

# SCIENCE

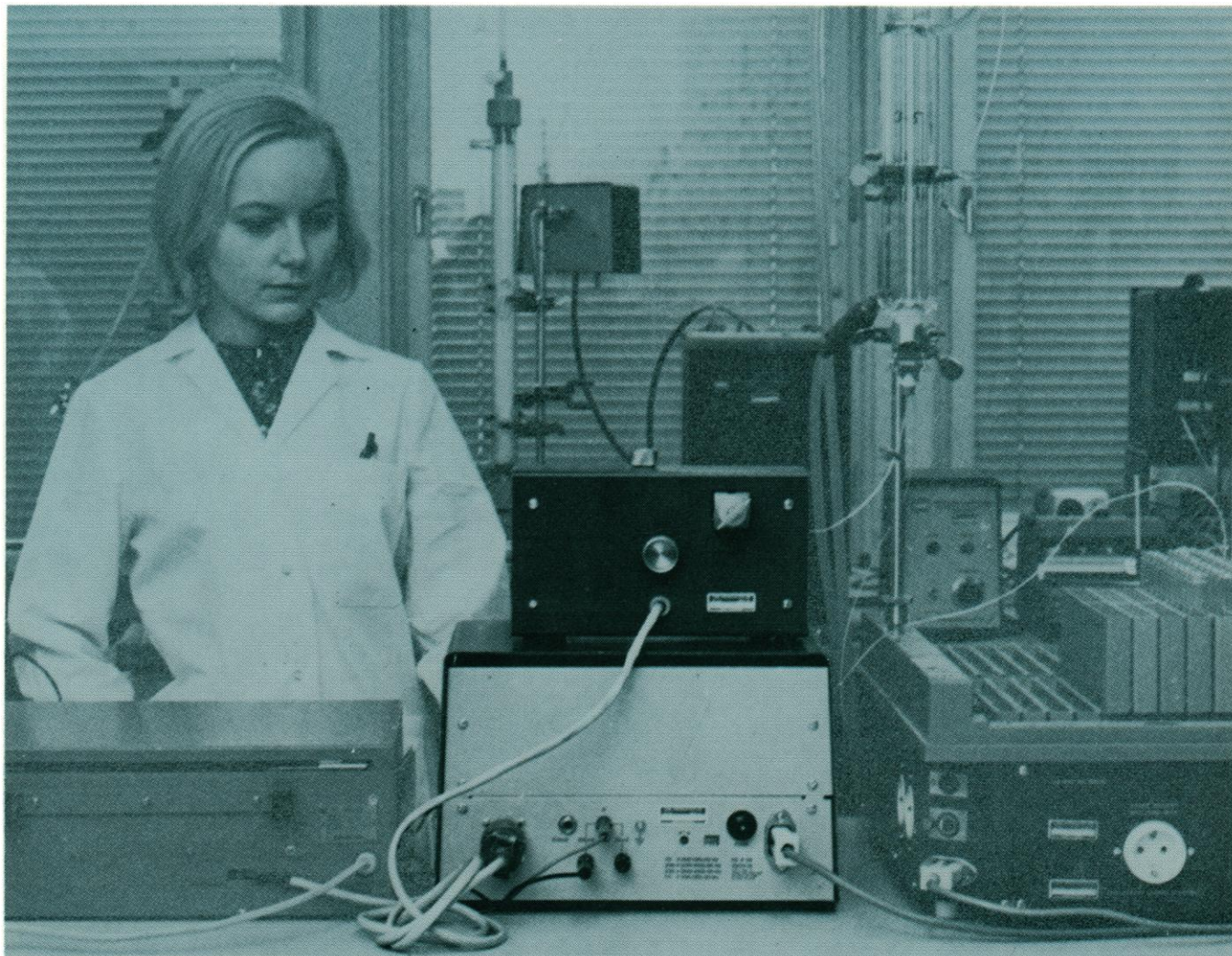
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Vol. 173, No. 4000

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE







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SCIENCE is published weekly, except the last week in December, but with an extra issue on the fourth Tuesday in September, by the American Association for the Advancement of Science, 1515 Massachusetts A.e., NW, Washington, D.C. 20005. Now combined with *The Scientific Monthly*. Second-class postage paid at Washington, D.C. Copyright © 1971 by the American Association for the Advancement of Science. Annual subscription \$20; foreign postage: Americas \$3; overseas \$5; air freight to Europe, North America, Near East \$16; single copies \$1 (back issues, \$2) except *Guide to Scientific Instruments* which is \$4. School year subscription: 9 months, \$15; 10 months, \$16.75. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.



