

11 April 1980 • Vol. 208 • No. 4440

\$1.50

# SCIENCE

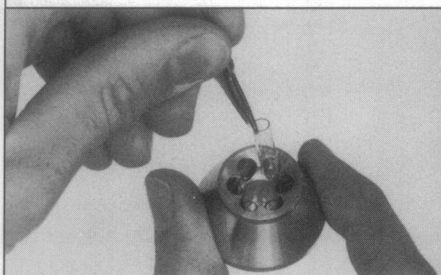
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





# New rotors for the Airfuge®-

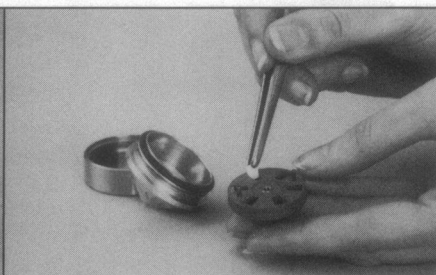
## the small-sample ultracentrifuge.



The new 30° fixed angle rotor holds up to 240  $\mu$ l per tube and provides forces up to 178,000 g.



The new Batch Rotor rapidly pellets 2 to 7 ml of material.



The new Electron Microscopy Particle Counting Rotor is useful for virus research.

The Airfuge® air-driven ultracentrifuge, with its high forces and speeds, is unsurpassed for centrifuging small samples rapidly. The Airfuge continues to grow in versatility. Now there are five rotors to choose from for numerous applications.

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The Batch Rotor pellets material in a polyethylene liner or in the rotor body itself. The Electron Microscopy

Particle Counting Rotor sediments particles uniformly onto the surfaces of specimen grids for rapid, accurate, and reliable detection and counting. The unique Chylomicron Rotor clarifies lipemic sera by flotation of chylomicrons in just ten minutes.

The Airfuge ultracentrifuge uses ordinary laboratory air pressure to spin rotors almost friction-free on a cushion of air. It's efficient, quiet, and simple to operate. Ask about the 30-day free trial offer for the Airfuge. For a description of the Airfuge and its applications, write for the new Airfuge brochure, SB-557, to Beckman Instruments, Inc., 1117 California Ave., Palo Alto, CA 94304.

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**Bacteriophage λ DNA** cleaved by *Hind* III restriction endonuclease and subsequently labeled [<sup>3</sup>H]

Six fragments, MW in daltons:

15.1x10 <sup>6</sup>	2.7x10 <sup>6</sup>
6.2x10 <sup>6</sup>	1.4x10 <sup>6</sup>
4.2x10 <sup>6</sup>	1.2x10 <sup>6</sup>

0.1-1.5mCi/mg DNA

Packaged in 10mM Tris-HCl (pH 8.0), 1.0mM EDTA, 100μg/ml yeast tRNA carrier, in silanized combi-vial, dry ice.

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Eleven fragments, MW in daltons:

8.79x10 <sup>5</sup>	1.76x10 <sup>5</sup>
7.01x10 <sup>5</sup>	1.52x10 <sup>5</sup>
5.67x10 <sup>5</sup>	1.26x10 <sup>5</sup>
3.92x10 <sup>5</sup>	0.767x10 <sup>5</sup>
2.02x10 <sup>5</sup>	0.468x10 <sup>5</sup>
1.81x10 <sup>5</sup>	

0.1-1.0mCi/mg DNA

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Deoxyribonucleic acid, [*thymine-methyl*-<sup>3</sup>H]-  
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## COVER

Pattern of radial stretching and wrinkling of a thin sheet of silicone rubber caused by the locomotion of fibroblasts spreading outward from an explant in the center. Using this method, the contractility of individual cultured cells can be studied. Dark-field illumination. Total width of field is 3.4 millimeters. See page 177. [Albert K. Harris, Department of Zoology, University of North Carolina, Chapel Hill]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



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# today's desktop for data acquisition

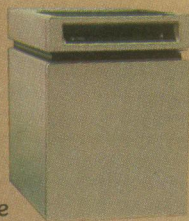


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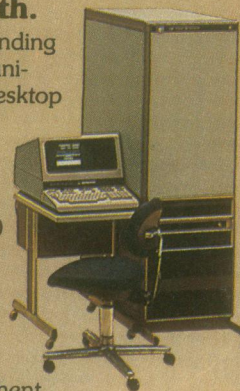


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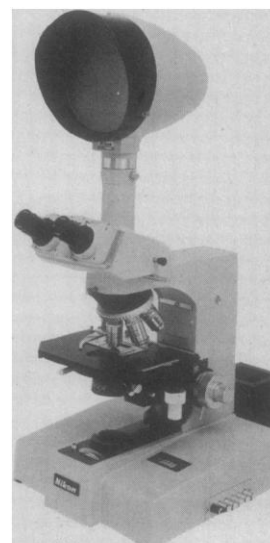
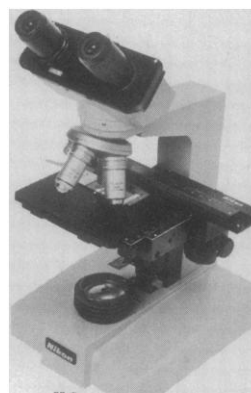
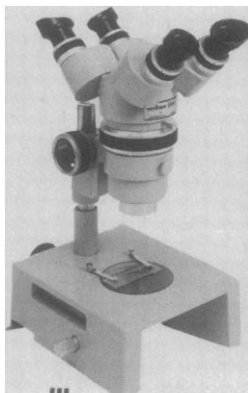
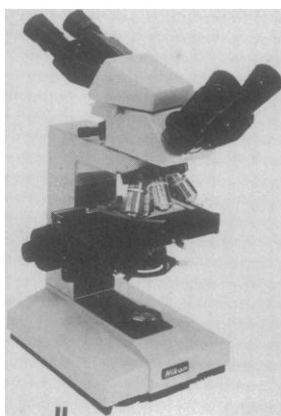
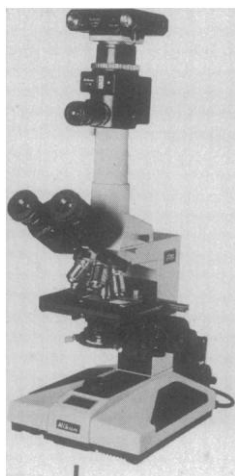
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---

