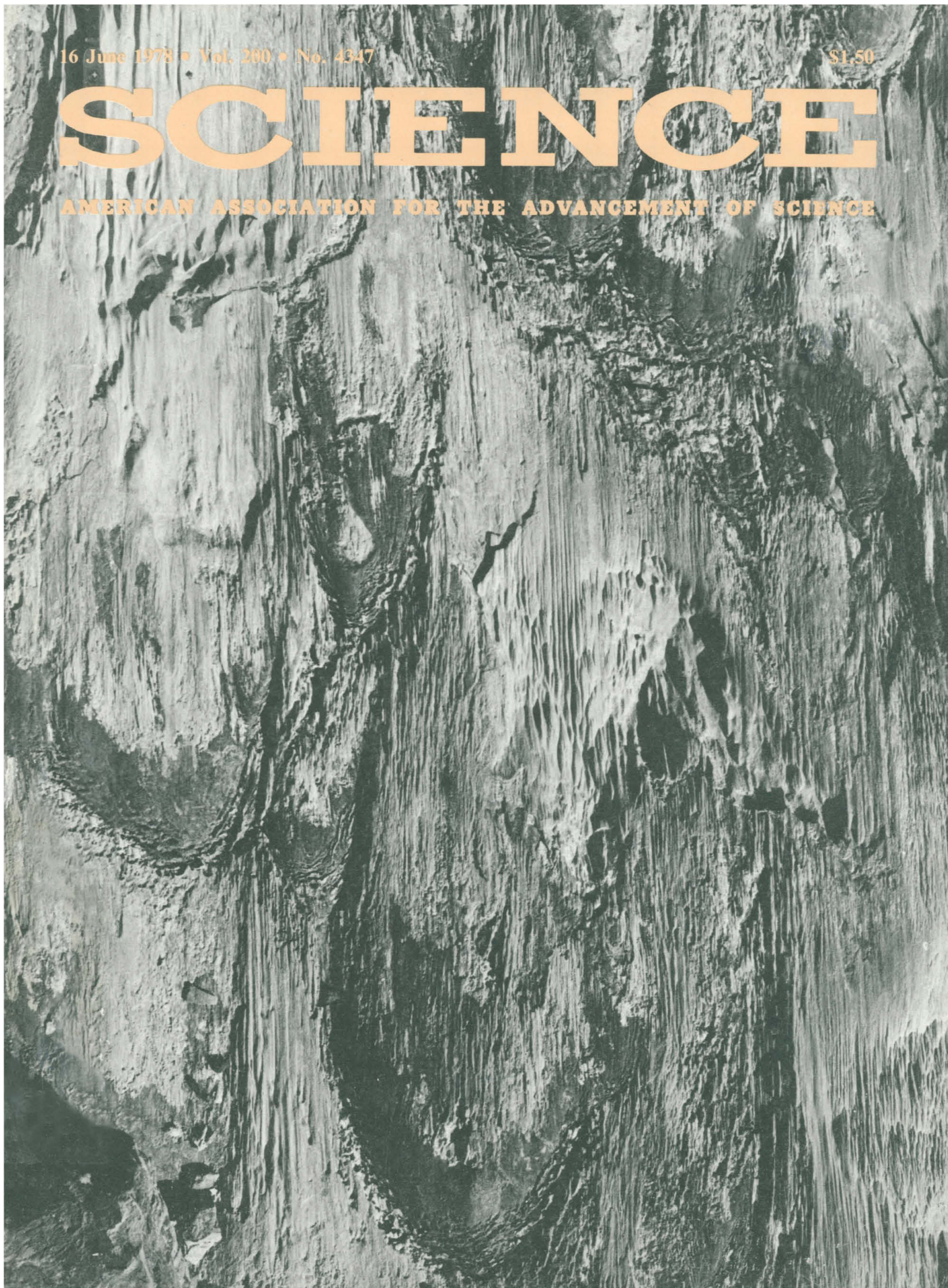


16 June 1978 • Vol. 260 • No. 4347

\$1.50

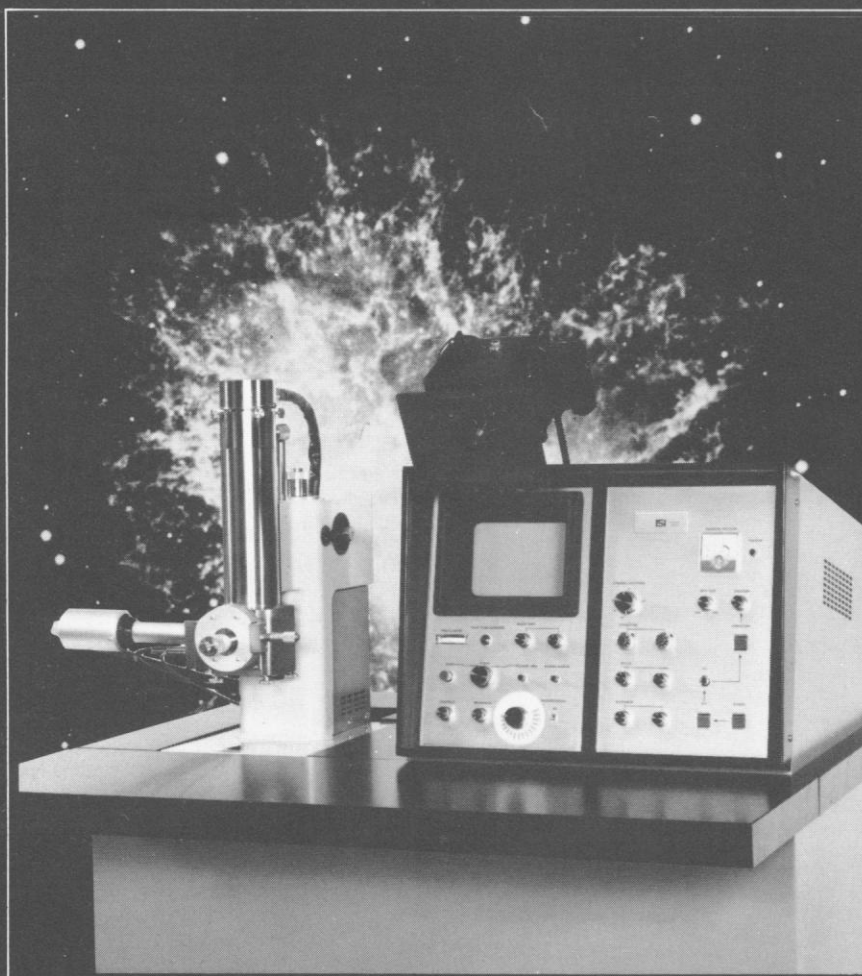
SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



ISI'S NEWEST STAR: ALPHA-9

NOW, FOR AN UNBELIEVABLY LOW PRICE,
ANYONE CAN HAVE SEM POWER.



Introducing the ISI Alpha-9
Scanning Electron Microscope.
The only SEM priced below \$14,000 complete.

Outstanding features 120 Angstroms resolution guaranteed. 100 Angstroms easily attainable.

- ☐ Completely self contained; vibration isolated console. ☐
- ☐ Large 3" diameter specimen chamber and stage available. ☐ Dynamic focusing. ☐
- ☐ Magnification 30X to 80,000X. ☐ Micron bar. ☐ Complete with Polaroid® camera attachment. ☐
- ☐ Quantity discounts available. ☐ The ideal SEM for quality control, teaching and applied research. ☐

Alpha-9: the newest bright star in our galaxy of SEM's.
Contact us for full specifications and/or a demonstration.

ISI International Scientific Instruments, Inc.

3255-6C Scott Blvd. ☐ Santa Clara, CA 95050 ☐ Phone (408) 249-9840

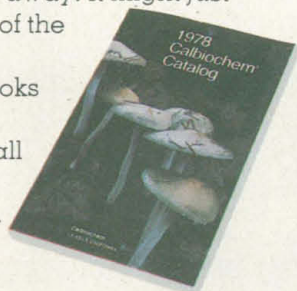
YOUR PARTNER IN ELECTRON MICROSCOPY

Circle No. 202 on Readers' Service Card

The 1978 Calbiochem Catalog. A complete guide to biochemicals from abrin to zwittergent.

The 1978 Calbiochem Catalog is now available. It's a complete catalog of biochemical products and related services. Over two hundred pages of product descriptions, from abrin to zwittergent. And each product, wherever possible, is referenced to the new Merck Index. So you can find background information quickly and easily.

Ask for your free copy of the 1978 Calbiochem Catalog and we'll send one out right away. It might just become one of the most used reference books in your lab. Write us or call us toll free at 800-854-2171.



CALBIOCHEM-BEHRING CORP.
10933 North Torrey Pines Rd., La Jolla, CA 92037

Circle No. 155 on Readers' Service Card



ISSN 0036-8075
16 June 1978
Volume 200, No. 4347

SCIENCE

LETTERS	Tanker Safety: <i>T. S. Wyman; A. McKenzie</i> ; Physicists Postpone Visit to Soviet Union: <i>D. A. Bromley et al.</i> ; Solar Energy in 2000: <i>R. Caputo</i> ; Paraquat Pyrolysis Products: <i>E. Leete</i>	1218
EDITORIAL	Bad Science and Social Penalties: <i>C. Comar</i>	1225
ARTICLES	Teotihuacán, Tepeapulco, and Obsidian Exploitation: <i>T. H. Charlton</i>	1227
	Radioimmunoassay: A Probe for the Fine Structure of Biologic Systems: <i>R. S. Yalow</i>	1236
NEWS AND COMMENT	Health Care as a Human Right: A Cuban Perspective	1246
	<i>Briefing</i> : Current Congress Could Give Cabinet Berth to Education; Eskimos Honor Whale Quota, but Ask New Terms for Hunt; U.S. Planning for UNCSTD—Problems of Development	1248
	Cloning Caper Makes It to the Halls of Congress	1250
	President and Science Adviser Push for a Foundation for Development	1252
RESEARCH NEWS	<i>Glomar Explorer</i> : New Era in Deep-Sea Drilling?	1254
	The Mating Game: What Happens When Sperm Meets Egg	1256
ANNUAL MEETING	Call for Contributed Papers; Instructions for Contributors	1260
BOOK REVIEWS	Proceedings of the International Conference on Quantitative Genetics, reviewed by <i>R. Milkman</i> ; Hypothalamic Peptide Hormones and Pituitary Regulation, <i>S. Reichlin</i> ; Plant Response to Wind, <i>J. W. Sturrock</i> ; Rockslides and Avalanches, <i>A. M. Johnson</i> ; Books Received and Book Order Service	1261

BOARD OF DIRECTORS					
EMILIO Q. DADDARIO Retiring President, Chairman	EDWARD E. DAVID, JR. President	KENNETH E. BOULDING President-Elect	ELOISE E. CLARK MARTIN M. CUMMINGS	RENÉE C. FOX BERNARD GIFFORD	
CHAIRMEN AND SECRETARIES OF AAAS SECTIONS					
MATHEMATICS (A) Mark Kac Ronald Graham	PHYSICS (B) D. Allan Bromley Rolf M. Sinclair	CHEMISTRY (C) William E. McEwen William L. Jolly	ASTRONOMY (D) Paul W. Hodge Donat G. Wentzel		
PSYCHOLOGY (J) Brenda Milner Meredith P. Crawford	SOCIAL AND ECONOMIC SCIENCES (K) Kurt W. Back Gillian Lindt	HISTORY AND PHILOSOPHY OF SCIENCE (L) Robert S. Cohen Diana L. Hall	ENGINEERING (M) Robert B. Beckmann Donald E. Marlowe		
EDUCATION (Q) Marjorie H. Gardner James T. Robinson	DENTISTRY (R) Sholom Pearlman John Termine	PHARMACEUTICAL SCIENCES (S) John G. Wagner Raymond Jang	INFORMATION, COMPUTING, AND COMMUNICATION (T) Eugene Garfield Madeline M. Henderson		
DIVISIONS					
ALASKA DIVISION		PACIFIC DIVISION		SOUTHWESTERN AND ROCKY MOUNTAIN DIVISION	
Donald H. Rosenberg President	Keith B. Mather Executive Secretary	Mildred Mathias President	Alan E. Leviton Secretary-Treasurer	James W. O'Leary President	Max P. Dunford Executive Officer
SCIENCE is published weekly, except the last week in December, but with an extra issue on the third Tuesday in September, by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with The Scientific Monthly®. Second-class postage paid at Washington, D.C., and additional entry. Copyright © 1978 by the American Association for the Advancement of Science. Member rates on request. Annual subscriptions \$65; foreign postage: Canada \$10; other surface \$13; air-surface via Amsterdam \$30. Single copies \$1.50; \$2 by mail (back issues \$3) except Guide to Scientific Instruments \$6. School year subscriptions: 9 months \$50; 10 months \$55. Provide 6 weeks' notice for change of address, giving new and old addresses and postal codes. Send a recent address label, including your 7-digit account number. Postmaster: Send Form 3579 to Science, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Science is indexed in two general periodical indexes—Readers' Guide to Periodical Literature and Monthly Cumulating Periodical Index—and in several specialized indexes.					

