SCIENCE

21 April 1972

Vol. 176, No. 4032

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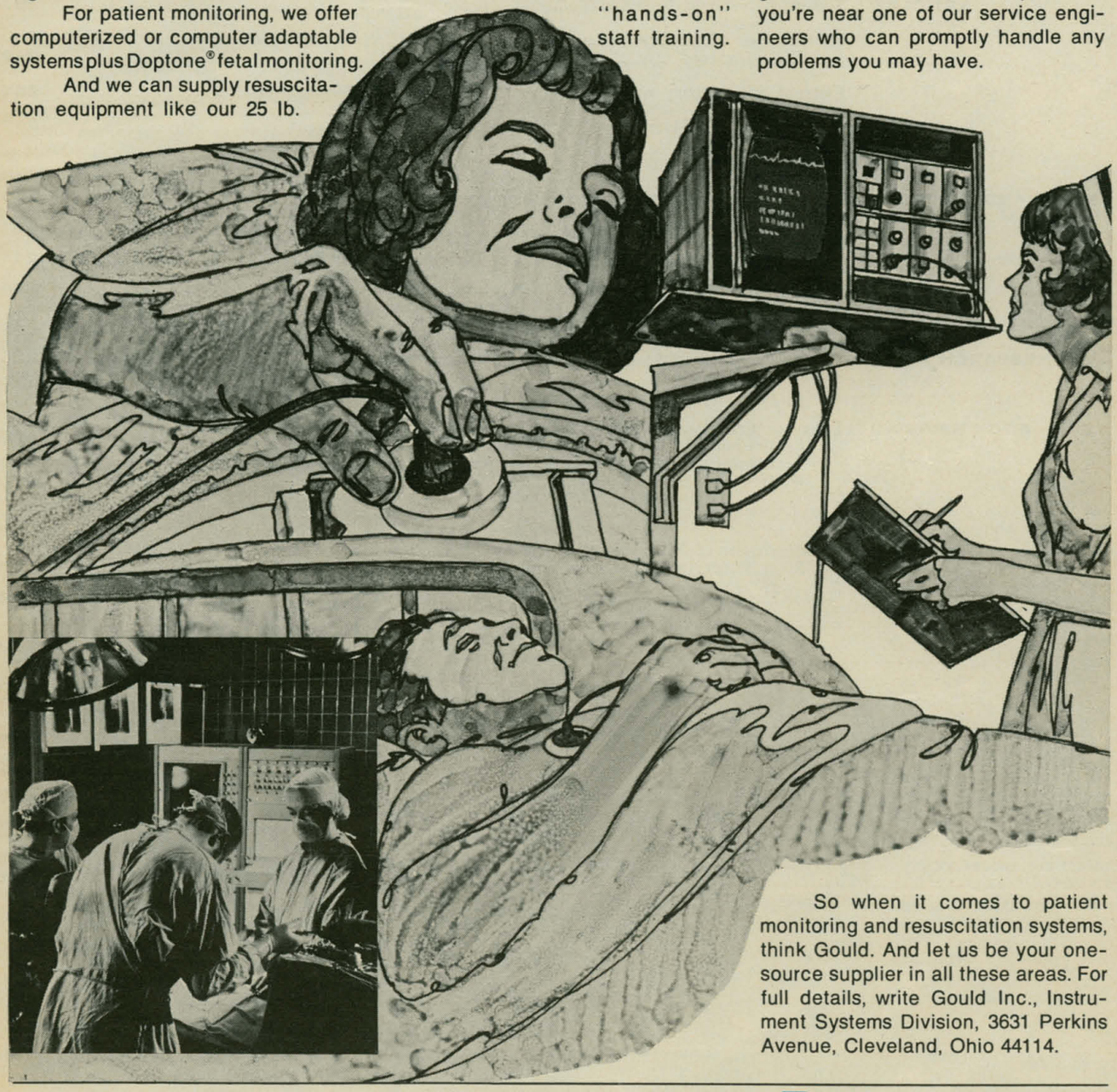

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Vol. 176, No. 4032

SCIENCE

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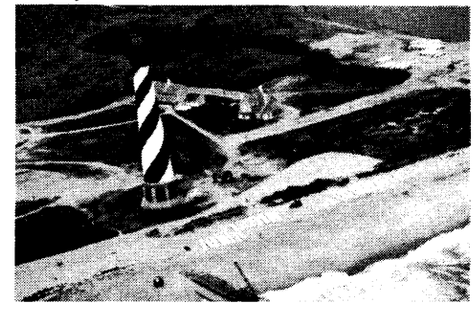
Man's impact on the morphology of North Carolina islands is obvious when the cover photo (taken in the early 1930's) of the Cape Hatteras Lighthouse and vicinity is compared with recent photo (below) of the same area. Although the National Park Service has been successful in stabilizing parts of the islands, the process may have serious geologic implications. See page 286. [Cover photo, © National Geographic Society]



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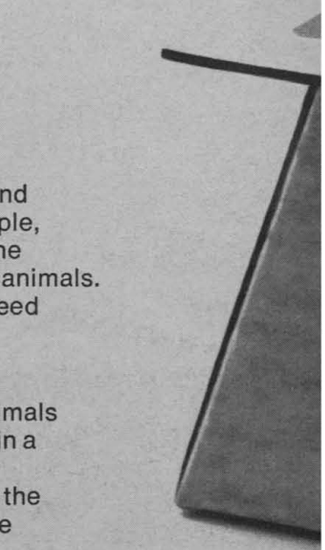

