SCIENCE

23 November 1973
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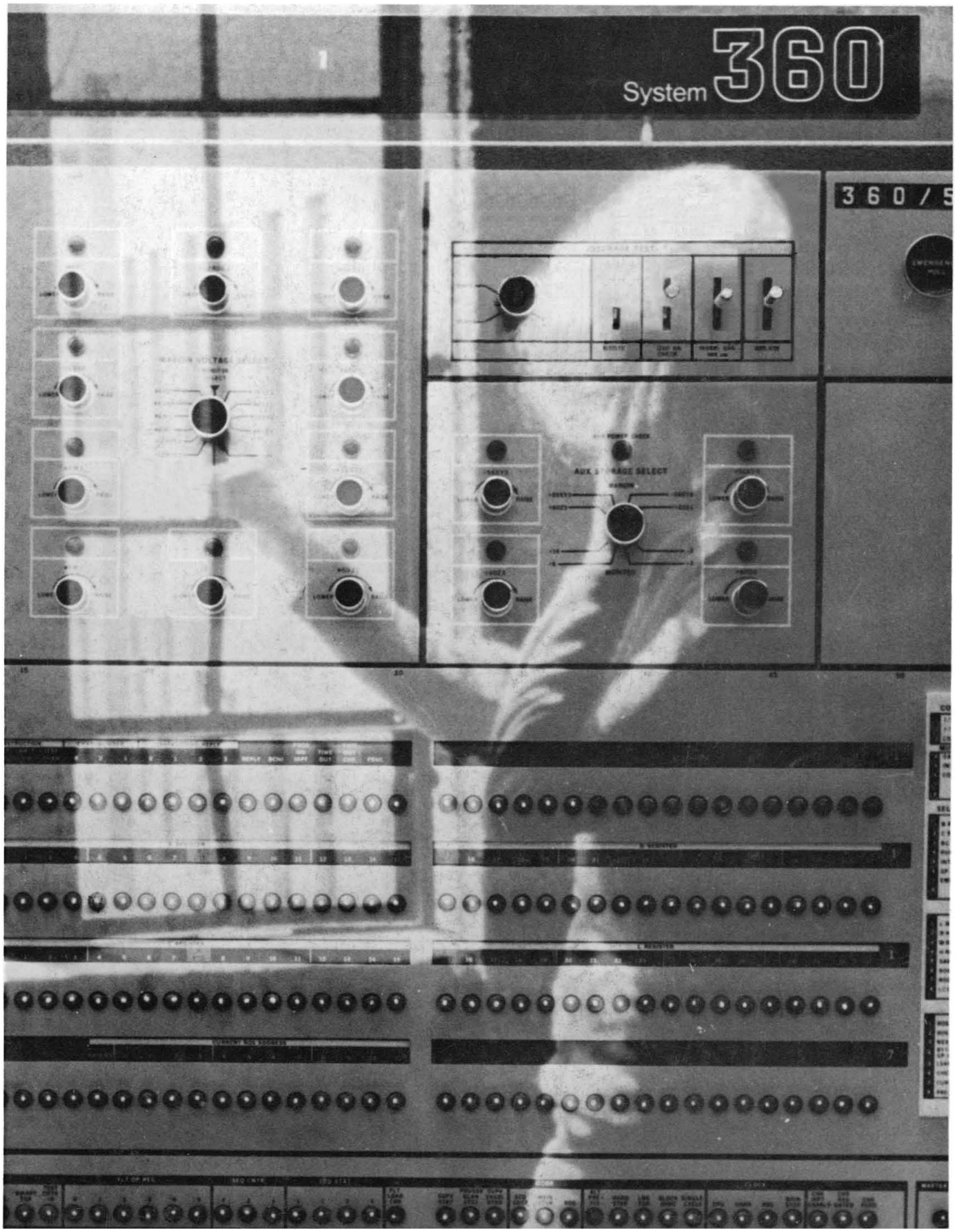


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SCIENCE

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COVER

With the increased use of computers as record-keeping devices, action to protect the privacy and confidentiality of these records must be taken. The negative sandwich montage symbolically illustrates the great potential of automation in the service of the mentally ill. See page 797. [Sidney Bernstein, Research Center, Rockland State Hospital, Orangeburg, New York]

