SCIENCE

3 May 1968
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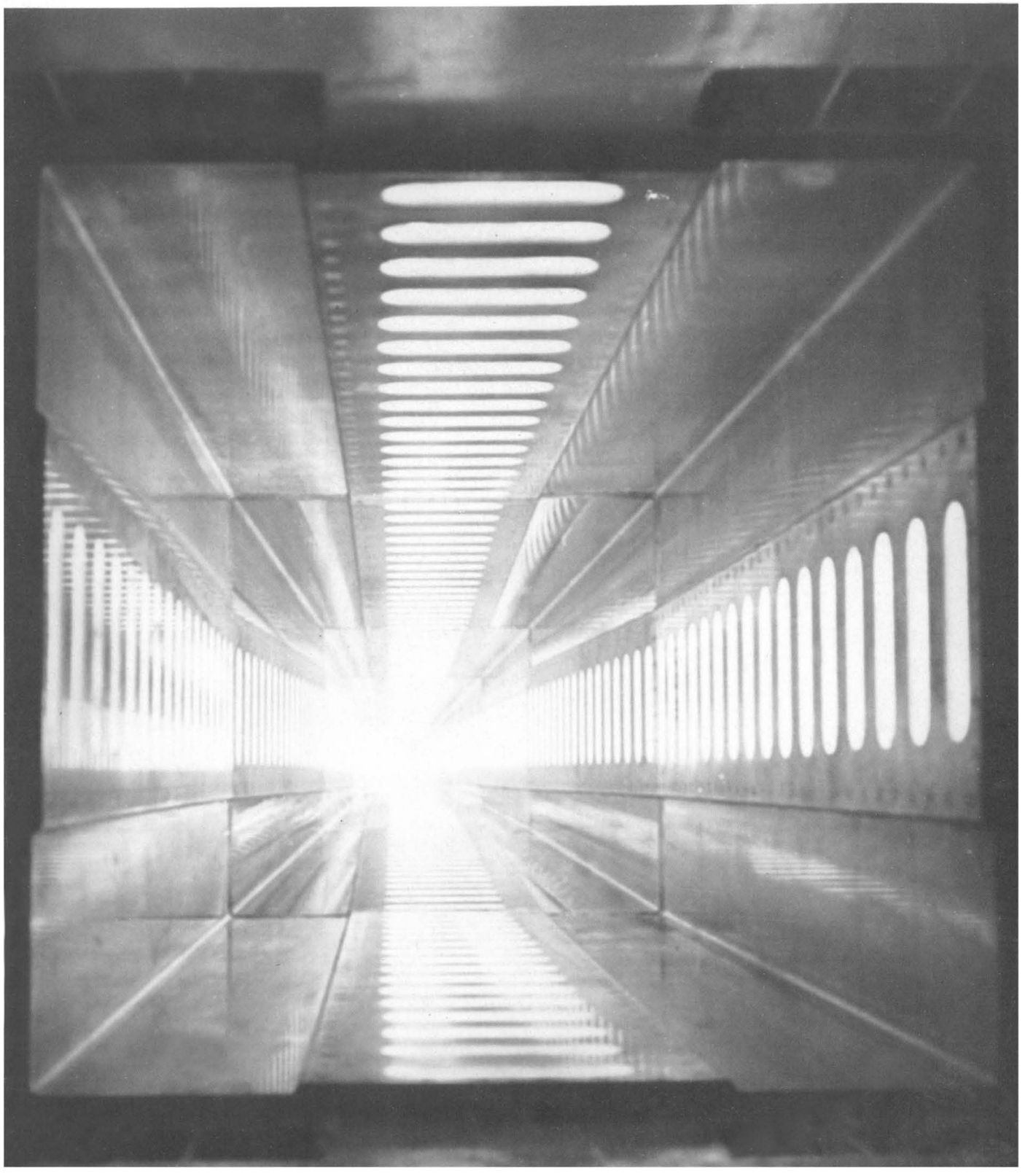
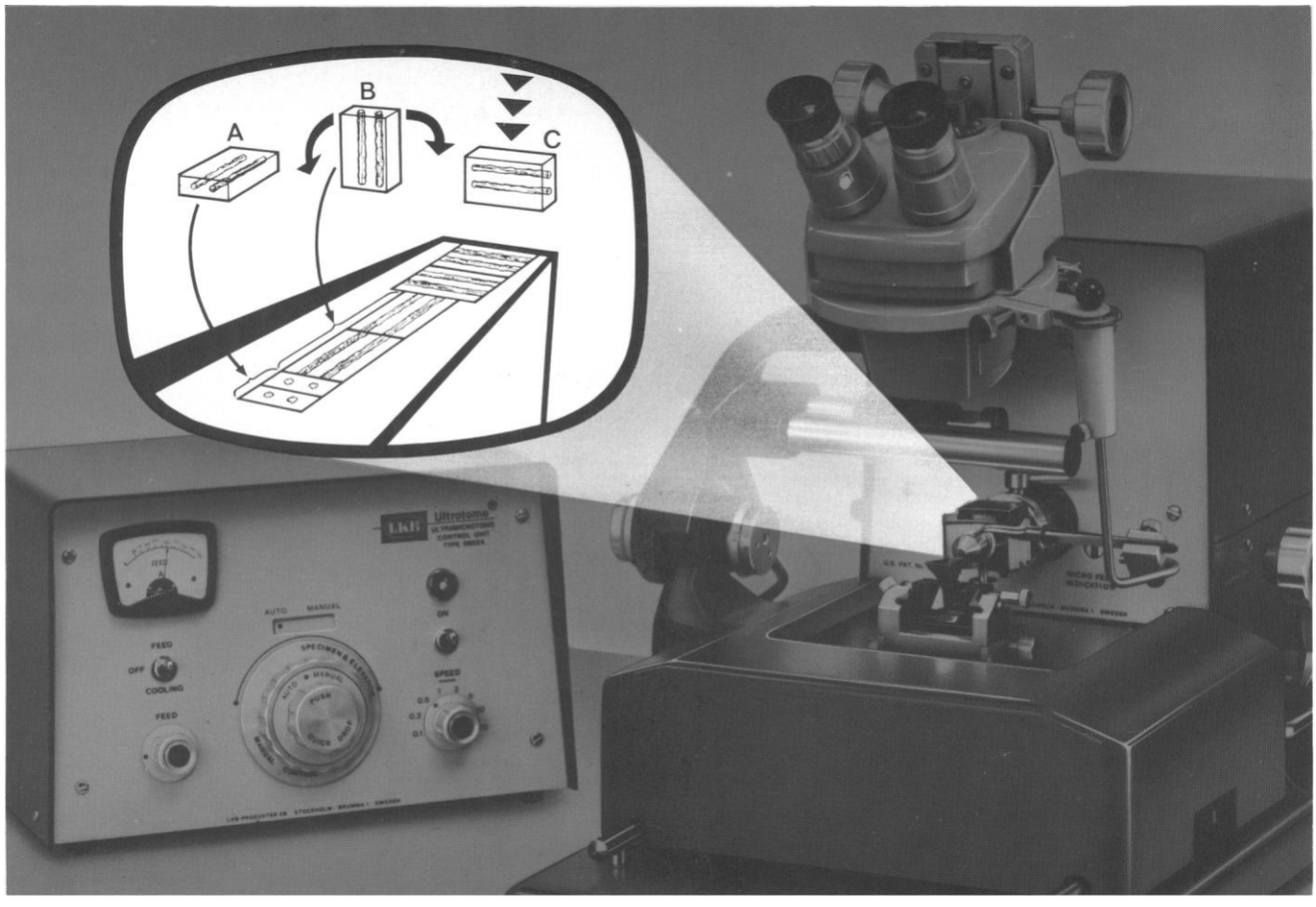
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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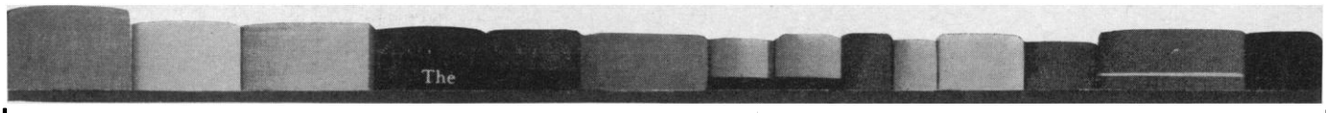