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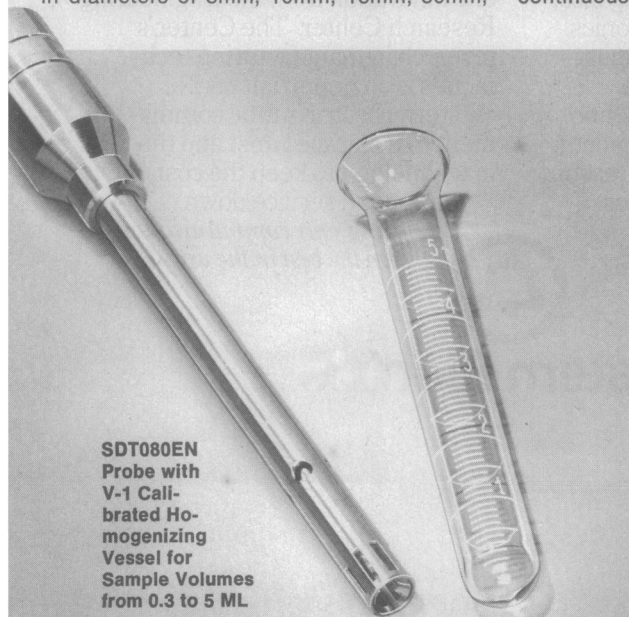
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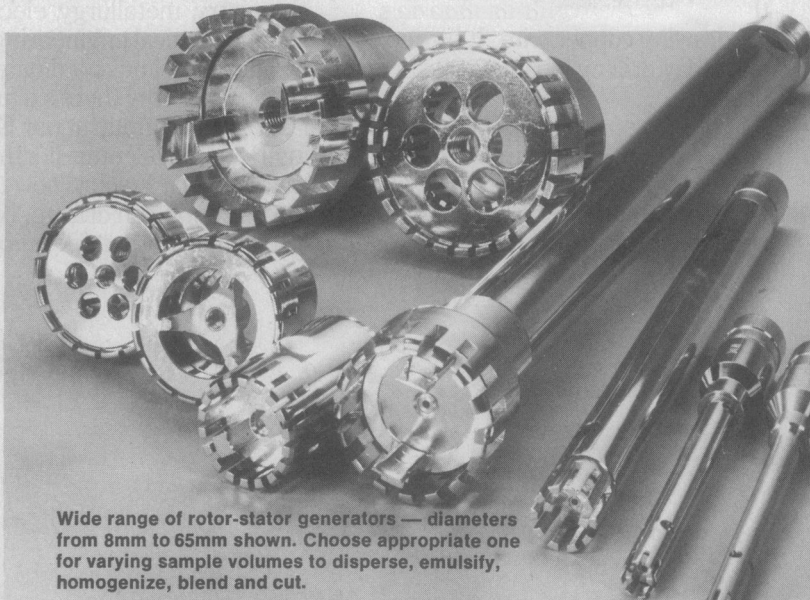
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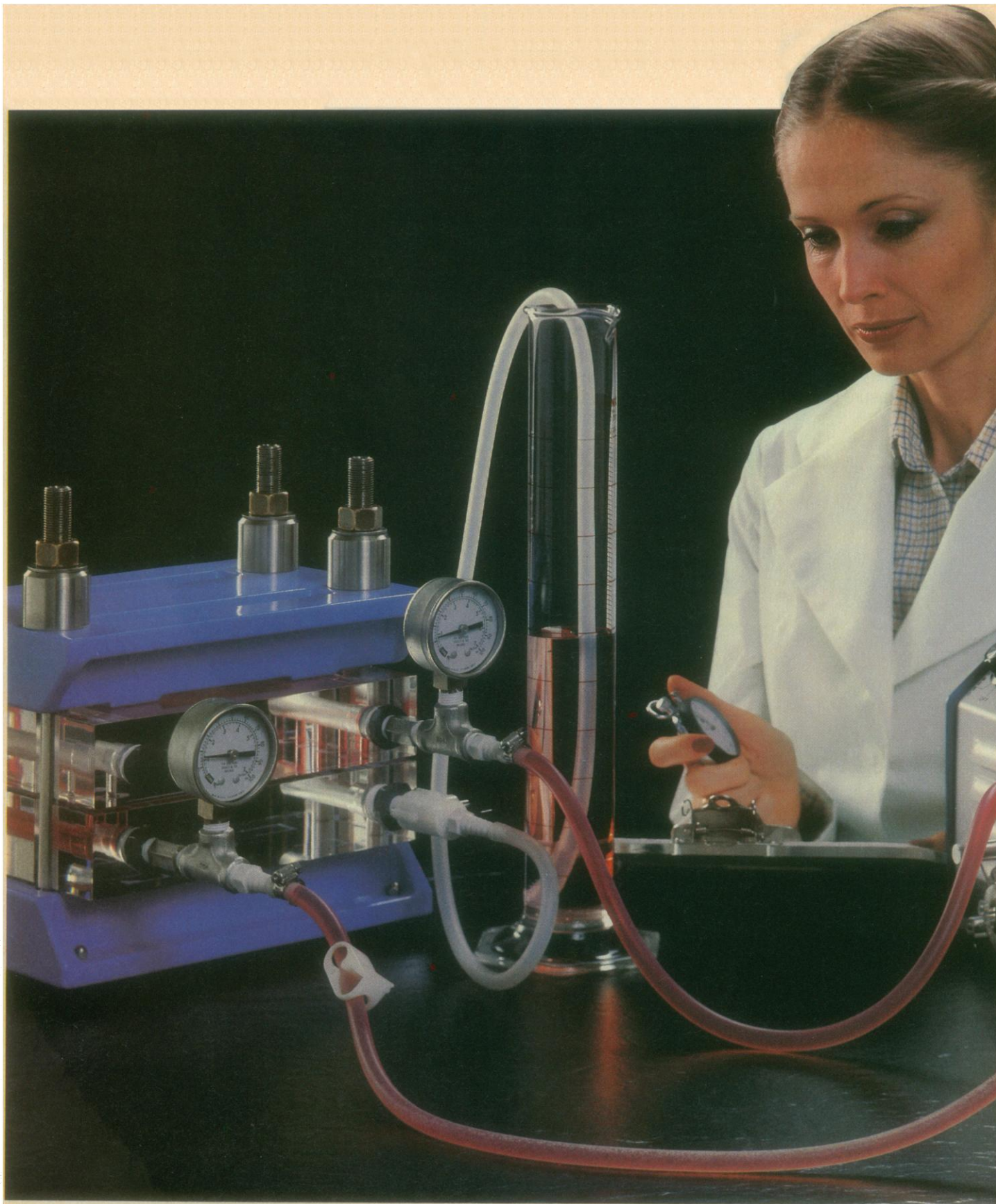
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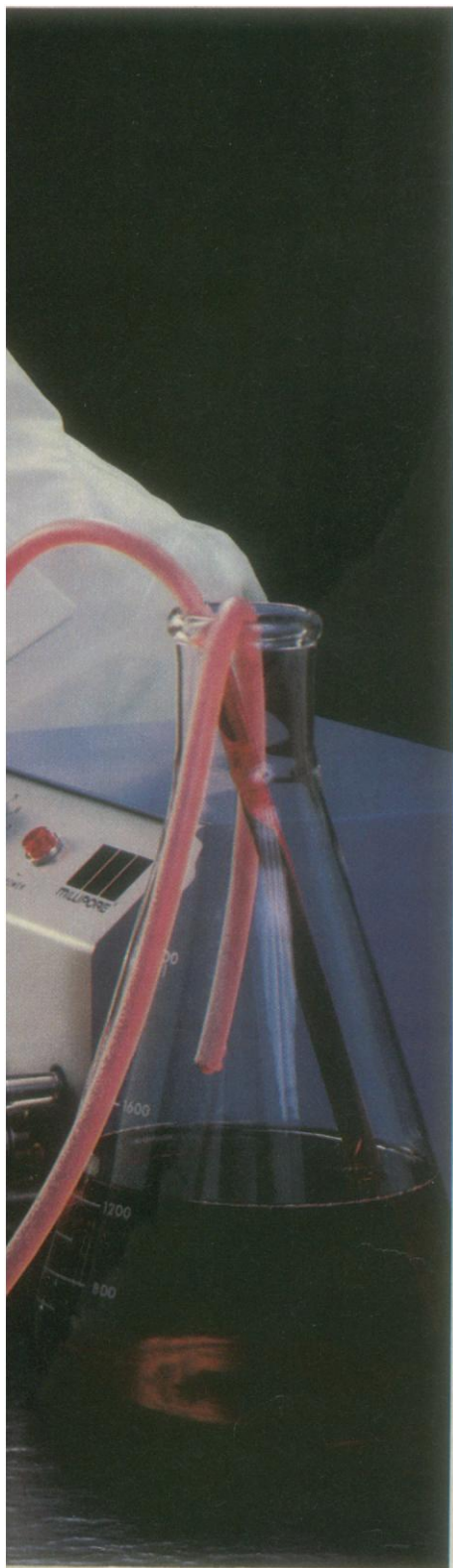
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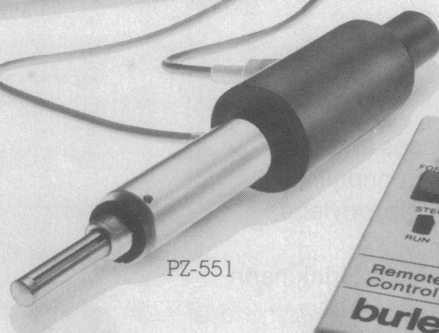
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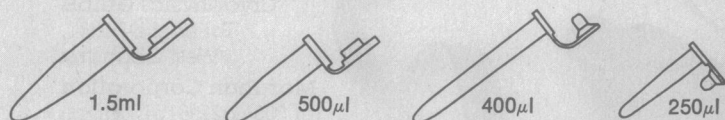
