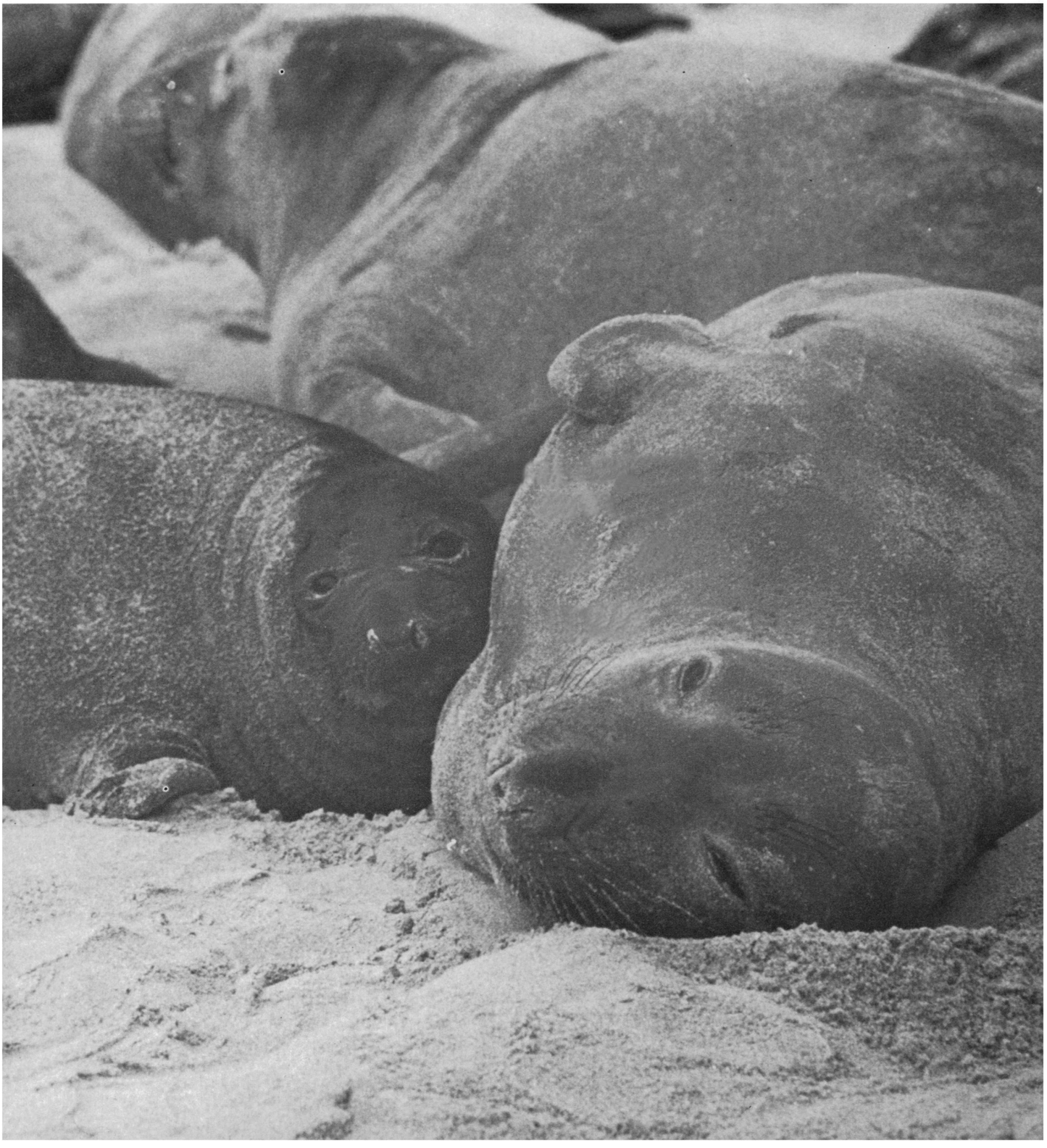
SCIENCE

24 May 1974

Vol. 184, No. 4139

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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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.

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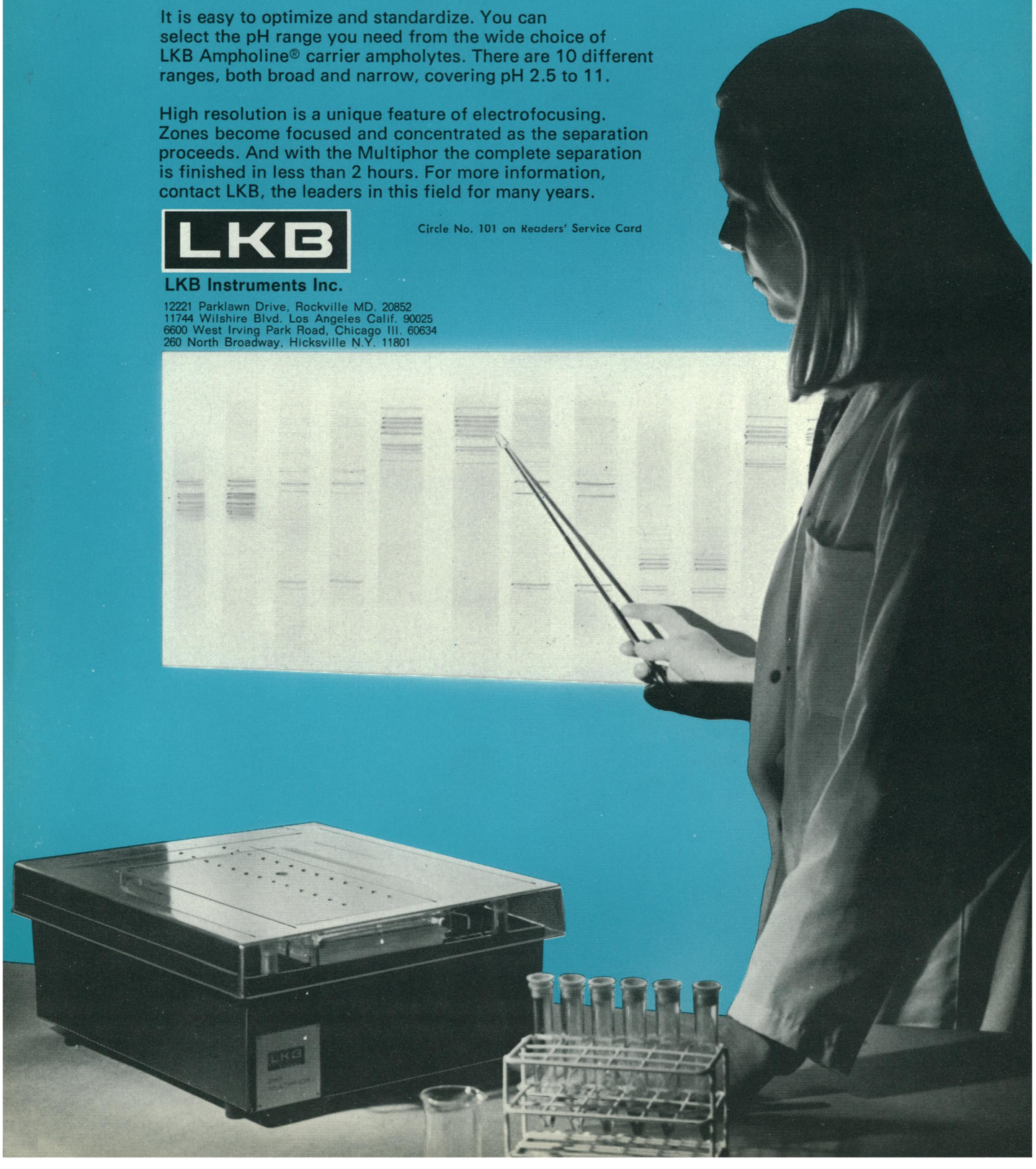