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

REPORTS	The Moon in Heiligenschein: <i>R. L. Wildey</i>	1265
	Oxygen Isotope Composition of Subglacially Precipitated Calcite: Possible Paleoclimatic Implications: <i>B. B. Hanshaw</i> and <i>B. Hallet</i>	1267
	Excitation-Contraction Coupling in Skeletal Muscle: Blockade by High Extracellular Concentrations of Calcium Buffers: <i>J. N. Barrett</i> and <i>E. F. Barrett</i>	1270
	Flake Tools Stratified Below Paleo-Indian Artifacts: <i>M. J. Reagan</i> et al.	1272
	An El Jobo Mastodon Kill at Taima-taima, Venezuela: <i>A. L. Bryan</i> et al.	1275
	Soybean Lines Lacking the 120,000-Dalton Seed Lectin: <i>S. P. Pull</i> et al.	1277
	Subpicosecond Spectroscopy of Bacteriorhodopsin: <i>E. P. Ippen</i> et al.	1279
	Thrombin-Induced Platelet Aggregation Is Mediated by a Platelet Plasma Membrane- Bound Lectin: <i>T. K. Gartner</i> et al.	1281
	Antibodies to Purified Insulin Receptor Have Insulin-Like Activity: <i>S. Jacobs,</i> <i>K.-J. Chang, P. Cuatrecasas</i>	1283
	Effect of Myasthenic Immunoglobulin on Acetylcholine Receptors of Intact Mammalian Neuromuscular Junctions: <i>E. F. Stanley</i> and <i>D. B. Drachman</i>	1285
	Is Pump Stimulation Associated with Positive Inotropy of the Heart?: <i>L. Michael,</i> <i>B. J. R. Pitts, A. Schwartz</i>	1287
	Deep-Sea Foraging Behavior: Its Bathymetric Potential in the Fossil Record: <i>J. A. Kitchell</i> et al.	1289
	Human Lateralization from Head to Foot: Sex-Related Factors: <i>J. Levy</i> and <i>J. M. Levy</i>	1291
	Substances Moved by Axonal Transport and Released by Nerve Stimulation Have an Innervation-Like Effect on Muscle: <i>S. G. Younkin</i> et al.	1292
	Allylglucosinolate and Herbivorous Caterpillars: A Contrast in Toxicity and Tolerance: <i>P. A. Blau</i> et al.	1296
	Prediction of Learning Rate from the Hippocampal Electroencephalogram: <i>S. D. Berry</i> and <i>R. F. Thompson</i>	1298
	Mating Behavior and Related Morphological Specialization in the Uropodine Mite, <i>Caminella peraphora</i> : <i>G. L. Compton</i> and <i>G. W. Krantz</i>	1300
	Learned Taste Aversions in Children Receiving Chemotherapy: <i>I. L. Bernstein</i> . . .	1302
	Genetic Method for the Preferential Elimination of Females of <i>Anopheles albimanus</i> : <i>J. A. Seawright</i> et al.	1303

MIKE MC CORMACK
FREDERICK MOSTELLER

RUSSELL W. PETERSON
CHEN NING YANG

WILLIAM T. GOLDEN
Treasurer

WILLIAM D. CAREY
Executive Officer

GEOLOGY AND GEOGRAPHY (E)
Gerald M. Friedman
Ramon E. Bisque

MEDICAL SCIENCES (N)
Leon O. Jacobson
Leah M. Lowenstein

STATISTICS (U)
Samuel W. Greenhouse
Ezra Glaser

BIOLOGICAL SCIENCES (G)
Ursula K. Abbott
Walter Chavin

AGRICULTURE (O)
James B. Kendrick
Coyt T. Wilson

ATMOSPHERIC AND HYDROSPHERIC
SCIENCES (W)
Kenneth C. Spengler
Glenn R. Hilst

ANTHROPOLOGY (H)
June Helm
Priscilla Reining

INDUSTRIAL SCIENCE (P)
David B. Hertz
Robert L. Stern

GENERAL (X)
Allen V. Astin
Joseph F. Coates

COVER

The lighter colored material is calcite that recently precipitated beneath the Blackfoot Glacier (Glacier National Park, Montana) when it overrode the dark colored Precambrian calcareous bedrock. See page 1267. [Photo about half scale; Bernard Hallet, Stanford University, Stanford, 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 foster scientific freedom and responsibility, 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.

The Noble

The Nobel Prizes that gave birth to an idea

One part of every LKB instrument is over 30 years old: our experience in biochemical separation techniques.

30 years ago the Nobel Prize winners Prof. The Svedberg and Prof. Arne Tiselius instilled into the new company the need for high quality in scientific instruments. Their cooperation and encouragement developed into close contacts with scientists worldwide. As a result, LKB is today in the forefront of ideas in biochemistry, and can present to the scientist the right equipment and techniques at the right time.



Using LKB equipment guarantees nobody a Nobel Prize, but it does lay a sure and certain basis for careful experiments and accurate results.

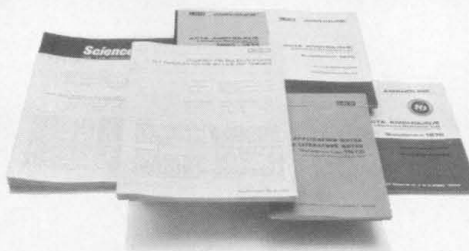
Complete and versatile equipment means access to a wide variety of methods

At LKB research and development of the instrument go hand in hand with research and development of the technique, so that the one is ideally suited to the other. Often, LKB instruments are developed with several techniques in mind. This allows the scientist to change methods easily without changing equipment, or to experiment within one method.

LKB supplies equipment necessary for growing and disintegration of microorganisms through to the final characterisation of a purified substance. Probably the most important techniques in biochemistry are those involving separation and analysis, and there we have our greatest experience.

LKB helps science advance, and serves the scientist

For science to advance, knowledge must be shared. At LKB knowledge comes from our experience and research and from our many worldwide contacts. We share our knowledge in several ways: in the quality of our instruments, as Workshops and Seminars, literature such as *Acta Ampholinae*, Application Notes and SCIENCE TOOLS.

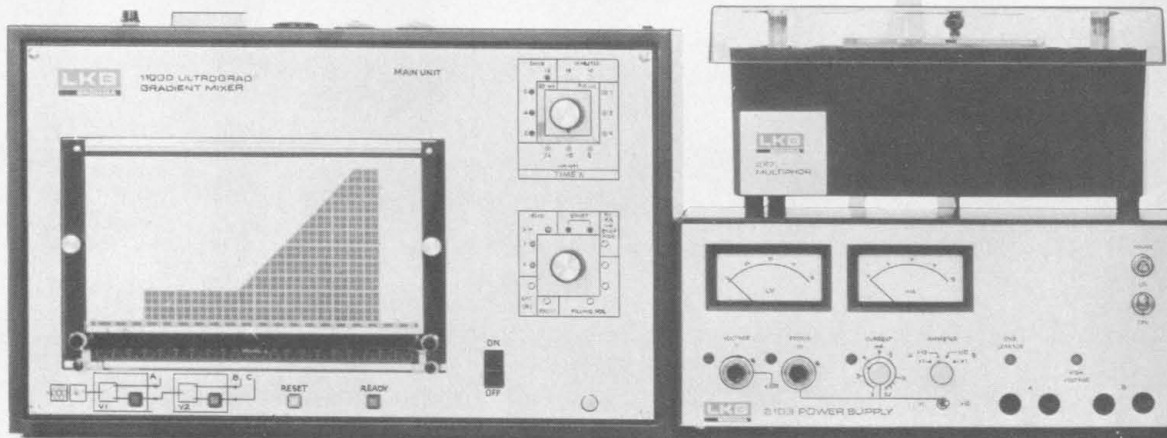


Electrophoresis

This technique laid the basis of LKB's entry into biochemical separations, and prepared the way for further developments. In developing reliable equipment we were greatly helped and encouraged by Arne Tiselius, whose important work on electrophoresis was rewarded by a Nobel Prize in 1948.

LKB provides the basic equipment needed for an electrophoretic system, analytical or preparative, column or thin layer: equipment such as power supplies with constant power, voltage and current; Multiphor for thin layer electrophoresis and immunoelectrophoresis; and Uniphor® for column electrophoresis.

Circle No. 170 on Readers' Service Card



Prize Kit

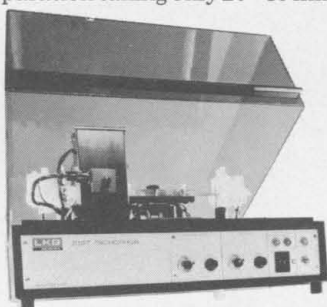
Electrofocusing

LKB has led the world in electrofocusing since we introduced it in 1966. Our breakthrough then was with Ampholine® carrier ampholytes and electrofocusing columns. The recent introduction of Multiphor, the ready-to-use Ampholine® PAG-plates, and the PEGG kit for preparative electrofocusing in granulated gel has extended even further the scope of this very efficient, high resolution, technique. Circle No. 171 on Readers' Service Card



Isotachopheresis

Kohlrausch's theory of 1897 was turned into simple practice when LKB introduced Tachophor in 1974. This latest and most advanced electrophoretic technique can be used for analysis or preparation on the microscale using Tachophor, a complete separation taking only 20-40 minutes.



For large-scale preparation in polyacrylamide gel, Uniphor should be used.

Circle No. 172 on Readers' Service Card

Gel filtration

The lagging development of gel filtration media has been given a new impulse by the introduction of LKB Ultrogel®. This new medium, a copolymer of polyacrylamide and agarose, gives better resolution and high flow rates. Ultrogel is becoming the gel of choice, especially in the difficult area of serum protein fractionation.

All the equipment you need for gel filtration – columns, Uvicord® UV monitors, Perpex Pumps, UltroRac® and RediRac fraction collectors – is made by LKB. Circle No. 173 on Readers' Service Card

Ion exchange, affinity and adsorption chromatography

The "adapted gradient technique", using LKB Ultrograd® gradient mixer, gives much improved resolution over ordinary gradient elution. You dictate the shape of the gradient simply by cutting it out on chart paper. Ultrograd produces controlled and reproducible gradients, and to scale-up for preparative work you simply increase the flow rate. Circle No. 174 on Readers' Service Card

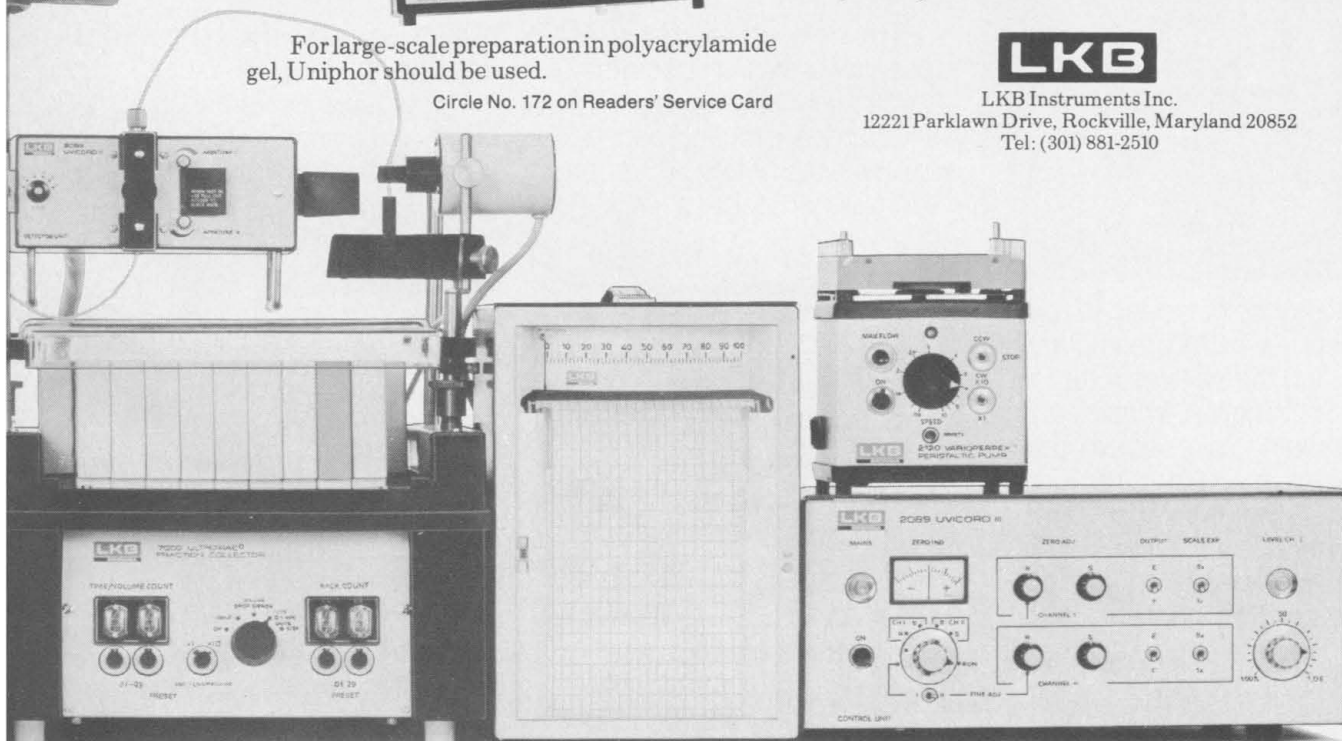
This summary of LKB equipment is necessarily short. Our new 58-page colour booklet "LKB Systems and Methods for Biochemical Research" illustrates all LKB equipment and describes in some detail the methods for which they are used. Our colour poster "Preparative Separation Principles in Biochemistry" is a worldwide attraction: like the booklet you can get a free copy by writing or phoning to us. Circle No. 175 on Readers' Service Card

LKB

LKB Instruments Inc.

12221 Parklawn Drive, Rockville, Maryland 20852

Tel: (301) 881-2510



216

Optics aren't the only thing to look at in a research microscope.

Of course, they are the most important. And ours are among the finest in the field.

But there are other features you should examine.

We've always tried to make our research instruments easy to use and adapt to a wide variety of techniques and applications.

Many of these features aren't easy to see. Which is why we'd like to bring some of them to your attention.

