# SCIENCE

9 February 1968

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# SCIENCE





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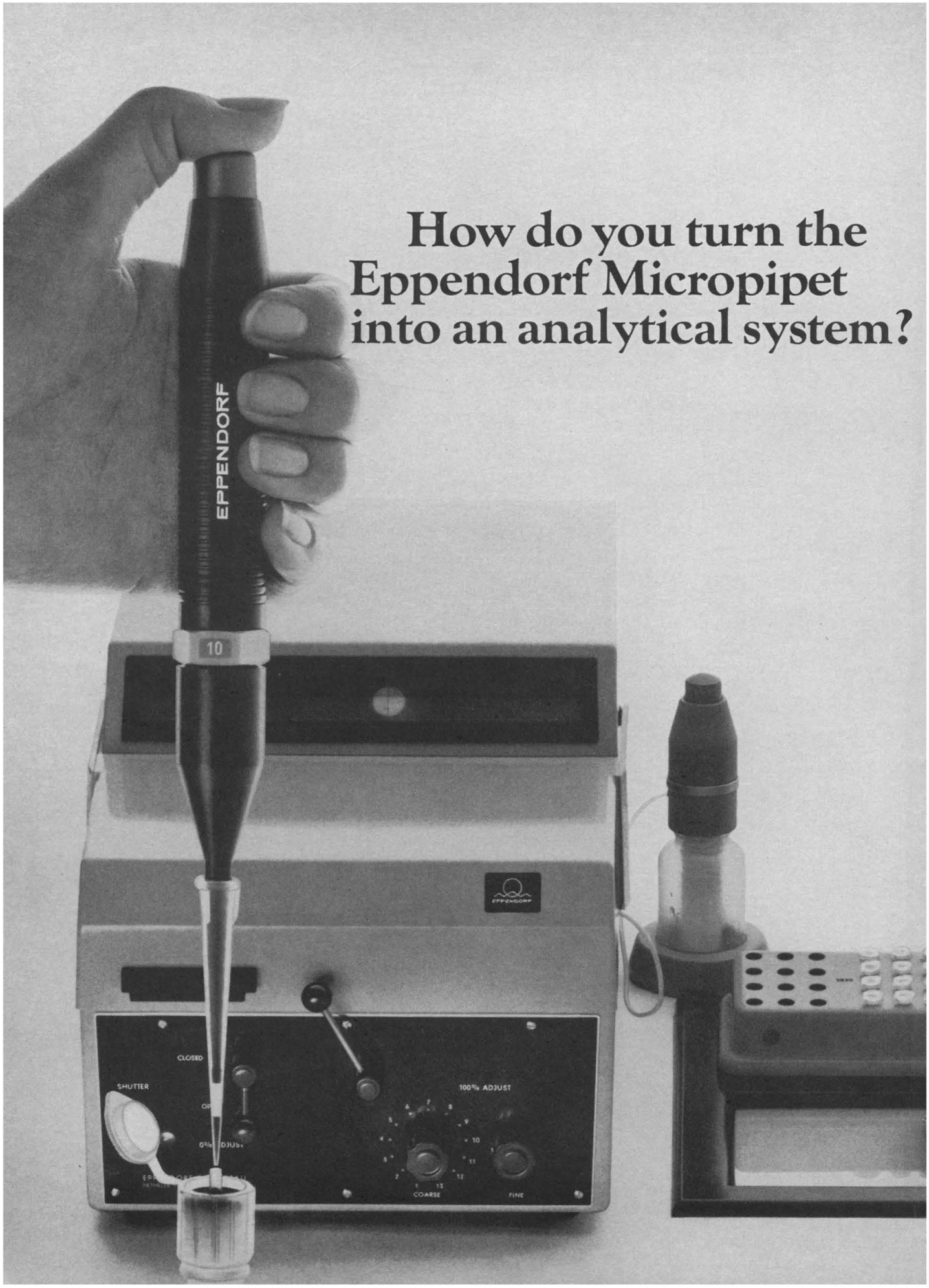
**COVER**

Military machine designed by Renaissance engineer, Roberto Valturio (1413–1484). Valturio's treatise on military techniques, *De re militari*, was printed in 1472 and went through four editions before 1500. The increasingly important role of engineers in the life of this period led to the publication of such works. See review of *Engineers of the Renaissance*, page 618. [M.I.T. Press, Cambridge, Massachusetts]