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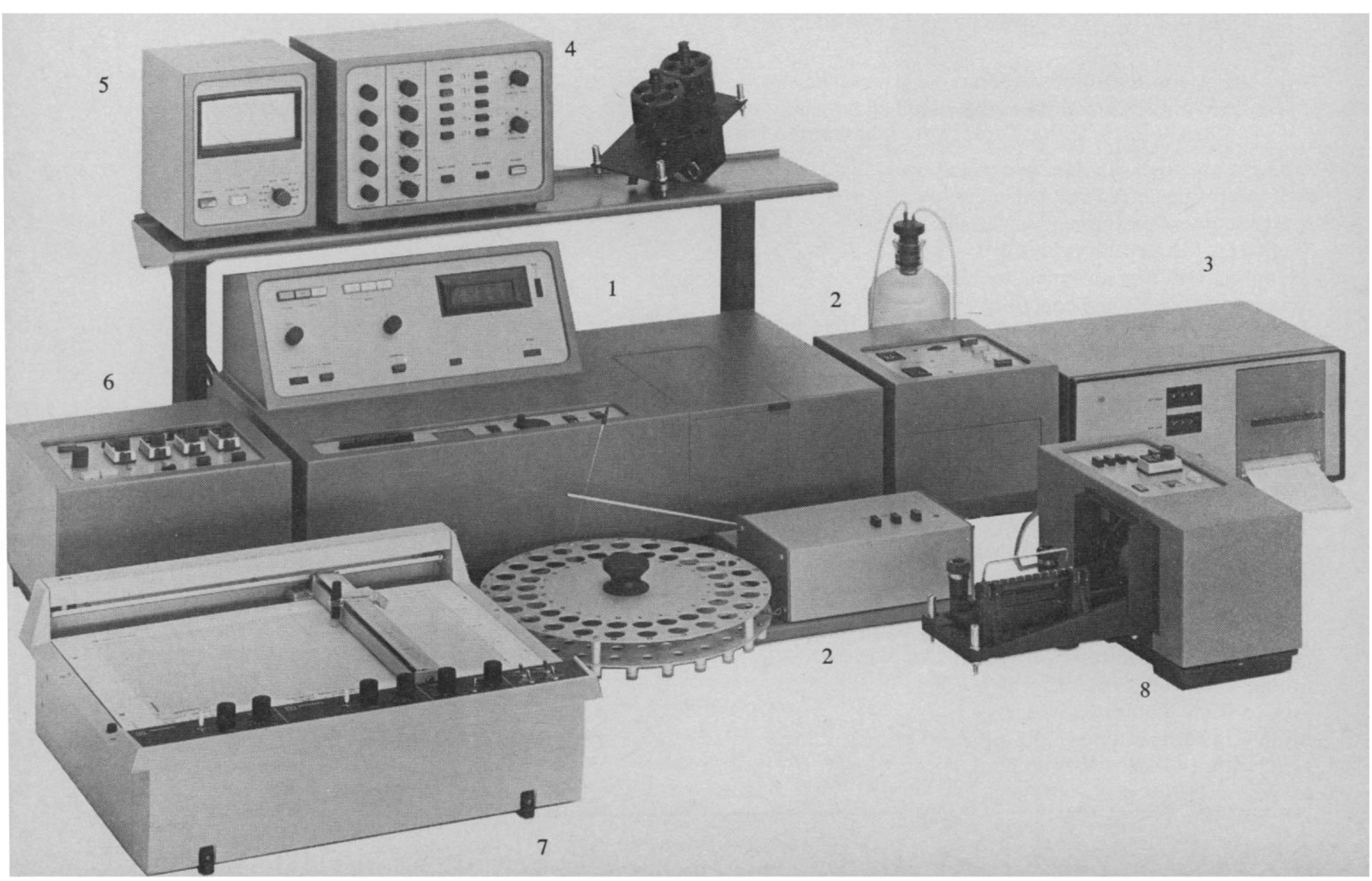

