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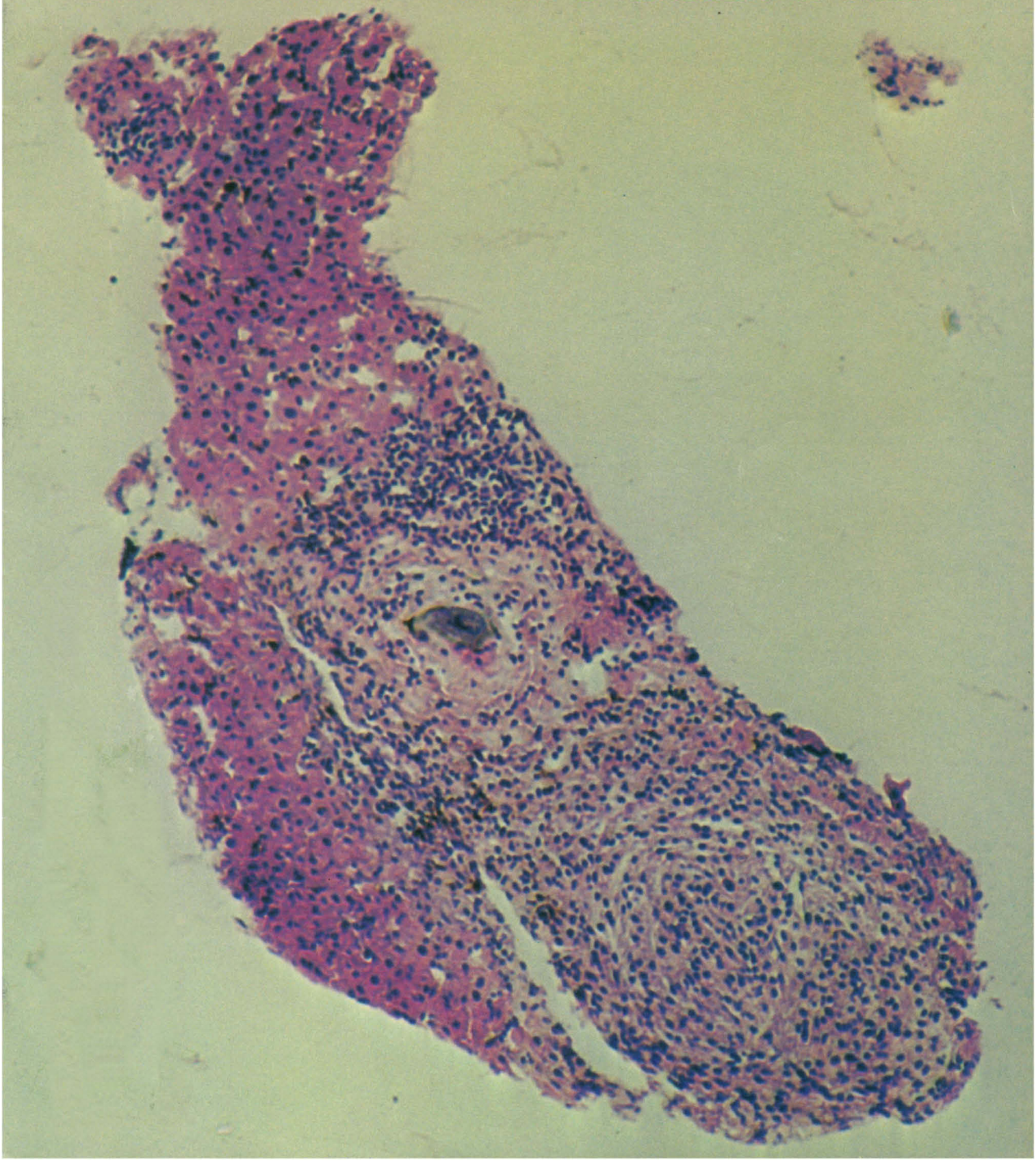

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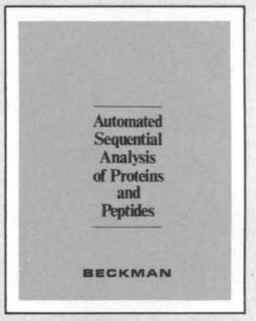

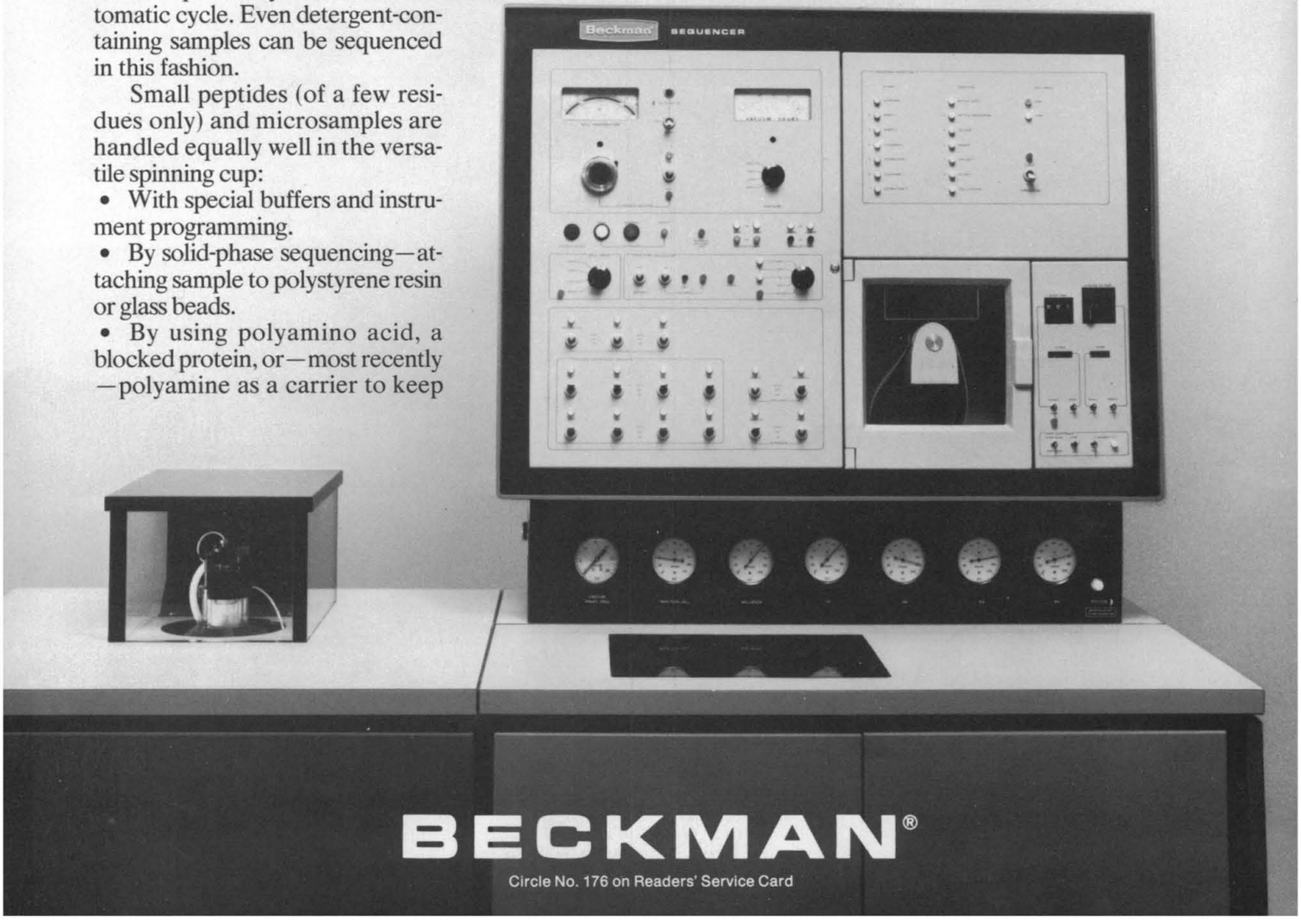

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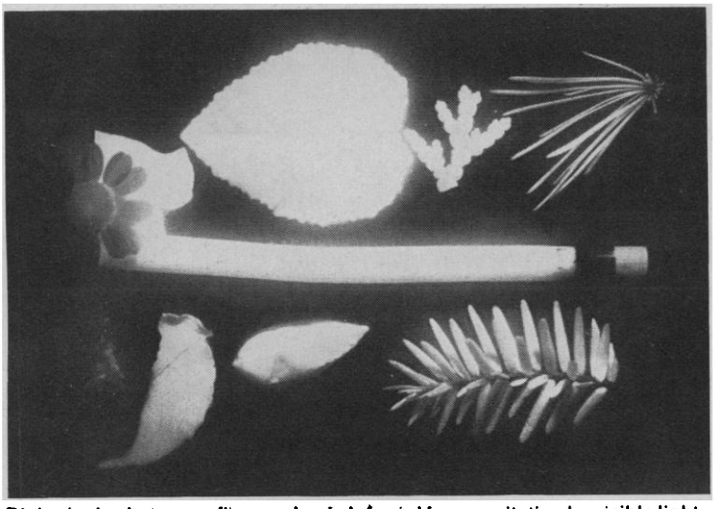

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Mr. Gibson at about the time he joined Kodak and Mr. Gibson in 1978, some years after retirement from Kodak.