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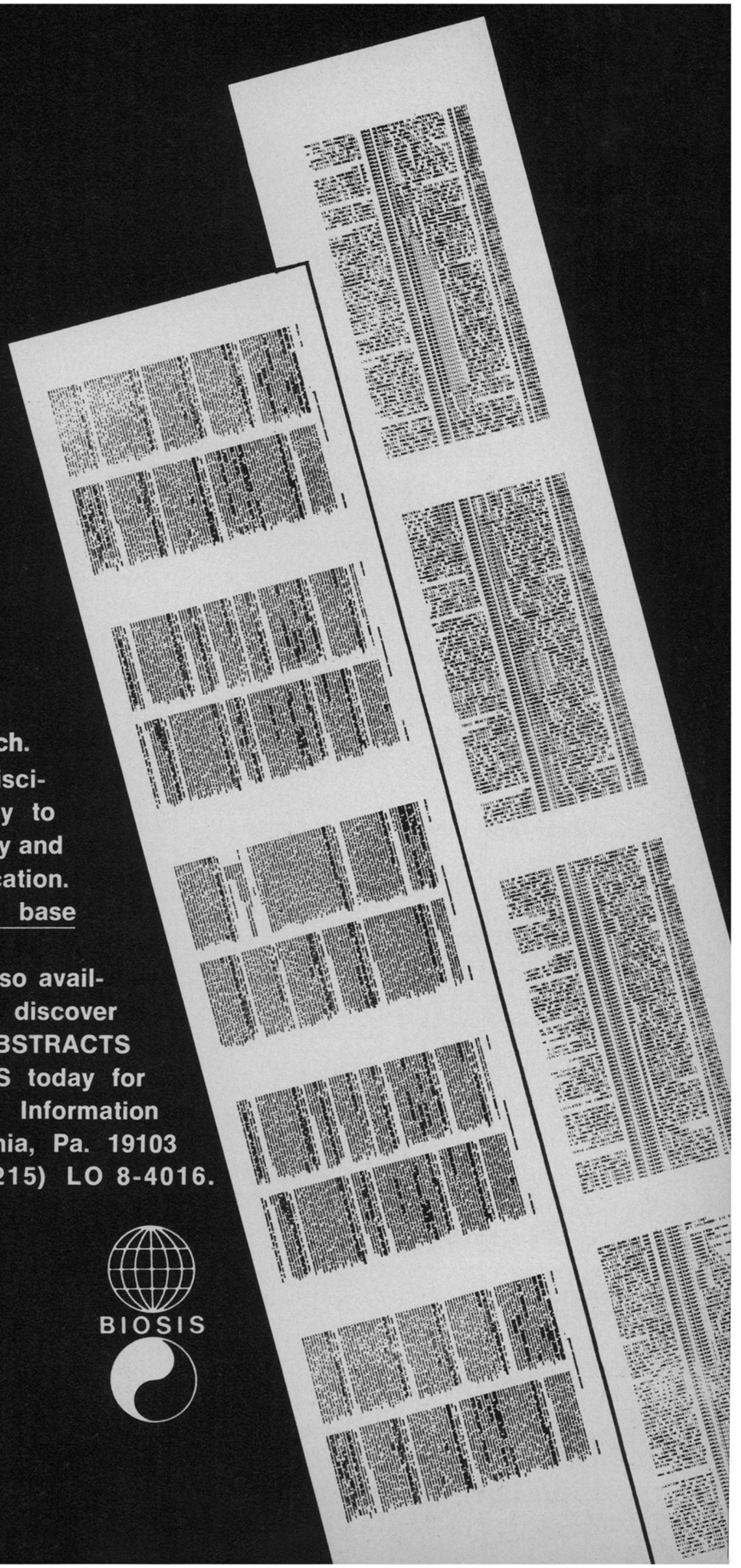

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BIOSIS

24 May 1974

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Northern elephant seal cow remains with her pup throughout its first 4 weeks of life, then breeds, and returns to the sea. At the time of its weaning, the pup may weigh nearly 300 pounds. See page 908. [M. L. Bonnell, University of California, Santa Cruz]

PHOTO BY MARTHA SWOPE

"Hair" we ain't. But we drew 30,000.

Our S/P productions are more educational than sensational. The things we spotlight are new product developments and applications. Sometimes we get real offbeat and produce a workshop on preventive maintenance. What is important is that our practical, informative Seminars, Workshops and Instrument Shows played to an audience of over 30,000 of your colleagues last year. And by all standards, that has to be some kind of a record.

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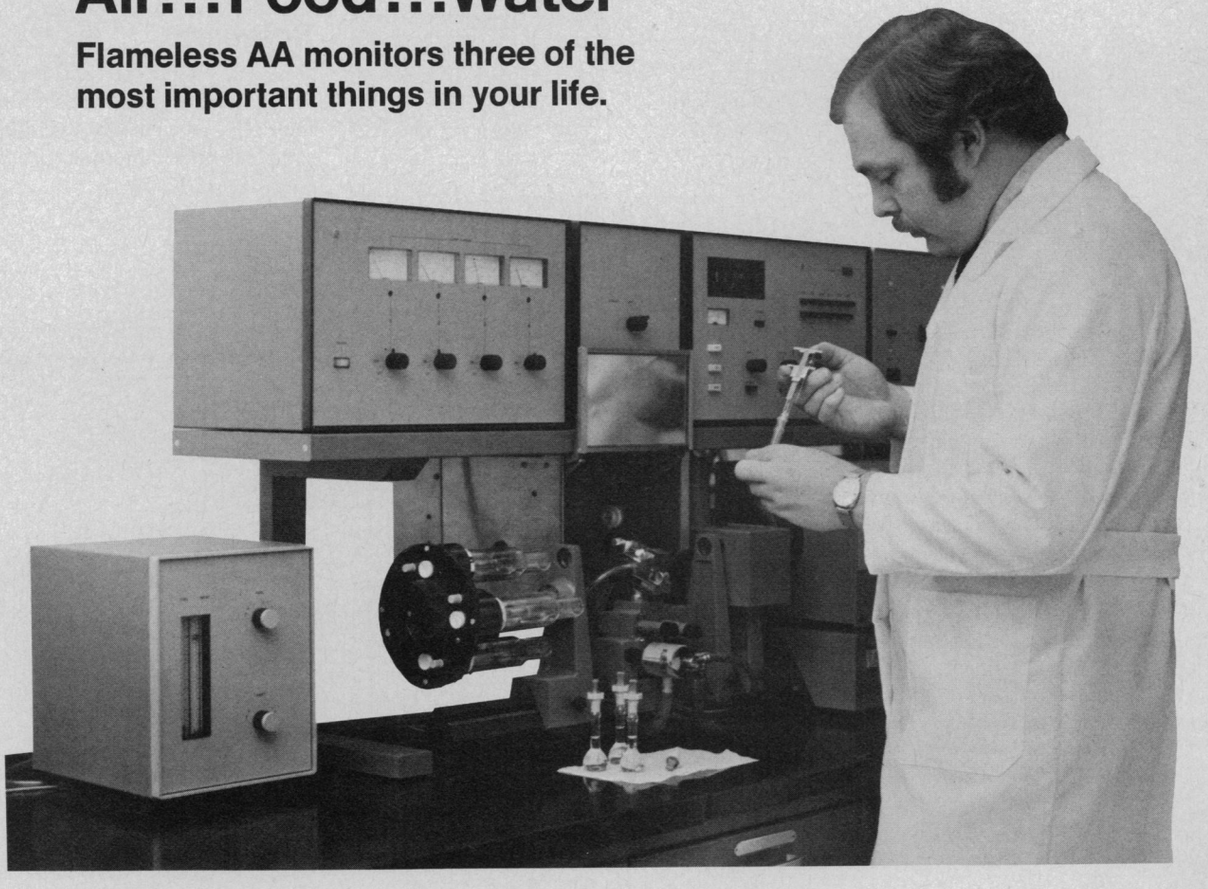
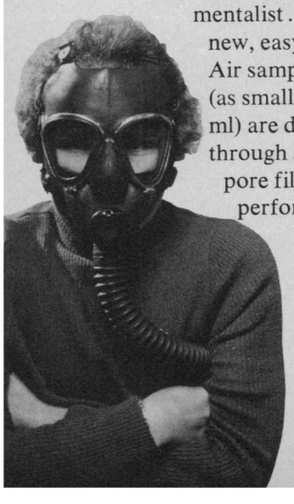


This new AA-6CS, *dedicated* to flameless atomic absorption, is *also dedicated* to scientists concerned with traces of toxic metals throughout the environment...

...in air

Monitoring toxic metals in the atmosphere from industrial plants and engine exhausts is vital to the environmentalist... and here's a new, easy, fast method. Air sample volumes (as small as 250 ml) are drawn through a Millipore filter in a perforated carbon cup, which is then placed in the AA-6CS and atomized. Within a minute, you know the concentration of lead, cadmium, or other toxic elements, in parts per billion!



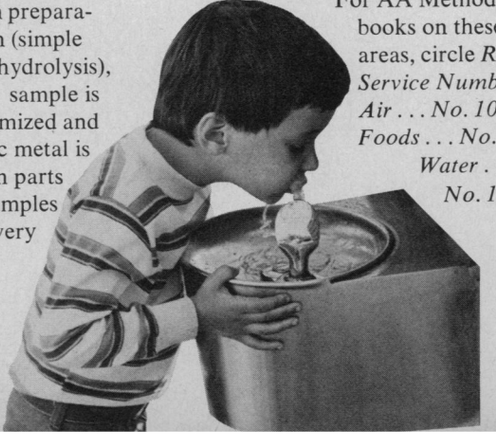
...in food

With the AA-6CS, analyzing for lead, cadmium, and other metals in fruits, vegetables and canned baby foods could be no easier! After minimum preparation (simple hydrolysis), sample is atomized and the toxic metal is measured in parts per billion; samples can be injected and analyzed every 90 seconds!

...in water

Direct determinations of toxic metals in water and effluents are simply and rapidly carried out on the standard AA-6CS. Little or no sample preparation is needed... and the analysis requires only microliter samples. Sensitivity is unmatched! To monitor water pollutants, select the leader in flameless AA... the AA-6CS from Varian Techtron!

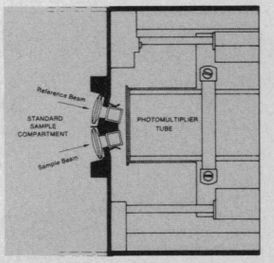
For AA Methodology books on these areas, circle *Reader Service Numbers: Air... No. 107, Foods... No. 108, Water... No. 109.*



Are turbid sample spectra your problem?

Problem:

Murky suspensions or cellular materials that scatter too much light to allow standard absorptiometric measurements.