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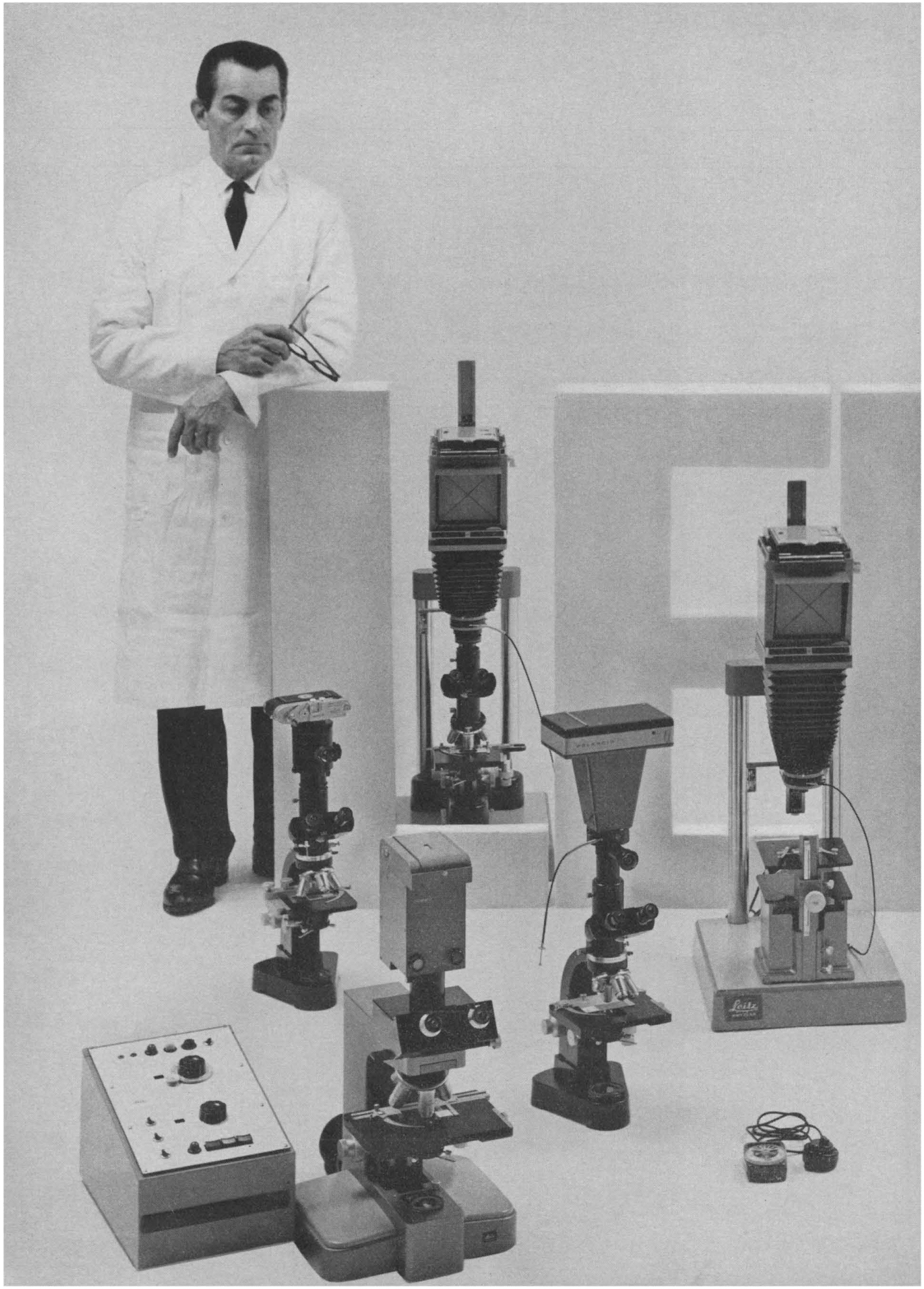
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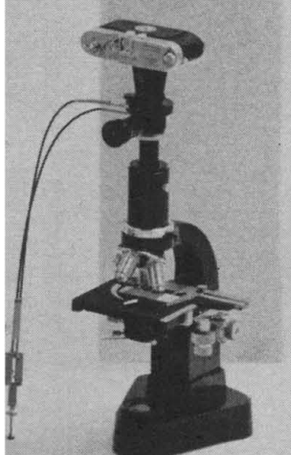

