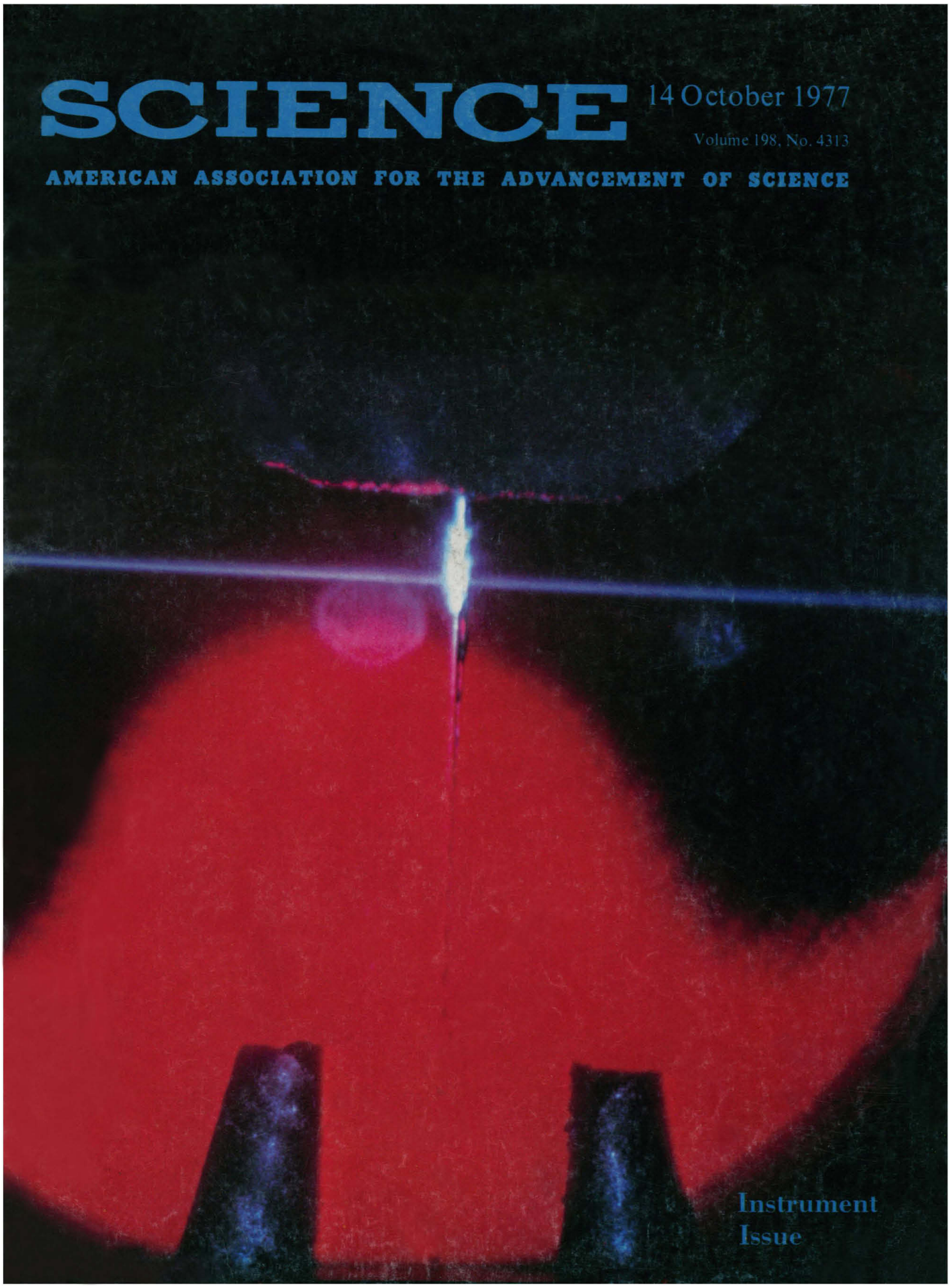
SCIENCE

14 October 1977

Volume 198, No. 4313

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Instrument Issue

An even better quiet Centrifuge: Beckman J-21C.

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You can start a quiet and more efficient revolution in your laboratory with a J-21C. Send for Data File 366 to Beckman Instruments, Inc., Spinco Division, 1117 California Ave., Palo Alto, California 94304.

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An Obelia, a microscopic marine animal found in tidal pools, in the medusa stage of its life cycle.

Photomicrograph by Dr. Robert F. Smith N.Y. State College of Veterinary Medicine

Look to Nikon

With a tireless dedication to the creation of superior optics, Nikon aids the scientist in his pursuit of truth. But superb optics are not enough. The complete Nikon system—attachments, accessories, options, flexibility of design, broad instrument line—frees the researcher to cross the most distant frontiers. For optical instrumentation as varied as man's quest for knowledge, look to Nikon.

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よりすぐれた光学レンズ創造への献身的努力を通じて、ニコンは科学者の真実追求の助けとなってまいりました。しかし最高の光学レンズだけでは充分ではありません。完全なニコンシステム — 補助機器、付属品、選択性、デザインの多様性、幅広い製品ライン — は最も離れた未知の世界の探求を可能にしました。人類のあくなき知識の追求に必要なあらゆる光学機器使用にはニコンとご用命下さい。

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14 October 1977

Volume 198, No. 4313

SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Flow cytometer. Fluorescence from biological cells within fluid stream (vertical column) is measured at intersection of laser beam (hortizontal blue line). The fluid stream is broken into uniform droplets; droplets containing cells of interest are electrostatically charged, sorting the cells of interest out of the main population (50,000 cells per minute). See page 149. [Joseph Balbuza, Coulter Electronics, Inc., Hialeah, Florida]

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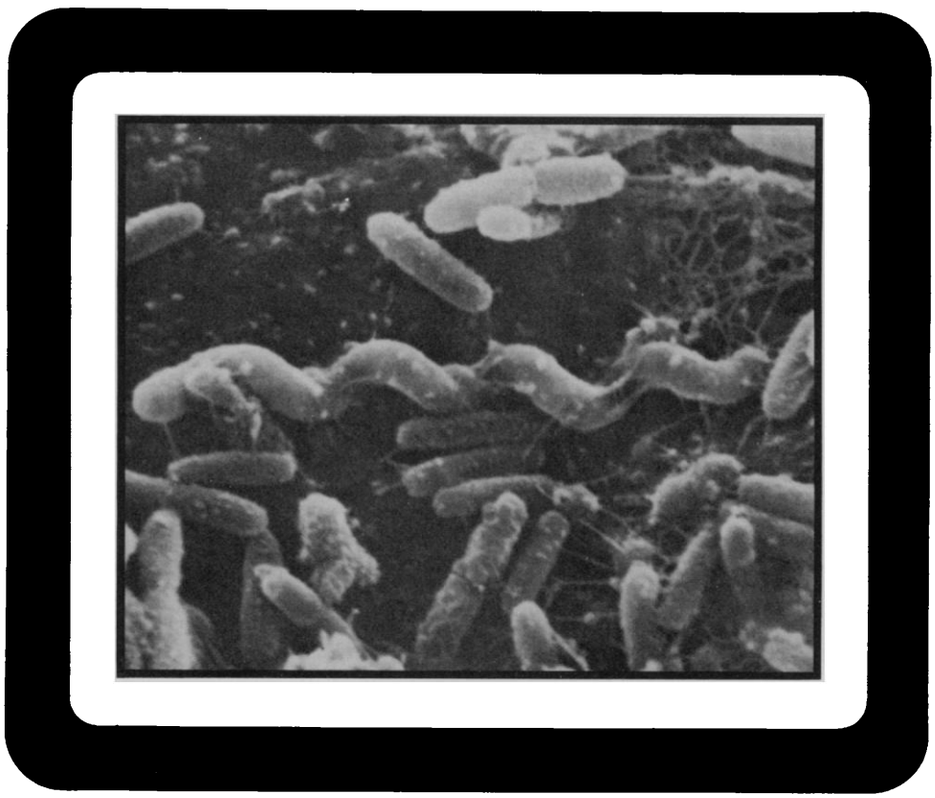

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By **Philip L. Carpenter,** Univ. of Rhode Island. 512 pp. 349 ill. (with 4 color plates). $12.95. May 1977. **Order #2438-3.**

The illustration reproduced on the left is a scanning electron micrograph of decaying salmon tail, showing a spirochete among a large population of bacterial rods. 11,100X. (Photograph by J.M. Sieburth and P. Johnson.) Figure 6-16: from Carpenter's **Microbiology.**

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Edited by **Arthur G. Steinberg,** PhD, Case Western Reserve Univ., **Alexander G. Bearn,** MD, Cornell Univ. Medical College; **Anro G. Motulsky,** MD, Univ. of Washington; and **Barton Childs,** MD, The Johns Hopkins Univ.; with 10 contributors. 290 pp. Illustd. $27.50. Aug. 1977. **Order #8588-9.**

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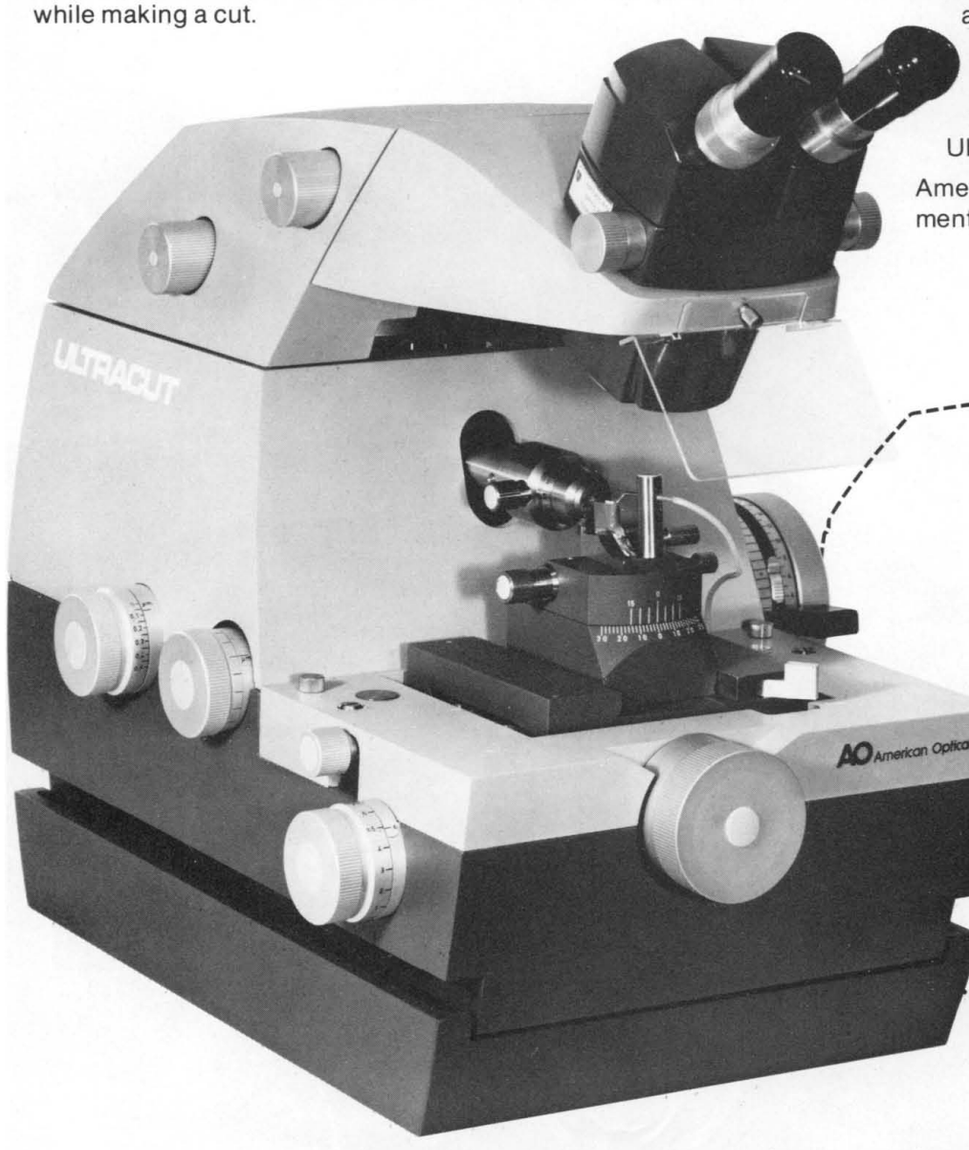

