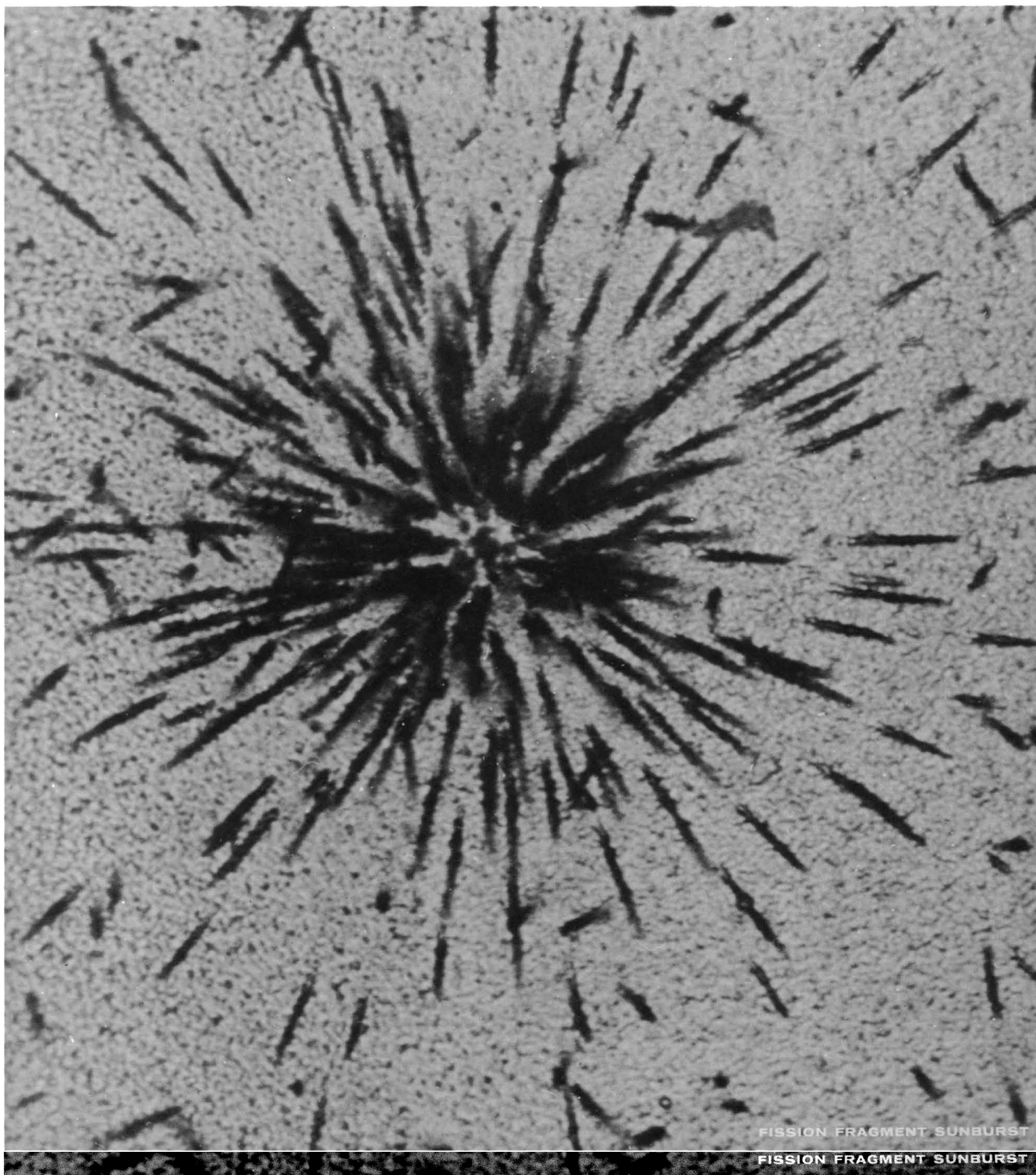


SCIENCE

14 June 1963

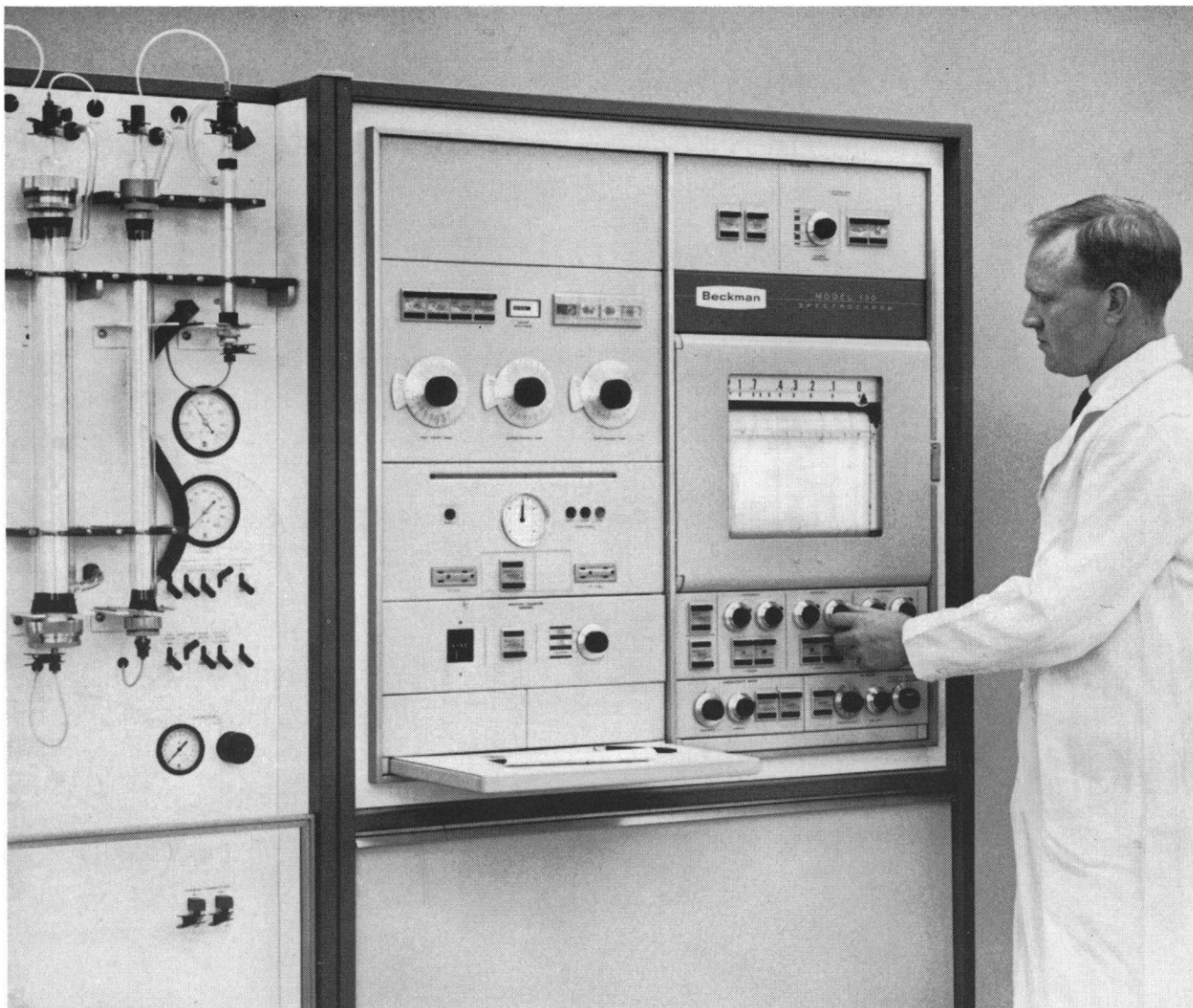
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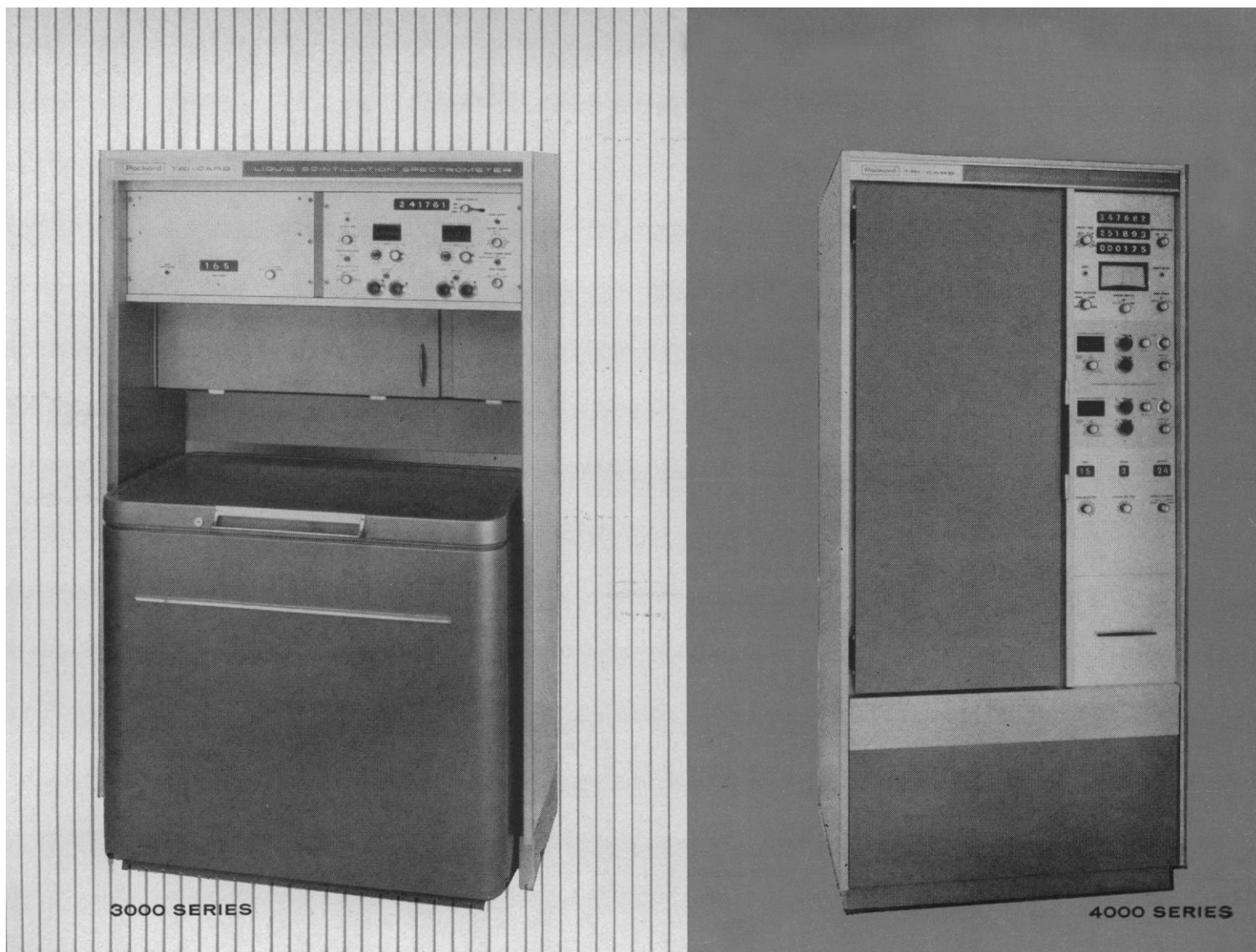
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COVER

A burst of fission fragment tracks that were chemically drilled in a high polymer after neutron irradiation. Fission fragments have emerged from a speck of dust about 5 microns in diameter. They result from neutron-induced fission of a small fraction of the one part per million of uranium impurities present in the dust ($\times 1100$). See page 1221.