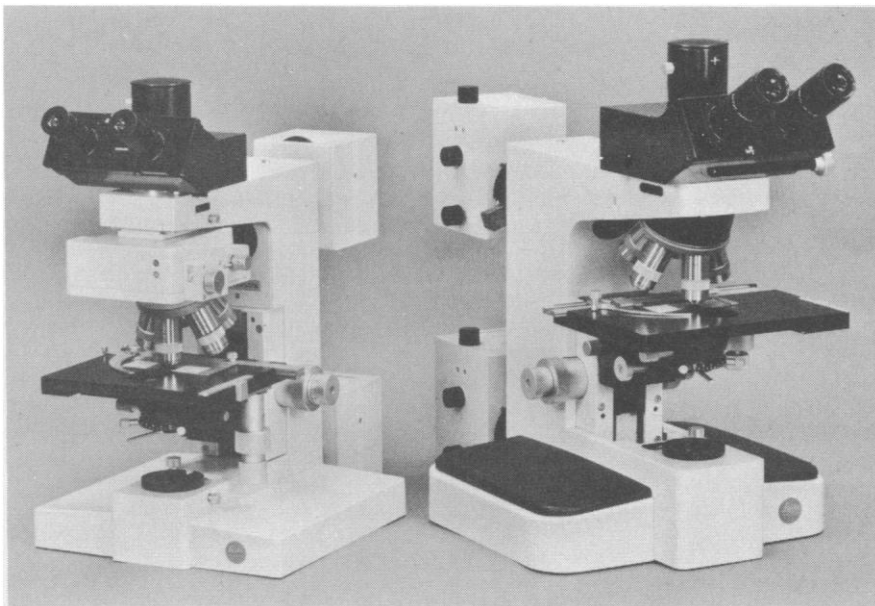
Our fluotar objectives, for one example, offer some very distinct advantages.



They're color-coded to tell you at a glance which type you are using. And the sleeves rotate for rapid identification. That means no more craning your neck to identify the objective you're using.

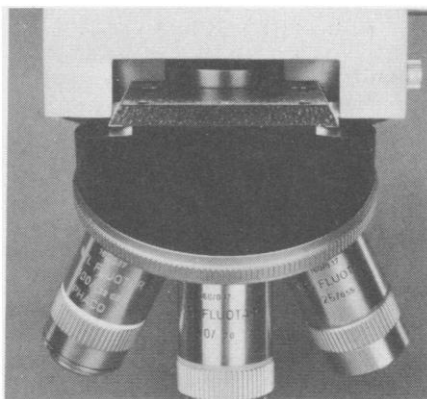
In addition, the knurled ring is placed low to make it easier to change objectives.

But don't overlook their truly superior optics. These are the result of combining the latest techniques in optical design with unique glasses developed in the Leitz Glass Research Laboratory.



5735

The objective carrier provides exceptional stability because of its unusually wide dovetail. This is very important for fluorescence work with the heavy incident light Ploem illuminator.

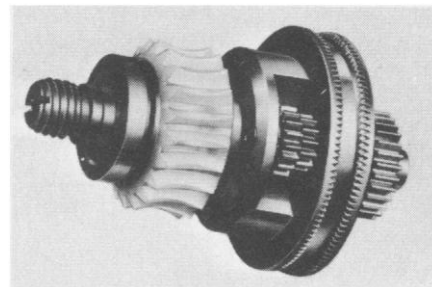


For easy exchange, the carrier slides out horizontally.

We don't expect you to look inside our microscope stand. But if you did, you'd find a complex

system of planetary gears like the one shown below.

The gears move the object stage and are designed to produce razor sharp focusing.

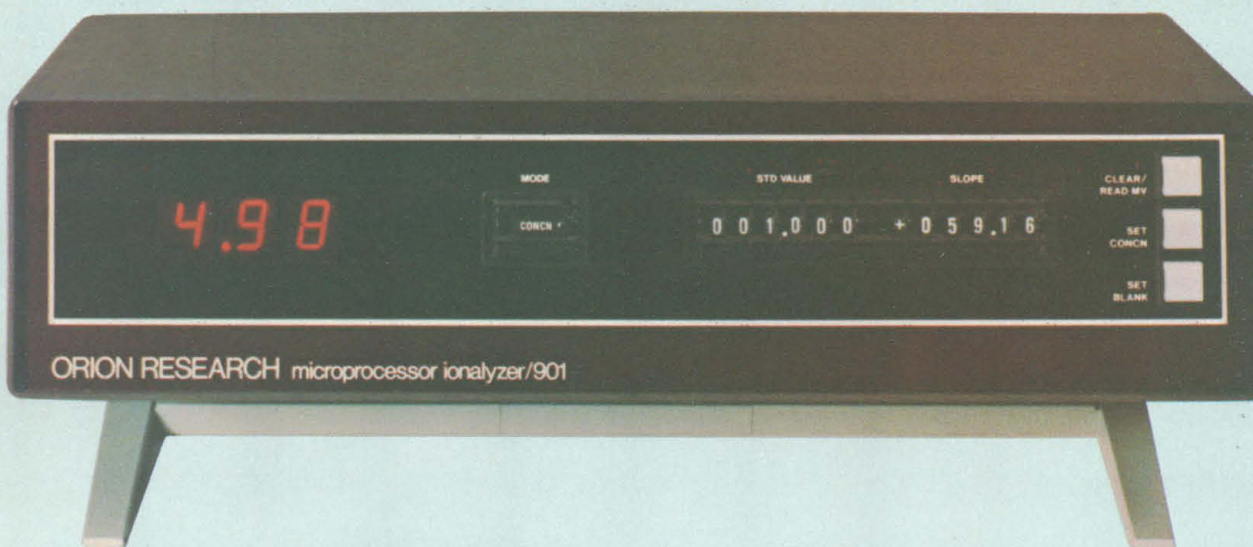


There are other advantages to our research microscopes we hope that you will look into such as our complete range of easily interchangeable accessories and low life cycle cost.

Contact E. Leitz, Inc.,
Dept. SC 616, Rockleigh,
New Jersey 07647.



LOOKS LIKE A pH METER.



WORKS LIKE A COMPUTER.

a digital specific ion meter

ORION has developed the Model 901 to further simplify all analyses made using pH, specific ion, and gas-sensing electrodes. A series of operating modes covers the full range of analytical methods used for performing electrode analyses:

direct reading concentration

incremental methods: known (standard) addition
known subtraction
analate (sample) addition
analate subtraction

absolute and relative millivolts: Gran's plots and titrations

pH

Results are calculated in real time with an accuracy that will satisfy the most demanding research applications – yet the 901 is simple enough to be used in all routine quality control applications.

Analytical parameters are entered on the digital switches on the control panel, with standardization and blank correction accomplished at the push of a button. Results are read directly from the LED display in the unit system of your choice. The 901 completely eliminates the use of calibration curves, tables, or calculations.

how the 901 works

The Model 901 has a high input impedance analog amplifier and analog-to-digital converter similar to that used in digital pH/mv meters. The output of the

converter is fed to a microprocessor which is pre-programmed with equations for calculating pH's and concentrations. Parameters needed to solve the electrode equations are supplied to the microprocessor from the switches and pushbuttons on the front panel.

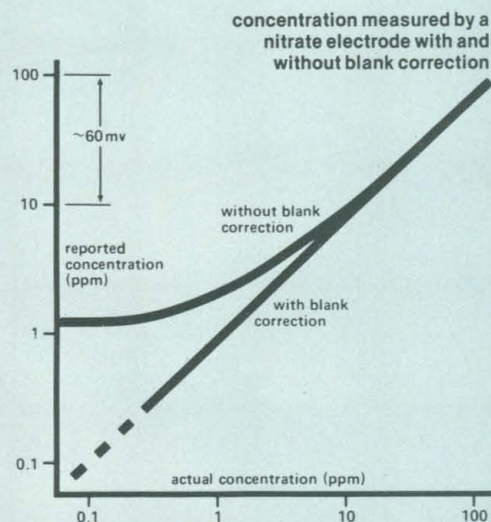
Twice each second the electrode's potential is digitalized and fed to the microprocessor, and the analytical result is calculated using the pre-programmed equations. A concentration result ranging between .000 and 999. is shown on the LED display in a three-digit floating decimal point format. Calculated pH results between 0.000 and 13.999 are displayed.

pushbutton blank correction

The 901 has a blank correction feature that is especially useful in overcoming two problems frequently encountered in making low-level measurements: slow time response of the electrode and deviation of the electrode response from theoretical.

In the first case a background level of the species measured is added to all samples and standards to bring the concentration up to the region of fast time response. The blank correction feature is used to automatically subtract this background level from the result.

In the second case the electrode potential in the blank solution is entered into the microprocessor's memory by pushbutton so that the results are automatically corrected over the region of nontheoretical response.



volume correction

When analyses are carried out by one of the incremental methods, the volume change that takes place when the standard is added to the sample (or vice versa) should be taken into consideration if a correct result is to be calculated. The various incremental modes include a volume correction factor that the microprocessor uses in calculating the result.

call us

Can we discuss applications for the 901 – or arrange a demonstration in your laboratory? Call us toll-free at 800-225-1480 (except Mass.) and ask for one of our Technical Service Representatives. In Canada call 800-363-9270.

ORION RESEARCH
380 Putnam Ave., Cambridge, MA 02139

Circle No. 209 on Readers' Service Card



VAX-11/780.

A lab system so hot, nothing can touch it.

If you have to crunch large amounts of data fast, we've got a lab system you can count on.

VAX-11/780. Offers the fast FORTRAN capability of a multi-million dollar mainframe for as little as \$141,000.

How fast is VAX? Consider the Whetstone test results. VAX performed 1200 Whetstones/second*, making it the fastest minicomputer we've seen. (By way of comparison, a CDC 7600 ran 9100 Whetstones/second. At over 50 times the price.)

Now translate VAX's speed into throughput, and you've got a lab system that can handle just about any fast FORTRAN application you can think of. Including inferential statistics, image processing and molecular modeling.

*Single-precision Floating Point

Crunching numbers isn't all it can do. In fact, it's only the beginning.

Using the latest in 32-bit architecture, VAX can run extremely large programs. (At our DIGITAL test lab we've run up to 128 MB). What's more, it can handle dozens of concurrent users. So you can use it to give all the people in your department the power of a mainframe, at a fraction of the cost.

You can also use VAX as a system for real-time lab data acquisition applications. And, since it's compatible with the full range of DECLAB systems, you can tie all your mini's together into a distributed data processing system with a minimum of time, effort and money.

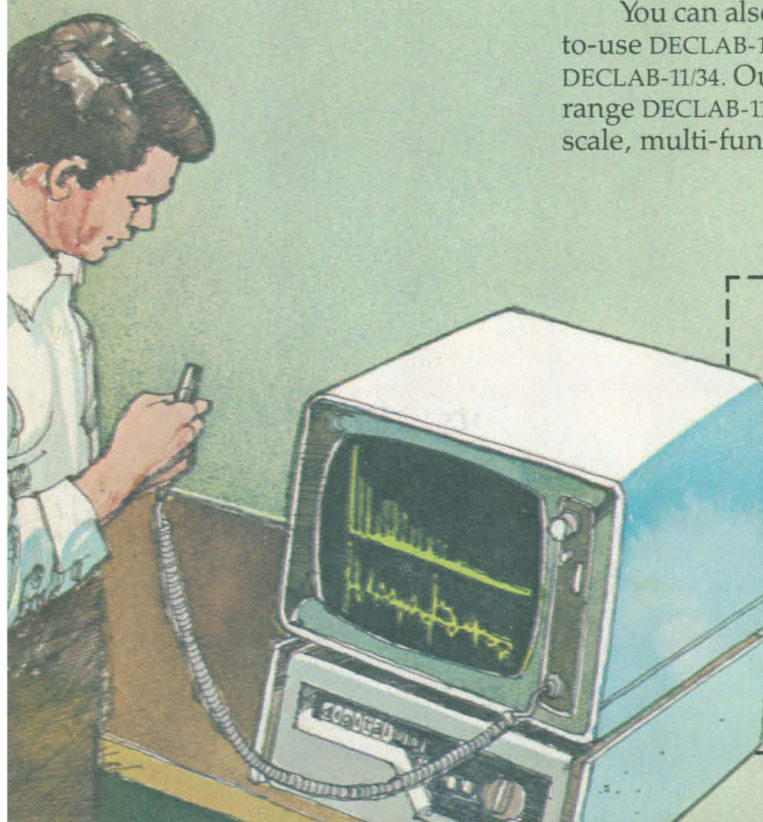
VAX-11/780. The 32-bit member of the DECLAB family.

You can also choose our easy-to-use DECLAB-11/03. Our versatile DECLAB-11/34. Our powerful mid-range DECLAB-11/60. Or our large scale, multi-functional DECLAB-11/70.

No matter whether you want a system for dedicated or multi-task applications, concurrent interactive program development, high-speed computation or lab networking, the DECLAB Family offers you the right system for your lab. And since they're all compatible, you never have to worry about today's DECLAB becoming too small for tomorrow's needs.

To find out more about the VAX-11/780 or any of our other systems, fill out the coupon and send it to Laboratory Data Products, MR2-4 M16, Digital Equipment Corporation, Marlborough, MA 01752. (617) 481-9511, ext. 6815. European headquarters: 12, av. des Morgines, 1213 Petit-Lancy/Geneva. Tel: 93 33 11. In Canada, Digital Equipment of Canada, Ltd.

digital
Computers in Research.



Digital Equipment Corporation, MR2-4 M16,
Marlborough, MA 01752.

S6168

Please send me information on:

☐ VAX-11/780 ☐ The DECLAB Family ☐ Please have a
Digital lab system specialist contact me.

Name _____

University or Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Ext. _____

Applications _____

Put less time in to get more results out with S&S pre-pleated filter papers.

A pre-pleated S&S filter paper gives you twice the exposed surface area of an ordinary filter folded by hand into quadrants. You not only save time on folding, your solid-liquid separations move faster, and a series of filtrations can be set up and run in measurably shorter time. Solids are more dispersed over the surface of the paper, and clogging is reduced or eliminated. Because of this, these filters are widely used to recycle reagents in chemistry autoanalyzers.

