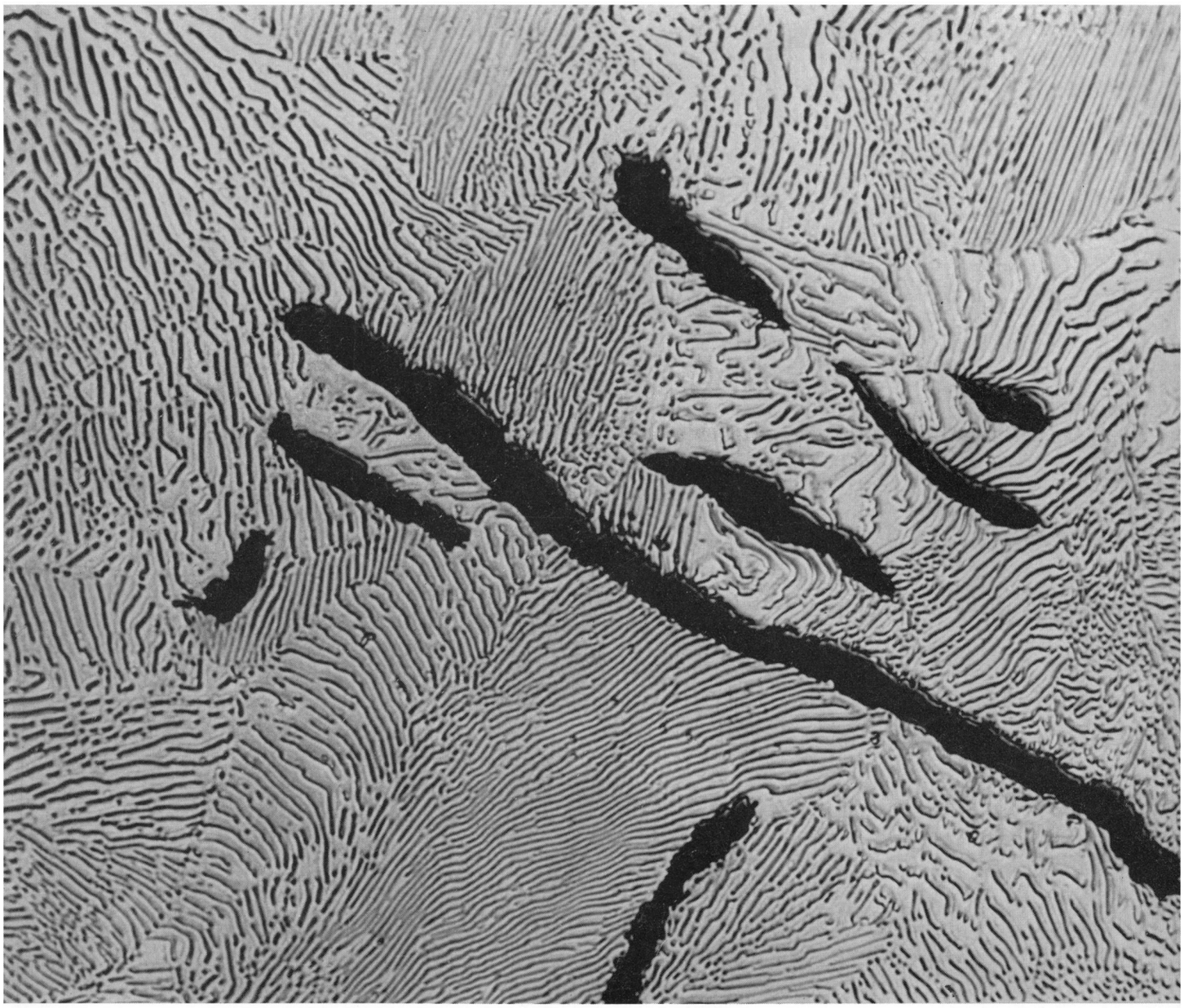
SCIENCE

19 February 1960

Vol. 131, No. 3399

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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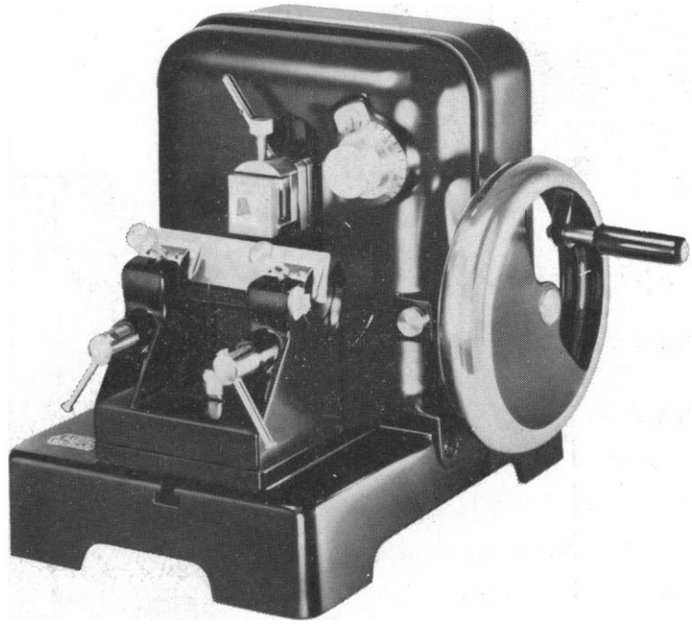

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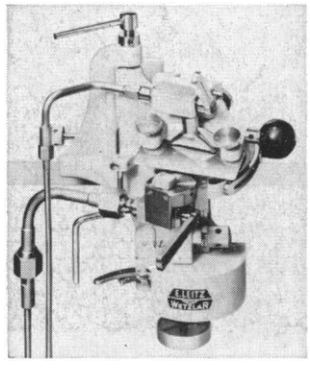

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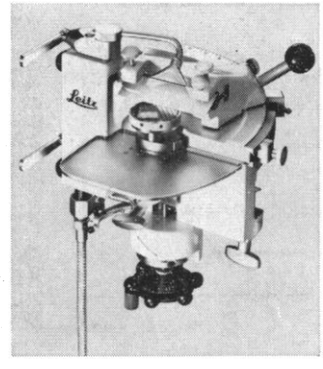

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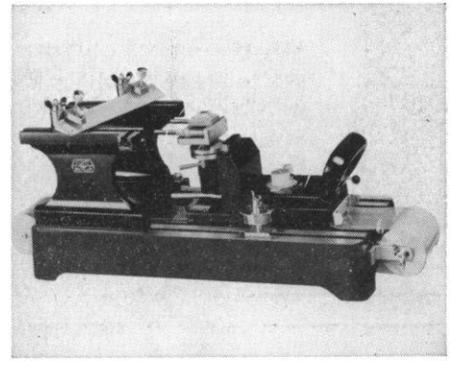

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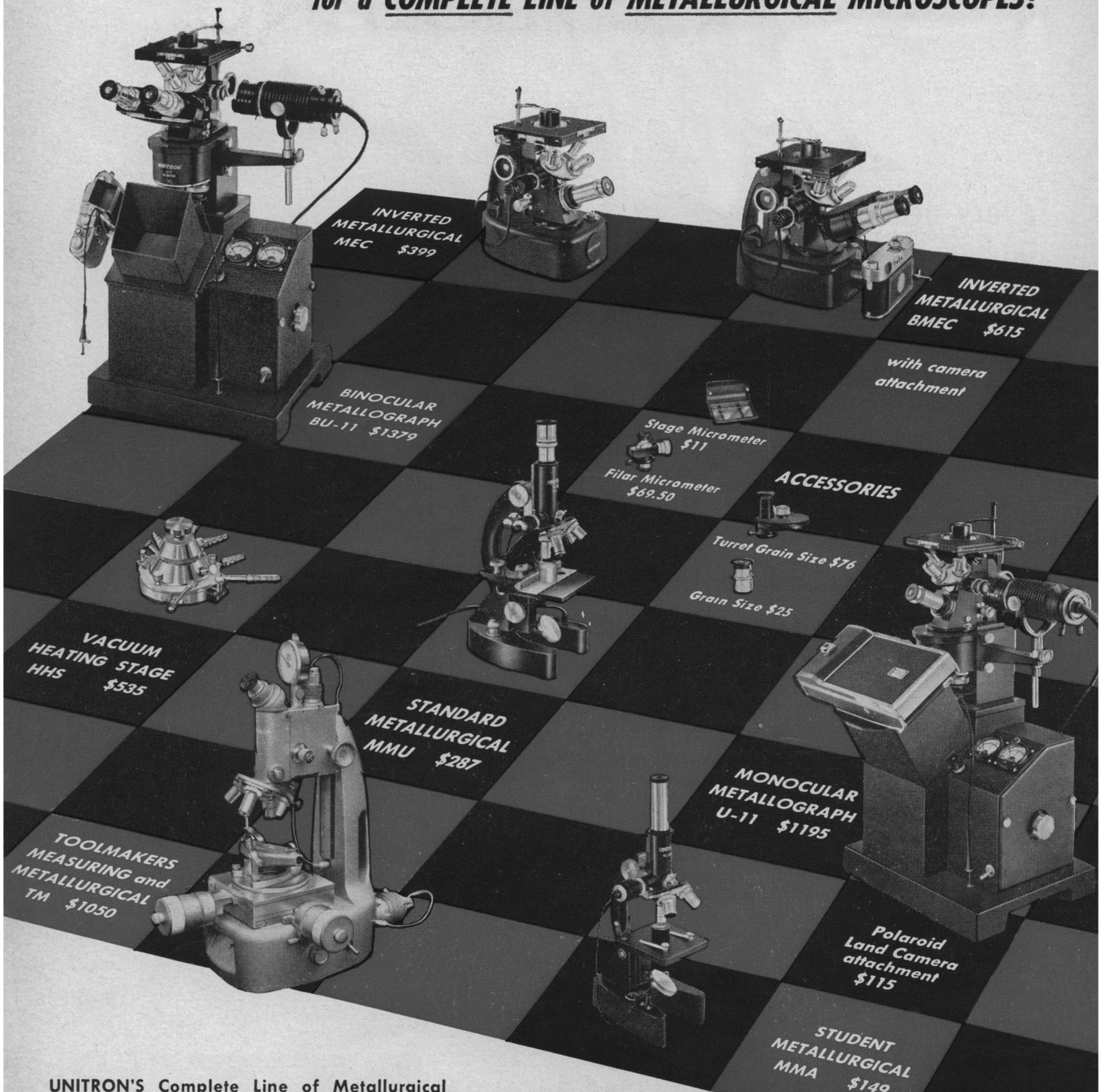

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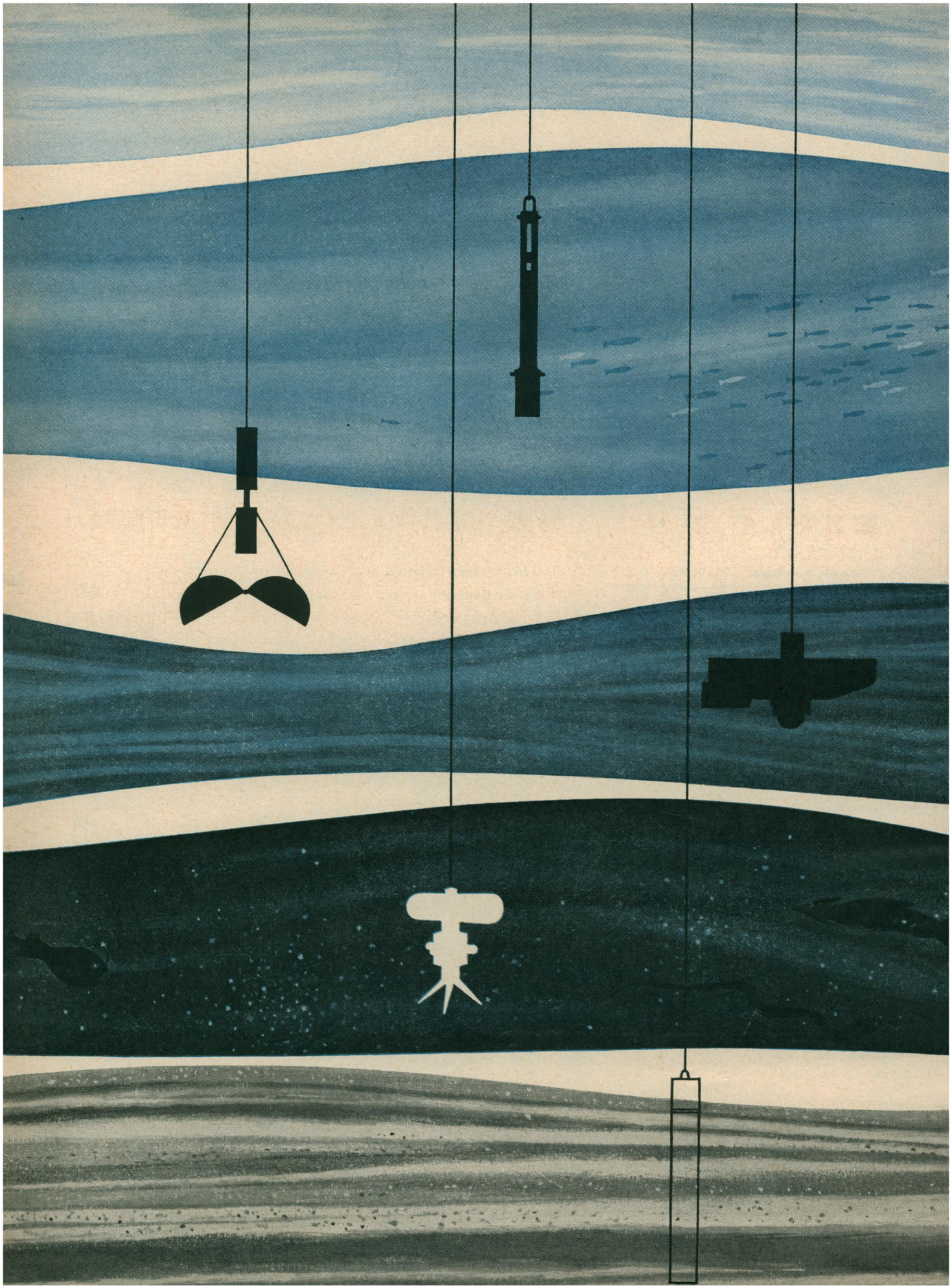
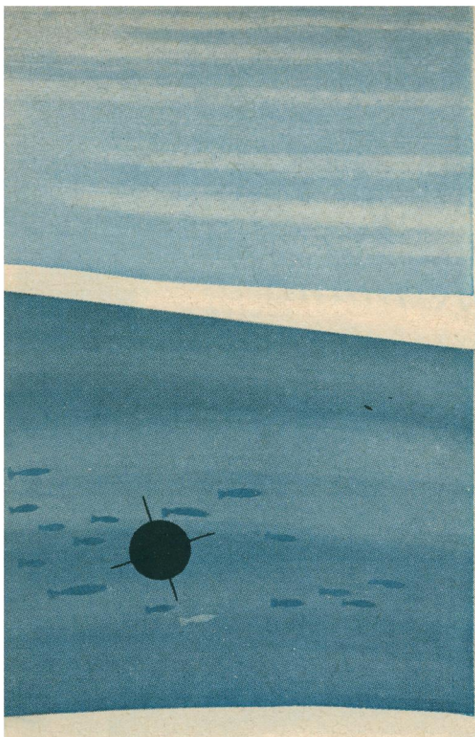
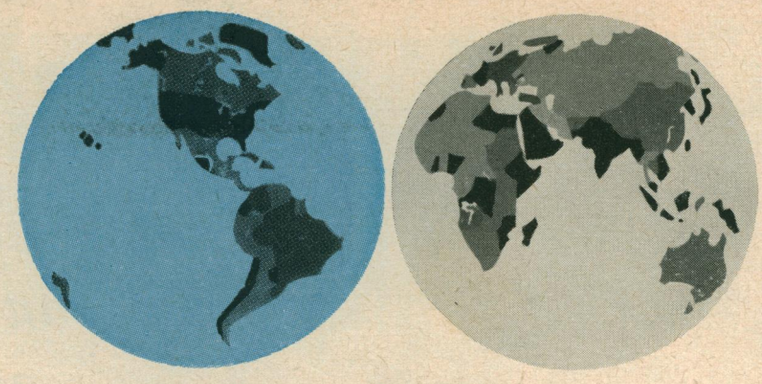
Cover

Pearlitic structure of cast iron. The basic mass is coarse pearlite; the black stripes are graphite. Chemical analysis (in percent): carbon, 3.20; silicon, 1.20; manganese, 0.78; phosphorus, 0.28; sulfur, 0.04. [By courtesy of E. Leitz, Inc.]







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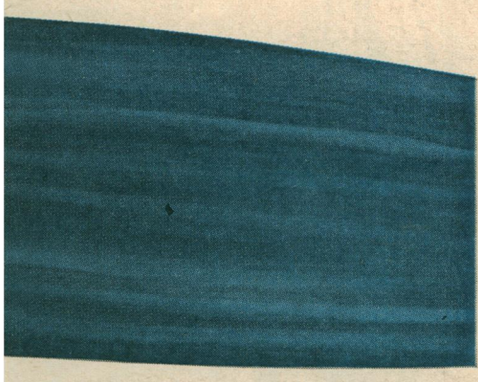

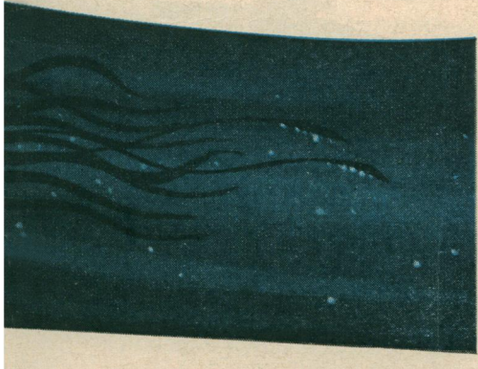

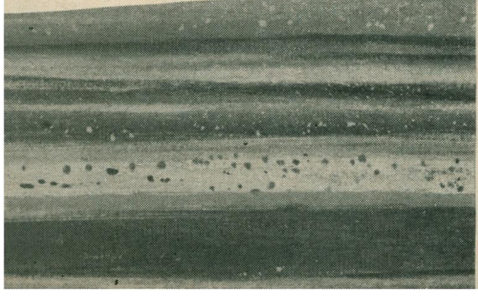

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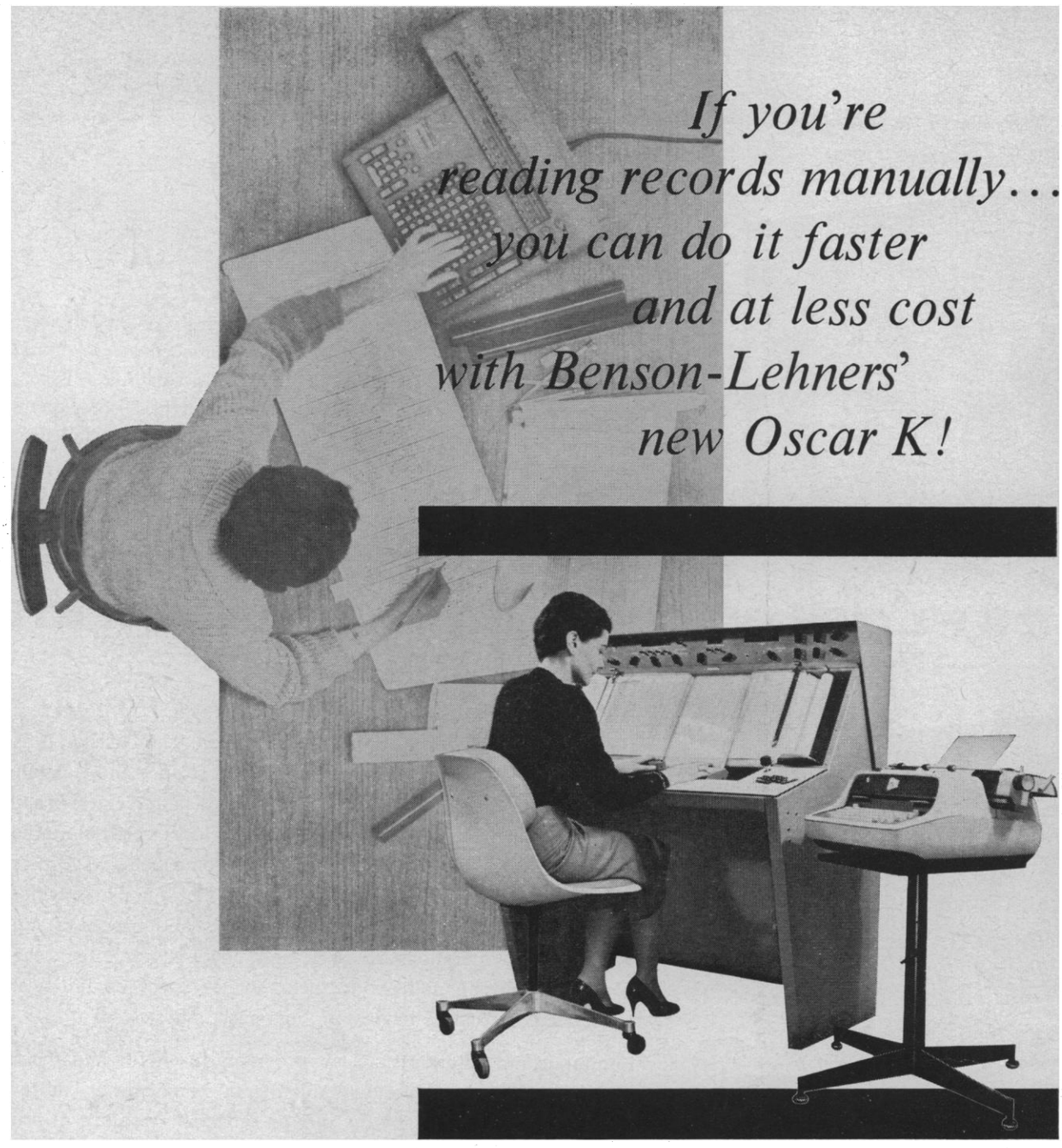