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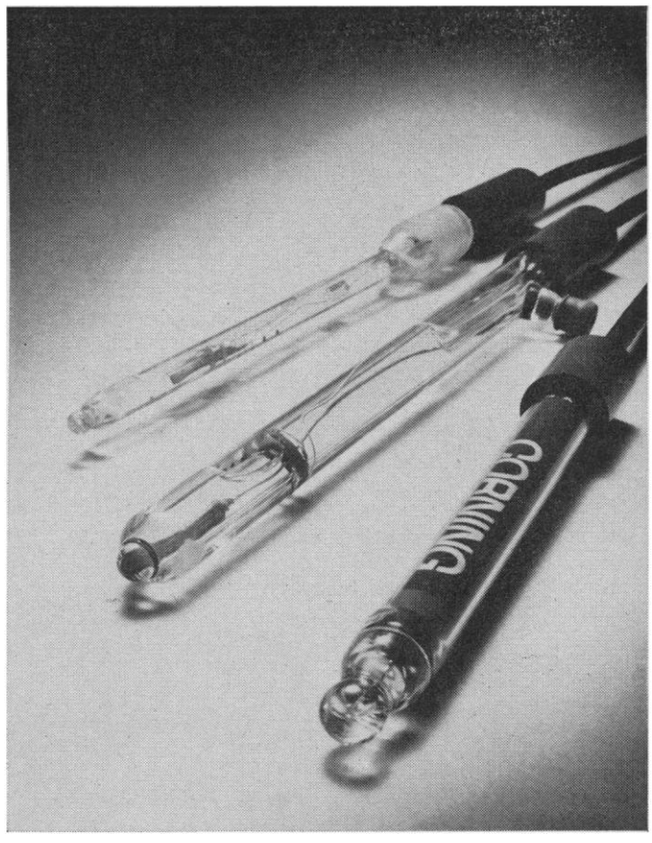


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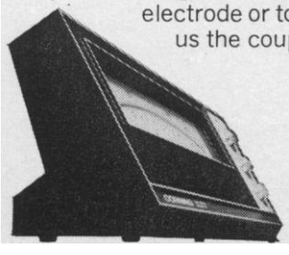

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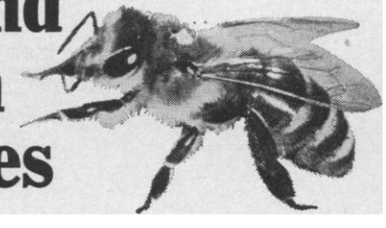

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## To grasp a nickel

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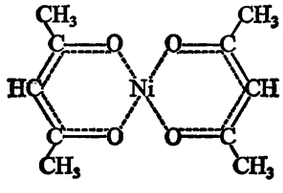


Now we read in *Chem. Commun.* 17:856 (1967) that in the solid state this compound really trimerizes into a cluster of three nickel ions in a straight line, surrounded by a dozen oxygen atoms, half of them serving as bridges between the nickels. This couples the spins of the nickels in a way to make a ferromagnetic ground state possible.

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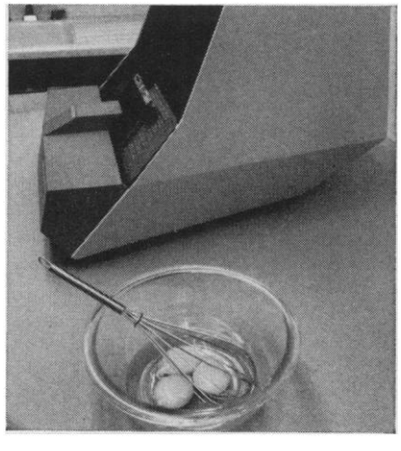

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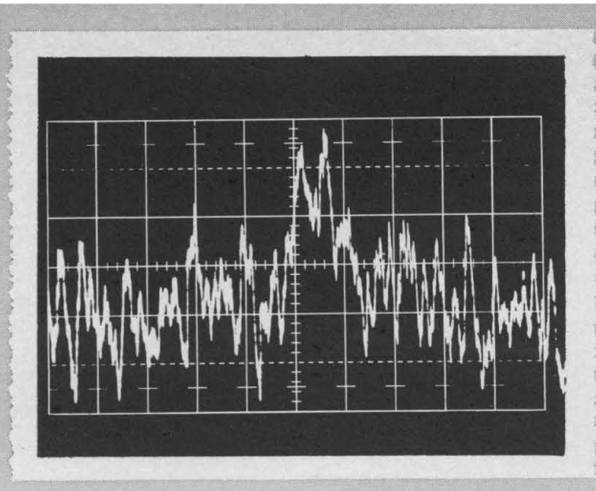