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Soft shell turtle (*Trionyx ferox*). The turtle is mainly a carnivore which may prey on a large number of animals but also scavenges. See page 936. [Leland LaFrance, Chicago Zoological Park, Brookfield, Illinois]

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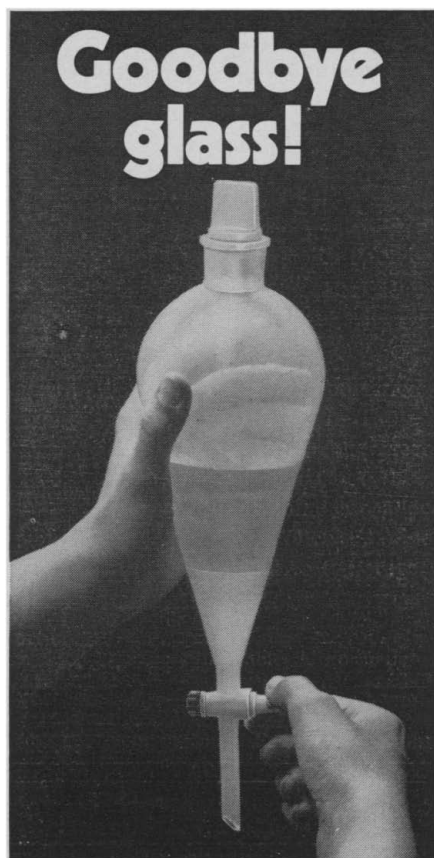
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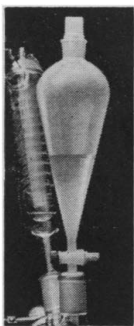
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manism in Social Science" (also 14 May, p. 661) Simpson, reviewing Friedrichs' *A Sociology of Sociology* and Gouldner's *The Coming Crisis of Western Sociology*, uses the word "paradigm" at least seven times and also refers explicitly to Kuhn's work. The widespread acceptance of Kuhn's ideas by scientists indicates that his insights illuminate the circumstances in which they actually practice science. His rejection by philosophers indicates that concepts that are clear to the research worker whose situation and environment they describe are unclear to the philosopher.

Nowhere, either in *Criticism and the Growth of Knowledge* or in Shapere's review, is the paradigm concept considered as a construct in the field of sociology. It is perhaps in this role that the paradigm concept will ultimately stand or fall. That Galileo recants or that Kuhn retreats has little to do with the descriptive and predictive power of their insights or with the productivity of the research that can go on under the aegis of their conceptual frameworks. Obviously, my approach here is intentionally Kuhnian. The acid test of the paradigm concept is not logic but effect, that is, its descriptive and predictive power. If the concept is effective it will survive and then the philosophers will have to find a way to deal with it.

WALTER J. FRASER

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### Indicators of Drug Effectiveness

One of the major problems in the practice of preventive medicine in developing countries is guaranteeing that drugs and biologicals are still effective at the time of use. This is especially true for live virus vaccines which must be kept within a narrow temperature range. Because of the hazardous conditions that sensitive pharmacologicals encounter in transit from the laboratory to the patient, many ineffective (and thus potentially harmful) drugs and biologicals are administered, or many effective drugs and biologicals are discarded because of a suspicious history.

Field workers desperately need a fail-safe indicator which either changes the color of the material or appears on the label (perhaps obliterating it) when temperature, time, or other factors have

adversely affected the effectiveness of the material. Sterilization indicators, which are routinely used in autoclaving, operate according to the same principle.

If the United States were to adopt similar devices for drugs and biologicals, the immediate benefits would be international.

KIT JOHNSON

Department of Preventive Medicine  
and Public Health, College  
of Medicine, Yonsei University,  
Seoul, Korea

### Reform at the National Academy of Sciences

Page's editorial (14 May, p. 635) on the new Institute of Medicine of the National Academy of Sciences (NAS) raises some important issues that deserve further discussion. The most serious problem is whether the NAS or an institute within it can provide the kind of leadership that is needed to "encourage creative change" [Stewart Udall, quoted in C. E. Barfield, *Nat. J.* 3, 111 (1971)]. Clearly some of the innovations outlined by Page are attempts to improve the situation. Especially laudable is the intent to make a candidate's election to the Institute of Medicine contingent upon a commitment of time for public service. Perhaps this same stipulation should be extended to the entire Academy, which in the past has been a kind of exalted Phi Beta Kappa.