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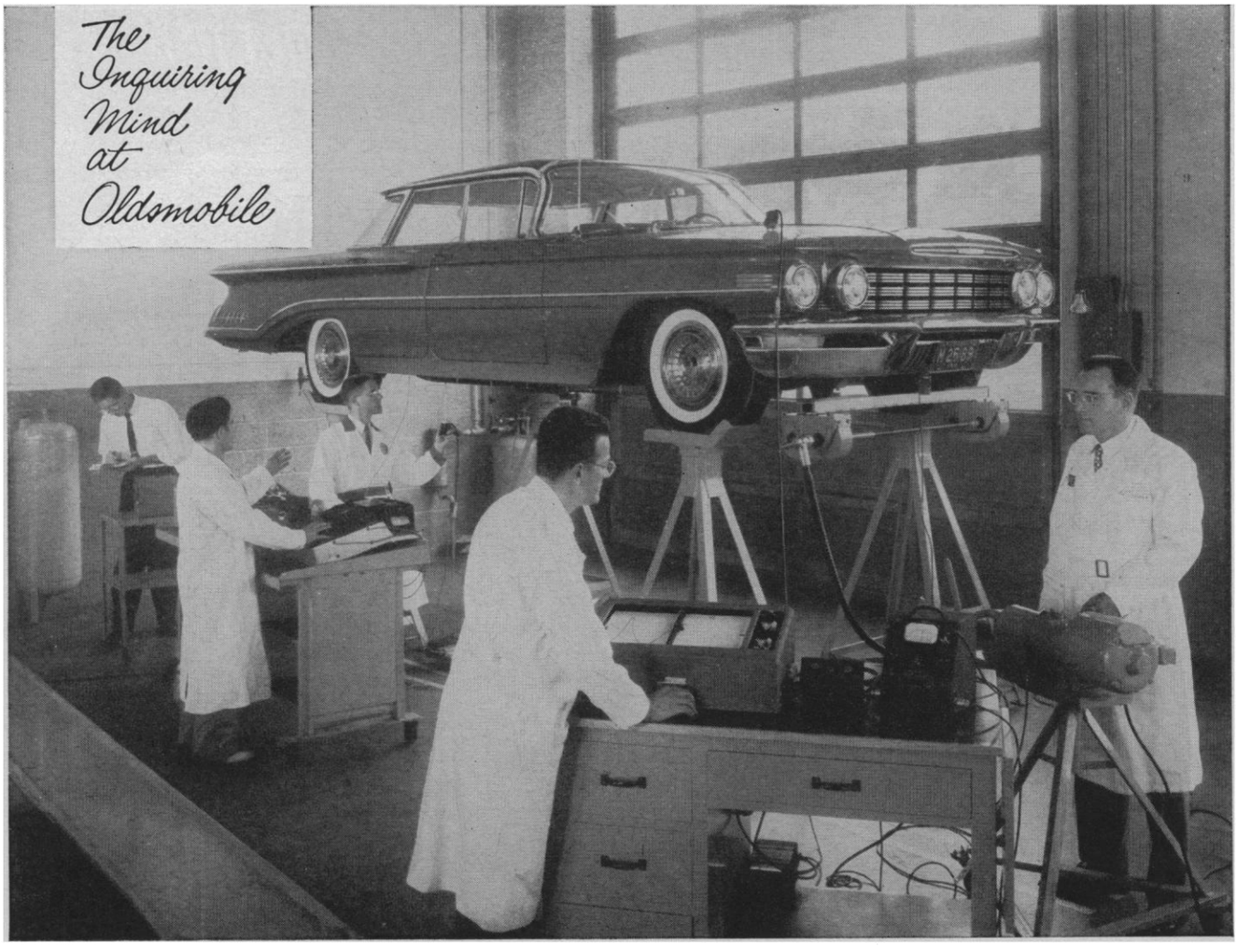

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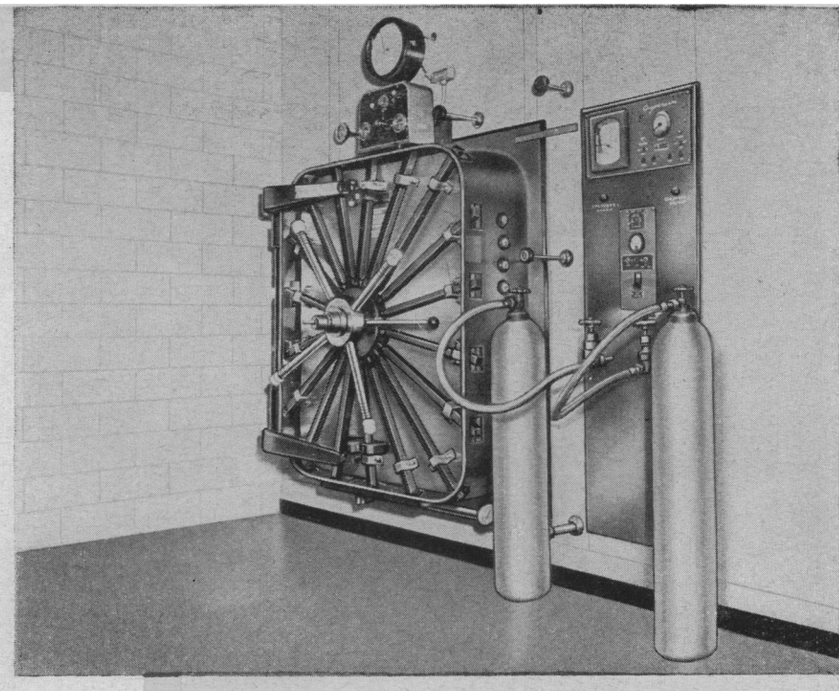

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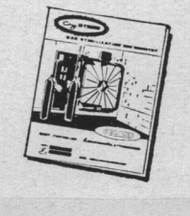

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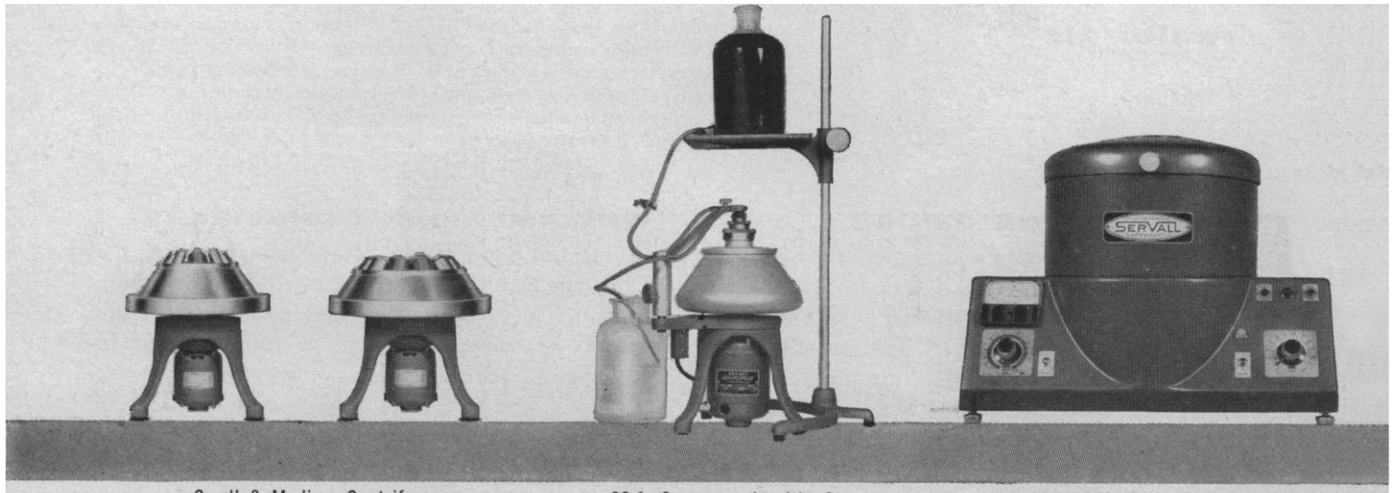

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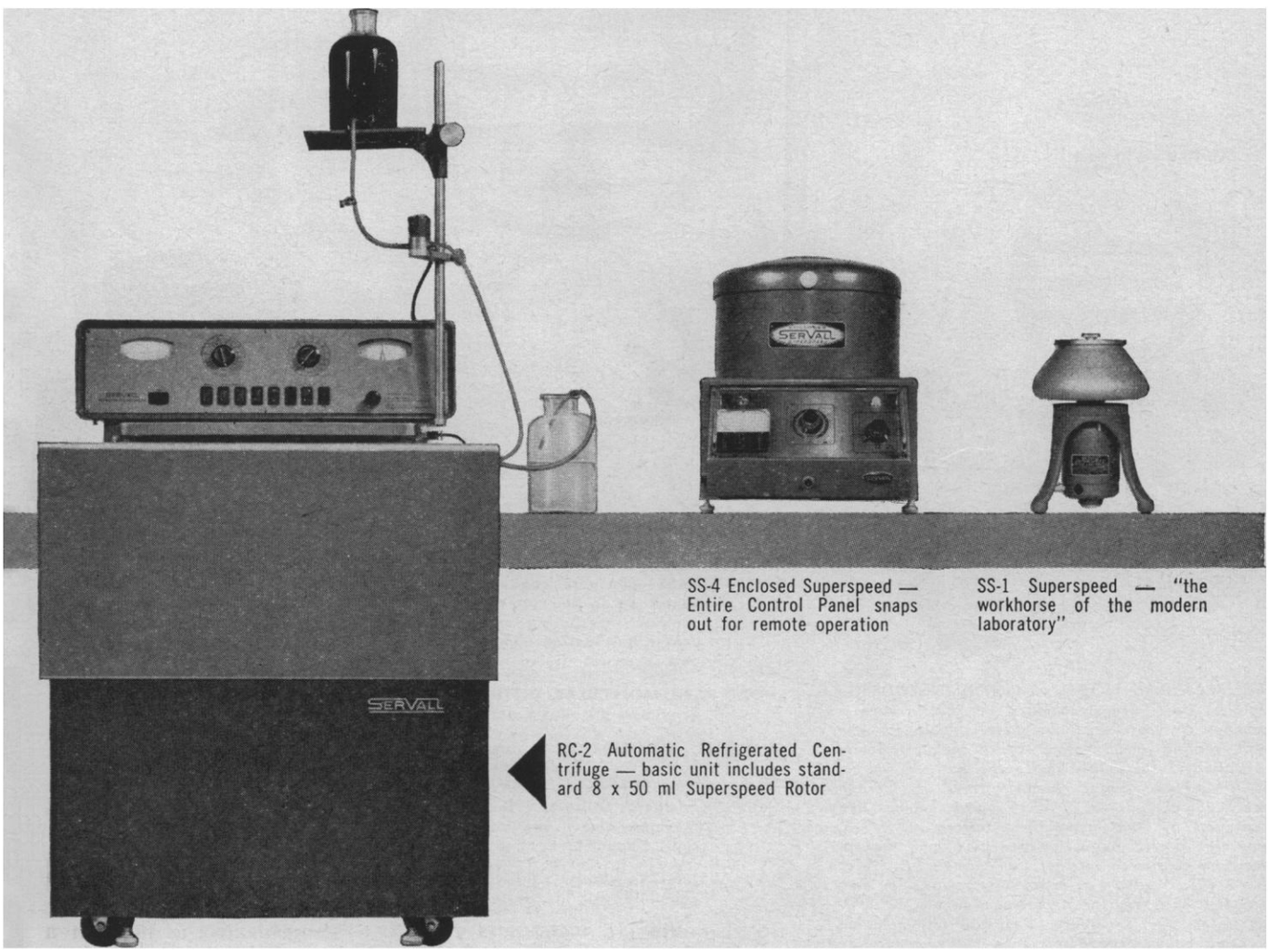

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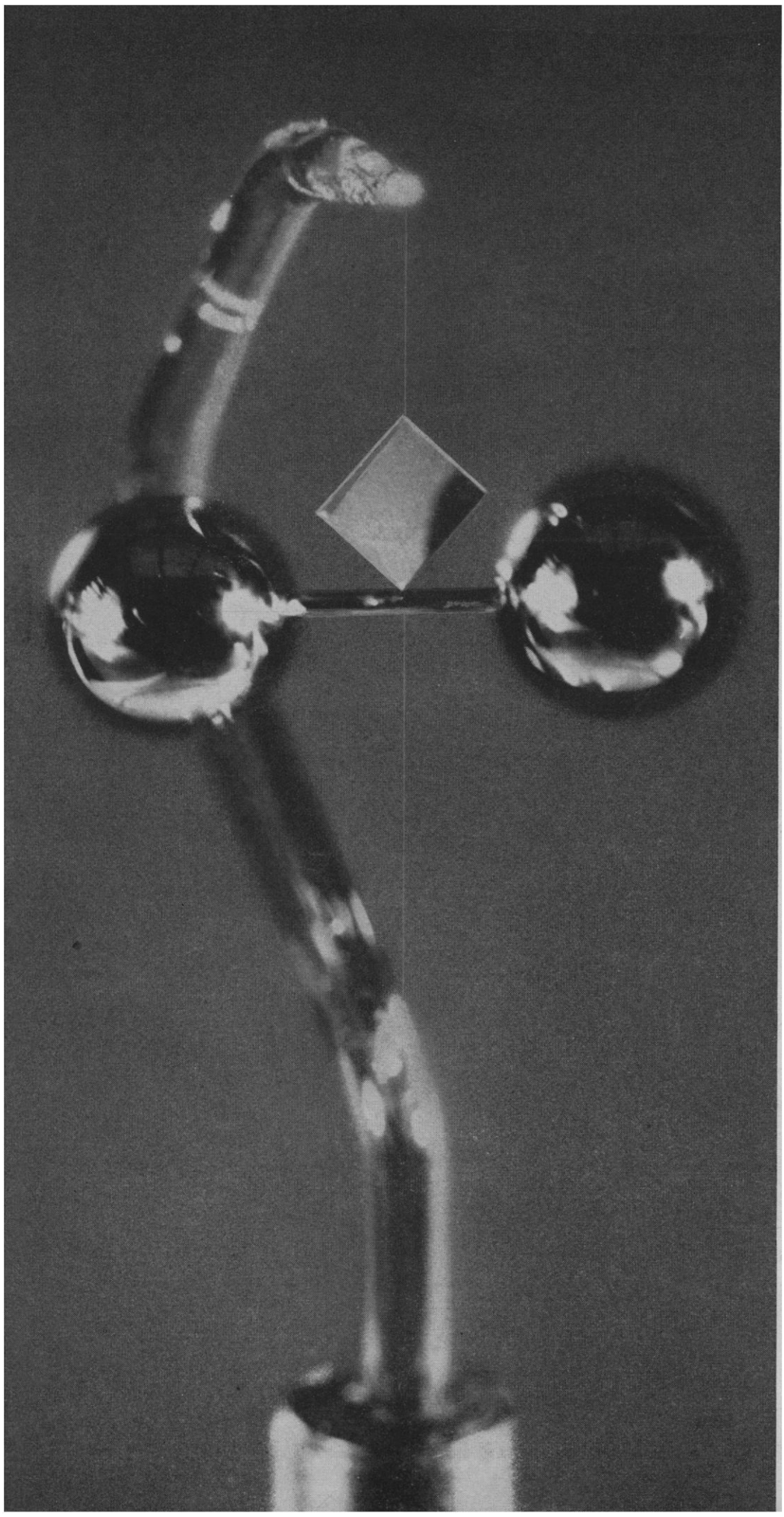

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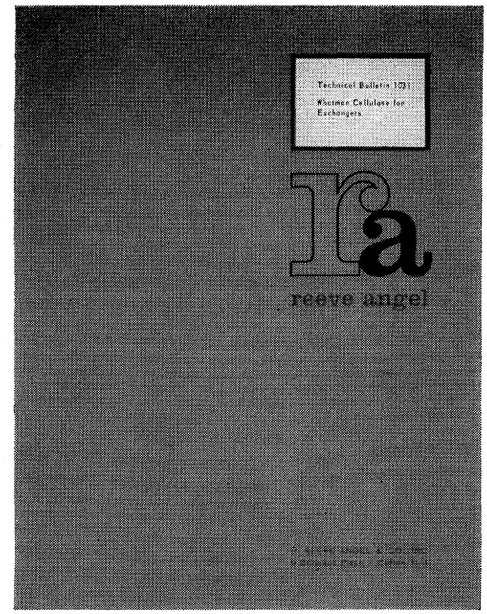

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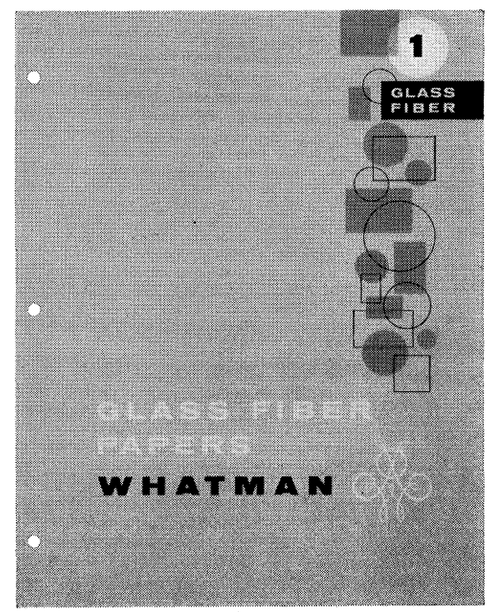

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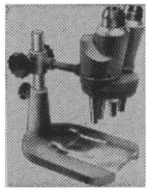

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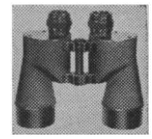