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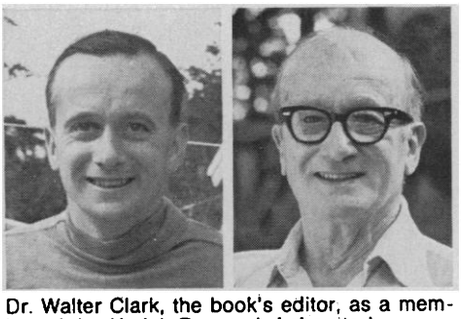

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COVER

Photomicrograph of schistosomal egg granulomas that have been isolated from livers of infected mice (about ×1000). See page 438. [David J. Wyler, Laboratory of Parasitic Diseases, National Institutes of Health, Bethesda, Maryland 20014]

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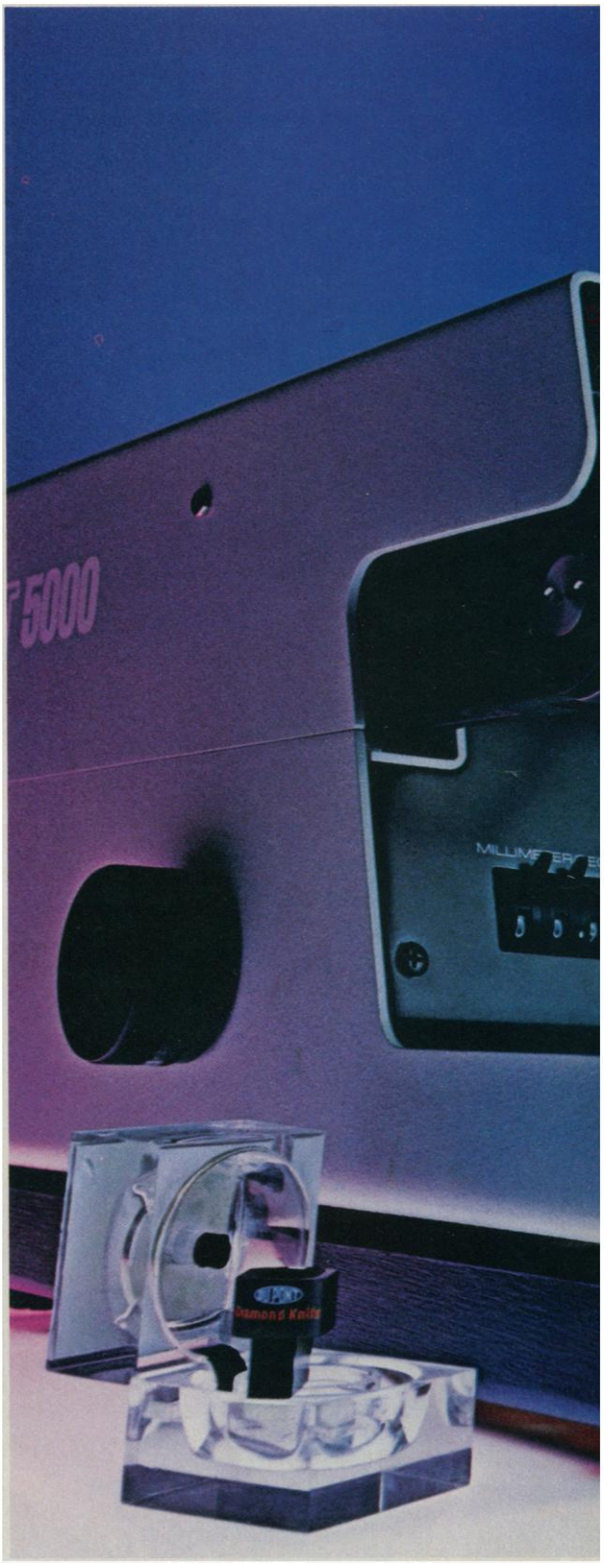

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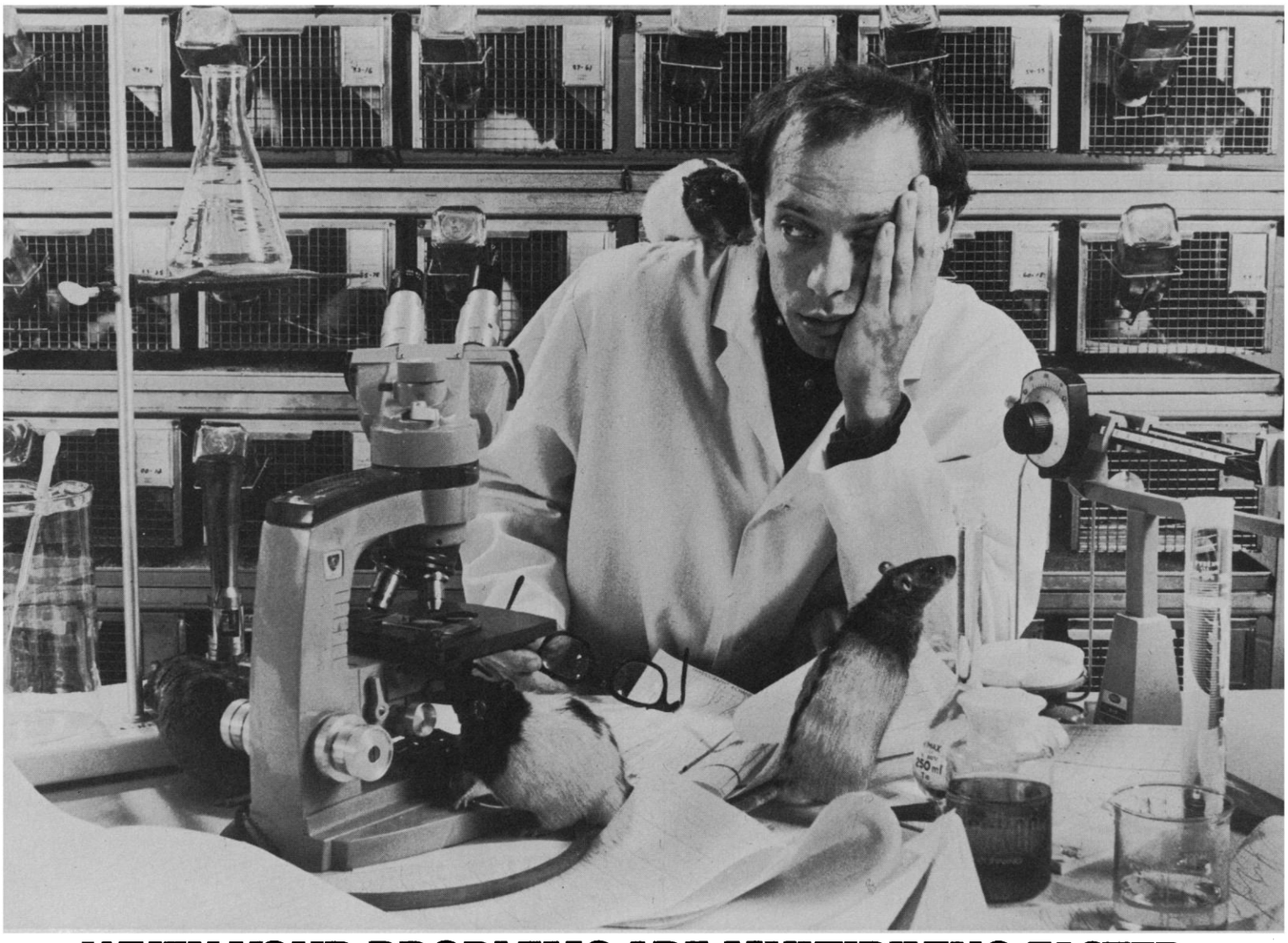

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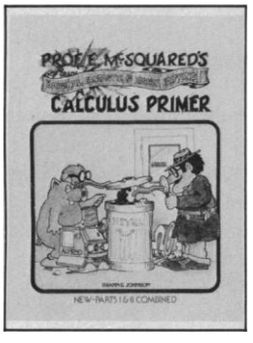