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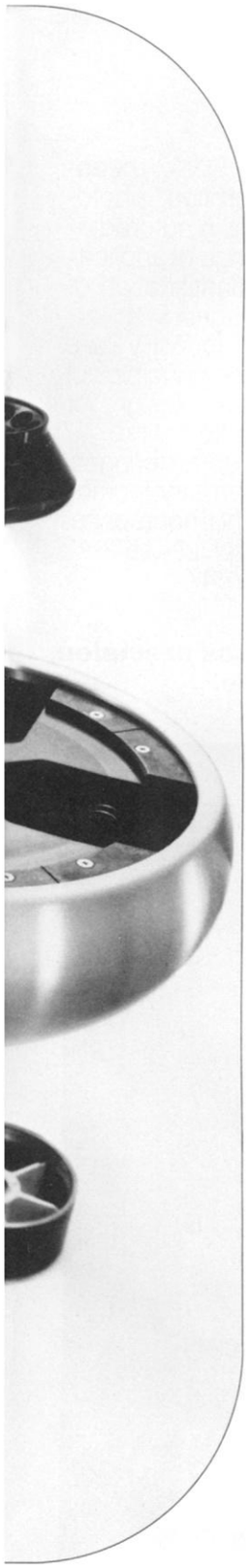
*computernik: Someone who thinks the next best thing to talking to computers is talking about them.

an evolutionary line:



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*U.S. Patent 3,998,383

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Even the electronics are modular. There are eight different functional assemblies to meet any application.

The basic systems can be upgraded to full scanning microspectrophotometry or for computer assisted pattern analysis. Objectives, illumination devices, scanning stages and other accessories can be added as your needs dictate.

Two models are available, the MPV 1 and MPV 2. With either instrument you can simultaneously view the illuminated area, the measuring area and the detail to be measured. And it all can be photographed. MPV 2 offers somewhat greater convenience and more automated operation. For example, you can flip a lever to change from reflected to transmitted light.

Both models can be used for fluorometry of chromosomes, or Feulgen stained nuclei for the determination of DNA; measurement of absorbtion; photometric grain count in autoradiographs; a wide range of applications involving quantification of microscopical images.

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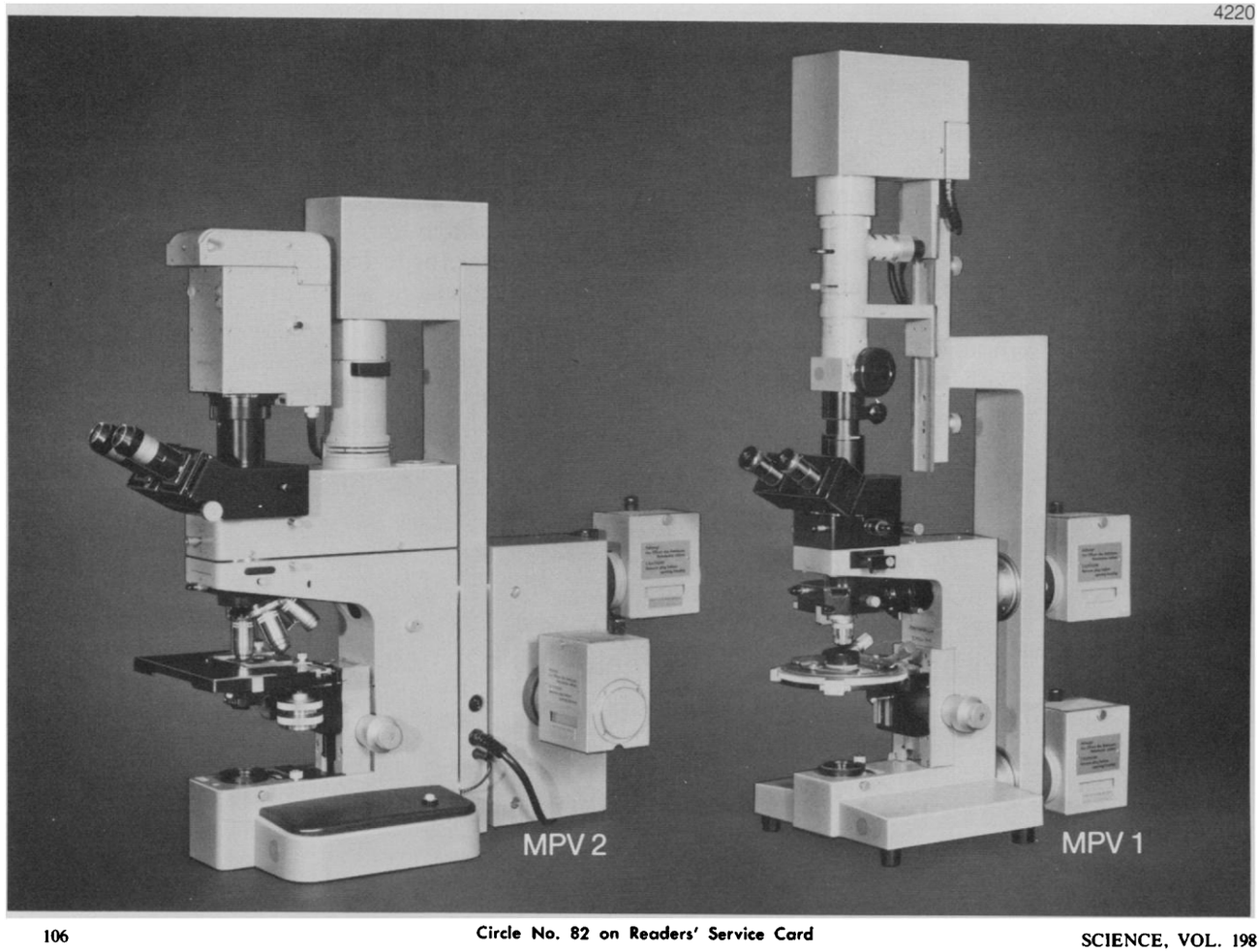

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New Sinclair Cambridge Programmable. An astonishing $29.95!

How pocket calculators grew up

A couple of years ago, calculators took a step forward. Programmability transformed the slick slide-rule calculator into an advanced scientific machine.

Sadly, it also transformed a cheap little calculating aid into a piece of capital investment.

Now the all-new Sinclair Cambridge Programmable puts programmability where it belongs: in the palm of your hand, for less than $30.

The features of the Sinclair Cambridge Programmable

The Cambridge Programmable is genuinely pocketable. A mere 4½" x 2", it weighs about 2oz.

Yet there is absolutely no compromise in the package of functions it offers.

Because the Cambridge Programmable is both a *scientific calculator* with memory, algebraic logic and brackets (which means you enter a calculation exactly as you write it), and a *programmable calculator* which offers simple, flexible through-the-keyboard program entry and operation.

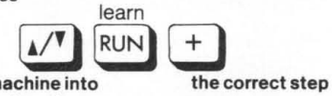
The Cambridge Programmable has a 36-step program memory, and features conditional and unconditional branch instructions (*go to* and *go if negative*).

There is also a step facility, which allows you to step through the program to check that it has been entered correctly. If there is any programming error, the learn key allows you to correct single steps without destroying any of the remainder of the program.

To achieve this, each program key-stroke has an identifying code, or 'check symbol'. (The symbols for the digit keys are the digits themselves, while the symbols for the operator keys are letters printed beside the keys.)

The check symbol for ⊟, for example, is F. So if, as you step through the program, the display shows

it means that ⊟ is programmed as step 26. If step 26 should have been ⊞, all you have to do is press



puts machine into 'learn' mode. **the correct step**

It's as simple as that!

These facilities make the Cambridge Programmable exceptionally powerful, whether it's running programs you devise for yourself or the programs in the Program Library.

Use the 294-program library to tailor the machine to your own specialty

Like a full-size computer – and *unlike* far more expensive specialist calculators – the Sinclair Cambridge Programmable can be programmed to handle calculations concerned with *any* specialty.

And of course, whatever it's doing the Programmable is error-free – in fact, once it's programmed, it can even be given to an operator who doesn't understand the program!

To save you time, and to help inexperienced programmers, Sinclair have produced a library of 294 programs ready to be entered straight into the calculator.

Using these standard programs, the Cambridge Programmable solves problems from quadratic equations (where the program gives both real and imaginary roots) to twin-T filter design, and from linear regression to bond yields. It even plays a lunar landing game! To realise the full power of the Cambridge Programmable, the Program Library is a must.

(The calculator is supplied with 12 sample programs, and full instructions for entering your own program. The four books in the program library are available at $4 each, or $10 for the complete set.)

Why the Cambridge Programmable costs so little

The Sinclair Cambridge Programmable uses the Sinclair talent for miniaturisation to the full – as you'd expect from the company that pioneered the truly pocketable pocket calculator, and recently introduced the world's first pocket TV.

Chip and circuitry design are unique to Sinclair, and the Cambridge Programmable is assembled by Sinclair's own staff at their headquarters plant. Shipped direct, and sold to you direct, the Cambridge Programmable accumulates no middleman's profits on the way.

The result is a pocket programmable calculator of advanced design, sold by the manufacturer with the manufacturer's own 1-year comprehensive guarantee, at a price unmatched by any comparable calculator.

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You need to see it and handle it... to program it yourself in a few seconds to save you hours... to check its performance against tables and graphs... to test the full range of programs available... to evaluate, perhaps, its use as an educational aid in developing a student's computer understanding.

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Nalge introduces the FILMWARE™ Scintillation Tube system for equivalent counting efficiency, plus exceptional economy from carrier to cocktail.
The new Nalge FILMWARE Scintillation Tube revolutionizes liquid scintillation counting by combining the advantages and eliminating the disadvantages of glass and plastic vials.
Like glass, FILMWARE tubes are transparent. Like glass, they have extremely low permeability to toluene. But they permit no adsorption of liquids, proteins, or ions to change the geometry of the system. And FILMWARE tubes contribute a background of less than half that of low-potassium glass.
Like plastic, FILMWARE tubes are unbreakable. But 500 times less permeable to toluene than polyethylene. And they can't swell, jamming the counter and creating the hazard of fire.
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Real savings in cocktail costs

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One-sixth the disposal volume.

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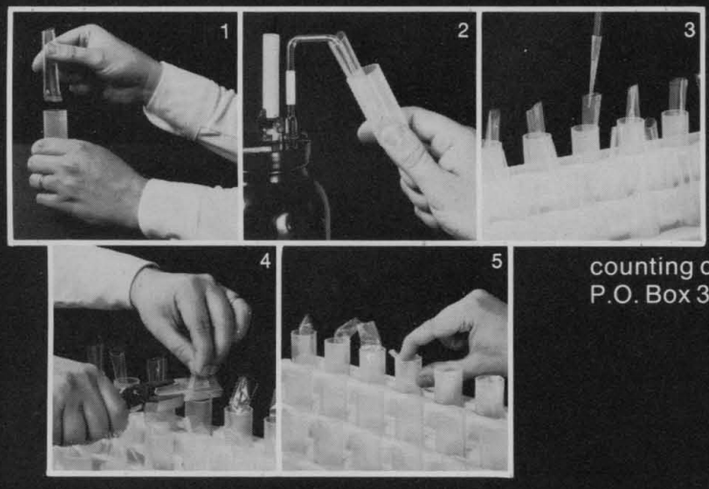
The elements of the system.