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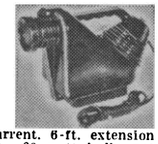

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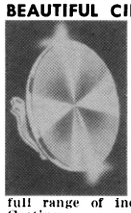

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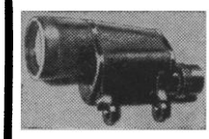

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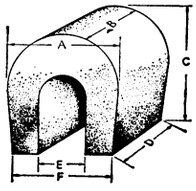

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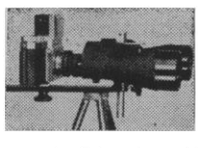

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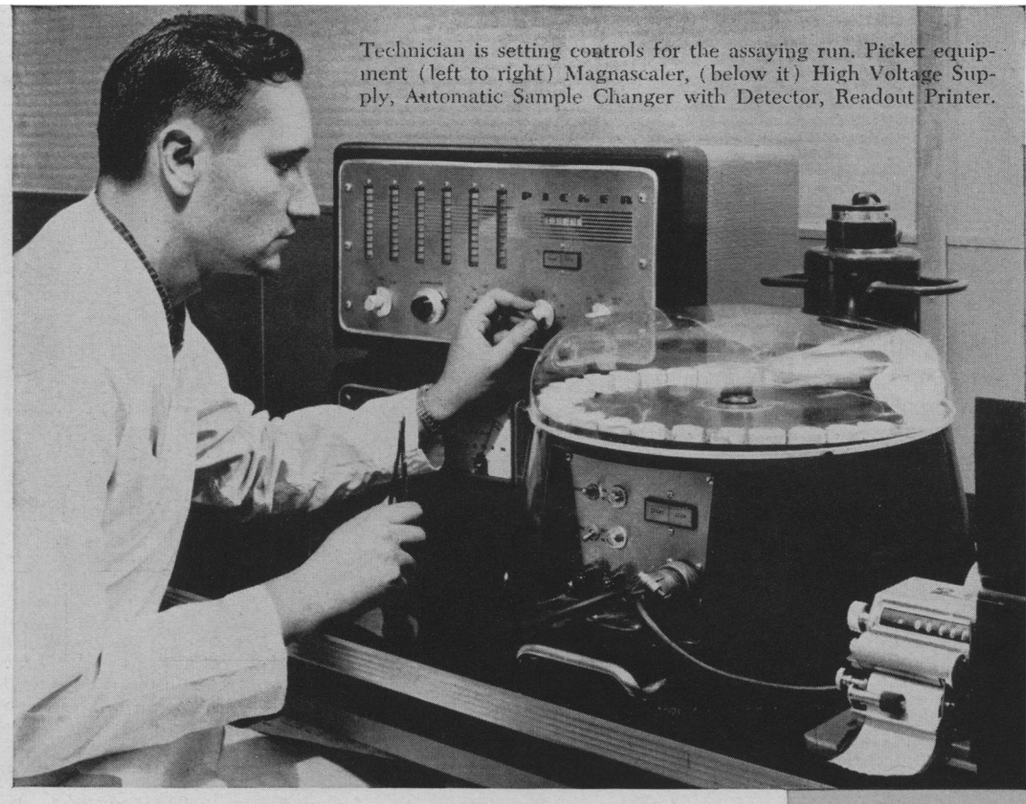

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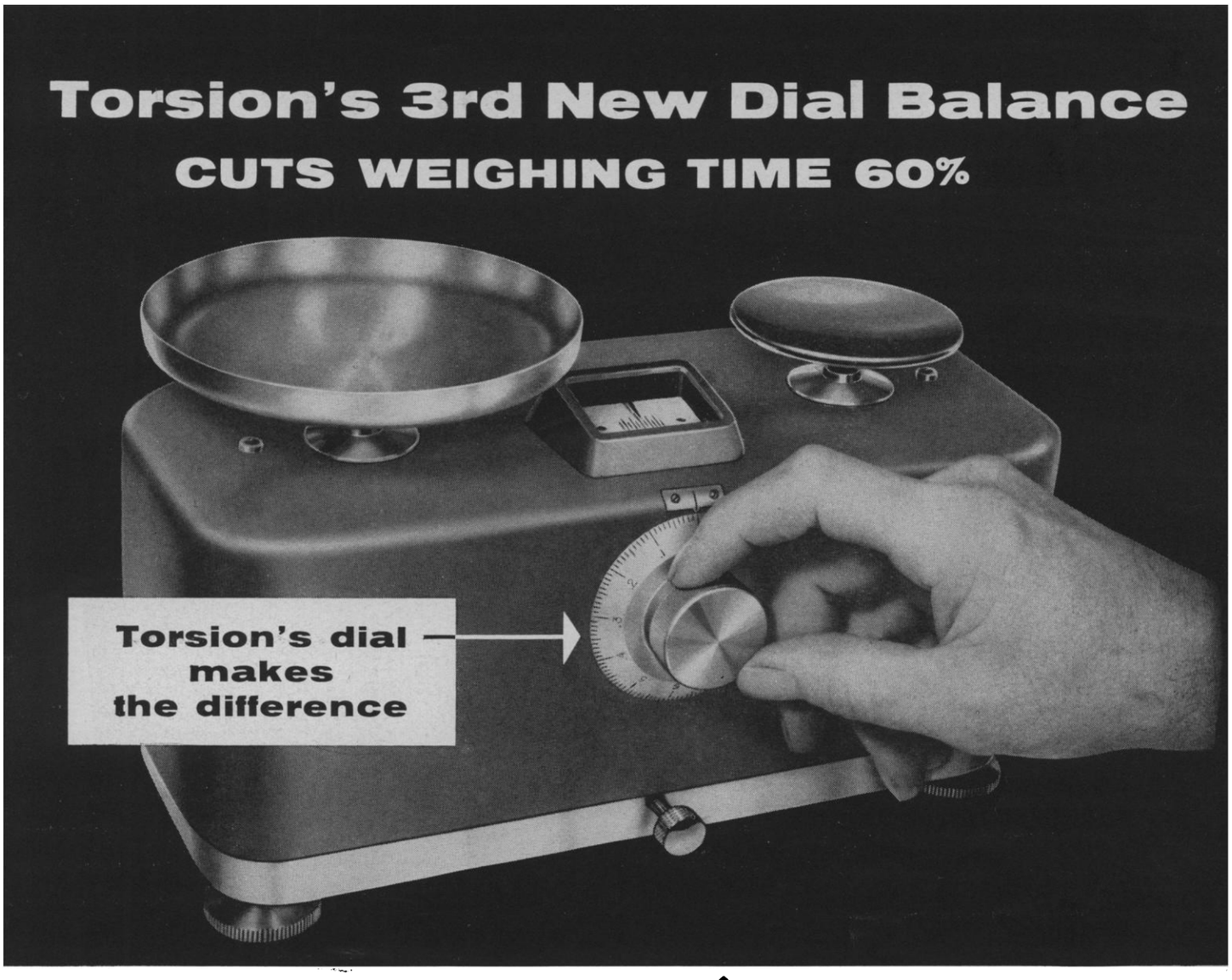

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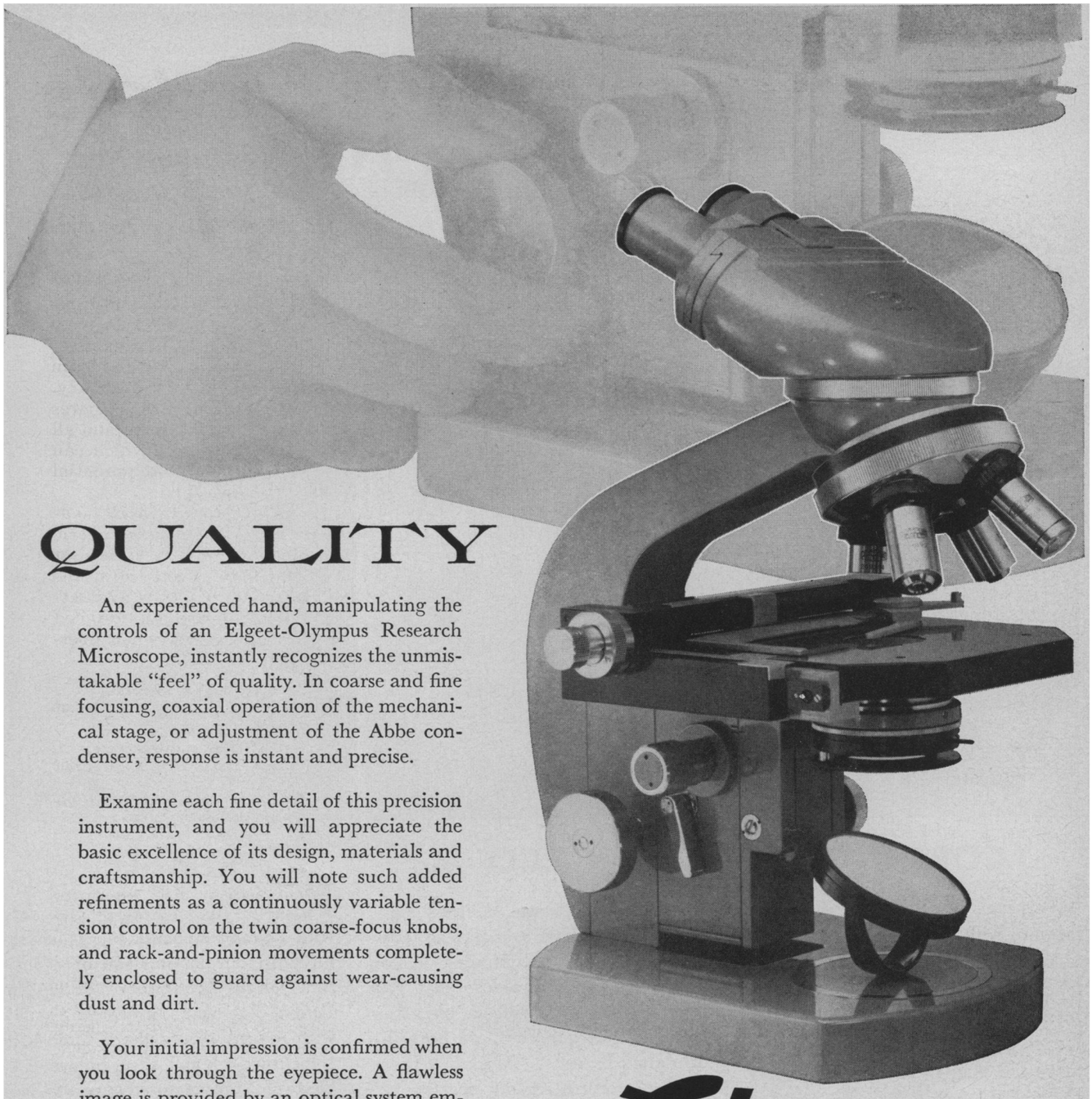

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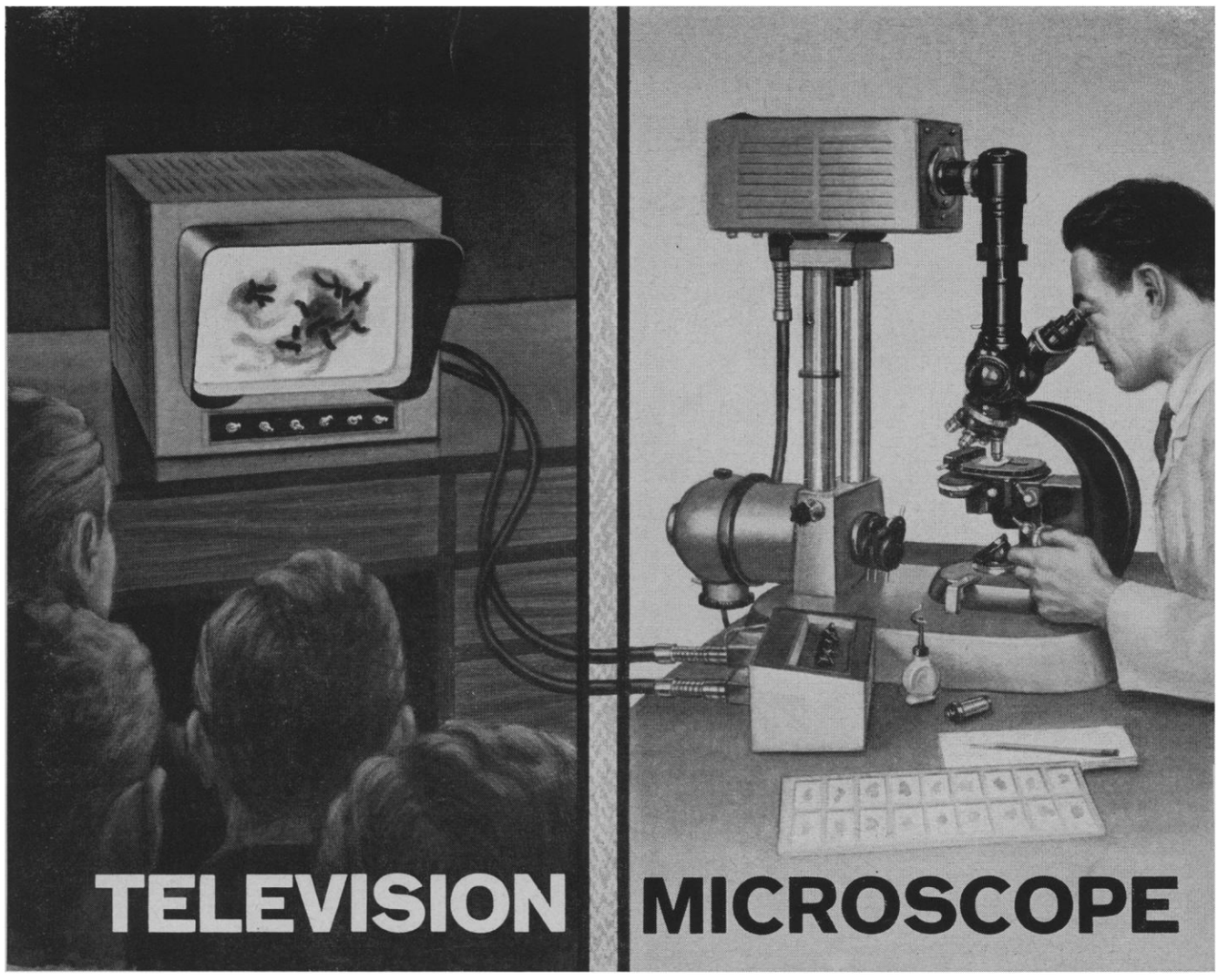

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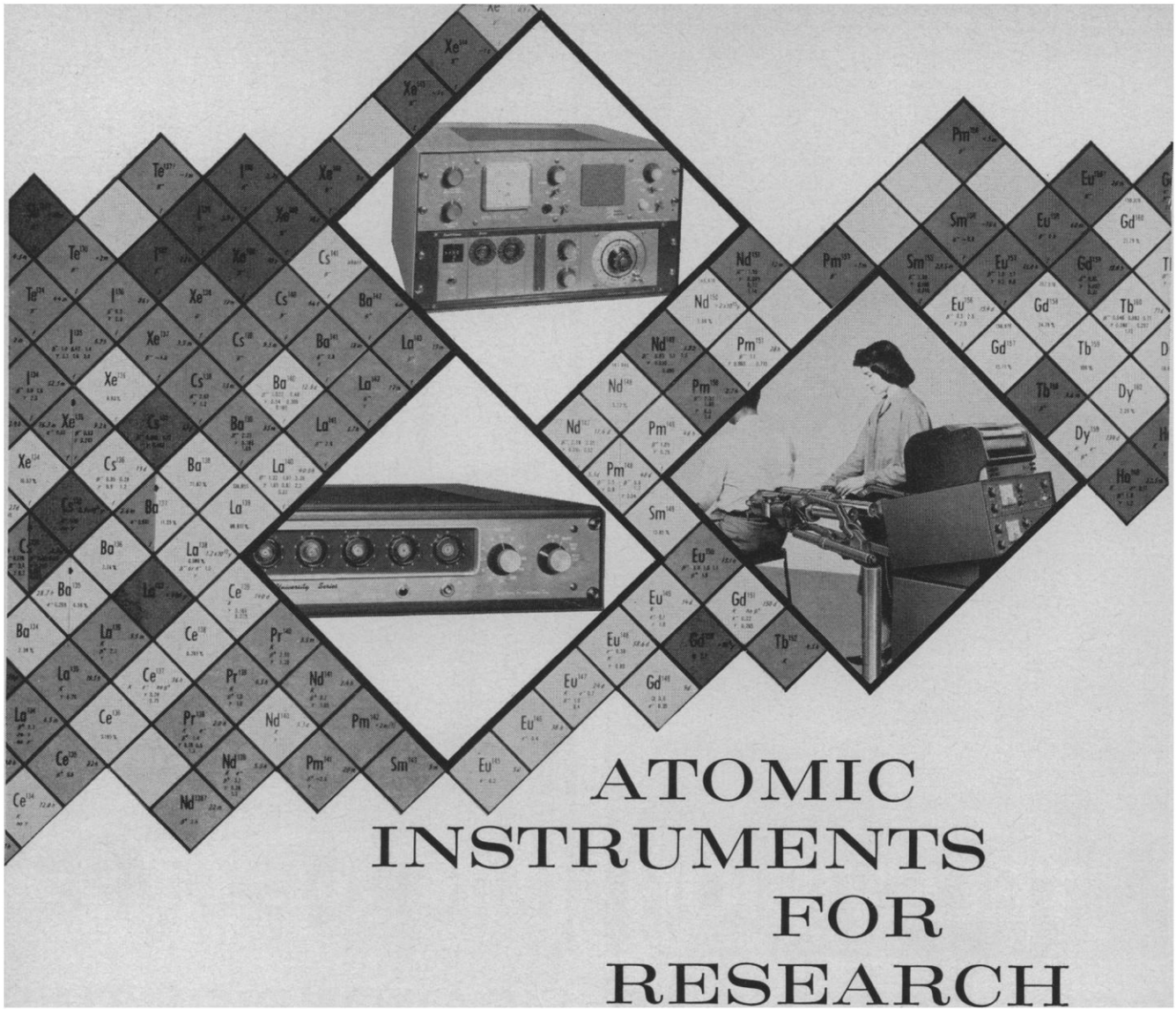

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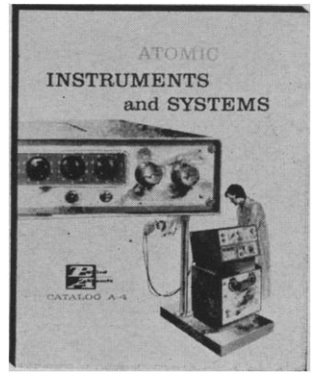

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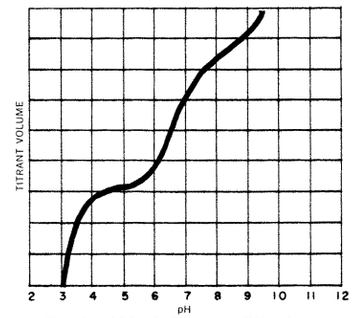

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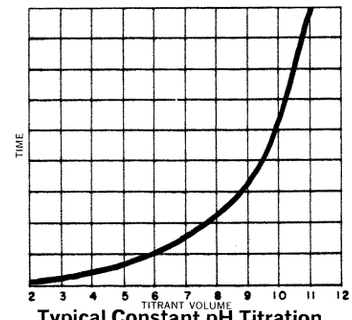

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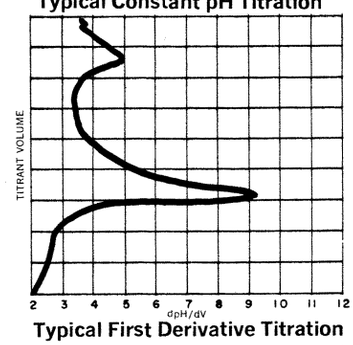