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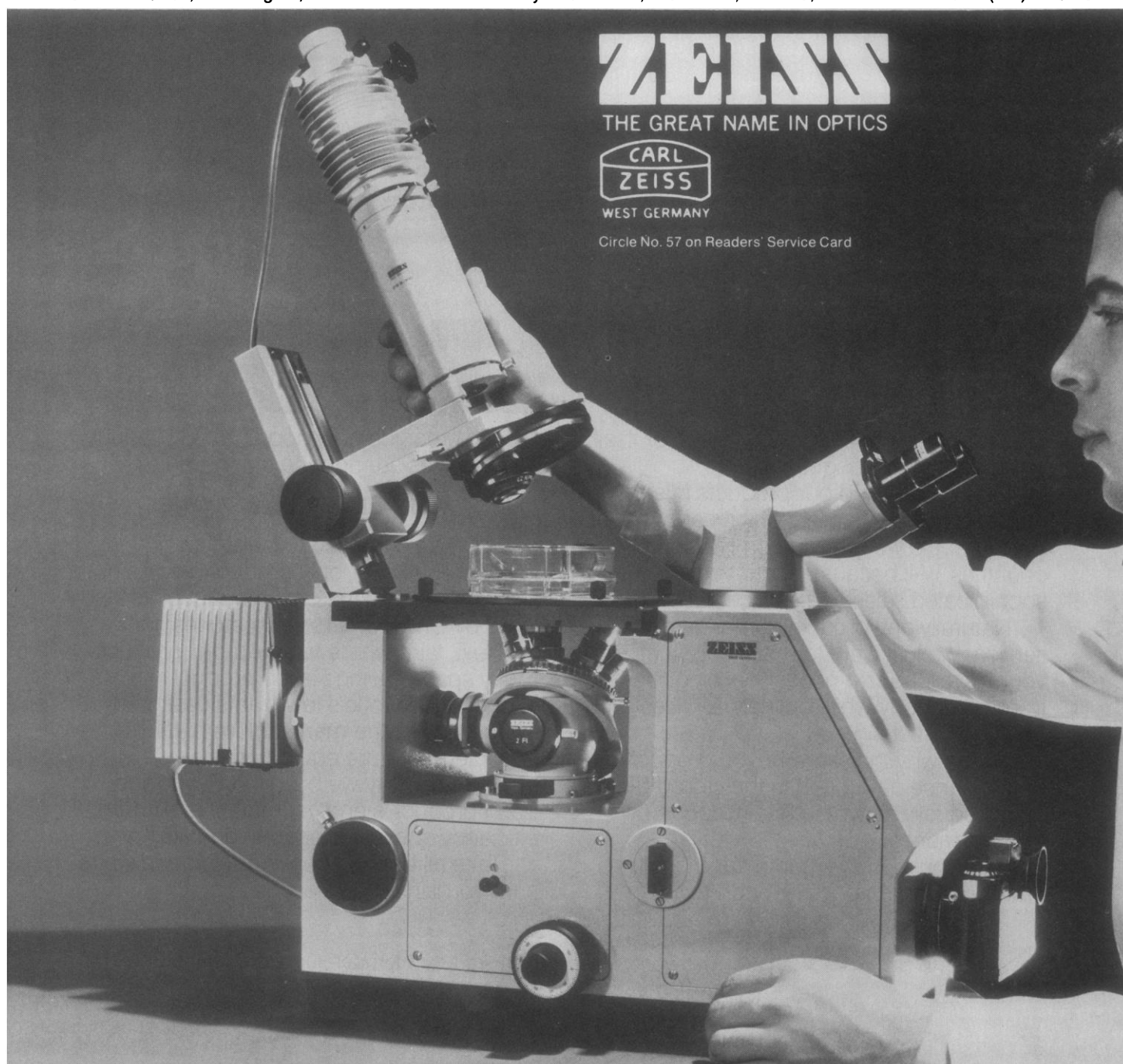
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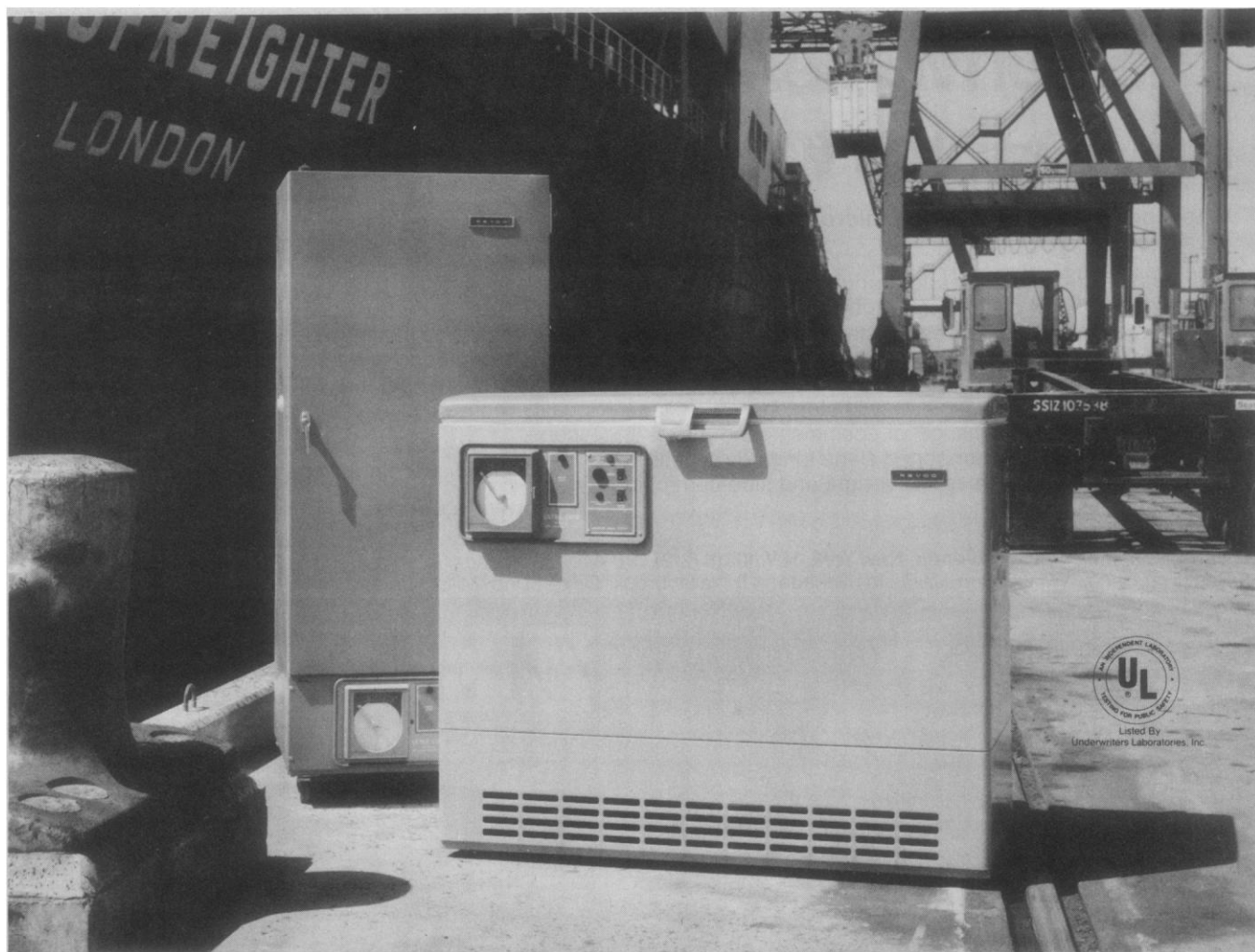
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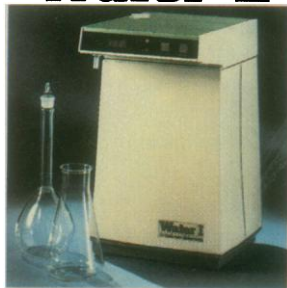
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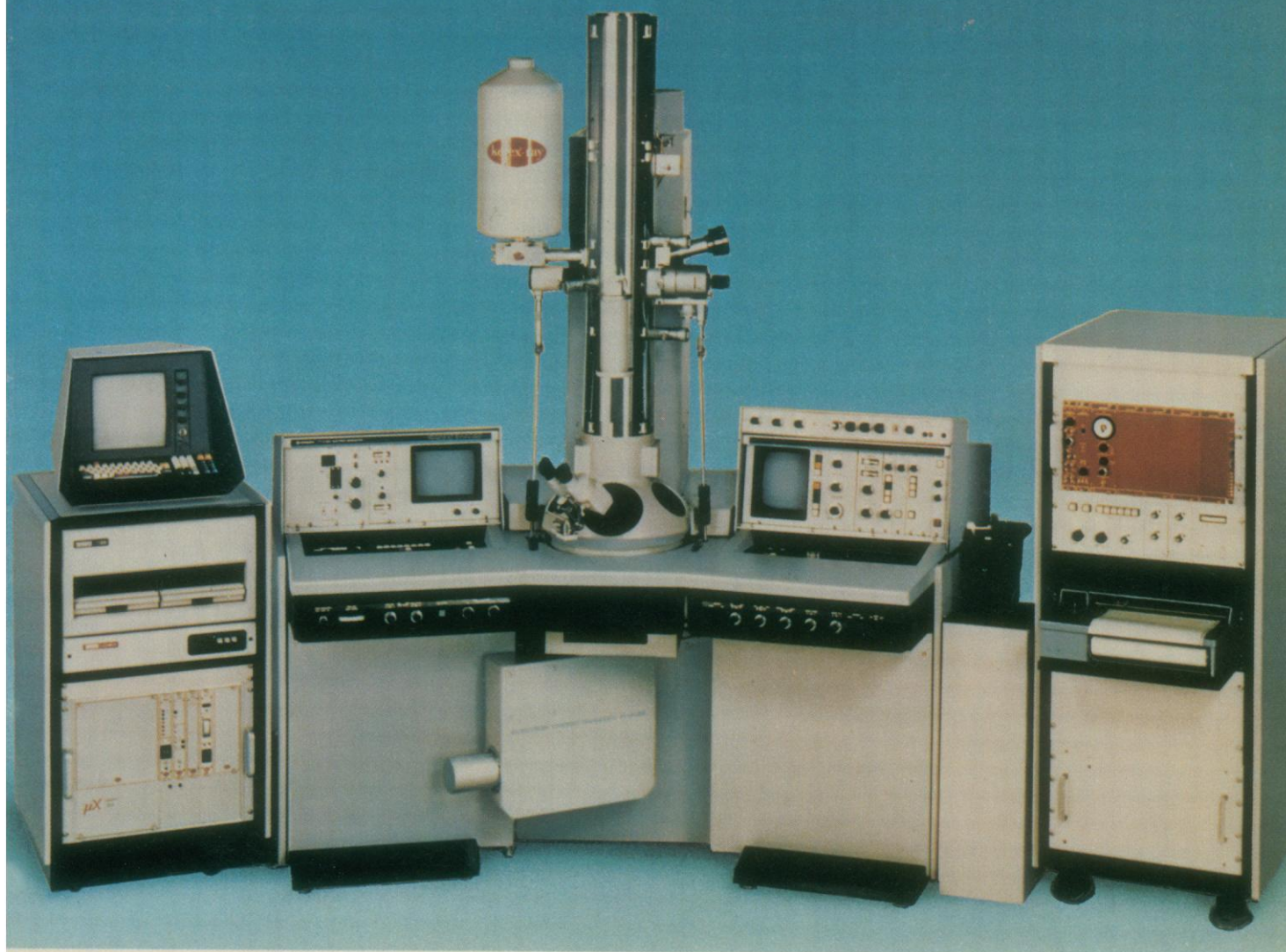
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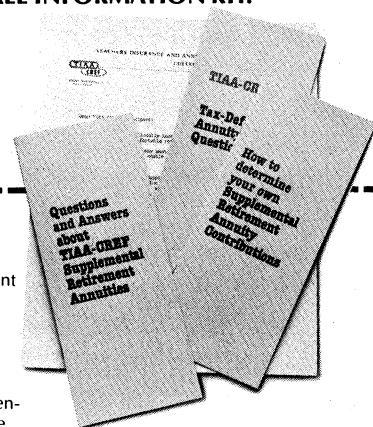
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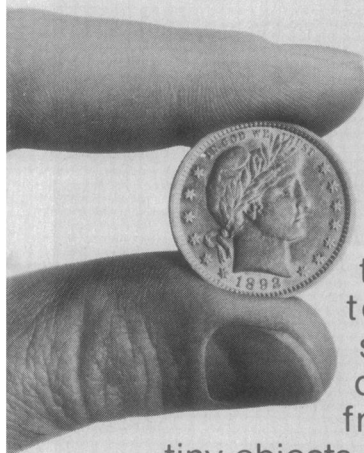