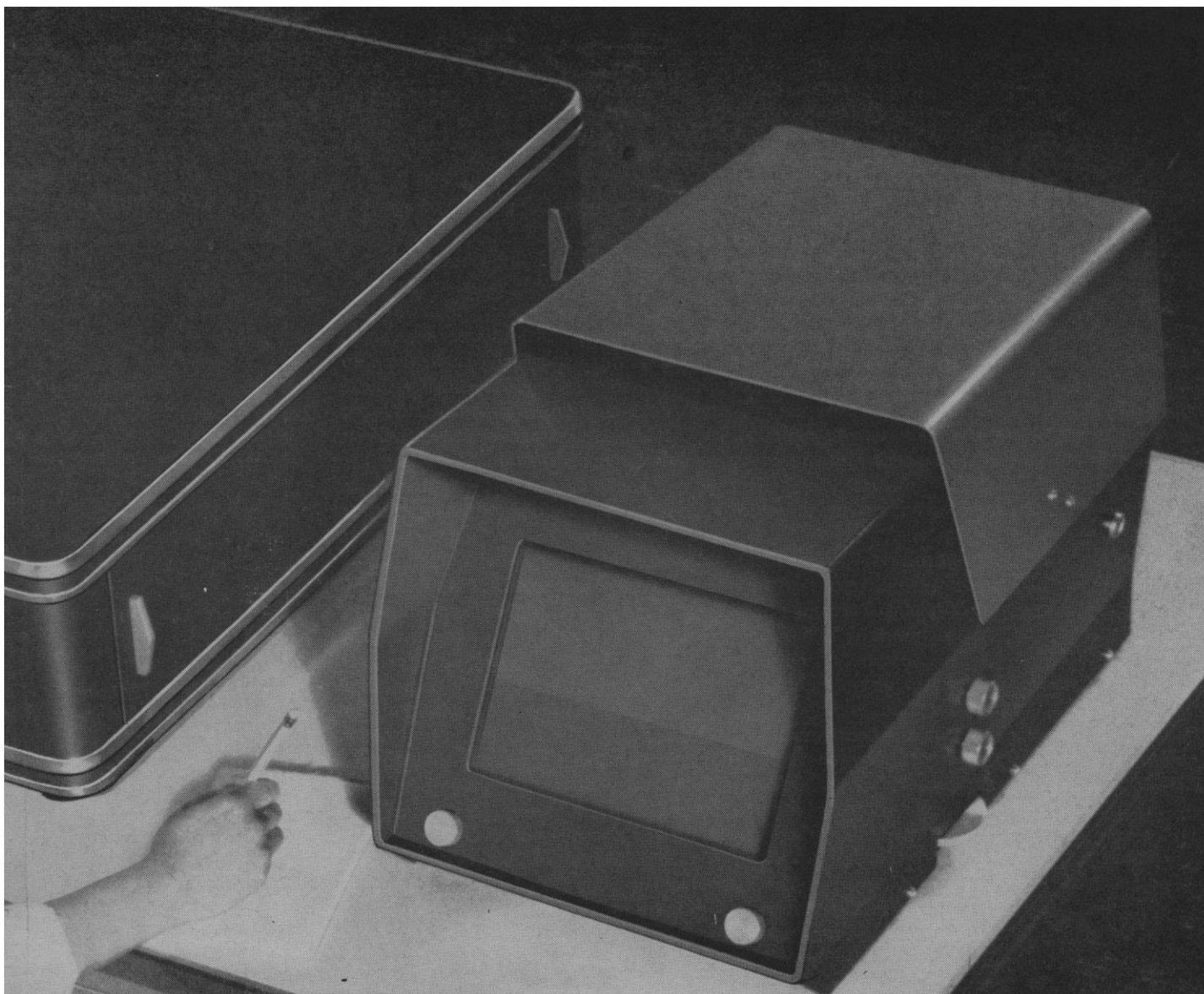


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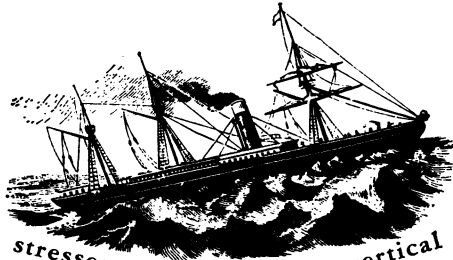


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Honeywell data acquisition system records stresses on ships at sea



The extremely low recording speed capability of a Honeywell Magnetic Tape System and the versatility of a Honeywell Visicorder Oscillograph have teamed up to report a new story of the punishment ships take at sea. Lessells and Associates, Inc., Boston, used the Honeywell system to measure the vertical longitudinal stresses induced in the hull each time a ship is pounded by a wave.

A Honeywell LAR 7460 Magnetic Tape Recording system was installed aboard the S.S. Hoosier State, and later aboard a sister ship, the S.S. Wolverine State. Both are 520-foot, 15,000 ton freighters operated by States Marine Lines of New York. Strain gages were attached to the port and starboard gunwales amidships to sense stresses produced by waves encountered over the turbulent trade routes of the North Atlantic.

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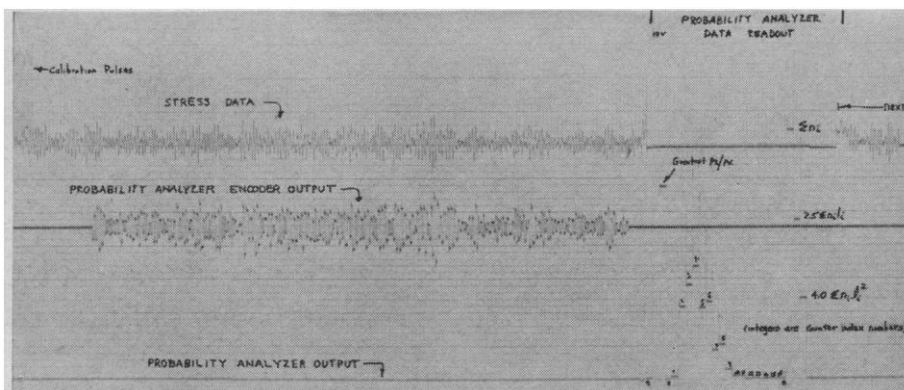
After the voyage, the tape was taken to Lessells' laboratory and played back from a Honeywell reproducing and amplifying system at 60 inches per second, or a speed ratio of 200 to 1. From the playback system, the data were recorded on a Honeywell Model 906 Visicorder oscillograph, operating at a paper speed of one inch per second.

The data were also fed through a probability distribution analyzer and this processed output was fed into the

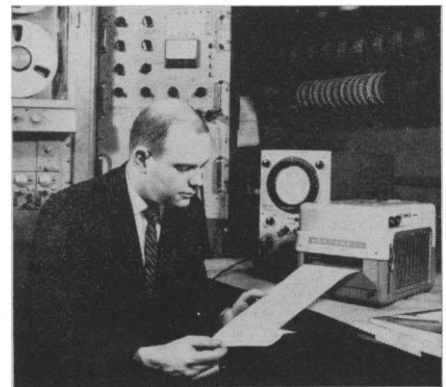
Visicorder to permit simultaneous observation of original and processed data. By being able to control both the recording speed and the playback speed, as well as the paper speed of the Visicorder, Lessells could obtain a permanent record of the data with any desired trace resolution.

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Top trace: Stress data as recorded on ship. Middle trace: Probability distribution analyzer encoder output. Bottom trace: Probability distribution analyzer output.



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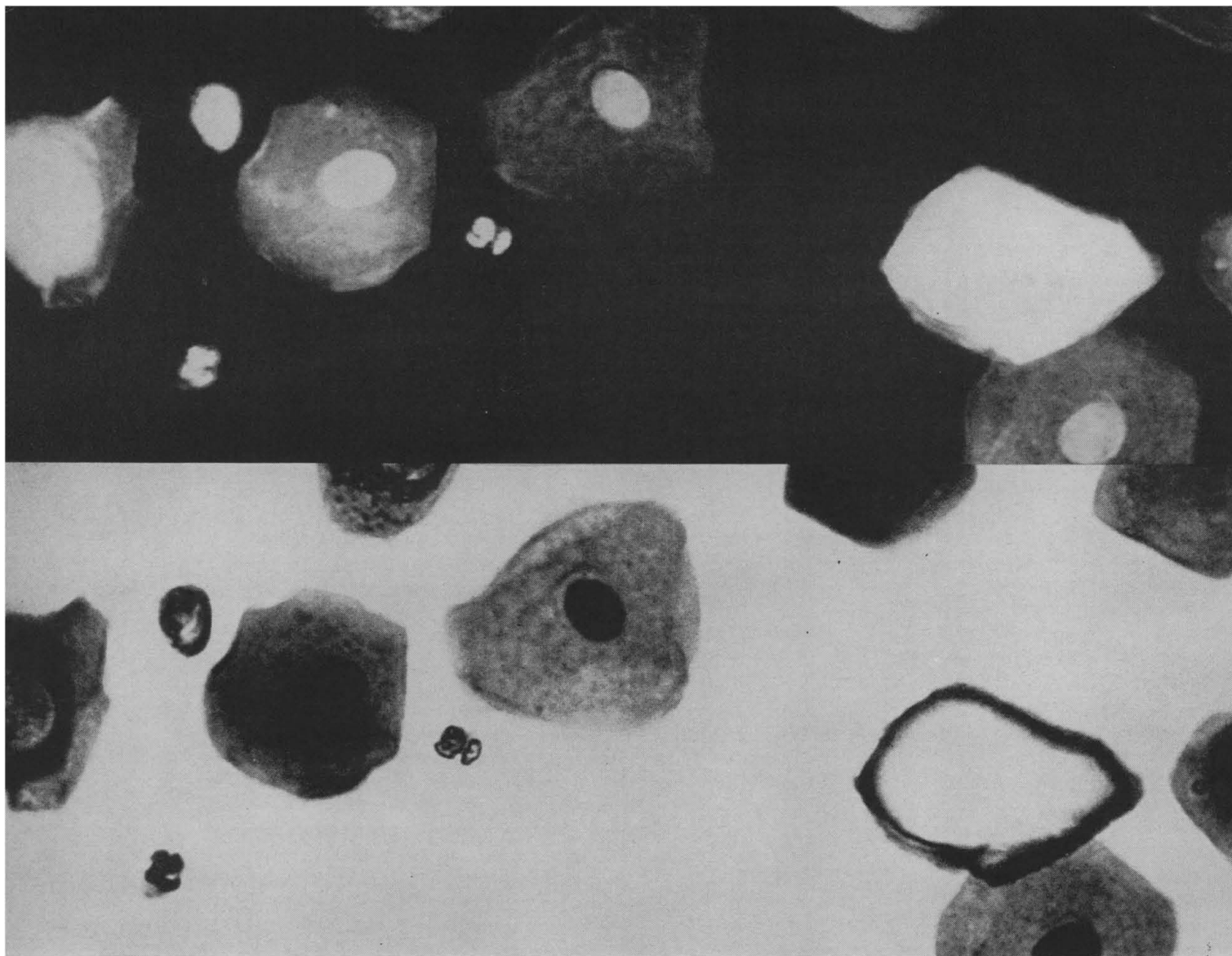
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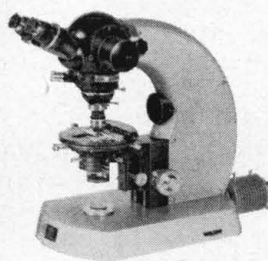