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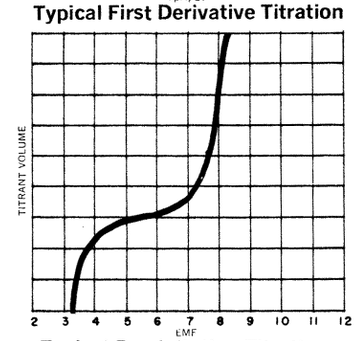

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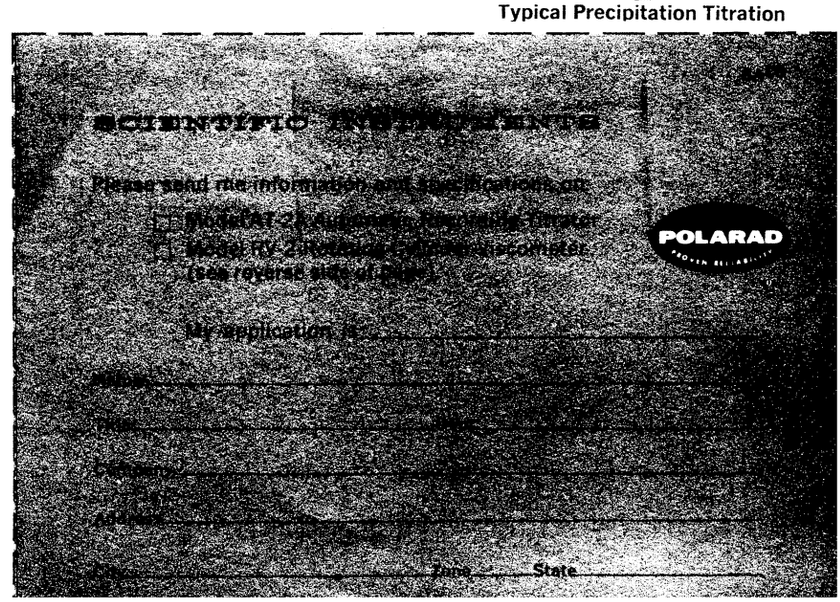

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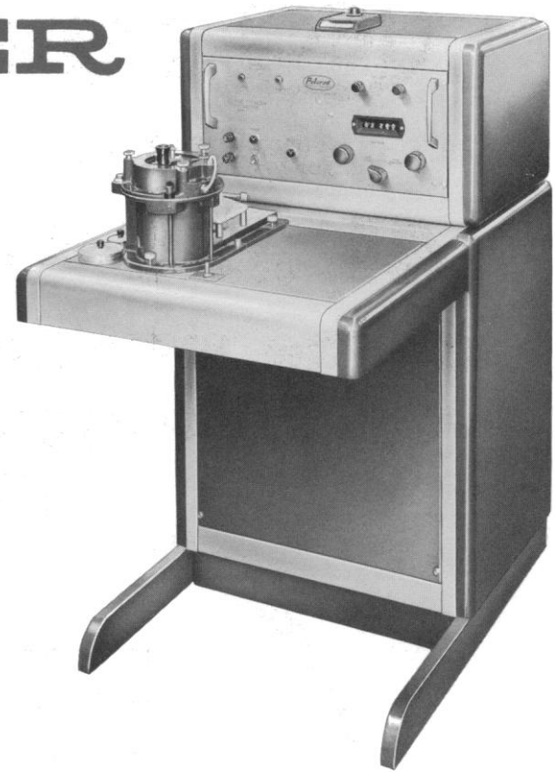

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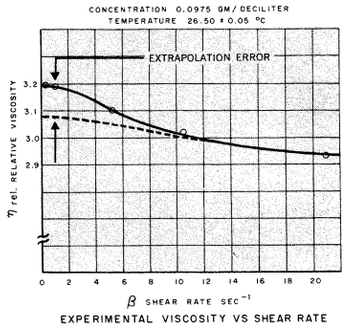
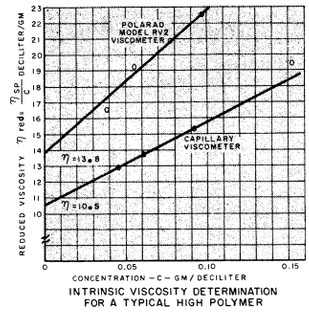
- Electrostatic restoring torque eliminates torsion wire problems.
- Temperature of sample maintained to within ±.05°C.
- Cylinder and float constructed from non-corrosive and non-contaminating material.
- The density of the liquid has no effect on the viscosity measurement.



EXPERIMENTAL VISCOSITY VS SHEAR RATE

Viscosity vs. Shear Rate

Analysis of Viscosity vs. Shear Rate for a water soluble high polymer demonstrates the effectiveness of this viscometer in measurement of true zero shear gradient viscosity. It can be seen that there was no necessity to extrapolate to zero shear rate because the instrument is capable of viscosity measurement on the plateau approaching this value.

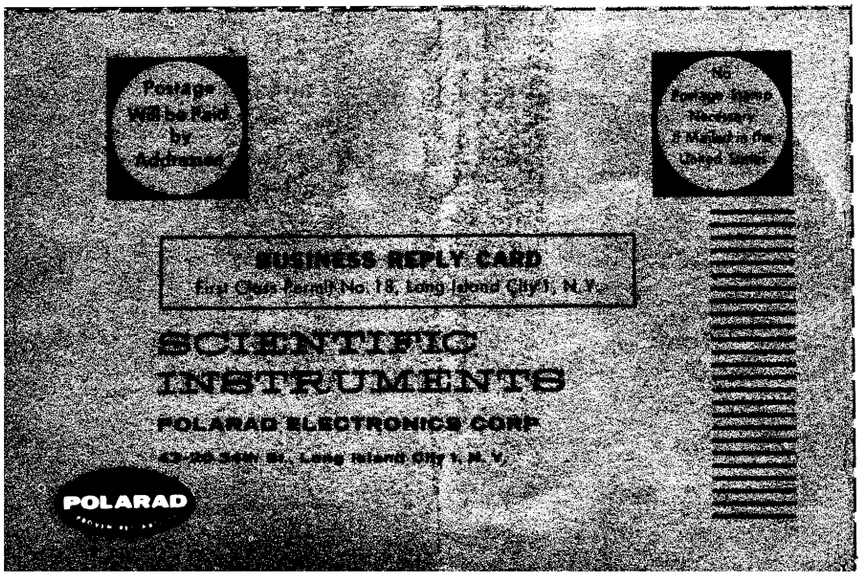


INTRINSIC VISCOSITY DETERMINATION FOR A TYPICAL HIGH POLYMER

Intrinsic Viscosity Determination for a Typical High Polymer

Here reduced viscosity $\frac{\eta SP}{C}$ is extrapolated to zero concentration to obtain intrinsic viscosity $[\eta]$ $\beta=0$. $C=0$.

Values of reduced viscosity were obtained directly without extrapolation to zero shear gradient. The lower curve is typical of the error to be expected when apparent viscosity is obtained at the high and nonuniform shear rate implicit in the capillary method.



Specifications:

Shear Stress Range: 0.002 dyne/cm² to 1.6 dyne/cm².

Shear Rate Range: 0.2 sec^{-1} to 50 sec^{-1}. in 26 steps.

Viscosity Range: Up to 800 centipoise at 0.2 sec^{-1}.

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Letters

Computers in Medicine

As a medical statistician, I read with much interest Robert S. Ledley's article on "Digital electronic computers in biomedical science" [*Science* **130**, 1225 (1959)]. I was happy to see how much attention is being given to some of the more mathematically complex problems in medicine today. I find some of Ledley's visions, however, not very realistic, in view of my own experiences. To cover these completely would require an article far more extensive than Ledley's, so I shall confine myself to a sketch of a few points.

Ledley states that there are a great many applications of computers in the straightforward statistical analysis of medical records. A large computer manufacturer investigated this problem, at the request of an organization I was with at the time, and found that the use of computers was too expensive. Standard punch-card machines are better.

With regard to statistical analysis of medical problems generally, I learned through eye-opening experience that large amounts of data and complex mathematical manipulations usually contribute nothing but disappointment and wasted effort. No more *valid* information can be gotten from a set of data than is inherent in the data. I think most people have to learn this the hard way.

Ledley states that measurements concerning an individual's normal state of health may serve as tools for instituting preventive measures before diseases occur. Vaccination and immunization programs come under this heading, but where do we go from here? It is almost a certainty that we will develop some circulatory-system "disease" before we die, if we live long enough, but how do we prevent it? We know very little about the prevention of many diseases, particularly those which afflict us later in life. Computers, to a certain extent, can help us study these problems, but that is all.

When a machine performs a discriminating function—the problem of diagnosis—it must have good data as well as a good discrimination program. What do we know about "normal values in medicine," fundamental data in this problem? I suggest that Ledley obtain a copy of a fairly recent book by F. W. Sunderman and F. Boerner, *Normal Values in Clinical Medicine* (W. B. Saunders, Philadelphia, 1950), and study some of these values. He should not be content with accepting the stated findings but should look up the original literature references, and should try to compare a set of "normal values" from one study with those of another study of the same thing. I have done some of this in connection with a book on medical statistics that I am now writing. I was so disturbed by what I found that I am attempting to interest the National Institutes of Health in giving the problem some serious study. In my opinion, adequate data as well as criteria for normality are lacking for many things in medicine.

Establishing normal "base lines" is only one step in dealing with medical problems. Current medical practices require continuous sources of accurate and precise measurements. How accurate and precise are current medical measurements? From the studies I have seen, they are subject to considerable improvement. Look, for example, at unit 3 of *A Syllabus of Laboratory Examinations in Clinical Diagnosis*, by T. H. Ham (Harvard Univ. Press, Cambridge, 1956). Results of a survey of the accuracy of some clinical laboratories are presented. The findings leave a great deal to be desired. Other more recent surveys show much the same thing. The main point here is that we have a long way to go before we can be satisfied with current practices in making some very basic medical measurements. Should we program a computer with data of unknown accuracy?

I would like somehow to convey to Ledley that medicine is *not* a mechanistic science. I know of no better way to learn this than by some first-hand experience. Ledley should visit a local hospital and listen while the physicians discuss their problems. If possible, he should talk to a few patients himself. This should be done in a small hospital in a small town.

I would like Ledley's opinion as to what to do in a case like this. An aged, senile member of a family is cared for in a nursing home. The financial drain on the family is very heavy, but he requires constant nursing care, too expensive to provide at home. His senility has advanced to the stage where he no longer even recognizes members of his own family. The patient develops pneumonia, which if not treated heroically will probably prove fatal. Should he be "cured" to return to his vegetable existence for a little while longer? Is "old age" a disease?

One prominent medical educator wrote not long ago, "In my opinion, what doctors say and do not say and what they do and do not do is one of today's most important factors in the cause and aggravation of illness" [W. Darley, "What is the next step in improving the teaching of preventive medicine," *Assoc. Teachers of Preventive Med. Newsletter* **6**, No. 2 (1959)]. A major factor in medicine is the inter-

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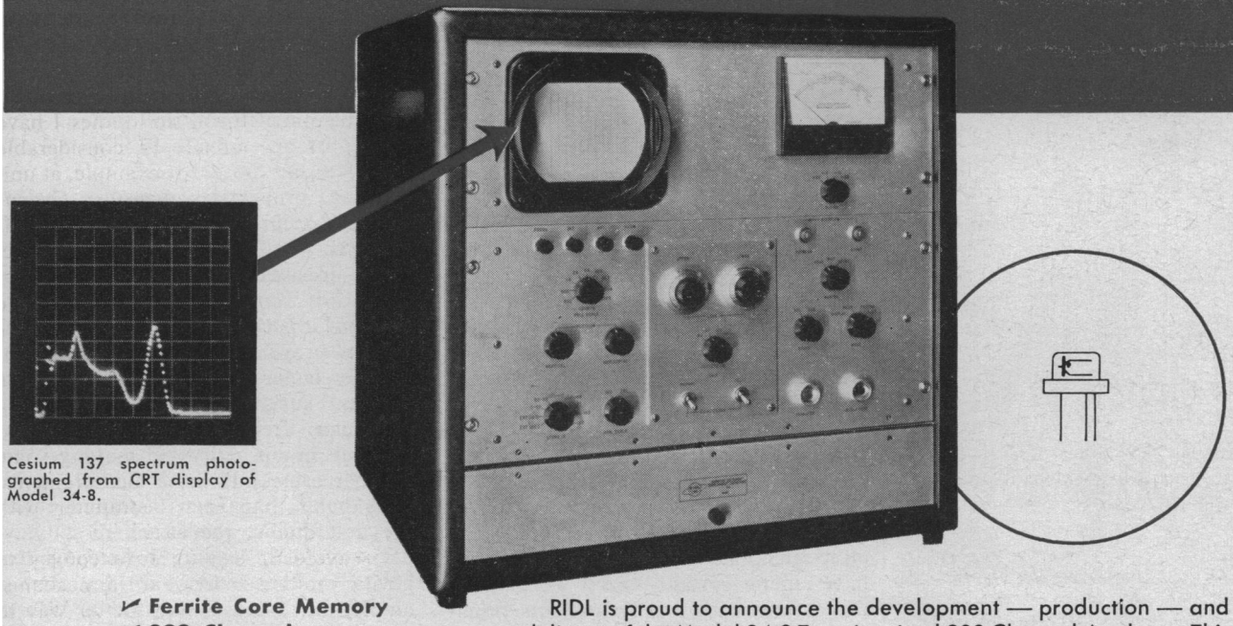

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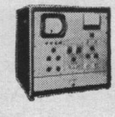

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personal relationship between the physician and the patient. What can computers do here?

Finally, I would like to repeat that I am much interested in learning about what is being done with computers in medicine. I think that Ledley's contribution will be greater, however, if he will learn more about the day-to-day problems and practices of medicine.

ROBERT G. HOFFMANN
J. Hillis Miller Health Center, University of Florida, Gainesville

Of the four general areas of applications of computers in biology and medicine discussed in my article—namely, (i) solutions to equations, (ii) simulations, (iii) data processing, and (iv) information retrieval—Hoffmann is evidently concerned only with aspects of the latter two. He seems to take issue, "in view of [his] own experiences," with my statement that "there are a great many applications of computers in the straightforward statistical analysis of medical records, experimental results, and other data." However, judging from Hoffmann's letter, apparently his own experiences with computers must be quite limited.

Before considering his specific points, I would like to note that he need not worry about a lack on my part of direct personal experience with patients for, although presently not in practice, I have spent several years working in clinics and with private patients. Hoffmann should heed the statement made in the article that presently most applications of computers in biomedical science are being made by people with extensive cross-discipline backgrounds.

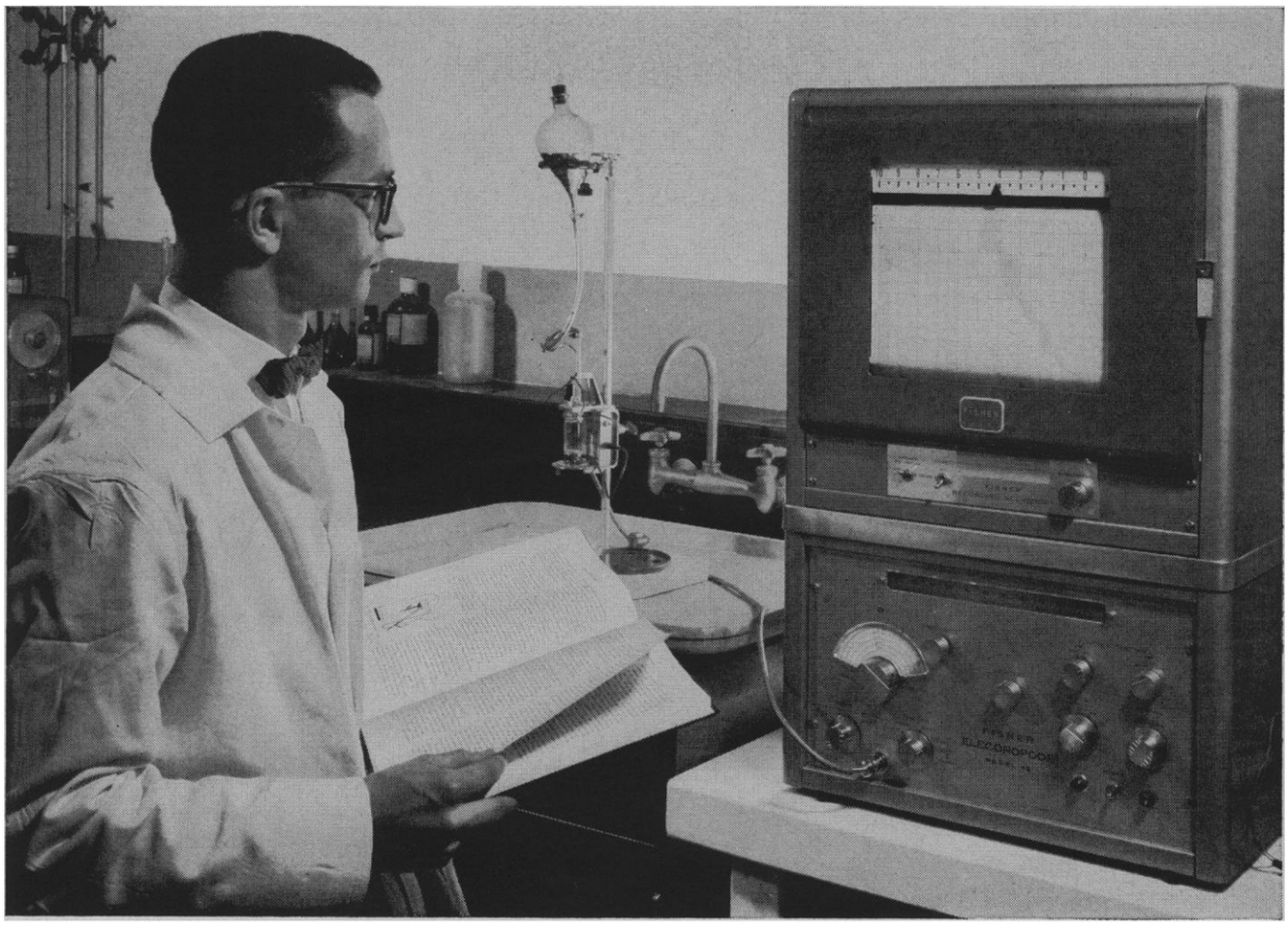
I believe that Hoffmann has missed the most important point in his comparison of punched-card machines and computers. As was pointed out in my article, "the advantage in the use of computers . . . is not derived merely from the fact that the computer can perform complex mathematical and logical operations rapidly, but rather from the observation that the electronic computer makes feasible the solutions to problems that could not otherwise be approached." Sometimes the use of computers can save money, sometimes not; no categorical statement can be made—it depends entirely on the particular circumstances. But the fact that an electronic computer presents vastly increased capabilities is beyond question. Consider, for example, just the basically simple case of handling ease: The information on a stock of punched cards that reaches as high as the Washington Monument and weighs about two tons would be difficult to manipulate with punched-card machines; under some circumstances a project involving so many cards might be considered unfeasible. But the same information can be recorded on a 1-foot-high stack of magnetic-tape reels weighing only 30 to 40 pounds, and conveniently processed by electronic computers. Also, it is usually not practical to perform on conventional punched-card equipment any mathematical calculations other than counting or sorting; in many such cases digital computers become a necessity. I certainly agree with Hoffmann that "no more valid information can be gotten from a set of data than is inherent in the data," but obviously no information at all can be obtained from a set of data without processing it. The kind and extent of processing evidently depends on each particular situation.