Counting with the Nalge FILMWARE Scintillation Tube takes no longer than the system using standard vials. FILMWARE tubes are specially designed to stay open for easy filling.

The optional, reusable carrier vials are straight-walled, for easy insertion of the tubes.

The optional, three-tiered rack provides easy access to the tubes for filling and holds 10-ml FILMWARE tubes without the carrier vials.

The heat sealer seals the tubes in about 2 seconds. It operates at 350° F, well below the ignition temperature of toluene. Tubes can be resealed after an internal standard is added by snipping the tops or puncturing them with a syringe.



1. Place FILMWARE tube into a wide-mouth vial.
2. Dispense as little as 1 ml of cocktail into tube.
3. Pipet sample into each tube. 4. Seal the tubes shut.
5. Tuck tubes down into carrier.

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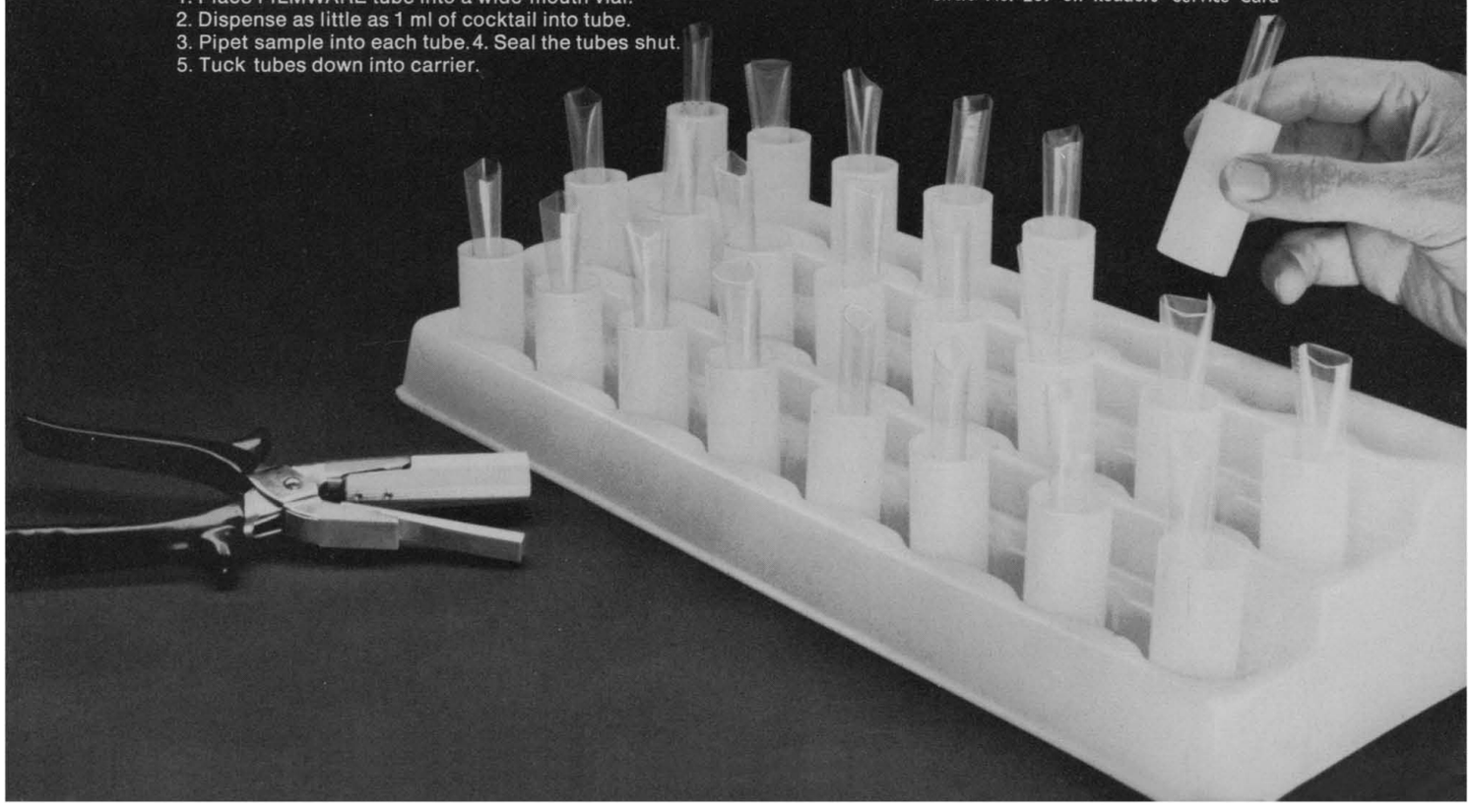

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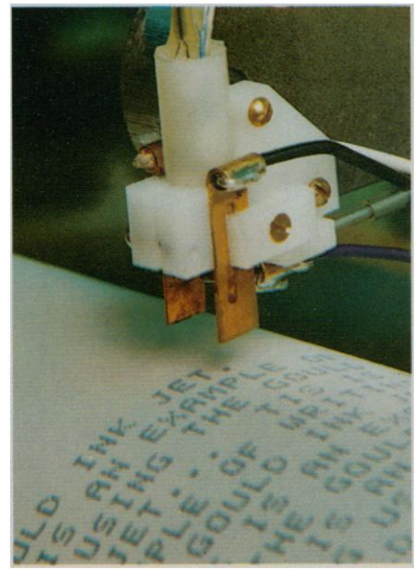

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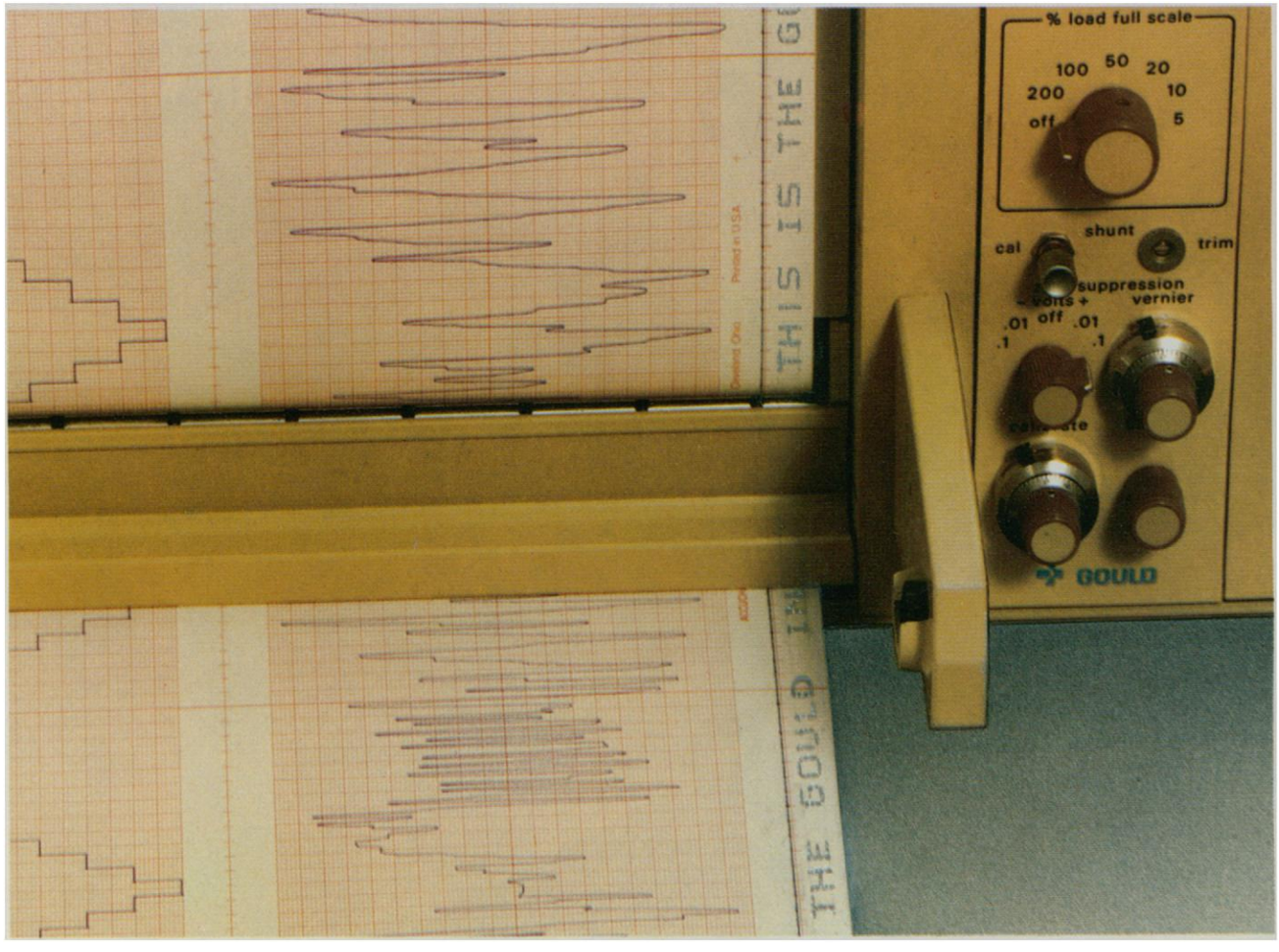

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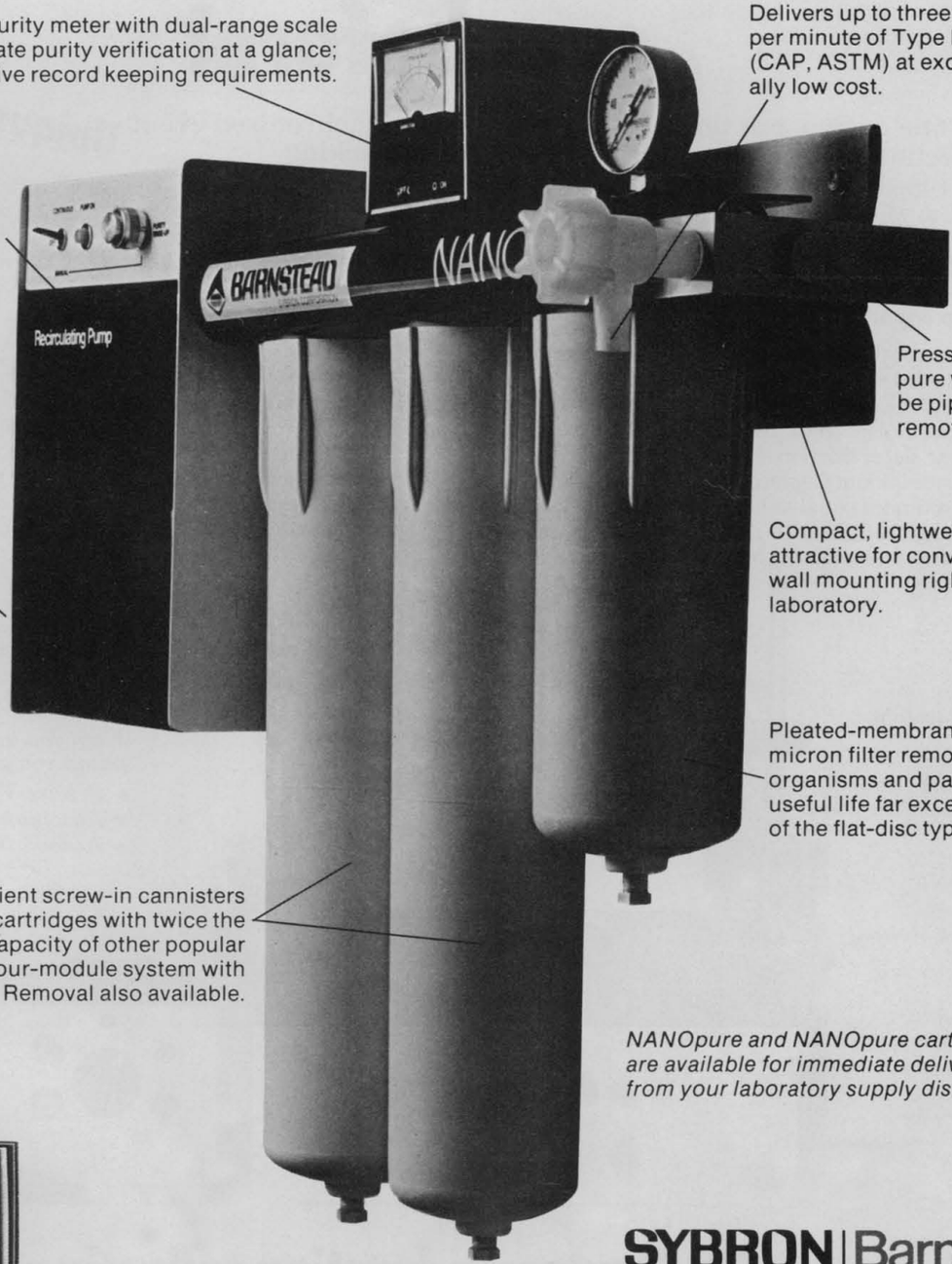