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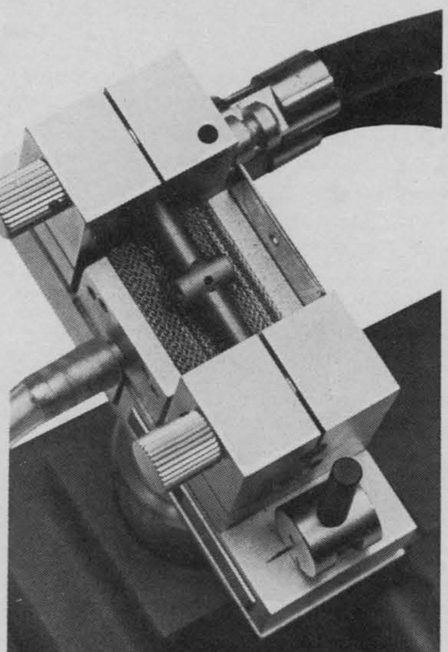

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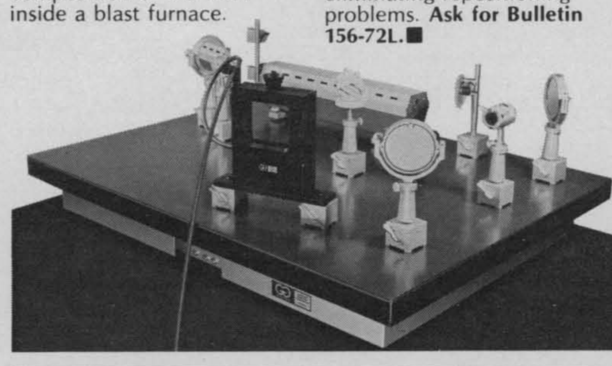

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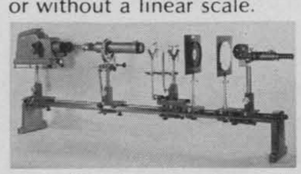

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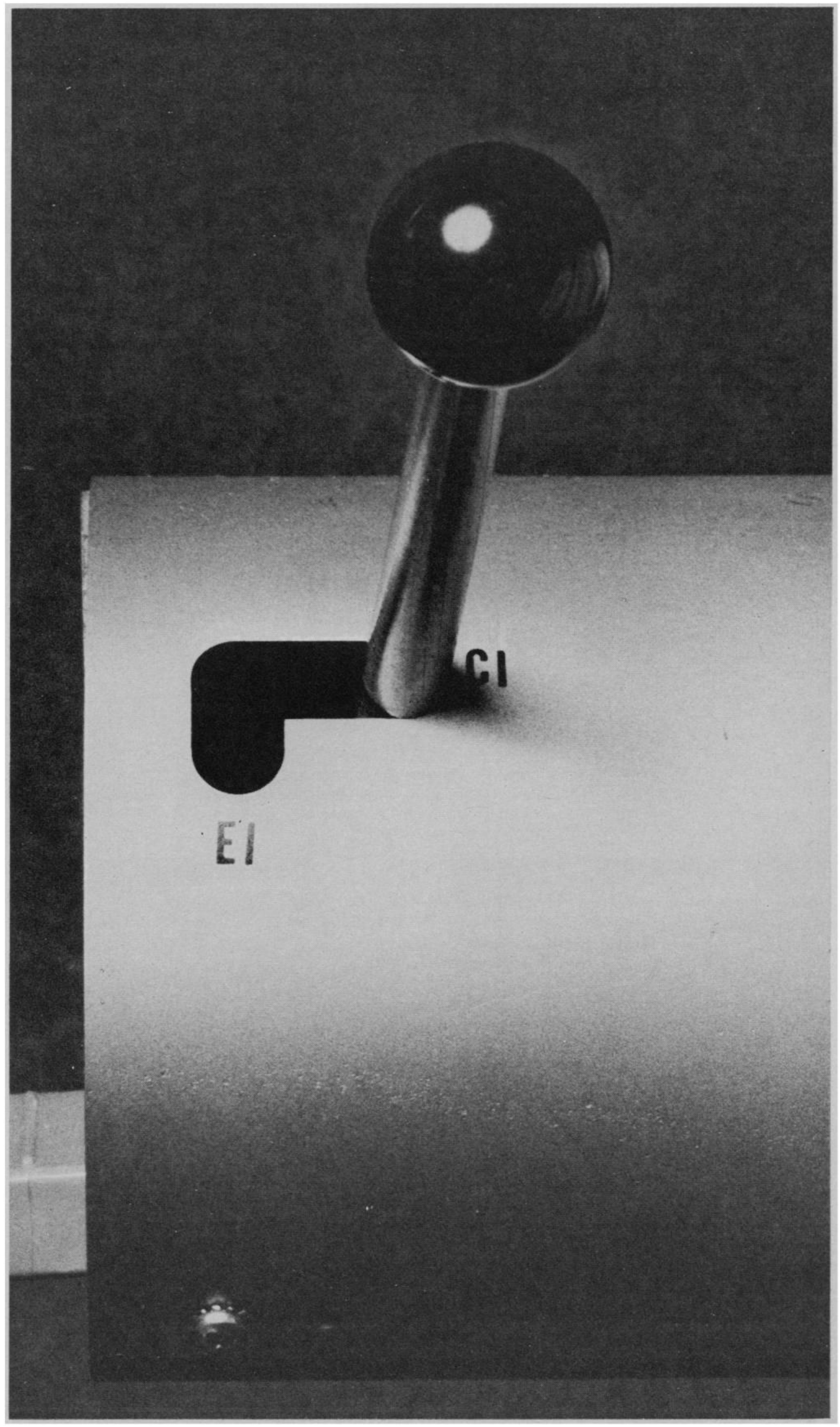