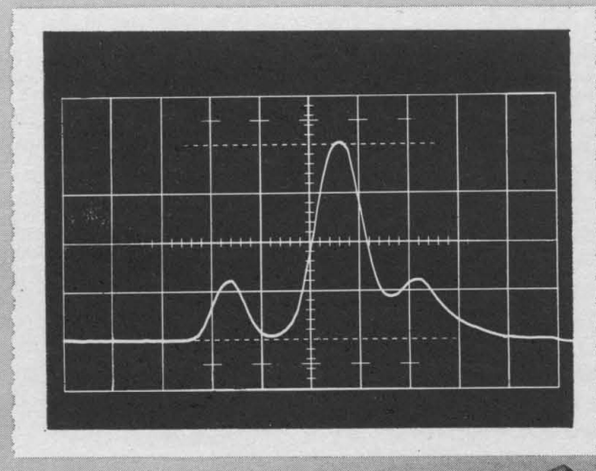

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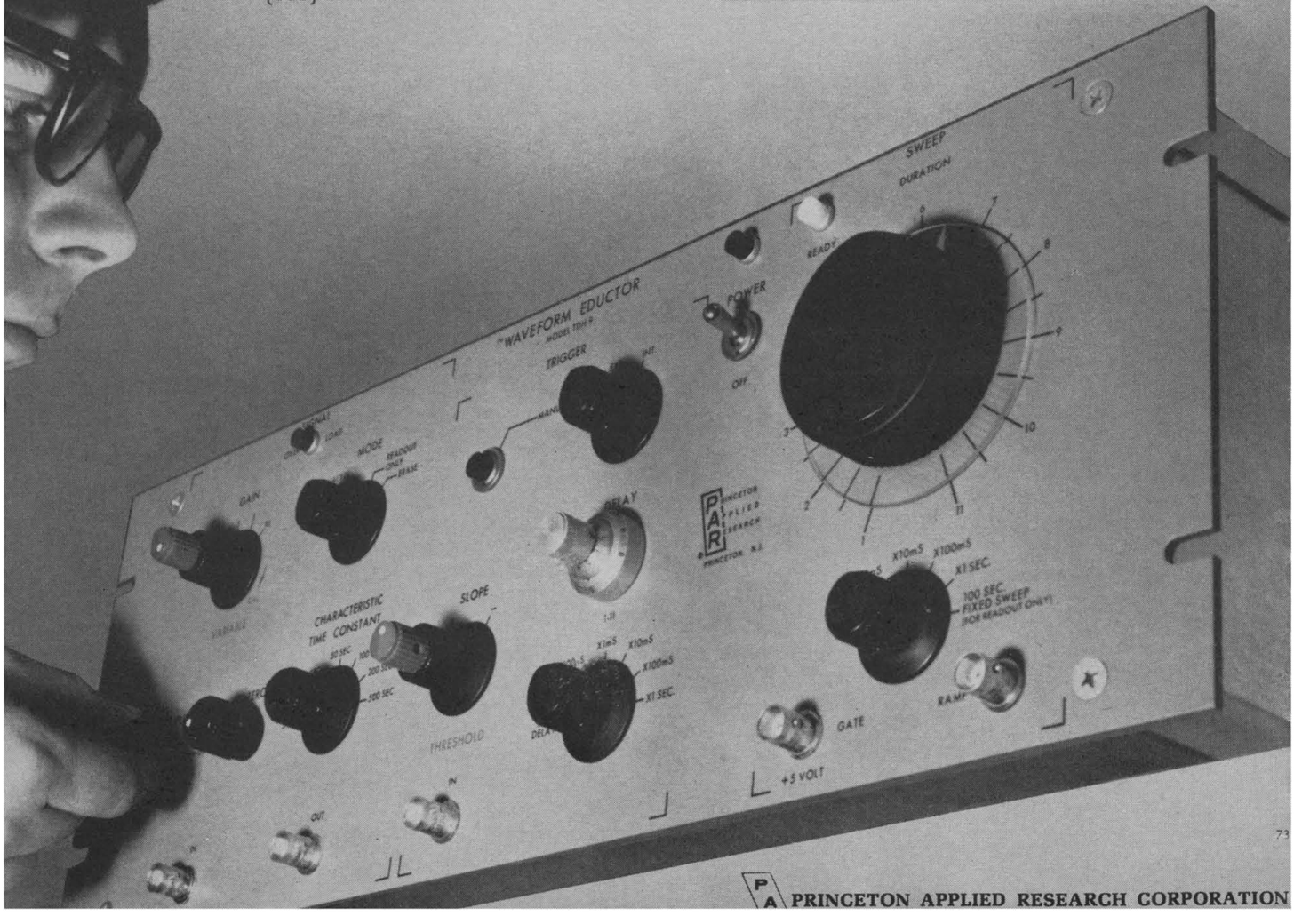