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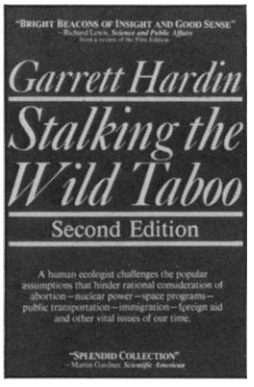

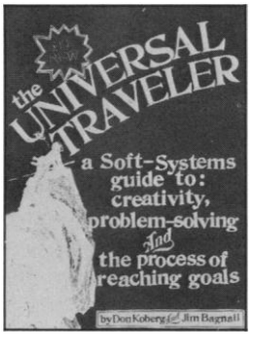

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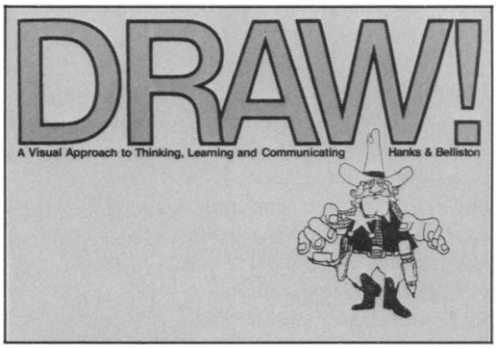

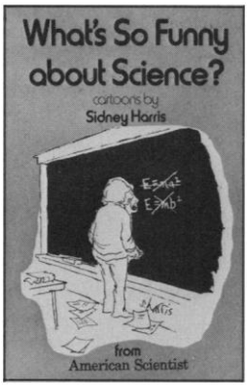

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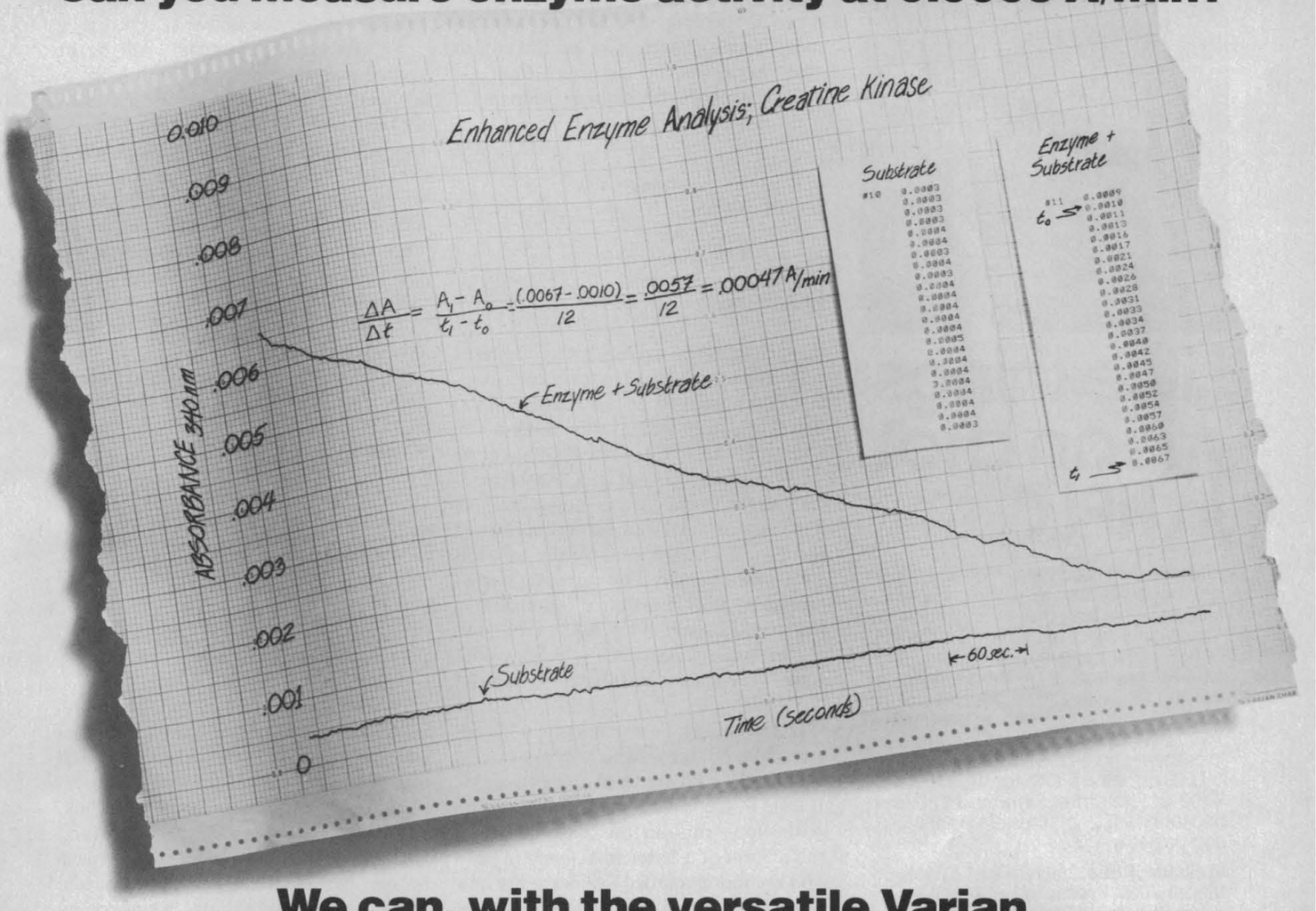

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were presented was the idea that any type of neutral beam gun may be rendered inoperable in a reactor environment because there may be no way to stop thermonuclear neutrons from escaping through the neutral beam ports and disabling the guns.

—WILLIAM D. METZ

References

1. J. R. McNally, *Nucl. Fusion* **17**, 6 (1977).

Helping Soviet Scientists

I should like to make some suggestions with regard to the letters and commentary published on the Russian situation (11 Aug., p. 482). I think I am qualified to advise in this area, as I spent 45 years in Russia (five of which were spent waiting for an exit visa to Israel) and was interrogated, arrested, and imprisoned there for my activities as a refusenik scientist. Additionally, the current group of refusenik and imprisoned scientists is comprised largely of my friends. Following are some suggestions which I would make to Western scientists visiting the U.S.S.R.

1) Do not ask Soviet scientists for advice. Some of those who are less careful in what they say (such as the colleagues of Dale P. Cruikshank) may be in trouble in the long run—in this case after the publication of a letter in *Science*. Those who are more guarded—as were the colleagues of Charles DeLisi—are probably not telling the full story.

2) Anyone who does not already possess a fairly profound knowledge of Russian life probably should not try to decide what to do by himself, bearing in mind the maxim that a disease cannot be cured except by a physician. In this instance, the "physicians" are, for instance, those who belong to the Committee of Concerned Scientists (the director is Mark Mellman, 9 East 40 Street, New York 10016). My own ideas on this point are presented in (*1*).

3) It should be borne in mind that dissident scientists are still scientists. They write papers, but they write them in a Russian style and with flawed English; they cannot prepare the papers properly, and their correspondence with scientific journals is cut off. It would be helpful if someone could assist in the preparation of their manuscripts. I have papers right now from, for example, Y. Orlov, V. Brailovsky, and I. Brailovsky. Volunteers from various fields of science (physics, mathematics, cybernetics) are badly needed, since each published paper of a dissident scientist is the result of someone's good will and devotion. Interested persons should contact Mark Mellman at the address above.

4) "Excluded scientists" will be organizing an International Conference on Collective Phenomena in Moscow on 27–29 December. The participation of Western scientists will be extremely important and effective so far as support is concerned, because those in the Soviet Union have been deprived of scientific communication. Information about the conference is available from Minko Balkanski, co-chairman, Université de Paris VI, 4 Place Jussieu, 75230 Paris Cedex 05, France.

MARK AZBEL*

Department of Physics,
Tel-Aviv University,
Ramat-Aviv, Tel Aviv, Israel

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1. M. Azbel, *Phys. Today* **31**, 9 (May 1978).

* Present address: Institute for Advanced Study, Princeton, New Jersey 08540.

The Brains of Geniuses

It is both easy and appropriate to deride the naively mechanistic notion that science might trace the cause of mental or moral excellence to the gross physical structure of a preserved brain (*1*). Thus, Einstein's genius remains elusive—and his brain remains in a cider box because no one has identified anything unusual about it worth publishing. As historical precedent for a negative result, Nicholas Wade (News and Comment, 25 Aug., p. 696) cites Rudolph Wagner's comparison of a laborer's brain with that of the great mathematician Friedrich Gauss. Wagner found no difference.