Unfortunately, such minor reforms do not go far enough. The most regressive feature of NAS—the election of members by a closed group—would be retained. This virtually assures that the institute and the NAS would remain unaccountable to the public and to the scientific community at large. I cannot help but feel that the problems of the poor and of minority groups will continue to be neglected under these circumstances.

The model provided by NAS is so deficient that a wholly different institution should be established to supply scientific and medical advice to the government. It should be designed to encourage inputs from competent scientists and nonscientists who are not necessarily members of the elite establishment.

D. MAX SNODDERLY, JR.

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Trouble



Conidiospores—really somatic cells—ride the wind. In effect, a single organism spreads genetically identical extensions of itself over a continent. Infection marks this "wind slot" from a narrow opening in the woods. Entire field was finally affected.

Mississippi State College photo



From spore to leafspot to new spore can take as little as 60 hours where and when dew is plentiful.

Mississippi State College photo



In 1970 Johnson grass, relative of corn, stayed healthy. Weeds and grass favor the blight by slowing the drying of the dew.



The mutant attacks the ears. The original race of Southern Corn Leaf Blight concentrated pretty much on leaves.

## We want to be useful ...and even interesting



### Corn, 1971

This is how Southern Corn Leaf Blight is being tracked this summer—by its color on KODAK AEROCROME Infrared Film 2443 (ESTAR Base). (Useful also in estimating dwelling units in a congested central city and in many other kinds of "remote sensing.") This film, instead of trying to imitate the colors of the real world, works by shifting man's color vision a short way into the infrared. Has nothing to do with temperature sensing but something to do with the way the brain works and a lot to do with the spectral reflectance of green plants.

Fortnightly since June 14, cameras have been flying 11 miles above 200 sample sites, each 1 mile by 8 miles, that have been thoroughly studied on the ground. Film goes to the Laboratory for Applications of Remote Sensing at Purdue University, where the interpreters work. From their reports, judgments are made that relate Race T of the asexually reproducing fungus *Helminthosporium maydis* to the price of hamburgers, steaks, chicken, milk.

"T" stands for Texas, as in Texas male-sterile cytoplasm, an invention in genetic engineering that cuts out the heavy cost of detasseling the hybrid seed plants (so that they shall be pollinated only by the adjacent row of the male parent in the cross). This was a most fruitful idea until, early in 1970, there appeared in Florida a mutant of the previously unimportant *H. maydis* that specializes in Texas male-sterile cytoplasm. With the dewy nights and warm days of the 1970 summer proving ideal for the development of the fungus, Race T swept north. But hybrid corn from seed produced the costly old way kept its high yield and the cob strength that corn-handling machinery requires. Such seed, though, has become scarce.

This year each grower has needed all the information he could get for picking his own best strategy against this unfamiliar threat to profitable farming. Switch to soy beans? Take a chance on hybrid seed corn blended with a percentage produced by detasseling? Plant thickly or thinly? Deep or shallow? Weed control? Liming against soil acidity? Crop insurance? Hedge through the futures market? Participate in the program for taking some acreage out of production, specifically bottom land where dew is frequent? What a tangled web of biology, economics, and divination extends back from the meat counter to the not-so-simple farmer!

Never has the biologist's need to communicate by means of photographs been more strongly felt than in comparing findings on the Race T problem and getting the new-found facts out to all those individual decision-makers. See glimpses at left and right of images that deliver their impact via TV and press away from the cities and suburbs. A good communicator, Dr. Luther Farrar of Auburn University in Auburn, Ala., gave them to us with a little advice ▶

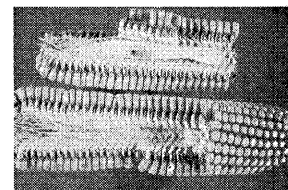
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The toxin hits only corn tissue, but when it goes all the way to stem rot it opens the way for secondary organisms. Some of these might produce toxins for the animal kingdom.