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"The Laboratory Mouse: Selection and Management"

by M. L. Simmons and J. O. Brick

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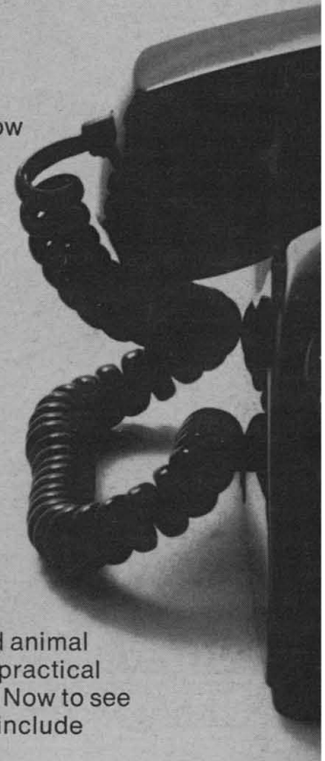

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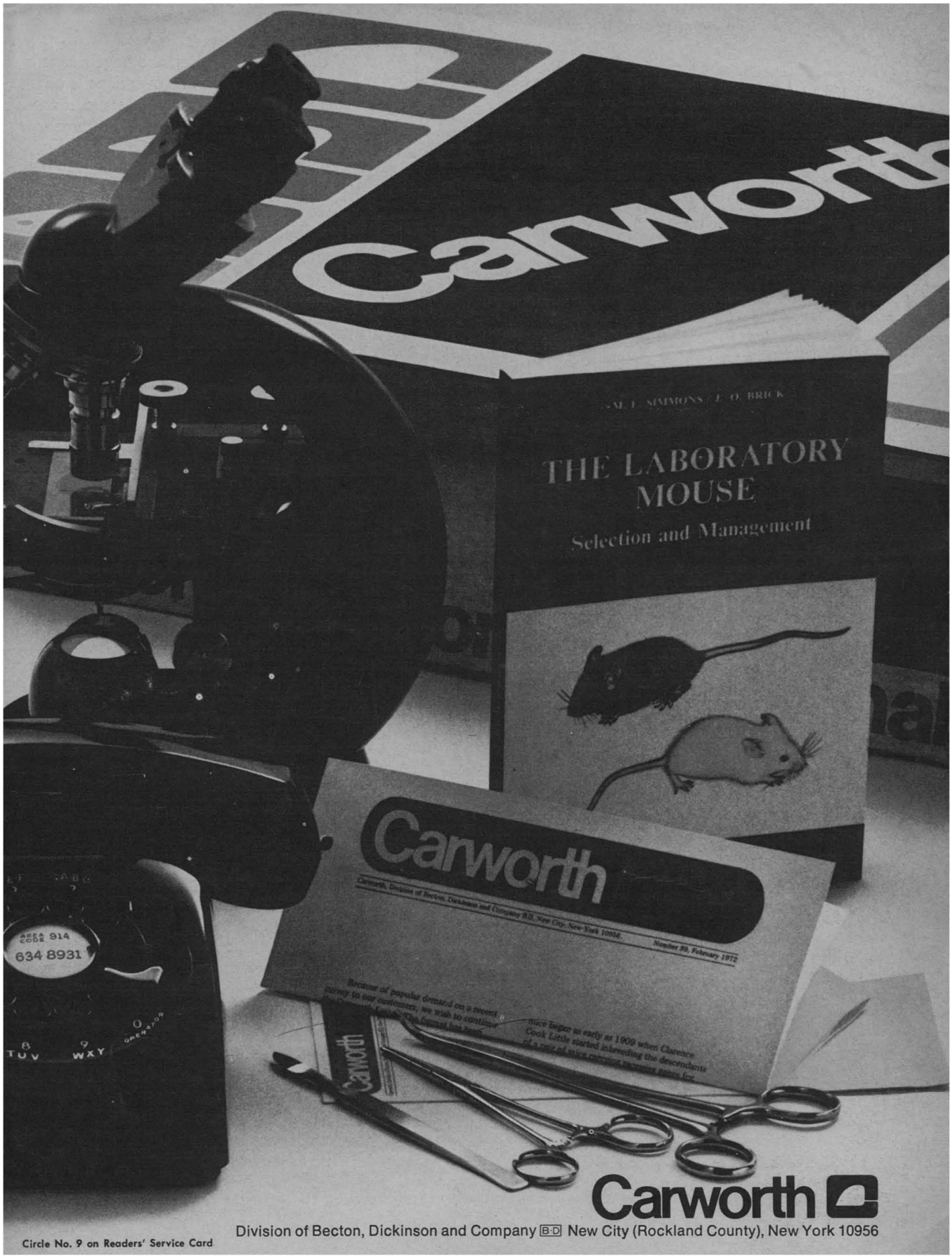