Hoffmann disagrees with my opinion that the biochemical and physiological indices of an individual's normal state of health can be used as a tool for instituting preventive measures before diseases occur—because, he says, "we know very little about the prevention of many diseases. . . ." The meaning of the words *very little* is of course relative, but it is certain that present knowledge of preventive measures for various diseases is far from zero. When an individual survives a heart attack, his physician frequently suggests many changes in his daily habits to prevent another attack. If these changes in his daily habits had been instituted *before* the first attack, the attack might have been avoided, leading to greater longevity for that individual. [See, for example, M. M. Gertler, M. A. Woodbury, L. G. Gottsch, P. D. White, H. A. Rusk, "The candidate for coronary heart diseases," *J. Am. Med. Assoc.* **170**, 194 (1959)].

Hoffmann appears distraught over the facts that "normal values in medicine" do not seem to be accurately known, and that "current medical measurements" are not always accurate or precise. Because of these inaccuracies he concludes that computers cannot be used. Certainly there are areas in medicine requiring vast improvements, but, quite contrary to Hoffmann's opinion, this indicates to me areas where computers can be significantly utilized—as aids to the more systematic collection of data, the more detailed analysis and evaluation of the results, the planning of improved studies, and so on. For example, perhaps the "normal values in medicine" appear not to be accurately known because without the aid of a computer individual variability has not been adequately considered or because it may have been too difficult to consider a sufficient number of factors or data.

In asking my opinion of euthanasia, which is quite irrelevant to the article, Hoffmann probably means to pose a question about computer aids to medi-

(Continued on page 564)



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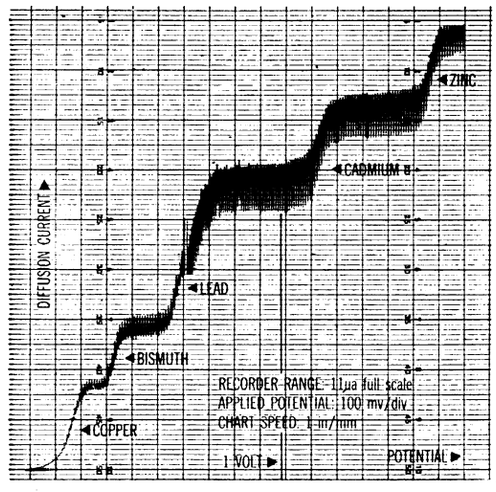

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Footlights and Foot-Pounds

In magnitude of preparations, complexity of operations, number of persons involved, and climactic quality, any large scientific meeting ranks high among other, comparable human activities. The uniquely complex Christmas meeting of the Association, which its own pressroom once described as the "world series of science," might be compared with the staging of a large-scale theatrical production.

The story line is born, and eventually there is a "book"; headliners and others are considered for leads and bit parts, then signed up for the cast; the physical facilities are booked; the playbills go out, and tickets (registrations) are sold, both in advance and at the door; finally, projection equipment and props are mobilized. At last, the "first night" arrives—the house lights dim, the footlights go on, and the audience hushes; in that moment of keen expectancy, everything must go right!

But AAAS meetings have no second nights. Another, not insignificant, difference is that there are scores of "first nights" (the programs) crowded into five and one-half days. And a perhaps poignant difference is that those who produced the programs and organized the meeting will write their own critiques!

An increasing number of those who attend AAAS meetings, however, are impelled to comment, generally in complimentary terms. From such unsolicited observations it is indicated that these registrants have come to realize that the preparations for the Association's annual meeting—and the actual operations connected with it—do add up to a substantial output of energy on the part of many people.

Even those who comment may not appreciate, however, the amount of thought, planning, correspondence, and persuasion that more than a hundred section and society secretaries and program chairmen have contributed. Editing, composing, and printing the General Program requires the almost undivided attention of one AAAS office and one devoted printer during two fall months. Shortly before the meeting opens, the committees on physical arrangements (which install lanterns and provide volunteers to operate them) and local public information become very active.

In the days and hours immediately before the meeting, the Association's office and the pressroom are activated; exhibit booths are erected; large crates and innumerable small cartons are delivered and unpacked, and their contents displayed; the session rooms are cleaned, and chairs arranged. During the meeting, more than a thousand authors deliver their papers, short or long; boards, committees, and councils meet; the registrants commingle and commune, often late into the night. Whether this collectively great expenditure of energy be measured in dynes, ergs, joules, or foot-pounds—and here, Section M's valuable programs on systems of units could help—the sum total, if it could be computed, would be impressive.

The expenditure of all these foot-pounds for the Chicago meeting was well worth while. As the reports in this issue indicate, the 126th AAAS meeting was notable for the uniformly high quality of its programs and exhibits, for the general smoothness of its operations, and for its good fellowship. Those who made the programs possible and those who participated have earned the thanks of the Association. They also have the satisfaction of knowing that, quite literally, they have helped science to advance.—RAYMOND L. TAYLOR, *AAAS*

E. J. MacNamara, New York Institute of Criminology, secretary-treasurer and AAAS Representative; Vernon Fox, Florida State University, member-at-large; and Howard Leary, deputy police commissioner of Philadelphia, editor.

The 1959 Annual Award of the American Society of Criminology was presented to the Most Reverend Bernard J. Sheil, D.D. Telegrams and letters congratulating Dr. Sheil were received from President Eisenhower, Vice President Nixon, Adlai Stevenson, Harry Truman, Eleanor Roosevelt, and several score criminologists and criminological organizations.

DONAL E. J. MACNAMARA,
Secretary-Treasurer

American Statistical Association (K5)

The American Statistical Association held two symposia, one on descriptive statistics and one on statistical techniques. The papers on descriptive statistics were concerned with the population statistics of the Ch'ing dynasty of China (Irene B. Taeuber and Nai-Chai Wang); an analysis, based on census data, of marital instability and its relation to education, income, and occupation (Karen G. Hillman); voting in Illinois from 1888 to 1958 (Duncan MacRae, Jr., and James A. Meldrum); and the estimation and use of production functions in agriculture (Earl O. Heady and Luther Tweeten).

In the second symposium, the following statistical techniques were discussed: "Beyond factor analysis" (R. Darrell Bock); the use of forced choice questions and the power function (Robert McGinnis); the repeated measurements problem (John W. Cotton); and a comprehensive model for reliability theory (Lee J. Cronbach and Goldine C. Gleser).

ROBERT F. WINCH, *Program Chairman*

History and Philosophy of Science (Section L)

I am delighted to report that the sessions of Section L were outstandingly successful. Many enthusiastic congratulations reached me during and after the Chicago meeting. Encouraged by Raymond L. Taylor's helpful and suggestive ideas on "Symposia in utopia" [*Science* **123**, 253 (17 Feb. 1956)] I had organized a 4-day conference consisting of two symposia on Theory Construction in Logical and Historical Perspectives and one symposium on each of

the following topics: Law and Convention in Physical Theory; Induction, Probability, and Simplicity; The Logic of Constants and Variables; Philosophical Issues of Quantum Theory; and Methodological Problems of Psychology and the Social Sciences.

I am deeply grateful to all the participants for their splendid contributions. The meetings were extremely well attended. The size of the audience varied from about 50 to over 200. The Lincoln-Douglas room of the LaSalle Hotel, in which all our sessions were held, was filled nearly to capacity at the symposia on quantum theory and probability and on the occasion of my vice-presidential address. The enthusiasm of the audience was impressive. On Tuesday, 29 December, morning, afternoon, and evening sessions were held, all well attended, with long and intensive discussions, also from the floor. Most remarkable in this respect was the symposium on the philosophy of quantum theory. An audience of 200 people listened with rapt attention (and participated) in this session which lasted without interruption for 4 hours. I don't think that there were more than three or four people who left the room during the symposium.

I wish it were possible in this all-too-brief report to summarize at least the highlights of the conference. But practically *all* speeches were of extraordinarily high quality, and space permits me to say only that a great number of the scientists and philosophers present in the audience told me that they had never witnessed a more "meaty and exciting" conference. Philosophy and history of science are now fully recognized in their important and indispensable role in the world of scholarship. The logic and methodology of the sciences, based on an adequate grasp of the crucial junctures in the history of scientific ideas, devoted to an analysis of the basic concepts, assumptions, and procedures of the sciences, were well reflected (even though only in a few areas of concentration) in the symposia held at the meeting.

It was very difficult to choose from the excellent set of lectures those papers which should be submitted for the Newcomb-Cleveland prize. Upon consultation with several of my most experienced colleagues I decided to submit six papers, each superb in its own way, as candidates for this honor.

Three publishing firms have already asked me for the rights of publication of the entire set of proceedings. It is our

intention to publish not only the main papers, but also those of the discussants as well as the rejoinders by the authors of the initial papers. In some cases even brief discussions from the audience will probably be included in the volume (to be edited by the Minnesota Center for Philosophy of Science).

Since the History of Science Association held its meetings simultaneously and in a different place, it is a matter of regret that there was only a very limited interchange between the two groups during the Chicago meeting. As currently planned, this defect will be remedied in the program of Section L in the New York meeting in 1960. The history of science will loom large in that program, and philosophy of science, having had such a full and rich representation at the Chicago meeting, will plan only for a smaller part of the New York sessions. In view of the interest in interdisciplinary communication, emphasized at the luncheon of the officers of the AAAS, I have suggested a symposium on comparative methodology of the sciences for New York 1960.

I wish to express my sincerest thanks to the officers of the AAAS, especially to R. L. Taylor, Mr. Streeter (secretary of Section L), and to the participants in the Chicago symposia on philosophy and history of science for their splendid cooperation which helped make our meeting one of such uniquely superb quality.

HERBERT FEIGL, *Chairman*

Philosophy of Science Association (L2)

William Alberts (University of Chicago) read a paper concerning the theory of "the public interest." The paper was criticized by Lewis Zerby (Michigan State) and Wayne Leys (Roosevelt) and provoked a lively discussion in which various members of the audience participated.

Most of the participants were inclined to the view that "the public interest" is a concept with theoretical significance, despite the fact that the words are often used for propagandistic purposes. To this extent there was disagreement with the conclusions reached by several political scientists in recent studies.

The issue that divided the symposiasts was the question whether "the public interest" should be conceived as an aggregate of interests or as the outcome of decision-making institutions when proper procedures are followed. This was the issue that had been defined by Leys and Perry in the investigation which they conducted last year for a committee of the American Philosophical Association.

Alberts took the "proceduralist" position, although he recognized several difficulties in this conception of "the public interest": (i) it undermines our faith that scientific knowledge can be used in any direct or simple fashion to determine "the public interest," since social problems (controversies regarding the public interest) cannot be viewed as the finding of efficient means for achieving common goals; (ii) it does not easily explain the consensus that seems to exist in a free society even when the decision-making procedures themselves are in dispute. Alberts suggested that this consensus is an agreement about the relevance of values, underlying debates over particular combinations of values to be realized by public policy.

Zerby and several speakers from the floor ably defended the "aggregationist" position, but their arguments cannot be included in the space allowed for this report.

WAYNE A. R. LEYS, *Program Chairman*

Medical Sciences (Section N)

Section N held its annual symposium organized along the conventional patterns of an interdisciplinary approach to a discussion of a subject of current interest and importance in the medical field. The subject for the symposium this year was Aging—Facts and Theories; the symposium was divided into four half-day sessions.

The first speaker, John W. McConnel (New York State School of Industrial and Labor Relations at Cornell University) emphasized the complexity of the economic problems arising from efforts to provide adequately for the aging population. He emphasized that a large portion of people over 65 do not have economic stability and that their total annual income is at a level which provides no more than the basic necessities of life. Moreover, the very real and important effect that inflation has upon the operation of the economy as a whole is reflected to a greater degree on incomes dependent upon current fixed pension systems.

Joseph T. Freeman (Philadelphia) reviewed the diseases of the aged and pointed out that although diseases of the young are also seen among the

aged, there are such diseases as osteoporosis, heart disease, cancer, and others which are found with much higher frequency in the older age group. He emphasized particularly the importance of the physician as a biologist in studying the aging problem, as aging is a phenomenon of all biological species; by studying aging in various species, answers to fundamental problems may be found. Robert J. Havighurst (University of Chicago) discussed the problems of work and retirement, emphasizing the importance of preparing psychologically for the retirement period. He also emphasized that a change in our retirement program should be permissible to allow the individual who is capable of working beyond a mandatory retirement age to do so. James Ebert (Carnegie Institution of Washington) discussed the very beautiful studies which have been performed with Rous sarcoma virus grown on chick chorioallantoic membrane mixed with crude fresh muscle extract derived from the adult chicken or 18-day-old embryo. He was able to show that, when the isolated Rous sarcoma microsomes and heart microsomes are applied in combination to the developing chick embryo, growths are produced on the chorioallantoic membranes which contain striations similar in character to those in cardiac tissue.

Abraham White (Albert Einstein College of Medicine) employed the method of studying the balance between antibolic and catabolic phenomena. He was able to show very beautifully that the influence of a hormone may be in opposite directions, depending upon the age of the host from which the particular tissue is taken.

Milton Landowne (Levindale Hebrew Home, Baltimore, Md.) stressed the importance of the changing nature of connective tissue ground substance accompanying the aging process. He discussed in particular those changes related to the cardiovascular system.

Gregory Pincus (Worcester Foundation for Experimental Biology) reviewed the current status of the steroid hormones in the aging of man, pointing out such observations as the increased somatropic hormones in postmenopausal women and of men of increasing age.

Bentley Glass (Johns Hopkins), in discussing the relationship of genetics to the aging process, very masterfully reviewed the theories of aging, indicating their weaknesses and strengths. He indicated that such significant contributions as those of Strehler, for example, contribute toward positive thinking in this field.

In the fourth and final session of the symposium consideration was given to the current facts relating to aging, and some of the theories which will, hopefully, offer a guide for future investigation. Nathan W. Shock (vice president of Section N) discussed in some detail the physiological changes which accompany the aging process. He emphasized in particular, those functions which decrease during the development of senescence and pointed out that these functions do not all decrease to the same extent. For example, changes in the heart and kidney are much greater than functional changes in the nervous system and enzyme activity of tissue. He presented evidence which indicated that performance associated with advancing age in human beings is due to three factors: (i) the dropping out of functional units in key systems; (ii) impairment in the functional capacity of the cells remaining; and (iii) the breakdown of integrated function in the individual.

Prioreschi (University of Montreal) discussed a stress theory of aging, arguing that the rate at which the initial amount of "adaptive energy" present at birth is finally expended contributes to the length of life of a species.

The symposium was closed by Samuel

E. Stumpf (Vanderbilt University) who entitled his discourse "The expanding new world of second-story people." He raised very interesting and provocative questions concerning the reasons for maintaining the aged, and the factors which have led to an increase in this so-called second-story, or postretirement population. He emphasized the necessity for maintaining in the aged the feeling of status, dignity, prestige, authority, and pleasure, which so frequently are significantly modified when the individual comes to the age of his retirement.

When viewing the status of current research in this field, it is clearly evident that solutions to problems of the aged, from a sociological, economic, and biological point of view are in their infancy. The reasons for aging are at the present time not clearly understood. It can be anticipated that the critical testing of the theories presented may give new clues to the reasons for senescence. Investigators reporting at this symposium are clearly to be congratulated on their adventurous approaches into this very important and complicated area of biological and sociological interest. (This symposium was in part supported by grant RG-6789 from the National Institutes of Health.)

ALLAN D. BASS, *Secretary*

Dentistry (Section Nd)

Section Nd held two symposia at the Chicago meeting arranged under the direction of the program chairman, Frank Orland (University of Chicago).

The first symposium, on the oral aspects of aging, with R. F. Sognnaes as moderator, covered various levels of observations from gross morphology to ultrastructure with the following subtopics:

S. Pruzansky (University of Illinois) reported on aging of the face as observed by means of cephalometry of the craniofacial growth pattern, with special reference to the syndrome of progeria in which the affected child resembles a very aged person.

E. O. Butcher and J. Klingsberg (New York University) reported on histological aging changes in the supporting tissues of the teeth in rats, hamsters, and monkeys of different age groups, and noted various differences in the susceptibility of these animals to gingival inflammation versus alveolar bone destruction.

J. R. Ring (Washington University) applied histochemical techniques to the

study of subepithelial connective tissue of the mouth, noting age changes which may be responsible for an impeded interchange of body fluids and the connective tissue cells.

A. A. Dahlberg (University of Chicago) presented a comparison from an anthropological point of view of the aging pattern in teeth from different population groups, noting variations in physiological response, wear and tear, in the aging pattern from group to group.

John Nalbandian and R. F. Sognnaes (Harvard) discussed the microstructural age changes in teeth of contemporary man, focusing primarily on the microradiographic and electronmicroscopic nature of dentin in connection with the increasing sclerosis of the root dentin with age.

David Weisberger (Harvard), in absentia, projected certain areas of oral age manifestations warranting further study in the future.

The second symposium arranged by Section Nd represented the final commemorating event of the 100th anniversary of the American Dental Association entitled "American Dentistry at the Centennial Crossroad."

G. C. Paffenbarger (National Bureau of Standards) reviewed the development and application of the varied types of dental materials employed in restorative dentistry over the past 100 years.

H. Trendley Dean (American Dental Association) discussed the use of the epidemiological method in dental research, illustrating its importance by reviewing the development of water fluoridation as a public health measure.

R. M. Stephan (National Institute of Dental Research) illustrated the antiquity of many so-called "modern" ideas and emphasized the need for making quickly available to investigators the latest world-wide research information.

S. Peterson (American Dental Association) reviewed the importance of dental education in the growth of dentistry as a profession, stressing the recent rapid extension of graduate and postgraduate studies, hospital internships, and residencies.

L. W. Morrey and N. C. Hudson (American Dental Association) presented a complete review of the periodical literature from the time of the publication of the first *American Journal of Dental Science* in 1839, up till 1958 when 173 dental publications were issued in the United States, versus 192 dental journals in 49 other countries.

B. S. Hollinshead (director, Survey of Dentistry) discussed certain philosophical problems of dentistry in its 100th year, including the relation between the profession and the public and the role of dental education and research in the progress of dentistry.

At the conclusion of these two formal scientific gatherings of Section Nd, resolutions were made on the death during 1959 of two distinguished contributors to dental science: Dr. Edward Hatton, past president and for many years secretary-treasurer of the International Association for Dental Research; and Dr. Frederick McKay, pioneer in the epidemiological research on mottled enamel which led to the use of fluoridation as a public health measure.

At the conclusion of the meetings, Paul Jeserich (University of Michigan), president of the American Dental Association, addressed a concluding luncheon meeting of Section Nd, emphasizing the need for coordinated efforts among the dental groups representing practitioners, educators, and research workers.

In addition to its own program, Section Nd cosponsored three other programs: the large symposium on aging arranged by Section N (Medicine); the extensive symposium on germ plasm resources in agriculture arranged by Section O (Agriculture); and the annual meeting of Alpha Epsilon Delta, national premedical honor society, which arranged a symposium on premedical and predental education. At the latter, L. R. Gribble, national president of Alpha Epsilon Delta, presided, and I. Schour, dean of the University of Illinois College of Dentistry, gave the welcoming remarks. The first two papers reviewed the usefulness and pitfalls of aptitude tests as predictions for success in medical and dental schools, C. F. Schumacher discussing the MCAT and Grace Parkin discussing the ADA aptitude test. The third speaker reviewed the recent Frank Bane report (U.S.P.H. Publ. No. 709) emphasizing the greater need for medical and dental practitioners at present and in the future, and the financial predicament of professional students. This part of the meeting was followed by panel discussions centering around the qualifications of students and specific approaches used by certain schools to select students. A luncheon meeting followed, during which H. E. Longenecker (University of Illinois) spoke on applicants in future years.

At the concluding Council meeting of the AAAS was announced the election of two new officers of Section Nd: for vice president and chairman, 1960, Joseph L. T. Appleton, professor emeritus and former dean, School of Dentistry, University of Pennsylvania; for councillor-at-large, 1960–63, John Hein, dean, Tufts University School of Dental Medicine.

REIDAR F. SOGNNAES, *Secretary*

Pharmacy (Section Np)

Section Np held eight sessions in Chicago. Forty-eight contributed papers on various studies were presented, and one symposium was held. Over 300 persons registered as having attended one or more of the section meetings.

