

Entire unit may be autoclaved at 120°C without disassembling.

Designed for rugged use.

No fragile protruding glass tubing. Not top-heavy; needs no special bottles or bases.

Outstanding reproducibility.

Better than 0.2% reproducibility. Absolute accuracy $\pm 1\%$ for adjustable models, $\pm 0.5\%$ for fixed-volume models.

FEP-coated ceramic plunger.

Will not freeze with alkaline reagents.

Precision valve and cylinder system.

Tefzel® valve head, precision-ground borosilicate glass cylinder, polished ball valves assure trouble-free performance.

Adjustable dispensing & filling cannulae.

Teflon® cannulae may be cut to any required length with scissors.

Simple to operate.

Raise cylinder sleeve fully, then depress. No 'dead volume' remains in cylinder.

Easily adjusted to exact volumes.

No meniscus reading problems. Exact volumes are easy to set with pointer and locking thumbscrew.

Compatible with virtually any reagent.

No corrosion problems. All materials contacting liquid are inert, even to reactive chemicals (except HF).

Fits standard screw-neck reagent bottles.

Supplied with 16 oz. or 32 oz. amber reagent bottle (depending on cylinder capacity). Easily fits other size screw-neck bottles with optional adapters.

Doesn't this sound like the bottle-top dispenser you've been waiting for? Shouldn't you have our literature? Just write: Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590. In Canada, write: Brinkmann Instruments (Canada) Ltd., 50 Galaxy Boulevard, Rexdale (Toronto), Ont.

**iB Brinkmann
Dispensette®**

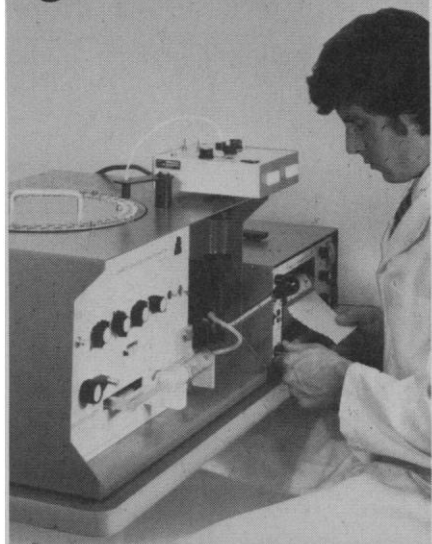
Available from: Ace Scientific/Curtin Matheson Scientific
Fisher Scientific/Preiser Scientific/Scientific Products
SGA Scientific/Arthur H. Thomas Co.

Circle No. 434 on Readers' Service Card

Tefzel® and Teflon® are Du Pont trademarks

Dispensette® is a registered trademark
of R. Brand Co., Wertheim, W. Germany

get the most out of your gradients



ISCO density gradient fractionators produce a continuous absorbance profile as the gradient is fractionated into a built-in collector. Zones undetectable by other methods are easily resolved and their exact locations plotted. Any size centrifuge tube can be quantitatively scanned at two wavelengths and fractionated with or without piercing.

The Model 570 gradient former sequentially produces up to 22 absolutely identical linear or curved gradients of any size from 3 to 80 ml. Gradient size and shape are precisely and reproducibly determined by differential pumping.

In addition to these instruments, our general catalog describes gradient pumps and scanners for zonal rotors, plus instrumentation for liquid chromatography and electrophoresis. Send for your copy now.



BOX 5347 LINCOLN, NEBRASKA 68505
PHONE (402) 464-0231 TELEX 48-6453

general courses. We needed fewer copies to meet student needs. Second, although our book budget has continued to increase every year, it has not increased enough to offset inflation, and our rate of accession has been virtually cut in half in 4 years. Third, our faculty members are distributing longer reading lists than they have in the recent past, so that student reading is no longer concentrated on a half-dozen texts which we had to buy in multiple copies.

I find it hard to believe that a college or university librarian would consciously purchase only a single copy of a work in the expectation that he would be able to borrow additional copies of the same work from other libraries when he needed them. Interlibrary loan is too slow a process to use for works in demand. Moreover, most libraries will not fill interlibrary loan requests on behalf of undergraduates, who are the principal users of multiple copies.

Benjamin also perceives a threat to the new monograph in the development of library consortia, which he thinks "will arrange to have one copy of a monograph serve the needs of the whole region." Cooperative purchasing has been taking place since the 19th century, and in recent years the decline of library budgets and the increase in costs of materials has lent some impetus to closer cooperation, with or without the fanfare surrounding the recent agreement among a number of eastern U.S. university and public libraries. But the concentration, as stated in Benjamin's quotation (2) from the director of the New York Public Library, will be on "expensive sets of volumes . . . or little-used journals." When a new monograph is published, is well reviewed, and is on a subject of interest, it will be in demand, and libraries will not be able to maintain standards of service unless they acquire those monographs. Our library is taking the same approach as many other research libraries in managing its collections budget, which is to stay current at all costs; what is getting cut out of our acquisitions programs is the rare, the expensive, the out-of-print. The publishers who should be concerned are those who flourished in the reprint business during the golden years of the 1960's, when new centers of learning were being founded across the continent and all were trying to catch up with Harvard. The golden years are over, and librarians

are having to answer to cost-benefit-minded administrators who want to know why thousands of dollars must be spent on a set of some obscure journal which might be referred to once in 5 years by four scholars at three neighboring universities. I am sure Benjamin, as a businessman and taxpayer, would ask that kind of question too. But as a publisher of monographs of the quality and distinction one has come to expect from his firm, Benjamin's fears on behalf of his product are unrealistic, where photocopying and cooperative purchasing are concerned. But there is no question that the market is changing. Academic planners and demographers tell us to anticipate fewer students; zero population growth does not in the end lead to an ever-expanding educational enterprise.

There has been much speculation about the implications of interlibrary lending for publishing and bookselling, and the continuing debate between librarians and publishers has been plagued with hunches and unsubstantiated hypotheses. It is encouraging to note that one of the provisions of a copyright bill (S.3976) which passed Congress on 19 December calls for the establishment of a National Commission on New Technological Uses of Copyrighted Works. This commission is to be composed of thirteen members: four selected from users of copyrighted works, presumably including libraries; four nongovernmental members selected from the public generally, including at least one "expert in consumer protection affairs"; four selected from authors and other copyright owners, presumably including publishers; and the Librarian of Congress. One of the functions of the commission will be to study and compile data on the reproduction and use of copyrighted works. So, at long last, there is the possibility that there will be sound information which can be used in the framing of legislation and, one hopes, in bringing together those who create and those who disseminate knowledge.

BASIL STUART-STUBBS

*Library,
University of British Columbia,
Vancouver, Canada V6T 1W5*

References

1. B. Stuart-Stubbs, *Purchasing and Copying Practices at Canadian University Libraries* (Canadian Association, Ottawa, 1971).
2. E. Pace, *New York Times*, 24 March 1974, p. 59, sect. 1, part 2.

3 of every 4 buyers of video recorders are buying U-format videocassette systems.

The simplicity, reliability, and effectiveness of the Sony U-matic Videocassette System are what have made it so successful.

So successful, in fact, that a 1974 independent survey* shows that 3 out of every 4 purchasers of video recording/playback equipment planned to buy the ¾" U-format Videocassette System.

So successful in use that the U. S. Army has publicly stated that their ¾" U-matic equipment is "99.9% reliable."

And the ¾" U-format is Sony's format. Originated and engineered by Sony. Perfected by Sony. And proven effective by thousands of users in Business and Industry: from the Fortune 500 to smaller regional companies. In Education: from Universities to Public School Systems. In Medicine, in Cable TV, Government.

Circle No. 423 on Readers' Service Card for Demonstration

Circle No. 422 on Readers' Service Card for Literature

Wherever people must interchange information.

It's the new concept in communication. With all the impact that you know television has. Simple to use, ideal for training, teaching, product demonstrations, messages from management.

Here are some special features of the Sony ¾" U-matic format:

Delivers a picture that's superior in resolution, color fidelity, and stability.

2-track sound for bilingual or technical and non-technical presentations.

Playing time of up to 60 minutes, twice that of some other systems.

Push-button controls. Pause, automatic rewind and shut-off.

A book-sized cassette that can be mailed inexpensively anywhere in the U.S. or the world.

And everything the Sony name stands for in quality, reliability, and nationwide service.

It's Sony's easy and effective way for you to move into a new world of communications. Find out how easy. Write today.

Sony. The proven one!



Sony Corporation of America
Video Products Dept. SCI-025A
9 West 57th Street, N. Y., N. Y. 10019

SN-209

- ☐ Send me more information about the Sony Videocassette System.
☐ Have a representative contact me for a demonstration.

NAME _____
TITLE _____
ORGANIZATION _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____
PHONE (AREA CODE) _____
TYPE OF BUSINESS _____

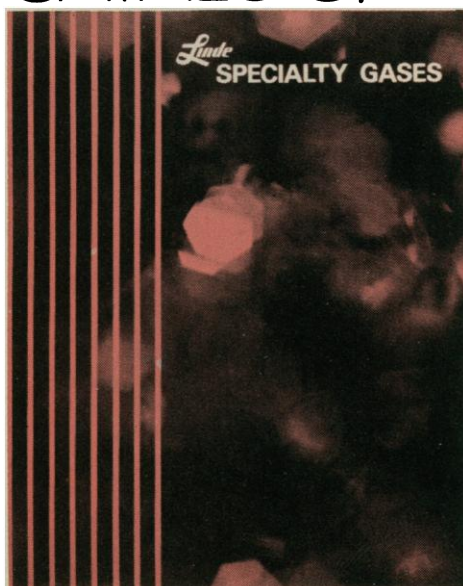
**Sony U-matic Color
Videocassette System**

* Educational & Industrial Television, February 1974
TV reception simulated



Free

THE NEW 1975 LINDE SPECIALTY GASES CATALOG.



It's 137 pages long, and contains all the information you need concerning specialty gases and equipment.

It has sections on pure and mixed gases. On hardware, including valves, regulators and flow-meters. Electronic material. A whole new section on molecular sieves. Plus a glossary and safety information.

It's color-coded so you can find what you need quickly.

And with more than 500 Linde distribution locations we can supply what you need quickly too. You know you'll be getting the best, because we manufacture most of the gases we sell.

The Linde Specialty Gases Catalog. It's yours free.

Another reason we say: Union Carbide gives you something extra.