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In their article, "The future of scientific journals" (1 Dec., p. 1153), Brown, Pierce, and Traub describe the journal of the future for which their Mercury service is the model. Their suggestions are timely and their experience with the Mercury system is invaluable. A parallel effort formed the basis for the publication of *Communications in Behavioral Biology*, an information system and primary publisher of scientific reports (8 Sept., p. 1149). *CBB* is a computerized journal and consists of two primary sections: (i) the abstracts and indices and (ii) the original articles. All articles are published as singles, prepunched for insertion in binders provided with the subscription. Articles are preindexed by the Brain Information Service (UCLA), utilizing a hierarchical index having many of the characteristics described by Brown. These are processed and printed at the Johns Hopkins Medical Computing Center and are immediately available (as preprints from xerographic copies). The abstract section of *CBB*, in conjunction with the indices, allows readers to select articles of interest, or they may request that all articles in selected index categories or by selected authors be sent to them, either as preprints or, a month later, in their final form. Articles are obtained with prepaid article-request cards supplied with subscriptions to the index and abstract section or purchased directly from the editorial offices. Libraries will also carry article request cards permitting users to order the article at a cost less than that of reproduction by xerography.

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STEPHEN A. WEINSTEIN
*Laboratory of Behavioral Physiology, Johns Hopkins University, Baltimore, Maryland 21205*


## Televised AAAS Symposia

Although my mobility has recently been limited by the arrival of a new baby, my interests have not, and I would like to thank the AAAS, its members, and the participants in its annual meeting for having made so widely available the opportunity to witness some of the proceedings through educational TV. The choice of televised sessions was exceptionally good. The topics were of the broadest general interest; the speakers neither engaged in superficialities—talking down to the television audience—nor resorted to esoteric vocabulary and the discussion of fine points.

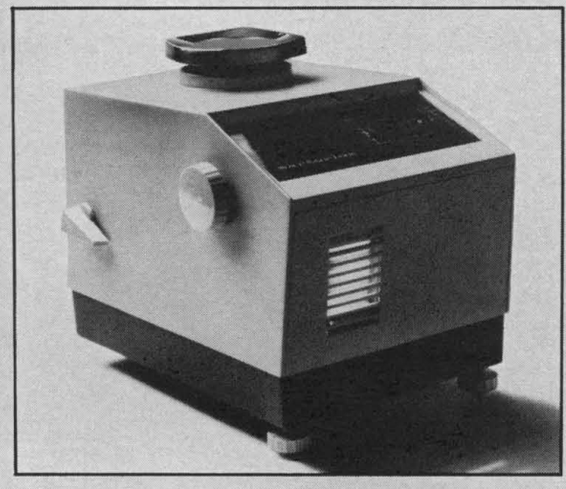
One of the most significant achievements was to help refute the notion (still prevalent despite Hiroshima) that scientific progress is a neutral entity, neither good nor evil in itself and laying no ethical burden on the scientist. Frank discussions of the impact of systems analysis and birth control on social and individual well-being, of ethical limits on secret and subsidized research, of privacy invasion by modern technology, and of the conflicting effects of modern agriculture on the life of underdeveloped countries, all showed scientists accepting the responsibility of their discoveries.

The medium is the message: television is a prime example of technological progress as a mixed blessing, and the excellent use the AAAS made of it is a hopeful sign for the future. I hope this fine contribution to public education will be repeated at future meetings.


MARGARET DICKEY WILDE
*1707 Columbia Road, NW, Washington, D.C. 20009*

# Wouldn't it be great if someone designed a 160 g top-loader with 1 mg accuracy and all-digital readout?

## Someone has. Sartorius.



There are other top-loading balances with 160g capacity, but none is as accurate and easy to read as the new Sartorius 2255... and none is as stable.

To eliminate interpolation error with 'between the line' results, the Model 2255 provides all-digital readout to 1 mg. To further insure accuracy, there is absolutely no discernible swing—this balance stays at the indicated weight. There's no need to squint, either. Its huge new optical scale is a pleasure to read, even under the most adverse lighting conditions.