Yet Gauss's brain did not rest in a beer keg, and Wagner's results were dismissed by all the great craniometricians who made racism a respectable science in the 19th century. The dissection of brains from "eminent men" became a cottage industry among anatomists and anthropologists: they pledged themselves to each other and practically solicited subscriptions. "To me the thought of an autopsy is certainly less repugnant than I imagine the process of cadaveric decomposition in the grave to be," cajoled one famous enthusiast (*2*). Gauss's brain, at the Columbian value of 1492 grams, was only modestly overaverage, but he was too magnificent a genius to lose for the cause. So Paul Broca, the world's leading craniometrician, mentioned Gauss's advanced age (78) and small stature and jacked the figure up (*3*). The American E. A. Spitzka summa-

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It includes some interesting computer-drawn histograms in its description of how to distinguish mitotic cells from cells in interphase based on differences in chromatin structure. Methods and results are described, with discussion and references.

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rized data on more than 100 "men of eminence" and praised Gauss for the richness of his convolutions and sutures. In an outrageous example of nonrandom selection, he arranged a sequence of Gauss, a bushwoman, and a gorilla, and wrote: "The brain of a first-class genius like Friedrich Gauss is as far removed from that of the savage Bushman as that of the latter is removed from the brain of the nearest related ape" (*4*). Data can always be twisted and misused if expectations are sufficiently powerful. The conviction that black and female inferiority would be located in brain structure led "men of eminence" to know themselves and proclaim their innately higher worth in the face of ambiguous and contrary evidence. Wade cites Gauss's tale in a modern perspective, but the story between Wagner and Wade needs to be told as well, if only to temper current humor with a reminder that the same information can be nonsense or profundity in different social contexts.

STEPHEN JAY GOULD
Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138

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2. E. A. Spitzka, *Trans. Am. Philos. Soc.* **21**, 235 (1907).
3. P. Broca, *Bull. Soc. Anthropol. Paris* **2**, 165 (1861).
4. E. A. Spitzka, *Trans. Am. Philos. Soc.* **21**, 226 (1907).

The brief article on Albert Einstein's brain recalled to me the fact that several of the great Swiss and German neuroanatomists in the period between the two World Wars were passionately interested in the study of brains of people of outstanding talent. One publication even carried the unusual title "How shall we study the brains of the elite?" These studies grew out of the discovery during this period that there were differences in the configuration of the cortex on the two sides of the brain and that, in addition, there were marked individual differences in this pattern of asymmetries. Even with this solid scientific basis, however, no firm conclusions could be drawn because the number of brains of distinguished people was too small. In the present state of study of the asymmetries of the brain, it is possible that differences would be found between the people who were highly verbal on the one hand and highly spatial on the other, but it is very doubtful that one could pick out the brains of geniuses.

There is a story, perhaps apocryphal, concerning the brain of another remarkable figure which was removed for study. One distinguished German anatomist is said to have reported at a medical meeting that the brain of Lenin was exceptional because on microscopic study it was found to have seven layers in the cerebral cortex instead of the usual six. At this point, one of his right-wing colleagues is supposed to have shouted angrily, "Would you consider a baby born with six fingers to be a superior specimen?"

NORMAN GESCHWIND
Department of Neurology, Harvard University Medical School, Boston, Massachusetts 02115

Alfredics

While William J. Broad's squib (News and Comment, 29 Sept., p. 1195) on my predictions of the 1978 Nobel Prize winners (in *Omni*, October 1978) is accurate in every other respect, he errs by suggesting that my method includes "hocus-pocus." No magic whatsoever was involved. Indeed, the predictions were derived from the 17 quantifidamncations which undergird low energy alfredics, alfred being the first name of the Nobel Prize. Alfredics of any energy level is a social science and, as you well know, there is no magic in a social science. Unfortunately, the entire 17-part formula upon which the predictions were based—plus the original title of the paper, "How to bet the Nobel Prize"—were snipped away by referees to discourage unwholesome elements from setting up in Stockholm. In the event that my prognostications are reasonably correct—I would consider one winner out of ten candidates to be reasonable—I will prepare a second paper outlining the complete system. It is my belief that the only way to democratize the secretive and elite Nobel operation is to make it possible for every fool to make money out of it.

WILLIAM K. STUCKEY
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Eavesdropping on Galactic Civilizations

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vantage point of some light years (27 Jan., p. 377). However, the possibility of such eavesdropping is not necessarily an argument for skewing radio search programs and the development of radio astronomical instrumentation toward an eavesdropping mode. Extensive microwave transmitting systems on the earth are at most 30 years old. Present trends are toward cable and tight beam transmission for television, and it seems likely that at least in the matter of television the high-intensity radio power spectrum of the earth has a lifetime of less than a century. This implies that the intensity-time curve of radio emission from the earth is approximately a delta function centered around the last quarter of the 20th century, with a half-width of about a century in a total lifetime of 4.6×10^9 years. If this experience is typical of emerging planetary civilizations, the probability that a given civilization is wastefully leaking radio power to space as we are has a probability of $\sim 10^{-8}$. As even optimistic estimates of the number of advanced technical civilizations in the galaxy (*2*) are less than 10^8, it follows that there is no civilization in the entire Milky Way Galaxy which should be preferentially detectable through radio eavesdropping. It is, of course, conceivable that advanced technical civilizations could have very high intensity space surveillance radar systems, for astronomical or military contingencies (and if such systems were spaceborne they need not have the awkward intermittency problem of a radar based on a rotating planetary surface). But this is quite a different situation from the television eavesdropping context and one less easy to understand by analogy with current terrestrial trends (*3*).

CARL SAGAN
Laboratory for Planetary Studies,
Cornell University,
Ithaca, New York 14853

References and Notes

1. I. S. Shklovskii and C. Sagan, *Intelligent Life in the Universe* (Holden-Day, San Francisco, 1966).
2. C. Sagan, Ed., *Communication with Extraterrestrial Intelligence (CETI)* (MIT Press, Cambridge, Mass., 1973).

3. Supported by NASA grant NGR 33-010-101.

Sagan's concern appears to be over the possibility that our article about eavesdropping on extraterrestrial civilizations might influence some researchers to alter their search strategies from conventional ideas put forward over the past 20 years. Indeed, we do believe that some efforts should be directed toward the eavesdropping mode, but nowhere in our article do we argue that searches for purposeful signals should take second

priority or be abandoned. In many cases virtually the same observational strategy can be employed for either type of search—it is the "decoding" of any received signals which is very different when acting on one hypothesis or the other. Sagan's arguments about the longevity of television leakage from earth are possibly correct, but the point is that we do not and cannot know how applicable they are to even the future of *this* planet, not to speak of the typical experience on other planets. The cable television people have by now been telling us for decades about their imminent dominance of the industry, and yet it has not happened and may well never happen. In any case, even if Sagan's probability of 10^{-8} for *television* leakage is correct, we do not imagine that any leakage signals we might detect would be at all related to television. In order for the principles of our article to apply, they need be only narrow-band, periodic, electromagnetic signals not intended for our reception. Our focus on the earth was only because it was the only example of a technical civilization which we had at hand.

As an addendum I note that in our article we concluded that the Ballistic Missile Early Warning System radars were probably detectable at the greatest distance of any that our civilization continuously emits into a reasonable fraction of the sky. I have now, however, learned of a more powerful transmitter, namely that of the U.S. Naval Space Surveillance System (*1*) located at Archer City, Texas.

The effective radiated power of this antenna is 1.4×10^{10} watts into a bandwidth of only ~ 0.1 hertz. Its beam is such that any eavesdropper in the declination range of 0° to 33° (28 percent of the sky) will be daily illuminated for a period of $\gtrsim 7$ seconds. This antenna then significantly extends the range of detectability of leaking terrestrial signals: to ~ 60 light years for an Arecibo-type (300-meter) antenna at the receiving end, or ~ 600 light years for a Cyclops array (1000 100-meter dishes). While this latter distance encompasses $\sim 10^6$ stars, it should be noted that the transmitter has only been on the air since A.D. 1967. Thus only a fraction of these stars have to date had a chance to be bathed in this radiation, although they all will have by the 26th century.