**Union Carbide Corporation, Linde Division, Dept. SM
270 Park Avenue, New York, New York 10017**

Gentlemen: Please send my free copy of the 1975 Linde Specialty Gases Catalog.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

Circle No. 458 on Readers' Service Card

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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

Editorial Board

1975

H. S. GUTOWSKY	DONALD LINDSLEY
N. BRUCE HANNAY	RUTH PATRICK
DONALD KENNEDY	RAYMOND H. THOMPSON
DANIEL E. KOSHLAND, JR.	

1976

ALFRED E. BROWN	FRANK PRESS
JAMES F. CROW	FRANK W. PUTNAM
HANS LANDSBERG	MAXINE SINGER
EDWARD NEY	ARTHUR M. SQUIRES

Editorial Staff

Editor

PHILIP H. ABELSON

Publisher

WILLIAM D. CAREY

Business Manager

HANS NUSSBAUM

Managing Editor: ROBERT V. ORMES

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

Assistant to the Editors: PATRICIA ROWE

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. MARK, ARTHUR L. ROBINSON, GINA BARI KOLATA, FANNIE GROOM

Book Reviews: KATHERINE LIVINGSTON, LYNN MANFIELD, JANET KEGG

Cover Editor: GRAYCE FINGER

Editorial Assistants: MARGARET ALLEN, ISABELLA BOULDIN, ELEANORE BUTZ, MARY DORFMAN, SYLVIA EBERHART, JUDITH GIVELBER, CORRINE HARRIS, NANCY HARTNAGEL, OLIVER HEATWOLE, CHRISTINE KARLIK, MARGARET LLOYD, ERIC POGGENPOHL, JEAN ROCKWOOD, LEAH RYAN, LOIS SCHMITT, RICHARD SEMIKLOSE, YA LI SWIGART, ELEANOR WARNER

Guide to Scientific Instruments: RICHARD SOMMER

Membership Recruitment: GWENDOLYN HUDDLE;
Subscription Records and Member Records: ANN RAGLAND

Advertising Staff

Director

EARL J. SCHERAGO

Production Manager

MARGARET STERLING

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: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-DE-7-4973); BEVERLY HILLS, CALIF. 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772); DORSET, VT. 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581)

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*, 28 June 1974. **ADVERTISING CORRESPONDENCE:** Room 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE-6-1858.

Students, Careers, and the Recession

College and university faculties properly are concerned about their responsibilities to their students, to their disciplines and professions, and to the social, economic, and intellectual health of the larger society.

As part of those responsibilities, some faculty members feel they should restrict students from entering programs of study preparatory for careers where prevailing estimates indicate that potential job opportunities are limited and diminishing. Other faculty members feel they should provide students with the best advice available about potential employment opportunities and, having done so, should offer students maximum freedom of choice to pursue the various instructional programs in our institutions of higher education.

I join the latter group for two reasons. First, our record in predicting specialized manpower requirements has been too poor to justify using such prognostications as a basis for preventing men and women from entering careers of their choice. Second, and more importantly, in a free and open society it should not be a responsibility of colleges and universities to police the entry of individuals into various careers.

It should be the responsibility of colleges and universities to make higher education maximally available. That responsibility should include advising students about employment opportunities in different fields. But it should not include denial of the opportunity to pursue a student's chosen area of study. An important but different consideration is that there is an advantage to the broad society in having persons trained in one field work with persons trained in another, for that condition ameliorates the potential isolation of specialized elites.

Since there are practical limits to the number of persons our universities can instruct and the number of programs our universities can offer, restrictions on enrollments in programs are often necessary. Such restrictions should not be based on faculty estimates of future manpower needs. They should be based on the availability of qualified students and faculty, views of the missions of the institution, cost benefits of various programs, and other considerations related to academic affairs and their support.

These two contrasting points of view are not novel. I raise them at this time because the issue is exacerbated during a recession. At present, beyond demographic and other factors, the recession is contributing to (i) a reduction in job opportunities and (ii) a largely unanticipated increase in overall college and university enrollments. Hence the issue is thrown into bolder relief (more students and fewer jobs) and the dilemma will be more pressing each day the recession continues.

Under such conditions, persons of good will must feel it wrong to provide individuals with professional preparation for careers for which few openings are expected to occur. Yet other persons of good will must feel it wrong to deprive individuals of the chance to compete for those few openings by denying them the opportunity to acquire the necessary academic preparation.

In a democracy committed to educational opportunity for all, the balance must lie on the side of keeping the doors of higher education open as wide as possible, consistent with quality instruction. Our young people should have full access to the potential job opportunities, be they few or many. To close certain of those doors as a response to an estimated reduction in specific manpower needs would mean that our colleges and universities were assuming the roles of agents for a controlled society.—ARNOLD B. GROBMAN, *Special Assistant to the President, University of Illinois, Box 4348, Chicago 60680*

Now there's a REPIPET® Dispenser and Dilutor for every lab need.

The six REPIPET® Dispensers shown here are but a few of the many models Labindustries can supply you for precise repetitive measurements. Every lab reagent — even corrosives — can be used with REPIPET Dispensers except

HF. Choose from 1, 5, 10, 20 and 50 ml sizes, all with 50% lifetime guarantees. Take a moment to circle the reader number for our free new catalog "L/I REPIPETS and Dilutors."

- 1.** Universal REPIPET Dispenser fits any container from ½ ml up to 5 gallons. Simply cut the TEFLON® tubing to fit. 10 ml model \$84.50.

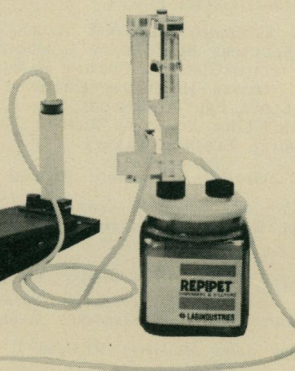
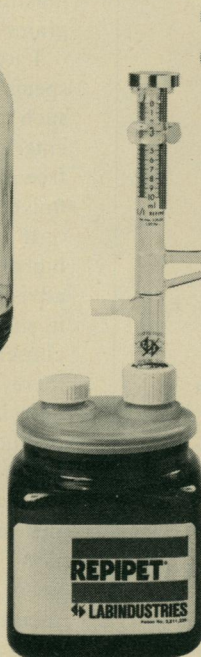
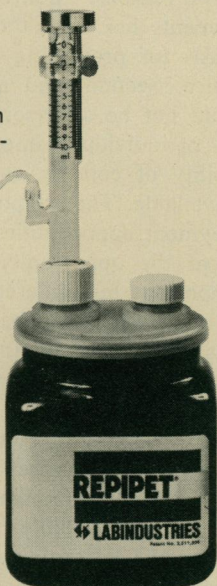
- 2. NEW** Low Silhouette with new 2-opening wide-mouth container. Leave the instrument in place, use the second opening to refill with reagent. This 10 ml unit \$68.50 including container.

- 3. NEW** REPIPET Jr. Dispenser only \$29.50. An unbreakable plastic 0.5% precision dispenser for non-corrosive reagents. We include chemical resistance chart.

- 5. NEW** AUTO-REPIPET Dispenser features air-activated foot-operated pedal — frees both of your hands for other work. The safest way possible to dispense corrosives. Model shown is \$190.

- 6. NEW** MINI-REPIPET Dispensers. Especially suited for dispensing directly from diagnostic reagent containers ½ ml and larger with 0.1% precision. Avoid the hazards of mouth pipetting! All standard sizes \$66.50.

- 4. NEW** REPIPET Dilutor. This simple, precise and low cost Dilutor now features sturdier construction and low profile container. Many models 1 to 50 ml. 10 ml model with 1 ml aspirator \$130.50.



Order from Labindustries or your distributor.

LABINDUSTRIES

1802 Second Street, Berkeley, CA 94710
Phone (415) 843-0220. Cable LABIND, Berkeley

Circle No. 432 on Readers' Service Card

MARKSON SCIENCE SHOP

You can order any item in this column direct from the supplier...details below.

Metric Converter/\$79

In a flash make 36 different metric to U.S. conversions: °F-°C, in-cm, in²-cm², in³-cm³, lb-kg, qt-liter. 5 full calculator functions (4 regular plus percentage). Rechargeable NiCd battery with AC charger, deluxe carrying pouch, 5 oz. light, handheld, wire wheels, automatic trans., AM-FM, air cond., solid state, gee whiz! Just 79 (bucks till Mar. 31, 1975) Order direct No. 8166 Metric Converter. For literature only...



3 pH Probes Cost Less Than 2

It's our popular long, thin combination electrode that reaches 10 inches down into test tubes and flasks. And it's precalibrated and gel filled. Never needs messy refilling. Order direct No. 808 pH electrode, \$98.00 each. Special offer (expires March 31, 1975):

Three or more, \$65.33 each. Or for literature only...



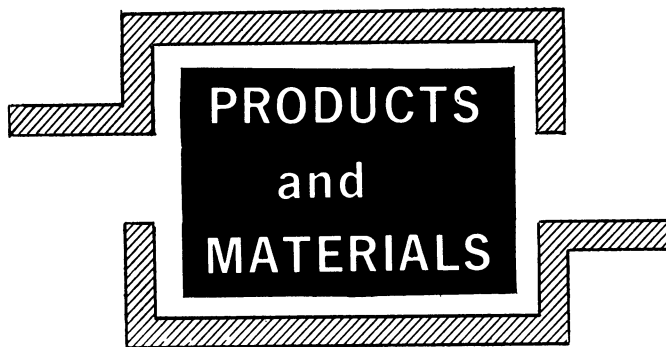
Waring Blenders: 1 qt-1 gal.

Famous Waring Blenders; rugged industrial lab models. Choose single speed, multi-speed, timer model, 1 qt., 2 qt. or giant gallon size. Accessories, too! Order direct No. 7882 1 qt., single speed, \$49.95, No. 7883 1 qt., 7-speed, \$88.95, No. 7888 2 qt., 2-speed, \$195, No. 7887 1 gal., 3-speed, \$399. All include glass container. Optional 1 qt. stainless steel container No. 7873, \$24.95. For literature only...



order direct from:

MARKSON SCIENCE INC.
131 Oak Street, Del Mar, CA 92014
Telephone (714) 755-6655



Liquid Dispensers

Dispensers are now available in 13 new fixed-volume models from 0.1 to 10 milliliters. Adjustable volume models cover 0.04 to 0.8 milliliter, 0.2 to 3 milliliters, and 3 to 10 milliliters. The devices are easy to prime with small amounts of the liquid to be dispensed. The barrels and plungers are factory matched for each instrument. Oxford Laboratories Incorporated. Circle 813.