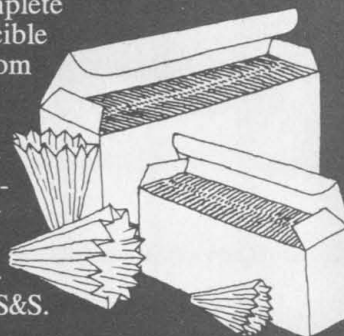
Standard grades of S&S pre-pleated filters resist dilute acidic and alkaline solutions. Their wet-strength is high and their relatively high flash point permits filtration of hot gelatins, agar and other culture media without degeneration of the filter.

If you've been avoiding pre-pleated filters because they sometimes burst at the apex during critical filtrations, use S&S pre-pleated filters without fear. They're burst-proof under normal laboratory conditions.

S&S pre-pleated filters retain precipitates from coarse to fine in six standard grades and 10 standard diameters from 12.5 cm to 50.0 cm. Now, for phase

separation requirements, they're also available in several sizes in 595hy 1/2 hydrophobic, silicone-impregnated for quick and complete separation of immiscible aqueous solutions from organic solvents.

For complete information and specifications, contact your nearby laboratory supply dealer. Samples of pre-pleated filters are available upon request from S&S.



Schleicher & Schuell



Schleicher & Schuell, Inc.

Keene, New Hampshire 03431

Schleicher & Schüll GmbH, D-3354, Dassel, West Germany

Schleicher & Schüll AG, 8714, Feldbach ZH, Switzerland

Circle No. 206 on Readers' Service Card



Density gradient spin times can be reduced more than 80% by Sorvall® OTD ultracentrifuges with new vertical rotors.

High resolution and time savings result when the combined advantages of a Sorvall® OTD ultracentrifuge and a Sorvall® vertical rotor are used for density gradient separations.

These patented rotors* hold the tube in a fixed vertical position while tube contents are reoriented 90°. The sedimentation path length is thus reduced from the length to the width of the tube, resulting in shorter spin times. Three vertical rotors are available to suit a wide range of capacity requirements.

Typical results are shown in the rate zonal separation of cowpea mosaic virus particles using 1 ml samples. Use of a Sorvall® 8-place vertical rotor instead of a 6-place swinging bucket rotor of comparable tube volume reduced spin time more than 80% while maintaining resolution. These rotors are equally suitable for isopycnic density gradient separations.

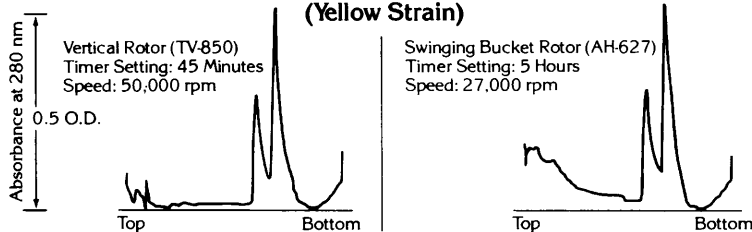
Sorvall® OTD ultracentrifuges incorporate a unique low-friction oil turbine drive capable of providing soft starting and stopping, and smooth acceleration and deceleration. The Sorvall® Automatic Rate Controller and Reograd mode of deceleration take full advantage of this capability to avoid stirback and mixing of the gradient between 0 and 1,000 rpm.

The oil turbine drive also eliminates the maintenance and replacement of gears, belts and brushes. The many other features of OTD centrifuges include trouble-free self-contained cooling system; precise, wide-range temperature control; and automatic and manual vacuum pumping system.

For full information on Sorvall® OTD ultracentrifuges and vertical rotors, write to Du Pont Instruments, Biomedical Division, Room 36512, Wilmington, DE 19898. *U.S. Patents 3,998,383 and 4,015,775



Separation of Cowpea Mosaic Virus Particles (Yellow Strain)



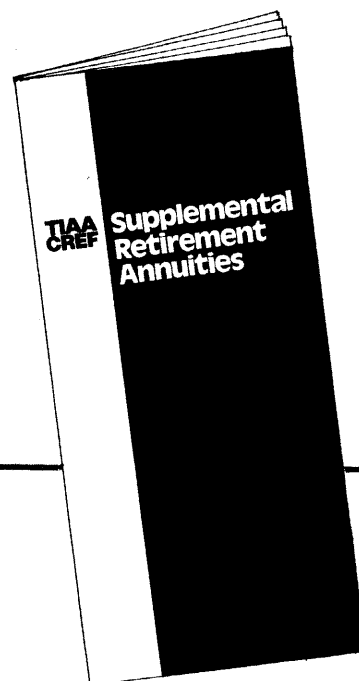
Rate-zonal separations in the Sorvall® OTD-65 using 1-ml sample volumes, 10-40% sucrose gradients (33 ml) at 4° C. Peaks at 95S and 115S.

With Sorvall® Centrifuges the spin times are changing.

Du Pont Instruments



TIAA-CREF Supplemental Retirement Annuities



for tax-deferred annuity programs

Supplemental Retirement Annuities (SRA's) are new forms of TIAA and CREF contracts designed expressly for use by persons who want to set aside tax-deferred retirement funds over and above amounts being accumulated under their institution's basic retirement plan. They are available for employees of colleges, universities, private schools and certain other nonprofit educational organizations with tax-deferred annuity (salary-or-annuity option) programs. Through a properly drawn agreement with their institution, staff members may divert part of their compensation before taxes to the purchase of these new contracts.

And SRA's are cashable at any time. This means that if the money accumulated by salary reduction is needed before retirement, the SRA contracts can be surrendered for their cash value. Benefits, whether payable in cash or as income, are taxable as ordinary income when received.

For more information and answers to questions send for your copy of the booklet on Supplemental Retirement Annuities.

Send me a booklet describing
TIAA-CREF Supplemental Retirement Annuities.



Name _____ Date of Birth _____

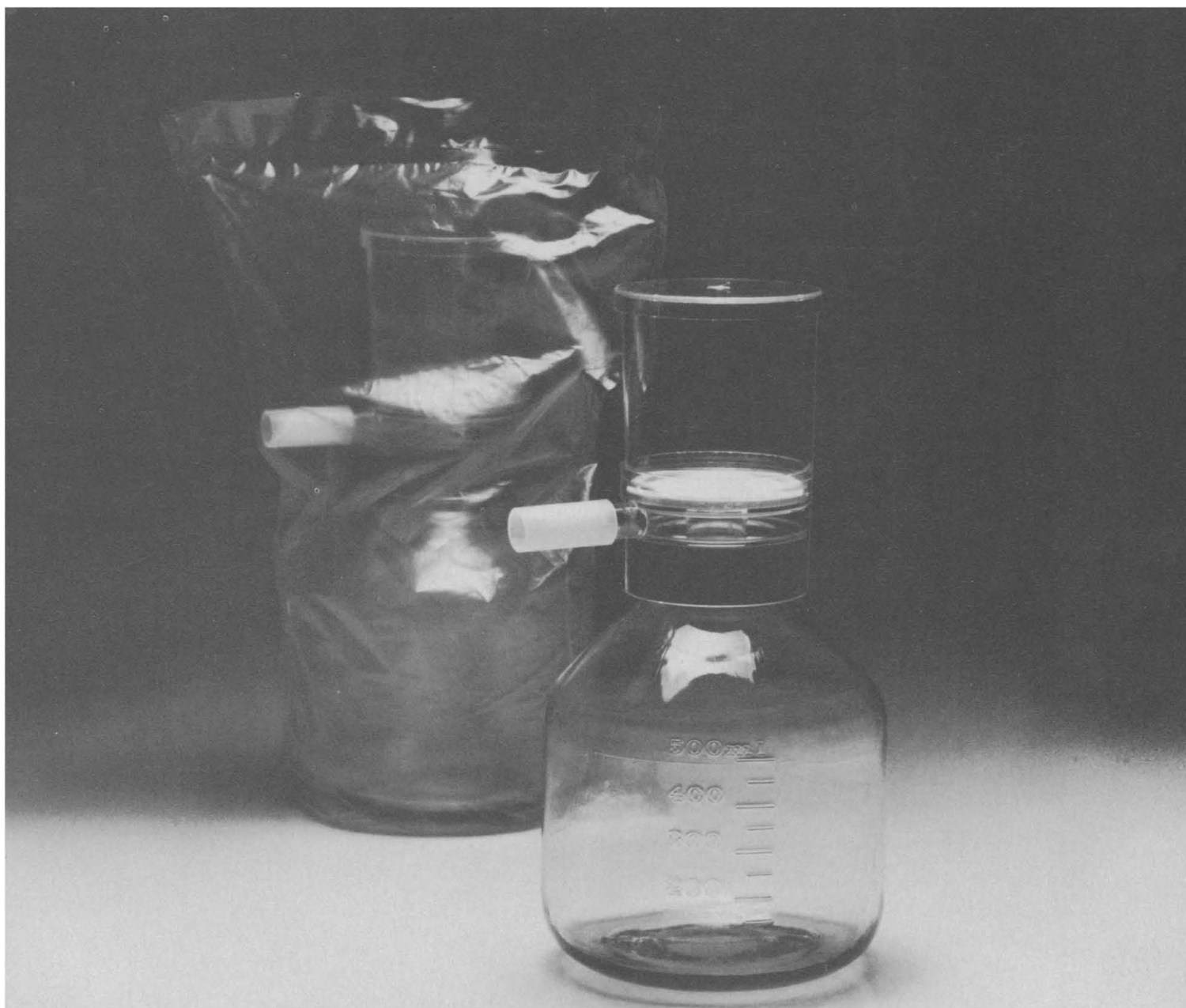
Address _____
Street

City _____ State _____ Zip _____

Nonprofit
Employer _____

Teachers Insurance and Annuity Association
730 Third Avenue, New York, New York 10017

wi



Take the wraps off the new Nalgene 500-ml filter unit.

And save time before, during, and after filtering.

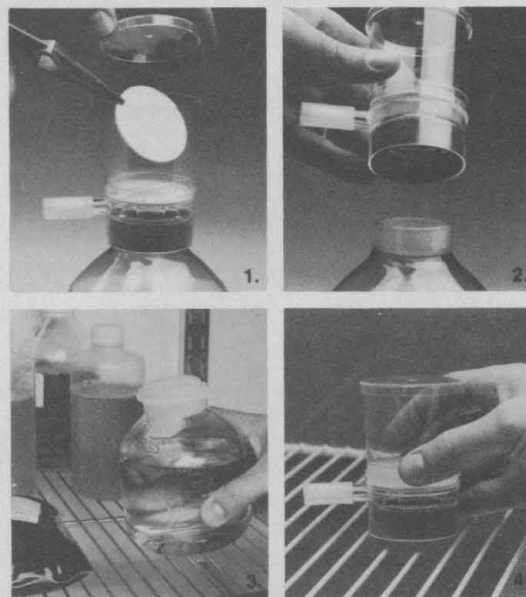
Before: There's no prep time needed. Like the widely-used Nalgene® 115-ml filter unit, the new Nalgene 500-ml filter unit is presterilized. Rigid quality control testing assures sterility of all filter unit elements. Like the 115-ml unit, the 500-ml filter unit is preassembled, so it's ready when you are. You don't waste time with costly autoclaving.

During: It offers increased throughput without compromising flow rate. A presterilized prefilter protects the membrane from clogging. Filter a full 500 ml with no stopping.

After: There's no clean-up. The Nalgene 500-ml filter unit is disposable, so you save time when your work is done. You can decant a full 500 ml from a sterile source, without transfer to a separate container. This is the first presterilized, disposable filter unit in the 500-ml size.

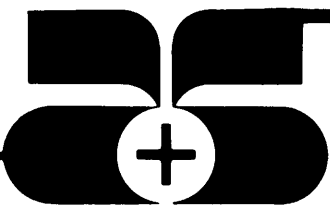
Now, choose either the standard Nalgene 115-ml filter unit (available with membranes in 0.20, 0.45 and 0.80 porosities) or the new 500-ml unit (in porosities of 0.20 and 0.45).

To order, call your lab supply dealer. For our current catalog, write: Nalge Company, Box 365, Rochester, New York 14602.



1. The new 500-ml filter unit comes complete with a prefilter for screening larger particles.
2. The filter cup and the receiver can be separated, and . . .
3. The receiver can be sealed with the presterilized polyethylene cap provided to store the filtrate. There's no need to transfer the sterile filtrate to a separate sterile container, so there's less chance of contamination.
4. With media added, the filter cup can be incubated to observe growth on the membrane.

SYBRON | Nalge



A HOT NEW TRACER FOR VITAMIN D STUDIES

1α , 25-Dihydroxy [$23, 24(n)^{-3}H$]-
cholecalciferol
60-100Ci/mmol code TRK.588
(Current batch-94Ci/mmol)

AVAILABLE ONLY FROM
AMERSHAM

Other hot tracers from Amersham for Vitamin D studies:

25-Hydroxy [$23,24 (n)^{-3}H$]-
cholecalciferol
60-120Ci/mmol code TRK.558
(Current batch—110Ci/mmol)

25-Hydroxy [$26(27)\text{-methyl-}^{-3}H$]-
cholecalciferol
5-15Ci/mmol code TRK.396

[$1\alpha,2\alpha (n)^{-3}H$] Vitamin D₃
5-15Ci/mmol code TRK.346

Write or call our Customer
Service Department for further
details. Call toll-free at
(800) 323-9750. In Illinois, Alaska
and Hawaii, call (312) 593-6300.