WOODRUFF T. SULLIVAN, III
Department of Astronomy, University of Washington, Seattle 98195

References

1. L. D. Breetz, *Electronic Aerospace Systems Convention (EASTCON) Record* (1968), p. 247.

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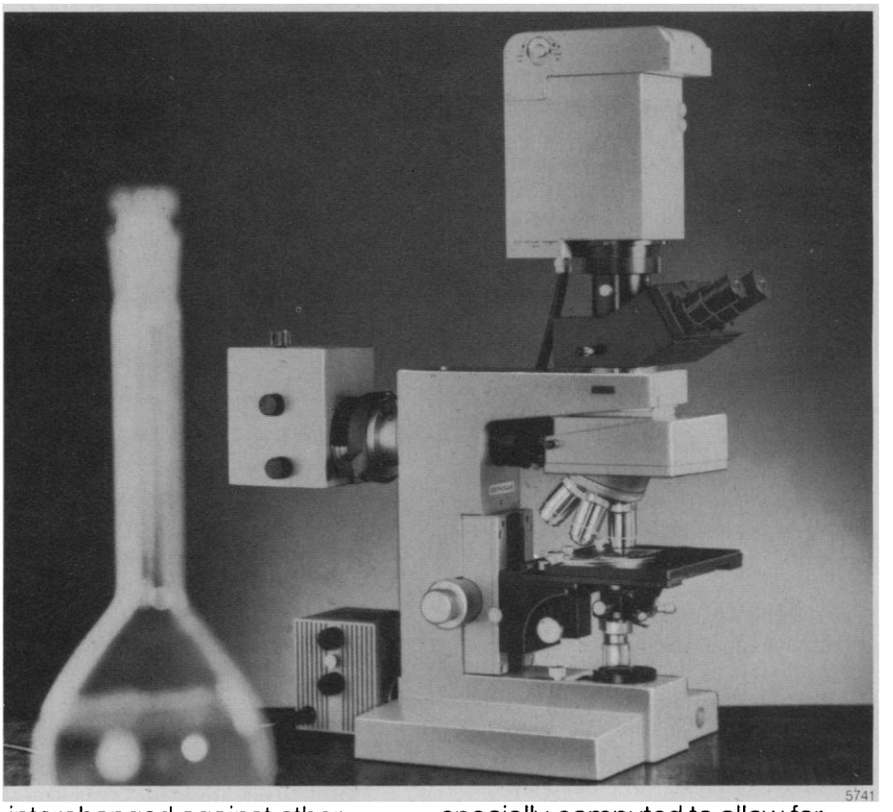

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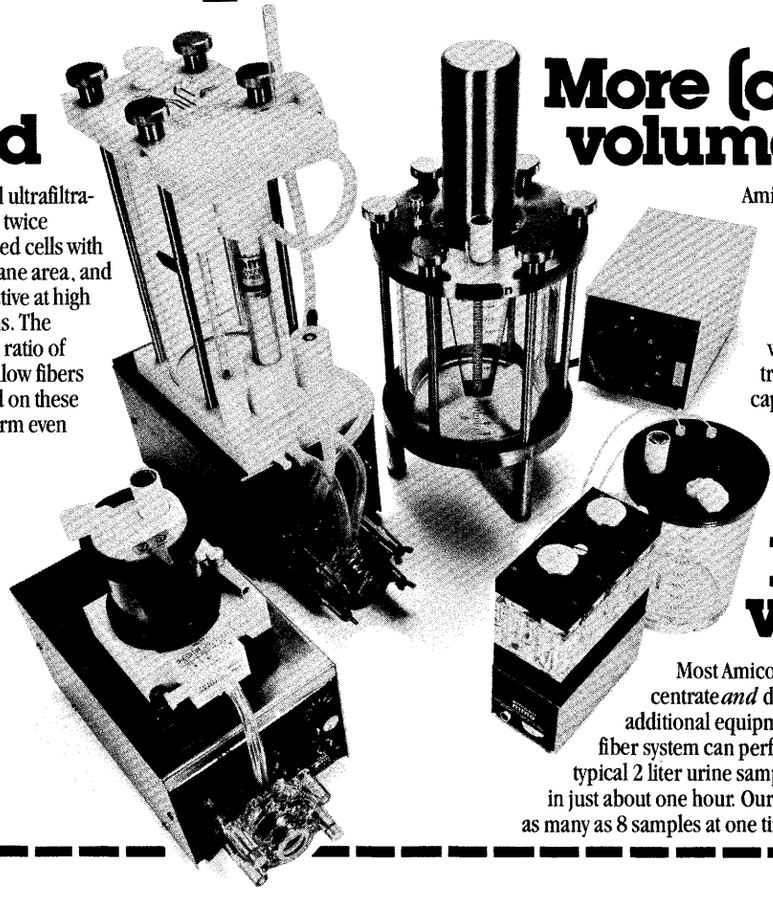

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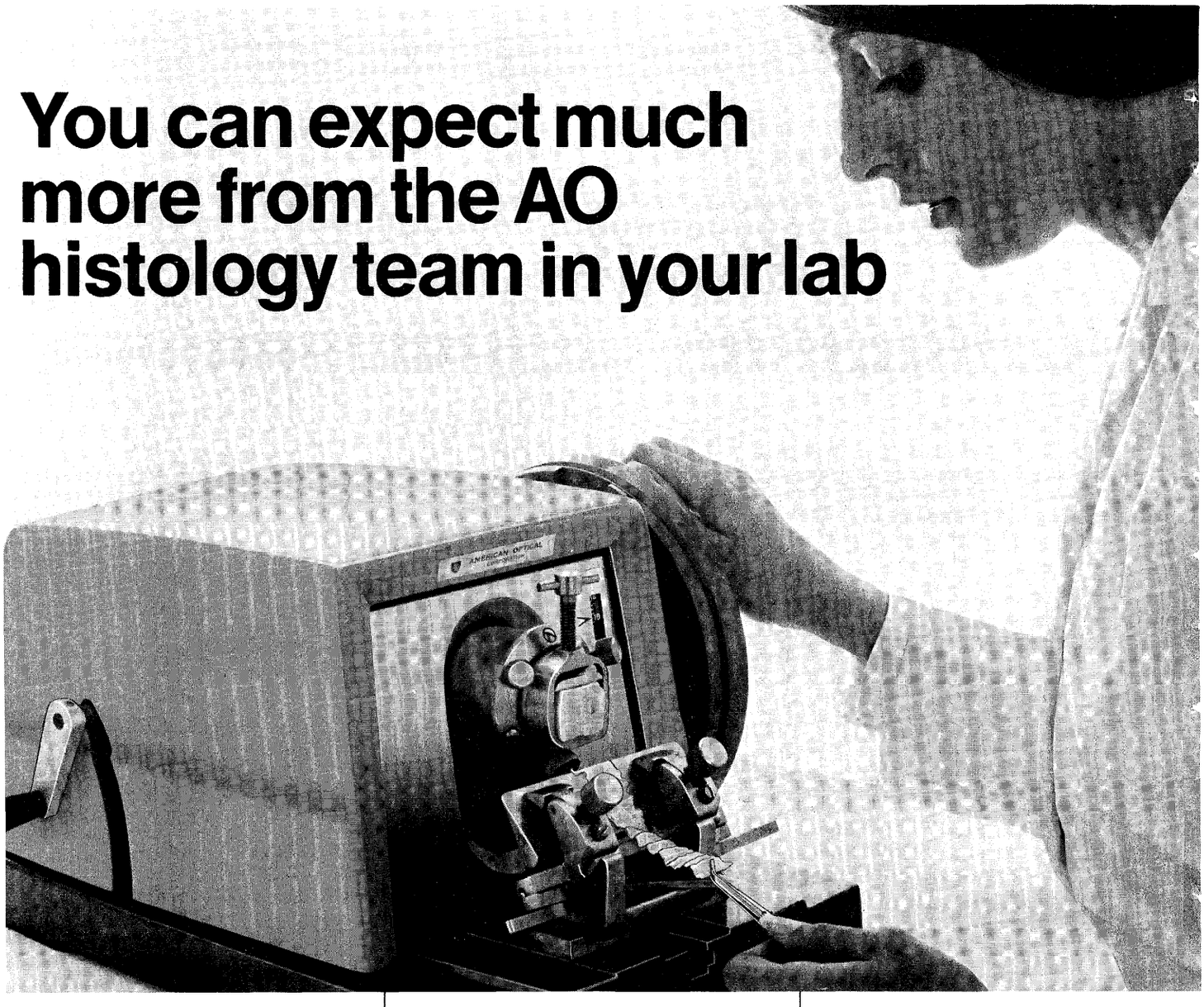

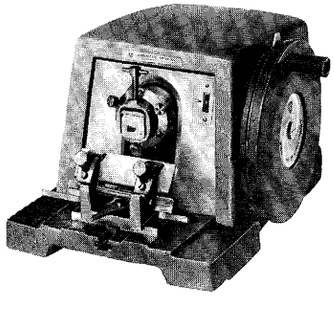

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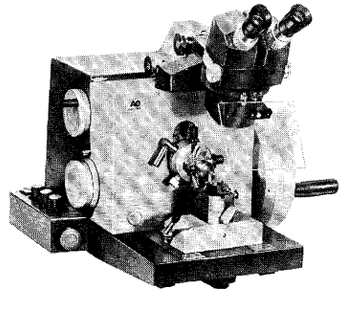