Incubator

The laboratory incubator is suitable for culturing coliform and other bacteria, yeast, and mold and for microbiological applications in quality control work. The unit features three aluminum shelves and overall dimension of 229 by 208 by 311 millimeters. The shelves are 279 by 140 millimeters. Temperature is indicated by an included thermometer and is thermostatically controlled to a variation of $\pm 5^{\circ}\text{C}$ in stable ambients. Operating temperature is adjusted by a panel knob from room ambient to 55°C . Capacity is 37 disposable 47-millimeter petri dishes. Millipore Corporation. Circle 811.

Digital Timers

The LT-20B series of digital timers consists of more than 30 models with a choice of resolution in minutes, seconds, milliseconds, and microseconds. Each model features direct-reading digital displays, which, at $\frac{3}{8}$ inch high, are legible up to 15 feet away. Models are available with from two to five digits. Advantages include solid-state circuitry and binary-coded decimal output for printing. Line frequency may be from 50 to 400 hertz for crystal oscillator models (0.005 percent accuracy) and 50 or 60 hertz for standard current models (0.1 percent accuracy). Durgin & Browne, Incorporated. Circle 815.

Photon Counter

The 5C1 photon counting system is designed to measure light from near infrared to ultraviolet wavelengths in a variety of applications. It operates at up to 100 megahertz with 10-nanosecond pulse-pair resolution. It can display, through an oscilloscope, the pulse-height distribution with marker pulses that show discriminator levels. The discriminator levels are selected by a dual-channel pulse-height analyzer that provides first-order pile-up correction at high counting rates and window-mode discrimination of high and low pulses. The 5C1 is thus able to operate within 5 percent of true linearity at counting rates where conventional systems "lose" counts. EG & G/Ortec, Incorporated. Circle 809.

Programmable Pocket Calculator

The HP-55 features simplified key-stroke programming with 49 steps of program memory plus branching, testing, and editing capability. It has 20 addressable memories and full register arithmetic may be performed on and with the data in ten of the memories. It has 86 keyboard functions and a digital timer with 100-hour capacity and the ability to store and recall up to ten splits (elapsed time readings within an event). In addition to standard arithmetic, trigonometric, and logarithmic functions, the HP-55 will work in any of three trigonometric modes: degrees, radians, and grads. Statistical applications are possible with the memory registers. A storage register permits correc-

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card (see pages 496A and 576C) and placing it in the mailbox. Postage is free.—RICHARD G. SOMMER

The preferred choice— Thelco® Incubators



It's a preference based on experience. Users know about Thelco value, best for over half a century. They depend on Thelco built-in quality and trouble-free performance. They rely on Thelco temperature uniformity throughout the chamber, $\pm 0.25^{\circ}\text{C}$ at 37°C and only $\pm 0.8^{\circ}\text{C}$ at 56°C . No need to worry about placement of tests. Thelco Incubators more than meet the stringent requirements of hospitals, medical schools, research labs, military and public health centers.

Ask your GCA/Precision Scientific Dealer or write us. GCA/Precision Scientific, 3737 W. Cortland St., Chicago, IL 60647. Sales offices in principal cities.

Circle No. 392 on Readers' Service Card

Michelangelo is going to demonstrate the new Olympus BH microscope for you.

Watch for further information in this magazine
about the remarkable new Olympus BH.

Circle No. 455 on Readers' Service Card

NEW PERFORMANCE BENEFITS FROM WHATMAN

WHATMAN® — the No. 1 name in laboratory filtration for over half a century — has added new dimensions to its traditional line of fine cellulose filter papers and lab accessories. Today WHATMAN products include Glass-Microfiber filter papers, Advanced Ion-Exchange Cellulose chromatographic media, and "Multi-System" Chromatography columns... each offers superior service and versatility.

A. WHATMAN® Glass-Microfiber Filter Paper —

Five grades available to meet range of liquid or gaseous filtration needs. . . all made of 100% borosilicate glass without addition of organic binders. . . offer unique combination of properties not found together in any other laboratory filters (cellulose, membrane, or sintered).

Performance Benefits

1. Saves you money over membranes or paper filters.
2. Particle retention ranges from level of best cellulose papers down to sub-micron size, 0.7μ in liquids (0.1μ in gases).

3. Depth filter structure resists clogging at high loadings for large volumes, unlike membranes.
4. Filters 10 times as fast as equivalent cellulose papers.
5. Resists chemicals and solvents for which other filters are unsuitable.
6. Withstands temperatures of 500°C (900°F).

B. WHATMAN® Advanced Ion-Exchange Cellulose Media —

Unique WHATMAN AIEC packings, in both fibrous and microgranular grades. . . proven effectiveness and consistent uniformity of exchanger activity. . . cationic or anionic activity in dry powder or preswollen (wet) form.

Performance Benefits

1. Pre-swollen form does not require precycling and saves you money over dry ion exchangers.
2. Superior accessibility of exchange sites to sample being analyzed.
3. Increased selectivity for large polyelectrolytes.

4. Better dimensional stability due to cross-linking.

C. WHATMAN® "Multi-system" Chromatography Columns —

New "3 in 1" functionality in Whatman precision-bore borosilicate columns. . . "twist-&-grip" end-piece locking for greater versatility. . . interchangeable sealing pistons for adapting to all types of systems.

Performance Benefits

1. Improved resolution & sharper peaks
2. Reduced tailing or band-spreading
3. Greater sample homogeneity
4. Superior reproducibility

Look to Whatman for top performance benefits in other lab necessities, too:

- Cellulose filter papers
- Chromatography paper
- Benchkote lab-bench covering
- Gamma-12 in-line filter unit
- Filtering aids
- 1 PS Phase-separating paper

Write today for your 1975 WHATMAN Science File Folder!



WHATMAN INC.
9 Bridewell Place
Clifton, New Jersey 07014

Whatman®

A member of the Whatman Reeve Angel Group.

® Whatman is the registered trademark of Whatman Ltd.

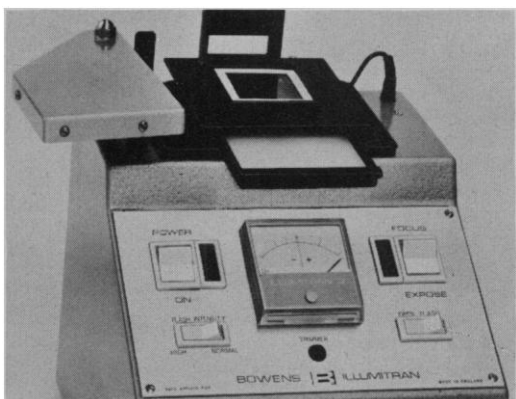
the new super duper

It's a technical wizard. It's the quickest, simplest and most economical way to make the finest quality dupes, filmstrips, internegs, sectional blowups and superimpositions without guesswork.

The new Bogen Illumitran 3, with its built-in, automatically controlled electronic flash, provides a repeatable, continuously variable lighting range of 5:1 in each of two intensity ranges: one for regular daylight films, the other for the new duping films.

A direct reading exposure meter, coupled to the light output, indicates the correct exposure and compensates when originals of varying density are being copied or when color compensating filters are being used.

You can copy original transparencies from 35mm to 4x5", make enlargements up to 10X and reductions to filmstrip format with the new Illumitran 3.



Ask your dealer or write for free literature on

**the new, more versatile
BOWENS ILLUMITRAN 3**

BOGEN PHOTO CORP.

100 So. Van Brunt St., P.O. Box 448
Englewood, N.J. 07631
Circle No. 430 on Readers' Service Card

tion of an error in arithmetic or number entry in the midst of any calculation. The HP-55 displays up to ten significant digits with a two-digit exponent and appropriate signs. Hewlett-Packard Company. Circle 810.

Magnetic Fluid Design Kit

The K-102 Special Kit provides two low-viscosity ferrofluids that will perform in damping, sealing, lubrication, levitation, and other applications. Each kit includes 30 cubic centimeters of a diester-base 200-gauss and 7 cubic centimeters of a hydrocarbon-base 400-gauss ferrofluid along with magnets, accessories, and detailed instructions. Ferrofluidics Corporation. Circle 819.

Fluorescence Spectrophotometer

The SPF-1000 CS is a corrected instrument that offers quantum efficiencies and corrected phosphorescent spectra. It records corrected excitation and emission spectra in quantum or energy units. It corrects emission spectra for the variable wave-number bandwidth of the emission monochromator. It offers a differential fluorescence mode of operation which continuously subtracts the blank or amplifies small differences in the corrected emission spectra of two related compounds. When a polarizer accessory is used, it automatically corrects polarization data for artifacts of the grating. The SPF-1000 CS will record spectra on an X-Y recorder with wavelength and wave-number units on the X-axis. American Instrument Company. Circle 812.

Inkless Chart Recorder

The Speed Servo II recorder thermally brands analog data from 4, 6, 8, 12, or 24 channels on a 10-inch calibrated heat-sensitive chart. Data format is programmable as a dot with channel number, a series of dots, or a combination of both. Data are easily readable at chart speeds as slow as 1/4 inch per hour. A universal input panel accepts millivolt/volt or thermocouple inputs. Options include channel print/skip switches, dual range control, alarms, and time or data identification number recording. Full-scale response is as rapid as 1 second per point and accuracy is ± 0.25 percent of span or ± 5 microvolts. Four chart drives are avail-

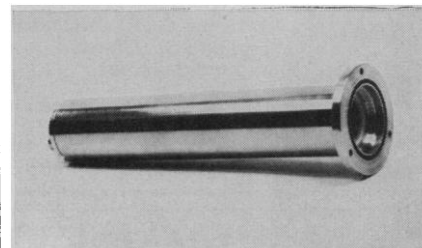


EMI GENCOM PMT HOUSINGS FOR

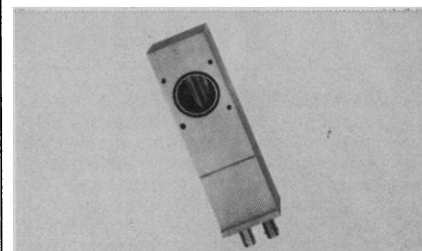
- : Broadband Photon Counting
- : General Lab Use
- : O.E.M. Applications

EMI Gencom PMT Housings are unsurpassed for flexibility, ease of use, litetite construction, and RFI shielding. They are designed by engineers with years of Photomultiplier Application experience.