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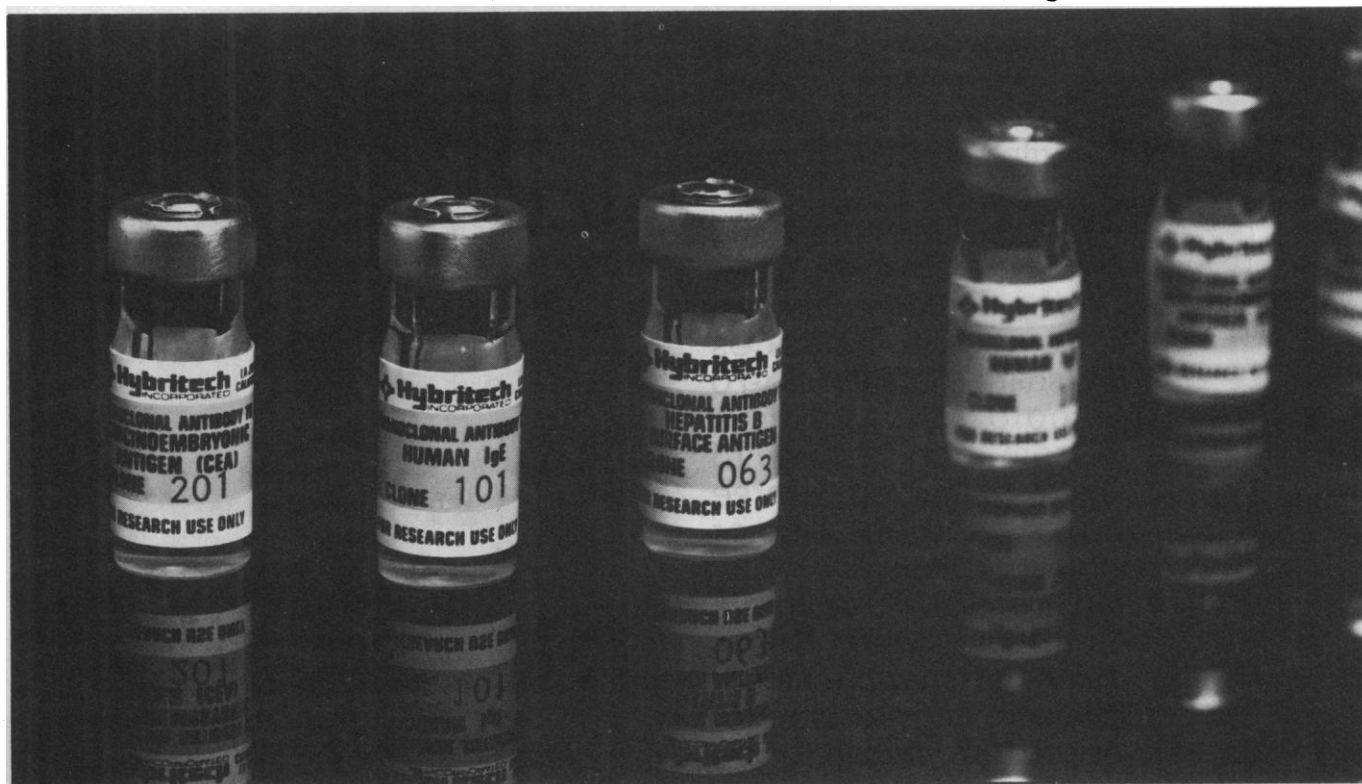
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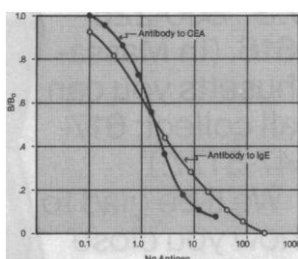
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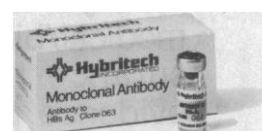
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2. See B. Ballou et al: "Tumor location detected with radioactively labeled monoclonal antibody and external scintigraphy"; *Science*, Nov. 1979; Vol. 206, pp. 844.