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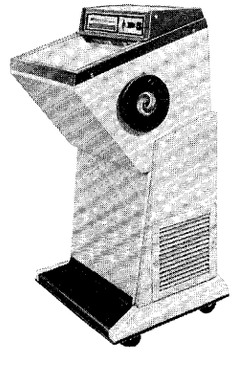

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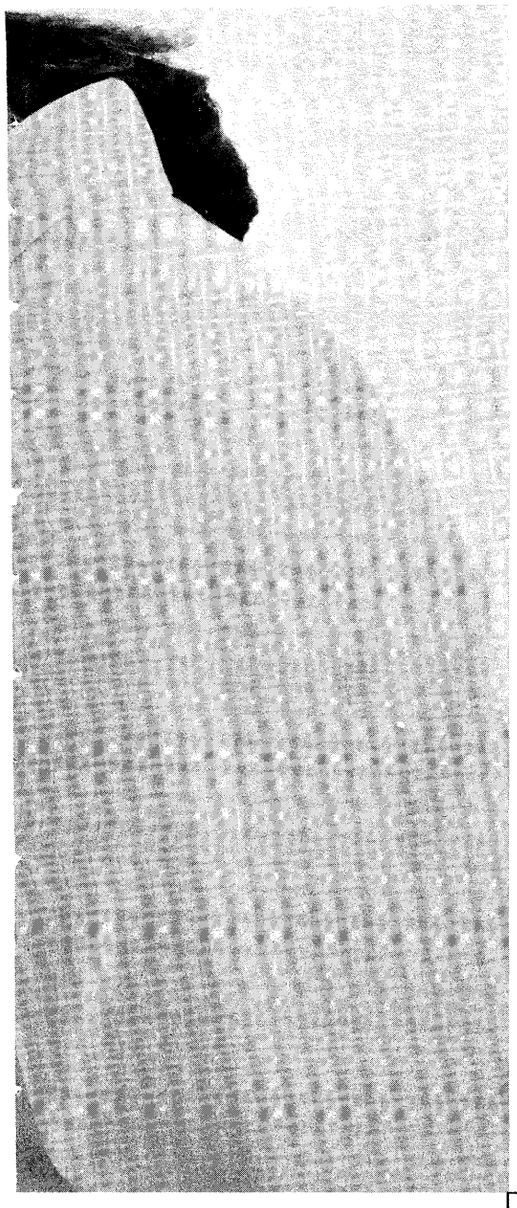

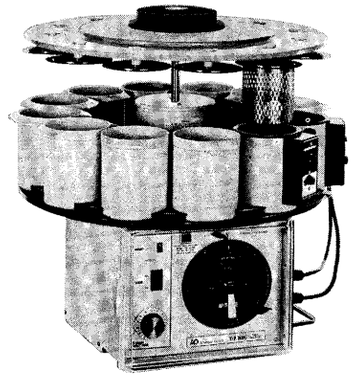

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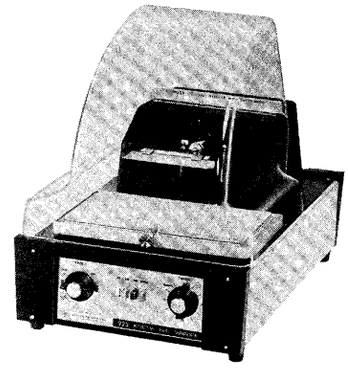

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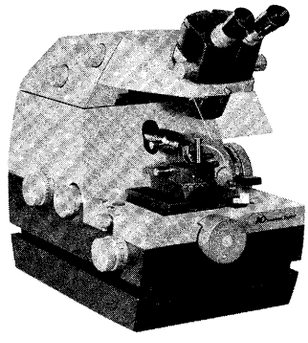

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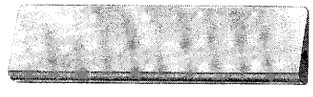

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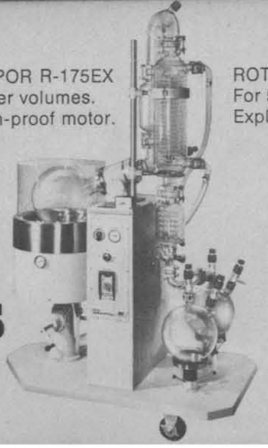

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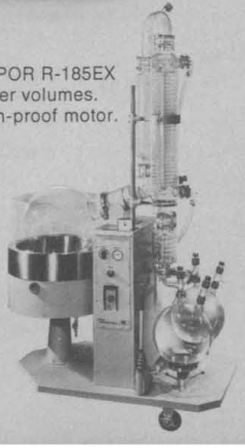

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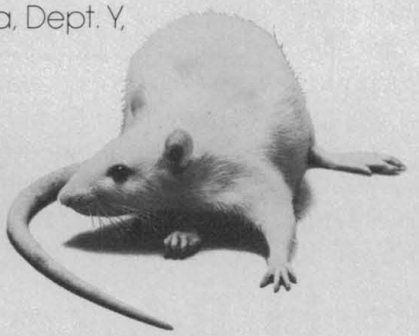

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27 October 1978, Volume 202, Number 4366 SCIENCE

Instrumentation Funding

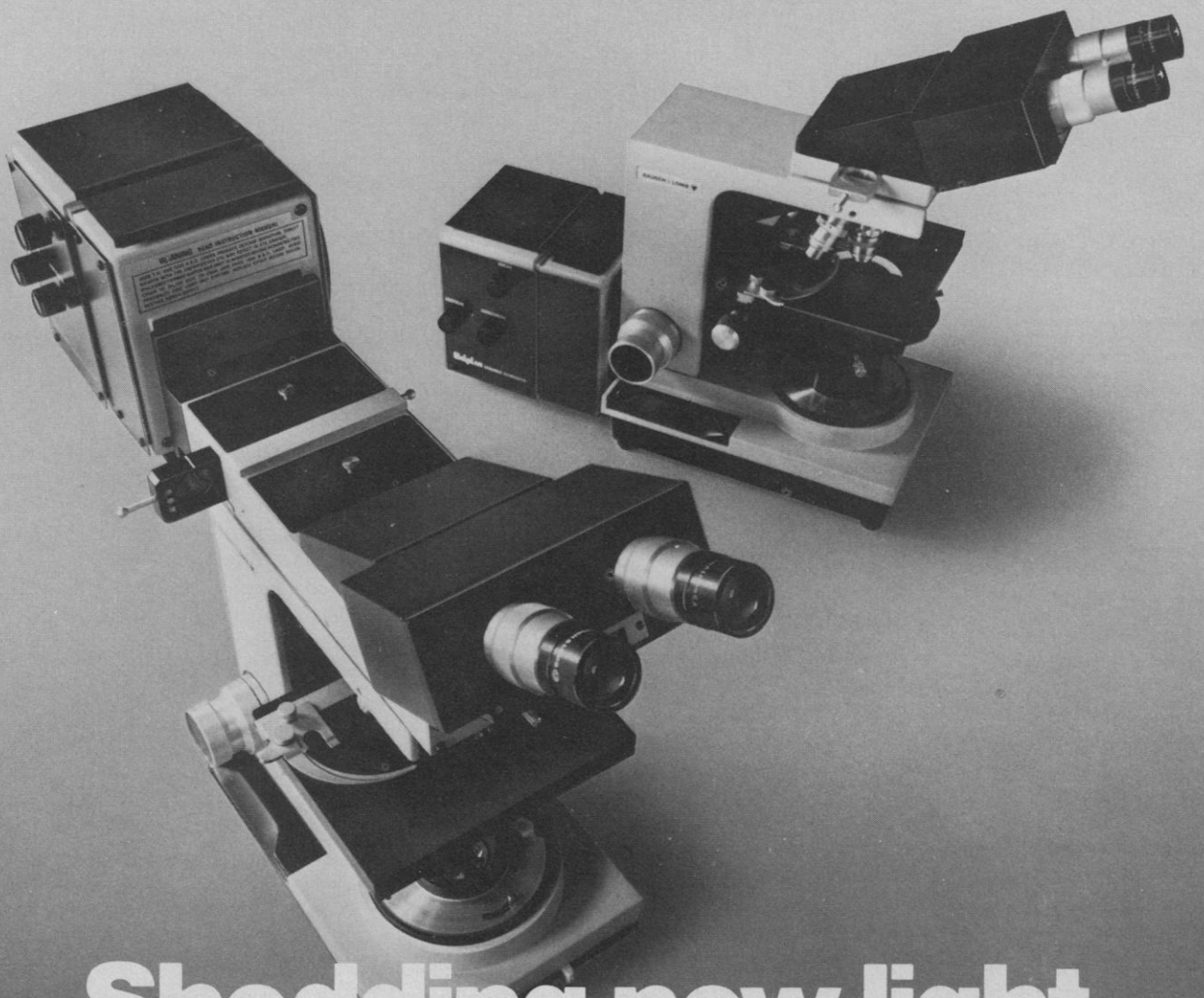
New measures are urgently required to bring under control the accelerating decline in the quality, quantity, and development of scientific research instruments in the United States. The main cause of the deterioration of equipment is lack of adequate funds for maintaining and updating it. Two major factors contribute to this lack. There has been a marked rise in replacement costs over the past decade due to inflation and to greater sophistication of the equipment. Simultaneously, there has been a decrease in the funds available for equipment, due to the effective 19 percent decline in federal expenditures for basic research combined with pressures to use the available research budgets to maintain existing operations despite the increased cost of personnel and supplies. Thus attention should be given to funding policies that will permit increased efficiency and cost effectiveness in the utilization of existing advanced instrumentation.