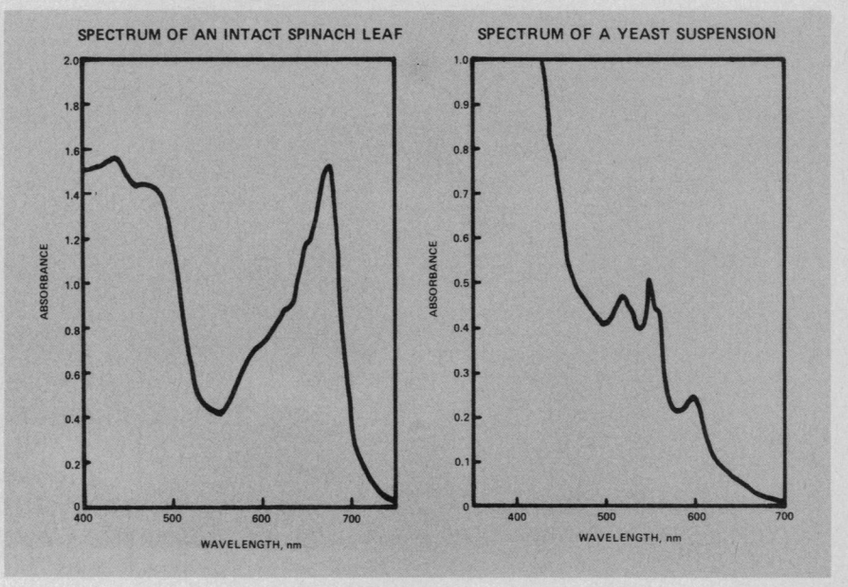


Solution:

A new Scattered Transmission Accessory detector system with end-on photomultiplier tube positioned close to the sample to collect more scattered light.

Measuring absorbance of such turbid biological systems as cytochromes, flavoproteins and hemoglobins in their native state has been difficult at best. But now, with our new Scattered Transmission Accessory, meaningful spectra can be routine. This accessory replaces the detector compartment of the Cary 118, retaining the standard cell compartment for non-scattering samples.

The Scattered Transmission Accessory increases light-gathering power up to 100-fold over the standard absorption method. This greater intensity vastly improves the resolution, the signal-to-noise ratio, or both. How? By placing the turbid sample next to a large end-on detector so that light scattered by the sample at angles up to 50° is collected.



Scattered transmission absorption curve of an intact spinach leaf, showing chlorophyl peak, and curve of closely packed yeast cells in suspension, resolving the cytochrome bands.

In addition to turbid sample capability, there are other reasons why the Cary 118 is the leading UV-Visible Spectrophotometer today:

Highest photometric precision of any instrument in its range.

Measures micro samples down to 20 microliters.

Performs derivative recording and difference measurements.

Far UV capability (down to 170 nm with optional accessory).

If your studies involve complex biological compounds in micro *or* macro quantities, the Cary 118 is the logical, and often the only, choice.

For more information, circle *Reader Service Number 110.*

Varian Instruments for Life Science Research & Analysis

Varian GC Autosampler

With this new automatic sampler you can run your gas chromatograph overnight, unattended, and have chromatograms from 60 samples (contained in four 15-vial quadrant holders which fit into a carrousel unit) by morning. Or, if you'd like to run it continuously for longer periods, each 15-vial holder can be easily removed after its samples are analyzed and replaced with new samples — all while the unit is operating! And reproducibility is 0.5% σ rel on an absolute basis, something no human operator can come close to.

For details, circle *Reader Service Number 112.*

Model 2100... first choice 'U' column GC

Model 2100 is the finest "U" column gas chromatograph ever built. Chemists choose it because its large, accessible oven and its multi-glass-column, multi-detector operation (up to four simultaneously) make it ideal to handle a large throughput of difficult samples such as steroids, triglycerides, amino acids, pesticides and other labile compounds.

For specifications, circle *Reader Service Number 113.*

New 8500 LC makes it easy to use the full power of liquid chromatography

The all-new Varian 8500 Liquid Chromatograph is the first push-button LC system. All the knobs and levers have been replaced by a simple, solid-state control panel. No other LC system is so easy to operate and control.

But more important, no other LC system gives you so much capability to use the full analytical power of liquid chromatography. Here are just a few of the full-performance features available only on the 8500:

Pulseless flow at rates up to 990 ml/hr at 8500 psi — full flow at full pressure and a wider selectable range of flow rates/pressures to improve your separation. Further, the 8500's pulseless, precisely-controlled flow ensures lowest detector noise, lowest minimum detectable quantities, and greater accuracy and reproducibility of peak areas and retention times.

8500 psi pumping — a significant margin of extra pressure for high speed LC and to take advantage of the new high performance columns that often require high solvent flow rates and corresponding pressures for fast analysis.

8500 psi injector — new easy-to-use design for highly reproducible injections.

8500 psi columns — columns that operate over the entire pressure range from 0 to 8500 psi, for greater efficiency, speed and capacity in all LC modes.

Multilinear Solvent Programmer controls the dual-pump gradient system. Provides capability to form gradients of virtually any useful shape to improve your analysis.

Choice of detectors — UV, Refractive Index and Variscan. Variscan is the detector that makes it possible to detect and analyze any compound that absorbs in the UV-Vis range from 200 to 800 nm.

Every component in the 8500 extends the range of liquid chromatography — makes it possible to do almost everything in LC either better or faster.

For full information, circle *Reader Service Number 111.*

Now the XL-100A NMR Spectrometer lets you think small

Thanks to another Varian first, a 1-mm Insert Accessory for the XL-100A Pulsed-Fourier Transform NMR Spectrometer, scientists such as biochemists and pharmaceutical chemists who have to work with limited sample quantities can obtain rapid proton NMR analysis of microgram samples.

Using the insert, it's possible to run proton spectra of 50 μg or less of sample. Spectra run thusly are obtained in less than 17 minutes, yet are superior to 8-hour runs in a 5-mm tube. Sensitivity for a fixed amount of sample can improve from 4- to 6-fold when the 1-mm Insert Accessory is used.

The two spectra of Δ^9-tetrahydrocannabinol (THC) shown here demonstrate the dramatic results possible using the 1-mm Insert. Spectrum A, of a concentrated sample in a 5-mm tube, serves as a comparison for the other spectra. Spectrum B (20 μg of sample in a 1-mm tube) and Spectrum C (20 μg of sample in a 5-mm tube) were run under identical conditions. Note the well-defined peaks in the spectrum run using the 1-mm Insert.

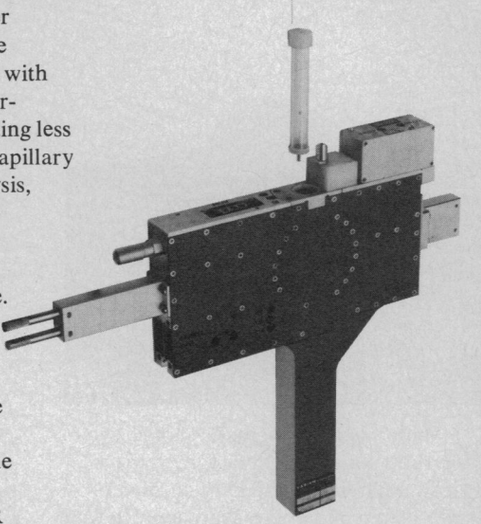
This innovative approach is successful since reducing the sizes of both the sample tube and the receiver coil ensures maximum coupling of the available nuclear magnetic moments with the coil. It permits the use of commercially available capillary tubes costing less than one cent each. Hence, the capillary can be thrown away after analysis, eliminating the messy clean-up required with special tubes, or the sample can be easily stored for future reference.

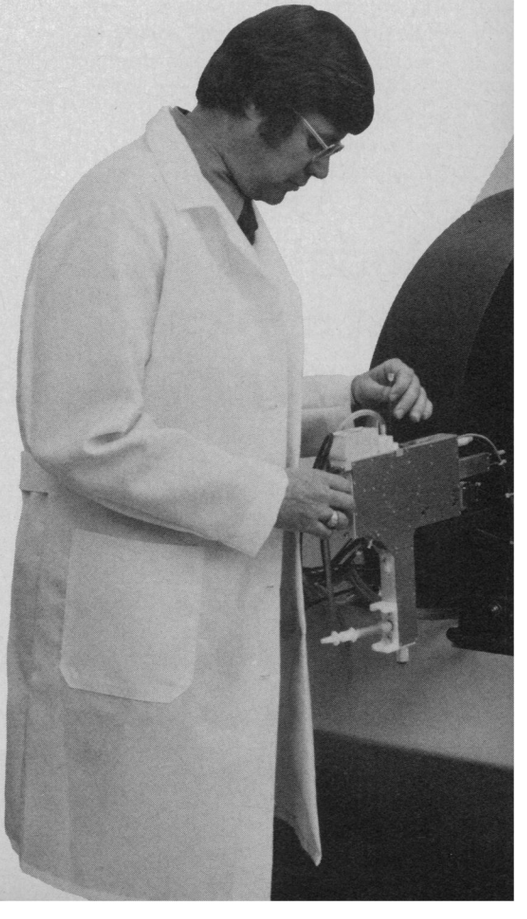
Interchanging the 1-mm Insert with standard XL-100A inserts is extremely easy. Merely take out one, put in the other, retune and balance. Sample preparation is easy, too. The sample is dissolved in 5 μl of an NMR solvent containing TMS for a reference. It is then transferred into a 1-mm sample tube by using a drawn out glass pipette or a hypodermic syringe. This eliminates the bubble problems which sometimes arise with the use of microcells in larger tubes. The resulting column length is about 10 mm, assuring freedom from line shape distortion. Since spinning produces no vortex, spinning speed is not a critical factor. The sample volume in the 1-mm Insert is so much less than the 400 μl required for 5-mm tubes that use of deuterated species becomes more economical.

The 1-mm capillary has its own spinner turbine attached. Unlike other existing techniques designed to accommodate small quantities of samples, there are no plugs to adjust and no sample positioning necessary. Proper positioning is automatic thereby assuring reproducible homogeneity.