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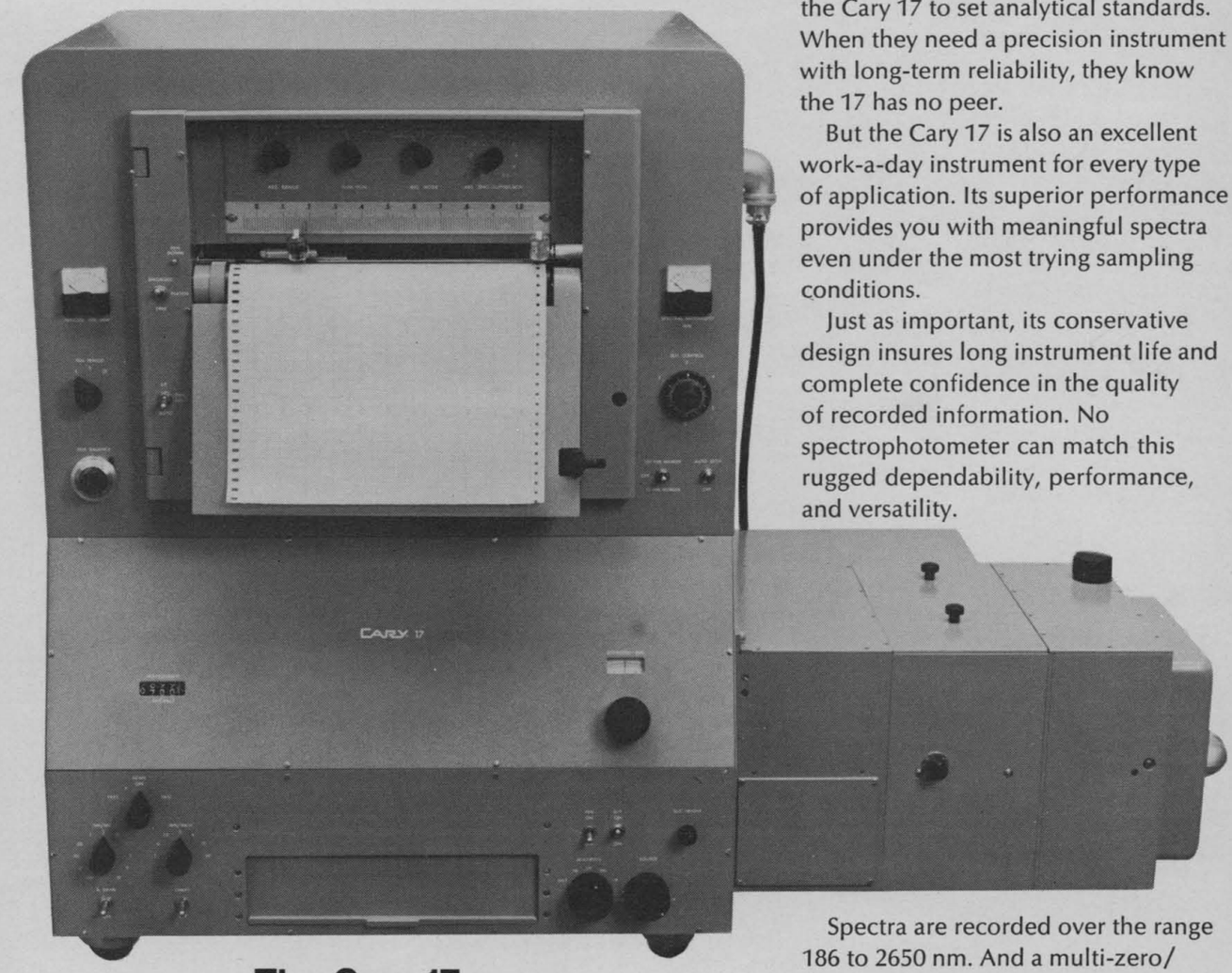

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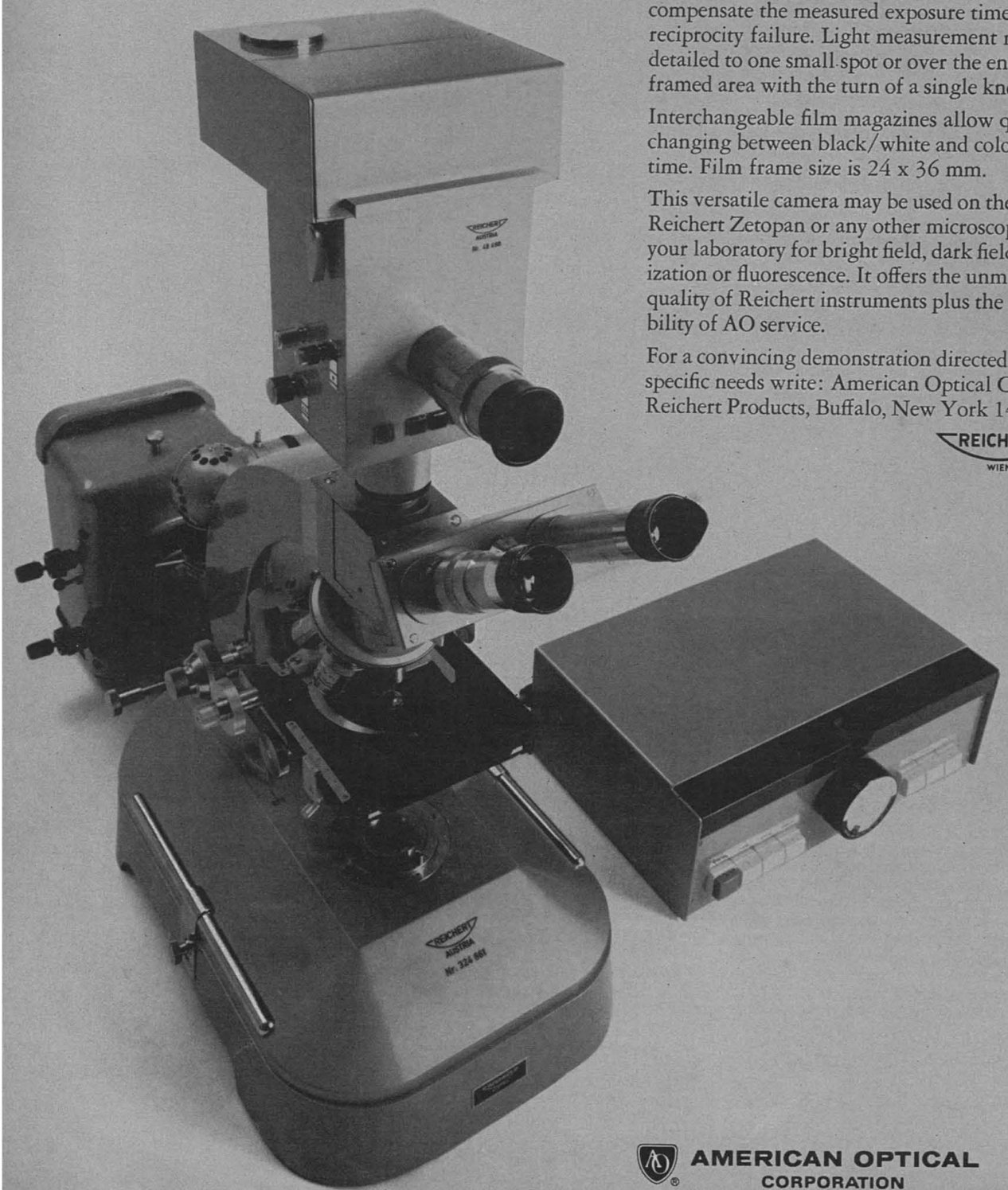