At only $725, the above features alone would make the 2255 a great buy, but there are more. The Taramatic® single knob taring system and below-balance weighing accessories are included at no extra cost.

For research, quality control, student use, or any other application requiring 1 mg weighing accuracy at loads up to 160g, this is the simplest, yet most advanced top-loading balance available.

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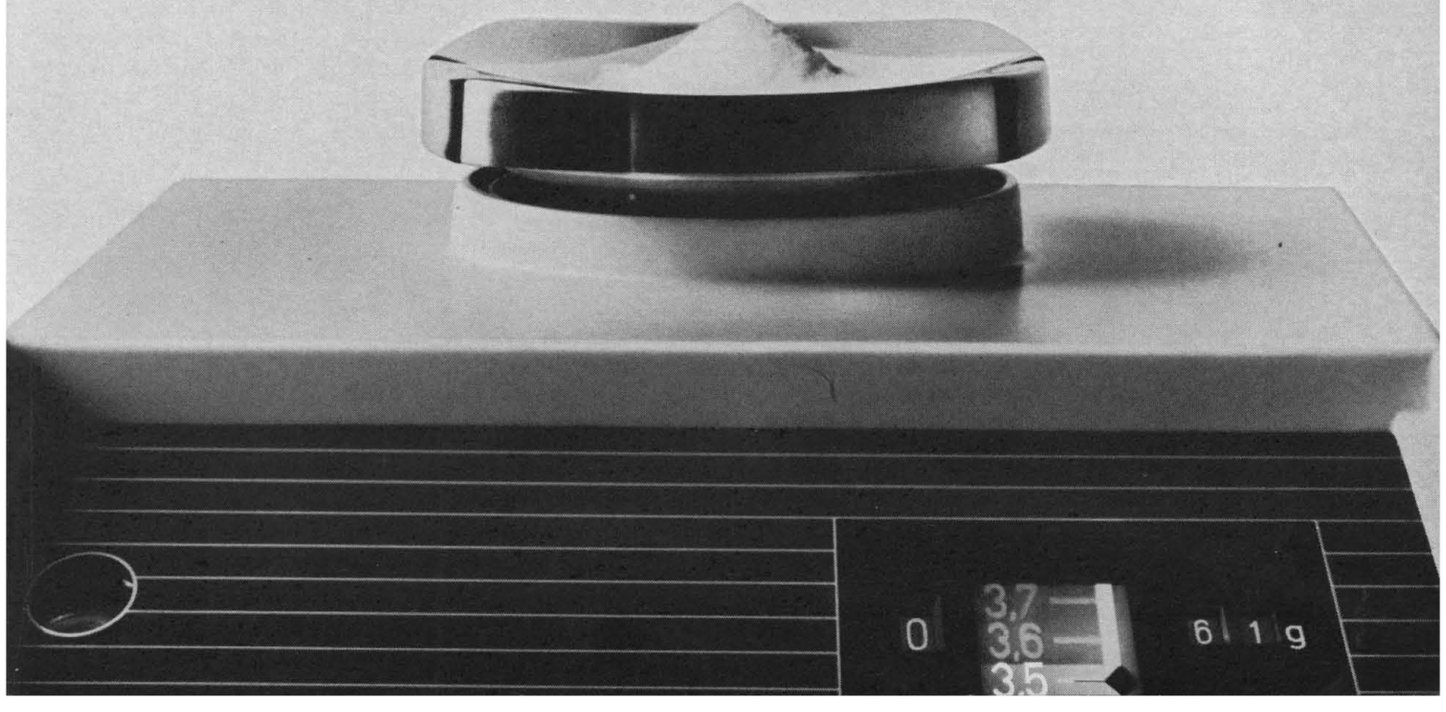
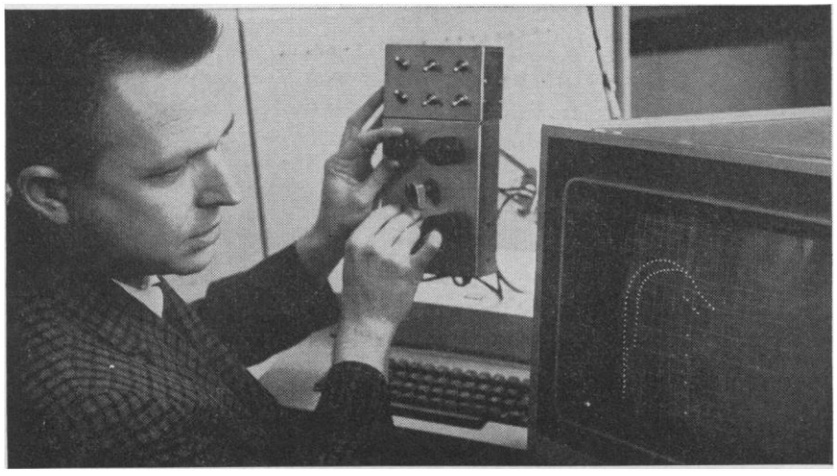