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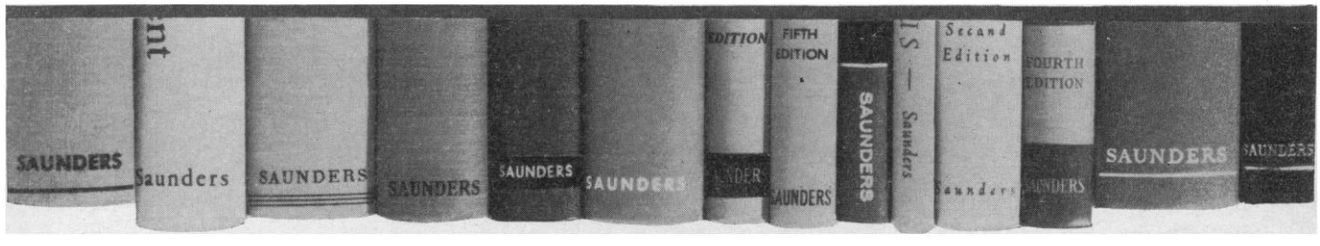

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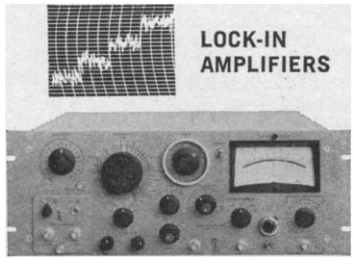
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Downward view through the 96-foot length of the phased line source feed of the Arecibo radio telescope in Puerto Rico. Observations are taking place with this telescope of pulsating radio sources (called "pulsars"). Such pulsars radiate brief pulses of radio emission periodically with a rate of repetition more nearly constant by farther than that of other known astronomical objects. See page 503. [Air Force Cambridge Research Laboratories, Bedford, Massachusetts]

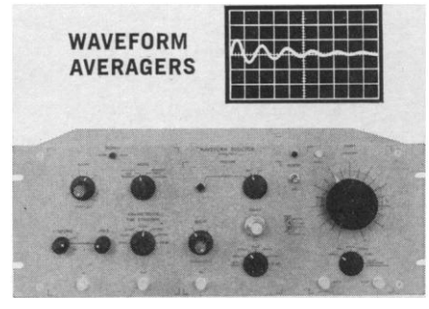
When information buried in noise is periodic, transient, or random, there is a *PAR*[T.M.] instrument to recover it

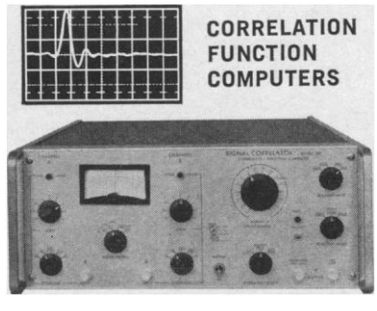
PAR manufactures a complete line of signal processing equipment to measure signals of various types buried in noise. The choice of the most appropriate instrument depends upon the characteristics of the signals. The equipment falls into three general classes:



Lock-In Amplifiers have application where the signal of interest is or can be made to appear at a single frequency and where a reference voltage related in frequency and phase to the signal can be obtained. These instruments employ phase-sensitive detection and narrow-band filtering techniques to provide a DC output signal proportional to the amplitude of the fundamental component of the signal being measured. The Lock-In Amplifier can be described as a tuned voltmeter, the response of which is "locked" to that particular frequency and phase at which the signal information has been made to appear. They operate typically in the frequency range of 1.5 Hz to 150 kHz with full scale sensitivities down to 10^{-9} volts.