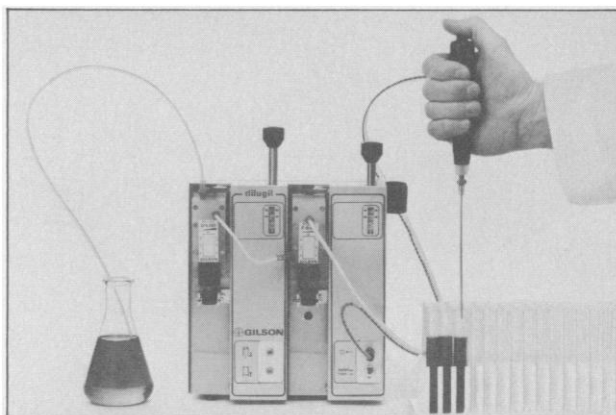
Amersham

AMERSHAM CORPORATION:
A SUBSIDIARY OF THE RADIOCHEMICAL CENTRE

2636 S. Clearbrook Dr., Arlington Heights, IL 60005
312/593-6300 or 800/323-9750 (Toll-free)

In Canada
505 Iroquois Shore Rd., Oakville, ONT L6H 2R3
416/842-2720 or 800/261-5061 (Toll free)

GILSON AUTOMATIC DILUTER for the most demanding laboratory



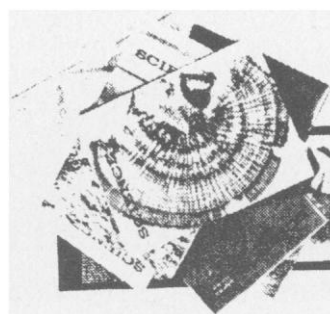
- Accuracy: 0.5%; reproducibility: 0.2%
- Superior chemical resistance and rugged construction-sapphire pistons and rotary valve. Reagents contact Teflon, Kel-F, and sapphire.
- Volume of diluent and sample are independently set by means of digital micrometers reading directly in volume-Range 2 μ l to 5 ml.
- Dilution ratio is continuously adjustable from 1/2500 to 250/1.
- Three easily interchangeable volumetric kits-Autoclavable.
- Small dead volumes-400 μ l or less.

For additional information call or write:

GILSON MEDICAL ELECTRONICS, INC.

P.O. BOX 27, MIDDLETON, WI 53562 • PHONE 608/836-1551

Circle No. 62 on Readers' Service Card



Do your
copies
look like
this?

If so, you need our attractive *Science* Binders to keep your copies of *Science* in good condition, and available for quick, easy reference. Simply snap the magazines in or out in a few seconds—no punching or mutilating. They open FLAT—for easy reference and readability. Sturdily constructed, these maroon imitation leather binders stamped in gold leaf will make a fine addition to your library.

Science Binders hold one three-month volume of *Science*. They have a 3-inch back and 14 fasteners. \$6.00 each. Four binders, \$22.00. (Please allow 6 to 8 weeks for delivery)

For orders outside the United States add .60 cents per binder. Imprint: name of owner, year of issues (for example: 1972-4 or vol. 178). add \$1.00 per binder.

Send to "Binders"



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

protected....

* in a light metal holder are the fine fitted plungers of these 800 Series Microliter Syringes (for 5 and 10 microlitres).

An extension which prevents the plunger from bending, and protects the samples from the warmth of the hand. But also an ingenious complement which gives the usual HAMILTON precision an even longer service life.

The barrel assembly and the holder are screwed together. It is, therefore, practical and economical when the barrel assembly needs to be replaced. The 800 Series types are, of course, also obtainable with removable needles.

For detailed technical information with prices please contact Hamilton Company, P.O. Box 10030, Reno, Nevada 89510, USA.

HAMILTON

Circle No. 168 on Readers' Service Card



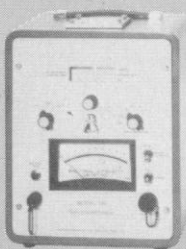
he depends on light

So do plants and other living things. That's why the ISCO Model SR Spectroradiometer is so important in the study of life processes. Portable, self-contained and operable from AC line or its internal batteries, the SR is practical for both field and laboratory applications.

The meter reads spectral intensity directly, over the entire spectrum from 380 to 1550 nm. A built-in sensor as well as a fiber optic remote probe obtain readings from otherwise inaccessible locations.

A programmed scanning recorder is available as an accessory to turn the instrument on and plot a continuous spectral intensity vs. wavelength curve at predetermined intervals.

ISCO
Model SR



For more information, dial direct, toll free (800) 228-4250 (continental U.S.A. except Nebraska). Or write Instrumentation Specialties Company, P.O. Box 5347, Lincoln, Nebraska 68505.



Instruments with a difference

LETTERS

Tanker Safety

The article by Luther J. Carter discussing the *Amoco Cadiz* incident and "... the elusive goal of tanker safety" (News and Comment, 5 May, p. 514) unfortunately contains lopsided reporting on the February conference sponsored by the United Nations' maritime agency, the Intergovernmental Maritime Consultative Organization (IMCO). The author's statement that a sure way to prevent pollution which may arise from ballasting operations would be to require that tankers be equipped with segregated ballast tanks (SBT's) does not square with the facts.

It was emphasized both in papers prepared for delegates to the IMCO conference and in exchanges between delegations that the cost of retrofitting tankers with segregated ballast would be far out of proportion to the marginal environmental benefits which might be thereby derived.

The assertion that the crude oil washing (COW) system is neither as effective nor as self-enforcing from a pollution prevention standpoint as equipping vessels with segregated ballast is simply not true. Conference delegates recognized that proper operation of the SBT system would require heavy reliance on vessel personnel to prevent pollution. Routine washing of cargo tanks on ballast voyages after cargo has been discharged and periodic ballasting of cargo tanks during especially heavy weather would create a potential for marine pollution from vessels with segregated ballast. On the other hand, COW conducted in port under close supervision avoids this possibility of marine pollution.

An accurate account of the conference should also include recognition that, aside from the United States, the most ardent supporters of the SBT concept were the Greek, Norwegian, and Swedish delegations, whose interests were not so much environmental as economic. Requiring that tankers be retrofitted with segregated ballast would reduce worldwide tanker capacity by 10 to 25 percent, thus shrinking the immense tanker surplus which plagues the merchant fleets of these nations. However, retrofitting the tanker fleets of the world and placing into operation additional tonnage to carry the same volume of petroleum would also add billions of dollars to the energy bills of importing nations and, contrary to ongoing conservation efforts, would require the consumption of substantial additional amounts of vessel fuel. In the final analysis, IMCO dele-

gates concluded that retrofitting tankers with SBT's simply could not be justified, either environmentally or economically.

With respect to the *Amoco Cadiz* spill, one must seriously question the author's assessment that the effects of the spill can be expected to persist for a decade or more in some places. This conclusion is not consistent with the fact that other areas affected by major oil pollution, such as resulted from the *Torrey Canyon* incident and offshore Santa Barbara drilling, fully recovered in a surprisingly short time. Scientific objectivity would be better served by making no dire predictions, but rather by letting the result of thorough investigations following such incidents speak for themselves.

T. S. WYMAN

*Chevron Shipping Company,
555 Market Street,
San Francisco, California 94105*

Carter's article on tanker safety is a poignant reminder of the magnitude of the task that confronts all of us in the tanker industry. Recently a former tanker captain with more than 40 years of experience in the tanker business with a major oil company wrote in a letter to me, "The tanker is an ugly, dirty beast, and the oil industry has a poor track record in trying to house-train this animal."

But it doesn't have to be this way. Oil tankers can be constructed and operated to be as environmentally and esthetically acceptable as the sailing ships that brought spices and teas into our harbors. We know how to do it. We need the legislative framework to establish the parameters within which the tanker industry can operate safely, economically, and practically pollution-free. No one company, no matter how big and rich, can afford to have its tankers operate at significantly higher costs than other tankers available for charter. Our industry wants, needs, requires, almost pleads for, firm government action to establish standards for tanker construction and operation that are considerably more effective than those presently in force. What we don't need is a watered-down, ineffective international agreement such as that proposed at the recent London conference on tanker safety and pollution prevention sponsored by IMCO. Our government should reject the results of this latest conference as inadequate and ineffective.

Changes are required in the way oil tankers are owned, operated, and built. Our government should legislate that foreign and U.S. tankers operating in U.S.-controlled waters or carrying oil for transshipment to the United States (i)

The First Translation Kit

It will make your life easier and your results more reproducible

New England Nuclear offers the first reticulocyte lysate kit for use in studying protein synthesis. Not only does it save all of the trouble of preparing your own cell extract, it gives you a system free from endogenous mRNA, high in protein synthesis activity, with an optimized high-activity tracer and quality control that includes testing every lot of Methionine, L-[^{35}S] using the kit.

The rabbit reticulocyte lysate system is reported to contain all factors required for translation of any eukaryotic mRNA.¹ But its use assumes the availability of suitable animals, preparation of the lysate extract, and inactivation of endogenous mRNA. And the meticulous tailoring of the salts, energizer, and amino acid mix. In short, it's a nuisance.

And you can get rid of all those rabbits

With our exclusive kit you bypass all that and concentrate on the study of protein synthesis. The kit contains:

A rabbit reticulocyte lysate—Treated with nuclease to inactivate endogenous mRNA, and tested to guarantee high protein synthesis activity.

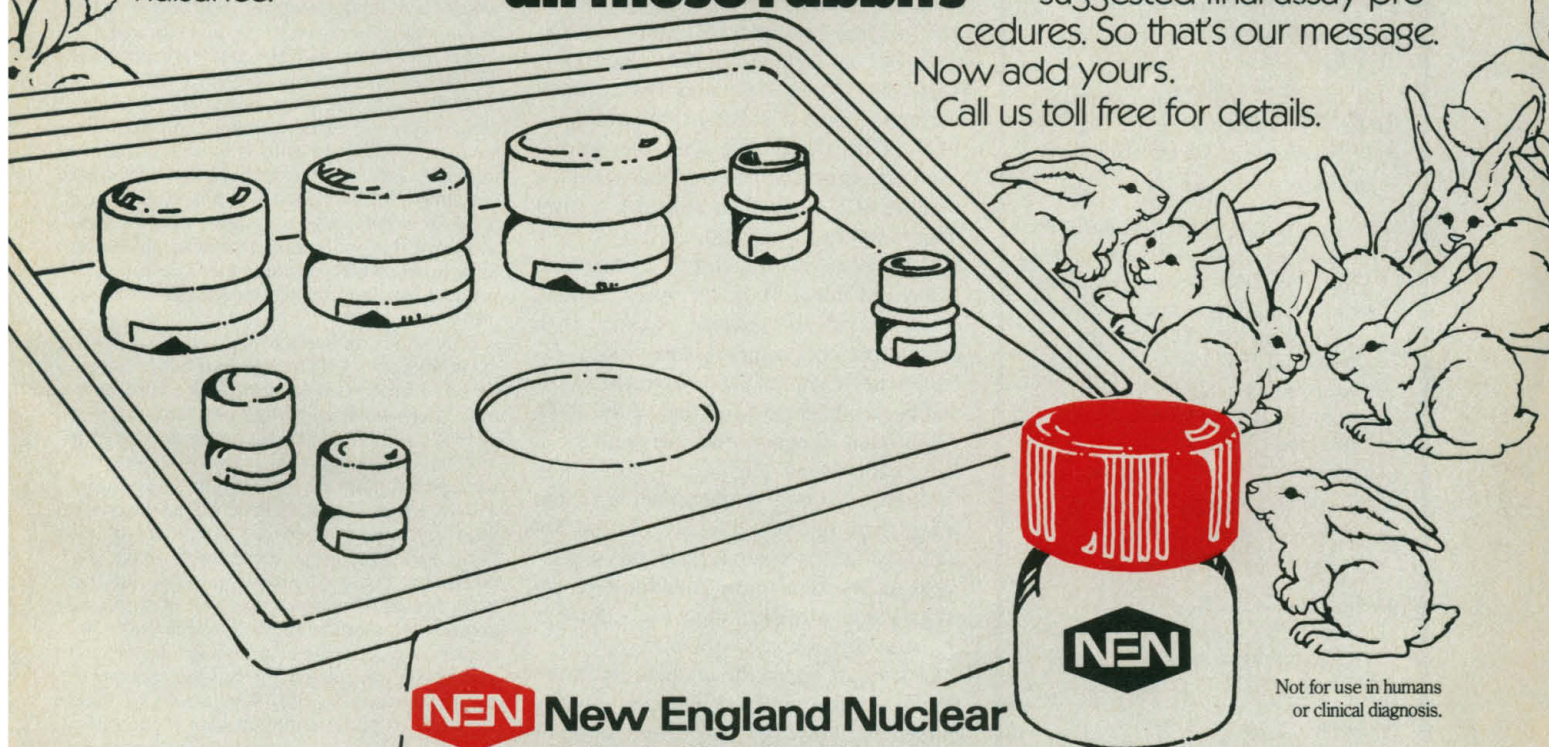
The finest tracer available—NEG-009T, NEN's translation grade [^{35}S]-Methionine, >500Ci/mmol, tested for incorporation into protein in cell-free translation systems. Each lot is optimized for compatibility with this system.

Translation cocktail—All the necessary components for proper translation conditions: 19 amino acids (excepting methionine) plus buffer, reducing agent, and energizer.

Control mRNA—Purified exogenous mRNA (adenovirus-infected HeLa cell mRNA) to check the biological activity of the system.

Salts and sterile deionized water—Selected and prepared to minimize potential ionic or enzymatic inhibition of the system.

The protocol is straightforward, and it includes suggested final assay procedures. So that's our message. Now add yours. Call us toll free for details.



New England Nuclear

549 Albany Street, Boston, Mass. 02118
Call toll-free: 800-225-1572
(In Massachusetts and International: 617-482-9595)

NEN Chemicals GmbH: D-6072 Dreieich, W. Germany
Daimlerstrasse 23, Postfach 401240, Telephone: (06103) 85034, Telex: 4-17993 NEN D
NEN Canada Ltd., 2453 46th Avenue, Lachine, Que. H8T 3C9, Telephone: 514-636-4971, Telex: 05-821808

Circle No. 159 on Readers' Service Card

¹Lodish, HF, Ann Rev Biochem, 45, 39 (1976)

Not for use in humans
or clinical diagnosis.