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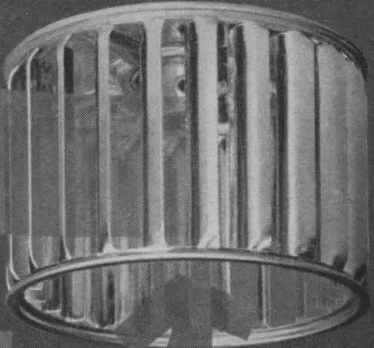
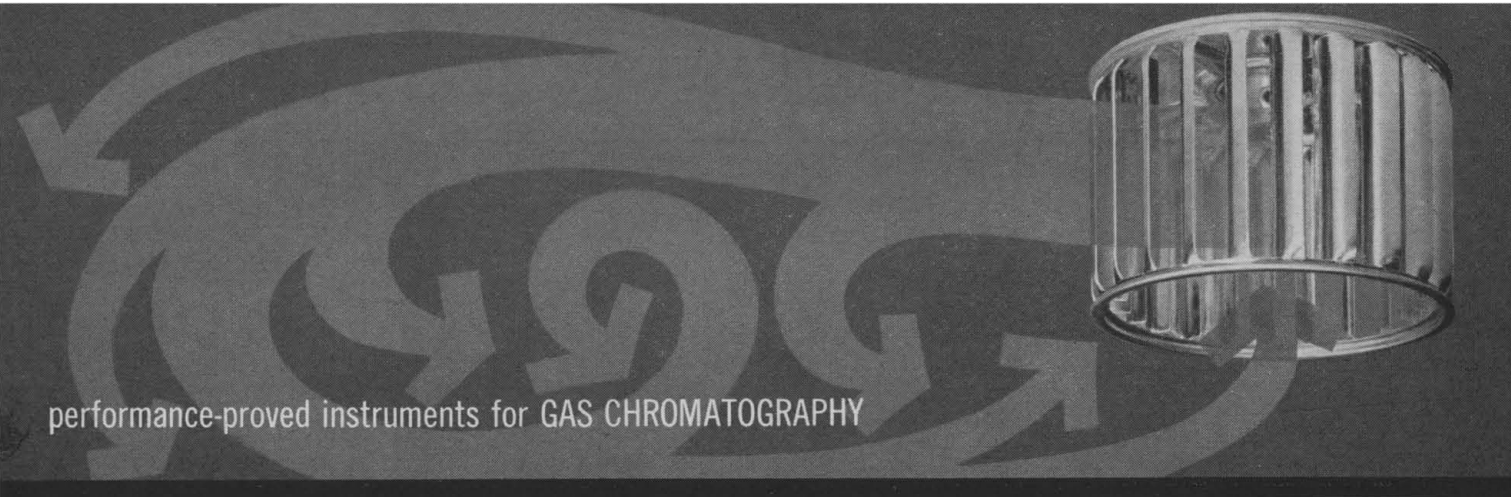


