

# SCIENCE

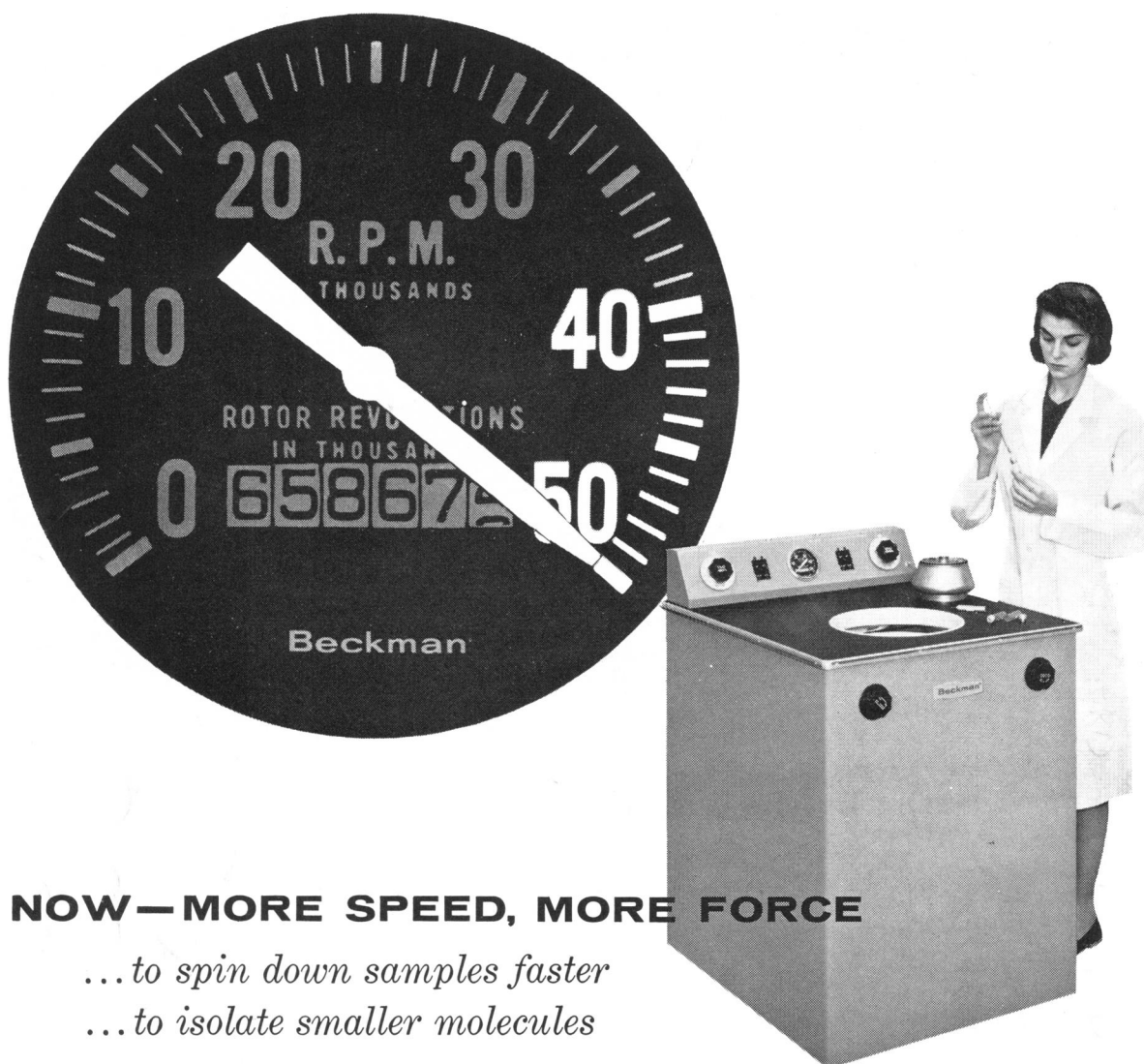
8 December 1961

Vol. 134, No. 3493

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Preconvention Issue



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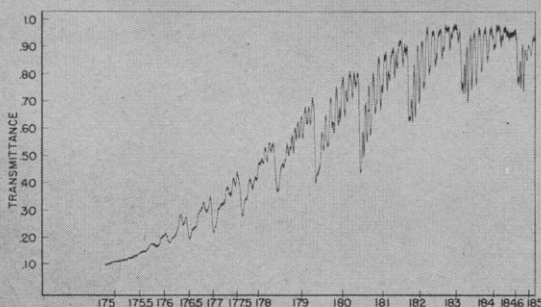
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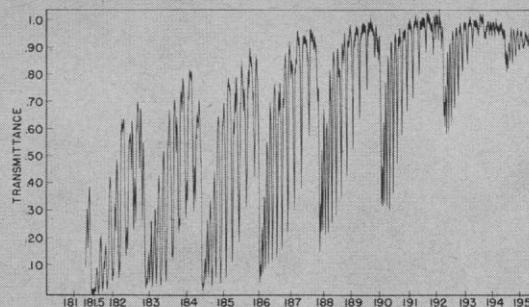
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<b>Cover</b>	One of the dunes in the Great Sand Dunes National Monument, near Alamosa, Colorado. [National Park Service]	

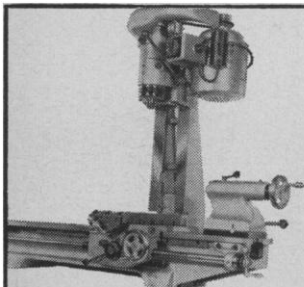
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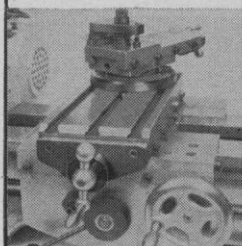