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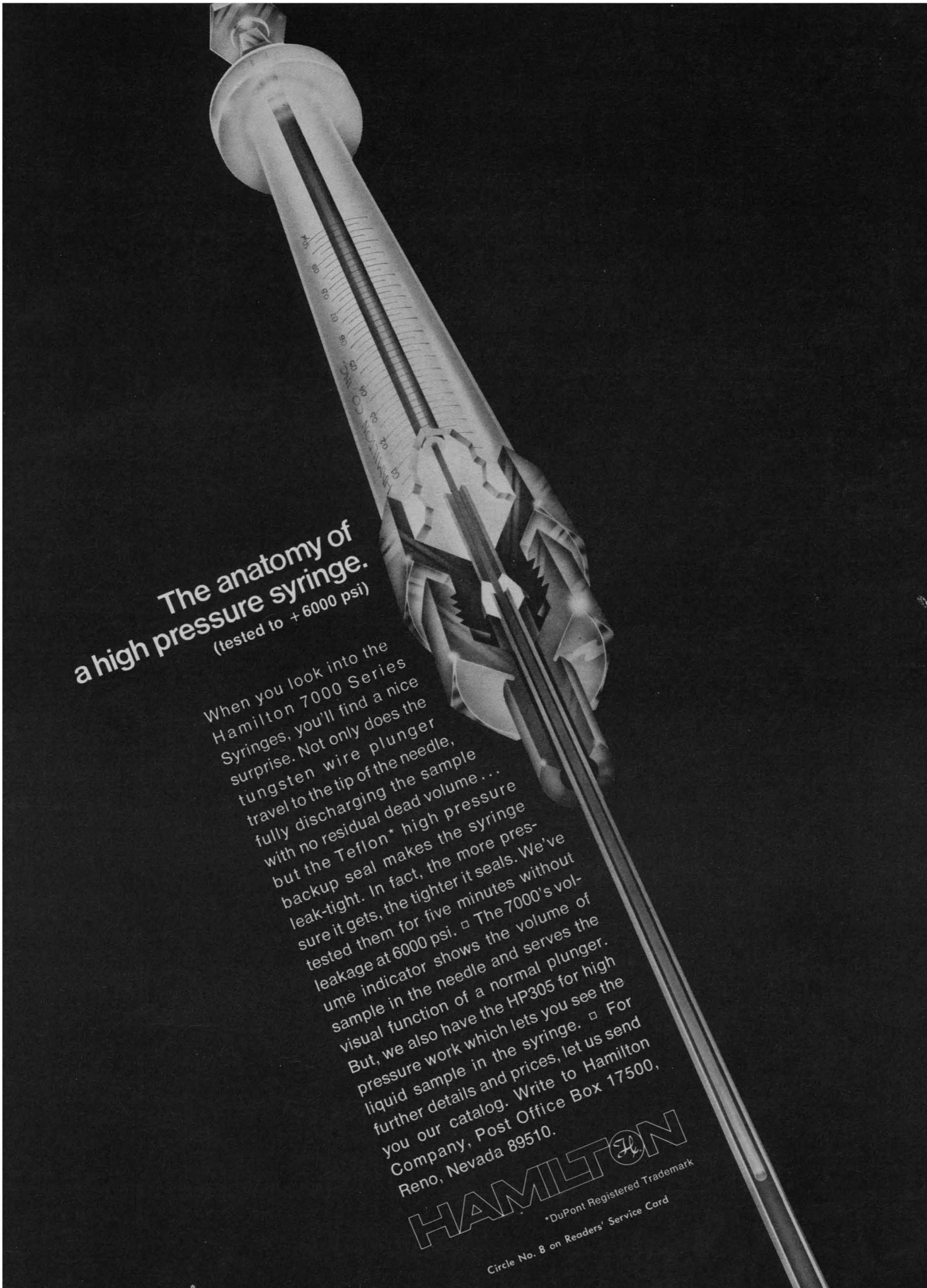
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Auto Pollution Research