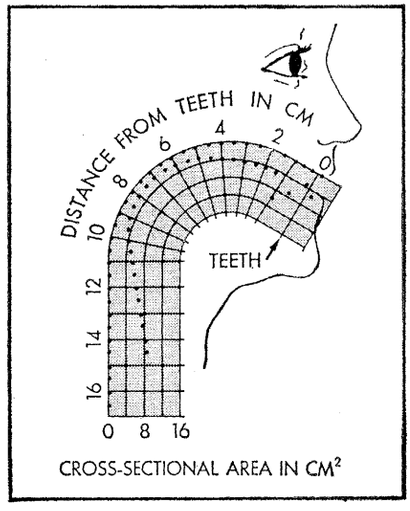
Report from

**BELL LABORATORIES**

# See a computer talk

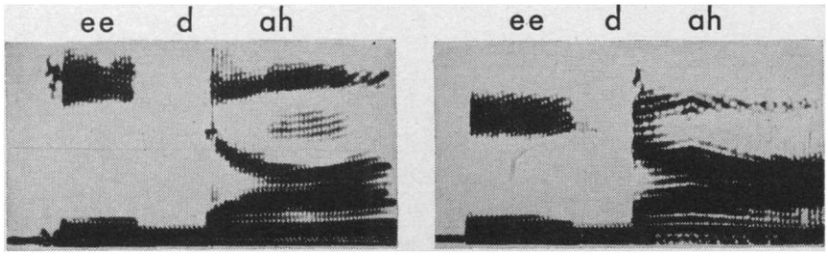


**C. H. Coker adjusts controls which change the outline of the "vocal tract" simulated on the oscilloscope. At the same time, he hears the sound corresponding to the displayed shape. Desired vocal-tract shapes (representing sounds) can be stored in the computer memory.**




**Bell Laboratories' computerized vocal-tract model. (Head outline added.) The various parts can be positioned to imitate any speech sound. The model displays tract length versus cross-sectional area. It is based on anatomical measurements of the vocal tract made by a number of acousticians.**

**A feature of the model is that it reproduces the transition sounds between word fragments. The nonsense word eedah, for example, consists of ee plus d plus ah. But the d is not the same as in, say, eedee. That is, the d is noticeably affected by context. Coker handles this by storing dynamic properties of the vocal articulators (the tongue, lips and jaw). The program automatically incorporates these properties in assembling word fragments.**




**Comparison of nonsense word "eedah," pronounced by a human (left) and by Coker's program. These speech spectrographic patterns represent time (horizontal scale), frequency (vertical), and intensity (line density). The dark bars are called "formants" and are characteristic of speech sounds. The technique for making these diagrams was conceived and developed in the early 40's at Bell Telephone Laboratories.**

Speech, one of the most complex of human activities, is studied as part of the continuing communications research at Bell Telephone Laboratories. But the speech mechanism has always been difficult to analyze: vocal-tract movements—crucial to the formation of meaningful acoustic signals—are mostly obscured from sight and are not easily measured. Now our understanding of speech is being advanced through a computerized simulation of the vocal tract devised by Cecil H. Coker of Bell Laboratories and Osamu Fujimura of the University of Tokyo, who worked at Bell Labs as a consultant.

The model (displayed on an oscilloscope, left) resembles the actual vocal tract and shows its principal parts. The parts can be moved either automatically by the computer program or by manual controls on the computer panel. The program calculates speech data corresponding to the displayed vocal-tract shape and delivers these data to an electronic speech synthesizer, designed by Coker. The synthesizer then generates a sound corresponding to the tract shape. Hence the researcher can hear the synthetic output at the same time he sees the tract motion.

The model accurately reproduces not only individual speech sounds but, for the first time, the subtle transitions that connect these sounds. It also demonstrates that these transitions are vital to clarity and realism.

The system produces patterns of frequency and energy (spectrograms) very like a human's (left). And it passes a more difficult test: pronouncing speech sounds which are understandable even when taken out of context.