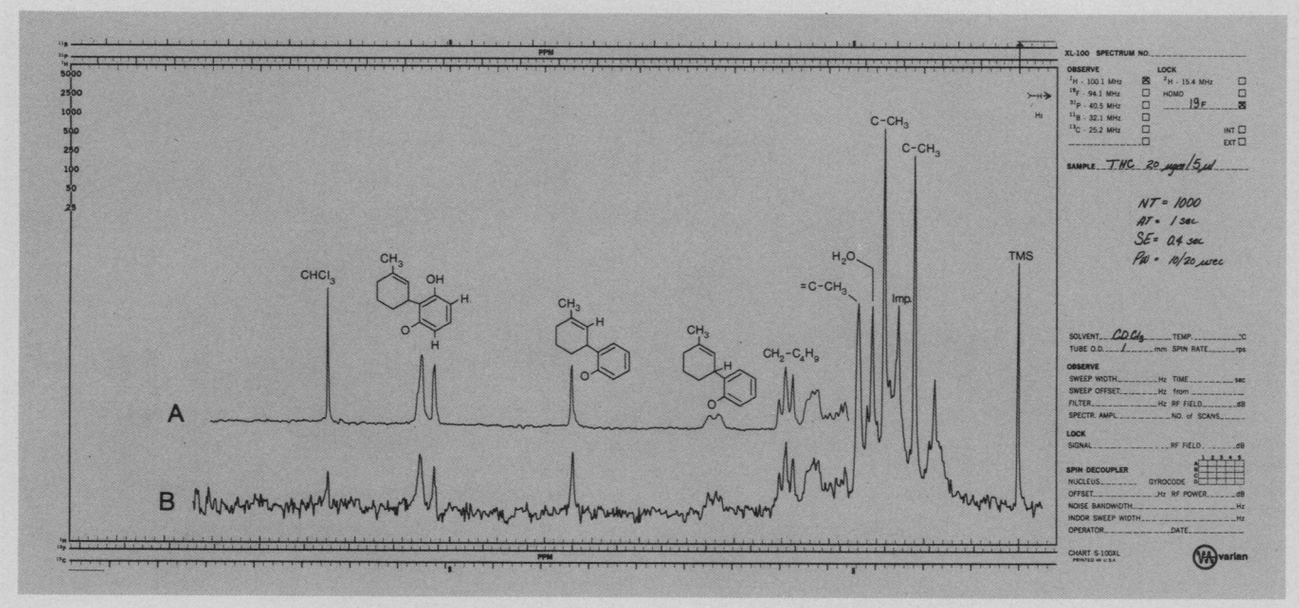
So, if your research would benefit from rapid proton NMR analysis of microgram samples, write for a copy of Varian's Application Report NMR-2, which describes the XL-100A Insert Accessory in more detail.

Circle *Reader Service Number 114.*

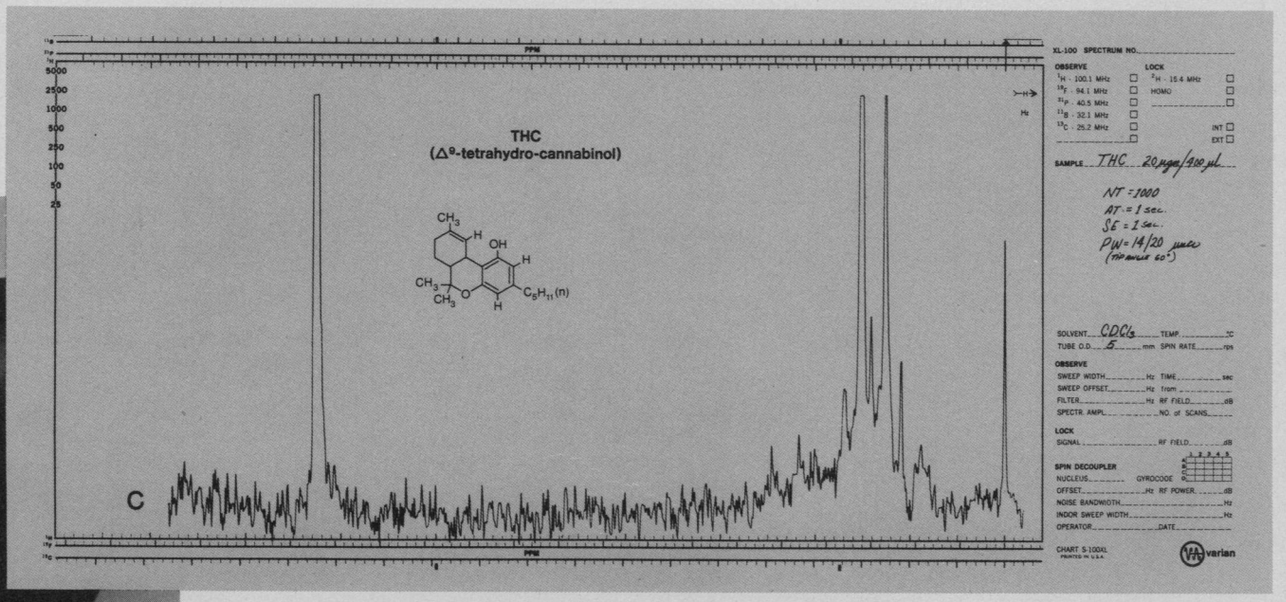




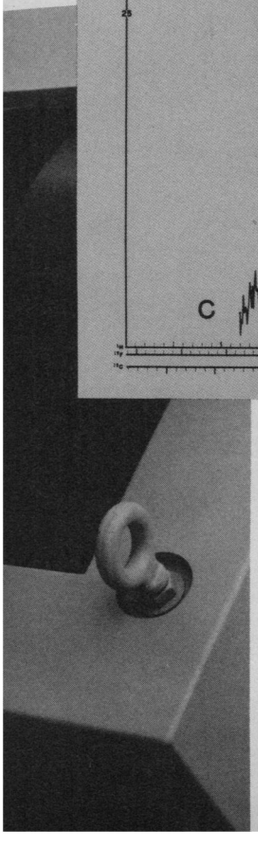
Varian Instruments for Life Science Research & Analysis



The spectrum of 20 μg of Δ⁹-THC (tetrahydro-cannabinol) in a 1-mm capillary with 5 μl $CDCl_3$. Total time was 16⅔ minutes (1000 pulses at 1-second intervals). The spectrum of a concentrated sample is partially reproduced above for comparison. Assignments are written over peaks.



The spectrum of 20 μg of Δ⁹-THC in a 5-mm tube with 400 μl $CDCl_3$. Total time was 16⅔ minutes (1000 pulses at 1-sec intervals). Note the huge background peaks from the residual $CHCl_3$, the H_2O in the solvent and adsorbed on the glassware, and solvent impurity.



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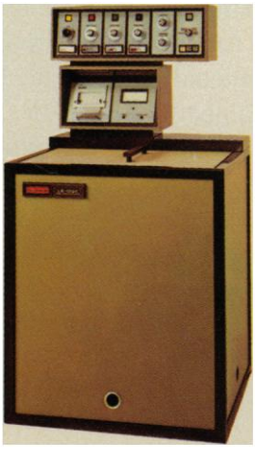

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"And what counts most heavily is that you get all this backup. We publish and make available more LS documentation, clinical briefs, data sheets and procedures than anyone else. We have three regional applications support centers. And they really operate. Training courses, workshops, seminars — even in-lab assistance for our customers. And our 425 field men are really on-call when you need them, out of 28 sales and service offices around the country.

"Being on the inside of this field, I know what problems can crop up. And I don't see why anyone in LS would settle for less than the Beckman combination of reliability, simplicity, and technical support.

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The Concentration of Macromolecules

Current Applications

Current applications of molecular filtration include concentrating macromolecules from column chromatography eluates, viruses from water supplies and cell lysates, proteins from cell extracts, lipopolysaccharides from bacteria and Bence-Jones protein from urine. Enzymes and nucleic acids can also be concentrated with minimal denaturation.

Standard Methods

Macromolecules typically are concentrated by precipitation, pressure dialysis, lyophilization, evaporation, ultracentrifugation, chromatography, and molecular sieving. Although widely used, these methods have one or more of the following disadvantages: They are either slow, cumbersome, damaging to molecules, expensive, or multiprocedural.

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Our recently developed selectively permeable membrane filters retain macromolecules, on the basis of size, above the filter surface. Large or small volumes are easily handled, equipment is simple and relatively inexpensive, and processing is fast yet gentle.

How fast? With membrane filtration 3ml of CSF can be concentrated 100X in 10 to 15 minutes. Two companies which prepare purified immunoglobulins have reduced processing time for a batch of serum from 3 weeks to 4 days by adopting a process using Millipore Pellicon® ultrafiltration. How gentle? Enzymes are concentrated with little or no loss of activity.

A major advantage of molecular filtration (ultrafiltration) in the concentration of macromolecules is that smaller molecules such as salts are not retained by the filter. Thus their concentration does not increase along with macromolecular species and subsequent dialysis is not required. A solution of protein in buffer can be concentrated 100:1 or more without concentrating the buffer molecules.

Millipore and Molecular Filtration

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We invite inquiries concerning these or other possible applications, and we extend our filtration technology and professional evaluation services to those interested in developing new or improved techniques. We also offer technical literature, and our technical representatives are available for seminars and training workshops throughout the U.S. and Canada.

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Find out why there are more Intertechnique computerized counting systems in the field than those of all other manufacturers combined.