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## The Importance of Being Ernest Rutherford

Ernest Rutherford's good friend and colleague, A. S. Eve, once playfully depreciated his immense contributions to physics by charging that he rode the crest of a wave. Rutherford responded, "Well, I *made* the wave, didn't I?" The centennial of Rutherford's birth on 30 August of this year makes this an opportune time to look at that wave.

It has long been accepted that "great men" only accelerate scientific progress a bit, but this cliché does not seem to apply to the man hailed as the greatest experimentalist since Faraday. Consider radioactivity early in this century: the significant workers could be counted on one's fingers, and none of them had the range of interests or the fertile, intuitive mind that Rutherford had. He advanced the disintegration theory of radioactivity (with Frederick Soddy, in 1902 and 1903), proposed a nuclear structure to the atom (1911), and succeeded in artificially transmuting a nucleus (1919).

Although Rutherford was no mathematical physicist, there is a notable theoretical component to each of these major achievements. He was, moreover, the leading prophet (in 1920) for the existence of the neutron (and  $^2\text{H}$  and  $^3\text{He}$  as well, though all this was based on faulty experimental data). Theoreticians who worked closely with his laboratory, with varying degrees of personal influence from Rutherford, included Soddy, Kasimir Fajans, Niels Bohr, C. G. Darwin, Ralph Fowler, Neville Mott, and George Gamow. Indeed, Rutherford was as great a research director as a discoverer, and Otto Hahn, George Hevesy, Hans Geiger, H. G. J. Moseley, James Chadwick, P. M. S. Blackett, Peter Kapitza, John Cockcroft, and E. T. S. Walton are only the most eminent of his distinguished pupil-colleagues.

For almost the last 20 years of his life Rutherford was director of the Cavendish Laboratory in Cambridge, England. There, he influenced the transition from little science to big science. Kapitza, Cockcroft, and Walton were among those responsible for introducing large machines and high costs into physics, and the electronic counters of C. E. Wynn-Williams and Geiger also presaged the new look. Although these departures from the "sealing wax and string" tradition were not entirely to his taste and Rutherford disliked looking for research funds, his "boys" generally acquired the equipment needed. As president of the Royal Society and later as chairman of the advisory committee to the government's Department of Scientific and Industrial Research, he was in a position to exert considerable influence throughout the "Establishment" of science.

A number of writers have pointed out that Rutherford said that the energy of the atom would never be harnessed. In effect, the criticism means that he failed to foresee a new physical phenomenon discovered a year after his death in 1937. In the early days of radioactivity, when Rutherford recognized that decaying radioelements eject alpha and beta particles, he actually wondered if larger chunks of the atom also broke off, but no evidence for what later was called fission could then be found. Still, with Chadwick's discovery of the neutron and with the discovery of fission by Hahn, Rutherford had a connection with applications of nuclear energy. We find his presence even in the beginnings of fusion research, as when in 1934, with M. L. E. Oliphant and Paul Harteck, he bombarded deuterium with deuterons. As a major participant in the transition from classical to modern physics, it would seem that the wave Rutherford created was even larger than he may have thought!—LAWRENCE BADASH, *Department of History, University of California, Santa Barbara*