In the article "Auto pollution: Research group charged with conflict of interest" (News and Comment, 24 Aug., p. 732) by Deborah Shapley, the relationships that exist within the CRC-APRAC (Coordinating Research Council–Air Pollution Research Advisory Committee) program between technical people in industry and the government are distorted. The first prerequisite in solving any complex problem is to obtain the facts, and this must not be confused with the separate job of interpreting these facts.

As president of CRC, I would like to emphasize that CRC does *not* interpret research results. The CRC-APRAC research program was initiated and continues with only one basic purpose—to develop factual research data. It has always been clearly recognized that each of the participants is free to interpret the facts in his own way and that each would be expected to conduct independently his own related research. Each party has done exactly that.

To obtain the needed facts in the soundest manner it is necessary to get the technical people in both industry and government to select the air pollution research programs needed and to recommend where this research should be conducted, utilizing the expertise of independent, nationally recognized research organizations. By the use of the best research talents in the country, there can be no question of bias nor dispute as to the facts. To obtain the facts is the function of CRC-APRAC. The CRC is not a trade organization. It is a nonprofit independent research organization directing scientific cooperative research.

We take issue with the obvious implication that the organizations chosen to conduct research are manipulated by those who are sponsoring the research. APRAC works with only the most competent investigators in the country. To imply that 12 universities, two government laboratories, the National Academy of Sciences, and more than 20 private research organizations are developing biased research information is irresponsible.

Government and industry independently turn to the same organizations for the same reasons CRC-APRAC does—to obtain expertise, experience, and facilities. These are the nation's top research organizations, and they are proud of their independence and reputation. Their credibility represents the very lifeblood of their existence.

By fostering the posture of arm's length confrontation between government and industry, the article serves to break down a proven system of cooperation, which has been developed over the years and is based on a feeling of mutual respect between technical people in industry and government.

The fundamental truth is that government and industry both serve the public, and both have a responsibility to present their thinking and outline their positions on how to solve the problems. This is a fundamental part of our system of government. If it is to work properly it is necessary that there be agreement on the basic facts, followed by independent interpretation and utilization of the facts.

PHILIP C. WHITE
Coordinating Research Council, Inc.,
30 Rockefeller Plaza,
New York 10020

Deborah Shapley's report on auto pollution research contains many insinuations about the objectivity of government research and development (R & D) as opposed to that of industry. However, it is all too readily assumed that the source of R & D funds carries with it the obligation that the results somehow match the major sponsor's wishes. This is an insult to the scientific community. The funding that CRC-APRAC (Coordinating Research Council–Air Pollution Research Advisory Committee) provided for auto pollution research has permitted a broader study of problems than would have been possible with government funding alone. The Environmental Protection Agency (EPA), as the guardian of air quality, still has the last word on what the regulations will be (unless Congress changes the laws) and has the obligation to defend them when challenged. That significant disagreements among investigators in this field occur only underscores the need for more vigorous research. We live in a technological society dependent upon vigorous industrial participation. To be effective, regulatory policies must take into account the realities of the scientific uncertainties on the one hand and the economic impacts resulting from overkill on the other. The CRC-APRAC approach, although imperfect, has the potential for keeping open lines of communication and making possible the exchange of ideas for the mutual resolution of air pollution problems.

The quote of some unnamed EPA official that "The only thing worse than an unemployed aerospace engineer . . . is an unemployed aerospace engineer who has gone to work on the environment" only belies the fact that quite a few former "aerospace engineers" are currently applying their professional skills within EPA and its state counterparts and within the ranks of its contractors. The technical community is trying to respond to national needs. EPA should be encouraging the participation of talented people, regardless of what they may have been involved with at some earlier time. It might lead to useful innovation. Fortunately some leaders in EPA recognize this.