Multi-Mat is the world leader in computerized beta and gamma counting. You have as many as four counters — simultaneously — on-line to a central processor. You can use any combination of Intertechnique liquid scintillation or gamma counters.

Multi-Mat gives you:

- **More programs**
- **More flexible programming**
- **More flexible configurations**

More Programs . . . Multi-Mat users get a library of more than 40 fully commented programs . . . and new ones are being added almost weekly. Programs for liquid scintillation or gamma counting: for RIA (we'll provide a tailor-made program for any commercially available RIA kit); for plotting histograms; for counting 1, 2 or 3 isotopes; for quench correction; specific activity; blood clearance; statistics, and more. For use on- or off- line. We're proud of what we have; we'll be more than happy to show you.

Flexible Programming . . . Multi-Mat users get LEM, the only high-level computer language developed expressly for bio-medical use. LEM is simple, straightforward, easily learned. It allows any user to write programs to meet your own specific requirements. No more waiting for someone else to get around to doing what you want done. No more being forced to accept compromises! With LEM, you can make yourself independent of a programmer because LEM is the language that can make everyone a programmer.

Flexible System Configurations . . . Multi-Mat systems can have from 1 to 4 counters . . . 200 sample or 300 sample . . . liquid scintillation or gamma . . . in any combination! Each counter may have a different operating program while all of them are on-line at the same time to a single Multi-20 central processor. That kind of flexibility is exclusive to Intertechnique . . . and there's even more. Each of several users of a single counter can have his own program which is automatically called into use only when his samples are in place and counting. And all of this programming is stored in core and called out as programs should be — electronically — and in microseconds. You won't find an equivalent elsewhere, because there is none.

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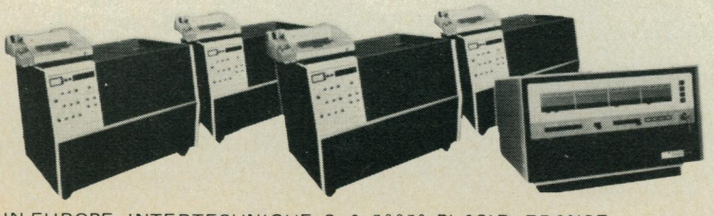

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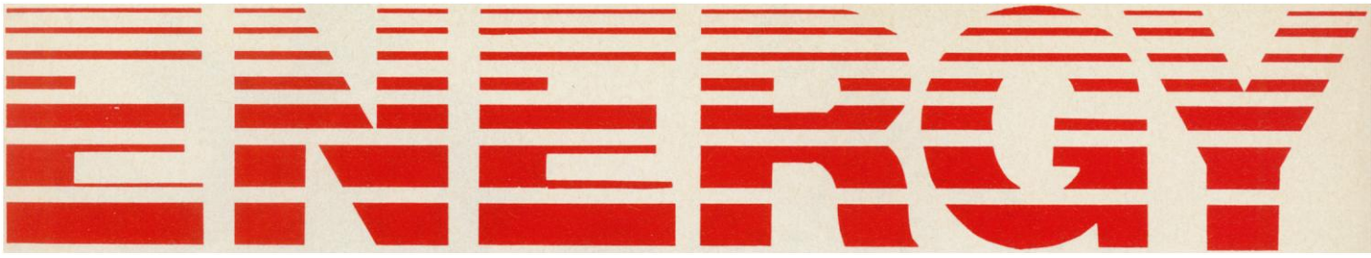

The following is a comprehensive list of items which can supplement your reading on the energy problem or can form the nucleus for your collection on energy:

Books and Magazine:

Energy and the Future by Allen Hammond, William Metz, and Thomas Maugh II. This book surveys current and future sources of energy and describes relevant technologies. Now in its third printing, it is used as a text in universities and colleges. Casebound, $9.95 ($8.95 Member price). Paperbound, $4.95 ($4.45 Member price).

Energy—A Glossary by Thomas Maugh II. Definitions for some of the most commonly encountered terms used in discussing energy. $1.00.

Science (Energy Issue), 19 April 1974. This issue is devoted to the energy crisis. $2.00.

Tapes:

Audiotapes are available as 5-inch reels or as cassettes. Playing time is about 3 hours per session. Price is $19.95 for the first session and $16.95 for each additional session of the same symposium.

41-69—Power Generation and Environmental Change (Sessions I–II)
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306) C. A. Berg, "Energy Conservation through Effective Utilization," 13 July 1973
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313) E. Hirst and J. C. Moyers, "Efficiency of Energy Use in the United States," 30 March 1973
321) L. W. Jones, "Liquid Hydrogen as a Fuel for the Future," 22 Oct. 1971
308) G. A. Lincoln, "Energy Conservation," 13 April 1973
320) E. F. Osborn, "Coal and the Present Energy Situation," 8 Feb. 1974
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312) D. Pimentel *et al.*, "Food Production and the Energy Crisis," 2 Nov. 1973
317) T. B. Reed and R. M. Lerner, "Methanol: a Versatile Fuel for Immediate Use," 28 Dec. 1973
324) D. J. Rose, "Controlled Nuclear Fusion: Status and Outlook," 21 May 1971
190) L. A. Sagan, "Human Cost of Nuclear Power," 11 Aug. 1972
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Books: *Energy and the Future*_____ *Energy—A Glossary*_____ *Science* (19 April 1974)_____

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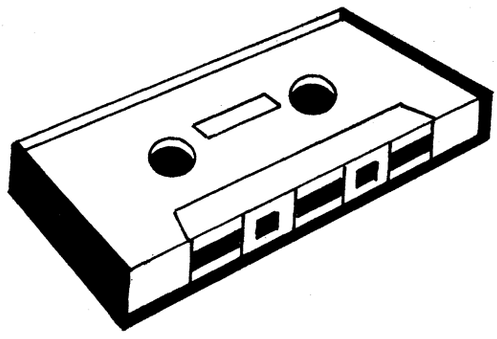
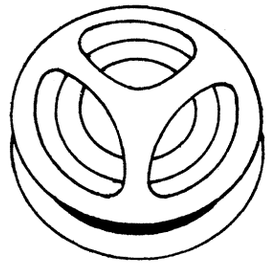
1974 AAAS Audiotapes





The following audiotapes were made during the 1974 AAAS Annual Meeting in San Francisco, 24 February to 1 March. They are available in 5-inch reels or cassettes. The price is $19.95 for the first session and $16.95 for each additional session of the same symposium. Each session is about 3 hours in length.

168-74—The Development of American Science in the 19th and 20th Centuries (Sessions I–II). Recent research on the history of American science with special emphasis upon the contributions of past presidents of the AAAS in connection with the organization's 125th anniversary. *Robert H. Kargon and Harry Woolf, Johns Hopkins University; Sally Kohlstedt, Simmons College; Charles Weiner, American Institute of Physics; and others.*

169-74—Architecture and the American Future: The Coming Showdown (Sessions I–IV). Architects, with their technical knowledge combined with a designer's attitude, can usefully comment on future environments perhaps better than those persons especially skilled in "social planning" or the "science and technology of physical resource allocation." *Nathaniel Alexander Owings, San Francisco; Glenn T. Seaborg, Lawrence Berkeley Laboratory; Paolo Soleri, Cosanti Foundation; and others.*

170-74—Biological Control of Populations (One Session). Not only must the size of human populations be better regulated but new methods, preferably nonchemical, are needed for control of populations of pests and parasites of man's domestic plants and animals. *R. W. Allard and M. M. Green, University of California (Davis); Robert van den Bosch, University of California (Berkeley); Timothy Prout, University of California (Riverside); and Kingsley Davis, University of California (Berkeley).*

171-74—Biomedical Aspects of Aging (Sessions I–IV). In general, there is a decline in physiological function with age. The loss of vigor and declining mental function are two changes familiar to all. A review of classical issues and problems on aging is presented. *Lester Smith, National Institutes of Health; F. Douglas Lawrason, Schering-Plough Corp.; Robert D. Terry, Albert Einstein College of Medicine; and others.*

172-74—Cosmic Evolution (One Session). An evolutionary scheme for the formation of the universe with a discussion of the possibility of intelligent life in the universe and methods for comunicating with it. *George Field, Smithsonian Astrophisical Observatory; Frank Drake, Cornell University; A. G. W. Cameron, Harvard College Observatory; and Cyril Ponnamperuma, University of Maryland.*

174-74—The "Dismal Science" Comes of Age: Economics in America's Third Century (One Session). Marina Whitman, University of Pittsburgh. As man gains control over his environment, and more and more things once regarded as free (e.g., air and water) become visibly scarce, the "trade-offs" or choices among scarce resources which are the central concern of economists will move more and more to the forefront.