The "B" type shown above uses the unique Bayonet Lock, is available in STD and RFI versions, with and without flange and provides space for AC-DC Power Supply if required. It accommodates all EMI 2" tubes and some competitive types.



The QL-30 is similar in design and fits all EMI 1-1/8" tubes. When supplied less flange, the slim line design allows compact packaging for OEM use. RFI shielded version available.



The new "S" Housing for side looking (squirrel cage) PMTs fits all tubes of this type, EMI or others. STD or RFI shielded versions available.

All of these new designs give improved performance at lower cost. Available from Stock.



Detailed
data
from:

EMI GENCOM INC.

80 Express St.
Plainview, New York 11803
Tel (516) 433-5900
TWX 510-221-1889

Circle No. 413 on Readers' Service Card

able, including a stepper motor drive with fixed and variable speed control from ¼ inch per hour to 1 inch per minute. Esterline Angus Instrument Corporation. Circle 814.

Video Disk Recording System

The model 80-0002 features high-resolution and the ability to stop and hold a single picture indefinitely. The heart of this modular system is a 12-inch magnetic, coated aluminum disk that revolves at 3600 revolutions per minute and records up to 60 images per second. With adequate light, the camera can be used with its own variable shutter to photograph fast-moving objects. Where more light is required, the unit may be operated with a high-frequency strobe light for stopping moving objects. Pictures may be stopped at any point during playback. Up to 1 hour of information may be stored and played back at variable speeds or in stopped-action. Redlake Corporation. Circle 820.

Cartridge Tape System

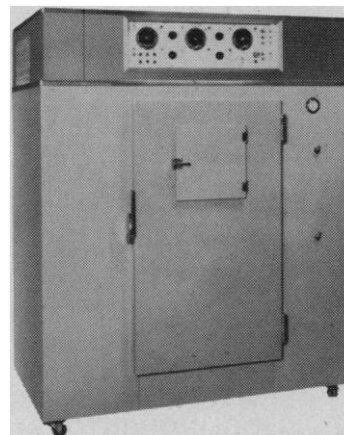
DataPacer can read or write on tape at speeds of 30 inches per second with a transfer rate of 48,000 bits per second. It comes complete with single cable, single card interfacing, and DEC-compatible software. For file operations it is bidirectional with 90-inch-per-second speed for rewinding and searching. It can store 2.8 million bytes on up to four selectable tracks per cartridge module. Up to three modules fit across a 19-inch rack. There are switch panels below each transport module for track selection, on-line or local selection, and off-line rewind. Tape position indicators show mode and position of each module at any time. Tennecomp Systems, Incorporated. Circle 817.

Scanning Polarograph

The Digi-Scan analyzer features a peak-capture capability which displays maximum current on a digital readout. Visual scanning eliminates meter reading. Applications include rapid repetitive analysis of metals and organic compounds such as detecting formaldehyde in air, acetaldehyde in acetic acid, corrosion inhibitors in generator-cooling water, iodides and bromates in aqueous systems, and others. Sensitivity is in

ENVIRONATOR is Growth Chambers

- * Solid state controls
- * Hinged lift top
- * Close tolerance temperature control $\pm .5^{\circ}\text{C}$
- * Modular design for low cost maintenance and accessibility
- * Barrier System: UVT Plexiglass
- * Covered observation window
- * Non-cycling reverse heat/cool system
- * Most capacity per floor space requirement



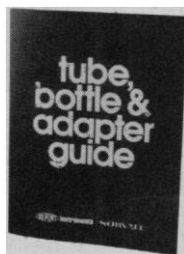
*Key to research with Super cold freezers * Growth Chambers * Programmed Incubators * Environmental Rooms **



6200 Main Street
Columbia, South Carolina 29203
803-754-8990
formerly
Environmental Equipment, Incorporated

Circle No. 290 on Readers' Service Card

FREE. 1975 Catalog of Tubes, Bottles and Adapters.



Listings include plastic, glass and stainless steel tubes and bottles for Du Pont Instruments/SORVALL and other centrifuge rotors. Charts and tables contain useful data on rotor applications, characteristics of various tube materials, and chemical resistance properties of plastic tubes.

For a free copy, send coupon to Du Pont Instruments, Room 23704B, Newtown, CT 06470.



Instruments

SORVALL®

☐ DR.
☐ MR.
NAME ☐ MS. _____
DEPT. _____
INSTITUTION _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

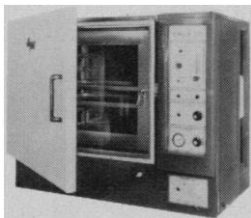
incubators?

stop right here because
Hotpack has them all!

✱ featuring SELF-DECONTAMINATION ✱

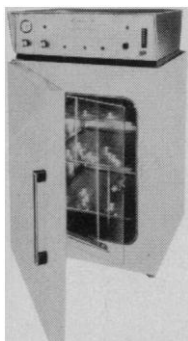
TABLE TOP CO₂ INCUBATORS

12 shelf capacity • direct
set CO₂ tension
automatic CO₂ recovery



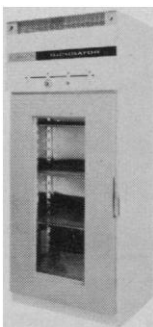
WATER JACKETED CO₂ INCUBATORS

table top • 3-wall construction •
proportional temperature control
±0.1°C



LARGE CAPACITY CO₂ INCUBATORS

fit through 30" doorway
• direct set CO₂
tension • automatic
CO₂ recovery



DUAL VERTICAL CHAMBER WATER JACKETED CO₂ INCUBATORS

3-wall construction • completely
separate controls for each chamber



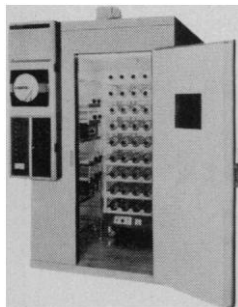
REFRIGERATED INCUBATORS

wide temperature
range • 50 cu. ft.



WALK-IN MODULAR CONTROLLED ENVIRONMENT ROOMS

installations in major laboratories
throughout the world



ask now for
our new catalog



H-102

HOTPACK CORPORATION (215) 333-1700 • TWX 710-670-1694
COTTMAN AVE. AT MELROSE STREET, PHILADELPHIA, PA. 19135
IN CANADA: HOTPACK (CANADA) LTD., WATERLOO, ONT.



The **2** most important
prostaglandins

are now available for
your current research

They're ready: Prostaglandins E₁ and E₂,
and their methyl esters. Produced biosyntheti-
cally, they are better than 97% pure. And,
best of all, you can get immediate delivery.

All this is the result of a major P-L
Biochemicals commitment . . . to produce high
purity lipid products for basic life science
research. The emphasis now is on prosta-
glandins. PGE₁ and PGE₂ are the first products
in this series. Coming soon, PGF_{2α} and
prostaglandins from coral.

Let P-L supply your present—and future—
prostaglandin requirements. For complete
information, write or call today.

excellence in biochemistry

(414) 271-0667



P-L biochemicals, inc.

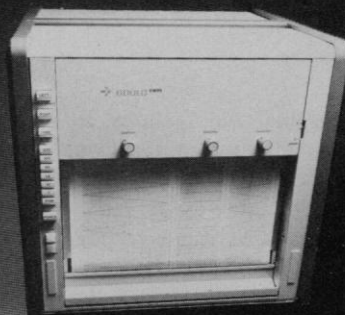
1037 WEST MCKINLEY AVENUE, MILWAUKEE, WIS. 53205

Circle No. 398 on Readers' Service Card

The New Gould 2400: the best performing, most versatile wide channel recorder you can buy.

It is available in 2, 3 and 4 channel configurations
utilizing combinations of 50 mm and 100 mm chan-
nels totalling 200 mm. It has a 99.65% linearity
over the full 100 mm channel. Its frequency re-
sponse is an outstanding 30 Hz at 100 mm, 50 Hz
at 50 mm and up to 125 Hz at reduced amplitude. It
has a full range of signal conditioners for just
about any scientific-medical application.

For full details on why the new Gould 2400 is the
best performing direct writing recorder you can
buy, write Gould Inc., Instrument Systems Division,
3631 Perkins Avenue, Cleveland, Ohio 44114. Or
Kouterveldstraat 13, B 1920 Diegem, Belgium.



GOULD

Circle No. 472 on Readers' Service Card

SCIENCE, VOL. 187

parts per million for many applications. The device is simple to operate; a single switch initiates a scan. The unit is compact and weighs less than 10 pounds. Heath International, Instrument Division. Circle 816.

Holography System

H-LAB-1 is a self-contained holography camera with an integral helium-neon laser and reconstruction system. It weighs less than 60 pounds and will take reflection holograms of objects up to 60 cubic inches. Also included are all required reflecting mirrors, diverging optics, beam splitters, shutters, variable density filters, and plate holders. External controls allow adjustment of laser intensity, the reconstruction device, and the shutter. Panel lamps indicate the status of the laser source, alignment, shutter, and reconstruction system. Apollo Lasers. Circle 818.

Literature

Liquid Chromatograph Model 80-500 is described in a four-page bulletin that includes accessories, design specifications, and suggested experiments. Gow-Mac Instrument Company. Circle 821.

An Introduction to Time and Frequency Domain Modulation and Waveform Analysis deals with the superheterodyne spectrum analyzer and its uses. Tektronix, Incorporated. Circle 822.

Hi-Low Temperature and Temperature Humidity Test Chambers are compared and illustrated in a product bulletin. Tenney Engineering, Incorporated. Circle 832.

Biology Equipment for Classroom and Laboratory is devoted to aquariums and caging equipment for studies of marine and terrestrial animals and plants. Jewel Industries, Incorporated. Circle 823.

Index to Scientific Reviews will identify more than 20,000 review articles from over 2,700 scientific journals each year. Institute for Scientific Information. Circle 824.

Model 1230 Test System for Fracture Mechanics Studies is a six-page brochure that illustrates a system for materials investigations. Instron Corporation. Circle 825.

How to Buy an Atomic Absorption Spectrophotometer details features and relative advantages for systems for various applications. Instrumentation Laboratory, Incorporated. Circle 826.

Biochemicals for Scientific Research—*Master Catalog II* lists more than 4000 products with emphasis on those for life science studies. Research Plus Laboratories. Circle 827.

1550 Series Broadcast Color Film Camera is an eight-page brochure devoted to a color television camera and optical multiplexer system. Cohu, Electronics Division. Circle 828.