Finally, the suggestion that the National Institute of Environmental Health Sciences should become a "third party" for resolving conflict in auto emissions research would be acceptable for the health effects aspects, but clearly inappropriate for the issues related to technology. In this respect, it is interesting to note that EPA, through an interagency R & D agreement, has given NASA's Lewis Research Center in Cleveland, Ohio, a major role in developing alternative power sources for automobiles.

J. STUART FORDYCE
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JAMES L. OLSEN, JR.
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Screwworm Control

In their article "Genetic control of insect populations" (15 Dec. 1972, p. 1164) Smith and von Borstel assert that "Ten billion irradiated adult *Cochliomyia* are now released yearly along the Mexico-Texas border, effectively controlling the natural screwworm [fly] population on both sides." This was true in 1971, but not in 1972. In 1971, there were 473 confirmed screwworm cases in American livestock. The total for 1972 exceeded 90,000 (*1*), and infestations were found not only in Oklahoma, but even in Kansas and Arkansas, hundreds of miles from the Rio Grande. Clearly, a massive breakdown in the "sterile male release" program occurred. And just as clearly, no one has gotten to the bottom of it.

JOHN CALMAN
2660 3rd Avenue,
San Diego, California 92101

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1. *Coop. Econ. Insect Rep.* **23**, 155 (1973).

As Calman points out, serious outbreaks of screwworm infestation occurred in 1972. Even when the release of sterile males was doubled along the Texas-Mexico border, control was not accomplished (*1*). It is important to emphasize, however, that the fault is not due to a failure of the sterile male principle, but to a failure in its application. In our article we predicted that sexual isolation or incompatibility could occur in the screwworm fly and result in an outbreak of screwworm infestation. In this case three alternatives seem possible: (i) The wild population contains genetic types which no longer mate with released flies. These flies would have a tremendous selective advantage in nature. (ii) Laboratory flies are no longer adapted to wild conditions because of the pressures imposed by rearing constraints. (iii) Both populations are evolving simultaneously in these opposing directions. Established genetic methods should be utilized to monitor both wild and laboratory populations to ascertain when genetic changes occur. The lack of genetic monitoring is a major defect in most sterile male programs at this time.

ROGER H. SMITH
Department of Biology,
Nuclear Research Centre
"Demokritos," Attikis, Greece

References

1. *Nature (Lond.)* **242**, 493 (1973).

Extra Deaths

In Gillette's review (News and Comment, 1 Dec. 1972, p. 966) of the National Academy of Sciences (NAS) report on radiation standards, the estimated risks are represented in terms of "extra deaths." Could someone please tell me what is meant by that?

Logically, the notion of "extra death" is pure nonsense. As each person can die only once, and every person must die sometime, neither war, accident, murder, radiation exposure, or any other agent can cause "extra deaths." What they *can* do is cause *premature* deaths, no more and no less.

Therefore, the only relevant parameter in such discussions is how the average life-span of a person within a given population may be affected by radiation exposure. But how can 6000 "extra deaths" per year in the U.S. population be translated into reduced life-spans? Or rather, how did the NAS committee convert their estimate of the reduction in life-span caused by radiation, which must have been their starting point if their figures are to make sense?

If we take the simple case of zero population growth, and assume stationary conditions in all respects, then the total population is $N = n\tau$, where τ is the average life-span and n is the number of births or deaths per year. This also means that the probability of death within a year of some randomly chosen person will be $1/\tau$. Let us then assume that some extra radiation exposure of the long-term type is introduced, reducing the life expectancy of a newborn to τ', corresponding to a new stable level of population $N' = n\tau'$. The risk connected with the radiation exposure can then be represented by the extra death probability $P_r = 1/\tau' - 1/\tau$ due to radiation effects. Is "extra deaths," which I shall denote as ΔD, perhaps computed as the product of N and P_r? If so, and assuming $\tau \sim \tau'$, which implies that P_r is small compared with $1/\tau'$ or $1/\tau$, we have $\Delta D \sim -(N\,\Delta\tau)/\tau^2$, or $\Delta\tau \sim -(\tau^2 \Delta D)/N$.