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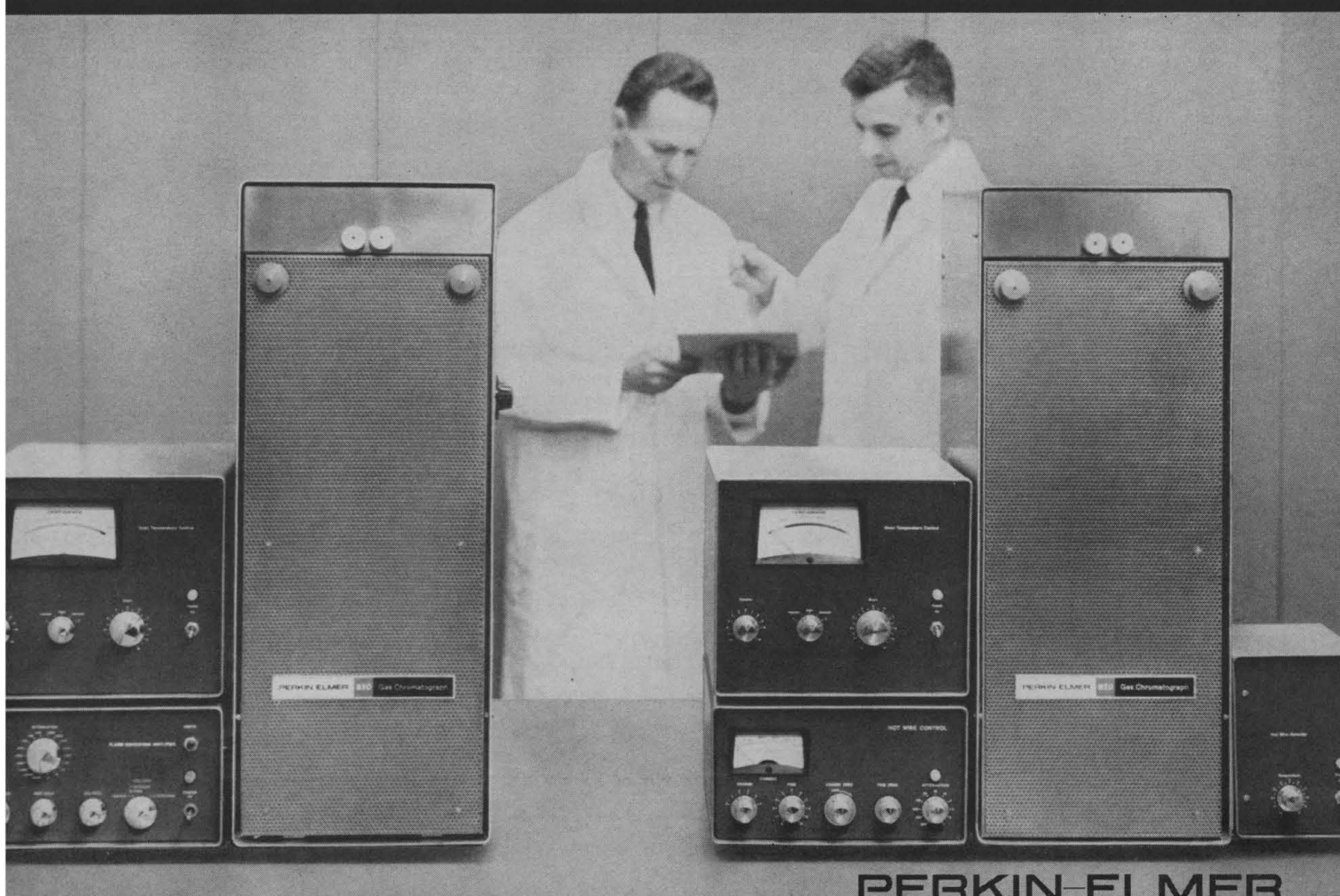
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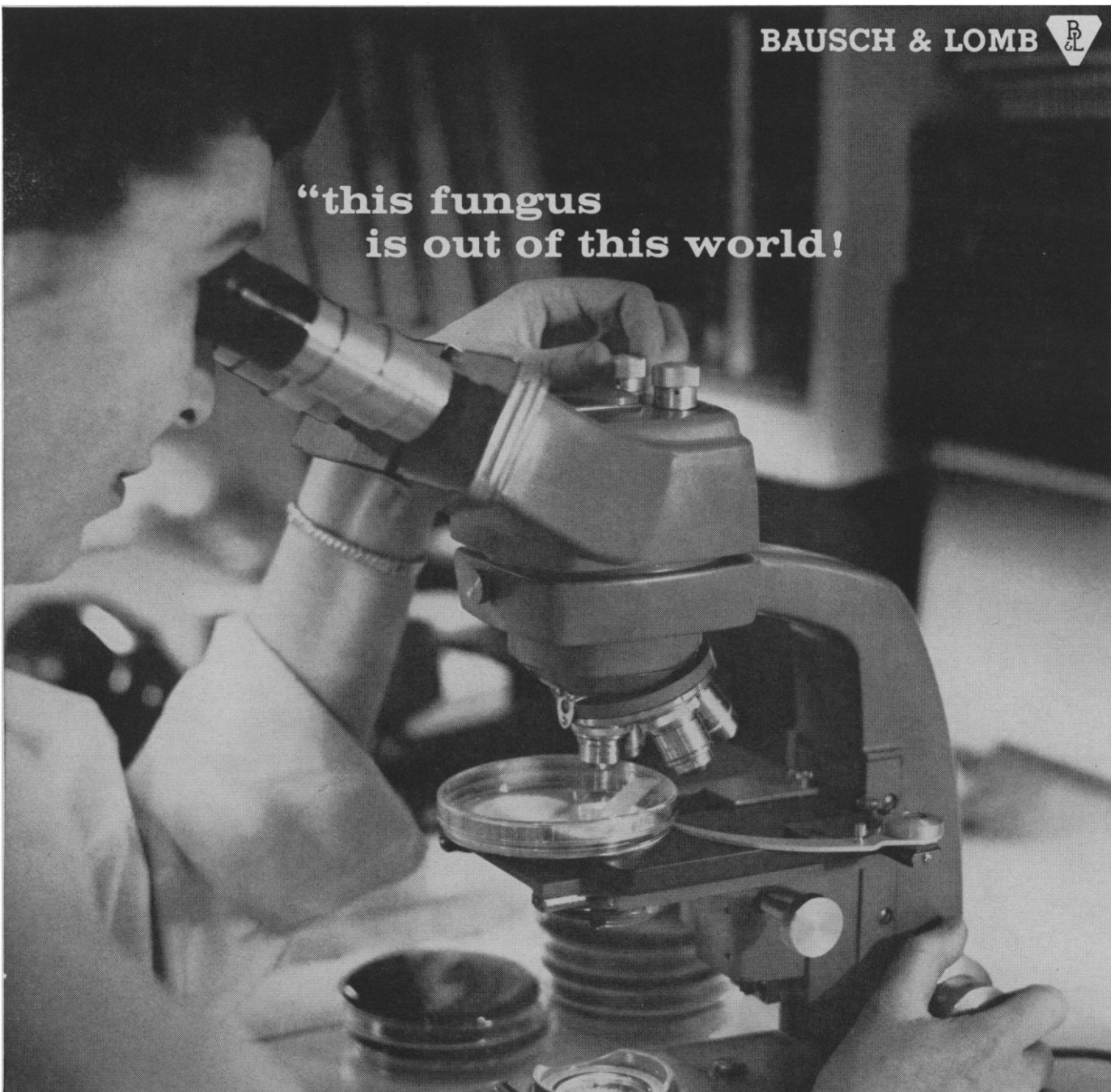


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Serendipity in Research

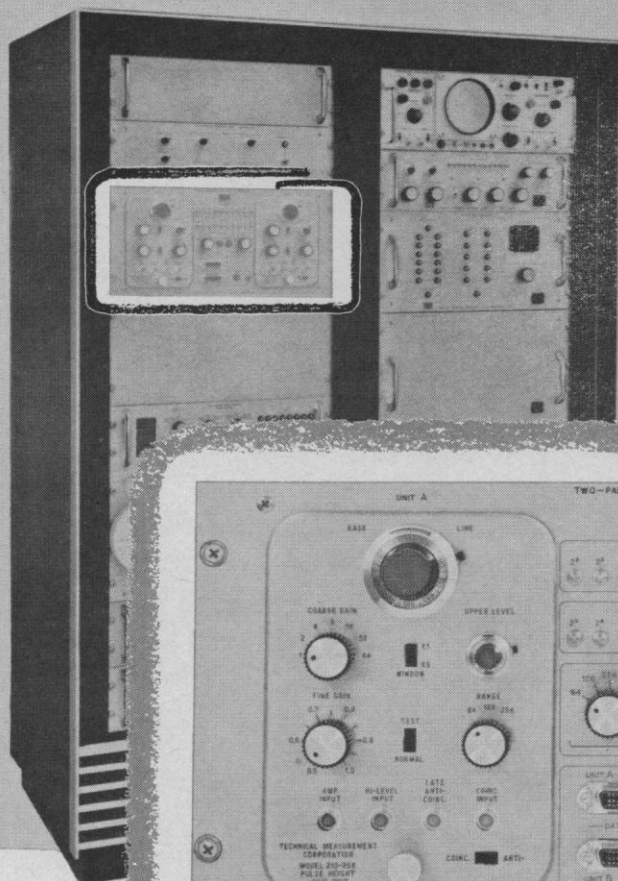
One of the popular misconceptions concerning research is the importance of serendipity. The public has come to think that the successful scientist is one who has "a gift for finding valuable or agreeable things not sought for." A few examples, such as Perkin's discovery of an artificial dye, have dramatic value and hence are overemphasized. Perkin's discovery, while important to the course of development of chemistry at the time, plays only a minor role in the structure of science today. Organic chemistry, one of man's greatest intellectual triumphs, was built as a cumulative result of answers to a series of closely directed questions. Occasionally a chance observation has led to unexpected enlightenment. In general, however, progress has come because experimenters were seeking it.

Consider advances in another field—nuclear physics during the 1930's. This was an area where, to the highest degree, a kind of serendipity entered in. The discoveries of the neutron, artificial radioactivity, and uranium fission were unexpected. Yet in each instance the experimenters involved were extraordinarily competent. They had posed clear-cut questions. Chadwick in 1932 was attempting to study the physics of interaction of alpha particles on beryllium when he noticed that a "hard" gamma ray accompanied the reaction. On exploring the matter further he found that he was dealing not with gamma rays but with neutrons. The Joliot-Curies were studying the reaction of aluminum with energetic alpha particles. They observed that when the source of particles was removed, the aluminum target continued to emit radiation.