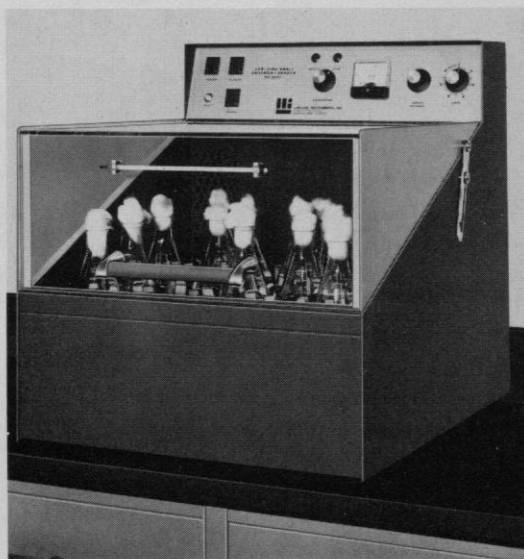
Quartz Multicomponent Measuring Platform measures forces exerted by a subject's feet in three orthogonal direc-

tions. Kristal Instrument Corporation. Circle 829.

Polarizing Mounts and Optics describes components and features a technical introduction to the polarization phenomenon. Oriel Corporation of America. Circle 830.

Universal Versaplot Software is a six-page pamphlet about a FORTRAN electrostatic plotting software package designed for virtually any computer, operating system, or plotting application. Versatec. Circle 831.

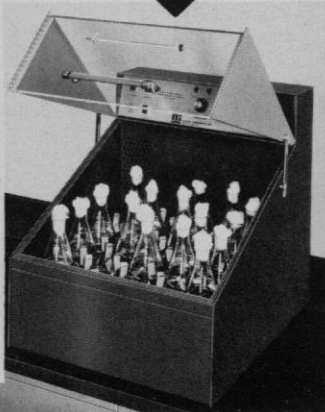
NOW! Greater Capacity at No Extra Cost with the New Lab-Line Orbit Environ-Shaker 18...



New! LAB-LINE ORBIT ENVIRON-SHAKER 18



E-Z-OPEN "Clear-View" hood allows for unobstructed observation of the chamber contents and thermometer.



Provides up to Twice the Capacity of Competitive Shakers at No Extra Cost...

The Lab-Line Orbit Environ-Shaker 18 combines greater capacity with accurate temperature control from ambient to 65°C, $\pm 0.5^\circ\text{C}$, and as low as 5°C above coolant temperature with optional cooling coil. High temperature safety thermostat is automatically set when temperature is selected, for over-temperature protection. Unit operates at variable speeds from 10 to 500 orbits per minute, with solid state speed control. Requires only 20 inches of bench space and features 29 interchangeable platforms available for holding all sizes of flasks, beakers, test tubes, etc. Specially designed 15°, 30°, or 45° angle flask platforms increases aeration without changing the agitation. Optional gassing manifold and optional light bank also available.

Ideal for general incubations, tissue cultures, assays, fermentation studies, enzyme reactions, controlled purification tests, aging tests, and growth studies at both static and agitated conditions.

Get more facts about this Shaker and our complete line of quality engineered Orbit Shakers. Write for Cat. No. 274 or circle number below on readers service card.



LAB-LINE INSTRUMENTS, Inc.
Designers and Manufacturers
Lab-Line Plaza
Melrose Park, Illinois 60160

S-2

FIRST IN INSTRUMENTS SERVING SCIENCE, INDUSTRY, AND EDUCATION SINCE 1908

Circle No. 134 on Readers' Service Card

Set it...Forget it Constant Current or Constant Voltage

If long-term stability is important in your electrophoresis work, we suggest you investigate our new power supply. Your setting is maintained within $\pm 0.05\%$ for as long as it takes to complete your separations. Change in line voltage will not affect set voltage or current. Other benefits include full burnout protection and easy-to-read, separate voltmeter and milliammeter. Single or multiple chamber use is regulated to 1000 VDC and 200 MA. Write today for complete details.

SEARLE

Buchler Instruments

Division of Searle Analytic Inc.
1327 Sixteenth Street
Fort Lee, New Jersey 07024

Visit Us
At Booth 1525
Pittsburgh Conference

Power Supply
with Buchler
analytical
electrophoresis
apparatus.



Circle No. 427 on Readers' Service Card

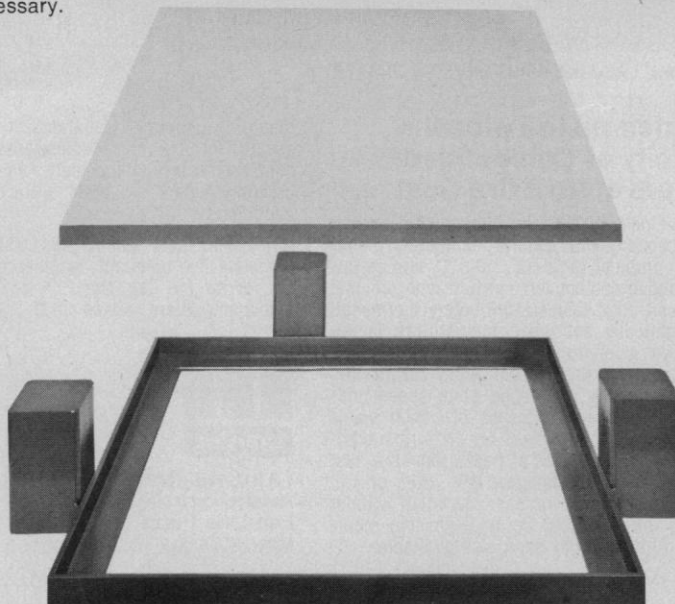
Eliminate on site vibration.

Vibration may be affecting the accuracy of your delicate instruments. Our versatile low frequency vibration isolation systems are designed to meet your most rigid requirements. Several standard sizes are available, but we will produce a VIT to meet your specific needs.

Our modular approach protects equipment ranging from photoscopes, to mask alignment and electron microscopes. All VIT's are self-contained; no continuous air supply is necessary.

Send or call for our free catalog on vibration. It includes a worksheet to help you determine your isolation requirements, and the type of VIT system most suitable for your environment and your work.

Instrument Group, Ehrenreich Photo-Optical Industries Inc., 623 Stewart Avenue, Garden City, New York 11530.
(516) 248-5200.



Circle No. 463 on Readers' Service Card

BOOKS RECEIVED

(Continued from page 534)

Dimensional Analysis for Engineers. Edward S. Taylor. Clarendon (Oxford University Press), New York, 1974. xii, 162 pp., illus. \$18.50.

The Discovery of the Sea. J. H. Parry. Dial, New York, 1974. xvi, 302 pp., illus. \$20.

Drug Interactions. Proceedings of a symposium. P. L. Morselli, S. Garattini, and S. N. Cohen, Eds. Raven, New York, 1974. x, 406 pp., illus. \$28. Monographs of the Mario Negri Institute for Pharmacological Research.

Electronic Structure and Magnetism of Inorganic Compounds. A Review of the Literature Published during 1972 and Early 1973. Vol. 3. P. Day, Senior Reporter. Chemical Society, London, 1974. xii, 434 pp., illus. £14. A Specialist Periodical Report.

The Elements of Chemical Kinetics and Reactor Calculations. A Self-Paced Approach. H. Scott Fogler. Prentice-Hall, Englewood Cliffs, N.J., 1974. xiv, 498 pp., illus. Spiral bound, \$21. Prentice-Hall International Series in the Physical and Chemical Engineering Sciences.

Endogene Bildmuster. Joseph Eichmeier. Urban and Schwarzenberg, Munich, 1974. xiv, 302 pp., illus. Paper, DM 16. U & S Taschenbücher 1004.

The Environment. Costs, Conflicts, Action. Papers from a conference, Blacksburg, Va., Oct. 1972. John Cairns, Jr., and Kenneth L. Dickson, Eds. Dekker, New York, 1974. viii, 156 pp., illus. \$12.75.

Environmental Pollution. Awareness and Control. Esber I. Shaheen. Engineering Technology Incorporated, Mahomet, Ill., 1974. xvi, 432 pp., illus. \$13.50.

Enzyme Handbook. Supplement 1. Thomas E. Barman. Springer-Verlag, New York, 1974. iv, 520 pp. \$21.30.

Essential Immunology. Ivan M. Roitt. Blackwell, Oxford, England, ed. 2, 1974 (U.S. distributor, Lippincott, Philadelphia). xii, 260 pp., illus. Paper, \$8.75.

Euclidean and Non-Euclidean Geometries. Development and History. Marvin Jay Greenberg. Freeman, San Francisco, 1974. xiv, 304 pp., illus. \$10.95.

Evaluation of Radiation Emergencies and Accidents. Selected Criteria and Data. Edward J. Vallario. International Atomic Energy Agency, Vienna, 1974 (U.S. distributor, Unipub, New York). x, 138 pp., illus. Paper, \$6. Technical Reports Series, No. 152.

Evolution of Biology. Or How Two Worms Evolved as a Mouse! Benjamin Zarr. Published by the author, P.O. Box 495, Worcester, Mass., 1974. iv, 380 pp., illus. \$10.

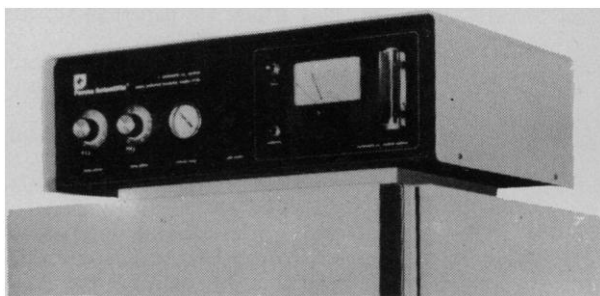
The Experimental Geneticist. An Introductory Laboratory Manual. Patricia Saint Lawrence, James W. Fristrom, and William H. Petri. Freeman, San Francisco, 1974. x, 118 pp., illus. Paper, \$4.95.

Experimental Techniques in Biochemistry. J. M. Brewer, A. J. Pesce, and R. B. Ashworth. Prentice-Hall, Englewood Cliffs, N.J., 1974. x, 374 pp., illus. \$12.50. Prentice-Hall Foundations of Modern Biochemistry Series.

New automatic CO₂ incubator. From Forma. Automatic.

Just set the desired CO₂ level and the incubator maintains itself within $\pm 0.20^\circ\text{C}$, reducing CO₂ consumption by as much as 95%. Readout is continuous on a large 4" scale meter; there's a panel-mounted CO₂ flow indicator. An even distribution of internal CO₂ environment eliminates CO₂ stratification. Temperature and humidity are uniform throughout the chamber with no air supply required. The chamber is automatically and quickly replenished after door openings, eliminating the need for manually activated recovery systems. Reliability is built in, with solid state electronics and stainless steel construction.