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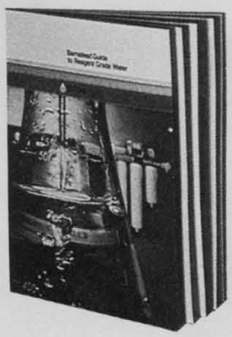

The Barnstead Guide to Reagent Grade Water - everything you need know about reagent grade water. Helps you make an informed decision when evaluating pure water systems. Write for your free copy.

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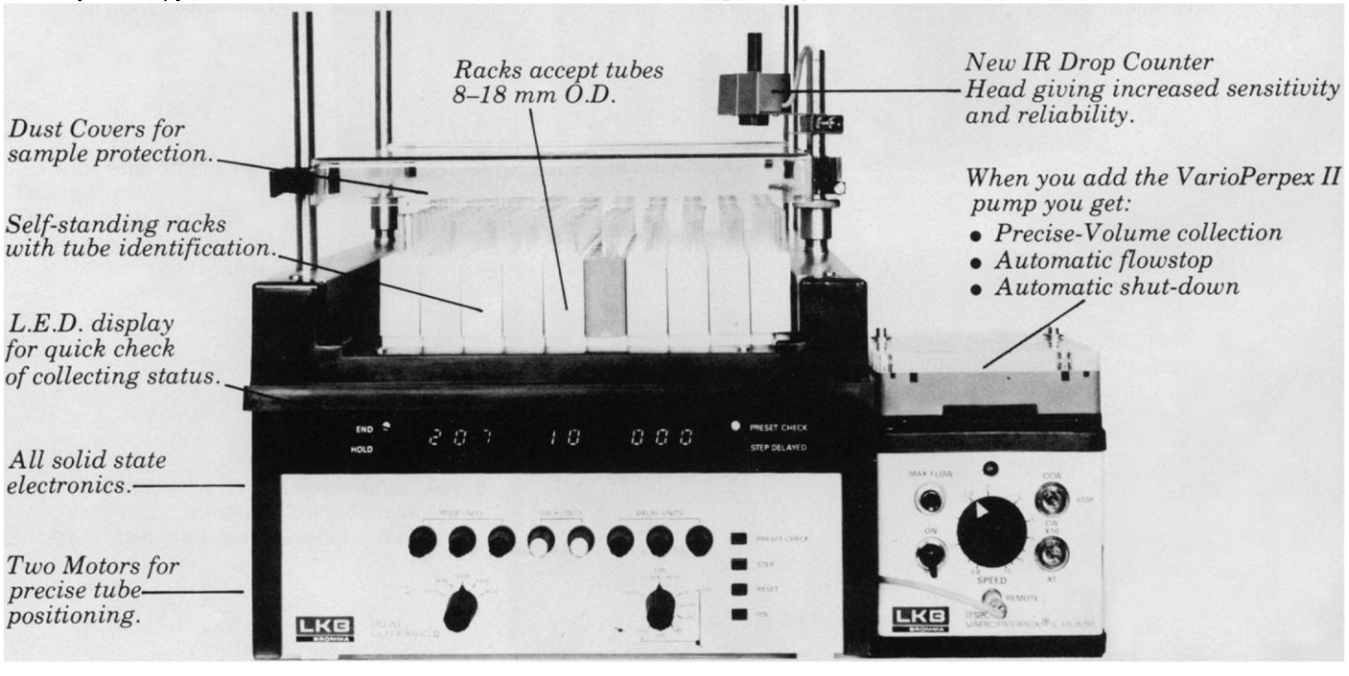

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Whatever your pH needs, we have a meter design to meet it. Meters by Coleman, Corning, IBC, Orion, Photovolt and more. Let us know what your requirements are. After all, the powerful names in pH are our stock in trade.

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Matheson Primary and Certified Standards are the workhorses of the analytical laboratory. Primary Standards are mixed gravimetrically to the highest accuracy and precision on a high load, high sensitivity analytical balance. Primary Standard accuracies often exceed the capability of your instrumentation. Certified Standards are recommended where the critical accuracy of Primary Standard is not required. Most standards are traceable to the NBS.

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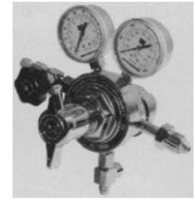
Regulators



The Matheson 3104 regulator is a high purity, two-stage regulator with a stainless steel diaphragm. Two-stage design provides even regulation regardless of cylinder pressure changes. Stainless steel diaphragm minimizes inboard leakage of air or water from the atmosphere, and does not outgas impurities into carrier or fuel gas systems. Five minute helium leak rate is $<2 \times 10^{-9}$ ccs. Excellent for applications involving trace components.

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High Purity Carrier Gases

Matheson makes carrier gases available in a variety of purity classifications — choose the specifications that most nearly meet your requirements. Routine analyses can be performed using Helium, High Purity, 99.995%. For more critical applications, you may choose Ultra High Purity 99.999% and Matheson Purity 99.9999%. For other applications, Argon, Hydrogen, and Nitrogen are all available in a variety of purities.

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Matheson recommends the use of purifiers in all flow systems for the purpose of keeping false peaks and background interferences to a minimum. Two types are available: The Hydrox Purifier is a gettering furnace capable of reducing impurity levels of 100 ppm water and oxygen to 0.1 ppm each.

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Matheson recommends No. 6164T High Purity Line Filters in all carrier and stream gas lines. It is stainless steel, heliarc welded — capable of removing particles 0.3 microns or larger, with a filtration efficiency of 99.999%. Using these filters minimizes background noise, and virtually eliminates the possibility of permanent damage by larger particles to sensitive valves, meters, and other parts of your system.

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Chart

Matheson offers, free of charge, a six-page brochure: "How to Succeed at Gas Chromatography." Inside, a 3-page chart details exactly what you require for a high performance GC set-up. Included are specifications for carrier gases, regulators, filters, tubing, etc., as they apply for the different methods of gas chromatography. Suggestions are also made for gas sampling techniques to minimize error and contamination.

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An expanded version of **Hemoglobinopathies,** this book adds discussions of hemoglobin physiology, biosynthesis and genetics. By **H. Franklin Bunn; Bernard G. Forget;** and **Helen M. Ranney.** 432 pp. Illustd. $18.00. May 1977. **Order #2178-3.**

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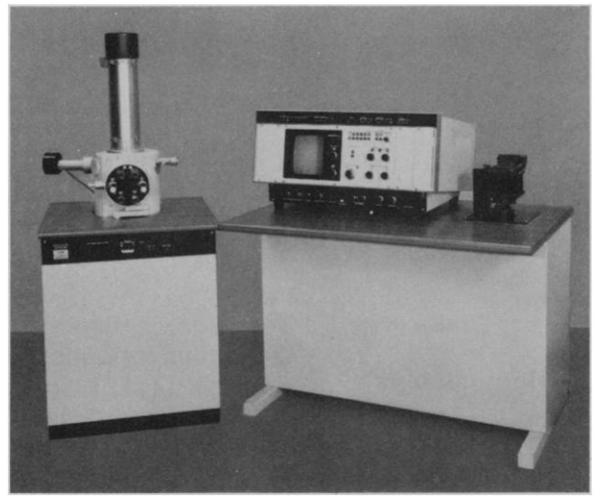

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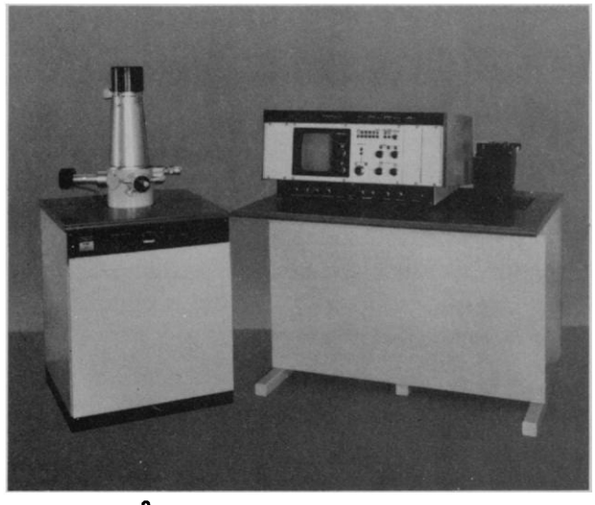

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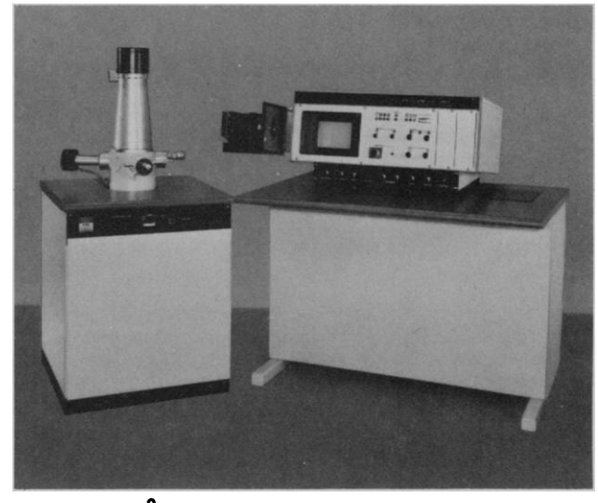

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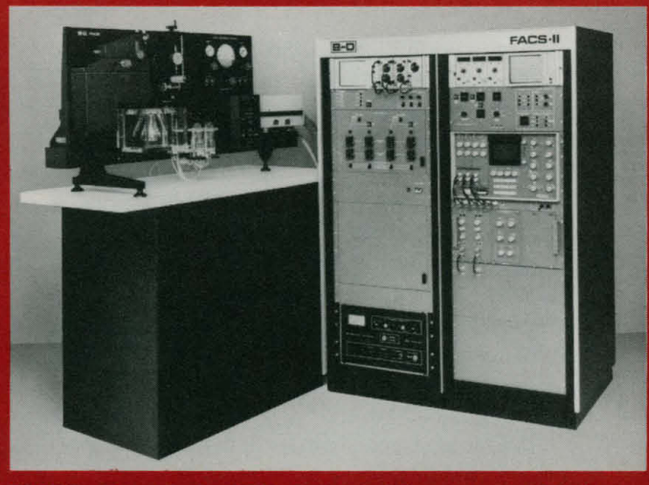

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Investment Energy

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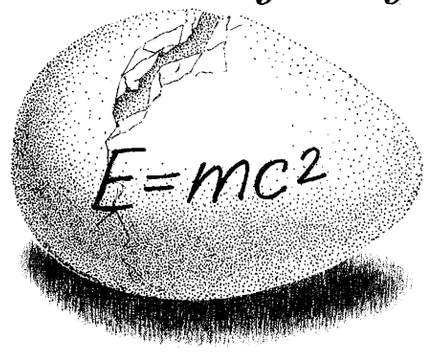
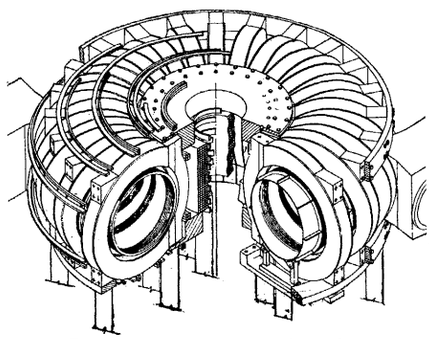


THE TECHNOLOGIES which offer the brightest promise of a major contribution to tomorrow's energy economy share a common need. In all cases, a large *investment* of energy is required, before a *return* on investment can be realized.