AAAS

Science Books & Films



American Association for the Advancement of Science

Science Books & Films is the quarterly review magazine which each year gives you reviews of

- 1000 new science trade/text books
- 250 new 16mm science films

In each issue you will find brief, informative, and authoritative reviews written and signed by specialists in the various fields. Our reviewers let you know the strengths and weaknesses of each book or film before you buy it.

SB&F can help you find the science books and films you need—quickly and easily.

- complete citations, ordering information, descriptive evaluations for both books and films
- nine explicit level designations (kindergarten [K] through professional [P])
- four ratings, highly recommended (**) to not recommended (NR)



Order from AAAS
SB&F Subscription Department
1515 Massachusetts Ave., NW
Washington, DC 20005

\$16.00 per year for AAAS members
\$17.50 per year for nonmembers
\$32.00 for two year subscription

stop using water in the cargo tanks of tankers for washing and ballasting; (ii) require deck and engine officers and pilots of tankers to demonstrate their competency on simulators; (iii) provide charterers, insurers, and authorities with their accident and oil spill records; (iv) convert part of the cargo tanks on existing tankers into segregated ballast tanks; and (v) construct double hulls on future new tankers, with the space between the hulls sufficient for all segregated ballast requirements.

Unilateral action by the United States is required. Our actions will quickly become adopted by other maritime nations. These proposed changes would add less than 1 cent to the cost of gasoline. They would result in oil tankers becoming "beautiful."

ARTHUR MCKENZIE
*Tanker Advisory Center, Inc.,
10 East End Avenue, New York 10021*

Physicists Postpone Visit to Soviet Union

Under the aegis of the Joint Coordinating Committee on Research on Fundamental Properties of Matter (JCC-FPM) established under the Nixon-Brezhnev agreements and involving the U.S. Department of Energy and the U.S.S.R. State Committee on the Peaceful Uses of Atomic Energy, we had planned, as a formal U.S. delegation, to visit nuclear research institutes in Moscow, Dubna, Leningrad, Kiev, Kharkov, Tashkent, Alma Ata, and Novosibirsk during the period 24 May through 7 June 1978. This delegation was the formal counterpart of a Soviet one that visited a number of U.S. nuclear research institutions roughly a year ago.

Collaborative activities under the JCC-FPM have thus far been heavily concentrated in particle physics with productive cooperative utilization of facilities at Fermilab and Novosibirsk. It had been our hope—and that of the JCC-FPM—that through the personal contacts established during our visits, and through our better understanding of the research programs under way in the Soviet institutions visited, it would be possible to broaden these collaborative activities substantially to include a number of areas of nuclear science.

In view of recent developments in the Soviet Union and discussions among ourselves, however, we have found it necessary to postpone our visit. We have forwarded the following letter to the directors of the institutions that had been

on our planned itinerary explaining this decision.

We believe our colleagues in the U.S. scientific community will be interested in our decision and the reasons for it.

As you have already learned through formal channels of the Joint Coordinating Committee on Research on Fundamental Properties of Matter (JCC-FPM), and the message from Dr. Kane to Professor Chuvilo dated May 22, 1978, we have decided to postpone our visit to your Institute.

We want to tell you why we have made this decision.

Our planned visits under JCC-FPM sponsorship have reflected our very strong belief in the importance of communication throughout the scientific—and particularly the physics—communities, and our belief that the activities already achieved under the JCC-FPM have made major contributions to scientific cooperation between our countries and to better understanding between our peoples. It has been—and is—our hope that such activities can be extended to new areas of science and to greater cooperation in those areas in which programs already exist.

We are sure that you will agree that one of the most important conditions for the advancement of any science—and again physics in particular—is freedom of communication among scientists. The exchange of ideas as well as the sharing of responsibilities is well known to be fruitful while compartmentalization is, in the end, sterile and unproductive.

It is for this reason that we are happy to have the opportunity to plan for our visits to Soviet institutions, such as your own, as a formal part of the JCC-FPM activity and as a counterpart of the productive visit paid to a number of U.S. nuclear research institutions by a Soviet nuclear science group during the past year. We have envisioned that cooperation between our two scientific communities would be mutually very valuable and we have been anxious to assist in its development.

It is, therefore, with the greatest regret that we have postponed the planned visits.

Cooperative ventures, however, as we are certain you will agree, can flourish only in an atmosphere of good will. It is a fact—an unfortunate fact, but nevertheless a fact—that the atmosphere of good will has eroded as a result of events in your country with the consequence that individual American physicists have progressively become more reluctant to become involved in joint programs involving our two countries.

It must be emphasized that American physicists have a very high regard for Soviet scientists and for Soviet science. It is a fact, however, that American physicists are reacting against a pattern of actions on the part of your government, which they view as repressive, exemplified most recently by the Orlov case. This reaction has now reached an intensity such that we, as individual members of the U.S. nuclear science community, have decided that it would not be possible, at this time, for us to achieve our goal of fostering greater communication and cooperation between our scientists and institutions and yours. It is our judgement that the concern of the American scientists who would be most valuable for participation in joint programs in nuclear science is so strong that little purpose would be served by our visit at this time.

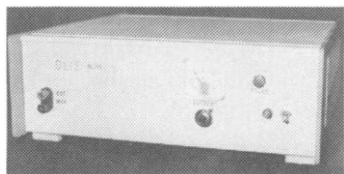
In postponing our visit, it is of course our strong hope that, in future, circumstances will

ALS

Route 2
Jefferson, Ga. 30549
(404) 367-9191



XL150 AND XL450 **PRECISION CURRENT REGULATED POWER SUPPLIES** PRECISION CURRENT SOURCES FOR XENON LAMPS



FEATURES

- High precision current regulation (less than 0.005% current variation with $\pm 15\%$ change in 115 v AC input).
- Output current, to 10 amp (XL150), to 25 amp (XL450).
- External modulation jack (response down 3 db @ 5 KHz).
- Output current meter.
- Elapsed time meter (optional).
- Reliable lamp starting.
- Fan cooled for maximum reliability.
- Rack mount version available.

SPECIFICATIONS

	MODEL XL150	MODEL XL450
AC POWER	3 amp	7 amp
DIMENSIONS	18½" x 18½" x 6½"	18½" x 18½" x 8½"
WEIGHT	44 lbs.	70 lbs.
LAMPS	up to 150 watts	up to 450 watts
STARTER (optional)	GID-25	GID-40K

PRICES

Model XL150	\$840.00
Model XL450	\$990.00
Model GID-25 starter and cable	\$160.00
Model GID-40K starter and cable	\$340.00

Prices subject to change. Delivery 30 days ARO. Terms: Net 30 days.

Circle No. 227 on Readers' Service Card

Exclusive **Receptor Studies**

125I

β -ADRENERGIC RECEPTOR ANTAGONIST

Iodohydroxybenzylpindolol, [125 I]-

Carrier-free, ~ 2200 Ci/mmol

n-Propanol: acetonitrile: water: phenol, ($\sim 30:10:40:1$).

Dry ice.

NEX-125 100 μ Ci 500 μ Ci 1mCi

ACETYLCHOLINE RECEPTOR BINDING

α -Bungarotoxin, [125 I]-

10-20 μ Ci/ μ g

0.05M Sodium phosphate buffer (pH7.5) containing

1.0% BSA. Dry ice.

NEX-126 250 μ Ci 500 μ Ci 1mCi

Not for use in humans or clinical diagnosis.

Request our "Ligands for Receptor Research" pamphlet.



New England Nuclear

549 Albany Street, Boston, Mass. 02118

Call toll-free: 800-225-1572

(In Massachusetts and International: 617-482-9595)

NEN Chemicals GmbH, Dreieich, W. Germany; NEN Canada Ltd., Lachine, Quebec

Circle No. 177 on Readers' Service Card

Only **micro** **osmometer**

(From Wescor, of course)

Our Model 5100B is the pacesetter in osmometry. The latest generation "B" series vapor pressure micro osmometers surpass all others in convenience, reliability, and economy.

Features:

- Automatic operation
- 8 microliter typical sample size
- Temperature compensated calibration
- Freedom from mechanical complexity
- No refrigeration
- No glassware
- Small size (weighs less than 4kg)

For complete specifications, dates of seminars, and other data, contact:



WESCOR, INC

459 South Main Street • Logan, Utah 84321

Phone (801) 752-6011

TWX 910-971-5870 • WESCOR LOGA

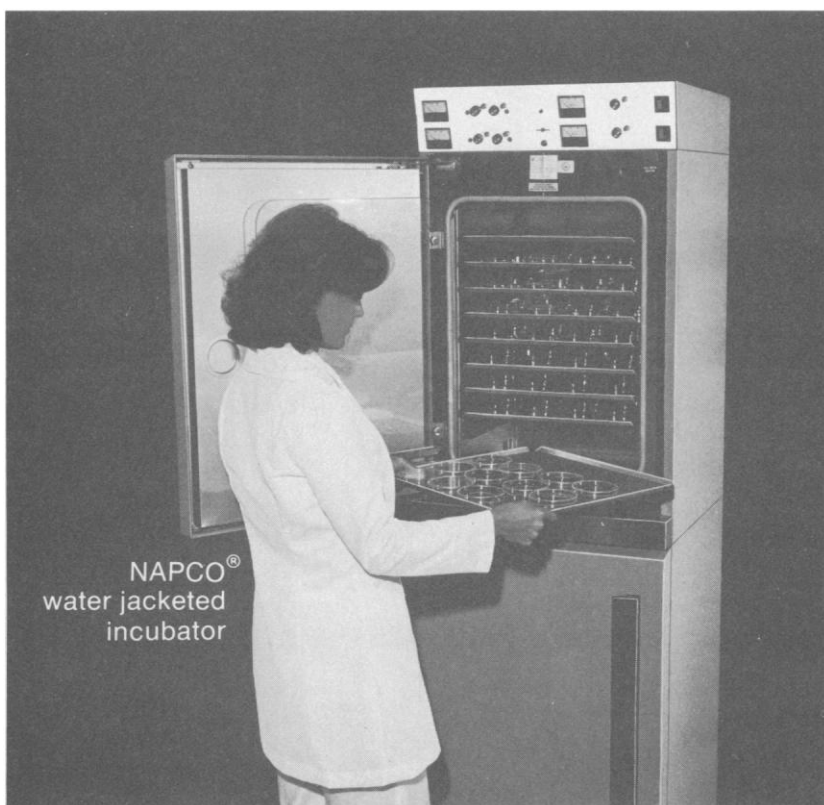
The leader in osmometry

New vial pack standards assure the accuracy of vapor pressure or freezing point osmometers. Only WESCOR has them!



For Literature Circle No. 108 on Readers' Service Card

For Demonstration Circle No. 109 on Readers' Service Card



A little known fact:

U.S. Patent #3848569

Most incubator problems can be traced to unreliable CO₂ control

It's true. Most models employ a relay and filament that corrodes. This causes the CO₂ to fluctuate, but you are usually unaware of it until an experiment is endangered.

Now Heinicke announces an exclusive patented solid state system featuring a thermister detector that obsoletes the relay and filament detector. It reduces zero drift and maintains the CO₂ at precisely the level you set it.

For super-convenient maintenance, the shelf

assembly snaps out, the heating element and electronic components slide out like a drawer, and the thermostat can be changed in minutes. No incubator has ever been made like this one.

Available in single or space saving vertical models. There's much more. Write for brochure.



**Heinicke
Instruments Co.
National
Appliance Co.**

3000 Taft Street
Hollywood, Florida 33021
Phone 1-800-327-9783
or (305) 987-6101

If you should ever have an equipment breakdown...
a Heinicke Minute Man will be on his way to you in 48 hours! You'll seldom need the Minute Man service, because Heinicke and Napco instruments are built to work. But if you do, dial toll-free 800-327-9783.

change such that we can again take up and build upon the strong bonds of collaboration and understanding already forged in JCC-FPM activities. Critical to this change is the rebuilding of the necessary open and free atmosphere.

Let us assure you that it is with the deepest regret that we find it necessary to take this action. We had much looked forward to meeting you, to visiting your Institute, and to exploring areas of possible future collaboration. And we look forward to a future time when such activities can be resumed as an important part of the truly international fabric of our science.

D. ALLAN BROMLEY

*Yale University,
New Haven, Connecticut 06520*

HERMAN FESHBACH
*Massachusetts Institute of Technology,
Cambridge 02139*

GERALD T. GARVEY
*Argonne National Laboratory,
Argonne, Illinois 60439*

EARL HYDE
*Lawrence Berkeley Laboratory,
Berkeley, California 94720*

O. LEWIN KELLER
*Oak Ridge National Laboratory,
Oak Ridge, Tennessee 37830*

JOSEPH WENESER
*Brookhaven National Laboratory,
Upton, Long Island, New York 11973*

Solar Energy in 2000

I must comment on Luther J. Carter's article of 12 May (News and Comment, p. 627), in which he discusses the recent solar energy report by the Council on Environmental Quality (CEQ). I feel I was quoted in that article in a manner that did not reflect my intended meaning. Frankly, I think the CEQ estimate that 25 percent of America's energy will be provided by solar technology in the year 2000 is probably optimistic. Although it may seem curious, I use the nuclear industry as a rule of thumb. This amounts to comparing a complex industry (nuclear) with what in most cases is a much simpler one (solar). However there are factors that tend to cancel the nuclear industry's increased complexity, such as the strong contributions from the weapons and naval reactor programs and the unquestioning support of congresses and presidents during the 1950's and 1960's. Thus a well-supported, successful program was able to supply about 10 percent of the nation's electrical energy (2.5 percent of total energy) approximately 20 years after commercial demonstration, and 30 years after the beginning of the R & D program. Because solar energy is not limited to just the electricity market, I feel it can supply from 5 to 10 percent of the nation's energy by 2000.

This business-as-usual projection has many uncertainties associated with it. Probably the most significant is the extent to which solar energy is perceived as more than just another energy option, although one with relatively benign environmental and health impacts to balance its present economic limitations. A projection of 5 to 10 percent by 2000 is low to the extent that solar energy is increasingly perceived as a symbol of a new way of thinking about the future. This emerging mind-set or cultural paradigm would look to solar as an energy source with significance beyond narrow marketplace economics.