Write or call Forma for further details.

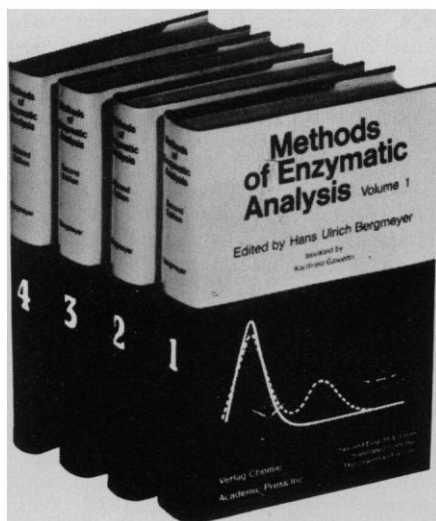


Circle No. 173 on Readers' Service Card

**Dürer
is
going to
demonstrate
the new
Olympus BH
microscope
for you.**

Watch for further information in this magazine
about the remarkable new Olympus BH.

Circle No. 456 on Readers' Service Card



Second English Edition 1974.
Translated from the Third German Edition 1974

Methods of Enzymatic Analysis

edited by **HANS ULRICH BERGMAYER**
assisted by **KARLFRIED GAWEHN**
translated by **D. H. WILLIAMSON**
with the assistance of **P. LUND**

The new edition of this outstanding reference work has now been expanded and updated to include the latest developments in analytical biochemistry.

CONTENTS OF VOLUME 1: *Section A: General Introduction:* The Importance of Enzymatic Analysis. Principles of Enzymatic Analysis. Experimental Techniques. Statistical Analysis, Control, and Assessment of Experimental Results. Cell and Tissue Disintegration. *Section B: Biochemical Reagents:* Reagents for Enzymatic Analysis. Enzymes as Biochemical Reagents. Coenzymes, Metabolites, and Other Biochemical Reagents. Complete Reagent Kits.

1974, 647 pp., \$56.00/£26.90; Set Price: \$49.50/£23.75*

CONTENTS OF VOLUME 2: *Section C: Methods for Determination of Enzyme Activity:* Oxidoreductases. Transferases. Hydrolases. Lyases, Isomerases, Ligases.

1974, 639 pp., \$56.00/£26.90; Set Price: \$49.50/£23.75*

CONTENTS OF VOLUME 3: *Section D: Methods for Determination of Metabolites:* Carbohydrate Metabolites. Citric Acid Cycle Metabolites.

1974, 582 pp., \$56.00/£26.90; Set Price: \$49.50/£23.75*

CONTENTS OF VOLUME 4: Proteins, Peptides, and Amino Acids. Fatty Acid Metabolites, Lipids, and Steroids. Nucleic Acids, Purines, Pyrimidines, Nucleosides, Coenzymes, and Related Compounds. Other Substrates and Effectors. Concentration of Metabolites in Animal Tissues.

1974, 758 pp., \$56.00/£26.90; Set Price: \$49.50/£23.75*

*The Set Price applies only to orders for all four volumes; thus, the total four-volume set price is \$198.00/£95.00.

Prices subject to change without notice.

Published jointly by Academic Press and Verlag Chemie

Academic Press

A Subsidiary of Harcourt Brace Jovanovich, Publishers
111 Fifth Avenue, New York, New York 10003
24-28 Oval Road, London NW1 7DX

Circle No. 310 on Readers' Service Card

Fauna of the U.S.S.R. B. E. Bykhovskii, Ed. Polychaetes, vol. 1. P. V. Ushakov. Translated from the Russian edition (Leningrad, 1972). Israel Program for Scientific Translations, Jerusalem, 1974 (U.S. distributor, International Scholarly Book Services, Portland, Ore.). iv, 260 pp., illus. \$26.

Finite-Amplitude Wave Effects in Fluids. Proceedings of a symposium, Copenhagen, Denmark, Aug. 1973. L. Bjørnø, Ed. IPC Science and Technology Press, Guildford, England, 1974. 282 pp., illus. Paper, £14.

Fitting In. Crosswise at Generation Gap. Herbert London. Grosset and Dunlap, New York, 1974. xii, 178 pp. \$7.95.

Flora of the U.S.S.R. B. K. Shishkin, Ed. Vol. 15, Malvales, Parietales, Myrtiflorae. B. K. Shishkin and E. G. Bobrov,

Eds. Translated from the Russian edition (Moscow, 1949). Israel Program for Scientific Translations, Jerusalem, 1974 (U.S. distributor, International Scholarly Book Services, Portland, Ore.). xxiv, 556 pp. + map. \$55.

Flowers and Plants. An International Lexicon with Biographical Notes. Robert Shostek. Quadrangle (New York Times), New York, 1974. xxii, 330 pp., illus. \$9.95.

France before the Romans. Stuart Pigott, Glyn Daniel, and Charles McBurney, Eds. Noyes, Park Ridge, N.J., 1975. 240 pp., illus. \$28.

Freedom's Edge. The Computer Threat to Society. Milton R. Wessel. Illustrated by Will Eisner. Addison-Wesley, Reading, Mass., 1974. xviii, 138 pp. Paper, \$4.95.

From Medical Police to Social Medicine. Essays on the History of Health Care. George Rosen. Science History Publications, New York, 1974. iv, 328 pp. + plates. Cloth, \$8.95; paper, \$5.95.

Functional Language Intervention. Readings. Vol. 1. Thomas M. Longhurst, Ed. MSS Information Corporation, New York, 1974. 250 pp., illus. Paper, \$6.25.

Fundamentals of Paleontology. A Manual for Paleontologists of the USSR. Yu. A. Orlov, B. P. Markovskii, V. E. Ruzhentsev, and B. S. Sokolov, Eds. Vol. 5, Mollusca—Cephalopoda I. V. E. Ruzhentsev, Ed. Translated from the Russian edition (Moscow, 1962). Israel Program for Scientific Translations, Jerusalem, 1974 (U.S. distributor, International Scholarly Book Services, Portland, Ore.). viii, 888 pp., illus. \$50.

A Guide to Psychologists and Their Concepts. Vernon J. Nordby and Calvin S. Hall. Freeman, San Francisco, 1974 (trade distributor, Scribner, New York). x, 188 pp., illus. Cloth, \$8; paper, \$3.50. A Series of Books in Psychology.

Helping the Retarded Child. Sol Nichten. Grosset and Dunlap, New York, 1974. xiv, 290 pp. \$8.95.

Human and Ecological Effects of Nuclear Power Plants. Leonard A. Sagan, Ed. Thomas, Springfield, Ill., 1974. xx, 536 pp., illus. \$34.50.

Human Chromosome Methodology. Jorge J. Yunis, Ed. Academic Press, New York, ed. 2, 1974. xviii, 378 pp., illus. \$24.

Industrial Aspects of Biochemistry. Vol. 30. Proceedings of a meeting, Dublin, April 1973. B. Spencer, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1974. Two parts. xvi, 972 pp., illus. \$64. Federation of European Biochemical Societies.

Information Science. Search for Identity. Proceedings of a NATO Advanced Study Institute, Champion, Pa., August 1972. Anthony Debons, Ed. Dekker, New York, 1974. xviii, 492 pp., illus. \$29.50.

Interdisciplinary Environmental Approaches. Albert E. Utton and Daniel H. Hennings, Eds. Educational Media Press, Costa Mesa, Calif., 1974. iv, 252 pp., illus. Paper, \$8.95.

International Review of Neurobiology. Vol. 16. Carl C. Pfeiffer and John R. Smythies, Eds. Academic Press, New York, 1974. viii, 374 pp., illus. \$29.50.

The Invisible Universe. The Story of Radio Astronomy. Gerrit L. Verschuur. English Universities Press, London, and Springer-Verlag, New York, 1974. xviii, 174 pp., illus. Paper, \$5.90. Heidelberg Science Library, vol. 20.

Is Man Incomprehensible to Man? Philip H. Rhinelander. Freeman, San Francisco, 1974 (trade distributor, Scribner, New York). xvi, 118 pp., illus. Cloth, \$5.95; paper, \$2.95. Reprint of the 1973 edition.

Isotopes and Radiation in Agricultural Research in the Soviet Union. Report of Study Tours Conducted Aug.-Sept. 1971 and July-Aug. 1972. A. Micke, D. Nethsinghe, and B. Sigurbjörnsson. International Atomic Energy Agency, Vienna, 1973 (U.S. distributor, Unipub, New York). viii, 108 pp. Paper, \$4.50.

Logic Design. A Review of Theory and Practice. Glen G. Langdon, Jr. Academic



Promote cell growth with new benchtop CO₂ incubator

Designed to meet the most stringent research requirements, this new CO₂ incubator provides a carefully controlled, high-humidity CO₂ environment. The unit has an 8½ cubic foot working chamber, yet needs little bench space. Temperature is electronically controlled from ambient to 70°C, and CO₂ tension is maintained from ambient to 20%. Other features include an automatic CO₂ recovery system, a visible water reservoir and a self-decontamination system. NBS manufactures a broad line of environmental chambers for incubation, humidification, refrigeration and controlled temperature shaking.



Biological bench-top incubator

ASK FOR BULLETIN CO-20S/275



Circle No. 342 on Readers' Service Card

NEW BRUNSWICK SCIENTIFIC CO., INC.
1130 Somerset Street, New Brunswick, N.J. 08903 • 201/846-4600
With NBS, Advanced Technology is a Way of Life.

Chemistry of Viruses

By
C. A. Knight
University of California, Berkeley,
California

This book is a concise, integrated account of chemical virology, beginning with an historical sketch and progressing through the purification of viruses, their chemical and physical characterization, to their reproduction, inactivation, and mutation. Major topics of chemical virology are reviewed with statements of principles followed by examples involving animal, bacterial, and plant viruses.

Actual experimental techniques are described, especially when they help to illustrate principles or phenomena typical of viruses. The material is concisely presented, profusely illustrated, heavily referenced, and thoroughly indexed.

Chemistry of Viruses is suitable for advanced undergraduate and graduate students and a convenient reference for those active in virological research.