In most approaches, this investment is an integral part of the production cycle–creating the environment in which energy generation can occur. In others, it's needed to prepare the materials and components that go into the process. But in all cases, the investment is massive... and it must be delivered with exceptional precision and managed with exceptional sensitivity.

UVC has won a position of leadership in this demanding field–through long-term participation in the research, development and testing of advanced energy systems... and the provision of power for high-energy applications in such related areas as particle acceleration, high-voltage power distribution, and laser systems.



Basic structure of the tokamak device (ORMAK) at Oak Ridge.

While the "payout" on investment in some of the fields in which we're involved may be a decade or even a generation away, we know that these are ventures of historic importance, and deserving of our best talents and highest efforts.

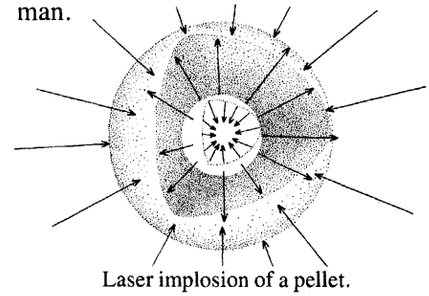
Fusion Through Plasma Heating and Magnetic Confinement

Progress continues toward the goal of achieving controlled thermonuclear reactions by the heating of isotopes of hydrogen (available in limitless quantities in the world's oceans) to stellar temperatures. Methods of maintaining such astronomical temperatures for sufficient periods of time include various 'magnetic confinement' schemes. The most promising of these are being investigated with reactors of the so-called tokamak (ORMAK) designs.

UVC equipment is presently in use, powering the neutral injection systems for heating of such reactors, at the Oak Ridge National Laboratory, Princeton University, The University of California at Livermore and Berkeley, and at private corporations funded by ERDA. These units, supplying energy for particle acceleration and deceleration, include the largest, highest-power equipment ever delivered by UVC.

Fusion Through Laser Implosion

Another dramatic approach to controlled fusion involves the ignition of thermonuclear reactions by subjecting tiny pellets of hydrogen isotopes to intense bursts of laser light. UVC has developed a wide variety of power supplies for laser fusion experiments ... including work being done at the Livermore laboratories of the University of California, where an effort is under way to generate the most powerful pulses of light ever created by man.



Laser implosion of a pellet.

Uranium Enrichment for Nuclear Power Generation

The 'enrichment' of uranium, by the separation of specific isotopes from the natural metal, is essential for the manufacture of the rods which fuel most types of nuclear fission reactors. Here, too, a laser application holds great promise for bringing new efficiency and economy to what has been an extremely costly and difficult process.

And here again, UVC power supplies are playing an important role in bringing this new technique to fruition.

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Whether you're concerned with advanced energy systems or more conventional power problems, you too may profit from UVC's uncommon competence. If you'd like to discuss how we might add some Investment Energy to a project of your own, please call or write:

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Moving data automatically into and out of a computer offers significant benefits: more precise data; control of laboratory instruments and test equipment; reduction of operator error; and most important, better use of your time.

But lab automation always contained the "Yes Buts." "Yes, but it's too complicated." "Yes, but I can't afford to interrupt my experiments." "Yes, but I can't be bothered learning another language." "Yes, but it's too expensive."

The IBM 7406 eliminates the "Yes Buts." You can plug the 7406 into your experiment in *days,* not months. It's portable so it can be moved from one experiment to another whenever you need it. You can look at runs by the dozen. Even exploratory runs you never thought you'd have time to examine. With the Device Coupler, a terminal and a telephone line you can enter data directly into virtually any terminal-oriented interactive system that has the data handling capacity you need.

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LETTERS

Medical Schools and the Government

Many readers may be astonished at the economic and social assumptions implicit in Philip H. Abelson's editorial "Coercion of medical schools" (16 Sept., p. 1137). If it costs society $250,000 to support a physician for a year, this is because the physicians control the supply of medical care—including the education of physicians and other health care practitioners. If medical schools successfully fight off governmental attempts to increase the supply of physicians, the costs of health care will surely continue to rise.

Abelson misleads readers when he warns against "increasing further what is now regarded as an excessive number of doctors." Even on the relatively comfortable Gulf Coast of Florida, 60 percent of the population does not have a family doctor. If, as Abelson states, there is "a large body of hypochondriacs and lonely people" overusing the health care system, there is a still larger body, including many readers of *Science*, who fail to seek adequate preventive medical attention because of exorbitant costs due, primarily, to control of the system by the relatively small number of physicians.

ALVIN W. WOLFE
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The comments expressed in Abelson's recent editorial discredit the efforts and education of many U.S. citizens attending foreign medical schools by tarring them all with the same brush. To state that the "standards of admission and training are generally inferior" at foreign medical schools is stereotyping at its worst and belies a lack of recognition of differences in program quality and the realities of medical education and practice today.

The statement that "Most of these students are U.S. citizens who were initially rejected by our medical schools," made without qualification, leaves open the inference that these students were rejected solely on the basis of quality, rather than other factors, such as lack of space, age, and ethnic background. Most medical schools openly admit that many very well qualified applicants cannot be accepted for lack of space. We also object to the editorial use of the prejudicial term "rejectees" and phrases such as "cost to society." Not all acceptees in the U.S. schools arrive by merit alone, but occasionally through political con-

nections in those "citadels of virtue" described in the editorial.

As an international group of students, we are keenly sensitive to the effects of branding any one segment of the population as second-class. Editorials such as Abelson's engender and perpetuate such designations.

NORMAN C. LYON
SCOTT A. HEATLEY
JAMES VAN PELT III
JACK DE LA TORRE
SANDY VERNICK
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Abelson quotes E. Ginzberg (*1*) as estimating at $250,000 the total expenditure society makes in "supporting a physician" for a year. Actually Ginzberg said, "the net addition of one physician adds approximately $250,000 to annual *operating costs of the health care enterprise*" [emphasis added].

In response let me say that we physicians render a service or, if you will, deliver a product, and hence our fees should not be construed as mere "support"; some portion of the price of a loaf of bread is for the bread, not for supporting the baker. Second, most of a physician's gross earnings "support" not himself but his landlord and staff, his Ma Bell, his Uncle Sam, and so forth.

Abelson presents a paradox by stating in consecutive sentences that there is "an excessive number of doctors" and "an infinite demand for medical attention." I agree that medical schools should refuse to accept government coercion, but the position could have been more lucidly and fairly presented.

HUGH A. LINDSAY
3041 University Avenue, Morgantown, West Virginia 26505

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1. E. Ginzberg, *N. Engl. J. Med.* **297**, 814 (1977).

Recombinant DNA Controversy

Like several other cities, San Diego, California, reacted to concerns about recombinant DNA research by appointing a citizens' committee to consider what risks, if any, were involved for the general public. Although San Diego's committee worked in a less emotionally charged atmosphere than its counterpart in Cambridge, Massachusetts, the conclusions it reached were similar. One major emphasis of the San Diego com-

mittee's report was directed at the need for the University of California's Biohazards Committee to go beyond the letter, while retaining the spirit, of the National Institutes of Health (NIH) guidelines in its surveillance of recombinant DNA research on the university's San Diego campus.

The San Diego committee's report was accepted by the city council in late March 1977. Since then the concern within the scientific community about the real and potential hazards of the research has lessened, particularly with respect to the use of the K-12 strain of *Escherichia coli*, as reported in Philip H. Abelson's editorial (19 Aug., p. 721).

Regardless of the outcome of the current debate on the regulation of recombinant DNA research, I fear that, with the increasing evidence that the research poses less danger than had been believed by its critics, the need for improved laboratory safety may be disregarded. One of the conclusions reached by the San Diego committee is that laboratory design and practices in general are not always consistent with the level of risk to which investigators, students, technicians, and others are exposed. Concern about complying with the NIH guidelines has at least drawn attention to situations in which research institutions are poorly prepared to deal with the emergencies posed by laboratory accidents. Another result of the open debate on recombinant DNA research is the increased public awareness of science and its role in society. In the long run that too can be beneficial.

If the current heightened awareness of the problem of laboratory safety is diminished by reduced anxiety about the dangers of recombinant DNA research, at least one of the tangible benefits of the controversy may be lost. Such a development would be tragic from the point of view of everyone's best interest.