For an order-of-magnitude calculation referring to the U.S. population, I shall take $N \sim 2 \times 10^8$ and $\tau \sim 65$ years, which gives $\Delta\tau \sim -0.13$ year if we use the value of ΔD given as corresponding to an extra exposure of 170 millirems per year. With the present average dose of ~ 80 millirems per year of man-made radiation, $\Delta\tau$ would be about -1 month, if my understanding is correct. This is then what has to be weighed against the possible benefits of radiological examinations, not the intuitively horrible number of several thousand "extra deaths" per year.

On the other hand the extra risk should of course be minimized, but it seems absurd to demand even stricter standards for technical applications (nuclear reactors, and so forth), which contribute on the average only a fraction of a millirem per year to the average population exposure, while letting M.D.'s carry on unchecked as before. What competence does the average M.D. have in matters like these? Can he, for example, be relied upon to check his x-ray apparatus properly? I doubt it.

Therefore, could someone please answer the following questions:

1) Is my understanding of "extra deaths" correct? If not, what is it then supposed to mean?

2) What is the estimated increase in average life-span due to the present use of radiological examinations?

3) What is the estimated resultant net gain or loss in life expectancy?

HARALD TREFALL
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23 November 1973, Volume 182, Number 4114 **SCIENCE**

Energy Independence

In his energy message of 7 November, President Nixon asked for a commitment to a new national endeavor called Project Independence. This would have as its goal "that, by the end of this decade, we will have developed the potential to meet our own energy needs without depending on any foreign . . . energy source."

In Washington, presidential messages come and go. Some lead to the enactment of legislation. Others are forgotten. This one could be decisive. Even before the new Middle East conflict, it was obvious that the United States would have to alter its energy policies. The Arab boycotts created the kind of political climate that makes drastic measures inevitable.

In a first reading, the President's goal seems clear. However, a little reflection uncovers questions. What forms of energy will we be using in 1980? Two or three decades from now, we may be able to depend on the sun, or on nuclear energy. However, if we are to function in 1980, we will be living much as we are today, depending on hydrocarbons for most of our energy. A second question has to do with the significance of "by the end of this decade, we will have developed the potential . . . ." There is a long road between developing the potential to meet a need and actually meeting it. One would hope that the President intended to convey the idea that we would have productive plants in existence which could meet our needs if an emergency dictated. That is to say, that in 1980 we might be importing, for example, 20 percent of our hydrocarbons, but that we could live with a sudden curtailment. A third and perhaps necessary ambiguity is in the phrase "energy needs." Who knows what the public will demand in 1980? It is to be hoped that society will be willing to practice conservation and that we will be driving smaller automobiles and implementing a host of energy-saving measures. In addition, it should be possible to replace most oil currently being used in power plants by coal; by 1980, methods should be perfected for removing sulfur dioxide and other pollutants.

Until recently, we were importing 6 million barrels of oil a day. Given unchecked growth, that might have risen to 20 million barrels per day by 1980. Assuming energy conservation and moderate growth, we should be thinking in terms of developing an additional domestic production capacity of about 10 million barrels of oil a day. By tapping the continental shelves and bringing oil from the North Slope of Alaska, we might be able to increase production by 5 million barrels a day. Accordingly, a minimum goal should be the capacity to produce 5 million barrels of liquid hydrocarbons a day from coal or shale. That would involve an investment on the order of $50 billion and the product would cost $5 and more a barrel—about the same as imports now. But costs to foreign producers are as little as $0.25 per barrel, and later they may well engage in price-cutting. If industry is to participate as it should in the development of liquid hydrocarbons from coal and shale, a guaranteed market and price must be provided, preferably after competitive bids.

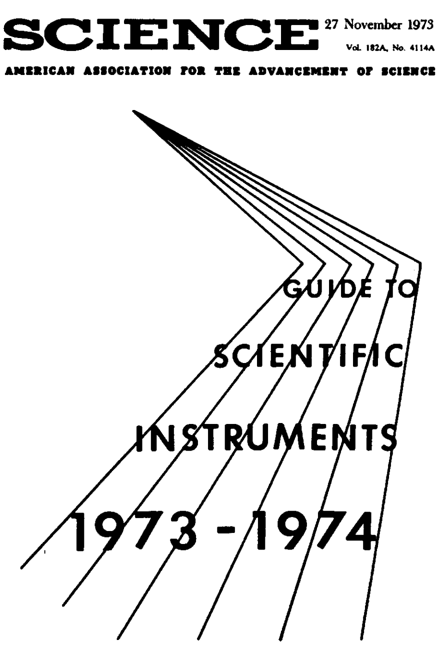
Getting oil from shale and coal presents tremendous problems. It is easy to cook hydrocarbons out of shale by using retorts, but the environmental problem of disposing of the residue is dreadful. Multimillion-dollar research devoted to getting oil from coal has been promising, but it has essentially proved only one thing—the practical problems of maintaining the effectiveness of hydrogenation catalysts are frustrating.