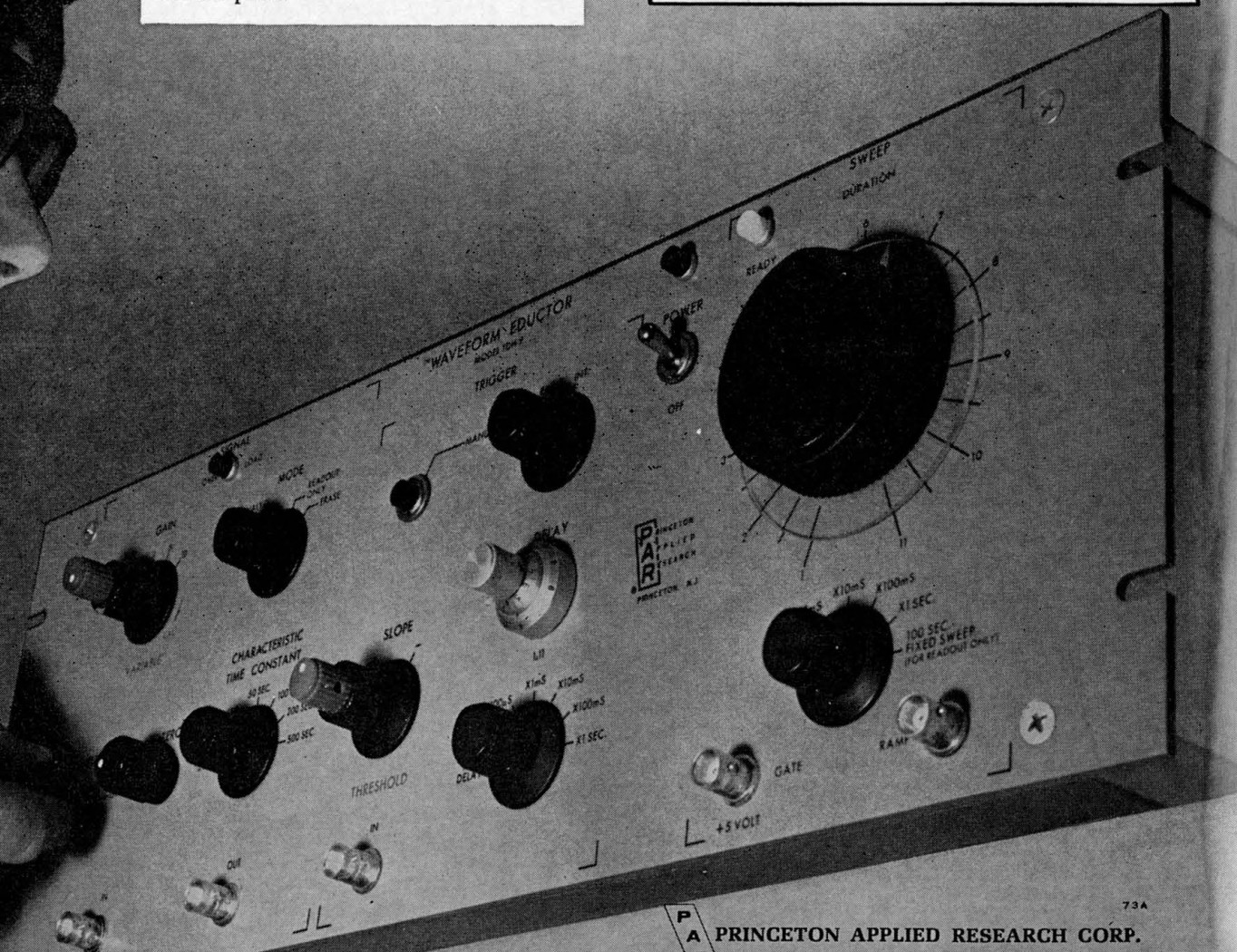
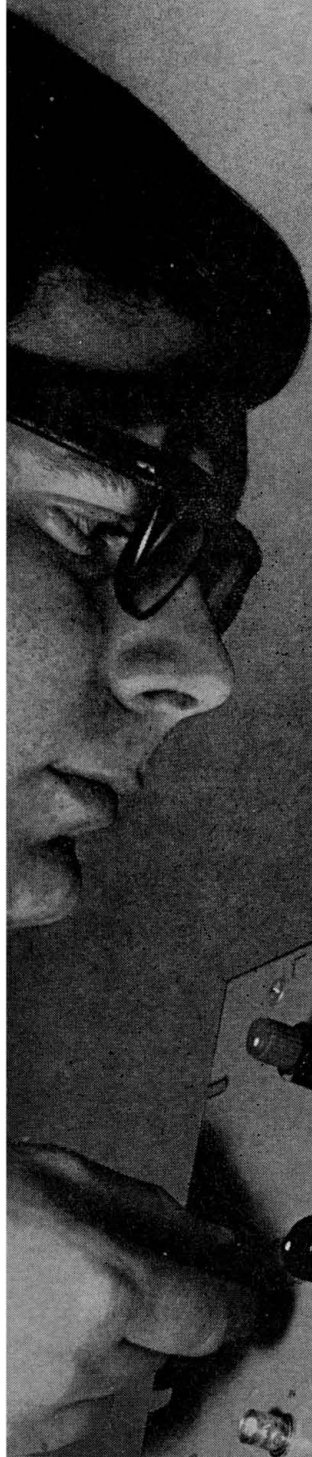
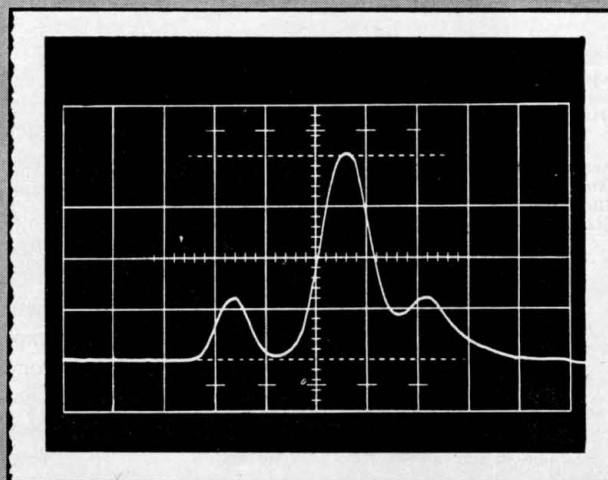
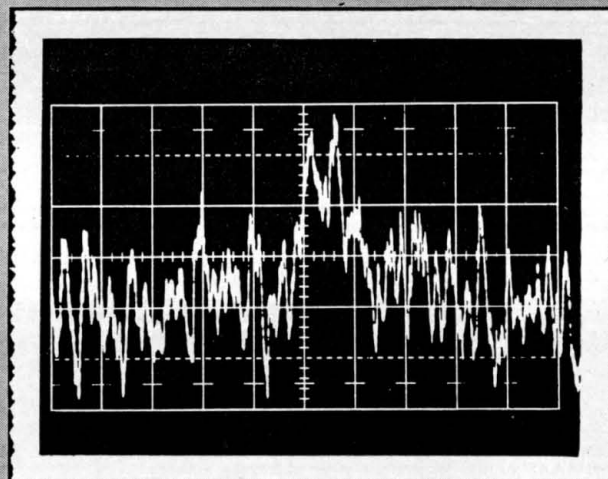
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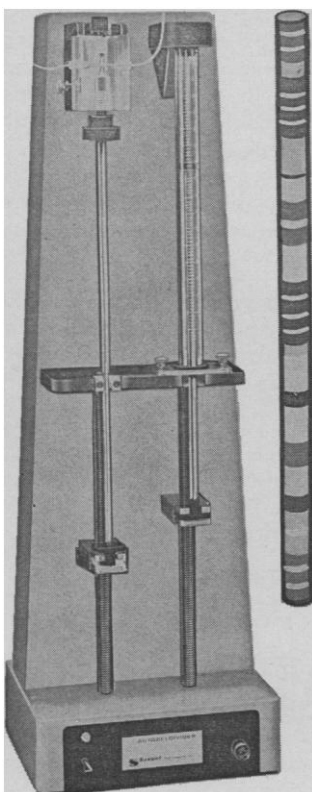