The AAAS Council, the governing body of the Association, elected Joseph Swintosky (Research Division, Smith, Kline and French Laboratories) as a vice president of the Association and Don E. Francke (University Hospital, University of Michigan) to serve on the committee-at-large of the section for a 4-year term. Swintosky will serve as chairman of the section for the coming year.

Of major interest to the group in attendance was a most stimulating vice-presidential address on "Professionalism and the pharmaceutical scientist" presented by Glenn L. Jenkins. A symposium entitled "The Scientist's Part in Protection of the Public, Part I: Food, Drug, Cosmetic and Hazardous Chemical Problems; Part II: Food Additive Legislation" also attracted considerable interest, not only on the part of the pharmaceutical scientists in attendance, but also by many individuals from other scientific disciplines. Joseph Swintosky and Glenn L. Jenkins gave introductory remarks and served as presiding officers. Bernard E. Conley (secretary of the Committee on Toxicology of the American Medical Association) gave a discussion of the labeling of hazardous chemicals. William F. Bousquet (Purdue University) presented the problems of legislation on pharmaceutical ingredients and approaches to solving them. Bousquet emphasized the importance of radioisotope techniques in studying food and drug residues and formed metabolitis. The role of the cosmetic scientist in protecting the public health was covered by Raymond E. Reed (Toni Company). John H. Rust (University of Chicago) spoke on the applications of radioactive isotope tracer techniques to studying the food additive problem. He emphasized the need for edu-

cation in isotope tracer techniques to supply trained personnel for food research now necessary under present food additive legislation. Problems in evaluating the safety of intentional food additives and unintentional food additives were set forth by O. Garth Fitzhugh and Arnold J. Lehman (Food and Drug Administration). Edward J. Matson (Abbott Laboratories) explored the philosophical question of scientific judgement in law and regulation. He emphasized the need for sound scientific judgement based on known facts in arriving at conclusions regarding levels of toxic and carcinogenic substances in foods for human consumption. The role of the scientific expert under recent food laws was summarized by Bernard L. Oser (Food and Drug Research Laboratories). The symposium was terminated with a question and answer session on current food, drug, and cosmetic problems.

In addition to the above-mentioned program, the hospital pharmacy group had a most informative and well-attended full-day session under the guidance of George F. Archambault and Joseph A. Oddis. The meeting was held in the recently completed facilities of the American Hospital Association. The following organizations were represented: American Society of Hospital Pharmacists, American Pharmaceutical Association, Illinois Society of Hospital Pharmacists, American Hospital Association, National Association of Boards of Pharmacy, U.S. Public Health Service, Illinois Hospital Association, and the National Institutes of Health. Luncheon, entertainment, and dinner were sponsored by E. R. Squibb & Sons, Mead Johnson and Company, and McKesson and Robbins, Inc., respectively.

George L. Webster (University of Illinois) opened the sessions of contributed papers. Egil Ramstad and his co-workers (Purdue University) presented a series of six papers describing work done on plant biogensis and metabolism using radioactive tracer techniques. C. T. Peng (University of California) discussed quenching of fluorescence in liquid scintillation counting and in a second paper the fate of tumor implants in rats. The distribution of C^{14} meprobamate in rat brain was discussed by J. L. Emmerson, T. S. Miya, and G. K. W. Yim (Purdue University). Herbert Schriftman (Wyeth Laboratories) spoke of the applications of paper chromatography and electrophoresis to the assay of pharmaceutical products. An improved 4π, whole-body liquid scintillation counter was described by B. G. Dunavant and J. E. Christian (Purdue University), and J. P. Vacik and J. E. Christian (Purdue) described the application of neutron activation analysis to the micro analysis of gold-containing pharmaceuticals. G. Levy (University of Buffalo) described the physical-chemical basis of the buffered aspirin controversy; D. E. Guttman (Ohio State University) discussed the solubilization of riboflavin; J. Autian (University of Michigan) discussed the binding of drugs by plastics; and M. L. Eichmann (Ohio State University) presented information concerning the interactions of xanthine molecules with serum albumin.

Other papers presented were "methods of synthesis of tetrahydroquinolizonium salts," "Color-coding of drug dosage forms," "Hydration of procaine base," "Evaluation of suppository bases," "The social psychology of prescription writing," "Effects of physostigmine on chick eggs," Pharmacological prevention of acute heart failure," and "Spray-drying of tablet granulations." These papers were delivered by D. M. Stuart (Oregon State College), R. G. Brown (University of Texas), W. A. Strickland, Jr. (University of Arkansas), J. Anschel (Warner-Lambert Research Institute), E. J. W. Hall (University of Texas), V. A. Green (University of Texas), J. W. Ingalls, Jr. (Long Island University), and A. M. Raff (Smith, Kline and French Laboratories), respectively.

This meeting proved to be one of the most successful meetings of Section Np of the AAAS in recent years and was exceedingly well attended.

JOHN E. CHRISTIAN, *Secretary*

Agriculture (Section O)

The Section O program consisted of a symposium on Germ Plasm Resources in Agriculture; Development and Protection. This program was arranged by the chairman of the section, R. E. Hodgson; it was co-sponsored by AAAS sections F, G, N, and Nd, and by 15 scientific societies. Of these societies, nine are affiliated with Section O, and six are affiliated with other AAAS sections.

The symposium was arranged in five half-day sessions as follows: (i) origin of germ plasm; (ii) the need for, and

utilization of, additional sources of germ plasm; (iii) developmental programs in crops and livestock; (iv) new approaches in the use of plant and animal germ plasm; (v) perpetuation and protection of breeding stocks. There were 26 invited papers and five discussion papers.

The entire program was very well attended, with a grand total of about 600. Interest and attendance were sustained to the very end of program, attesting to the excellence of the papers presented. The symposium topic dealt equally with plants and animals, and it accomplished the objective of providing interdisciplinary knowledge, techniques, and concepts to scientists concerned with many phases of germ plasm resources and their development and protection.

The chairman designated for Section O for 1960 is Firman E. Bear, of Rutgers University. A theme for the 1960 symposium program in New York has been selected: Rural land zoning for agriculture and forestry and for urban and industrial development. Bear will have responsibility for the development of the program. R. E. Hodgson (1959 chairman), has been elected as a committeeman-at-large for Section O, for a 4-year term.

HOWARD B. SPRAGUE, *Secretary*

Industrial Science (Section P)

The total impact of modern science on the food industry provided the central theme for Section P. In a half-day program, the present and potential future contributions of the biological, physical, social, and behavioral sciences to the food industry were assessed respectively by: Walter L. Obold (Drexel Institute of Technology), John R. Matchett (U.S. Department of Agriculture), Ross A. Kelly (University of Illinois), and Leonard Kent (Needham, Louis and Brorby, Inc.).

In introducing the symposium, Earl P. Stevenson, vice president for Section P, observed that modern technology has a practical concern for reconciling man's productive potential with his reproductive potential. While we must be mindful that the balancing of the two cannot be achieved through production alone, the realistic approach is not the control of population growth, necessary as this may prove to be, but the fullest utilization of existing resources to increase production. He stated that, while two-thirds of the people of the world are hungry and struggling to survive on minimum or insufficient diets, obesity is the principal nutritional affliction of America.

Frank C. Croxton (Battelle Memorial Institute; retiring vice president for Section P) spoke at a luncheon following the symposium on the topic, "Scientific man and unscientific society." He observed, "The individual of today, having the ability to be objective, selfless, and unhampered by group pressures, has the capability to be scientific in thought and approach. Today, society being essentially subjective, harried by group pressures and necessarily guided by nationalistic egoism, is rarely able to be scientific. . . . It is important for each one of us to encourage individual creativity, the scientific method and the incorporation of both into the behavior of society. . . . The constantly and rapidly increasing importance of science in the lives of men and nations imposes on us the absolute necessity of assuring the position of aspiring man in our conservative or even antiscientific society. . . . The scientist must be provided with the freedom necessary for creative research. He in turn must continually be aware of society's problems and his potentialities for improving human welfare."

The 1959 Industrial Science Achievement Award of Section P was presented jointly to Armour and Company and Swift & Company in recognition of the accomplishments of their respective research departments in finding practical applications of scientific knowledge in the development of a wide variety of foodstuffs and chemical products.

ALLEN T. BONNELL, *Secretary*

Institute of Management Sciences (P1)

The Institute of Management Sciences, recently affiliated with the Association, held a special program at the Chicago meeting. The symposium, "Management science," with Abraham Charnes as chairman and Allen Newell, Anatol Rapoport, and Harold Guetzkow as speakers, ran smoothly throughout and was entirely successful.

MERRILL M. FLOOD, *Program Chairman*

Society for Industrial Microbiology (P2)

A Chicago section of the Society for Industrial Microbiology was organized. There was a fine representation of local industrial microbiologists. The section is already functioning with what we hope will be an interesting program for our colleagues in the Chicago area.

A. DAVID BASKIN, *President, Chicago Section*

Education (Section Q)

Section Q had a comprehensive program of symposia, contributed papers, field trips, conferences, and reports. In general, the sessions were well attended and interest was high. In Section Q and in the programs of the affiliated societies, 18 sessions were devoted to papers which treated subjects as varied as "Radio telemetry of nerve action potentials" and "Analysis of algebra textbooks used in the Russian secondary schools." There were five lectures and a special report of the National Project for the Identification, Development, and Utilization of Human Talent. Numerous other special programs and committee meetings were also scheduled. Paul Witty's report on televiewing had an excellent reception, both with the audience to which he presented it, and with the press.

The excellent vice-presidential address on "Fallacies in the concept of overachievement," by Warren Findley, was well attended. The most vigorous business meeting in several years was held, and plans were laid for a more active involvement of the section committee in section affairs.

There are increasing indications, in both the section itself, and in its affiliated societies, that closer identification with the subject-matter sections is desired. This was evidenced by an expression of a need for greater opportunities and encouragement to attend the programs of other sections, and by a desire for opportunity to share more fully with other sections in the development of programs of mutual interest.

Joseph Novak (Purdue University) was elected to a 4-year term as committeeman-at-large, and John C. Flanagan (University of Pittsburgh) was elected by the Council as vice president and chairman of Section Q.

HERBERT A. SMITH, *Secretary*

Section Q and the Council for Exceptional Children held joint sessions in the morning and afternoon of 26 December. The morning session was devoted to a consideration of organic and social factors in mental deficiency and their significance to the educational program. George Yacorzynski (Northwestern University Medical School) reported research indicating that precipitate delivery and anoxia are more frequently associated with later evidences of brain damage than are prolonged labor or instrument deliveries. Bernard Demsch and William Itkin (Cooperative Re-

search Project on Mental Deficiency of the Chicago public schools) presented research data strongly suggesting that individual psychological examinations utilizing either the Stanford-Binet test or the WISC test underestimate the potential of children who have recently migrated from the rural south to an urban school system, since these children appear to achieve more rapidly than their intelligence scores would predict after a few years in the urban school situation. Other papers were presented by Louise Sinderson (Joliet public schools) and Henry Turkel (Detroit, Mich.).

The afternoon session was devoted to the topic "Weapons of the school in the war against delinquency." The importance of a strong and flexible total school program was stressed in the first two papers by Louise Daugherty (Forrestville School, Chicago) and Irving Abrams (director of health services, Chicago). They pointed out the need for school organization which permits the principal of a school in an underprivileged area to adapt the curriculum and the organization to the needs of the community. Abrams presented research on an extensive health survey of a large school in a problem neighborhood, revealing the high incidence of health problems in a population which also has a high delinquency rate. He recommended strengthening the school health program in such communities, particularly a roving team of medical experts, including a pediatrician, a psychiatrist, nad a neurologist, who would make rapid evaluations at the school site of children with health problems referred by the school staff. A number of other special school programs were described. One was an effective guidance and adjustment program for young people returned to a city high school after serving a term in a state school for delinquents. Another was a series of special classes in Milwaukee designed to introduce migrants to ways of living in the city and succeeding in the city schools. A third was the revised curriculum in a school for socially maladjusted adolescent girls reflecting many years of experience in the girls' branch of the Montefiore special school in Chicago. Discussion of these papers emphasized the many aspects of the school's responsibility in the prevention of delinquency. First of all, the school must be a good school providing a strong academic program preparing all young people to meet the varied demands of American citizenship; second, an effective school sys-

tem must devise and utilize a wide variety of special attacks on special problems to meet the needs of individual children and special groups of children, utilizing the disciplines of medicine, social work, and psychology as well as education.

FRANCES A. MULLEN,
Program Chairman

AAAS Cooperative Committee on the Teaching of Science and Mathematics (Q1)

Sunday, 27 December. John R. Mayor reviewed the STIP studies in science teacher education now being undertaken by several universities. These studies include use of undergraduates as laboratory assistants in science courses, appointment of science advisers for elementary school science teachers in training, development of testing programs for teacher certification, and training in laboratory procedures for more effective teaching. J. R. C. Brown reported on the program designed to encourage research in smaller colleges, specifically those engaged in teacher training. Further grants are needed to continue these programs since the heavy teaching load of science teachers in smaller colleges frequently prevents these teachers from doing any research. F. B. Dutton gave a summary of the use of special teachers of science and mathematics in grades 5 and 6. Further evaluation will be necessary before a final report can be made.

William P. Viall reviewed the plans of the National Association of State Directors of Teacher Education and Teacher Certification for a national study of certification requirements for teachers of secondary science and mathematics.

Harold E. Wise presided over a panel discussion dealing with the recent Garrett report of certification of secondary science teachers. Pertinent observations made during the discussion included (i) the need for those presently teaching science courses for teachers to up-grade these programs; (ii) integration of what is taught in elementary and secondary science courses with college courses; (iii) greater responsibility by faculty members in matters of teacher certification; (iv) comparable recognition for teaching and for research; and (v) awarding of graduate credit for at least some of the courses taken in the recommended fifth year of training for secondary science teachers.

BROTHER G. NICHOLAS,
Program Chairman

Wednesday, 30 December. Malcolm Smith reported for the Physical Science Study Committee. Smith reviewed the status of the present course in high school physics and referred to the widespread try-out of materials during this school year. He also indicated the availability of films for the course and for teachers. E. G. Begle (Yale University) reviewed the work of the School Mathematics Study Group which has prepared sample textbooks for grades 7 through 12; these books are being used this year by more than 600 teachers in 100 schools on an experimental basis. Teachers are reporting experiences, and revision of the textbooks will be made during the summer of 1960 on the basis of these experiences. Reference was also made to the panels on monographs, teacher education, mathematics for slow students, and mathematics in grades 4–6. Arnold Grobman (University of Colorado), director of the Biological Sciences Curriculum Study, indicated that the first serious writing on the project would be carried on during the summer of 1960 on a basis similar to that used by the physics and mathematics studies. In the meantime, teams are working on teacher education materials, on identification of qualities of gifted biology teachers, and on the goals of biology education from kindergarten through grade 12. B. F. Heller (University of Minnesota, Duluth) reviewed the work of the Teaching Resources Planning Group in Geology held at Duluth last summer. The project is directing its attention to preparation of supplementary materials for elementary and secondary schools. The plan does not call for the recommendation of a year's course in geology in the secondary school. Robert Silber, representing a committee of the Division of Chemical Education of the American Chemical Society, reported on plans for curriculum studies in chemistry and included reference to the Chemical Bonds Approach Project which developed a sample course at Reed College last summer.

JOHN R. MAYOR, *Program Chairman*

National Science Teachers Association (Q6)

The general session of the science teaching societies affiliated with the American Association for the Advancement of Science, held on the morning of 27 December, had as its theme, "Man and space travel." John A. O'Keefe (Theoretical Division, National Aeronautics and Space Administration) presented a paper on the surface of the moon, dealing with the phenomenon of retroreflection. James C. Fowler (Cranbrook Institute of Science) spoke on the place of planetaria in teaching space science.

Concurrent elementary school, junior high school, and senior high school sessions dealing with "Here's how I teach space science" were held that afternoon. These sessions were chaired respectively by Helen J. Challand (National College of Education), Edward Victor (Northwestern University), and John S. Richardson (Ohio State University). These programs, offering practical classroom ideas, have been a popular feature at previous meetings. At the senior high school session a group of able students from Evanston Township High School demonstrated how they learn physics of an extremely advanced nature.

A symposium on K-12 planning, which began on 28 December, under the leadership of Donald G. Decker, president of the National Science Teachers Association, continued through three sessions. At the preliminary meet-

ing, critical problems of curriculum planning were highlighted by a panel of speakers. The problems thus identified were the basis of six concurrent round-table discussions which followed. At the third session, the members of the round-table groups reassembled to summarize their considerations of the problems and issues involved in K-12 curriculum planning. Data collected by a questionnaire prepared by Decker indicated that those present felt (i) that a carefully integrated K-12 program is the aim of science education and (ii) that NSTA should provide leadership in developing such a program to be modified by schools for local use.

J. Myron Atkin (University of Illinois) was chairman of a joint assembly on elementary science teaching problems on 29 December.

On 30 December, Zachariah Subarsky (Bronx High School of Science) presided at an invitational conference providing opportunities for scientists to hear about, discuss, and counsel on the program and activities of the Future Scientists of America Foundation.

MARGARET J. MCKIBBEN,
Program Coordinator

Science Teaching Societies (Q7)

This is the final statement from the general chairman for the 1959 joint meetings of the Science Teaching Societies affiliated with AAAS. From all reports everything proceeded smoothly.

I appreciate the generous cooperation which I received from the officers of the AAAS and the societies, from the committee chairmen, and from members of all committees. I also appreciate the fine cooperation of the Sherman Hotel personnel.

The publicity committee worked hard on their tedious but important task of addressing thousands of letters to the administrators in the adjacent states.

The hospitality committee did a fine job of manning the tables and answering questions. Students from Rosary College and Chicago Teachers College volunteered for these posts.

Because of the decision to use the facilities and services of the Chicago school system for projecting slides, the services of the physical facilities committee were not used to the fullest possible extent.

The success of the coffee hour committee was evident from the large attendance at that function and the apparent enjoyment on the part of those who attended of this period set aside for visiting with friends.

Information on educational tours was mimeographed by the educational tours committee and distributed at the registration desks.

For all these efforts I am deeply grateful. The combined activities and cooperation of many people contributed to the success of the Chicago meeting.

MURIEL BEUSCHLEIN, *Coordinator*

Academy Conference (X1)

The Academy Conference held a very successful and well attended meeting at the Hotel Sherman on 27–28 December. The first session was given over to problems of the Junior Academies of Science. Elnore Stoldt (Jacksonville, Ill.) organized and presided over the program, which featured talks by Harry Bennett (Louisiana Academy of Science), M. S. McCay (Tennessee Junior Academy Program), and C. Leplie Kanatzar (Illinois State Academy of Science).

The president of the conference, A. M. Winchester (Stetson University) presided over the Monday morning session, which featured reports of representatives of the member academies from all over the nation. Interesting discussions were also presented on the methods of application for and utilization of grants from national organizations by John Yarbrough (Meredith College) and Clinton Baker (Southwestern at Memphis). Robert C. Miller (California Academy of Science) was selected as the president elect of the Academy Conference, and E. Ruffin Jones (University of Florida) was re-elected as secretary.

John G. Arnold (Loyola University) presided over the Monday afternoon session which featured problems of the senior academies. Speakers included: W. C. Oelke (Grinnell College), Robert C. Miller (California Academy), Harold Hansen (Minnesota Academy), P. H. Yancey (Alabama Academy), and Wayne Taylor (Michigan Academy).

The dinner meeting on Monday evening was presided over by the retiring president John Yarbrough and featured the presidential address by A. M. Winchester. His topic was "Tribulations of the textbook author."

A. M. WINCHESTER, *President*

Session on junior academies of science. Beginning with the conference at Navy Pier in Chicago 4 years ago, adult leaders of junior academies of science have pursued possibilities for improving

the quality of junior academies, so that those groups might be of greater service to young persons. It seemed fitting at the 1959 meeting, therefore, to focus attention on what has been accomplished and to point out a few of the things that are being done to implement the suggested programs.