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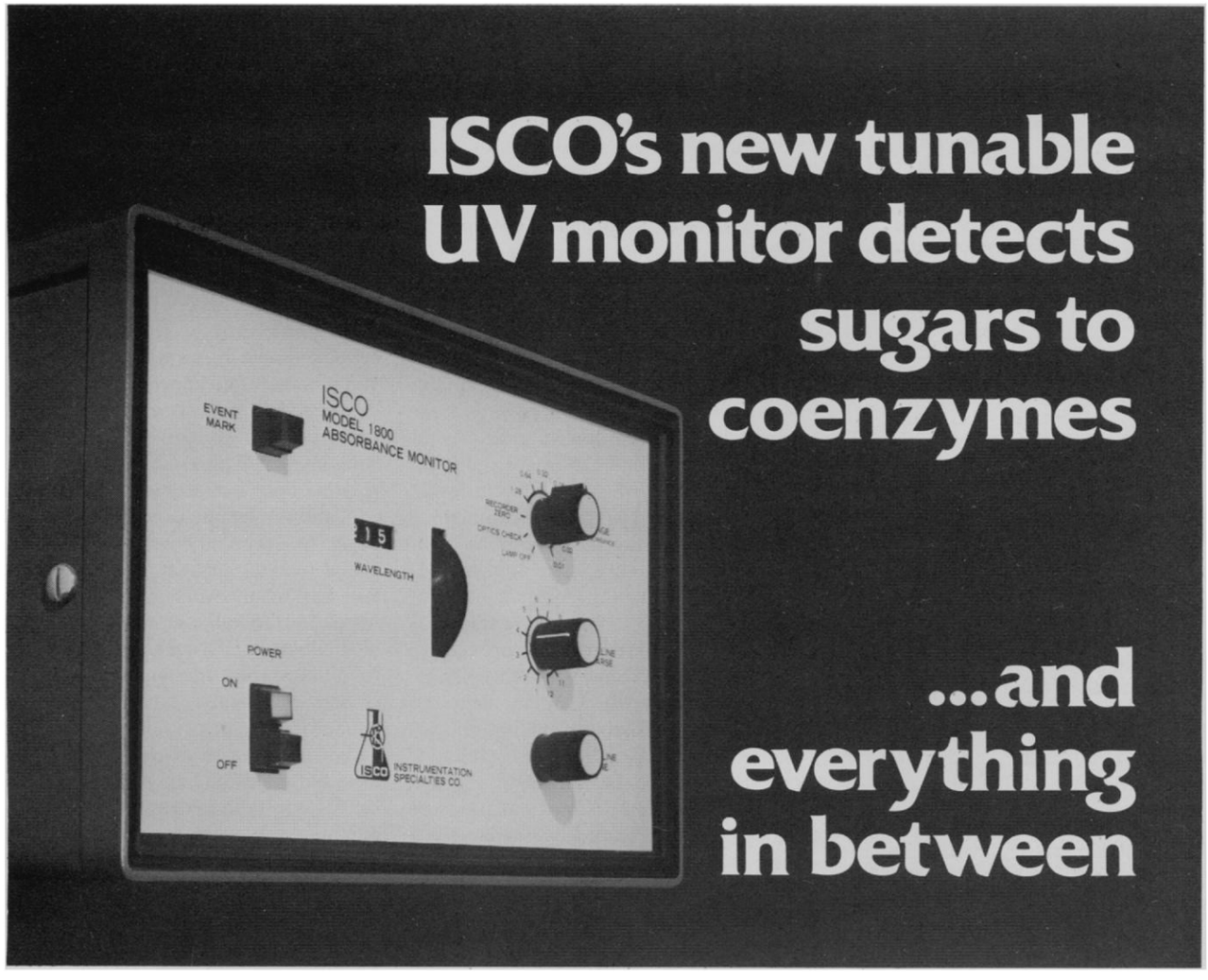
Augmentation Trends

A hypothesis is always more interesting when accompanied by a test. I demonstrate here that the windedness index of M. O'Hare (Letters, 1 July, p. 6) gives an even stronger lengthening trend for writings in *Science* than I envisioned.

Before presenting the data, though, I wish to explain [see letter from R. J. Huxtable (15 July, p. 208)] that my original letter (10 June, p. 1154) was not intended as an attack on novelists as well as science news writers. Novelists and poets experiment with form as well as content and I do not want to impinge on their game. Consequently, I take as gratuitous the apparent support for my thesis provided by the Faulkner example of Huxtable. I should add, however, that I do not wish to annoy only news writers in scientific journals; I address all science writers and, in particular, all *Science* writers. Incidentally, the symptoms described by Huxtable, who falls asleep reading Boswell, may be due to periodomonotony (although Boswell's sentences are atrociously long, and there may be interaction). The onset of this curious clinical entity is manifested by slow eyelid lowering and saltatory head and body movements (in severe cases, injuries from falling out of a chair have occurred), apparently induced by an overregular repartition of typographical signs in a text. Writers can aid in eradicating this malady by avoiding uniform sentence length. Effective antidotes are LP's [long-windedness profiles (see my letter, 10 June)] having a skewed normal distribution (increased frequencies at shorter lengths) and a mean below 25 words per sentence. For a more radical treatment Huxtable might try reading G. Garcia Marquez, who writes without paragraphs or periods, although some commas remain (caveat: his novels are not placebos and may provoke sleeplessness).

As the French observe at railroad crossings, "*Un train peut en cacher un autre.*" Similarly, one trend can hide another. I am not ready to say what the fundamental trend is, but its expression in *Science* seems to involve *both* sentence length and report length. Thus, I now extend my demonstration to authors of reports. (I have also made compatible observations over the same period of articles and news items, but I do not describe them here because of a self-imposed length limit for this letter.) My sample is the first issue of *Science* in July of each year, from 1 July 1955, when the modern three-column design was adopted, through 1 July 1977. For each issue, I have measured the number of pages (P) and reports (R) in the Reports section. The results are shown in Table 1.

A plot shows that evolution of the ratio P/R approaches a straight line. As with many evolutionary processes, it is hard to believe this came about without design. Some workers may feel this trend has been established by the ran-



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dom accumulation of neutral changes in publishing and editorial policy, author behavior, and so forth. I find this notion distasteful. Length (in pages or words) of present *Science* reports is roughly triple that of a generation ago! By contrast, the human brain took several million years to triple in volume. The P/R growth rate is even greater than that of the earth's population. It also exceeds that for world military spending, which in the 20-year period 1957 through 1976 went up from $155 billion to $280 billion (or only 80 percent), on a constant dollar basis (*1*). Therefore, a cause should be sought for this drift, which cannot be due solely to change ($P < .01$).

Happily, I have been able to identify another trend of comparable magnitude. Augmentation of the *Science* subscriber population seems to have paralleled that of P/R. It is rare and extremely gratifying that phenomena on such different levels can be linked. The best explanation I have found for the increase in *Science* subscribers, hinted at here but not detailed, appears in (*2*). After due reflection, I am driven to the unexpected conclusion that the P/R growth has been selected by readers, and most directly by paid subscribers. My compliments to the editor and publisher for making this selection possible by perceiving that an increasing fraction of the earth's population likes nonmystical explanations of natural phenomena and is preadapted to the consumption of more comprehensive scientific reports.

At the same time I still believe the sentence-lengthening trend should be reversed. My working hypothesis is that this is a parasite trend which has been able to hide itself in the rush of P/R change. Further, I claim that sentence lengthening has a negative value for the primary goal of greater scientific communication.

Table 1.

Year	P (No.)	R (No.)	P/R
1977	46.0	20	2.30
1976	25.2	13	1.94
1975	16.8	9	1.87
1974	25.0	12	2.08
1973	37.1	17	2.18
1972	33.7	16	2.11
1971	37.5	17	2.21
1970	49.3	24	2.05
1969	34.0	18	1.89
1968	33.6	19	1.77
1967	43.6	25	1.74
1966	36.2	20	1.81
1965	41.9	21	1.99
1964	28.0	15	1.87
1963	21.0	14	1.50
1962	8.0	7	1.14
1961	12.0	9	1.33
1960	14.0	12	1.17
1959	8.0	7	1.14
1958	9.0	9	1.00
1957	9.0	9	1.00
1956	10.0	9	1.11
1955	5.0	7	0.71

R. GRANTHAM
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1. R. Press, *Nature (London)* **268**, 476 (1977).
2. G. DuShane, *Science* **137**, 255 (1962).

The recent attack in the letter from Huxtable (15 July) on quantitative punctuational analysis was well taken; the amusing nature of his riposte makes an issue, which while it may be grave beyond simple concern for linguistic tradition, more often appears portrayed as a mild eccentricity of our materialistic, statistical society; however, before succumbing to the pleasures of satire, I, for reasons both connected to my classical education—beginning with 6 years of Latin in secondary school—and associated with my respect as a scientist, vitally tied by my profession to the printed word, for the value of precision in communication, might question whether this trivial-appearing matter does not have greater significance than the simple-minded penchant of modern pedants to assign numbers to matters of heart and taste but instead deals with the more essential question of the sophistication of our human thought processes in an era when $20 will purchase an electronic device capable of remembering and using ten levels of parentheses, two memories, one constant, and six hierarchical, grammatical functions, while human beings who, more machine-like than the machines themselves, are restricted usually by their own indecision to the multiple-choice format of exams, simple menus of fast-food restaurants, or the three channels of culture proffered at no cost by ABC, NBC, and CBS, and are, at their best, prominent and cultured citizens, authors of renown, winners of the Nobel and Pulitzer awards, who nonetheless limit the complexity of their grammar not to the legalistic elegance of a pages-long speech by Cicero, who was, perhaps, the noblest proponent of the parsimonious period to ever exist, to the Roman senate, but to short, clauseless, phraseless declarative sentences which, whatever their virtue as barroom expletives or exhortations by cheerleaders, can provide but little challenge to the 95 percent of our organic brain mass, which, all too sad, is never used.

STEPHEN M. SCHWARTZ
Department of Pathology, School of Medicine, University of Washington, Seattle 98195

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Dihydrotestosterone, [1,2,4,5,6,7,16,17-^{3}H(N)]-
Dihydrotestosterone, [1,2,4,5,6,7-^{3}H(N)]-
Dexamethasone, [6,7-^{3}H(N)]-
Estradiol, [2,4,6,7,16,17-^{3}H]-
Estradiol, [2,4,6,7-^{3}H]-
Prednisolone, [6,7-^{3}H(N)]-
Progesterone, [1,2,6,7-^{3}H(N)]-
Testosterone, [1,2,6,7,16,17-^{3}H(N)]-
Triamcinolone acetonide, [6,7-^{3}H(N)]-
R5020-^{3}H (manufactured by New England Nuclear under licensed agreement of ROUSSEL UCLAF)

α-Adrenergic Receptor Studies
Dihydroergocryptine,9,10-[9,10-^{3}H(N)]-

β-Adrenergic Receptor Studies
Dihydroalprenolol hydrochloride, *levo*-[*propyl*-2,3-^{3}H]-
Propranolol hydrochloride, DL-[^{3}H(G)]-
Propranolol hydrochloride, *levo*-[4-^{3}H(N)]-

Cholinergic Receptor Studies
Choline chloride, [*methyl*-^{3}H]-
(QNB) Quinuclidinyl benzilate, DL-[*benzilic*-4,4′-^{3}H(N)]-
Tubocurarine chloride, *dextro*-[13′-^{3}H(N)]-

Dopamine Receptor Studies
Dihydroxyphenylethylamine, 3,4-[*ethyl*-1-^{3}H(N)]-
Dihydroxyphenylethylamine, 3,4-[*ethyl*-2-^{3}H(N)]-
Haloperidol, [^{3}H(G)]-
Spiroperidol, [1-*phenyl*-4-^{3}H]-

Amino Acid Receptor Studies
Aminobutyric acid, γ-[2,3-^{3}H(N)]-
Glycine, [2-^{3}H]-