Waveform Averagers are useful when, after processing, the actual waveform of the signal of interest must be maintained and the signals are repetitive waveforms or transients whose onset can be related to a trigger pulse. The application of a synchronized, repetitive waveform will result in an output that corresponds to the average value at each of the segments of the waveform being studied, whereas any non-repetitive (or un-synchronized) signals such as noise will be suppressed since their average after many occurrences will approach zero. PAR makes two instruments that perform this function; the Boxcar Integrator and the Waveform Eductor.[T.M.] The Boxcar Integrator is a single point averager in which a single slice, as narrow as 1 microsecond, of the input waveform is averaged while the position of the slice is slowly scanned through the waveform. The Waveform Eductor simultaneously averages one hundred points of the waveform which can be distributed over periods varying from 100 microseconds to 10 seconds.





Correlation Function Computers are the most general form of signal processing equipment that can be constructed (Lock-In Amplifiers and Waveform Averagers are actually special cases of correlation equipment). Whereas a reference or synchronization signal is required in the other equipment discussed, autocorrelation analysis allows periodic and random signals to be defined without this restriction. An even more powerful technique is crosscorrelation which has the ability to describe the degree of conformity between two different signals as a function of their mutual delay. The PAR Signal Correlator simultaneously computes in real time 100 points of either the auto- or crosscorrelation function over total delay spans of 100 microseconds to 10 seconds.

A variety of instruments and associated peripheral equipment is available from PAR in each general class. Instrument prices range from $765 to $9500. Since PAR has wide experience in applying these systems to many situations in all fields of science and engineering (e.g.: aero- and hydrodynamics, spectroscopy, medical physics, geophysics, etc.), we welcome the opportunity to discuss your specific application. For additional information, or to arrange for a demonstration at your facility, contact Princeton Applied Research Corporation, Dept. G, P.O. Box 565, Princeton, New Jersey 08540. Telephone: (609) 924-6835.

PRINCETON APPLIED RESEARCH CORP.

product. In Argentina, wheat losses from insect infestation during storage amount to the equivalent of 40 million kilos of bread. In the Congo, 50 percent of the harvested sorghum—a staple for Central Africans—is destroyed by insects (*4*). Irradiation at less than 0.1 megarad kills or sterilizes these insects and reduces storage losses greatly, with no discernible effect on the food. Several million people could be fed from the resulting food supply.

As far as the hazards of consuming irradiated foods are concerned, studies of rats and dogs fed foods for over 2 years, irradiated at doses proposed for foods to be consumed by man, have produced no defects in the animals or their offspring directly attributable to the fact that their food was irradiated.

Food irradiation is not a fad, but an important and valuable new technique, and the consumer should look forward to its use because it means he will have fresh food throughout the year.

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2. J. H. Clausen and J. W. Osburn, Jr., "Food Irradiation Activities Throughout the World," *U.S. Dept. Commerce Rep.* (Government Printing Office, Washington, D.C., 1968).
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4. S. Baron, *Freedom From Hunger* (magazine of the FAO) **8**, 6 (Mar.–Apr. 1967).

In the course of 15 years of research in the field and of service on scientific advisory committees, I have reviewed work on the wholesomeness and safety of irradiated foods, including extensive long-term feeding studies with different species of animals who were fed a variety of irradiated foods in several laboratories throughout the world. While experiments on certain foods are still in progress, including studies on possible mutagenicity, results to date confirm the wholesomeness of irradiated foods. Therefore, I assure Hardin that experiments to establish the "burden of proof" have been carried out and that the evidence is not inconclusive. It should be pointed out that "100 percent safety" will not be established in this or any other biological testing program and I know of no scientist involved in these experiments who has said that "food irradiation is 100 percent safe."

Hardin also stated that Auerbach ("The chemical production of mutations," 1 Dec., p. 1141) commented on "evidence that irradiation of food makes

it mutagenic for mice." What Auerbach actually said was "experiments on mice might give clearer evidence. . . ." To my knowledge no mutagenicity studies on irradiated foods have been carried out with mice.

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Pitfalls of Language Training

Page's "Omnibus language proposal" (Letters, 22 Sept. 1967) suggested that several foreign languages be taught simultaneously to graduate students in the sciences. He reported that Fritz Zwicky said the Swiss employ this method because students can more easily remember similarities and differences as they pursue several languages. For many years the City College of New York required its students in arts and sciences to take three foreign languages which were begun successively in the first, second, and third years and met five times a week. Such rigorous treatment produced satisfactory practical linguists even among those with little aptitude. If nothing else, it proved the merits of extensive and continuous exposure to a language.