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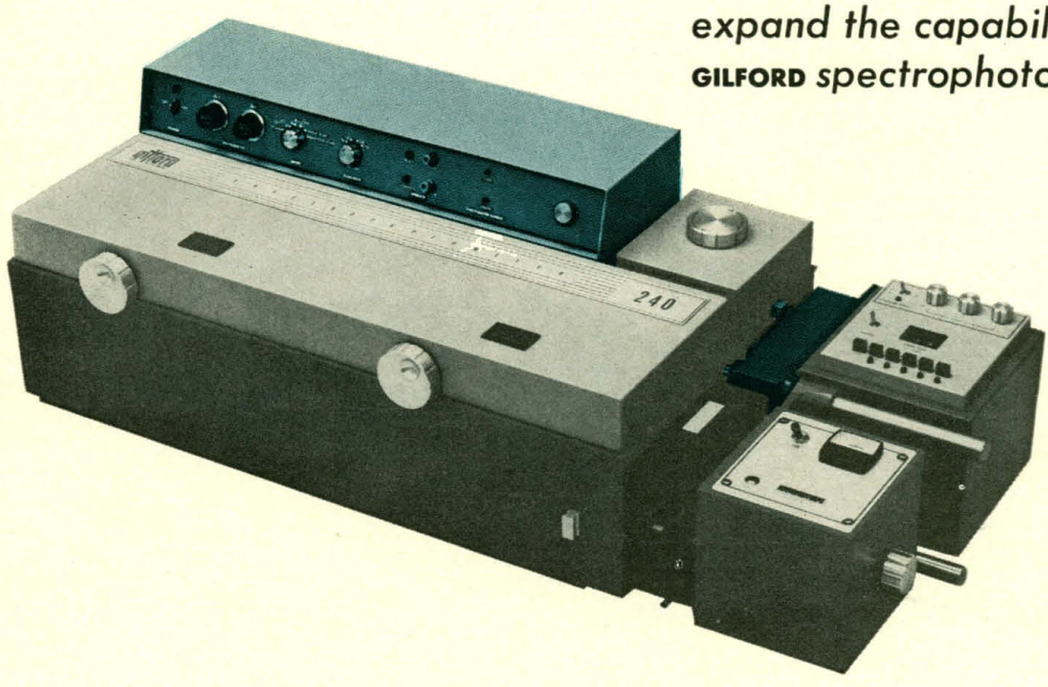

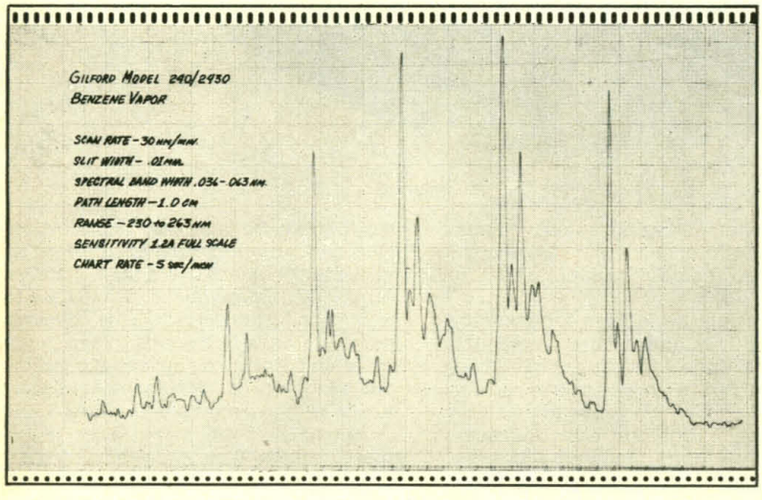

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have consistently and forcefully set forth the technical aspects of these problems so that when decisions are made by the appropriate officials they will not be made in ignorance. This is all that any science adviser can hope or expect. Scientists advise on scientific matters; they do not (and are not competent to) decide on issues in which nonscientific elements may be overriding.