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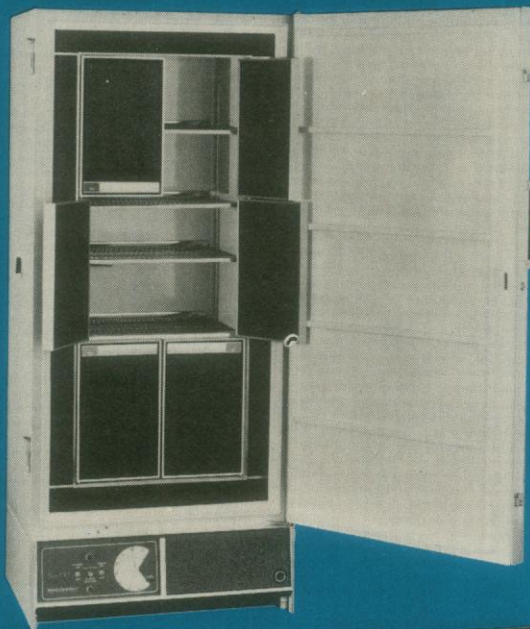
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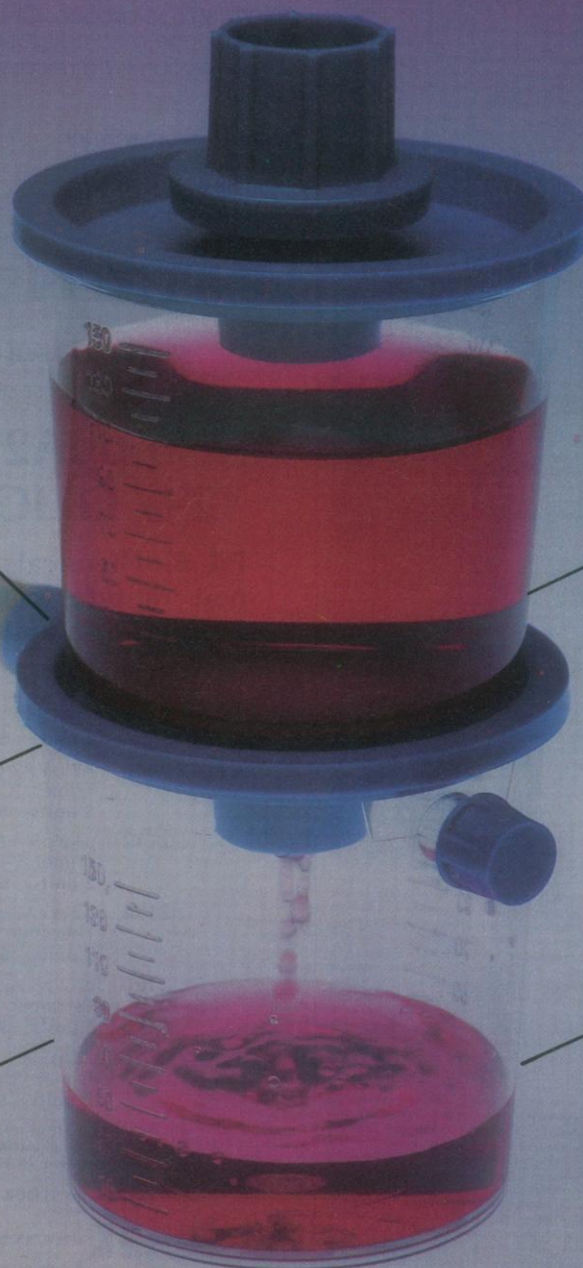
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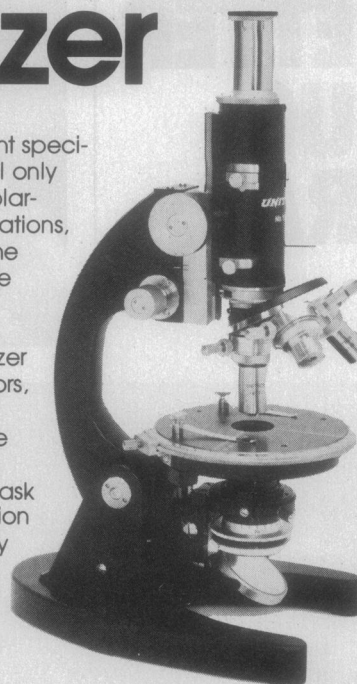
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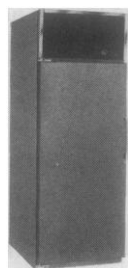
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As coauthor with Cooper of the lead workers mortality study that was the subject of the letter by Kang *et al.*, I should like the opportunity to reply. I will confine myself to the specific statistical issues raised by Kang *et al.*