The most unexpected and far-reaching discovery in nuclear physics was that of uranium fission, reported by Hahn and Strassmann in 1939. In this case the discovery was more a result of careful work than anything else. Earlier, Fermi and his group had irradiated uranium with neutrons, and they thought they had discovered transuranic elements. Hahn and Strassmann were following up this work and found what they believed might be radium, presumably arising from neutron-stimulated emission of alpha particles from uranium. A first step in the isolation of radium is coprecipitation of radium and a barium salt. Later the mixture is recrystallized and the two elements can be separated. But in the products from uranium the radioactivity precipitated with the barium could not later be separated from it. When this was confirmed, Hahn and Strassmann were forced to conclude that they had produced barium from uranium. In a sense the discovery involved luck, but only in part. The experimenters had posed an interesting, clear-cut question, "Is radium a product of irradiation of uranium?" They devised an appropriate set of experiments to answer the query. The result was certain to be important, whatever it was. If they had proved that radium was a product, the result would have been considered very important, though not so significant as what they actually found.

Other developments in nuclear physics, such as the discovery of carbon-14 and other radioactive tracers, were sought, as was the understanding of nuclear forces. Indeed, most of the structure of nuclear physics is a product of carefully planned research rather than a series of happy incidents. In general, the research worker gets no more from his experiments than he puts in by way of thought, preparation, performance, and analysis. Serendipity is a bonus to the perceptive, prepared scientist, not a substitute for hard work.—P.H.A.

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The 242 contains two 10-bit address registers, thereby providing dual 1024-channel address resolving capability. The registers can operate in coincidence or in an independent fashion. Access to the registers is possible by parallel entry into all bits or by a serial pulse train into either 10-bit register. Neon indicators are provided for address identification. The output format may be binary or BCD, as selected by a rear panel switch. In addition, register outputs are buffered so the unit can feed parallel address information simul-

taneously to other equipment, such as an "on-line" general-purpose computer.

Input flexibility in TMC 4096-channel systems is matched by readout/read-in variety. Data readout can be provided by magnetic tape, perforated paper tape, parallel printer, or typewriter. Read-in (with summation or subtraction) is possible by magnetic tape or perforated paper tape.

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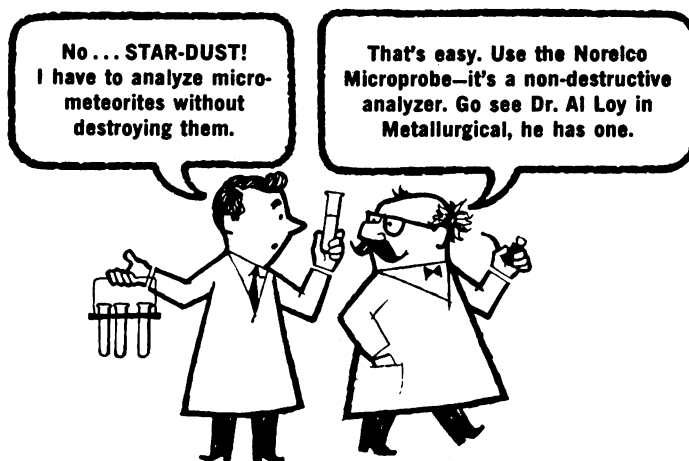
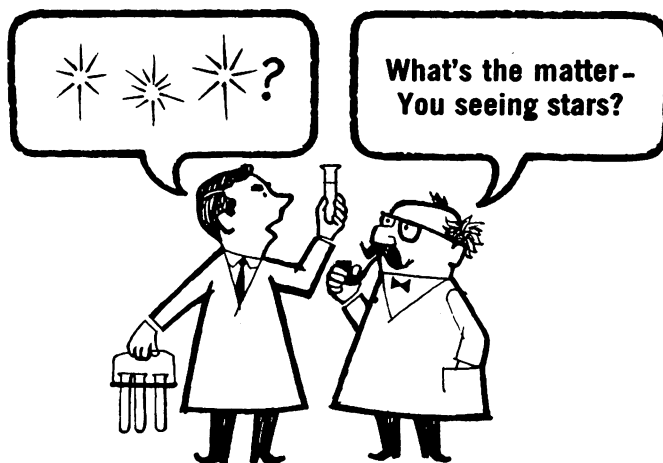


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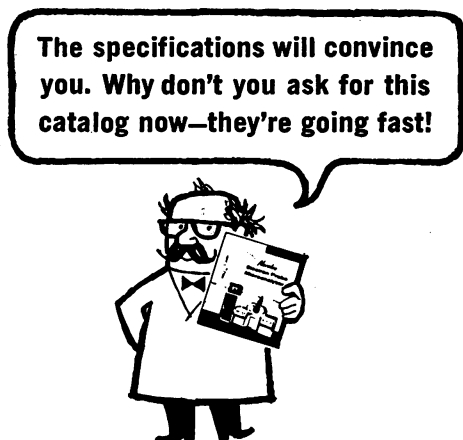
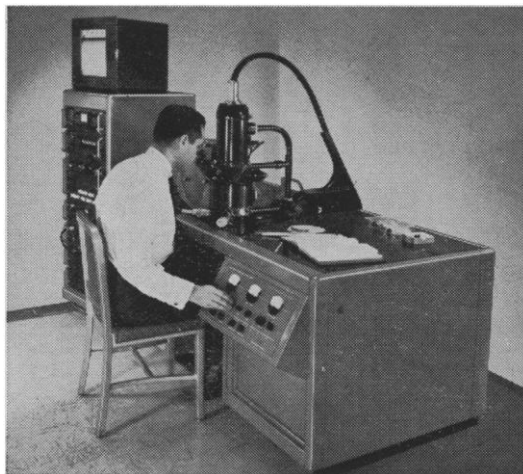
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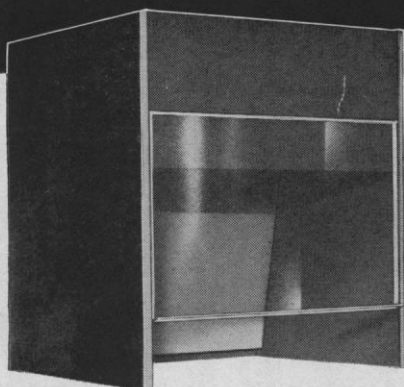
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Prepaid dues and subscriptions for which members and other subscribers had not received <i>Science</i> or other services	\$ 539,224
Unexpended balance of grants from National Science Foundation, Alfred P. Sloan Foundation, and others	444,703
Academy grants, allocated but not as yet disbursed	9,599
Accounts payable to others	167,730
Remainder of mortgage on building payable in 3 1/2 years	68,165
Held for Gordon Research Conferences, Inc.	54,574
Total	\$1,283,995

The difference between the assets and the liabilities represents the Association's net worth, which at the end of 1962 was distributed as follows:

Endowment funds with income earmarked for:	
Research	\$ 251,886
General purposes (to pay subscription costs for life and emeritus members)	274,455
Newcomb Cleveland Prize	38,833
Socio-Psychological Prize	33,944
Creating emeritus life memberships	6,974
Retirement	5,011
Association funds invested in land, building, equipment	886,432
Unallocated reserve	800,015
Unrealized appreciation in value of securities	9,781
Total	\$2,307,331

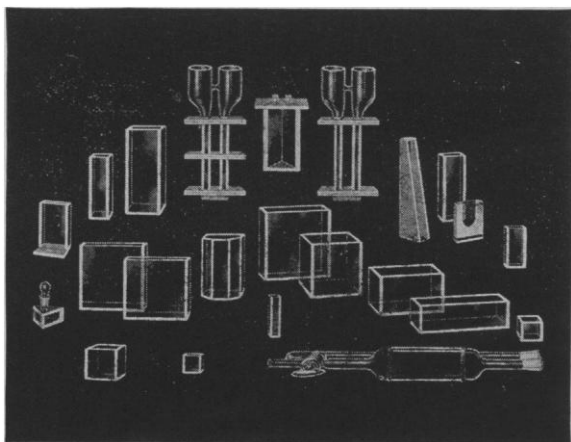
Net worth increased during 1962 by \$156,423. This gain resulted from an excess of receipts over expenditures and an increase of \$69,525 in the appraised value of the land on which the Association's headquarters building stands. A partially offsetting factor was a decrease in market value of a number of the securities held in the Association's portfolio.