In his summary, Perl blames the lack of "effectiveness" in certain areas on the "multiple functions" of the scientific establishment. In fact, this is one of the great strengths of the advisory system. How could its functions be other than "multiple" in view of the growing multiplicity of national problems that have some scientific content? They should be more multiple and be extended into areas such as transportation and housing.

Perl expresses his greatest concern about environmental problems, which are serious and which, by their nature, cannot be solved by scientists alone. Yet many scientists are working hard on the technical problems. Responsible groups have not attempted to advocate impractical panaceas—such as prohibiting the use of the automobile, of DDT, or of phosphates in detergents. On each of these issues there are many pros and cons—scientific as well as economic. There is no known nonpolluting substitute for the motor vehicle, although the new ones are getting better every year. DDT, many scientists think, has done far more good than harm in the world, and there is no general substitute for it, as there is none for phosphates in detergents.

Our nation faces many different problems—as does the whole world. Shall we blame only the scientists? What about economists, political scientists, lawyers, businessmen, labor leaders—and the *people?* We all share the burden and the responsibility. To discredit one group, who are, and have been for a long time, working on advancing our knowledge and promoting its more humane use is only to impede, not accelerate, progress.

LEE A. DUBRIDGE
2355-3A, Via Mariposa, West,
Laguna Hills, California 92653

In Clark's letter and in much of DuBridge's letter just the first two-thirds of my article are discussed. Generally they agree with my conclusions that the scientific advisory system is effective on limited technical questions but ineffective on broad technical questions. Their criticisms are either that it is inappropriate to judge the scientific advisory system on broad technical questions, or that the scientific advisory system should not be expected to be effective on such questions. In studying the scientific advisory system, I did not concern myself with what was appropriate or with what was to be expected, but only with the behavior of the advisory system and the response of the executive branch. Certainly the broad technical questions should be included in such a study.

More important, Clark and DuBridge ignore the last third of my article, where I concluded that "the advisory system, as presently constituted, combined with the multiple functions of the scientific establishment, is detrimental in important ways to the process of technical decision-making in this country." This conclusion does not depend upon whether one agrees with my evaluation of the effectiveness of the scientific advisory system on broad technical questions. Obviously, if one agrees with that evaluation, this conclusion is more distressing.

DuBridge, in the latter part of his letter, suggests that I was criticizing all of science or all scientists. This I was certainly not doing. I do not lay the failures of the scientific advisory system on all of the scientific community.

With respect to Long's letter, I am in general agreement—there is more work to be done. But I see no value in describing as an informal scientific advisory system the groups he mentions, groups which I also indirectly referred to in my discussion of the scientific community. These groups, when they are effective, are usually acting as pressure groups or as political groups, not as advisory groups. When they act only as advisory groups, they are usually ineffective.

MARTIN L. PERL
Stanford Linear Accelerator Center,
Stanford University,
Stanford, California 94305

Pregnant Baboons

I am engaged in automobile safety research. I am designing and testing the most appropriate restraint systems for pregnant occupants of motor vehicles. This research has utilized pregnant baboons in different stages of pregnancy. At the present time, our

supply of pregnant baboons is waning, and in order to complete the research, I need more than our breeding colony can supply. Would anyone with baboons in the early stages of pregnancy, who would be interested in selling them, please contact me. All inquiries should be directed to my address below.

WARREN M. CROSBY
Department of Gynecology and Obstetrics, University of Oklahoma Health Sciences Center, 800 Northeast Thirteenth Street, Oklahoma City 73190

Coal Workers' Pneumoconiosis

Despite Joseph Pichirallo's attempt to be impartial, there are several half-truths in his account (News and Comment, 8 Oct., p. 132) of the present dispute over coal workers' pneumoconiosis (CWP). This is a disease caused by the inhalation and retention of particles of coal, and a definition of the disease has been agreed upon by both the International Labor Office and the World Health Organization—the retention of coal dust in the lung and the tissues' reaction to it. Furthermore, it has been shown that there is a strong relationship between the amount of coal dust in the lungs and x-ray category. Since the onset of complicated CWP is directly related to the dust content of the lung, and since this form of CWP is universally accepted as both disabling and as a cause of premature death (in contrast to simple CWP), the x-ray remains the only way of quantifying dust exposure and hence the likelihood that complicated CWP will develop.

Simple CWP leads to only minor impairments of pulmonary function that are not associated with respiratory disability and cannot be diagnosed from a chest film. However, the issue is confused by the fact that chronic bronchitis and emphysema probably occur more frequently in coal miners than in the general population and likewise cannot be recognized in a chest x-ray. The major cause of these diseases in miners is cigarette smoking, although it is likely that dust exposure has an additive effect.

The chest x-ray is used by the Social Security Administration to determine dust retention in the lungs, and there would seem to be much justification for their policy. However, under the

Federal Coal Mine Health and Safety Act, coal miners have a separate disability award that is based on the assumption (known to be erroneous) that simple CWP is a disabling condition. Moreover, the disability criteria on which awards are based are the same as those for chronic bronchitis and emphysema. That this is unfair to nonminers should be apparent to all.