In the present tight money climate, the decline in the quality of scientific equipment can be reversed only by increasing the opportunities for sharing of technological resources. A significant shift in the distribution of funds available for instrumentation and a restructuring of funding policies are needed to achieve this goal. Existing avenues for the funding of costly instrumentation include both categorical grants and shared resources. Categorical grants, which are designed to further specific projects, neither mandate the sharing of instrumentation acquired under their terms nor provide for the cost of sharing—that is, the costs resulting from increased use. Instrumentation facilities funded as shared resources do not suffer from lack of use when the operational funds include an adequate provision for the cost of sharing. A properly managed shared resource best ensures both utilization of the instrumentation and maximum access to it.

Existing funding patterns are at variance with the need for wider sharing of resources. The Division of Research Resources of the National Institutes of Health (NIH) has had a constant level of funding since 1967. Since the rate of inflation in equipment costs in many cases exceeded 100 percent over this period, the net decrease in instrumentation funding far exceeds the estimated 19 percent decline in the support of basic research. The Division of Chemical Instrumentation of the National Science Foundation (NSF) recently announced an instrumentation program to establish regional laboratories. Although this is a commendatory beginning, no ongoing funding for full implementation has yet been secured. No specific provision exists within the NSF to fund major instrumentation for biological research.

We strongly endorse the NSF chemical instrumentation program and recommend that a parallel program be established for biological instrumentation. We further recommend that the NIH Division of Research Resources be revitalized, at least to its earlier levels of activity. A three- to fivefold increase in these budgets will be needed to prevent a continuing decline in the utilization of advanced technology and technological innovation in the United States. We would prefer to see a net increase in the appropriations earmarked to meet instrumentation needs. Barring such a possibility, it may be essential to change the distribution of the national R & D appropriation.

It is therefore recommended that the renewal and development of scientific equipment be specifically and primarily (although not exclusively) mandated to the divisions of federal granting agencies responsible for the establishment and maintenance of shared resources. At present these are the NIH Division of Research Resources and the NSF Division of Chemical Instrumentation; an NSF Division of Biological Instrumentation should be added. A substantial increase in their budgets should be mandated by Congress.—E. R. BLOUT, *Harvard Medical School, Boston, Massachusetts 02115;* D. M. GRANT, *University of Utah, Salt Lake City 84112;* O. JARDETSKY, *Stanford University, Stanford, California 94305;* W. D. PHILLIPS, *Washington University, St. Louis, Missouri 63130;* K. R. PORTER, *University of Colorado, Boulder 80302 (Ad Hoc Committee on Instrumentation Funding)*



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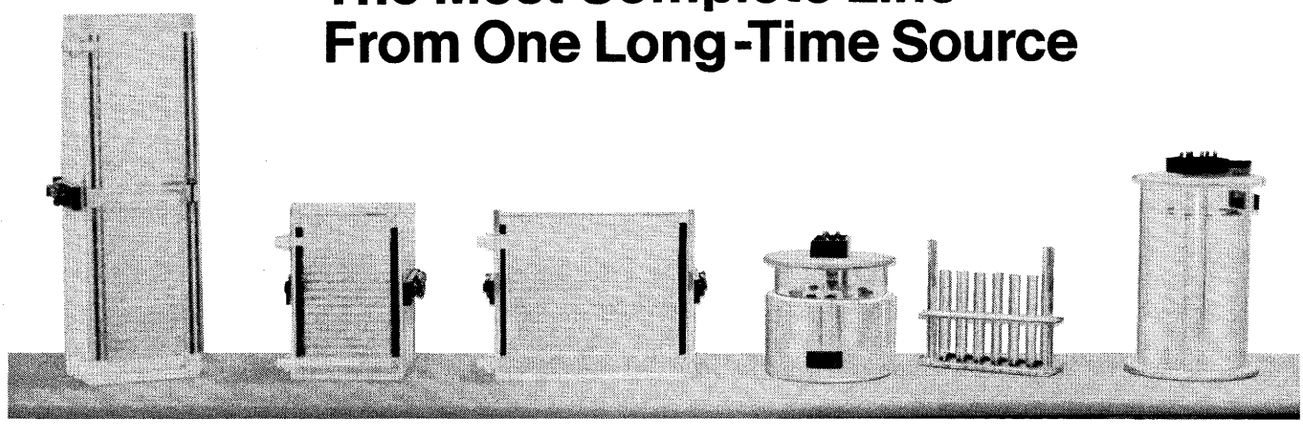