For brief review, the recorder for the meeting, H. Neil Hardy (Indiana University Laboratory School), recalled the ten proposals developed at the first meeting and indicated which have been implemented wholly or in part. It was noted that there is still need for more high school teachers to assume positions of leadership in the academies and for more exchange of ideas and information among groups.

Representing the host state, Robert C. Wallace, chairman of the Illinois Junior Academy, was present. As samples of activities of one academy, the chairman of the meeting presented two students, Lynda Hartman and David Lloyd, who were selected by the Illinois Junior Academy to honorary membership in the AAAS for this year. She also presented Earl O. Ehrhardt (Illinois Bell Telephone Company), who described the Businessman's Advisory Committee set up by the Illinois Chamber of Commerce to aid the Junior Academy with advisory and financial contributions from industry and business.

The program consisted of three presentations, two of which concerned programs for state junior academies where National Science Foundation aid is being used. Harry J. Bennett (Louisiana Junior Academy of Science), described the program being followed in Louisiana, and M. S. McCay (Tennessee Junior Academy Program) spoke of the methods used in Tennessee.

Presenting a contrasting method used to encourage participation of young persons in science activities, C. Leplie Kanatzar (Illinois Academy of Science), described his observations of the Young Naturalists' and Young Technicians' Circles, which are the Soviet counterpart of American junior academies of science. To illustrate his talk, he used slides of photographs he made on two visits to the U.S.S.R.

This session was well-attended. Most persons present had attended at least one of the previous meetings that dealt with the junior academies. There was expression of the hope that continued effort will be made to bring these groups into closer contact and to improve their services.

ELNORE STOLDT, *Program Chairman*

Encouraging Women To Select and To Advance in Scientific Careers (X2)

The second conference, cosponsored by Sigma Delta Epsilon and the American Council on Women in Science, met on Monday afternoon, 28 December. Alan T. Waterman, director of the National Science Foundation, the keynote speaker, discussed "scientific womanpower—a neglected resource." He said, "At a time when the extent and quality of our scientific manpower resources are of critical importance we are failing to exploit the potentialities of women for scientific research and the teaching of science. . . . As a nation, we cannot afford this serious waste of intellectual resources. Women's general lack of interest in the scientific and technical fields is traceable to (i) prevailing cultural and social attitudes; (ii) discriminatory practices which deprive them of equal opportunities with men for advancement and recognition; and (iii) the difficulties of combining a professional career with homemaking and motherhood." After questions and discussion from the audience, two group discussions were held simultaneously.

Captain Apollonia Adams, chief of the Division of Nursing Resources, Public Health Service, Department of Health, Education, and Welfare, and Hazel Bishop, president of H–B Laboratories, spoke to one group about problems of the working woman scientist. Captain Adams was moderator of the group discussion.

The other group met with Mary Louise Robbins, department of bacteriology, George Washington University School of Medicine, who discussed undergraduate and graduate training for women in science. Dr. Robbins was moderator of the audience discussion.

The two groups then met together to hear summaries of the two discussions. Commander Ernestine Thurman, Division of Special Grants, National Institutes of Health, reported the discussion on problems of the working woman scientist, and Esther Hand, traveling science teacher, Michigan State University, reported the discussion on undergraduate and graduate training.

ETHALINE CORTELYOU, *Chairman*

Chicago Academy of Sciences (X6)

A symposium on the physiology of reproduction of birds, cosponsored by the Chicago Academy of Sciences and Section F, was held on 28 and 29 December. The Monday sessions, which

were attended by 50 to 60 people, covered the general topics of environmental control of the reproductive system (Wolfson), the role of the hypothalamus (Ralph) and the pituitary (Nalbandov and Harris) in reproduction, the endocrinology of embryos (Watterson, Pincus, Meyer), and the hormonal responses of the female (van Tienhoven) and male (Hilton) reproductive tracts and accessories. These sessions were chaired by McLean and Edgren. The Tuesday sessions were less well attended, 25 to 35 persons; with Beecher and Wolfson in the chair, they covered the effects of the sex hormones on lipid (Pick and Cook) and calcium (McLean) metabolism, a discussion of secondary sex characteristics that might be hormonally controlled (Beecher), and sex behavior and the behavioral effects of sex hormones (Guhl and Lehrman). Although attendance at these sessions was rather small, discussion of the excellent series of papers was animated.

Beecher and his academy staff are to be congratulated for the coffee and other refreshments served during the breaks and for arranging the informal luncheons that allowed continuation of discussions. I was particularly pleased with the exchange of ideas that resulted from gathering ornithologists, naturalists, physiologists, endocrinologists, pharmacologists, and psychologists together in the same room.

RICHARD A. EDGREN, *Secretary and Program Chairman*

Conference on Scientific Manpower (X8)

The Conference on Scientific Manpower met on 28 December to consider the general theme of higher education and training in emerging fields of technology. Morning and afternoon sessions were held, and six papers were presented dealing with specialized fields.

R. D. Maxson (Commonwealth Edison Company and the Western Society of Engineers) served as chairman of the morning session. Harold L. Hazen (Massachusetts Institute of Technology), in discussing engineering education, described the trend toward sound general education with emphasis on science and mathematics; greater depth, generality, and fundamental relationships in advanced science applications; and development of basic intellectual skills, including rigor of analysis, breadth of concept, creativity, and judgment, rather than specific engineering practice. John P. Hagen (National Aeronautics and

Space Administration) reviewed the many fields included in "space sciences" and urged that thorough training in analysis and understanding of the scientific method be included in graduate science training. Gordon A. Riley (Yale University) noted the unusual factors associated with training in oceanography and advocated greater fellowship support for this field.

S. B. Ingram (Bell Telephone Laboratories) presided over the afternoon session. Charles W. Shilling (Atomic Energy Commission) reported on training programs supported by his agency and on the importance of public attitudes in developing excellence. W. R. Hibbard, Jr., (Metallurgy and Ceramics Research Department, General Electric Co.) placed emphasis on the field of metallurgy requirements for quality rather than quantity of trained manpower. Richard D. Greckler (Aerojet-General Corp.), discussing training for work on chemical fuels, urged "teaching the meaning of the fundamental laws of nature."

The conference was again sponsored by the Engineering Manpower Commission, the Scientific Manpower Commission, the National Research Council, the National Science Foundation, and AAAS Section M–Engineering. Papers delivered at the conference will again be published by the NSF. Copies should be available by March.

THOMAS J. MILLS, *Program Chairman*

Sigma Delta Epsilon (X16)

The grand chapter and dinner meeting of Sigma Delta Epsilon was held in the Walnut Room of the Morrison Hotel on 29 December. Approximately 60 attended the luncheon for all women in science on 30 December. Delaphine Wyckoff (Wellesley College) spoke on "Science in education and education in science." She emphasized the importance of scientific training for both girls and boys in the lower grades through college for a better understanding of science in this space age.

Two chapters were established in 1959—Tau, with members in southern California and western Arizona, and Upsilon, at Indiana University. The organization has 20 chapters.

Mary Lou Pritchard (Lincoln, Neb.) has been appointed editor of the *Newsletter*. Betty McLaughlin, (Washington, D.C.) was elected permanent secretary.

The fraternity recommended that one or more grants-in-aid be awarded annually for research especially for older

women who need funds to complete a special project. When funds are available, a larger grant will be made.

A national honorary membership (the highest award in Sigma Delta Epsilon) was awarded to Louise A. Boyd, explorer and author, of San Rafael, Calif. She is known for her exploratory and scientific work in the arctic polar region, Greenland, Spitzbergen, and Franz Joseph Land. In addition to polar research, her interests include geography, geology, botany, and photogrammetry.

ESTHER S. ANDERSON, *President*

Meetings

Forthcoming Events

March

18–19. American Laryngological Assoc., Miami Beach, Fla. (L. Richards, Massachusetts Institute of Technology, Cambridge.)

20–23. American Assoc. of Dental Schools, Chicago, Ill. (R. Sullen, 840 N. Lake Shore Drive, Chicago 11.)

20–26. American Cong. on Surveying and Mapping, Washington, D.C. (C. E. Palmer, American Soc. of Photogrammetry, 1515 Massachusetts Ave., NW, Washington 5.)

20–26. American Soc. of Photogrammetry, Washington, D.C. (C. E. Palmer, ASP, 1515 Massachusetts Ave., NW, Washington 5.)

21–24. American Acad. of General Practice, 12th annual, Philadelphia, Pa. (AAGP, Volker Blvd. at Brookside, Kansas City 12, Mo.)

21–24. Institute of Radio Engineers, natl. conv., New York, N.Y. (L. G. Cumming, IRE, 1 E. 79 St., New York 21.)

22–24. High-Polymer Physics, 20th, Detroit, Mich. (T. L. Smith, American Physical Soc., Stanford Research Inst., Menlo Park, Calif.)

23–25. National Council on Alcoholism, annual, New York, N.Y. (M. Ross, American Psychiatric Assoc., 1700 18 St., NW, Washington 9.)

23–25. Optical Spectrometric Measurements of High Temperatures, symp., Chicago, Ill. (F. Brech, Laboratories for Applied Science, Univ. of Chicago, 6220 S. Drexel Ave., Chicago 37.)

24–25. Human Factors in Electronics, 1st annual symp. (IRE), New York, N.Y. (J. E. Karlin, Bell Telephone Laboratories, Murray Hill, N.J.)

24–26. American Assoc. for the History of Medicine, Charleston, S.C. (J. B. Blake, c/o Smithsonian Institution, Washington 25.)

24–26. Aviation Education, 4th natl. conf., Denver, Colo. (W. Kinkley, Superintendent of Schools, Aurora, Colo.)

26–27. American Psychosomatic Soc., 17th annual, Montreal, Canada. (E. D. Wittkower, APS 265 Nassau Rd., Roosevelt, N.Y.)

28–31. Exploitation of Natural Animal Populations, symp., Durham, England. (E. D. Le Cren, British Ecological Soc., The Ferry House, Ambleside, Westmorland, England.)

29–31. American Power Conf., 22nd annual, Chicago, Ill. (R. A. Budenholzer, Mechanical Engineering Dept., Illinois Inst. of Technology, 3300 Federal St., Chicago 16.)

29–2. National Science Teachers Assoc., 8th annual conv., Kansas City, Mo. (Miss M. R. Broom, NSTA, National Education Assoc., 1201 16 St., NW, Washington 4.)

30–31. Adrenergic Mechanisms, Ciba Foundation symp. (by invitation only), London, England. (G. E. W. Wolstenholme, Ciba Foundation, 41 Portland Pl., London, W.1, England.)

31–1. Continuous Culture of Microorganisms, symp., London, England. (R. Elsworth, c/o Ministry of Supply, Microbiological Research Establishment, Porton, Salisbury, Wilts., England.)

31–2. American Gastroenterological Assoc., New Orleans, La. (W. Volwiler, Dept. of Medicine, Univ. of Washington, Seattle.)

April

1–3. American Soc. of Internal Medicine, San Francisco, Calif. (R. L. Richards, 350 Post St., San Francisco 8.)

1–3. American Soc. for the Study of Sterility, Cincinnati, Ohio (H. H. Thomas, 920 S. 19 St., Birmingham 5, Ala.)

1–4. Bahamas Medical Conf., Nassau. (B. L. Frank, P.O. Box 4037, Fort Lauderdale, Fla.)

2. Paleontological Research Institution, Ithaca, N.Y. (Miss R. S. Harris, 126 Kelvin Pl., Ithaca.)

2–6. American College of Obstetrics and Gynecologists, Cincinnati, Ohio. (D. F. Richardson, 79 W. Monroe St., Chicago 3.)

3–6. American Surgical Assoc., White Sulphur Springs, W.Va. (W. A. Altemeier, Cincinnati General Hospital, Cincinnati, Ohio.)

3–7. International Anesthesia Research Soc., Washington, D.C. (A. W. Friend, E. 107 St. and Park Lane, Cleveland 6, Ohio.)

3–8. Nuclear Cong., New York, N.Y. (P. Lange, Engineers Joint Council, 29 W. 39 St., New York.)

4–5. Solar Energy, symp., Gainesville, Fla. (J. C. Reed, Mechanical Engineering Dept., Univ. of Florida, Gainesville.)

4–6. American Inst. of Electrical Engineers, Houston, Tex. (N. S. Hibsham, AIEE, 145 N. High St., Columbus 15, Ohio.)

4–6. American Inst. of Mining, Metallurgical and Petroleum Engineers (43rd Natl. Open Hearth Steel Conf. and Blast Furnace, Coke Oven and Raw Materials Conf.), Chicago, Ill. (E. O. Kirkendall, AIME, 29 W. 39 St., New York 18.)

4–6. American Oil Chemists' Soc., Dallas, Tex. (Mrs. L. R. Hawkins, AOCS, 35 E. Wacker Drive, Chicago 1, Ill.)

4–6. Chemical and Petroleum Instrumentation Symp., 3rd natl., Rochester, N.Y. (Director, Technical & Educational Services, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.)

4–7. Atomic Exposition, New York, N.Y. (Atomic Exposition, 117 S. 17 St., Philadelphia, Pa.)

4–8. American College of Physicians, annual, San Francisco, Calif. (M. Ross, American Psychiatric Assoc., 1700 18 St., Washington 9.)

4–8. American Meteorological Soc., 3rd applied meteorology conf., Santa Barbara, Calif. (H. G. Houghton, AMS, Dept. of Meteorology, Massachusetts Inst. of Technology, Cambridge 39.)

4–8. American Soc. of Mechanical Engineers, New York, N.Y. (D. B. MacDougall, ASME, 29 W. 39 St., New York.)

4–9. American College of Physicians, San Francisco, Calif. (E. R. Loveland. 4200 Pine St., Philadelphia 4.)

5–7. Instrument Soc. of America (Natl. Chemical and Petroleum Symp.), Rochester, N.Y. (H. S. Kindler, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.)

5–7. Naval Structural Mechanics, 2nd symp., Providence, R.I. (E. H. Lee, Brown Univ., Providence.)

5–14. American Chemical Soc., natl., Cleveland, Ohio. (A. T. Winstead, ACS, 1155 16 St., NW, Washington 6.)

6–8. Biochemistry and Pharmacology of Compounds Derived from Marine Organisms, symp., New York, N.Y. (R. F. Nigrelli,. Dept. of Marine Biochemistry and Ecology, New York Aquarium, Seaside Park, Eighth St. and Surf Ave., Brooklyn 24, N.Y.)

6–8. Hyper-Environments—Space Frontier (Inst. of Environmental Scientists), Los Angeles, Calif. (M. S. Christensen, IES, 6251 Marita St., Long Beach 15, Calif.)

6–8. Radiofrequency Spectroscopy Group, Nottingham, England. (J. E. Ingram, RSG, c/o Dept. of Electronics. Telecommunications and Radio Engineering, Univ. of Southampton, England.)

6–8. Structural Design of Space Vehicles, conf., Santa Barbara, Calif. (A. F. Denham, 925 Book Bldg., Detroit 26, Mich.)

6–9. Mineral Processing, intern. cong., London, England. (B. W. Kerrigan, Institution of Mining and Metallurgy, 44 Portland Pl., London, W.1, England.)

7–8 Cathode Protection, European symp., Frankfort am Main, Germany. (Secrétariat du Symposium, Deutsche Gesellschaft fur Metallkunde, Alteburgerstrasse 402, Koln-Marienburg, Germany.)

7–9. American Assoc. of Railway Surgeons, Chicago, Ill. (C. C. Guy, 5800 Stoney Island Ave., Chicago 37.)

7–9. Association of Surgeons of Great Britain and Ireland, Birmingham, England. (F. A. R. Stammers, 47 Lincolns Inn Fields, London, W.C.2, England.)

7–9. Optical Soc. of America, Washington, D.C. (K. S. Gibson, OSA, Natl. Bureau of Standards, Washington 25.)

8–9. American Assoc. of University Professors, Detroit, Mich. (P. R. David, Univ. of Oklahoma, Norman.)

8–9. New Mexico Acad. of Science, Socorro. (K. G. Melgaard, P.O. Box 546, University Park, N.M.)

8–9. Southern Soc. for Philosophy and Psychology, Biloxi, Miss. (E. Henderson, Florida State Univ. Tallahassee.)

8–11. American Dermatological Assoc., Boca Raton, Fla. (W. M. Sams, 308 Ingraham Bldg., Miami 32, Fla.)

9–10. Histochemical Soc., 11th annual, New York, N.Y. (H. W. Deane, Albert Einstein College of Medicine, Bronx 61, N.Y.)

10–11. American Soc. for Artificial Internal Organs, Chicago, Ill. (C. K. Kirby, ASFAIO, 3400 Spruce St., Philadelphia 4, Pa.)

11–13. American College of Surgeons, Minneapolis. Minn. (H. P. Saunders, 40 E. Erie St., Chicago 11, Ill.)

11–13. Forest Tree Growth, intern. conf., Tucson, Ariz. (Forest Tree Growth Conf., Laboratory of Tree-Ring Research, Univ. of Arizona, Tucson.)

11–14. American College Personnel Assoc., Philadelphia, Pa. (M. D. Hardee, Florida State Univ., Tallahassee.)

11–14. American Meteorological Soc., 8th weather radar conf., San Francisco, Calif. (H. G. Houghton, AMS, Dept. of Meteorology, Massachusetts Inst. of Technology, Cambridge 39.)

11–15. American Assoc. of Immunologists, Chicago, Ill. (C. Howe, Columbia Univ., College of Physicians and Surgeons, New York 22.)

11–15. American Inst. of Nutrition, Chicago, Ill. (G. M. Briggs, Div. of General Medical Sciences, National Institutes of Health, Bethesda, Md.)

11-15. American Physiological Soc., Chicago, Ill. (R. G. Daggs, 9650 Wisconsin Ave., NW, Washington 14.)

11–15. American Soc. for Experimental Pathology, Chicago, Ill. (F. J. A. McManus, Univ. of Alabama Medical Center, Birmingham.)

11–15. American Soc. for Pharmacology and Experimental Therapeutics, Chicago, Ill. (K. H. Beyer, Merck Sharp & Dohme Research Laboratories, West Point, Pa.)

11–15. Federation of American Socs. for Experimental Biology, Chicago, Ill. (M. O. Lee, 9650 Wisconsin Ave., NW, Washington 14.)

11–16. American Assoc. of Anatomists, New York, N.Y. (L. B. Flexner, Dept. of Anatomy, School of Medicine, Univ. of Pennsylvania, Philadelphia 4.)

11–16. American Soc. of Biological Chemists, Chicago, Ill. (F. W. Putnam, Dept. of Biochemistry, Univ. of Florida, Gainesville.)

11–16. Anatomical Congress, 7th intern., New York, N.Y. (D. W. Fawcett, Dept. of Anatomy, Harvard Medical School, Boston 15, Mass.)

11–16. Congress of Anatomy, 7th intern., New York, N.Y. (J. C. Hinsey, New York Hospital, Cornell Medical Center, 525 E. 68 St., New York 21.)

11–16. International Anatomical Cong., New York, N.Y. (D. W. Fawcett, Dept. of Anatomy, Cornell Univ. Medical College, 1300 York Ave., New York 21.)

13–15. American Public Health Assoc. (Southern Branch), Memphis, Tenn. (L. M. Groves. Shelby County Health Dept., Memphis.)

14–16. Pennsylvania Acad. of Science, Williamsport. (K. B. Hoover, Messiah College, Grantham, Pa.)

15–16 Eastern Psychological Assoc., Atlantic City, N.J. (C. H. Rush, Standard Oil Co. (N.J.), Rockefeller Plaza, New York, N.Y.)

18–19. Radioactivity in Man, Measurements and Effects of Internal Gamma Ray Emitting Radiosotopes, AAAS symp., Nashville, Tenn. (G. R. Meneely, School of Medicine, Vanderbilt Univ., Nashville 5.)