My other major point was that projecting that solar energy will provide 5 to 10 percent of the nation's total energy by 2000 does not mean that it is not an important part of the solution to our *current* energy problems. I find this attitude as unrealistic as a projection that the solar share of the market will be 25 percent by 2000.

RICHARD CAPUTO

*Solar Energy Research Institute,
Golden, Colorado 80401*

Paraquat Pyrolysis Products

R. Jeffrey Smith, in two recent articles (News and Comment, 24 Feb., p. 861, and 28 Apr., p. 417), describes a health hazard arising from the presence of the herbicide paraquat (1,1'-dimethyl-4,4'-bipyridinium dichloride) on marijuana supplies obtained from Mexico. Smith states that pyrolysis of the paraquat results in the formation of "bypiridine," which is not considered to be cause for concern because it is present in smoke from tobacco cigarettes. Actually, the pyrolysis product of paraquat is 4,4'-bipyridine, a compound which has never been found in tobacco smoke. The only bipyridines which have been detected in tobacco smoke are the 2,2' and 2,3' isomers (1). 2,2'-Bipyridine decreases gastric secretory volumes and pepsin output in rats (2). I am not aware of any studies on the pharmacology or toxicity of 4,4'-bipyridine, but it seems highly unlikely that it is completely innocuous.

EDWARD LEETE

*Natural Products Laboratory,
School of Chemistry, University of
Minnesota, Minneapolis 55455*

References

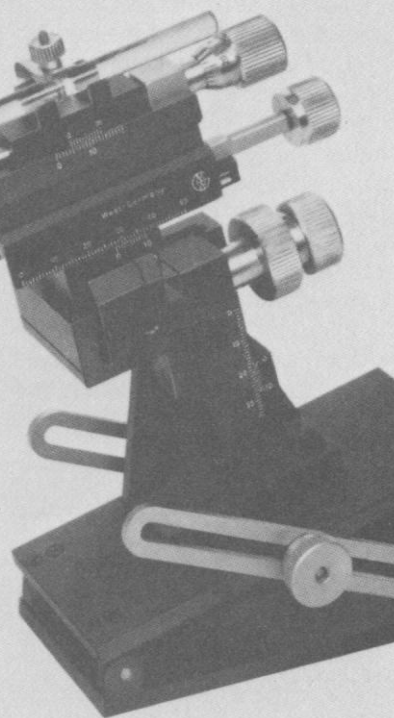
1. I. Schmeltz and D. Hoffman, *Chem. Rev.* **77**, 295 (1977).
2. P. Bass, R. A. Purdon, M. A. Patterson, D. E. Butler, *J. Pharmacol. Exp. Ther.* **152**, 104 (1966).

Our compact MM-33 micromanipulator drives by hand or motorized 'joy stick'.

Ideal for working at magnifications up to 250X, the MM-33 provides coarse movements in 3 planes (XYZ) plus fine movement in the thrust axis. Excursions calibrated in millimeters with vernier readings to 0.1 mm; final drive calibrated to 10 microns. Ball-bearing raceways assure smooth, backlash-free operation. All controls aligned in same vertical plane permits use of several MM-33's side by side. Mounts on Flexbar or a variety of bases.

Also available in a motorized version (MM-33M), with 'Joy Stick' remote unit for vibration-free control of speed and direction. For literature, write: Brinkmann Instruments, Cantiague Rd., Westbury, N.Y. 11590.

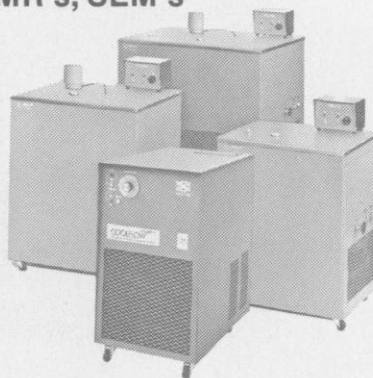
**Brinkmann
Micromanipulators**



Circle No. 137 on Readers' Service Card

DON'T LET SUMMERTIME BE DOWNTIME

Built to cool:
GC/MS's, Lasers
X-Ray Diffraction
Diffusion Pumps
NMR's, SEM's



If you have been relying on tap water cooling, you know how unreliable that system can be — especially in hot weather.

Neslab's line of Coolflow and HX constant temperature cool water recirculators offer working temperature ranges from +5°C to +35°C with ±1.0°C control.

Order before the hot weather arrives — for a reliable, money-saving, efficient alternative to tap water.



Call the leader — toll free

1-800-258-0830

In N.H. call collect 603-436-9444

NESLAB the name in circulation

NESLAB INSTRUMENTS, INC. 871 ISLINGTON STREET, PORTSMOUTH, N.H. 03801 U.S.A.

Circle No. 29 on Readers' Service Card

Three major technical advances have made Neslab's constant temperature circulating baths the most advanced laboratory cooling baths available. The temperature range of +250 down to -100°C only hints at the new lows we've reached.

Multi-point sensing probes housed in a stainless steel sheath read the temperature three times per second at three different points in the bath. Unavailable in laboratory baths at any price, Neslab's 3-point sensing virtually eliminates overshoot and lag, and keeps control deviations lower than ever before possible.

The proportional IC controller provides unmatched short-term control without long-term instability or drift. Four integrated circuits provide stability of a low $\pm 0.02^\circ\text{C}$ or less. Conservatively.

The new circulating pump is adjustable from 0 to 13 liters/minute. It combines a specially designed motor, industrial grade ball bearings, a multi-bladed rotor and a massive $\frac{1}{2}$ " diameter shaft, reducing vibration and noise to a new

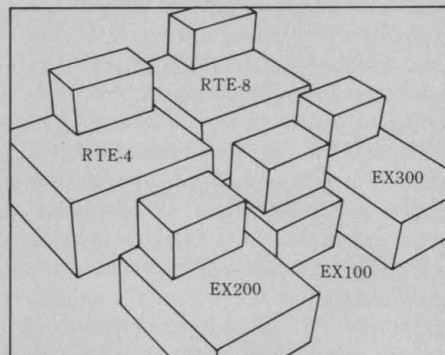
low. With no sacrifice in flow or pressure.

The efficient, progressive cavity pump design reduces mechanical heat input to a new low. It can operate with a wide range of temperatures, bath fluids and viscosity conditions, and is designed to run for years. Continuously.

Lowest of all is the price tag. Neslab's baths actually cost less than others not having their exclusive features. And we think that's the best low of all.

Phone right away. Or write away.

NESLAB INSTRUMENTS, INC.,
871 Islington St., Portsmouth, N.H.
03801 U.S.A., (603) 436-9444.



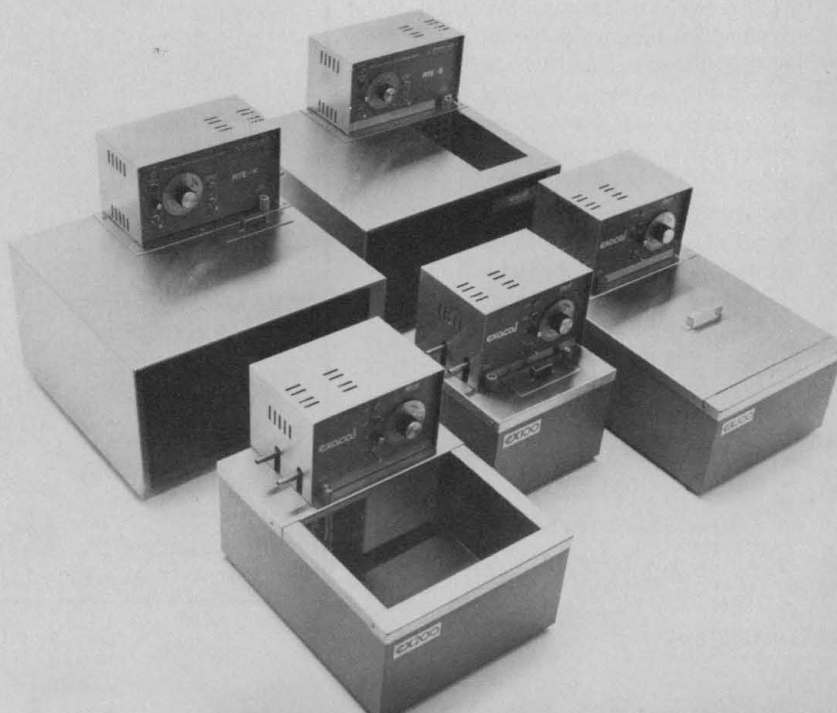
EXACAL BATH CIRCULATORS provide constant temperatures from -35 to $+150^\circ\text{C}$. Stability: $\pm 0.02^\circ\text{C}$ or less. Work areas: up to $10'' \times 12'' \times 5\frac{3}{4}''$ deep. Accessories: refrigeration units; electronic temperature programmer.

RTE-4 & 8 REFRIGERATED BATH CIRCULATORS have 20-30% greater cooling capacity than most baths. From -30 to $+100^\circ\text{C}$. Stability: $\pm 0.02^\circ\text{C}$. Work areas: up to $8\frac{3}{4}'' \times 4\frac{3}{4}'' \times 9''$ deep. Accessory: electronic temperature programmer.

LT-9 LOW-TEMPERATURE BATH CIRCULATOR (not illustrated) can maintain a high 300 watt heat removal capacity at -70°C . From $+10^\circ\text{C}$ to -80°C . Stability: $\pm 0.05^\circ\text{C}$. Work area: $6\frac{3}{4}''$ dia. $\times 8''$ deep. Accessory: electronic temperature programmer.

We've reached some new lows in temperature control.

Circle No. 166 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

1978: RICHARD E. BALZHISER, JAMES F. CROW, HANS LANDSBERG, EDWARD NEY, FRANK W. PUTNAM, MAXINE SINGER, PAUL E. WAGGONER, F. KARL WILLENBROCK

1979: E. PETER GEIDUSCHEK, WARD GOODENOUGH, N. BRUCE HANNAY, MARTIN J. KLEIN, FRANKLIN A. LONG, NEAL E. MILLER, JEFFREY J. WINE

Publisher

WILLIAM D. CAREY

Editor

PHILIP H. ABELSON

Editorial Staff

Managing Editor

ROBERT V. ORMES

Assistant Managing Editor

JOHN E. RINGLE

News and Comment: BARBARA J. CULLITON, *Editor*; LUTHER J. CARTER, CONSTANCE HOLDEN, DEBORAH SHAPLEY, R. JEFFREY SMITH, NICHOLAS WADE, JOHN WALSH. *Editorial Assistant*, SCHERRAINE MACK

Research News: ALLEN L. HAMMOND, *Editor*; RICHARD A. KERR, GINA BARI KOLATA, JEAN L. MARX, THOMAS H. MAUGH II, WILLIAM D. METZ, ARTHUR L. ROBINSON. *Editorial Assistant*, FANNIE GROOM

Associate Editors: ELEANORE BUTZ, MARY DORFMAN, SYLVIA EBERHART, JUDITH GOTTLIEB

Assistant Editors: CAITILIN GORDON, RUTH KULSTAD, LOIS SCHMITT, DIANE TURKIN

Book Reviews: KATHERINE LIVINGSTON, *Editor*; LINDA HEISERMAN, JANET KEGG

Letters: CHRISTINE KARLIK

Copy Editors: ISABELLA BOULDIN, OLIVER HEATWOLE

Production: NANCY HARTNAGEL, JOHN BAKER; YA LI SWIGART, ELEANOR WARNER; JEAN ROCKWOOD, LEAH RYAN, SHARON RYAN

Covers, Reprints, and Permissions: GRAYCE FINGER, *Editor*; CORRINE HARRIS, MARGARET LLOYD

Guide to Scientific Instruments: RICHARD SOMMER

Assistant to the Editors: RICHARD SEMIKLOSE

Membership Recruitment: GWENDOLYN HUDDLE

Member and Subscription Records: ANN RAGLAND

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Area code 202. General Editorial Office, 467-4350; Book Reviews, 467-4367; Guide to Scientific Instruments, 467-4480; News and Comment, 467-4430; Reprints and Permissions, 467-4483; Research News, 467-4321; Cable: *Advances*, Washington. For "Instructions for Contributors," write the editorial office or see page xv, *Science*, 30 September 1977.

BUSINESS CORRESPONDENCE: Area Code 202. Business Office, 467-4411; Circulation, 467-4417.

Advertising Representatives

Director: EARL J. SCHERAGO

Production Manager: MARGARET STERLING

Advertising Sales Manager: RICHARD L. CHARLES

Marketing Manager: HERBERT L. BURKLUND

Sales: NEW YORK, N.Y. 10036: Steve Hamburger, 1515 Broadway (212-730-1050); 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)

ADVERTISING CORRESPONDENCE: Tenth floor, 1515 Broadway, New York, N.Y. 10036. Phone: 212-730-1050.

Bad Science and Social Penalties

Bad science, especially in the environment and health area, may well impose socioeconomic penalties hardly envisioned. Health effects data, for example, are used as a basis and as a rationale (often emotional) for far-reaching decisions on the control of technology. All too often, published partial findings are taken uncritically at face value, misinterpreted, and misused; their qualifications are disregarded and their uncertainties forgotten. This can lead to technological fixes that do more harm than good.

I use the term bad science whenever hard conclusions from scientific investigation are not warranted by the data or the data are misapplied. The fault can lie with incompetent experimentation, analysis, or interpretation—the scientist's direct responsibility. Or the fault can lie with the misapplication of data. In the past, professional tradition has largely prevented or corrected bad science. Peer review and editorial discretion have promoted the scientific quality of published works; the responsibility and joy of scientists in confirming or denying published conclusions have led to the eventual obscurity of bad science.