Kang and his colleagues allege that an incorrect formula for the standard error of the SMR was used and that an incorrect  $z$  value was used for the 1 percent level of significance. In fact, these were both typographical errors. The square root sign that was missing in our report was in fact used in the actual tests. A missing line of type in the part of the text referring to  $z$  values created the erroneous impression as to which critical values were used. The text (but not the calculations) is indeed in error. Incidentally, the description by Kang *et al.* of my use of the "technique developed by Chin Long Chiang" is incorrect. I used Chiang's work to satisfy myself that the SMR did not follow the Poisson distribution and that the Poisson assumption was probably conservative. The responsibility for the choice of test was mine alone.

The important issue raised by Kang and his colleagues is that of whether a one-sided or a two-sided test should have been used. Concluding that a one-sided test should have been used, the remainder of the letter contains references to "apparent errors," "the need for use of appropriate . . . statistical analyses," and so forth. Yet one of the authors of the letter—Infante—appears to use two-sided tests in other studies of a similar nature (1). Since Infante *et al.* (1) do not adhere to the IRLG guidelines, it is impossible to tell what test was used. It is easy, however, to verify that the one-sided test Kang *et al.* use in their reanalysis of our data was *not* used in (1). In addition, the use of two-sided tests is more generally accepted than Kang *et al.* suggest. In a copy of a journal issue entitled "Occupational carcinogenesis" (2), I found four articles (3) by NIOSH authors (nine persons in all) in which two-sided tests had been used. My own view is that significantly low SMR's may have much to tell us. For example, in the case of cancer mortality, in which the healthy worker effect is not strong, a significantly high SMR for one site combined with a significantly low SMR for a second site invites suspicion that there may be some consistent errors in cause of death certification. Other causes of death can be interpreted as socioeconomic indices, and low values may be informative about selection bias in the study population. My views on this matter appear to be shared by a substantial body of experienced investigators at NIOSH.