175-74—Energy and Society (Session II only). Energy and social policy. *Robert Engler, City University of New York; W. Fred Cottrell, Miami University; Arnold H. Packer, Committee for Economic Development, Washington, D.C.; and others.*

176-74—Ethical and Public Policy Issues in Amniocentesis and Biomedical Innovation (Sessions I–II). New breakthroughs in genetics are increasingly making heredity, once a mystery of nature, into a matter of human decision-making and design. Amniocentesis is a new biomedical technique allowing early diagnosis of genetic diseases of the unborn. *Amitai Etzioni, Columbia University; Lloyd Smith, University of California (San Francisco); Leon E. Rosenberg, Yale University; and others.*

177-74—Search for Extraterrestrial Life (One Session). *Harold P. Klein and Keith A. Kvenvolden, NASA-Ames Research Center; Carl Sagan, Cornell University; and others.*

178-74—Food Additives: Beneficial or Deleterious? (One Session). Nutritive value of food additives in child and adult diets are considered. Possible deleterious effects of additives are discussed. Numerous benefits and potential risks of additives are weighed against each other. *W. Ann Reynolds, University of Illinois at the Medical Center; L. J. Filer, Jr., Iowa College of Medicine; Leon Goldberg, Albany Medical College of Union University; and others.*

179-74—Fusion Power (One Session). Power from controlled thermonuclear fusion of the light elements promises to be a viable and unique solution to the energy crisis facing our technological society. *Rolf M. Sinclair, National Science Foundation; Robert L. Hirsch, U.S. Atomic Energy Commission; and others.*

180-74—Implied New Directions for Science and Technology (One Session). A large part of the national effort in R & D is heavily influenced by new and dimly perceived federal policies in allocating resources; much can be gained from a firsthand observation of the system by which the allocations are made and carried out. *Howard J. Lewis,* Public Science; *Hugh Loweth, Office of Management and Budget, Washington, D.C.; Eugene B. Skolnikoff, Massachusetts Institute of Technology; and others.*

181-74—Neurobiological Mechanisms of Adaptation and Behavior (Sessions I-IV). *Arnold J. Mandell, University of California (San Diego); Walter Lovenberg, National Heart and Lung Institute; Joseph J. Schildkraut, Massachusetts Mental Health Center; and others.*

182-74—New Developments in Brain Function for Speech Perception and Production (One Session). Psychophysical and physiologic data on general models and data on asymmetry of the human brain for speech perception and production. *C. I. Berlin, Louisiana State University Medical Center; Ruth S. Day, Yale University; and others.*

183-74—The Emerging Portrait of the Planets (Sessions I-II). The Moon, Mars, Venus, and Jupiter. *Carl Sagan, Cornell University; S. I. Rasool, NASA; Bruce Murray, California Institute of Technology; and others.*

184-74—Science and the People's Republic of China (Sessions I-II). Reports from American scientists who have visited China. *Anne Keatley, National Academy of Sciences; John W. Lewis, Stanford University; Edward Chao, U.S. Geological Survey; and others.*

185-74—Science for the Naked Eye: Or the Physics of Everyday Experience (Sessions I-II). The fundamental concepts of science that can be derived from our everyday experiences. *Rolf M. Sinclair, National Science Foundation; James E. Gunn and Eugene Shoemaker, California Institute of Technology; and others.*

186-74—Velikovsky's Challenge to Science (Sessions I-II). Immanuel Velikovsky has concluded that close encounters between the earth and the planets Mars and Venus occurred at about 1500 B.C. and 775 B.C. Arguments for and against his theory are discussed. *Immanuel Velikovsky; Carl Sagan, Cornell University; J. Derral Mulholland, University of Texas; and others.*

187-74—Skylab Science Experiments: A First Report (Sessions I-IV). Scientific information gathered from the Skylab flights. *George W. Morgenthaler, Martin Marietta Corp.; William C. Schneider, National Aeronautics and Space Administration; Philip O'B. Montgomery, Southwestern Medical School; and others.*

188-74—Nutrition and Numbers in the Third World. J. George Harrar, president emeritus, The Rockefeller Foundation. The progress of civilization is squarely dependent on the provision of an adequate diet, health protection, education, and productive opportunity for all of the world's citizens.

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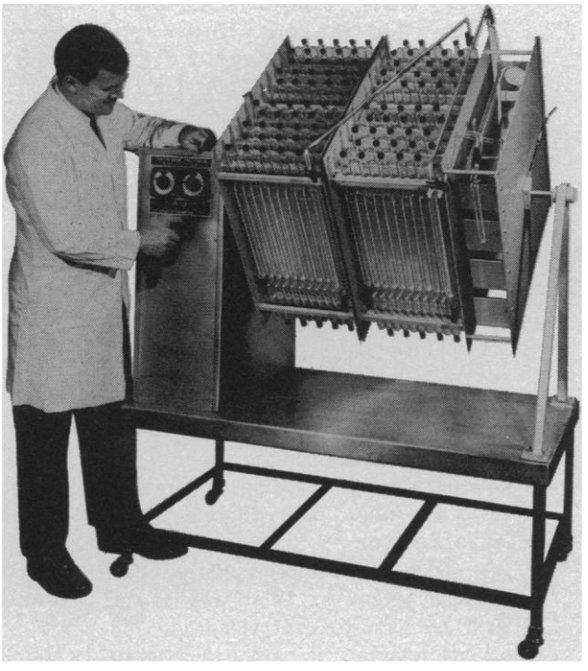

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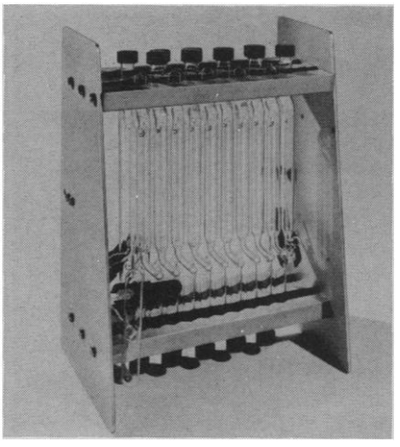

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they study as "bacteria under the microscope," non-Japanese primatologists, as a matter of course, have made a point of learning about their subjects' life histories and personalities. Indeed, van Lawick-Goodall (*2*), whose work in this field is perhaps the best known to nonprimatologists, began by naming some of her chimpanzee subjects after "popular and traditional figures," for example, Huxley and Leakey.

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Philadelphia 19174

References

1. J. Frisch, in *Studies in Japanese Culture*, J. Roggendorf, Ed. (Sophia University, Tokyo, 1963), pp. 225–244.
2. J. van Lawick-Goodall, *Anim. Behav. Monogr.* **1**, 161 (1968).

Born into Japanese culture, having studied science and technology in Japan, and having had the opportunities of studying and teaching in America and of visiting both European and Asian countries, I have come to be very much aware of the cultural differences between the West and Japan. Such consciousness provided the impetus for my article, although its basic idea was shaped some 10 years ago. To my surprise and delight, I am now getting a wide response, regardless of the fact that I could only present a sketchy description of the theme.

I am glad that Robert B. Livingston has reinforced my point with an additional example drawn from the field of contemporary physics. I agree with him in his emphasis on the fruitfulness of cross-cultural exchanges; modern science and technology should be considered more in relation to the cultural soil in which they were born and into which they are introduced.

It is true, as Irene Bloom states, that the Chinese invented instruments to study earthquakes at a very early date. The Japanese also, for example, developed an exquisite metallurgical art of producing swords and invented an advanced form of mathematics called *wasan*. Yet, none of these inventions and techniques gave birth to modern science. Modern science, at least at the time of its birth, premised a certain world view which, I believe, is uniquely Occidental.

Regarding the comment by Robert S. O. Harding about my example of the field studies of nonhuman primates, I want to reply that there existed a big

natural "gap between West and East," and this gap has been artificially narrowed down to its present state primarily as a result of mutual exchange. I strongly suspect that it was the Japanese workers that first started to name the animals they studied and that there still is something different between the respective approaches of Western and Japanese researchers.

In closing, let me cite the following passages from the preface of Robert Hooke's *Micrographia* (1665) (*1*).

> It is the great prerogative of Mankind above other Creatures, that we are not only able to behold the works of Nature, or barely to sustein [sic] our lives by them, but we have also the power of considering, comparing, altering, assisting, and improving them to various uses. . . . And as at first, mankind fell by tasting of the forbidden Tree of Knowledge, so we, their Posterity, may be in part restor'd by the same way, not only by beholding and contemplating, but by tasing [sic] too those fruits of Natural knowledge, that were never yet forbidden.

This will help illustrate how deeply and positively modern scientific investigation of nature was rooted in Western thought and culture.

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History of Science, University of Tokyo, Komaba, Meguro-ku, Tokyo 153, Japan

References

1. R. Hooke, *Micrographia* (Dover, New York, 1938), preface.

Oncogene Theory

In reference to the oncogene theory of Huebner and Todaro, Thomas H. Maugh II (Research News, 22 Mar., p. 1181) states that ". . . it offers no normal role for the oncogene or the virogene."

The proponents of the oncogene theory have clearly suggested a role for the type C RNA genome in embryonic development (*1*). This possibility, as well as others, has been reiterated by Bryan (*2*).

DANIEL D. JONES
Information Systems Programs, General Electric Company, 1400 Wilson Boulevard, Arlington, Virginia 22209

References

1. R. J. Hueber *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **67**, 366 (1970).
2. W. R. Bryan, in *Cancer Medicine*, J. F. Holland and E. Frei, Eds. (Lea & Febiger, Philadelphia, 1973).

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24 May 1974, Volume 184, Number 4139 **SCIENCE**

Maintaining a Pluralistic Society

The tides are running against the private sector in education and in American life generally. The watchwords are equality and cost-effectiveness.

There is nothing new about egalitarianism in this country. De Tocqueville in the early 19th century already saw it as the hallmark of democracy in America. But today it is assuming vigorous new forms. According to this tendency, equality of opportunity is not enough; what must be guaranteed is equality of result.

In the United Kingdom we are seeing what "equality of results" means to the private sector in secondary education in the Labour Party's announced determination first to remove the tax advantages and government support now enjoyed by Eton, Harrow, Rugby, and the rest, and then to wipe them out entirely by making it illegal to charge fees for full-time school attendance. The rationale, in the words of Roy Hattersley, M.P., is simple: "Competitive education, which allows the few to leap further and further ahead, insures that the less fortunate fall further and further behind. That is why the pursuit of equality of opportunity had to be replaced by the pursuit of equality itself."