1975. x, 325p. 30 illus. paper/\$17.80
Examination copies available

Lymphocytic Choriomeningitis Virus and Other Arenaviruses

Edited by
F. Lehmann-Grube

"This book is a publication based on a meeting in Hamburg in 1972, but it is somewhat more than just another written-up symposium. The arrangement of the papers in relation to each other is well planned, and not the least valuable chapters are those about arenaviruses other than LCM, principally the South American haemorrhagic fever viruses. These include Tacaribe, Pichinde, Machupo and Tamiami viruses. . . . The group also includes . . . Lassa fever virus. This volume owes its success probably to the way in which the editors appear to have planned it as a book and made the meeting the servant of the book, and, in spite of its multiple authorship, it can be strongly recommended."

Abstracts on Hygiene,
February 1974

1973. xii, 339p. 110 illus. paper/\$18.10

To order books or obtain additional
information, write to

Springer-Verlag New York Inc.
175 Fifth Avenue
New York, NY 10010



Circle No. 535 on Readers' Service Card

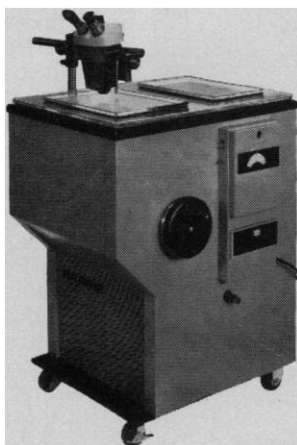
The First Wide Range Microtome-cryostat... Temperatures from -15°C to -50°C... Frozen Sections from 40 μ to 2 μ.

The Harris LoTemp model WRC is two microtome-cryostats in one. A single unit that can do both routine diagnostic procedures and such sophisticated research procedures as thin section light microscopy, autoradiography, fluorescence microscopy and other histological procedures, at a cost comparable to presently available routine cryostats.

The Harris model WRC is compact . . . can be moved anywhere it's needed. The cold chamber has extra room for tissue handling, storage or freeze drying. Full opening top with special access ports combines the features of a totally closed system with the easy accessibility of open top models.

Available equipped with International Equipment Corp. microtomes, or cryostat only prepared for installation of your present I.E.C. microtome. Installed stereo zoom microscope also available.

For a full description of the Harris WRC and its wide range of additional features write or call . . .



Harris Manufacturing Co., Inc.
14 Republic Road
Treble Cove Industrial Park
North Billerica, Mass. 01862
(617) 667-5116

Circle No. 603 on Readers' Service Card

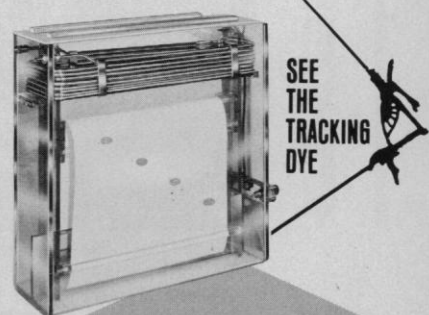
The world's most complete High Voltage Electrophoresis System ...and it's SAFE, TOO!



**SAVANT'S HIGH VOLTAGE
ELECTROPHORESIS ENCLOSURE
WITH TWO LUCITE TANKS.**

**A fully integrated ELECTRICAL and
FIRE PROTECTED chamber.**

- ☐ Fire Detection and CO₂ Extinguishing System.
- ☐ Audible Alarm and Remote Alert Signal.
- ☐ Electrical Interlocks for Primary and High Voltage Protection.
- ☐ Ground Fault Detection and Circuit Interruption.
- ☐ Flow-Thru Ventilation for Vapor Disposal.
- ☐ Cooling Water Flow Monitor and Visual Indicator.
- ☐ Unobstructed Visibility.
- ☐ Dimensions: 36" Wide x 39" Deep x 80" High.



Savant HVE Systems are "PROVEN"
in over one thousand laboratories
around the world. Request cat. #8036.

**Savant
Instruments, Inc.**

221 Park Avenue Hicksville, N.Y. 11801
(516) 935-8774

Circle No. 553 on Readers' Service Card

Press, New York, 1974. x, 180 pp., illus. \$14.50. Association for Computing Machinery Monograph Series.

Mammals of Ontario. Anne Innis Dagg. Roslyn A. Alexander, Illus. Otter Press, Waterloo, Ontario, Canada, 1974. 160 pp. Cloth, \$10; paper, \$6.50.

Man under Stress. Proceedings of a conference, Adelaide, Australia, Aug. 1972. A. T. Welford, Ed. Taylor and Francis, London, and Halsted (Wiley), New York, 1974. x, 140 pp., illus. \$10.95. Reprinted from *Ergonomics*, Vol. 16, No. 5, 1973.

Manual of Clinical Microbiology. Edwin H. Lennette, Earle H. Spaulding, and Joseph P. Truant, Eds. American Society for Microbiology, Washington, D.C., ed. 2, 1974. xxii, 970 pp., illus. Cloth. \$20; paper, \$15.

Marine Atlas of Hawaii. Bays and Harbors. Jean McKean Grace, Ed. Lois S. Nishimoto, cartographer. University of Hawaii Sea Grant College Program, Honolulu, 1974 (distributor, University Press of Hawaii, Honolulu). x, 242 pp., illus. Paper, \$22. Sea Grant Miscellaneous Report UNIHI-SEAGRANT-MR-74-01.

Medical Psychiatry Journal Articles. F. Gordon Foster and Richert E. Goyette, Eds. Medical Examination Publishing, Flushing, N.Y., 1974. 416 pp., illus. \$12.

Medicine. An International History. Paul Hastings. Praeger, New York, 1974. 144 pp., illus. \$6.50.

Medicine in Seventeenth Century Eng-

land. Papers from a symposium, Los Angeles, Mar. 1971. Allen G. Debus, Ed. University of California Press, Berkeley, 1974. xiv, 486 pp. \$15.

Men at Work. Applications of Ergonomics to Performance and Design. Roy J. Shephard. Thomas, Springfield, Ill., 1974. x, 396 pp., illus. \$23.50.

Mercury and the Environment. Studies of Mercury Use, Emission, Biological Impact and Control. Organisation for Economic Co-operation and Development, Paris, 1974 (available from OECD Publications Center, 1750 Pennsylvania Ave., NW., Washington, D.C.). 198 pp., illus. Paper, \$6.25.

Microbial Iron Metabolism. A Comprehensive Treatise. J. B. Neilands, Ed. Academic Press, New York, 1974. xviii, 598 pp., illus. \$42.

Microprobe Analysis as Applied to Cells and Tissues. Proceedings of a conference, Seattle, Wash., Apr. 1973. Theodore Hall, Patrick Echlin, and Raimund Kaufmann, Eds. Academic Press, New York, 1974. xx, 436 pp., illus. \$20.25.

Muscle and Blood. Rachel Scott. Dutton, New York, 1974. xiv, 306 pp. + plates. \$8.95.

Natural Hazards. Local, National, Global. Gilbert F. White, Ed. Oxford University Press, New York, 1974. xvi, 288 pp., illus. Cloth, \$12.95; paper, \$6.95.

Neuroendocrinologie de l'Axe Cortico-

trone. Brain-Adrenal Interactions. Proceedings of a colloquium, Marseille, Sept. 1973. Paul Dell, Ed. Institut National de la Santé et de la Recherche Médicale, Paris, 1973. xx, 354 pp., illus. Paper, 50 F. Colloques et Séminaires, vol. 22.

Neuropsychopharmacology of Monoamines and Their Regulatory Enzymes. Proceedings of a meeting, Dec. 1973. Earl Usdin, Ed. Raven, New York, 1974. xviii, 462 pp., illus. \$29.50. Advances in Biochemical Psychopharmacology, vol. 12.


The Nimonic Alloys and Other Nickel-Base High-Temperature Alloys. W. Betteridge and J. Heslop, Eds. Crane, Rusak, New York, ed. 2, 1974. xiv, 498 pp., illus. \$42.50.

Nonequilibrium Statistical Thermodynamics. D. N. Zubarev. Translated from the Russian edition (Moscow, 1971) by P. J. Shepherd. P. Gray and P. J. Shepherd, Transl. Eds. Consultants Bureau (Plenum), New York, 1974. xx, 490 pp. \$25. Studies in Soviet Science.

Nonverbal Communication. Proceedings of a symposium, Mississauga, Ontario, Mar. 1973. Lester Krames, Patricia Pliner, and Thomas Alloway, Eds. Plenum, New York, 1974. xii, 212 pp., illus. \$14.95. Advances in the Study of Communication and Affect, vol. 1.


Operating Theories of Personality. Arthur Burton, Ed. Brunner/Mazel, New York, 1974. x, 422 pp., illus. \$15.

Organizing for Science in Britain. A Case-Study. Ian Varcoe. Oxford University Press, New York, 1974. x, 94 pp.




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. 245 on Readers' Service Card

Won't leave you in-capacitated

Up to 41,300xG... 4-litre capacity... 800 ml/min. flow rate. All yours with Lourdes Beta-Fuge™. And built to take it day after day. Designed with your people in mind; that's why the front controls. The easier, faster operation. The space-saving, time-saving sliding door. Lourdes Beta-Fuge. Up with capacity. Down with downtime.

See your Lourdes dealer, or write:



Vernitron



MEDICAL PRODUCTS, INC.
 5 Empire Boulevard, Carlstadt, New Jersey 07072

Circle No. 418 on Readers' Service Card



Sigma is pleased to offer

CHOLINE KINASE

Although crude, this first offering is useful in the ^{14}C Acetyl-Choline determination of Feigenson and Saelens¹. It can also be used in the fluorometric² or ^{32}P assay of as little as 100 picomoles of Choline³, or in a spectrophotometric procedure², which is somewhat less sensitive. We expect to offer higher purities when time permits.

No. C 2761 **CHOLINE KINASE, CRUDE**

(Choline Phosphokinase: E.C. No. 2.7.1.32)
From Yeast.

1 unit (min. activity) per vial — \$8.00

1 unit will catalyze the transfer of 1 μMole of Phosphate from ATP to Choline, per min. at pH 8.5 at 25°C.

Ref.: 1. Feigenson ME, Saelens JK, *Biochem Pharm* 18: 1479, 1969
2. Browning ET, *Anal Biochem* 46: 624, 1972
3. Reid WD, Haubrich DR, Krishna G, *Anal Biochem* 42: 390, 1971

CORDYCEPIN

An interesting compound
produced by the mold *Cordyceps militaris*
Believed to be 3'-Deoxyadenosine.