The next issue in the letter by Kang *et*

*al.* concerns whether the appropriate two-sided test is a critical ratio or a confidence interval. There will be some marginal cases in which an excess SMR will be statistically significant by the first test but not by the second. I nevertheless prefer the confidence interval. This avoids the logical contradiction, with the critical ratio, of sometimes finding an SMR significantly greater than 100 but with a confidence interval that includes 100. An additional consideration not addressed by Kang *et al.* is that the formula for the standard error of the SMR is, in any case, an approximation. The argument then comes down to whether one approximation is better than another. In view of the fact that all significance statements in a cohort study of this kind are plagued by the multiple comparison problem, any reasonable investigator must regard significance levels, however they are determined, as nominal figures only.

The final reference by Kang *et al.* to the Epidemiology Work Group of the IRLG puzzles me. The implication is that this work group has laid out prescriptions for proper study design and analysis. In fact, the IRLG guidelines confine themselves to prescriptions for disclosure. That document specifies what constitutes good practice in disclosing the details of a study design and analysis and is very wisely silent about prescribing study designs. Although the study by Cooper and me antedated by 5 years the promulgation of the IRLG document, we appear to have provided enough detail about what we did to give Kang and his colleagues the basis for a critique.

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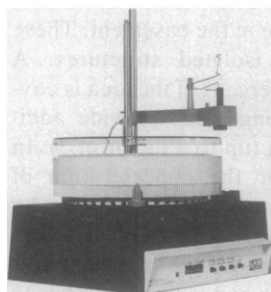
#### References

1. P. F. Infante, J. K. Wagoner, R. A. Rinsky, R. J. Young, *Lancet* 1977-II, 76 (1977).
2. *Ann. N.Y. Acad. Sci.* 271 (whole issue) (1976).
3. P. Decoufle, *ibid.*, p. 94; R. A. Lemen, J. S. Lee, J. K. Wagoner, H. P. Blejer, *ibid.*, p. 273; V. E. Archer, J. D. Gillam, J. K. Wagoner, *ibid.*, p. 280; D. L. Bayliss, J. M. Dement, J. K. Wagoner, H. P. Blejer, *ibid.*, p. 324.

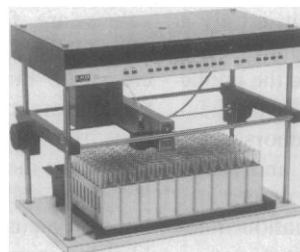
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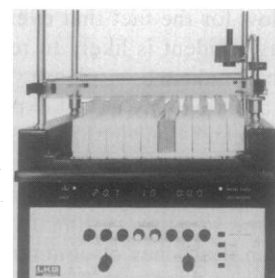
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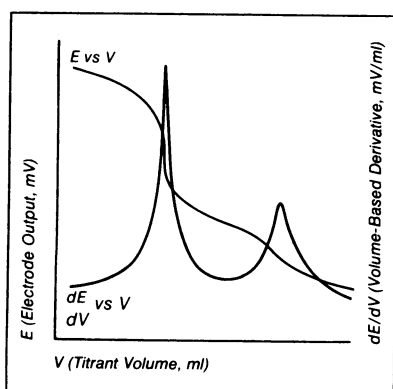
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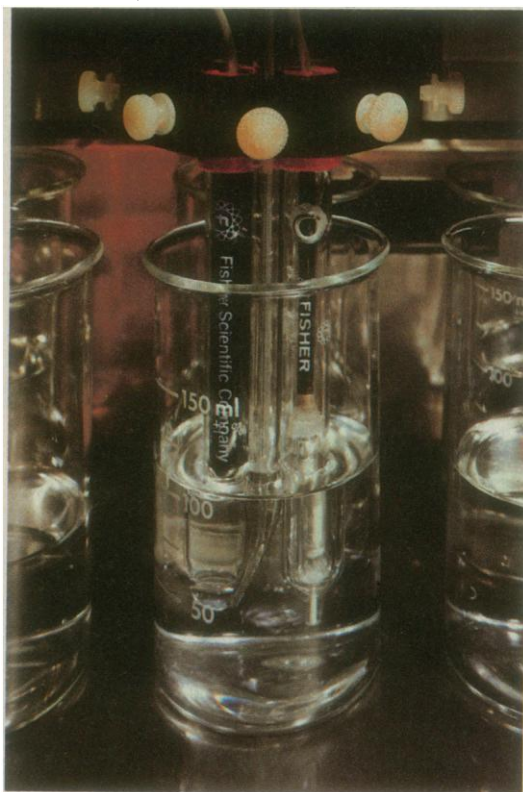
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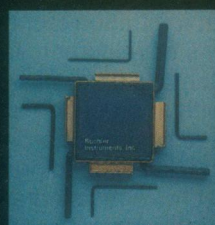
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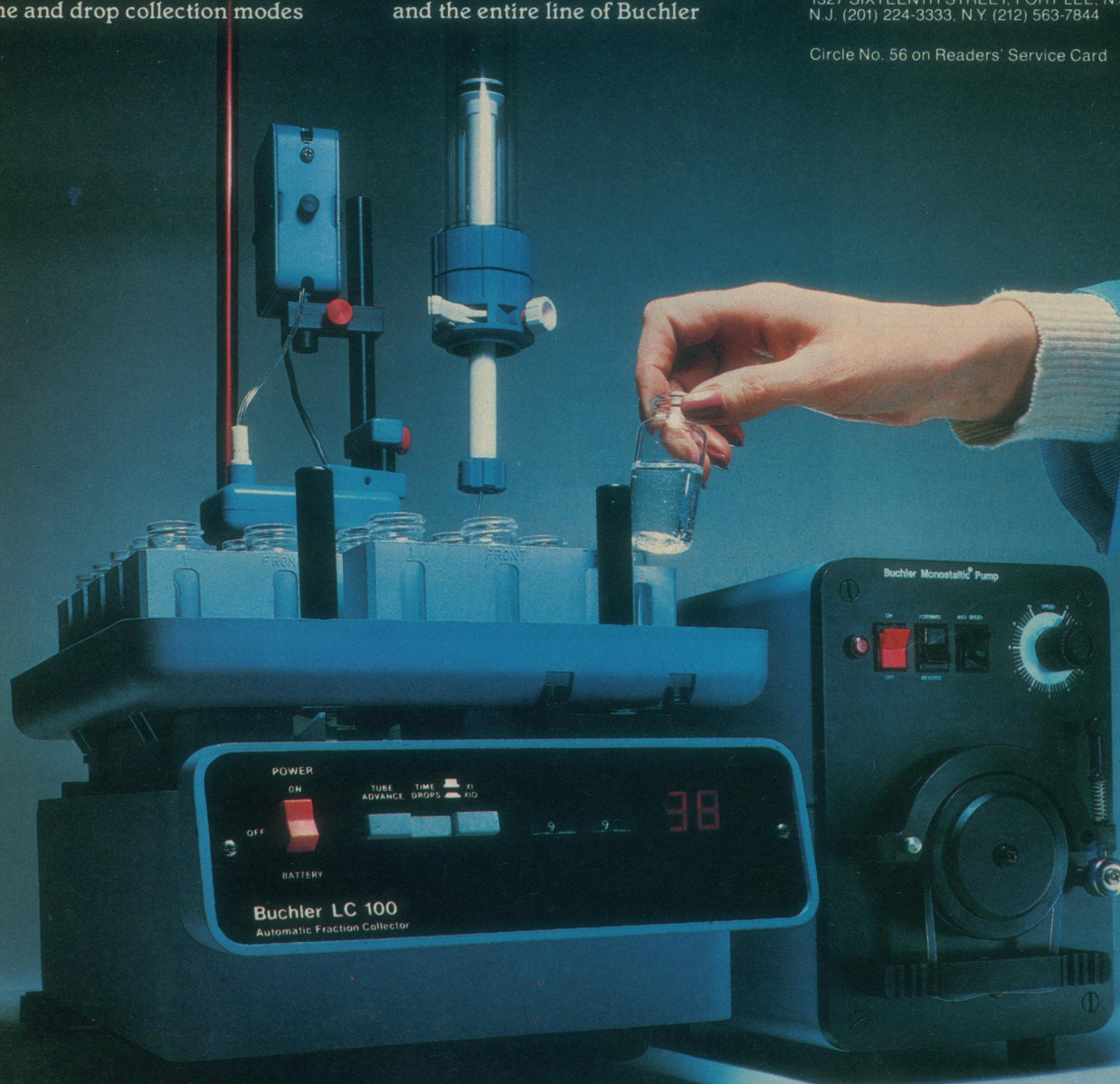