Yet I would discourage both Page and Zwicky because students lacking linguistic training cannot, with less time and less intensive study, acquire satisfactory skills, even in their scientific fields. Syntax and lexicology are too complex for superficial study. Zwicky claimed that scientific terminology tends to be the same in most languages. This is true of those terms formed from Greek and Latin, but not if all tongues are included. "Nitrogen" in German can be *Stickstoff*, in Dutch *stikstof*, and in French it is more likely to be *azote* than *nitrogène*. It might be possible to acquire a workable vocabulary in a linguistic branch by simultaneously studying the Romance languages, or the Slavic languages, or Teutonic languages, but this would not produce a speaking knowledge or basic understanding of syntax. Even with more intensive study of closely related languages, so many similarities are misleading and confusing that CCNY prohibited students from initiating more than two such languages simultaneously, such as Spanish and Portuguese or even Spanish and Italian.

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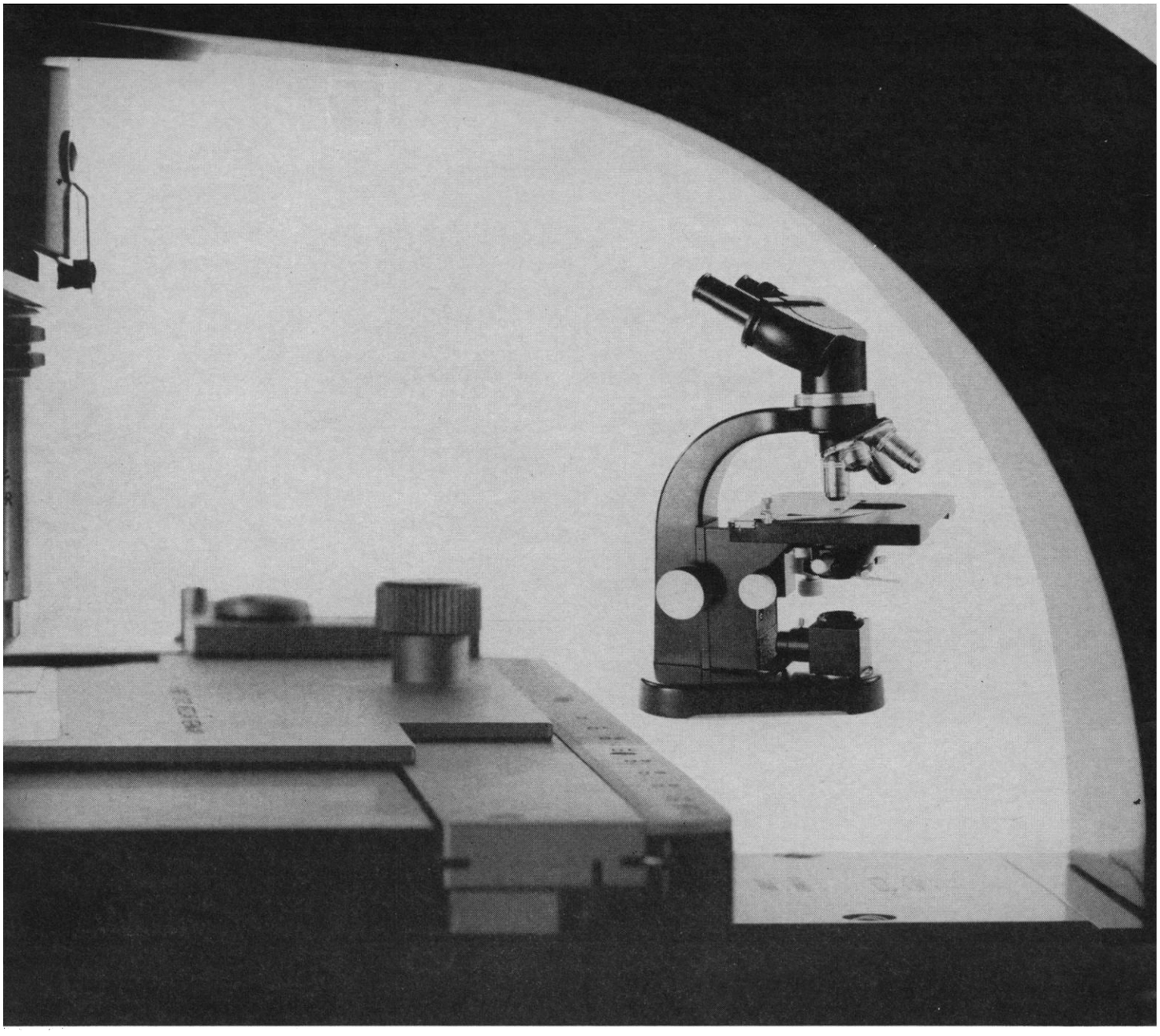