If a man has a disease or injury which precludes his working, society has a responsibility to him. Compensation should be paid irrespective of how his injury or disease originated or how many quarters he has paid Social Security. This can best be effected through the Social Security Administration. Let there be a contribution from industry to the fund that is based on an actuarial assessment of the frequency of industry-related injury and disease. The present haphazard system of each state having its own workmen's compensation laws is grossly unfair and is often discriminatory. In some states, awards are inadequate and difficult to obtain, and in many instances up to 50 percent of the award finds its way to the pocket of a lawyer. A federally administered system would ensure that the disabled man, rather than a third party, receives the benefits.

W. KEITH C. MORGAN
CHARLES E. ANDREWS
School of Medicine,
West Virginia University,
Morgantown 26506

Newton and the Mint

The danger of relying solely on aging classical histories is illustrated in L. A. Segal's letter "Newton, the politician" (21 Jan., p. 255). Sir John Craig (*1*) gives the following description of Newton's tenure as Warden of the Mint: "The credit given to Newton . . . is doubly wrong. The Great Recoinage was a social crime, and its principles had not been advocated by him." Examination of the chronology indicates that the laws were passed and issuance of the new coin and collection of the old begun before Newton assumed his new post. Craig quotes Montague's description of the position to Newton as not having "too much business to require more attendance than you may spare." Craig concludes that Newton managed "varied business with diligence and a moderate efficiency . . . but . . .

did not set the course of events on any new bearing."

Montague's appointment of the inexpert Newton can hardly be considered an exemplary instance of the "cooperation between politicians and intellectuals to solve a pressing social problem." Segal's pronouncement may even arouse indecorous mirth among the frivolous-minded who know Voltaire's scurrilous tale that the position was Montague's way of rewarding Newton for having so amiable a niece.

LEONARD N. BECK
3722 North Edison Street,
Arlington, Virginia 22207

References

1. J. Craig, *Newton at the Mint* (Cambridge Univ. Press, London, 1946).
2. Voltaire, "Dictionnaire philosophique" in *Oeuvres Complètes* (Imprimerie de la Société Littéraire-Typographique, Kehl, 1785), vol. 42, p. 165.

Ki'lo·me'ter

Some years ago, I noticed that a European friend pronounced the word for a thousand meters, ki'lo·me'ter, whereas I was pronouncing it, ki·lom'·e·ter'. I consulted my dictionary, *Webster's New International Dictionary of the English Language* (Merriam-Webster, Springfield, Mass., ed. 2, 1950). It said that this word should be pronounced kil'o·me'ter, but sometimes pronounced ki·lom'e·ter' "by false analogy with" ba·rom'e·ter. Following this, I tried to correct my pronunciation of the word and succeeded in doing so.

Because many scientists are still using the second (erroneous) pronunciation, I again consulted a dictionary. *Webster's Third New International Dictionary* (1961) gives both pronunciations as acceptable. This is because we scientists have used the wrong pronunciation for many years, and, of course, the dictionary tries to keep up with us, or perhaps better to keep down with us. Should we then use the following pronunciations—mil·lim'e·ter', cen·tim'e·ter', ki·log'ram, ki·lov'olt, and so forth?

May I appeal to all my friends (if I have any friends after complaining about such details) to use the same pronunciations that are used in European countries.

HAROLD C. UREY
Department of Chemistry,
University of California, San Diego,
La Jolla 92037

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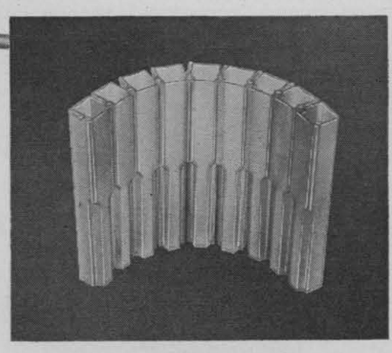

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21 April 1972, Volume 176, Number 4032 **SCIENCE**

A Blind Spot in Biology

The authors of biology textbooks conspire with nature to keep plant roots and their activities in the dark.

Life requires a supply of energy and of essential nutrient elements. Energy comes from the sun and results in the fixation of carbon from the atmosphere and its incorporation into energy-rich compounds. The role of photosynthesis in the chemical economy of nature is therefore given ample scope in textbooks of biology, and rightly so. Not only that, but there will be some discussion of the biophysics and biochemistry of photosynthesis and of the metabolism of its initial products.

In addition to energy, carbon, and the elements of water, living things require 15 to 20 mineral nutrients, which, for terrestrial life, are derived mainly from the soil and enter food chains via membrane transport mechanisms located in the plasma membranes of the cells of plant roots. Potassium, magnesium, phosphorus, sulfur, iron, and other essential mineral nutrients present in the water of the soil, the "soil solution," in extremely low concentrations are as unavailable to animals and human beings as is carbon in the form of 0.03 percent carbon dioxide in the atmosphere. The processes of active ion transport, whereby the mineral nutrients are initially secured from the nonliving environment and introduced into the biosphere, are therefore as critical for terrestrial life as those that bring about the assimilation of carbon. The leaf is the port of entry for one nutrient; the root is the interface between terrestrial life and the mineral substrate supplying all other essential elements.

Now check the same biology texts that do such an adequate job in their exposition of photosynthesis to see what they say about the entry into the biosphere of the essential inorganic nutrients. There is almost nothing. There may be some vague references to "permselective membranes"; there may even be mention of active transport; but there will be no, or virtually no, presentation of experimental evidence, no discussion of mechanisms—nothing, in fact, that could not have been written at least a generation ago. Nor will there be any exposition of the significance of the process of mineral ion transport in the chemical economy of the biosphere.