The notion that one student's progress necessarily implies another's failure may seem preposterous. Yet we are hearing logic like Mr. Hattersley's more and more often in this country.

Perhaps equally threatening is the newfound passion for rationalizing the allocation and use of resources throughout our society. We are seeing the creation of new authorities, armed with fresh powers of investigation and recommendation, sometimes even outright implementation, whose task it is to eliminate inefficiency and duplication throughout the private and public sectors alike. These so-called "superboards" oversee not only the tax-supported institutions of higher education, but the privately supported, and can shape or limit the latter virtually as if they were parts of the state system.

We believe that a society is more likely to be open and free when the individual citizen's capacity to stand up against the otherwise overwhelming force of modern government is strengthened, and when the state does not possess a monopoly of service to the public—when side by side with great public school systems there are strong independent schools.

The classic defense of the pluralist society is that of Edmund Burke, stimulated (or provoked) by the French Revolution. The revolutionaries, Burke argued, in their zeal for liberty and equality in the abstract, were busily tearing down all of the intermediate corporate bodies and parochial loyalties that stood between the individual and the State. These "little platoons," as Burke called them, were attacked in the name of the most high-sounding principles: Down with feudal distinctions, down with the special privileges of the guilds and the obscurantism and greed of the 18th-century Church. But the result of thus wiping the slate clean, Burke concluded, was to leave the individual defenseless and alone, confronted by the power of an all-encompassing State, which was theoretically his, but over which he had in actuality little or no control.

The message has startling contemporary relevance. We who are responsible for the continuing health of our "little platoons"—and even the greatest of the private universities are "little platoons" when matched against the dimensions of state-supported higher education—we have our work cut out for us, and we don't have a Burke to lend eloquence to our cause.—RICHARD W. LYMAN, *President, Stanford University, Stanford, California 94305*

Adapted from "Remarks" before the 1974 Annual Conference of the National and California Associations of Independent Schools, San Francisco, 21 March 1974.

PRODUCTS and MATERIALS

Portable Area Meter

The model LI-3000 measures leaf area on living plants in the field or laboratory. Tissue area of perforated leaves or those with irregular margins may be measured precisely. The LI-3000 is powered by rechargeable batteries. The device has applications wherever nondestructive area measurement is desired. Lambda Instruments Corporation. Circle No. 780 on Readers' Service Card.

Karl Fischer Titrator

The Metrohm model E547 (Fig. 1) features interchangeable burets that snap in place quickly. This design enables the operator to change solvents or reagent strengths simultaneously. The operator selects direction and polarization current for end-point indication. A light indicates attainment of end point and the reagent consumption may be read to 0.01 milliliter directly from the burets. Brinkmann Instruments Incorporated. Circle No. 776 on Readers' Service Card.

Recording Vacuum Microbalance

The Autobalance model AR-2 features 5-gram capacity, 1-gram maximum weight change, and 0.1-microgram sensitivity. There are 16 fixed recorder ranges from 10 micrograms full scale to 1 gram full scale. The AR-2 has digital zero-suppression which is continuously adjustable during recording and is read directly in milligrams to five places. There is also a "percent sample" control which allows the operator to set the weight of the sample as 100 percent on the recorder and record the weight loss as a percentage of the original weight. Perkin-Elmer Corporation, Instrument Division. Circle No. 779 on Readers' Service Card.

Data Reduction System for Nuclear Counting

The MB series is an integral accessory for gamma counters and radioimmunoassay instruments. Installation results in data presentation in required units such as nanograms per milliliter, micro international units per milliliter, microgram percent, and others. Programming modules known as RIA Sets render the systems conversational. Specific sets are available for use with designated kits. A general purpose set allows flexibility in radioimmunoassay. The MB system features positive test and protocol identification preceding data entry. It rejects obviously incorrect answers and, during operation, flags abnormal values and answers outside ±10 percent limits. Sample number is kept track of and upon completion of calculations the program is erased. Beckman Instruments, Incorporated, Scientific Instruments Division. Circle No. 777 on Readers' Service Card.

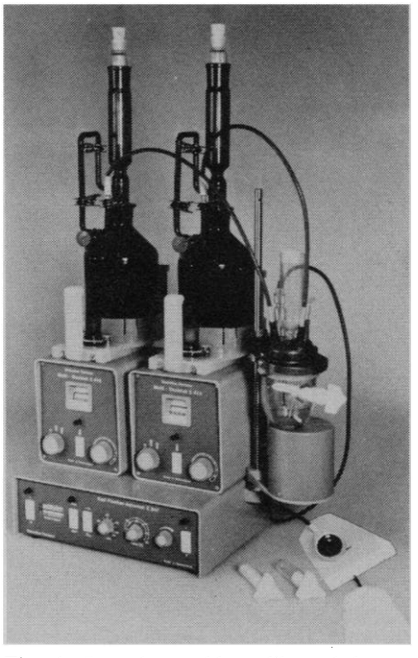

Fig. 1. Interchangeable calibrated burets make all steps of end point determination easier with Brinkmann's E547 Karl Fischer titrator.

pH Meter/Blood Gas Analyzer

The IL 513 (Fig. 2) automatically introduces blood, buffers and gases, eliminates sample splitting, and provides wash and shutdown cycles. The tanks, tubes, and electrodes are transparent; the operator can monitor all steps in analysis and detect bubbles, clots, or other malfunctions. The device measures pH, pCO_2, and pO_2 and derives values for base excess, bicarbonate, and carbon dioxide content. Results are displayed or printed in 72 seconds. Instrumentation Laboratory Incorporated. Circle No. 783 on Readers' Service Card.

Video Display Terminal

The Delta 5500 (Fig. 3) offers 2048-character buffered memory, speeds up to 9600 bits per second and bit parity checks without response. The terminal displays up to 27 lines of 80 characters each. Characters are formed by a seven-by-nine dot matrix. All of the characters in memory may be displayed regardless of line widths. Other features include blinking and underlining, TTY, buffered and TTY paper-tape

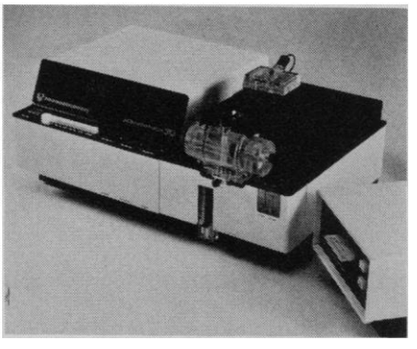

Fig. 2. The model 513 blood gas analyzer for clinical or research applications has transparent tanks, tubes, and electrodes and features simple push-button control and automatic operation.

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 846A and 910C and placing it in the mailbox. Postage is free.—RICHARD G. SOMMER

modes, a protected data mode, a six-position tab and margin control, and editing functions. Delta Data Systems Corporation. Circle No. 784 on Readers' Service Card.

Metric Measuring Kit

The kit includes caliper, thread-pitch gauge, tape measure, ruler, and a metric information chart. The vernier caliper is calibrated in millimeters, fractions, and decimals and is adjusted with a thumb roller. The thread-pitch gauge has 20 blades with a range from M2 to M60 millimeters. The automatic-lock power tape extends to 3 meters and carries inch and millimeter markings. The 20-millimeter steel ruler also has inch markings. The chart features conversion tables of fractions, decimals to millimeters, ISO metric screw thread comparison, and other data. The kit is $6.95. Zelenda Machine & Tools Corporation. Circle No. 778 on Readers' Service Card.

Cryostat for Microtomes

The Cryo-Histomat MK-2 (Fig. 4) provides for preparation of histologic "frozen sections." A solid-state Peltier device makes up the cryo-stage which is attached to the microtome. A separate power supply delivers the current. A small volume of water is circulated to carry off the heat extracted from the specimen. Freezing is rapid and stabilizes at about −40°C. The console houses switches, a temperature regulater, and an ammeter in addition to the power equipment. Polarity can be reversed with a toggle switch. Hacker Instruments Incorporated. Circle No. 775 on Readers' Service Card.

Mixer for Liquid Samples

The Safety Uni-Mixer delivers 20 rocking motions per minute to ensure mixing in up to eight 25 by 150 millimeter tubes or up to 44 6-millimeter tubes at once. It can accommodate over 40 13-millimeter blood collection tubes. Tubes may be added or removed without stopping the unit or disturbing the mixing of samples in other tubes. Vessels of different sizes and capacities can be rocked simultaneously. Lab-Line Instruments, Incorporated. Circle No. 781 on Readers' Service Card.

Laser Power Meter

The model IL500 (Fig. 5) measures power from 2.0×10^{-7} to 250 watts. It has an illuminated dial for operation in a darkroom, reads directly in watts or watts per square centimeter, and has three recorder outputs—10, 100, and 1000 millivolts. It can be operated as a nanoammeter and, with photomultiplier accessories, its sensitivity is extended to 1×10^{-14} watt. Standard spectral range is from 200 to 800 nanometers. International Light Incorporated. Circle No. 782 on Readers' Service Card.

Biofeedback Instruments

A complete line of equipment is available to monitor and feedback brainwaves, muscle activity, blood flow, surface temperature, and galvanic skin response. The BioLab system can accommodate five input modules. The instruments may be interfaced to polygraphs, calculators, or other recording devices. Cyborg Corporation. Circle No. 785 on Readers' Service Card.

Literature

Tektronix Computer Products 1974 Catalog lists a complete line of terminals, peripherals, display units, accessories, interfaces, software, and advisory services. Tektronix Incorporated. Circle No. 786 on Readers' Service Card.