The 1962 accounts have not yet been reviewed by G. P. Graham and Company, certified public accountants, who annually audit the Association's records. Experience indicates that the auditor's review will result in a few changes, attributable chiefly to the fact that there will be several additional items of income or expense that were applicable to 1962 but that were not available when this report was prepared. Experience also indicates that changes resulting from the audit are unlikely to be large enough to alter any of the figures to a material degree. If this should not be the case, corrections will be included in the annual financial report for 1963.

DAEL WOLFLE

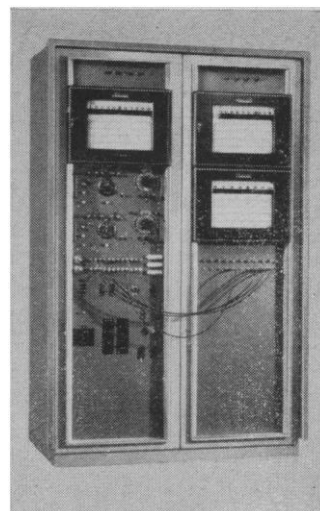
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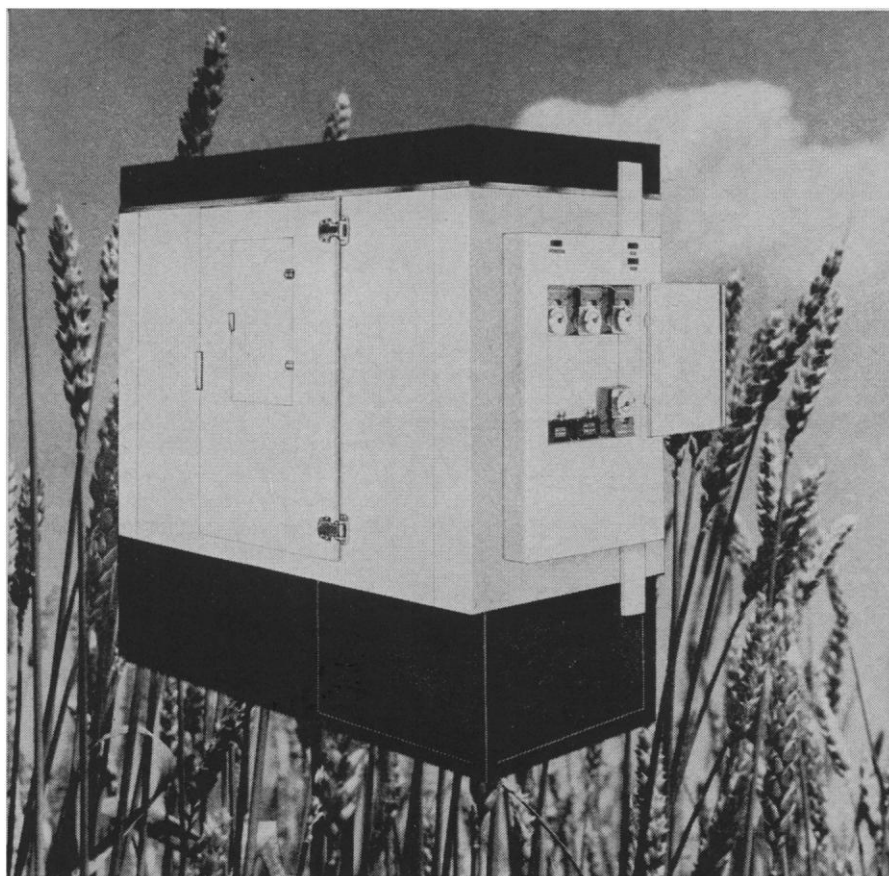
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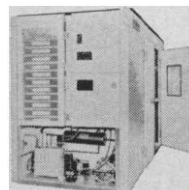
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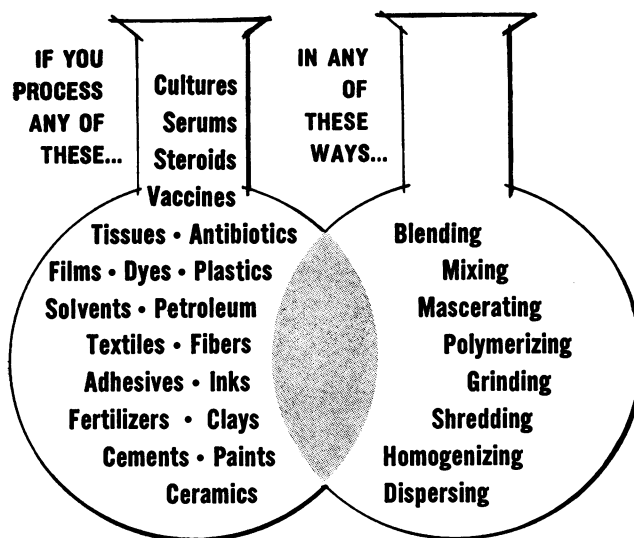
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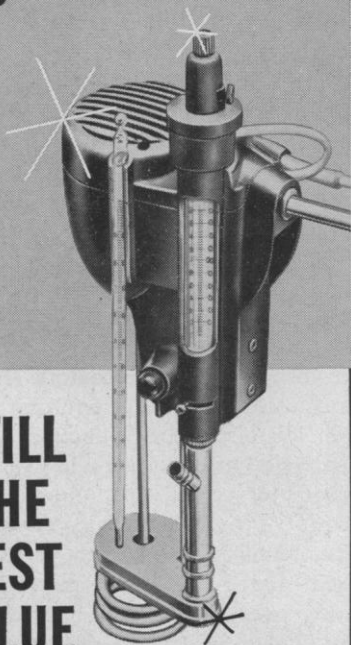
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ity of Munich). The new society has just held its first congress (Vienna, Austria, 18–20 April 1963) a 2½-day meeting in the course of which more than 40 technical papers were delivered. About half the papers were immediately concerned with anatomy and histology, and the bulk of the remainder dealt with either metallurgical or mathematical topics. Abstracts and preliminary manuscripts received in time were published in a proceedings volume distributed to members at the meeting; simultaneous translation in English and German was available throughout the technical sessions; and despite dreadful overcrowding of the program no parallel sessions were held. The subject matter ranged from geometrical probability to the interpretation of electron microphotographs of brain and nerve tissue.