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The National Science Foundation

The latest annual report* of the National Science Foundation is excellent. It is a well-written account of the roles and the accomplishments of the agency that provides a basis for increased confidence in the leadership of NSF. This is due in part to the quality of the report and to its substantive content. It is also due to the fact that NSF has analyzed the current situation and taken defensible policy positions.

The National Science Foundation Act of 1950 assigned to the Foundation the responsibility to strengthen basic research and education in the sciences throughout the United States. Since then, other responsibilities have been added, including study, research, and evaluation in the area of weather modification and responsibilities under the National Sea Grant College and Program Act. Most of the Foundation's programs are concentrated in the country's universities and colleges. However, much effort has been devoted to the improvement of science education in primary and secondary schools.

The latest report emphasizes the close relationship among research, training, and the needs of society. "Basic research at academic institutions provides . . . apprentice-type training essential to graduate education while producing significant new knowledge." Furthermore, the report says, "production of knowledge as well as of scientific and technical manpower plays an important part in the cultural, social, economic and intellectual development of various regions of the United States. . . . Since it is exceedingly difficult to predict future utilization of basic knowledge most research is supported for its own intellectual value. However, this is done with the full realization, which is backed up by past experience, that most if not all, of the research results will sooner or later prove to be of direct value to society. Furthermore, if it is clearly evident that research activities in specific areas should be intensified because of present societal needs, attempts are made to stimulate this type of investigation."

In meeting its responsibilties the Foundation supports many programs; all of these are covered in the report. Where evolution of the Foundation's program has occurred, the changes are emphasized. This serves to convey the impression of an organization seeking to meet challenges.

About half the budget, or $235 million, was used to support research. A corresponding fraction of the report is devoted to providing highlights of research activities. Each of the major disciplines is represented by one or more examples. A typical description begins with a brief, simple statement of the question asked and its significance. The principal results are summarized, and their implications are discussed in terms of relevance both to science and to society.

The weakest part of the report is that devoted to discussion of science policy planning. However, the weakness is ameliorated by a thoughtful policy statement adopted by the National Science Board on "Criteria for the Support of Research by the National Science Foundation."

Preparation of an excellent annual report covering the complex activities of a large organization is a difficult and time-consuming task. It to be hoped that the diligence of the Foundation will be rewarded by cohesive support from the scientific community during the difficult days ahead.—PHILIP H. ABELSON