There is a growing and justified concern over toxins in the environment and their progression into food chains. The entry of many of these substances into the terrestrial biosphere is via the same route and by the same processes as the entry of the essential mineral nutrients. We need to understand their distribution and fate far better than we do. To this end, knowledge of the transport of solutes across plant root membranes should be extended and diffused among biologists; it is no help to find that the current textbooks of biology all but ignore this subject.

We have witnessed in recent years an amazing recrudescence of a quaint lore about "organic" gardening and food production that reveals an almost total ignorance among many people, including a sizable fraction of our college population, of the most basic facts concerning the nutrient elements of plants and their absorption. The neglect of this subject in the current teaching of biology has no doubt contributed to the ready acceptance among so many students of thoroughly discredited ideas concerning the nutrition of plants.

It is high time that the authors of biology textbooks closed the information gap concerning the processes of active ion transport by which the membranes of the cells of plant roots "mine" that low-grade ore, soil, for essential and other elements—processes that are literally at the root of life on Earth.—EMANUEL EPSTEIN, *Department of Soils and Plant Nutrition, College of Agricultural and Environmental Sciences, University of California, Davis 95616*

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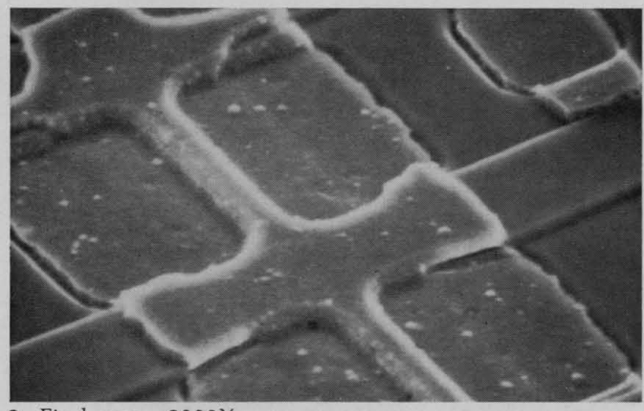
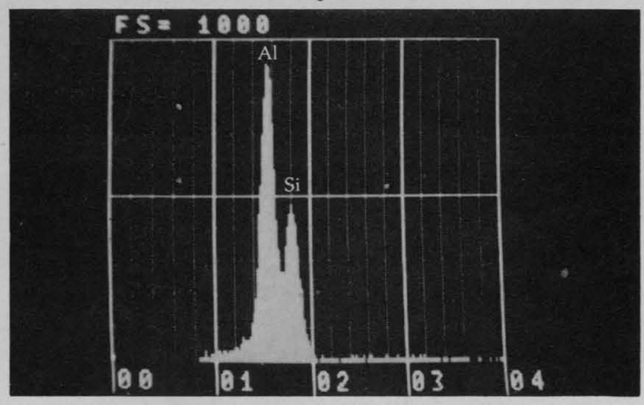


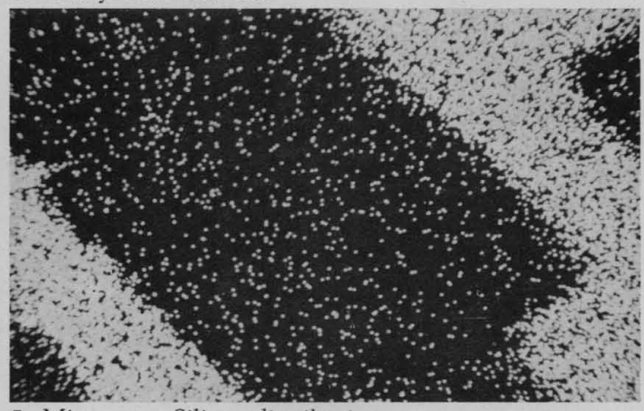
2. Find area—2000X

3. Inspect crack—11,500X

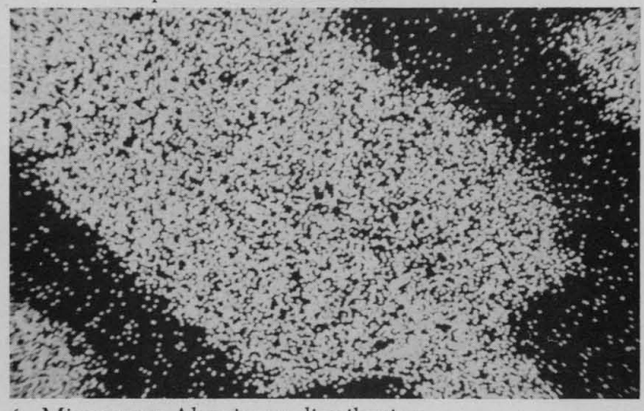
Analyze it!