If we are to achieve anything like energy independence by 1980, we must be prepared to back a number of competing and parallel approaches, and we must not underestimate the cost or the difficulties of the task.—PHILIP H. ABELSON

PRODUCTS and MATERIALS

Guide to Scientific Instruments

The 1973–74 *Guide*, published 27 November, is a special annual issue of *Science*. It consists of an alphabetic list of over 5000 kinds of scientific apparatus, materials, instruments, and supplies. Within each of 2400 categories the names and addresses of manufac-



turers or suppliers are presented. Nearly 2100 companies' products are included and the companies are pledged to respond promptly to inquiries generated by the *Guide*. The *Guide* is available at $4 per copy from the AAAS Publications Sales Department. It is also available free with each subscription to *Science*. Circle No. 130 on Readers' Service Card.

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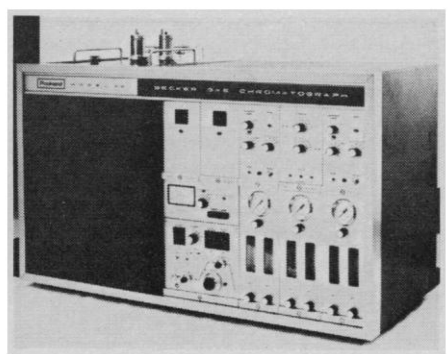

are front mounted and easily accessible. Packard Instrument Company Incorporated. Circle No. 131 on Readers' Service Card.

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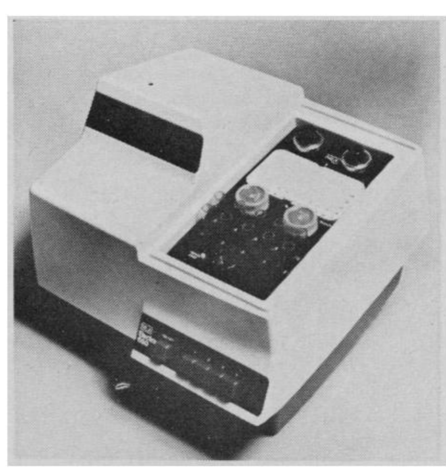
The Electra 650 measures thrombin, prothrombin, and activated partial thromboplastin times. It also performs factor assays and measures dilution curves from 100 to 12½ percent. The



device is photometric and operates with oxalate or citrate anticoagulants. The specimens in disposable cuvettes are heated to 37°C by a dry block incubator rather than by a water bath. Medical Laboratory Automation. Circle No. 132 on Readers' Service Card.

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Bibliography of Radioimmunoassay Periodical Literature lists over 950 items. The *Bibliography* is $3 per copy. Beckman Instruments, Incorporated. Circle No. 134 on Readers' Service Card.

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Infrared Shopper is published quarterly and offers products for infrared analysis in a newsletter-tabloid format. Wilks Scientific Corporation. Circle No. 129 on Readers' Service Card.

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(Continued from page 818)

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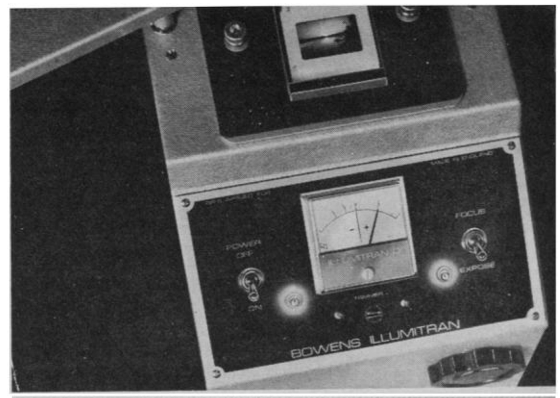

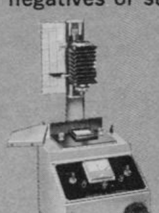

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