Opiate Receptor Studies
Enkephalin (5-L-methionine), [*tyrosyl*-3,5-^{3}H(N)]-
Enkephalin (5-L-leucine), [*tyrosyl*-3,5-^{3}H(N)]-
Enkephalinamide (2-D-alanine-5-L-methionine), [*tyrosyl-ring*-2,6-^{3}H]-
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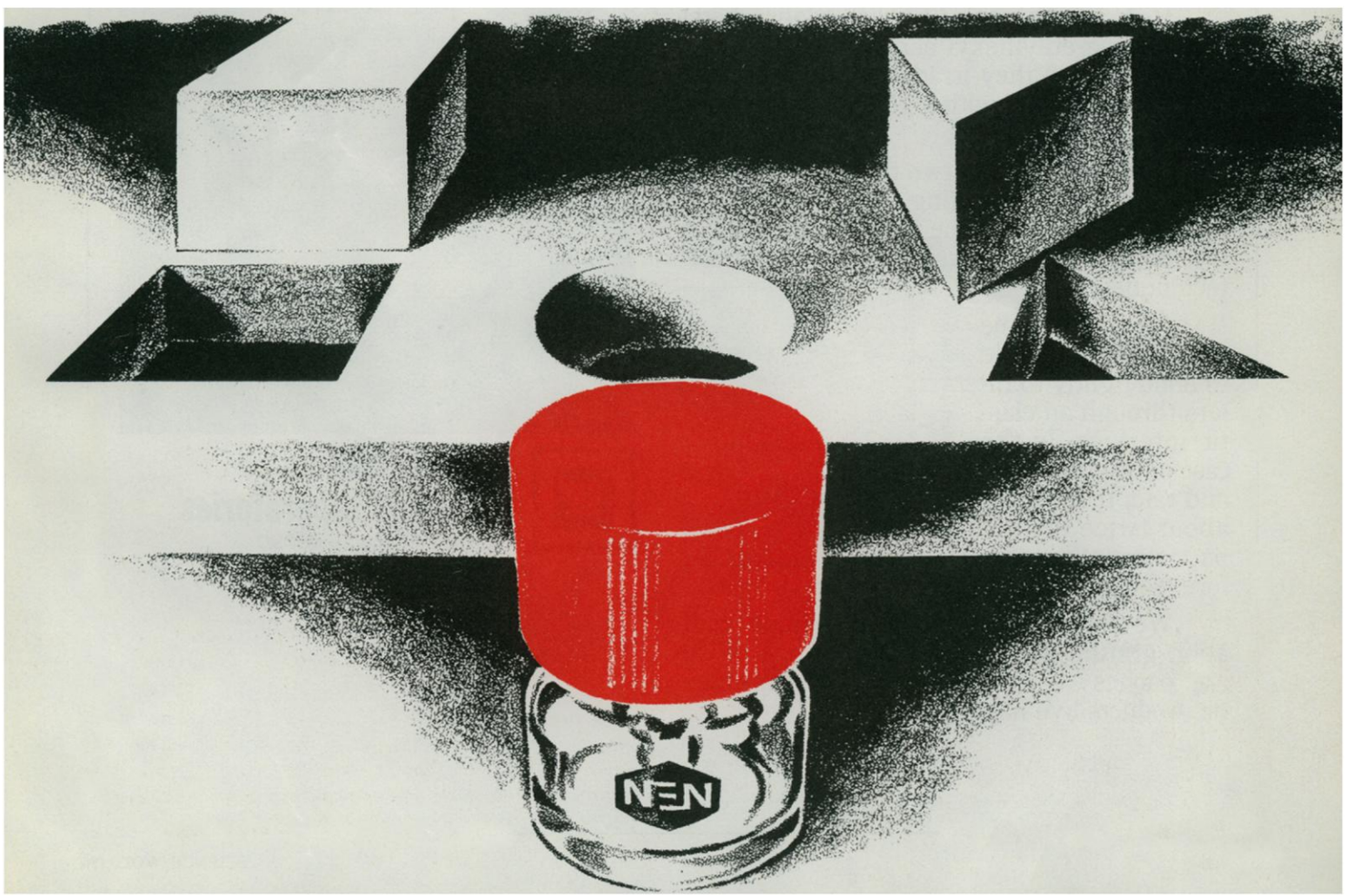

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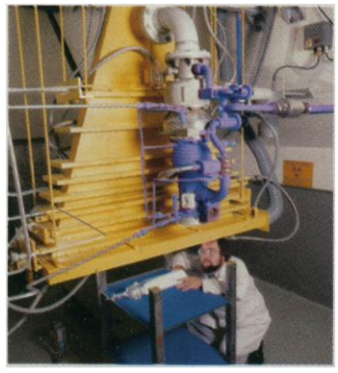

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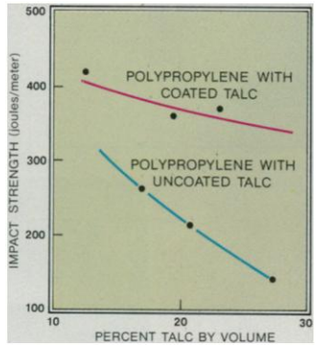

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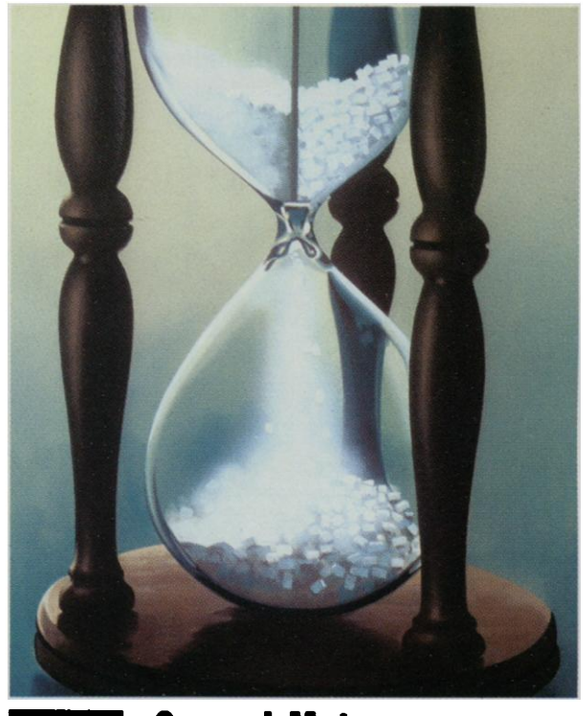

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14 October 1977, Volume 198, Number 4313 **SCIENCE**

Thoughts on Reorganization

Among the superstitions of modern societies, few match the lures of reorganization. Like taking the waters, in a quieter age, overwrought managers now reach for reorganization as an all-purpose cure. Anyone who has served in government is reminded of the rumble of tectonic activity followed by transient surface eruptions.

Still, reorganization has its uses. It serves, however briefly, to let in light and break old habits. Occasionally it veers in the direction of harnessing power and resources for the work that must be done. If it rarely does this well, it is because counterpressures drive us to cut deals, so that the outcome is less than meets the eye.

Now the Carter Administration is busy with reorganization studies on a scale that has not been attempted since the Hoover Commission. It will be a very different kind of exercise. The agenda of government looks entirely different, and priorities and values have changed in many ways. Science and technology are part of the action to an extent that would surprise the Hoover Commission, and they figure large in government's doings at home and abroad. How much of this is getting through to the reorganization planners is not clear. But if reorganization is going to touch science and technology sooner or later, the starting point ought to be a critique of policy management. Structures and landscaping can wait.

If we try to comprehend what has been happening to American science and technology since World War II, three features stand out. First, science and technology have been *politicized* because of the one-sided leverage of government. Next, they are being *secularized* as lay publics participate in negotiating their right uses. And third, science and technology have been *internationalized* by the advent of new and tougher problems such as the management of the biosphere, population pressure on life support systems, and the claims of developing countries. These changes spell an aching need for new frameworks of goal-setting. Reorganization should be concerned with more than body counts and administrative dispositions.

Reorganization in government's scientific and technical affairs ought to start with the correction of flaws in policy management. Science and technology still cool their heels in the waiting rooms of American diplomacy. There is still no visible focus in government for the stimulation of innovation and risk-taking in the market economy. With one hand, public policy tries to shape energy policies, while with the other, it intimidates industry from sharing know-how which could speed solutions. Well-meant regulation stretches out capital improvements which could raise productivity. Centers of excellence in research and standards-setting, like the Bureau of Standards, have been allowed to run downhill. And government is only beginning to look searchingly into the relationships between research and development and the nation's unmet economic potential.

If these and other shortfalls could be looked into with some care, there would be a point to tackling the questions of reorganization. A Noah's ark of science and technology is the last thing we need. Nor is it sensible to shake up the whole anatomy of science in government. But with better policy aims to start with, there are both near-term and future options. One is to remake the Commerce Department into a Department of Industry Economics and Technology. Another is to recombine the National Aeronautics and Space Administration, the Bureau of Standards, and the National Science Foundation in an Office of Scientific Research and Development with resources to tackle barriers to productivity and innovation and marshal federal laboratories to better serve federal, state and local, and industrial needs.

So there is an agenda for reorganization, after all, if we can first put our science and technology policies in order.—WILLIAM D. CAREY

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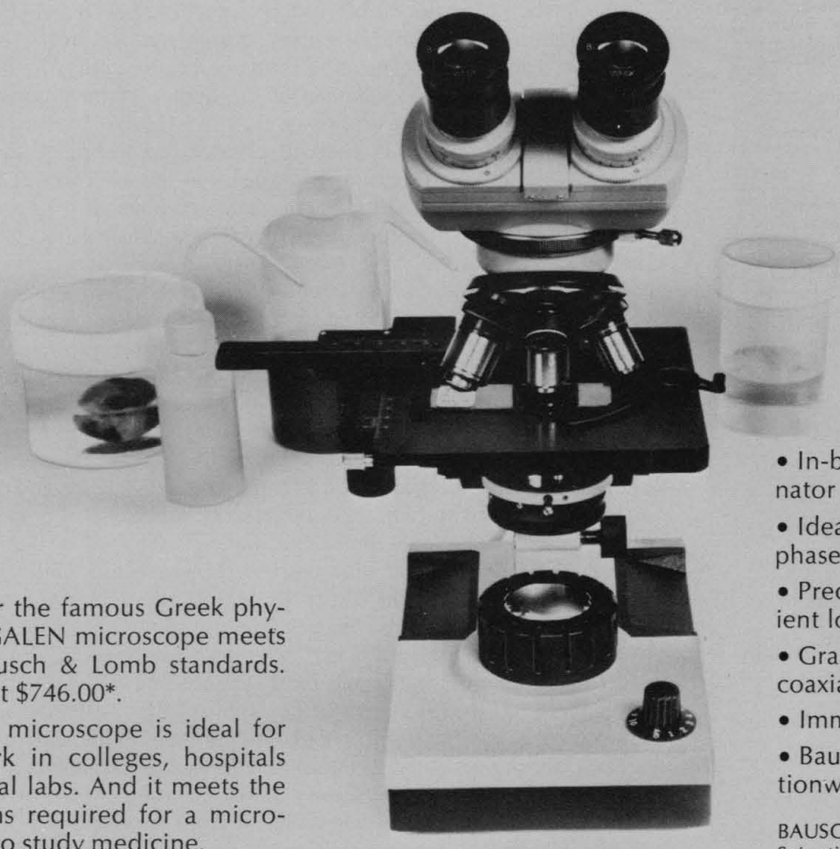

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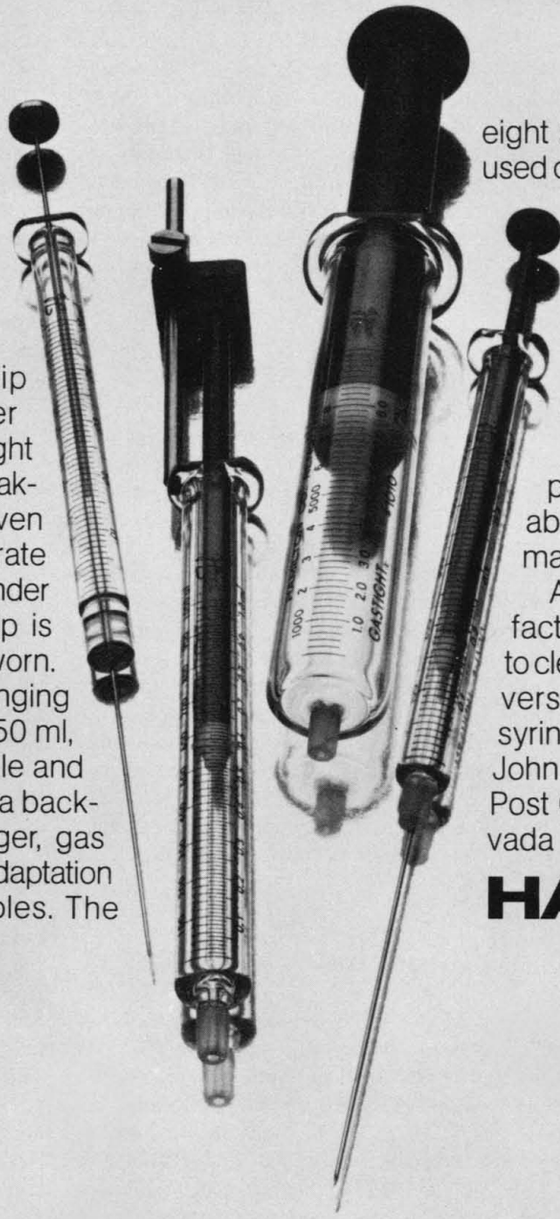

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Each set of Spectronic standards is tested and certified to be accurate with values traceable to the National Bureau of Standards. Each set permits the user to check any spectrophotometer for zero percent transmittance, wavelength accuracy, stray radiant energy, spectrophotometric accuracy, linearity, precision, and optical alignment. Each set is supplied in a case with a cleaning brush and detailed instructions. Bausch & Lomb. Circle 668.