4. Analyze for elements



5. Micro-map Silicon distribution



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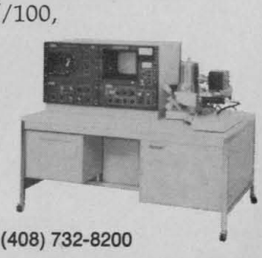

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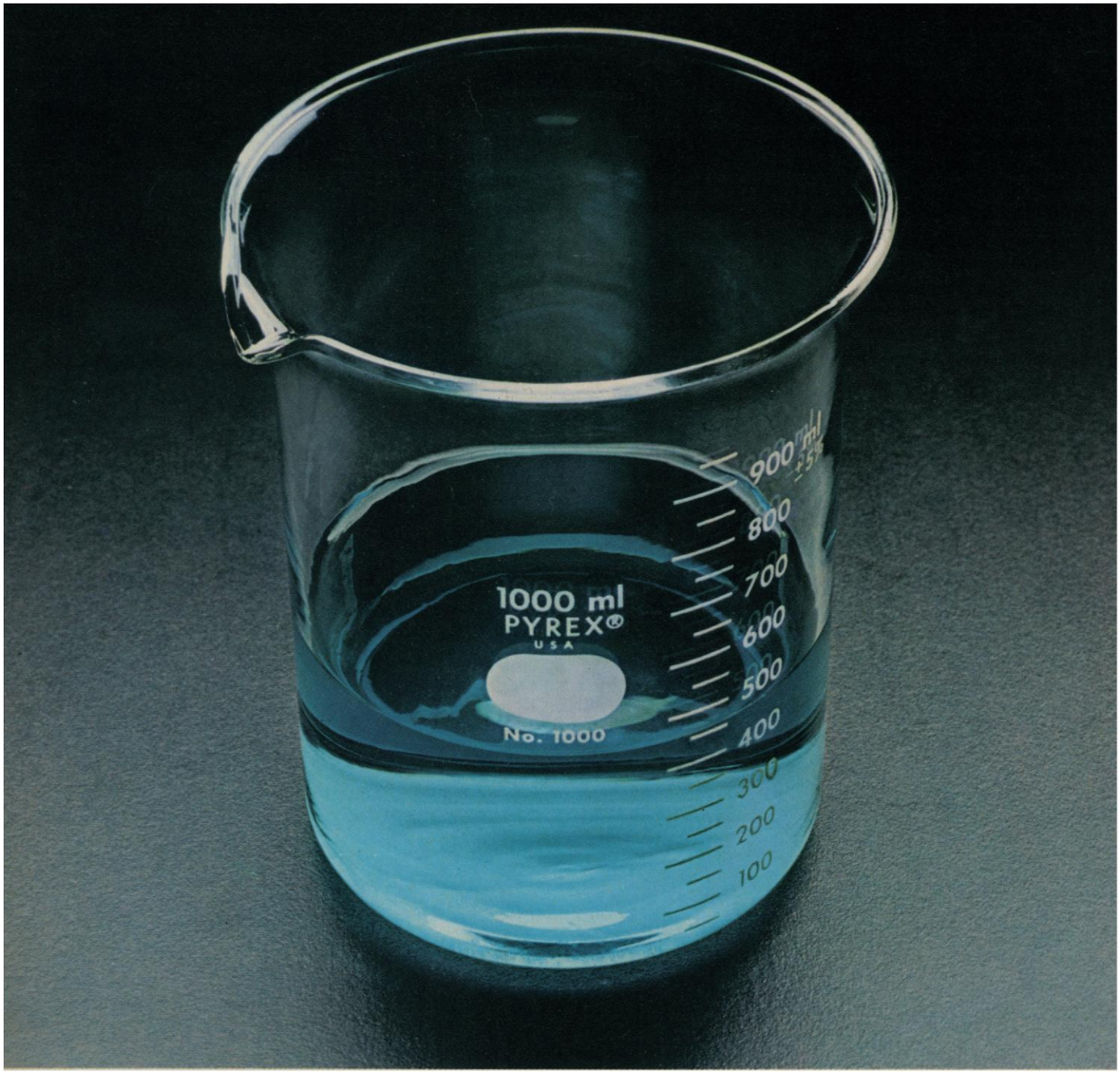

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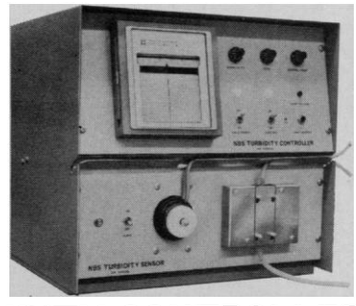

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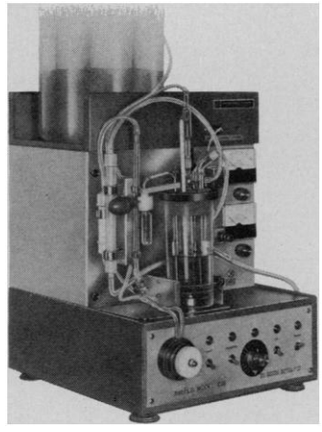

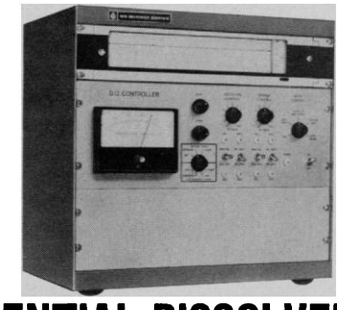

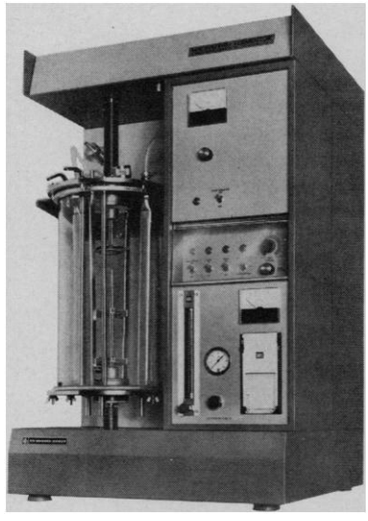

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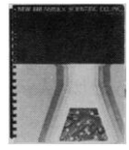

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(Continued from page 272)

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