It is reported to:

- Interfere with nuclear RNA synthesis.¹
- Inhibit the synthesis of messenger RNA but not Heterogeneous Nuclear RNA in HeLa Cells.²
- Inhibit DNA, RNA, protein synthesis and cell division in cultured Novikoff Hepatoma cells.³
- Selectively inhibit the synthesis of ribosomal RNA and its precursors in isolated rat nuclei of neurons, astrocytes, oligodendrites and microglial cells, but not to inhibit 25S and 12S RNA synthesis.⁴
- Inhibit mitochondrial specific RNA synthesis, without allowing production of short RNA molecules.⁵
- Induce nodules on mammalian cell nucleoli.⁶
- Inhibit Adenosine Kinase in Ehrlich ascites tumor cell extracts.⁷
- Delay the growth cycle of Plasmodium Knowles in vitro, delay synthesis of Nucleic Acid and cause development of abnormal parasites, but to have no effect on host red cells.⁸

C 2380 **CORDYCEPIN** Crystalline.

10 mg. \$18.00 25 mg. \$36.00 100 mg. \$100.00

References

1. Penman S et al., Cold Spring Harbor Symp Quant Biol 35:561, 1970
2. Penman S et al., Proc Natl Acad Sci USA 67: 1878, 1970
3. Plagemann PG, Erbe J, Arch Biochem Biophys 144:401, 1971
4. Grahm B, Loevtrup/Rein H, Acta Physiol Scand 82:28, 1971
5. Zybler EA et al., Biochim Biophys Acta 240:588, 1971
6. Recher L et al., Cancer Res 31:1915, 1971
7. Caldwell IC, Henderson JF, Cancer Chemother Rep 2:237, 1971
8. Trigg P et al., Trans R Soc Trop Med Hyg 65:514, 1971

It's a Pleasure Doing Business With Sigma!

SIGMA CHEMICAL COMPANY
The Research Laboratories of

division of SIGMA INTERNATIONAL, LTD.
P.O. BOX 14508 • SAINT LOUIS, MISSOURI 63178 U.S.A.

MANUFACTURERS OF THE FINEST BIOCHEMICALS AVAILABLE

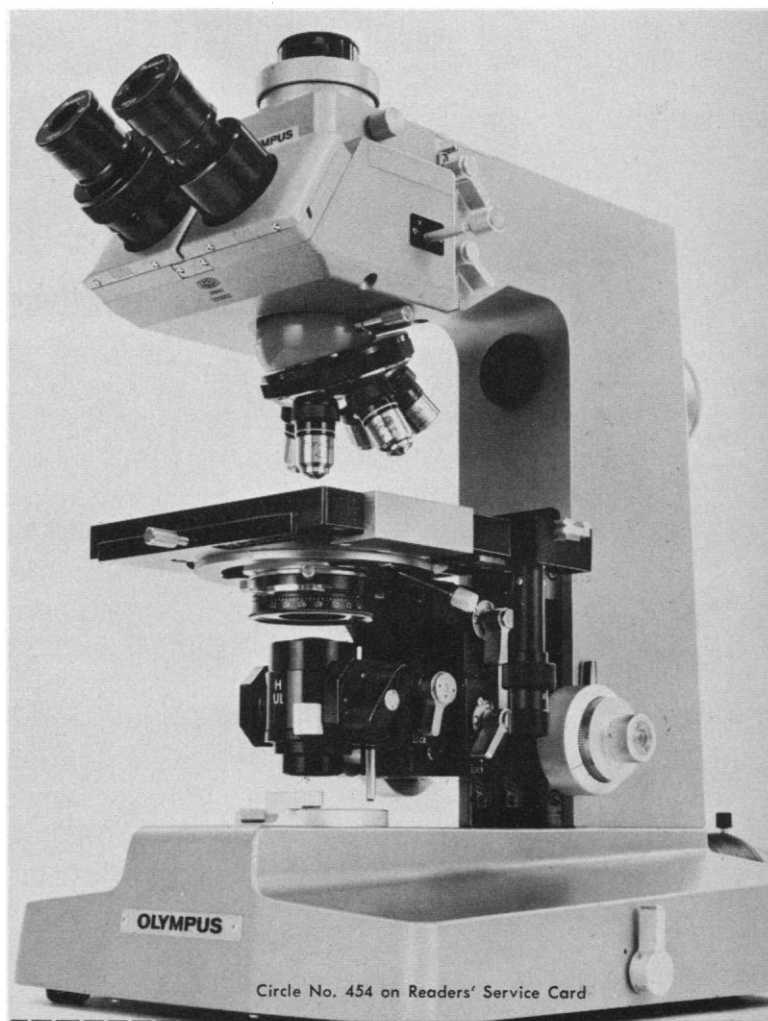
Distributed through
SIGMA LONDON Chem. Co. Ltd. • Norbiton Station Yard, Kingston upon Thames, Surrey KT2 7BH, England
Telephone: 01 549 3171 (Reverse Charges)

SIGMA Chemie GmbH MÜNCHEN • D-8014 Neuberg, Isarstrasse 14, W. Germany
Telephone: 089 60 70 03 (Reverse Charges)

Circle No. 512 on Readers' Service Card

Meet fifteen new Olympus Microscopes: The universal research microscope **AH/VANOX**

Olympus meets change with change, and offers you the most flexible research microscope ever. Its rugged, modern, square-line stand contains a wide choice of application-oriented options that let you modify its configuration to suit your own use. You choose from four light sources, bright field or dark field contrast, phase contrast, fluorescence, from achromats to plan apochromats three stages, interference contrast—transmitted and reflected light. The new Olympus AH/VANOX modular concept increases your opportunities to build a system around your own requirements by providing a complete range of Olympus accessories. They include objective lens combinations and modular attachment camera systems that can be used with other Olympus microscopes. An economy without sacrificing quality. Find out how you can give your lab ultimate capabilities. Your Olympus dealer can give you more details, or send the coupon.



OLYMPUS
CORPORATION OF AMERICA

☐ Send information on the AH/VANOX

☐ On the complete Olympus line.

☐ Contact me to set up a demonstration.

Precision Instrument Division, Dept. A-8
2 Nevada Drive, New Hyde Park, N. Y. 11040
(Telephone: 516-488-3880)

Name _____
Title _____
Address _____

Look into our Zoom Stereomicroscope

WILD M-7A.



you'll really see something.

You'll see exceptionally crisp, completely flat images. You'll see a superbly crafted Swiss instrument with large field diameters, ample working distance, and convenience like never before, plus stands for all requirements. Field diameter at 6x is 36.0mm; at 31x, 6.6mm. Total power range: 3x to 124x.

Photomicrography? Simply insert the phototube with trinocular head under the binocular and attach the 35mm magazine (shown in photo). Or use a Polaroid® Pack Adapter. Select depth of field with built in double iris diaphragm, focus, observe and take your photo.

Wild M-7A Zoom Stereomicroscope. Look into it.

WILD[®]
HEERBRUGG

Write or
call for
Brochure M-7A.

WILD HEERBRUGG INSTRUMENTS, INC.
FARMINGDALE, NEW YORK 11735 • 516-293-7400
WILD OF CANADA, 881 LADY ELLEN PLACE, OTTAWA 3, CANADA
WILD OF MEXICO, S.A. LONDRES 256, MEXICO 6, D. F.

\$7.75. Science and Engineering Policy Series.

The Palaeolithic Site at Douara Cave in Syria. Report of the Fourth Season of the Tokyo University Scientific Expedition to Western Asia. Part 2. Hisashi Suzuki and Fuyuji Takai, Eds. University of Tokyo Press, Tokyo, 1974 (U.S. distributor, International Scholarly Book Services, Portland, Ore.). vi, 182 pp., illus., + plates. \$23.

Patterns in Physics. W. Bolton. McGraw-Hill, New York, 1974. xii, 428 pp., illus. Paper, \$10.95. Secondary Science Series.

Perspectives in Palaeoanthropology. Professor D. Sen Festschrift. Asok K. Ghosh, Ed. Mukhopadhyay, Calcutta, 1974. xii, 380 pp., illus. Rs. 100.

Pest Control. A Survey. Arthur Woods. Halsted (Wiley), New York, 1974. xiv, 408 pp., illus. + plates. \$29.50.

Pheromones. Martin C. Birch, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1974. xii, 496 pp., illus. \$42.30.

Physical Methods in Heterocyclic Chemistry. Vol. 6. A. R. Katritzky, Ed. Academic Press, New York, 1974. xvi, 302 pp., illus. \$28.50.

Physics of Drop Formation in the Atmosphere. Yu. S. Sedunov. Translated from the Russian edition (Leningrad, 1972) by D. Lederman. P. Greenberg, Transl. Ed. Halsted (Wiley), New York, and Israel Program for Scientific Translations, Jerusalem, 1974. x, 234 pp., illus. \$21.

Plant Collections in the British Isles. A Preliminary Index. J. T. Williams. Bentham-Moxon Trust, Royal Botanic Gardens, Kew, England, 1974. ii, 58 pp. 50p.

Platelets. Production, Function, Transfusion, and Storage. Papers from a conference, Boston, June 1973. Mario G. Baladini and Shirley Ebbe, Eds. Grune and Stratton, New York, 1974. xviii, 418 pp., illus. \$29.50.

The Politics of Nuclear Proliferation. George Quester. Johns Hopkins University Press, Baltimore, 1973. xii, 250 pp. \$11.50.

Residue Reviews. Residues of Pesticides and Other Contaminants in the Total Environment. Francis A. Gunther and Jane Davies Gunther, Eds. Springer-Verlag, New York, 1974. Vol. 50. xii, 180 pp., illus. \$18.80. Vol. 52. x, 158 pp., illus. \$15.80.

Root Anatomy and Morphology. A Guide to the Literature. Robert H. Miller. Archon, Hamden, Conn., 1974. viii, 272 pp. \$11.50.

Societal Structures of the Mind. Uriel G. Foa and Edna B. Foa. Thomas, Springfield, Ill., 1974. xiv, 452 pp., illus. \$21.50.

Solving Problems in Chemistry. With Emphasis on Stoichiometry and Equilibrium and Applications in Biological and Medical Sciences, Engineering and Economics, and Environmental Sciences. Ron O'Connor and Charles Mickey. Harper and Row, New York, 1974. xii, 402 pp., illus. Paper, \$4.95.

Some Must Watch While Some Must Sleep. William C. Dement. Freeman, San Francisco, 1974 (distributor, Scribner, New York). xvi, 148 pp., illus. Cloth, \$5.95; paper, \$2.95. Reprint of the 1972 edition.