Mass Spectrometer

The system 250 gas isotope mass spectrometer offers sensitivity of 0.2 angstrom per millibar. This is possible because of einzel lens focusing and a stigmatic focusing analyzer system that features nearly 100 percent transmission plus the high (10 kilovolts) ion accelerating voltage. The system determines isotope ratios, requires only small samples, has a calculator-controlled sample inlet, and offers on-line analysis and printout of results. Varian MAT. Circle 669.

Gel Preparation Rack

Model 215 holds a variety of tube sizes simultaneously. It will accommodate from 1 to 24 tubes in sizes from 5 to 18 millimeters (outside diameter) and from 60 to 250 millimeters long. Parafilm seals the bottom of each tube and spring steel fingers position each tube in a vertical position for polymerization. The rack also features leveling screws and a bubble level. Bio-Rad Laboratories. Circle 676.

Portable Incubator

Incublock will incubate up to 36 cultures at 35° or 44.5°C. It will operate from a 12-volt battery or from line current. The cast aluminum heat block will hold 47- or 54-millimeter petri dishes. The temperature within each well is stable to within ±0.2°C. Temperature is controlled by thermostat and solid state circuitry. A pilot light indicates on-off condition. Vista Scientific. Circle 677.

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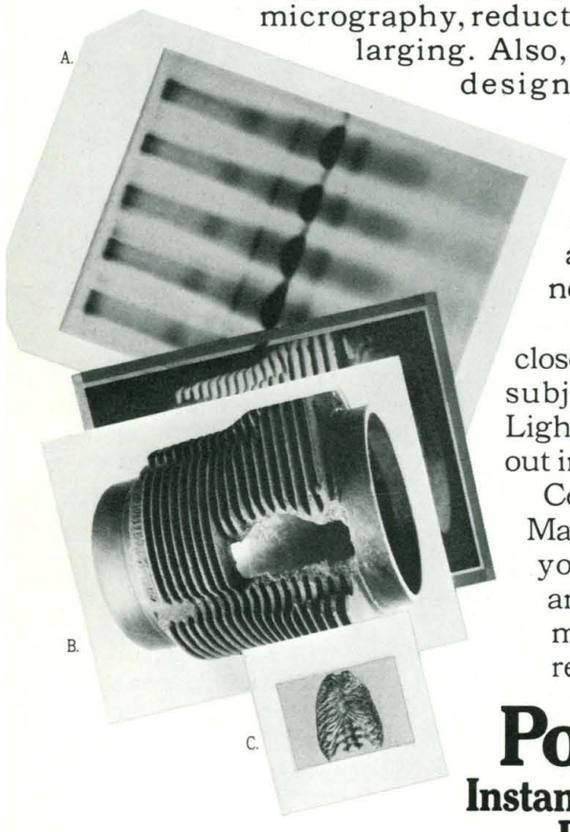

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enable the operator to convert data, enter programs, recall information, and calculate results. There is a single-range model (300 grams readable to within 0.01 gram) and a dual range version (30 grams readable to within 0.001 gram and 300 grams readable to within 0.01 gram). Brinkmann Instruments. Circle 674.

Multipurpose *p*H Meter

Model 671 is a digital meter that measures *p*H, millivolts, dissolved oxygen, and temperature. It is suitable for the detection of specific ions and for measuring oxidation-reduction potential. It may be operated by battery or on-line power. It measures *p*H from 0 to 14 units with a resolution and accuracy of 0.01 unit; millivolts from 0 to ± 1999 millivolts with resolution of 1 millivolt and accuracy to within 0.1 percent; dissolved oxygen from 0 to 19.99 parts per million with resolution of 0.01 part per million and accuracy to within 0.2 part per million; and temperature from 0° to 100°C with resolution of 0.1°C and accuracy to within 0.5°C. Extech International. Circle 675.

Ten-Signal Multiplexer

Dataplex 10 has ten input channels and a single output. It enables the user to channel up to ten different signals to a single recorder, meter, printer, or similar device. The user selects the number of channels to be scanned from one to ten and the dwell in seconds from 1 to 20. In the scan mode, the device will feed each input signal in sequence to the output. Hampshire Controls. Circle 678.

Particle-Sizing Microscope

The PSS-10 is a ten-power, monocular microscope for measuring particles. There is a hemocytometer grid in the eyepiece that rotates through a full circle. The nosepiece will accept two additional objectives and the eyepiece tube will accept photographic accessories. The basic microscope includes a lamp condenser lens, daylight blue filter, line cord and switch, and a spare bulb. General Radioisotope Products. Circle 679.

Micro-Scale Glassware

The Micro Kit enables chemists and others to work with small samples. Components are assembled with screw-threaded Wheaton Connections. Special grease-free design and inert Teflon provide positive seal between components without risk of contamination or loss of sample. Wetted parts are either Wheaton 200 brand borosilicate glass or Teflon. All caps have open tops and Teflon-faced septa. Flask sizes are from 1 to 10 milliliters; vials with conical interiors are included. Wheaton Scientific. Circle 680.

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Tri-S brand supplemental seafoods are available in 12 natural varieties. They include over 70 trace elements, 17 essential vitamins, and 8 minerals and they are more than 60 percent protein. They will meet the needs of most freshwater and marine species. They are packaged in 3-ounce, transparent zip-lock bags that are resealable. Sea Lake Systems. Circle 681.

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The Ultracut microtome is designed so that the operator can reach all controls while viewing the specimen through the stereomicroscope. Feed and drive mechanisms are insulated from external vibration and thermal disturbances. Within a ribbon, the operator may alternate among large area ultra-thin sections, semi-thin sections, and macrosections. Even hard specimens may be sectioned. American Optical. Circle 671.

Liquid Chromatography System

This system contains the Mixograd gradient former, the Minipuls peristaltic pump, a chromatographic spectrophotometer, a column, a valve, fittings, shut-off valve, and the Race Track fractionator. The system may be assembled with or without individual components to tailor it for use in ion exchange, gel permeation, adsorption, high performance liquid chromatography, and others. Gilson Medical Electronics. Circle 672.

Literature

Molecular Weight Standards are available for instrument calibration and polymer characterization by osmometry, chromatography, and other techniques. ArRo Laboratories. Circle 693.

Image Analysis Bibliography provides references and author indexing for 329 articles in life sciences and physical sciences. Cambridge Instrument. Circle 695.

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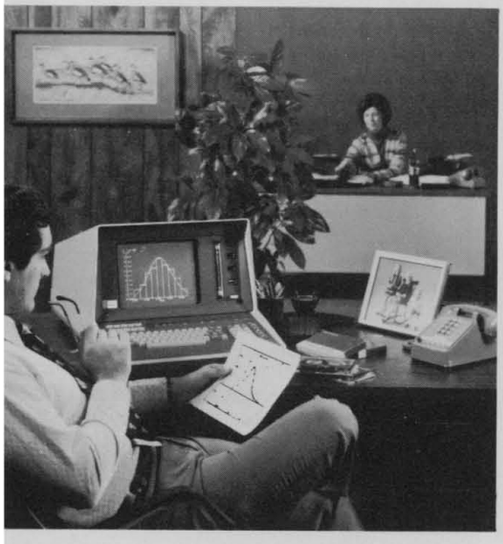

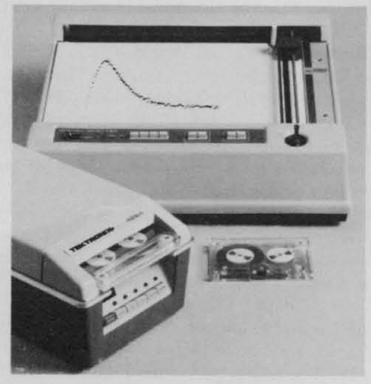

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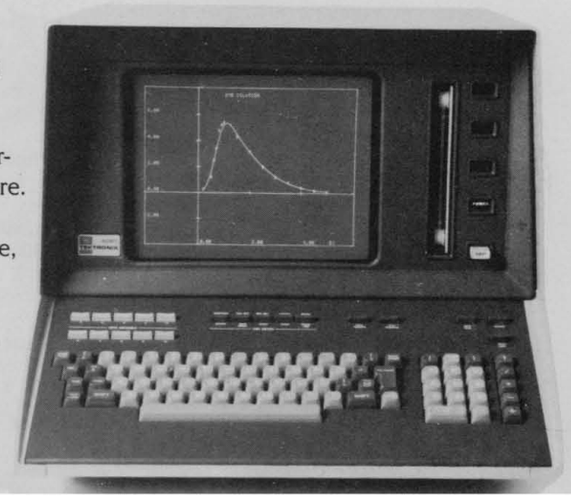

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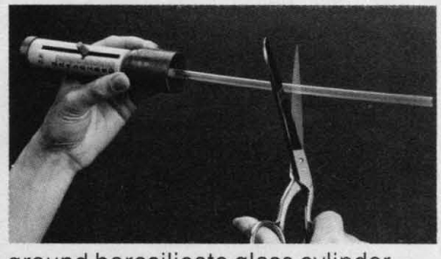

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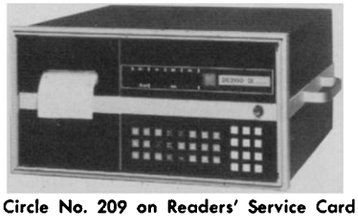

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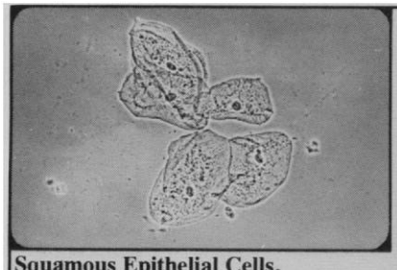

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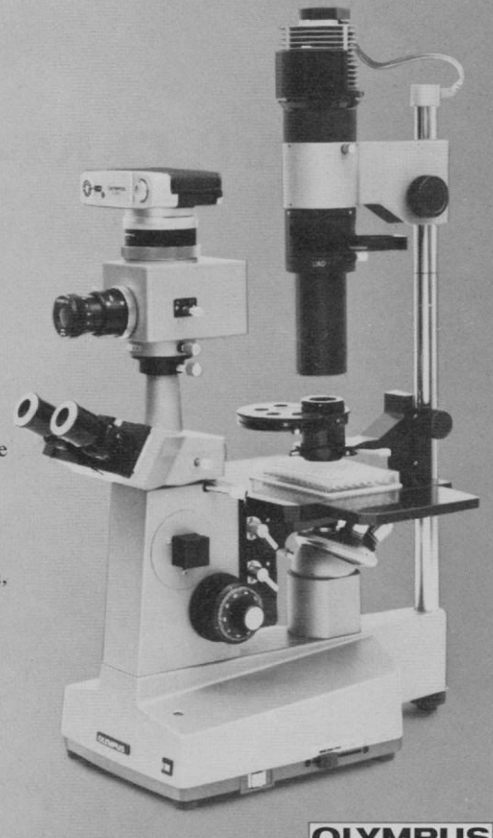

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