25 Ideas . . . How to Put a Real Time Spectrum Analyzer to Work for You explains spectrum analysis, real time analysis, and digital integration. Signal Analysis Operation, Test Instruments Division, Honeywell, Incorporated. Circle No. 787 on Readers' Service Card.

What Kind of a World Do You Live In? introduces the reader to a line of instruments for vacuum ultraviolet, ultraviolet-visible-infrared, and electron spectroscopy. GCA/McPherson Instrument. Circle No. 788 on Readers' Service Card.

Spectrophotometers is a 12-page brochure that discusses physical and performance characteristics of ultraviolet-visible, ultraviolet-visible-near infrared, atomic absorption, and raman spectrophotometers. Varian Associates, Instrument Divsion. Circle No. 789 on Readers' Service Card.

Optical Mechanical Construction System (Catalog 07) and *Optical Building Block Unit* (Instruction Manual 06) describe materials for prototype assemblies, demonstrations, and research that require linear, planar, or spatial assemblies. Klinger Scientific Apparatus Corporation. Circle No. 795 on Readers' Service Card.

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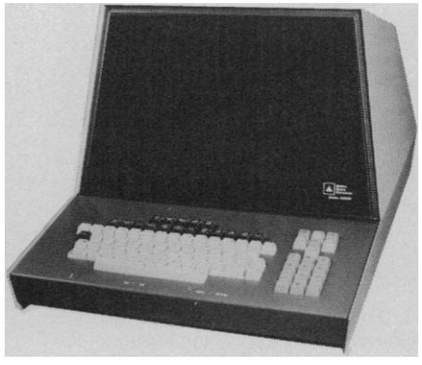
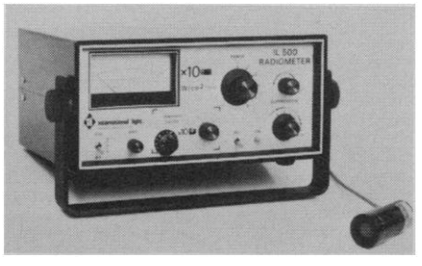




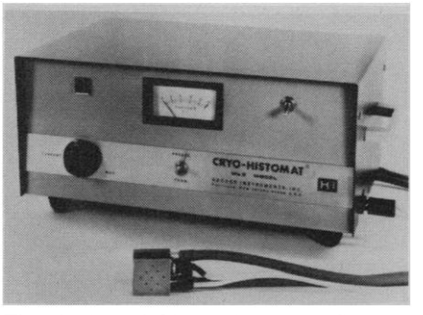
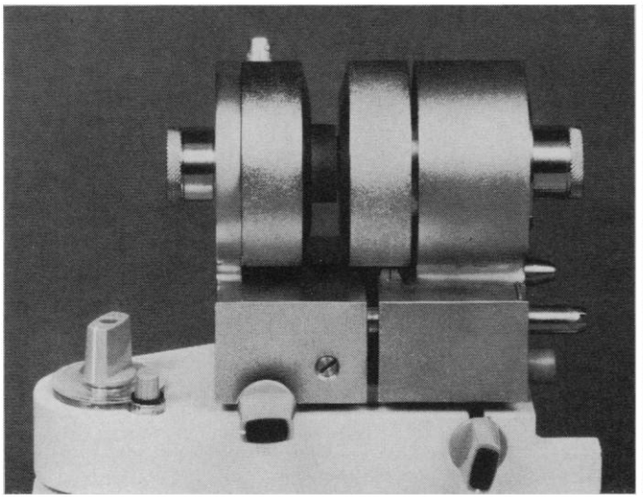
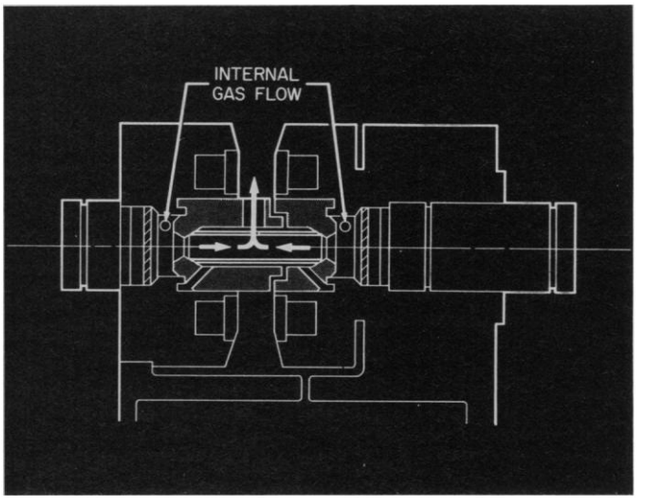


Fig. 3 (top left). Delta Data Systems manufactures this model 5500 video display terminal. It has a 2048-character buffered memory and displays up to 27 lines of 80 characters each. Fig. 4 (top right). The Cryo-Histomat MK-2 from Hacker Instruments provides rapid freezing of tissue samples for microtomy and rapid reversal of polarity to allow specimen removal or repositioning. Fig. 5 (bottom left). International Light offers the IL 500 radiometer for power measurement in the range of 200 to 800 nanometers. Readout is in watts or watts per square centimeter.

The new Perkin-Elmer HGA-2100: the best in flameless AA gets better.





The new HGA-2100 Graphite Furnace combines unmatched performance with ease-of-use and safety. The large sample capacity and high sensitivity provide outstanding detection limits. The new opposed gas-flow system and improved furnace temperature distribution make previously difficult analyses routine. The new mounting system enables quick and easy alignment without tools and simplifies interchanging the HGA-2100 with flame systems.

Samples in solution are pipetted directly into the Furnace, while solid samples are inserted from the end. During the operator-controlled temperature program, the opposed internal gas-flows (shown in the cross-sectional drawing above) confine the sample to the hotter central portion of the Furnace eliminating potential condensation problems and substantially reducing background absorption with many types of samples. The opposed gas-flows efficiently sweep from the Furnace all vaporized sample matrix. During atomization, the gas-flows are automatically reduced to provide maximum residence time and sensitivity.

Check these HGA-2100 features against your requirements for flameless sampling.

Safety

- No flames or combustible gases required.
- Temperature-sensing safety system to control maximum external furnace temperatures.
- Closed furnace design for operator protection.

Performance

- Detection limits 100X to 1000X better than with flame sampling.
- Opposed gas-flow design to eliminate condensation and minimize potential background absorption interferences.
- Sample solution capacity of up to 100 microliters for best detection limits.
- Constant current power supply with feedback control gives outstanding day-to-day and lab-to-lab reproducibility (and compensates for most voltage reductions automatically).
- Fully automatic gas controls with variable atomization-flow for control of sensitivity.
- One graphite tube optimized for all elements, for aqueous or organic solutions, and for solid samples.
- Less than 30 seconds cooldown time to provide faster sample analyses.

Convenience

- Readout directly in temperature from ambient to 2800°C in all three cycles (temperatures are continuously adjustable).
- Automatic temperature programming with time and temperature under operator control.
- Automatic readout controls for remotely activating recorder, peak reader, etc.
- Convenient and quick alignment without tools.

For further information, write Instrument Division, Perkin-Elmer Corporation, Main Avenue, Norwalk, Connecticut 06856.

Note: Perkin-Elmer offers several versions of the Graphite Furnace which have similar control functions, performance characteristics, and price. To determine which version is available in your area contact your local Perkin-Elmer sales representative.

PERKIN-ELMER

Circle No. 120 on Readers' Service Card

niture, supplies, and chemicals. Fisher Scientific Company. Circle No. 790 on Readers' Service Card.

Literature References 1974 documents the use of Sephadex, Sepharose, dextrans, and Ficoll in research applications. Pharmacia Fine Chemicals. Circle No. 791 on Readers' Service Card.

Plastic Centrifugeware Catalog includes plastic tubes and enclosures for use in ultracentrifuges and in radioimmunoassays and other multi-tube procedures. Cal-Nova Manufacturing Company. Circle No. 792 on Readers' Service Card.

Series MKK and BMKK Laboratory and Medical Microscopes outlines monocular and binocular designs for application in clinical and medical laboratories. Unitron Instrument Company. Circle No. 793 on Readers' Service Card.

8800 Turret-Head Sequential Sputtering System is the subject of an illustrated brochure. Materials Research Corporation. Circle No. 794 on Readers' Service Card.

Prestidigitator is an illustrated product sheet that gives specifications of the model 801A *p*H/millivolt meter. Orion Research Incorporated. Circle No. 796 on Readers' Service Card.

Concrete Testing Equipment Catalog devotes 88 pages to apparatus for industrial, research, and engineering applications. Soiltest, Incorporated. Circle No. 797 on Readers' Service Card.

1974 Lab Instruments Catalog describes more than 120 devices including flowmeters, syringes, burets, manometers, and McLeod gauges. Roger Gilmont Instruments, Incorporated. Circle No. 798 on Readers' Service Card.

Series 5830A Reporting Gas Chromatographs illustrates and describes functions and specifications of a line of analytical systems. Software integration, programming, and setup are detailed. Hewlett-Packard Corporation, Avondale Division, Circle No. 799 on Readers' Service Card.

Clinilogics is a newsletter that incorporates descriptions of clinical techniques and products and light humor. Calbiochem. Circle No. 800 on Readers' Service Card.

The General Purpose, High Precision, Digital Oscilloscope is a 12-page brochure that outlines the characteristics and capabilities of devices incorporating digital techniques. Nicolet Instrument Corporation. Circle No. 801 on Readers' Service Card.