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# Energy Policies of the United States and U.S.S.R.

The prestige of the United States has declined sharply during the past few years. In some circles these losses have been attributed to inept day-to-day conduct of foreign affairs. But there are other, more enduring factors behind the deterioration that have received little media or political attention. One factor is a decade-long, self-centered energy policy that has ignored legitimate needs and interests of the rest of the world. Another factor is abdication of world leadership with respect to nuclear energy.

During the 1970's the United States massively increased its imports of oil, and this was a major cause of a tenfold increase in world oil prices. In 1972 imports of oil and its products were 4.5 million barrels per day; in 1973, 6.2; in 1977, 8.8; and in 1979, 8.1. In contrast, the Soviet Union did not compete for oil but instead became a supplier of energy to Western Europe.

Energy has become crucial in diplomacy and national well-being. We have become aware that we are vulnerable to a partial interruption of oil imports. For us imported oil represents only 19 percent of total energy consumption. Many other countries are far more dependent on energy imports. In 1976 the total energy dependence of France was 78 percent; West Germany, 54 percent; Italy, 81 percent; and Japan, 86 percent. In large measure their dependence rests on imports of oil from the Middle East. When other countries adopt policies toward the U.S.S.R. and Arab countries that are different from those of the United States, one should not be surprised.

Oil is not the only energy import of Western Europe. Two years ago, while in Austria, I visited an impressive energy installation not far from the Czechoslovak border. The facility is the control center for the major pipeline that transports natural gas from the Soviet Union to Western Europe. Natural gas is dispatched to Austria, Switzerland, northern Italy, southern Germany, and southern France. Some gas is stored underground in Austria, but if the Russians stopped the flow of gas at the beginning of a heating season, many homes would be without heat.

In an effort to lessen dependence on oil, some of the countries of Western Europe—notably France—have begun to replace oil by coal. France has little coal, and what it has is expensive to mine. So coal must be imported. A major source of this coal is Poland.

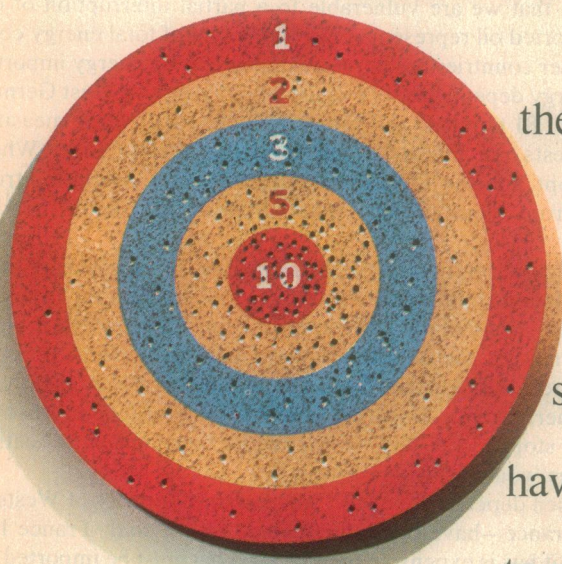
Efforts of the Carter Administration designed to curb nuclear proliferation, while having a desirable goal, have been counterproductive. For many years the United States was practically the sole supplier of partially separated uranium for use as fuel in nuclear reactors. But in 1977 the Administration attempted to enforce regulations that other countries found onerous. Austria, Belgium, Finland, France, Italy, Spain, Sweden, and West Germany have obtained or are obtaining all or part of their separated uranium from the Russians.

Understandably, the French do not enjoy being vulnerable to sudden changes in policy of others and they have urgently sought to lessen their energy dependence. They have programs for conservation and solar energy, but have concluded that they must rapidly expand their use of nuclear energy. They have progressed far with a total nuclear program that includes a major isotope separation plant, many light-water power reactors, successful breeder reactors, successful commercial fuel reprocessing, and radioactive waste disposal. The isotope plant, which is already partially on stream, will have a capacity equal to that of our Oak Ridge facility. In the breeder reactor program (see this issue) the French have had several years of successful operating experience and are world leaders.

The United States has lost leadership in nuclear energy and much of its ability to influence the nuclear energy policies of others. We have opened the door wide for an enhancement of Russian influence in Europe. Simultaneously, our drain on world oil has caused severe financial problems for us and even greater ones for the rest of the world. It is time that we considered where such a performance is taking us.—PHILIP H. ABELSON



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Our best estimate, at the time, was a potential of 50 new customers.

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It's hard to believe that a forecast could have been so wide of the mark.

But then, as now, this industry continues to surprise nearly everyone.

Who would have dreamed, back in the '50s, that in less than 30 years this would be an industry that has installed more than 500,000 computer systems in the U.S. alone.

Who could have guessed that a business started by a few dozen scientists, inventors, and engineers would become a multibillion dollar industry employing more than three-quarters of a million people here in the United States.

For the past 30 years computer technology has been exploding, and even today demand continues to exceed the most optimistic forecasts.

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