18–21. American Astronomical Soc., Pittsburgh, Pa. (J. A. Hynek, Smithsonian Astrophysical Observatory, 60 Garden St., Cambridge 38, Mass.)

18–22. Association of American Geographers, Dallas, Tex. (A. C. Gerlach, Map Div., Library of Congress, Washington 25.)

18-22. European Soc. of Ophthalmology, 1st cong., Athens, Greece. (P. Velissaropoulis, c/o Ophthalmology Clinic, Faculty of Medicine, 26, rue de l'Université, Athens, Greece.)

19–21. Active Networks and Feedback Systems, 10th intern. symp., New York, N.Y. (H. J. Carlin, Microwave Research Inst., Polytechnic Inst. of Brooklyn, 55 Johnson St., Brooklyn 1, N.Y.)

19–21. American Soc. of Lubrication Engineers, annual, Cincinnati, Ohio. (C. L. Willey, ASLE, 84 E. Randolph St., Chicago, Ill.)

19–22. Metallurgy of Plutonium—session on nuclear fuels, intern. symp., Grenoble, France. (Société Française de Métallurgie, 25, rue de Clichy, Paris, France.)

20–22. Biological Waste Treatment, 3rd conf., New York, N.Y. (W. W. Eckenfelder, Dept. of Civil Engineering, Manhattan College, New York 71.)

20-22. Manned Space Stations, Inst. of the Aeronautical Sciences symp., Los Angeles, Calif. (E. Levin, Rand Corp., 1700 Main St., Santa Monica, Calif.)

New Products

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither Science *nor the writer assumes responsibility for the accuracy of the information. A coupon for use in making inquiries concerning the items listed is included in the post card insert.*

■ PLASMA GENERATOR supplies a continuous flow of air at temperatures up to 18,000°F with pressures characteristic of the hypersonic re-entry of ballistic missiles. Gases are heated in passing through a 20 to 1000 kw arc. (Avco Research and Advanced Development Division, Dept. Sci320, 201 Lowell St., Wilmington, Del.)

■ FUNCTION GENERATOR operates essentially as an adjustable nonlinear potentiometer and will produce any mathematical or empirical curve with 34-chord accuracy. Curves may be generated singly with ten shaft turns or as continuous repetitive functions with unidirectional shaft rotation. Adjustments can be made while the instrument is operating. Each voltage level is selectable to within ±0.5 percent of desired value. (Perkin-Elmer Corp., Dept. Sci-346, Norwalk, Conn.)

■ X-RAY MOTION-PICTURE CAMERA operates as auxiliary equipment to the x-ray generator by photographing the output of an image amplifier tube that in turn intensifies the output of an x-ray excited phosphor. The camera is equipped with an $f/0.95$ lens of 25-mm focal length. Exposure of the patient is minimized by a device that limits x-ray exposure to periods of frame sequence. Four frame rates from 7.5 to 60 per second are provided. (Photomechanisms, Inc., Dept. Sci353, 6 West 18 St., Huntington Station, L.I., N.Y.)

■ VARIABLE DELAY LINES consist of a continuously variable delay line that can achieve a smallest incremental delay less than 0.08 mμsec, and a step-variable delay line serving as coarse control with total delay up to 32 μsec. Rise time is less than 7 percent of the time delay. Output impedance of the 32 μsec total delay model is 1300 ohm. (Ad-Yu Electronics Lab Inc., Dept. Sci359, 249 Terhune Ave., Passaic, N.J.)

■ LIQUID SENSOR is designed to detect the presence or absence of liquid at a probe sensing point. In operation, a light beam originating within the probe assembly travels through the probe and into the liquid. In the absence of liquid, the probe tip internally reflects the light beam, causing a relay to be energized. In the presence of liquid the light beam is diffused into the liquid. (Pioneer-Central Div., Bendix Aviation Corp., Dept. Sci368, Davenport, Iowa.)

■ AUDIOMETER with record playback and desk speaker permits the operator to make 13 major pure tone and speech tests. The audiometer includes a Wien bridge oscillator with a tone interrupter with 0.1-sec rise and decay time without click. Frequency range is 125 to 8000 cy/sec. A masking control is calibrated in effective masking at 1000 cy/sec. Various accessories are available. (Zenith Radio Corp., Dept. Sci-364, 6001 W. Dickens Ave., Chicago 39, Ill.)

■ GLASS-CERAMIC FRIT can be used to seal aluminosilicate glasses to themselves, to molybdenum, or to tungsten, and to seal molybdenum and tungsten to themselves. Sealing and service temperature is 750°C. It can be used also with other materials, with expansion coefficients in the range 40 to 50×10^{-7}, that can withstand the sealing temperature. (Corning Glass Works, Dept. Sci-366, Corning, N.Y.)

■ SYRINGE is gas-tight for use with corrosive liquids. The syringe incorporates a stainless-steel plunger, coated with Kel-F, and a Teflon gasket. Plunger movement is said to be stiff but smooth. Leak-proof range is 20 mm-Hg to 3 atm. Calibration of scales is said to be accurate to ±1 percent or better. (Hamilton Co., Inc., Dept. Sci367, Box 307, Whittier, Calif.)

■ VIBRATION METER is a battery-powered, transistorized unit that reads directly displacement, velocity, and acceleration of vibration. The instrument accepts simultaneously outputs of three velocity pickups and three crystal accelerometers, one output at a time being selected as desired. Acceleration is measured to 1000 grav, velocity from 0.01 to 100 in./sec, and displacement from 0.001 to 10 in., all with ±5 percent accuracy. Plug-in filters may be switched in to remove low-frequency components. (Southwestern Industrial Electronics Co., Dept. Sci360, 10201 Westheimer Rd., Houston 19, Tex.)

■ PRESSURE SWITCHES are designed for single pole, single throw switching of electrical circuits in response to pressure changes in fluids. Switch mechanism is isolated from the pressure medium. Ranges available are 1 to 500 lb/in.^{2} gage. Electrical rating is 100 ma inductive, 200 ma resistive. (Bourns Inc., Dept. Sci374, P.O. Box 2112, Riverside, Calif.)

■ PLOTTING BOARD is available in two models designed to plot one d-c analog signal, or two signals simultaneously, on a 30- by 30-in. surface. The completely transistorized instrument consists of a plotting assembly and control panel with the plotting surface in any position de-

sired, from horizontal to vertical. Maximum plotting sensitivity is 20 in./volt and plotting speed is 30 in./sec with maximum acceleration 250 in./sec^2 on the x-axis and 1000 in./sec^2 on the y-axis. Input impedance is 1 megohm or greater on all sensitivity settings. Dynamic accuracy and linearity are said to be ±0.05 percent of full scale at speeds up to 10 in./sec. Larger plotting surfaces can be furnished in multiples of the standard 30 by 30 in. (Computer Systems, Inc., Dept. Sci361, 611 Broadway, New York 12, N.Y.)

■ ELECTRONIC VOLTMETER measures either true r.m.s., peak, or average values of voltage over the frequency range 2 to 200,000 cy/sec. Accuracy is said to be ±0.5 db for r.m.s. indication of signals with crest factors up to 5 and over a 20-db dynamic range. (B & K Instruments, Inc., Dept. Sci362, 3044 W. 106 St., Cleveland 11, Ohio)

■ FLOWMETER uses the thermal-conductivity-bridge principle to measure and control the flow of liquids or gases. The sensing elements are on the outside of thin-wall, stainless-steel flow tubes. Gas flow is measured from 0 to 5 cm^3/min (hydrogen or equivalent). Liquid flow is measured in ranges from 0 to 1 cm^3/hr to 0 to 100 cm^3/min (water or equivalent). Accuracy is said to be ±1 percent and repeatability better than ±0.5 percent. Pressure up to 2000 lb/in.^{2} and temperatures to 170°F are permissible. (Thermal Instrument Co., Dept. Sci363, Box 72, Cheltenham, Pa.)

■ FLAME DETECTOR employs an ultraviolet sensor to distinguish between an actual flame and a hot refractory. The detector is said to be usable with any 2- to 4-sec flame rectification relay. (Minneapolis-Honeywell Regulator Co., Dept. Sci371, 2747 Fourth Ave. South, Minneapolis 8, Minn.)

■ MICROSCOPIC FINDER enables the microscopist to relocate a point of interest on a slide. The finder is a glass slide marked over its top surface in such a way that a reference position can be deduced by direct reading, the relationship between the reference pattern and the locating edges being the same for all finders. The pattern subdivides the slide into 1-mm squares that are further subdivided into a central ring and four segments. Reference letters and numbers identify each area. (Eric Sobotka Co., Dept. Sci372, 110 W. 40 St., New York 18, N.Y.)

■ SIGNAL GENERATOR furnishes sine-wave output from 100 cy to 100 kcy/sec. Accuracy of any frequency is said to be ±0.02 percent or better. Frequency setting is accomplished by five decimal rotary selector switches. The

selected frequency is available within 1 second after the setting is made. Signal amplitude is adjustable from 0 to 20 volts peak-to-peak. Distortion ranges from a nominal 5 percent to 10 percent in some regions. (Digital Instrument Laboratories, Dept. Sci373, 5115 Via Corona, Los Angeles 22, Calif.)

■ TEMPERATURE TEST CHAMBER is a 30-ft³ chamber provided with two full-opening doors on opposite sides of the chamber, each with a 24 by 24 in. viewing window. The chamber is designed for both low and high temperatures. Casters provide mobility. (Conrad Inc., Dept. Sci370, 141 Jefferson St., Holland, Mich.)

■ TAPE PERFORATOR is available in two models for fanfold tape and for reel tape. Punching rate is 60 characters per second. Tape widths up to eight channels are accepted. The perforator prepares tape from keyboards, tape reproducers, digital counters, and digital data-handling systems. Minimum time interval between perforating cycles is 16⅔ msec. (Tally Register Corp., Dept. Sci375, 5300 14th Ave., N.W., Seattle 7, Wash.)

■ LEVELER AMPLIFIER holds radio-frequency output from single-frequency or swept microwave sources constant within ±0.1 db at a fixed frequency. The amplifier is also a broad-band attenuator with 30 db dynamic range over which power is constant. Input may be 3 mv to 1 volt. Output is 100 volts (max.). Frequency response is d-c to 100 kcy/sec. (Alfred Electronics, Dept. Sci376, 897 Commercial St., Palo Alto, Calif.)

■ INFRARED ABSORPTION CELL, primarily designed for solvent-compensation applications, is a wedge-cavity variable pathlength cell produced from a block of rock salt by ultrasonic machining. The block is mounted to move transversely to the spectrometer beam for path selection. (Connecticut Instrument Corp., Dept. Sci377, Wilton, Conn.)

■ GAIN CONTROL for accelerometers converts all accelerometer sensitivities to a uniform 1 volt/grav. The device includes a cathode-follower input and a variable-gain amplifier. Accelerometer sensitivity is set on a dial to select appropriate gain. (Unholtz-Dickie Corp., Dept. Sci378, 2994 Whitney Ave., Hamden 17, Conn.)

■ SOUND AND VIBRATION ANALYZER covers the frequency range 2.5 cy to 25 kcy/sec with a 10-to-1 span on each of four ranges. The analyzer is a tunable voltmeter whose band width is a constant percentage of the center frequency. Band width may be 1/3 octave, 8 percent, or full pass. The 8-percent re-

sponse provides 40 db discrimination one octave removed and is uniform ±2 db over the entire tuning range; the 1/3 octave response is uniform ±4 db; and the full-pass response is uniform ±2 db. (General Radio Co., Dept. Sci386, West Concord, Mass.)

■ PEAK ACCELEROMETER uses a barium-titanate transducer connected to an amplifier and indicator unit that retains the peak reading for 15 sec for shock measurements or follows peak acceleration when used for vibration measurement. Four ranges cover acceleration to 1000 grav. (Ferranti Electric Inc., Dept. Sci390, 95 Madison Ave., Hempstead, N.Y.)

■ NUMERICAL POSITION-CONTROL EQUIPMENT is designed for rapid point-to-point positioning of machine tools and allied equipment in Cartesian or polar coordinates. Measurement of position is accomplished by means of linear or circular grating of pitch suitable for the accuracy required. Standard 11/16-in. punched tape is used for input with blocks of information read simultaneously rather than single characters. (Ferranti Electric Inc., Dept. Sci382, 95 Madison Ave., Hempstead, N.Y.)

■ TRITIUM MONITOR detects 10^{-12} c/ml of tritium in air. Four ranges of 10^{-11} to 10^{-14} amp full scale correspond to about 2.0 to 0.002 rep integrated dose per hour. Ion chamber volume is 850 cm^3. Zero drift is less than 5×10^{-16} amp in 24 hr. Short-period noise is less than 4.0×10^{-16} amp r.m.s. from natural radioactivity. (Applied Physics Corp., Dept. Sci384, 2724 South Peck Rd., Monrovia, Calif.)

■ CHROMATOGRAPH performs continuously unidimensional paper-chromatography separations. The solution to be separated is deposited on the upper edge of a slowly rotating vertical paper cylinder. Twenty-eight funnels and collecting tubes, arranged in a circle, receive the separated fractions from the serrated lower edge of the paper. As a result of the cylinder rotation, each fraction is characterized by a unique slope of its path from source point to collector, the slope being a function of the rate of migration down the paper. Four rotational speeds are selectable from 1 to 4 rev/24 hr. (Arthur S. LaPine and Co., Dept. Sci365, 6001 S. Knox Ave., Chicago 29, Ill.)

■ RECORDING SYSTEM of modular design is available in four-, six-, and eight-channel models recording on either roll charts or folded charts. A choice of five interchangeable preamplifiers is offered. The basic unit is mounted in a standard, 19-in., caster-mounted relay rack. (Epsco, Inc., Dept. Sci380, 588 Commonwealth Ave., Boston 15, Mass.)

■ TAPE EDITING CONSOLE for paper tape consists of a numerical keyboard, a control and comparison section with six-digit decimal readout, two tape readers, and one tape perforator. Tape may be produced from source data entered at the keyboard, or it may be reproduced from a master tape placed in one of the readers. Tape verification is accomplished either through keyboard re-entry or through comparison in the two read stations. Tape-to-tape duplication and verification can be performed at 60 characters per second. Standard tape widths 0.687, 0.875, and 1.000 in. are accommodated. (Tally Register Corp., Dept. Sci335, 5300 14th Ave. N.W., Seattle 7, Wash.)

■ SIGNAL GENERATOR covering the frequency range 1300 to 2500 Mcy/sec can be frequency modulated by application of external signals having modulation band widths up to 500 kcy/sec. A nominal 2-Mcy/sec peak-to-peak deviation is produced by a modulating amplitude of 1.0 volt peak-to-peak. Radio-frequency output is adjustable between 0 and −110 dbm. Deviation linearity is 1 percent. (Sierra Electronic Corp., Dept. Sci388, 3885 Bohannon Drive, Menlo Park, Calif.)

JOSHUA STERN
National Bureau of Standards, Washington, D.C.

Letters

(Continued from page 474)

cal diagnosis that is covered in the article "Reasoning foundations of medical diagnosis," by R. S. Ledley and L. B. Lusted [*Science* **130**, 9 (1959)]. In that article mathematical methods are used to separate basically quantitative values from the so-called "intangibles" or value decisions frequently required of the physician that involve moral, ethical, social, and economic considerations of great complexity. As pointed out in that article, the use of the computer might "enable the physician to define more clearly the intangibles involved and therefore enable him to concentrate full attention on the more difficult judgments."

However I am afraid the computer cannot be of aid in the "interpersonal relationship between the physician and the patient," as Hoffmann puts it, unless of course we stretch a point and say that any assistance a computer may give the physician in making a more precise diagnosis and a more scientific determination of the plan of treatment will tend to improve physician-patient relationships in general.

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Cardiotachometer

In a report by Rowley, Głagov, and Stoner published in *Science* [**130**, 976 (1959)], entitled "Measurement of human heart rate during usual activity," the authors stated, "Quantitative data on heart rate in beats per many minutes to many hours during various kinds of activity and work are not available."

It is apparent that the authors are unfamiliar with past developments in this field. In 1929, the late Ernst P. Boas developed the "cardiotachometer," which was designed to take continuous records of the heart rate for periods of hours or days. The many papers relating to this development were summarized in a text, *The Heart Rate* (Thomas, Springfield, Ill., and Baltimore, 1932). Since that time the device has been used extensively in many countries of the world and has been incorporated in many diagnostic and research tools.

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We should like to express our gratitude to Norman F. Boas for calling our attention to the outstanding work of the late Ernst P. Boas, who published a detailed description of his cardiotachometer in 1928 ["The cardiotachom-

eter, an instrument to count the totality of heart beats over long periods of time," *A.M.A. Arch. Internal Med.* **41**, 403 (1928)]. The instrument was about the size of a present-day electrocardiograph; precordial electrodes, held in place by straps encircling the chest, were connected to the cardiotachometer by long lead wires.

The miniature heartbeat counter described by us in *Science* is completely self-contained and will permit epidemiologic studies which were not possible with the cardiotachometer developed by Boas.

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Metric System

The American Geophysical Union's Special Committee for the Study of the Metric System in the United States noted your publication of our letter to the editor and its accompanying questionnaire [*Science* **129**, 532 (27 Feb. 1959)]. The committee appreciates your presenting this matter to your readers. It wishes, also, to thank the readers who aided the committee by a generous return of completed questionnaires. Many of the replies included letters containing helpful suggestions and offering financial assistance.

In the September 1959 *Transactions of the American Geophysical Union* your readers will find a full report of the committee, together with an analysis of the replies to the questionnaire received as of July. At this writing, three months later, 1080 have been analyzed. The fields of science and engineering were quite well covered by publication of the letter or questionnaire, or both, in eight leading journals and magazines in the United States. In reply to the most significant question, as to whether it would be desirable to replace the English system by the metric as the "only official system" of weights and measures in the United States, 90 percent replied in the affirmative. The average period of transition suggested was about 22 years; this indicates agreement with the committee on the necessity for a long transition period to avoid economic dislocation. Such a transition period would permit time for education in the schools, normal retirement of presently active older personnel, and normal obsolescence of existing equipment.

The Congress of the United States, for the first time in nearly 30 years, is faced with a decision in this matter. House bill HR7401, introduced last

May by Representative Brooks of Louisiana, and Senate bill S2420, introduced in July by Senator Neuberger, both call for a feasibility study of the problem by an appropriate government agency, with authorization of funds. Also of interest was the introduction in July 1959, by Representative Fulton, of House Concurrent Resolution 364, which would place Congress on record as favoring adoption of the metric system.

It is apparent that the United States must soon decide whether to change over gradually, during the next generation, to a far simpler and more logical system of weights and measures or to continue to be counted with the remaining 10 percent of the world's population that is not yet under the metric system.

Note added in proof. A revised report on the larger number of questionnaires is contained in the December 1959 *Transactions of the American Geophysical Union.*

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Time of Planet Formation

Reynolds (*1*) has recently observed high relative concentrations of Xe^{129} in the chondritic meteorite which fell in Richardton, N.D., in 1919. He correctly attributes this isotope to the decay of fossil I^{129} and derives a time of formation of the meteorite 3.5×10^8 years after element formation. This is to be compared to 2.7×10^8 years for the formation of the earth, according to Katcoff, Schaeffer, and Hastings (*2*), who base their calculations on data for terrestrial xenon, and to 3 to 5×10^8 years for the formation of the moon (*3*).

While in the article on the lunar atmosphere (*3*) several mechanisms were considered and three were selected as indistinguishable upon the basis of available information, the new data strongly support the I–Xe mechanism. It is therefore probable that the rare lunar atmosphere is nearly pure Xe^{129}.

The coincidence of these three ages gives strong support to the hypothesis that the planets were formed in a relatively short period, and to the Moulton and Chamberlain planetesimal hypothesis.

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2. S. Katcoff, O. A. Schaeffer, J. M. Hastings, *Phys. Rev.* **82**, 688 (1951).
3. W. F. Edwards and L. B. Borst, *Science* **127**, 325 (1958).