But these professional procedures are being bypassed because of the needs of the times. The traditional outlet for scientific reporting is often short-circuited. Scientific work appears in unrefereed reports, news statements, hearing records, symposium transcripts, speeches, and independently published documents. Even editorial reviews are tending to become less critical to avoid any appearance of suppression of controversial findings. Also, much experimental work is becoming extremely difficult to confirm or refute—it may be large-scale, involve sophisticated techniques of experimentation and analysis, and be heavily computerized so that the original data are hard to obtain or the procedures difficult to check. In addition, political and regulatory pressures created by public concern often cannot await the inherently slow pace of scientific tradition.

Many practical problems caused by bad science currently arise from biomedical research, especially from epidemiologic studies. It is easy to understand, for example, why persons of keen analytic mind such as economists, physical scientists, and statisticians feel that if historical records exist on air pollution and in hospitals, it is easy to make correlations and determine the extent to which cleansing the air of the measured pollutants would improve health. But in reality, how difficult! The generally uncertain quality of the original data and the confounding factors are usually overlooked.

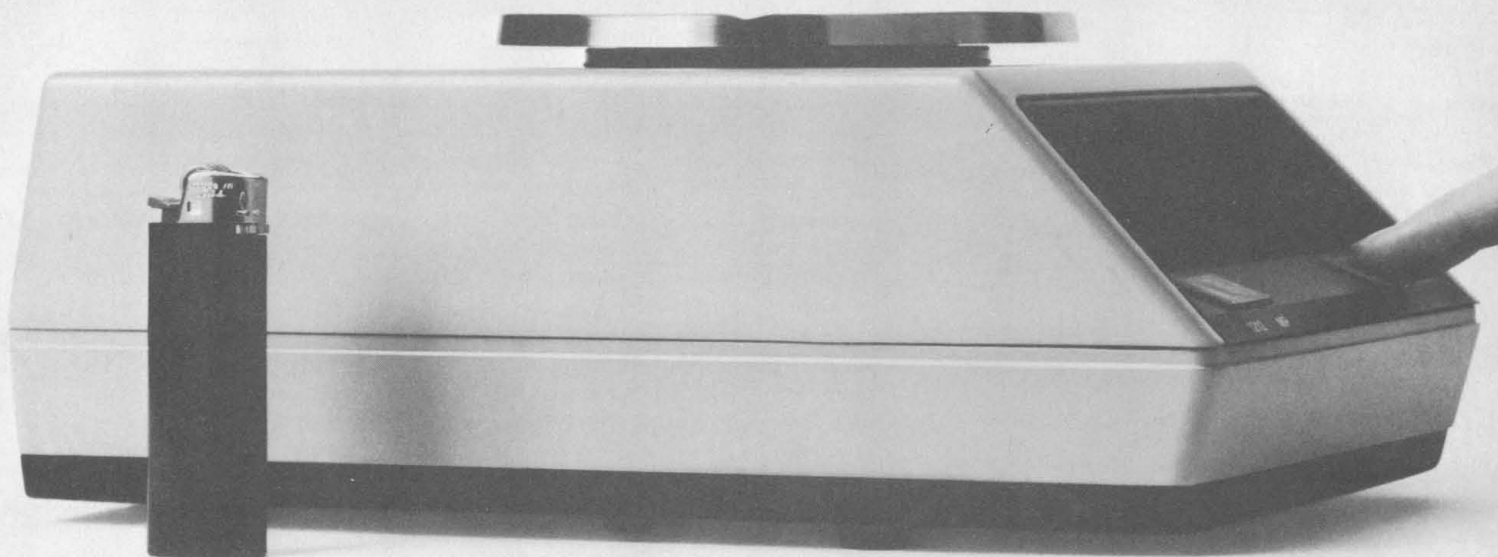
What can be done? Bad science, being more newsworthy, will tend to be publicized and seized on by some to support their convictions. Resolution of issues by the "science court" is untested, not having gained broad support, and the National Academy of Sciences is already overburdened. Perhaps the solution lies in greatly increased efforts of individual scientists—to vigorously take initiative and responsibility, to immediately expose bad science whenever it occurs, and thereby to reestablish credibility.

This plea to be more critical in the reporting and acceptance of science as a basis for important decisions is not meant to inhibit innovative work, withhold information from the public, or delay action needed in the public interest. Any reports that suggest a public health problem should be quickly examined to determine if immediate action is needed to prevent existing or imminent harm. (Fortunately, this determination can often be made on the basis of previous experiences.) Then such reports should be used to spur and guide any needed additional research.

The present spate of "doomsday" items, if taken at face value, could cumulatively produce either socioeconomic dislocations with little or no net health benefit, or public derision and counterreaction that would inhibit environmental improvement.—CYRIL COMAR, *Professor Emeritus, Cornell University, and Director, Environmental Assessment Department, Electric Power Research Institute, Palo Alto, California 94303*

SARTORIUS DOES IT AGAIN!

Introducing new microprocessor-equipped electronic balances with new capabilities and new add-on keyboard programmers.



Last year, Sartorius introduced a major advance in fully electronic weighing with the revolutionary Series 3700 Balances.

This year, Sartorius does it again with its new MP models. These extremely versatile top-loading balances and scales utilize Texas Instruments microprocessors that are pre-programmed for the performance of specific functions, while also offering vastly expanded data processing capabilities.

Optional plug-in keyboard programmers can be used to select programs, convert weight data, recall information and even calculate results.

Some typical applications of these programmers include: instantaneous conversion from metric to non-metric calibration (weighings in pounds, ounces, carats, grains, pennyweights, etc.), parts counting, mean weight determination, percentage weighing, and adjustable integration time for more precise animal weighings.

MP models also provide complete weighings in 1-2 seconds, instant electronic taring, automatic overload protection, a built-in vibration filter, data storage memory, and are available with BCD and analog outputs.

Can you afford to buy a new balance without these capabilities?

When you choose a Sartorius MP model, you have selected a balance that will be quite as advanced tomorrow as it is today. Even if you do not need all its capabilities now, the purchase of the appropriate plug-in

keyboard makes the needed capability instantly available any time in the future. Only Sartorius offers this flexibility.

For all their advanced technology, Sartorius MP models, priced as low as \$1,295 are significantly less expensive than many other electronic balances without such features. For literature, write: Sartorius Balances Division, Brinkmann Instruments, Inc., Cantiague Road, Westbury, N.Y. 11590.

sartorius



MODEL (Partial Listing)	1205MP	1202MP	1212MP (Dual Range)	1204	3716MP (Dual Range)	1203MP	3713MP (Dual Range)	3802MP	3804MP	3806MP
Weighing Range	0-160g	0-300g	0-30g 0-300g	0-1200g	0-120g 0-1200g	0-3000g	0-300g 0-3000g	0-6000g	0-16,000g	0-30,000g
Readability	0.001g	0.01g	0.001g 0.01g	0.01g	0.01g 0.1g	0.1g	0.01g 0.1g	0.1g	0.1g	1.0g

Circle No. 132 on Readers' Service Card



Annual Meeting
Houston
3-8 January 1979

Call for Contributed Papers

Poster Sessions Only. Deadline: 5 September 1978

Following our newly established tradition of the two recent Annual Meetings, AAAS will again have contributed paper sessions at its forthcoming Annual Meeting in Houston (3-8 January 1979). However, because the next Annual Meeting is some 6 weeks earlier in the year than the one just past, we will have less time to prepare for it and therefore we will be unable to schedule slide sessions. The Houston Meeting will have poster sessions only. All abstracts must be submitted according to the instructions given below, not later than 5 September 1978. Abstracts which fail to meet the requirements as

indicated below will be returned. *All contributions must be submitted (and signed) by a AAAS member or fellow* (although this person need not be one of the authors). Contributors will be informed about where and when they will make their presentations in late October 1978. Contributed paper sessions will be of the poster session type only; in such sessions each contributor will have a bulletin board on which to place text and graphic material (of oversized nature) for an extended period of time so that he can discuss his work at length with all interested parties (see *Science*, 28 June 1974, page 1361).

Instructions for Contributors

Type abstracts, using a clean (new) ribbon, on ordinary white bond paper (8.5 by 11 inches; 21.5 by 28 cm) according to the format shown on the right (the example is reduced to about one-half of the linear dimension; your abstract will be printed *directly from your copy* at about two-thirds of its linear dimensions). Indicate at the top of the page the letter of the AAAS Section which comes closest to your subject matter (a full list will be found at the bottom of the contents page of any issue of *Science*), as well as two or three words which give the subspecialty involved.

It is very important to keep your abstract within the limits of a 5-inch (12.7-cm) square. If it is too wide, it will be returned; if it is too long, it may be arbitrarily cut. Note that your original will be our camera-ready copy, so type and letter as neatly as possible.

At the bottom of the page, left side, type the name and address of the person who should be contacted regarding the abstract (that is, the person we should notify of where and when the presentation should be made). On the right side, type the name and affiliation of the AAAS member or fellow who is submitting the abstract and have this person sign the abstract. *The privilege of submitting a contributed-paper abstract for the Annual Meeting is limited to AAAS members or fellows.*

Send the *original* together with two copies of your abstract to:

Contributed Papers
AAAS Meetings Office
1776 Massachusetts Avenue, NW
Washington, D.C. 20036

**NOT LATER THAN
5 SEPTEMBER 1978**

Abstract submitted for a POSTER SESSION at the AAAS Annual Meeting in Houston (3-8 January 1979).

AAAS Section nearest subject matter _____

Subspecialty of this Section _____

5 inches (12.7 cm)

Indent Five Spaces and Type Title in Upper and Lower Case Letters and Underline. AUTHOR'S NAME (Institution in Parentheses), SECOND AUTHOR (Institution).*

Skip a space and type abstract. The full width of the column of typed material should be 5 inches (12.7 cm) and must not extend beyond that. Abstracts which are wider than this will not be printed (only the title and authors will be printed). The total length of the material, from top of title to bottom of footnotes, should not exceed 5 inches (12.7 cm); material which takes up more than this space is subject to arbitrary cutting. All special symbols and signs which must be hand lettered (e.g., π) should be rendered in reproducible black ink as clearly and carefully as possible. The entire submission should be of camera-ready quality so that it can be photographed, turned into a plate, and printed. The printed abstract will be about 2/3 the size of the typed version. Avoid paragraphing as this wastes space. However, you may use your allotted space to neatly letter in equations and diagrams, as you deem necessary,

$$-\frac{\hbar^2}{2m} \nabla^2 \psi + V \psi = i\hbar \frac{\partial \psi}{\partial t}$$

as indicated in this example.

*Skip a space and type footnotes. Author's names should be in all upper case letters; institutions in upper and lower case letters.

Person to be contacted
about abstract:

Full Name
Complete Address

Submitted by AAAS member:

Type name of member
Type affiliation of member

(signature of member)

Restriction Nucleases

ALL AVAILABLE FROM STOCK AT REDUCED PRICES

Cat. No.	Product	Specificity	Package Sizes	Prices*
0884	<i>Alu</i> I	AG↓CT	50 units	\$ 22.50
0868	<i>Bam</i> H-I	G↓GATCC	100 units	22.50
0854	<i>Eco</i> RI	G↓AATTC	100 units	22.50
0866	<i>Hae</i> III	GG↓CC	25 units	22.50
0888	<i>Hha</i> I	GCG↓C	100 units	22.50
0858	<i>Hinc</i> II	GTPy↓PuAC	20 units	32.50
0860	<i>Hind</i> III	A↓AGCTT	100 units	22.50
0862	<i>Hpa</i> I	GTT↓AAC	20 units	32.50
0864	<i>Hpa</i> II	C↓CGG	50 units	22.50
0908	<i>Kpn</i> I	Unknown	200 units	22.50
0886	<i>Pst</i> I	CTGCA↓G	20 units	32.50
0882	<i>Sal</i> I	G↓TCGAC	20 units	32.50

*One unit is the amount required to degrade 1.0 microgram of lambda DNA in 60 minutes at 37° in 0.05 ml.

Insulated container and refrigerant charge — \$6.00.

excellence in biochemistry



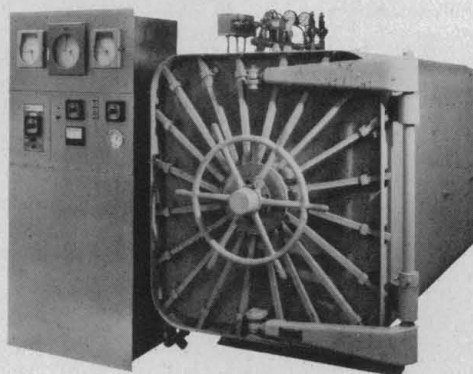
PL biochemicals, inc.

1037 WEST MCKINLEY AVENUE, MILWAUKEE, WIS. 53205

® Call 414/347-7442 TWX 910-262-1111

Circle No. 228 on Readers' Service Card

Custom remanufactured sterilizers...



...can save you as much as 40% off the list price of a new steam or ethylene oxide unit.

Engineered to your specifications, with custom remanufactured vessel and door, new controls, operating parts, steam generator and fittings specified for your applications. Three year performance warranty—longest in the industry.

We have a model, size and type to meet every sterilizer need, plus a line of new bulk sterilizers. Call or write for our brochure.



Scientific Industries, Inc.

70 Orville Drive, Airport International Plaza, Bohemia, New York 11716, 516/567-4700

Circle No. 181 on Readers' Service Card

Computerized Scanning Densitometer System



- **Reflectance, fluorescence and transmission scans**

- All media, including cellulose acetate, agarose, paper, TLC, radiochromatograms, gel tubes

- Up to 20 cm × 20 cm sample size
- Automatic zero
- Monochromator; 190 to 740 nm
- 0.2% resolution
- Computing integrator prints four lines per second
- Automatic or manual fraction detection
- 100 slit-size combinations



**TRANSIDYNE
GENERAL
CORPORATION**

903 AIRPORT DRIVE • ANN ARBOR, MICHIGAN 48106 • 313/769-1900