**Bell Telephone Laboratories**
Research and Development Unit of the Bell System

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SCIENCE



## Custodians of Knowledge

This generation's major contribution to the human heritage is a great fund of new knowledge and the means of using scientific principles effectively. This knowledge was accumulated at a cost to society of billions of dollars, and scientists should consider how the facts that have been discovered can continue to be made available. So long as books and archives are preserved, information can be retrieved, if scholars are willing to spend enough time working at it. However, to many scientists the continuing increase in information is a source of worry. They wonder how anyone can keep up with the flood of publications. The answer, of course, is that no one, unaided, can. The situation is difficult enough in one's own field. The difficulty is compounded when one wants to become aware of, and locate, facts in adjacent or distant disciplines. Some scientists look hopefully to electronic data processing as a means of meeting the problem. Others manage to cope with the information explosion. They keep current in their own fields through participation in "invisible colleges." Outside their own specialties they rely on colleagues they can trust to lead them to experts who can be trusted, who in turn either directly provide the needed information or guide them to the most reliable relevant literature. In a short time and after a few telephone calls, the skilled scholar is in a position to tap much of the world's store of knowledge. Reliance on this human network provides more than raw information. It provides judgment, and suggestions of more feasible approaches to the problem being considered. In view of the many strengths of this information network, computer technology has far to go to match it in effectiveness and especially in cost.

Maintenance of a comprehensive network of this kind is not automatic. If the system is to be effective and if knowledge is to be easily accessible, there must exist living, communicative custodians of that knowledge. This is the case when the subject area is widely taught, or when at least a few scientists are actively pursuing research in the field in question. However, the social instincts of men repeatedly lead to fads and fashions in research. At one time, most areas of physics were depopulated as the majority of physicists turned to nuclear research. Today the center of attention is solid-state physics.

Almost everywhere in science one can note examples of virtual abandonment of once-flourishing fields. To a degree this is desirable, but it can be overdone. If information developed by research in an area is truly fundamental, there will be continuing demands for it, and indeed that information will often be of importance to new research. For example, Gerhard H. Dieke of Johns Hopkins was a spectroscopist who did not join the rush to nuclear physics. He continued his work on energy levels in molecules. When physicists turned to work on masers and lasers, Dieke and his publications were an invaluable source of information.

Today the latest fads in research enjoy support and attention. In considering priorities for support of research, we should recognize and weigh the desirability of maintaining at least minimal activity in all fundamental fields of science. We should also consider how the present human information network can be made even more effective.—PHILIP H. ABELSON

crete antigens in a random population, the concept was derived that these factors were components of a single complex system. Similar conclusions were drawn from linkage studies. In certain families, including those recently studied at the Torino workshop (Torino, Italy, June 1967), the patterns of the isoantigens in the children's leukocytes can be explained on the basis of the inheritance of an "allelic" unit of inheritance from each parent. Further confirmation has come from a comparison of serologic findings with survival of experimental skin grafts exchanged between siblings and from culture reactions. Other isoantigenic systems independent of the main locus have been described. In some of these, the antigens are widely distributed on the tissues; in others, the antigens appear to be restricted to a single cell lineage.

Several names have been proposed for the major locus: Group IV, after the first leukocyte "group" to be detected; Hu-1, for the association shown among ten antigens; Du-1, from the relationship of three complex subgroups; LA, because of the intricate relationship among the four antigens of the LA system; TO, for the antigens detected in Torino; and LC, emphasizing the expression of these antigens on the lymphocyte. Some investigators have used simple numbers. Yet another nomenclature was devised in which each antigen was identified by its cellular or tissue distribution, for example, on platelets or granulocytes, and so forth.

A World Health Organization (WHO) committee is being formed to discuss and formulate terminology. As an interim measure, the investigators listed below, who agreed as a result of discussions held at a meeting at Williamsburg, Virginia, in November 1967, suggest that the major locus be designated HL-A. We hope that this designation will be generally accepted.

Investigators accepting the proposed terminology HL-A for the major locus were: F. H. Allen, D. B. Amos, H. Balner, J. R. Batchelor, W. Bodmer, R. Ceppellini, J. Dausset, V. Eijsvoogel, C. P. Engelfriet, P. Ivanyi, F. Kissmeyer-Neilson, P. Lalazari, S. Lawler, J. J. van Loghem, R. S. Metzgar, V. Miggiano, R. D. Owen, R. Payne, N. Rogentine, J. J. van Rood, P. Terasaki, R. Walford, Ch. M. van der Weerdt, and C. M. Zmijewski.


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