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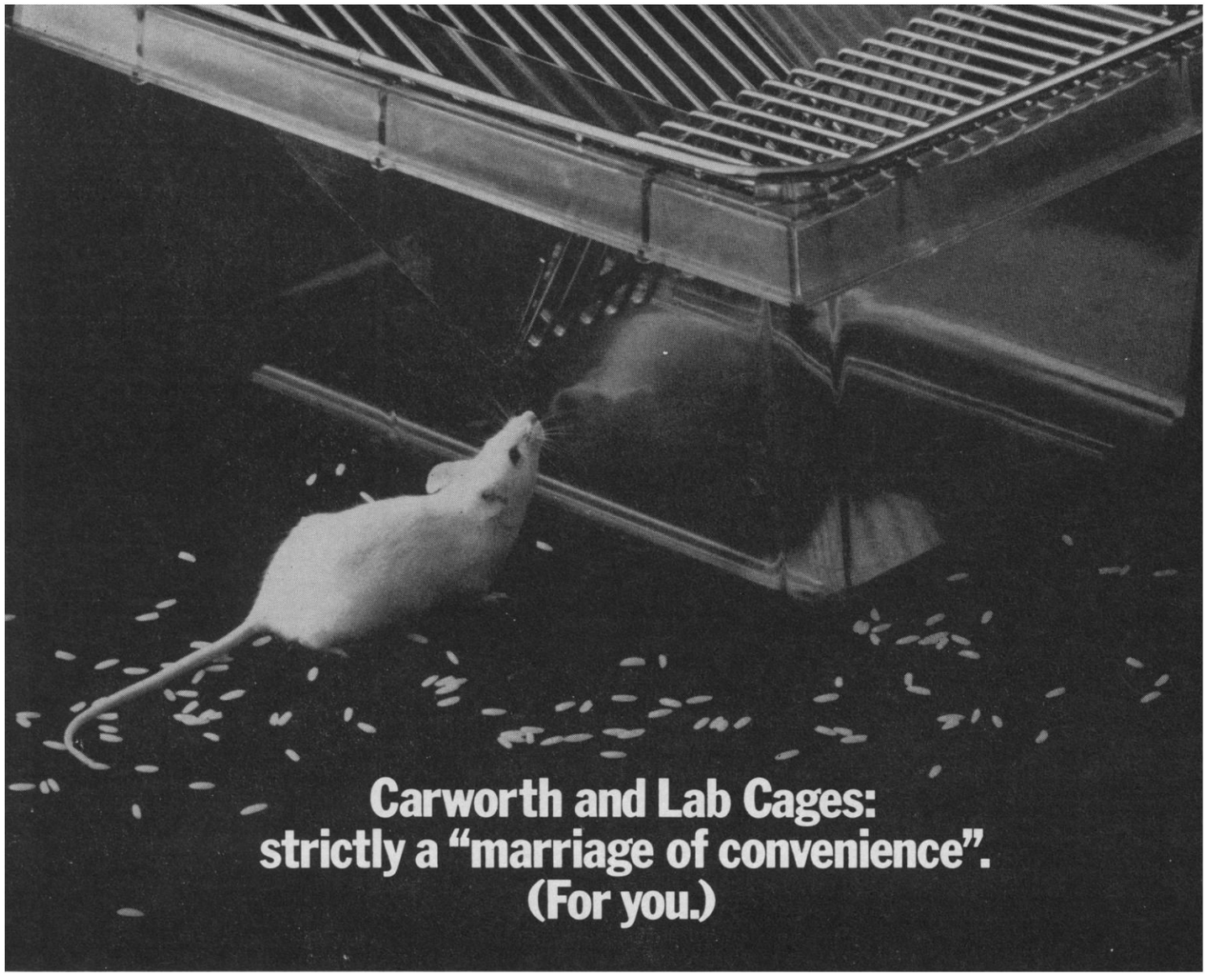
* *National Science Foundation Publication NSF-68-1* (Government Printing Office, Washington, D.C., 1968).



Carworth and Lab Cages: strictly a "marriage of convenience". (For you.)

Observation: though animals need cages, and cages "need" animals, to-date suppliers of one have not been able to satisfy your needs for the other. Curious.

Especially curious in the face of our growing awareness that the animal and its housing are not separate, independent entities, but truly segments of an integrated "system". That the animal's immediate environment—and its cage is certainly about as immediate as you can get—can have a meaningful influence on the animal is obviously not news to researchers or breeders.

Accordingly, then, might it not follow that a company that supplies *both* laboratory animals *and* animal housing (and is expert in each of these areas separately, and as one is related to the other) would be a nice thing to have? Just as an example, wouldn't it be confidence-engendering to know that your cage supplier *also* raises animals and hence knows intimately (and can now do something about) the everyday problems of the typical user? There would be other benefits, of course: dealing with a single supplier can simplify your life in terms of ordering, shipping, billing, or whatever.

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