Both the society and its congress seem of particular interest as experiments in communication. At the moment the society has 128 members, of whom 55 were registered at the congress. Throughout most of the technical session the audience included more than 40 of these. These figures reflect a very high level of membership participation, but of course it remains to be seen whether this level can be maintained as the society grows. The usual escape from the intellectually deadening atmosphere of the large society convention is the small “by-invitation-only” symposium, dedicated to intensive discussion of a single subject. There are advantages in this scheme, but there are also advantages in the normal society organization which we are perhaps sacrificing unnecessarily. Small scientific “craftunions” purposely cutting across the “industrial-union” rationale of the major professional societies might provide communication channels combining the advantages of continuing organization with those of the small ad hoc symposium.

The range of subject matter was so great and the opportunity for informal discussion so limited by language difficulty and excessive crowding of the program that specific interdisciplinary collaboration was hardly to be expected. Probably the principal effect on most of us was a rather general intellectual stimulation. It is exciting, for instance, to speculate about the possibility that the descriptive techniques and vocabulary of structural petrology might find application in the study of the orientation of cells and fibers in nerve tissues, and that, similarly, the behavior of

geological materials in the plastic flow leading to isoclinal folding might find parallels in the development of convolutions in brain tissues. Interactions of this sort—and most participants experienced one or more of them—are immensely satisfying. They probably would have been more numerous had there been more opportunity for informal, off-the-floor discussion.

At the close of the technical session the organizing committee was relieved of its functions and the first business meeting of the new society elected a full set of officers, with H. Elias as its first president. The second meeting, scheduled for spring of 1966, will be held on the campus of the University of Florida, at Gainesville. F. Rhines, (University of Florida Metallurgical Research Laboratory) is in charge of program and meeting arrangements.

FELIX CHAYES

*Carnegie Institution of Washington,
Washington, D.C.*

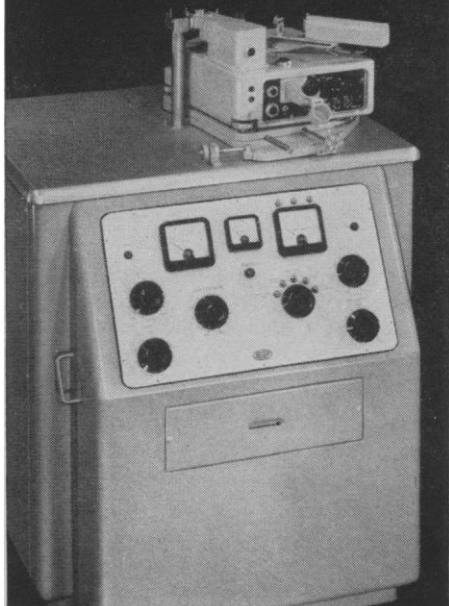
Genetics: Molecular Structure and Function

A symposium on molecular studies on the structure and function of genes was a highlight of the 8th annual meeting of the Genetics Society of Canada, held at Ottawa 18 to 20 March. Topics as diverse as cereal-crop breeding and cytogenetics, genetics of vegetable crops, mutation, radiation genetics, medical genetics, genetics of swine, poultry genetics, *Drosophila* genetics, and the genetics of microorganisms were discussed.

The annual invitational lecture, delivered by Bruce Wallace (Cornell University), dealt with the genetic structure of *Drosophila* populations. He discussed the bearing of his studies upon evolutionary theory. His data indicate that mutation may not be as harmful as is often thought, for heterozygotes are, on the whole, adaptively superior to both kinds of homozygotes.

I. Takahashi (Central Experimental Farm, Ottawa) discussed his work on the DNA of bacteriophages ϕBS1 and ϕBS2 . Although this DNA appears to have a typical double-helix structure, the bases include uracil rather than thymine, a characteristic usually associated with RNA. Also, glucose is attached to the cytosines and guanines. M. Ycas (State University of New York) spoke on “Reading the gene” and em-

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phasized data and viewpoints that do not fit well with current theories. Data on adaptive enzymes suggest that the genes which determine them are not, as commonly thought, blocked by suppressors. Rather, these genes (and others?) are normally inactive until activity is induced by the appropriate substrate. The complexity of most enzymes and hence the probability that they must be determined in several steps is a theoretical stumbling block for the one gene-one enzyme theory. However, it may be illusory if the several determining units comprise one operand, which function (or fail) together. Finally, he expressed grave doubts that chromosomal proteins are as inert as commonly supposed. Specifically, he suggested that they might form complexes to bind materials upon which the genetic DNA acts. G. H. Dixon (University of Toronto) discussed studies by himself and G. E. Connell on human haptoglobins, studies carried out by starch-gel electrophoresis. These experiments suggest the possibility that unequal crossing over, eliminating small segments of DNA, and duplicating others, might result in losses of specific amino acids from the haptoglobin molecule while other parts of the molecule are duplicated.

EDWARD O. DODSON
*Department of Biology,
University of Ottawa, Ottawa, Canada*

Forthcoming Events

July

5-9. **Pure and Applied Chemistry**, 22nd conf., London, England. (Div. of Chemistry and Chemical Technology, Natl. Research Council, 2101 Constitution Ave., Washington 25)

7-17. **Aerospace Education**, 7th natl. conf., Miami Beach, Fla. (Natl. Aerospace Education Council, 1025 Connecticut Ave., NW, Washington 6)

8-13. **Ionization Phenomena in Gases**, 6th intern. conf., Orsay, France. [P. Hubert, CENFAR, P.O. Box 6, Fontenay-aux-Roses (Seine), France]

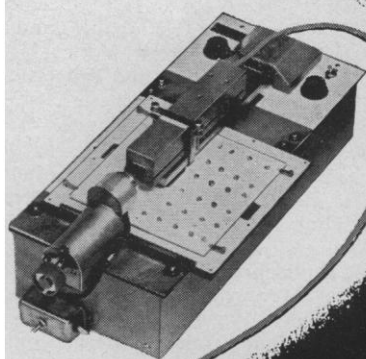
9-11. **Space Telecommunications**, intern. symp., Boulder, Colo. (Boulder Laboratory, Natl. Bureau of Standards, Boulder)

10-12. **Meteorological Support for Aerospace Testing and Operation**, Fort Collins, Colo. (Inst. of Aerospace Sciences, 2 E. 64 St., New York 21)

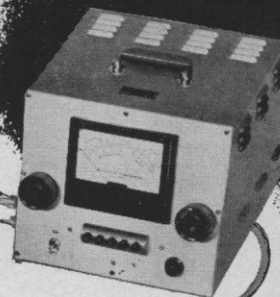
10-12. **High Magnetic Fields**, production and applications, conf., Oxford, England. (N. Kurti, Clarendon Laboratory, Parks Rd., Oxford)

10-17. **Pure and Applied Chemistry**, 19th intern. congr., London, England. (Div. of Chemistry and Chemical Technology, Natl. Research Council, 2101 Constitution Ave., Washington 25)

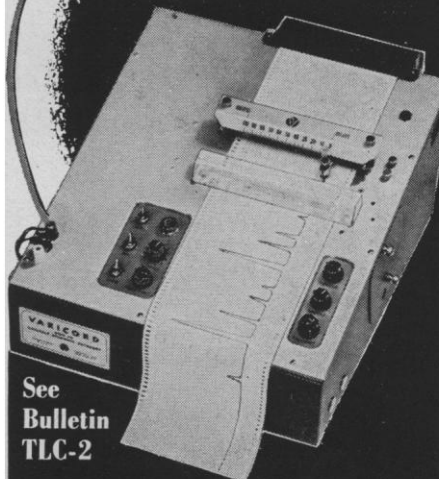
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