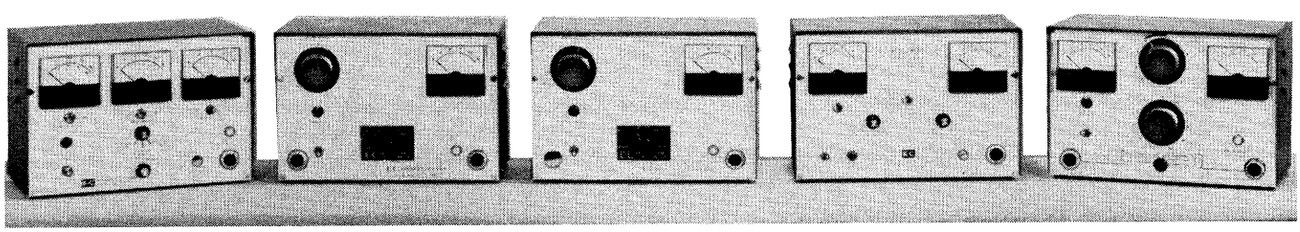

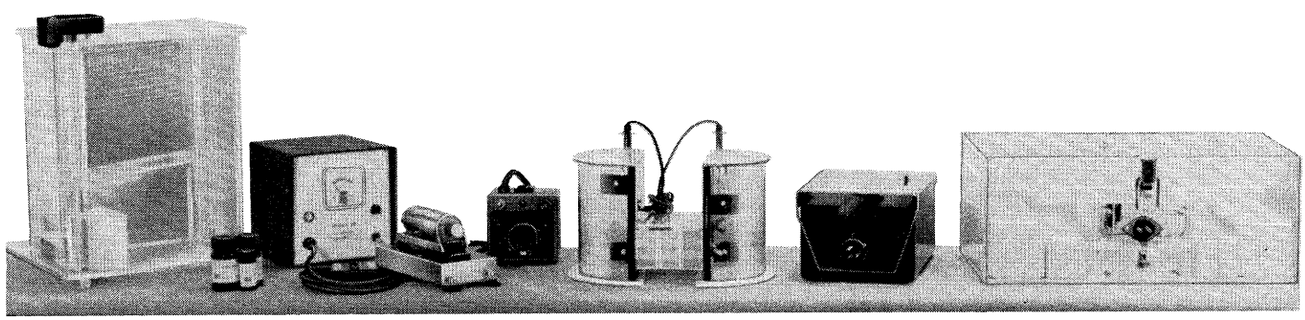

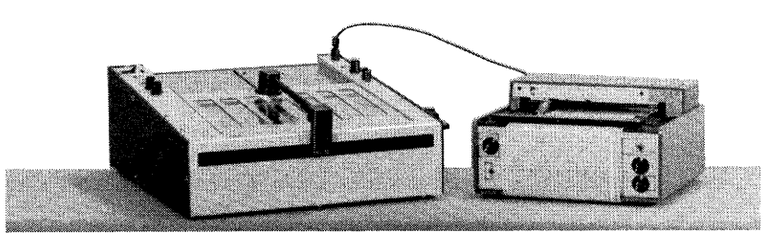

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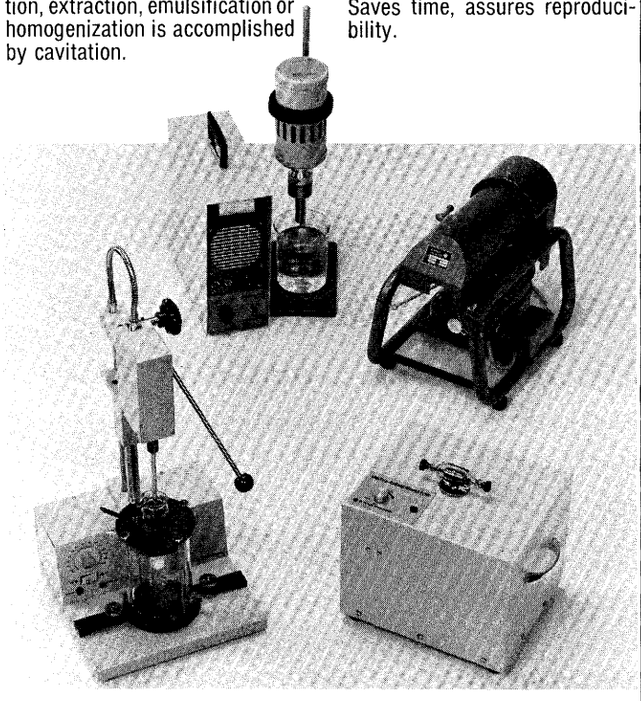

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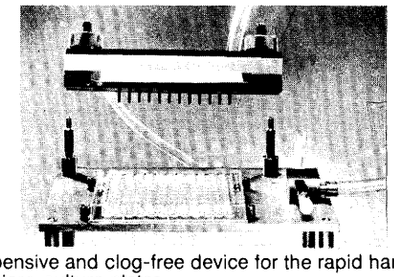
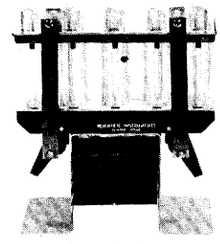


A new inexpensive and clog-free device for the rapid harvesting of cells from micro-culture plates.
Pat. Pending.

MULTIPLE MEMBRANE FILTERS - 92.051/052

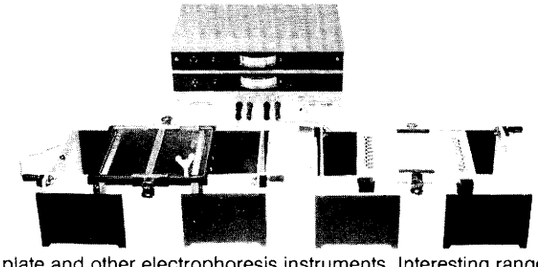


Instruments for rapid processing of a large number of radioactive samples for collection of filtrates and/or precipitates.
U.S.A. Patent No. 3,888,770.

YEDA PRESS - 92.049/050

Devices for the controlled disruption of biological material under conditions which maintain biological activity. 28 ml. and 250 ml.
U.S.A. Patent No. 3,679,139.

ELECTROPHORESIS INSTRUMENTS AND POWER SUPPLIES



Flat plate and other electrophoresis instruments. Interesting range of stablized power supplies, O-500 VDC. Also "constant" power supply.

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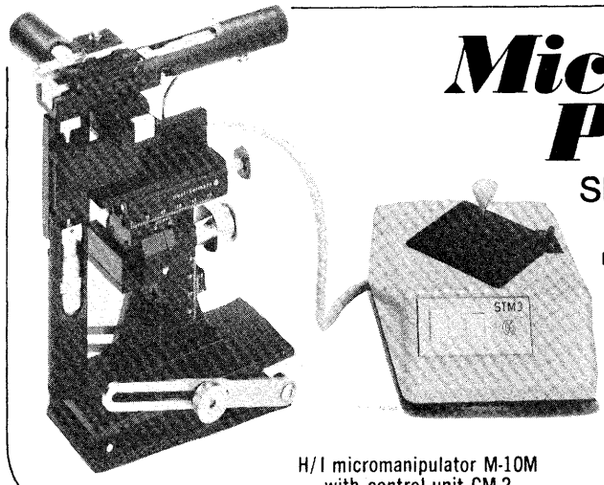

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PRODUCTS and MATERIALS

Cold Transport Pack for Laboratory Samples

Porta-Sample is a disposable transport pack to preserve samples by refrigeration during transportation. It may also be used to cool samples quickly where such procedure is required for analysis. Porta-Sample lowers temperature from 98° to 36°F in less than 10 minutes. Samples will remain at that temperature for another 20 minutes. Kay Laboratories. Circle 723.

Assay for Cocaine Metabolite

Abuscreen RIA is an assay for the detection of benzoylecgonine, the major urinary metabolite of cocaine. A screening cutoff of 100 nanograms per milliliter makes this test more sensitive than others in current use. The limit of detection of benzoylecgonine under conditions of this assay is 5 nanograms per milliliter. With the exception of cocaine and its congeners, there are no significant cross-reactions with other substances. This strongly reduces false positive and false negative readings. Roche Diagnostics. Circle 724.

Microcomputer

The Bluebird is a Z80-based, desk-top device designed to run laboratory routines and to perform mathematic and statistical analyses. With self-prompting software written in 14.6K extended BASIC, the system features a high-resolution monitor, full keyboard, math pad, and 13 user-defined keys for programmed subroutines. A 32K random-access memory is standard and it is expandable to 64K. Dual magnetic-tape cassettes provide 1000 bytes of storage. There are three parallel and two serial input/output interfaces for a line printer and other optional equipment. Eastern Analytical Laboratories. Circle 725.

Hydrophobic Chromatography

A new chromatographic technique uses a series of polymers, insoluble in water, each of which bears hydrophobic hydrocarbon chains of a given length. Materials may be separated according to their preferential binding to a particular chain length. A kit is available to determine which specific polymer is useful for a given separation and purification. Individual polymers are also available. Miles Laboratories, Research Products Division. Circle 726.

Reagent Strip Urinalysis

The Urotron system increases speed, accuracy, and convenience of reagent strip urinalysis. The system consists of an electronic strip reader and patented Chemstrip reagent strips. The reader optically scans the strips, compensates for urine color variations, and provides a printout of the results. The printout renders abnormal values visible at a glance and may be incorporated into clinical or experimental records. It also minimizes differences created by subjective observation of test results. Up to 120 strips may be read in an hour. Bio-Dynamics/bmc. Circle 727.

Infrared Image Converter

Model LCT is designed for general-purpose infrared viewing. Response is in the spectral range from 700 to 1200 nanometers. Any T-mount lens systems may be used with this instrument. An internally controlled infrared source is provided. The viewer is suitable for physiological and behavioral studies, observation of fluorescence, location of heat sources, and other forms of spectral analysis. Accessories are also available including a variety of lenses, rings, and filters. Barsom. Circle 728.

Color Television for Microscopy

The MV 100 system consists of a color camera and an adapter to fit the camera tube of any existing microscope and a monitor with a 13-inch (diagonal) screen with a resolution greater than 350 lines. The system is compatible wth a videotape recorder for the creation of permanent records. The microscope adapter features a standard 2.8 power and there is an optional adapter with 5.6 power optics. Comtronix. Circle 735.

Literature

Test Equipment for Patient Monitors describes simulators and accessories for accurate testing and calibration of electrocardiographs and blood pressure and temperature-monitoring equipment. Fogg System. Circle 729.

Ultramicrotome is devoted to the Ultrotome V sectioning device for researchers, clinicians, and industrial microscopists. LKB Instruments. Circle 730.

Spectrodensitometer supplies detailed information about the SD 3000 model designed for thin-layer chromatography. Schoeffel Instrument. Circle 731.

Tube Gel Electrophoresis Apparatus gives design specifications of the TG-3, three-sample instrument for quick tests of range of molecular weight using all types of gel techniques. Dickinson Instrument. Circle 732.

Mercury Intrusion Porosimeter describes the features, operation, and applications of this instrument. American Instrument. Circle 733.

X-ray Analysis is a paper that details 50 years in the history of this technique through four generations of development. Siemens. Circle 734.

Liquid Chromatography provides spectra and describes standard and optional features of the 5000 series instruments. The six basic models range from simple isocratic to fully automatic gradient systems. Varian Instrument Division. Circle 736.

Thermometer lists thermometers, accessories, and hydrometers for research, industrial, and teaching applications. Brooklyn Thermometer. Circle 717.

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 Reader's Service Card (pages 378A and 442E) and placing it in the mailbox. Postage is free.

—RICHARD G. SOMMER