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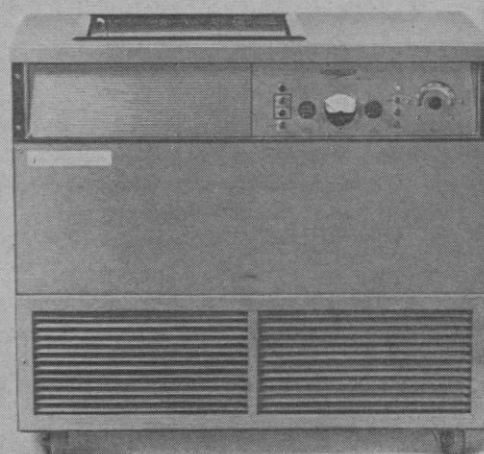
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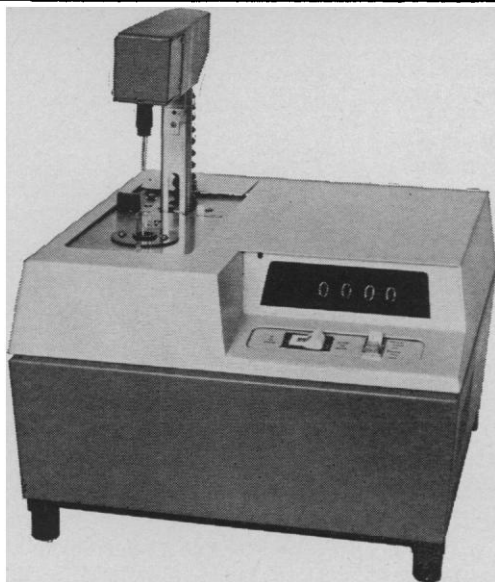
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