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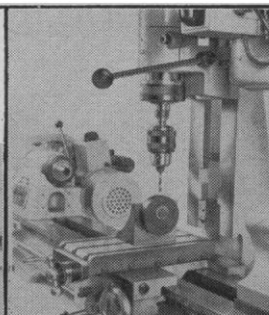
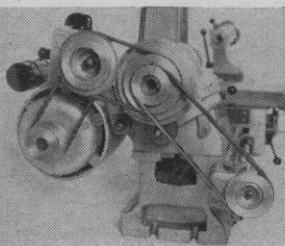


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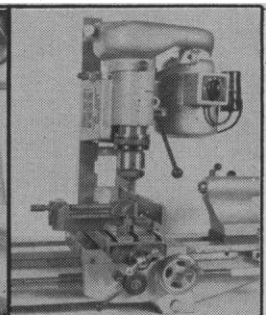
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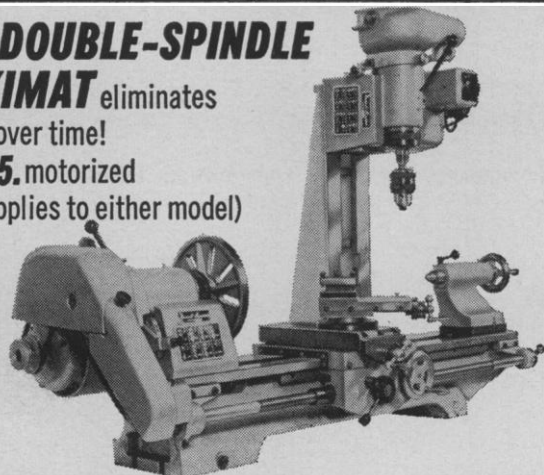


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Table, cross feed	6 1/4"
Table, longitudinal feed	19 3/8"
6-bearing Headstock Spindle	
Hole through spindle	9/16"
Headstock spindle taper	Morse, No. 2
Collet capacity	9/16"
No. of thread pitches available (Inch, metric, and diametrical pitch threads)	82



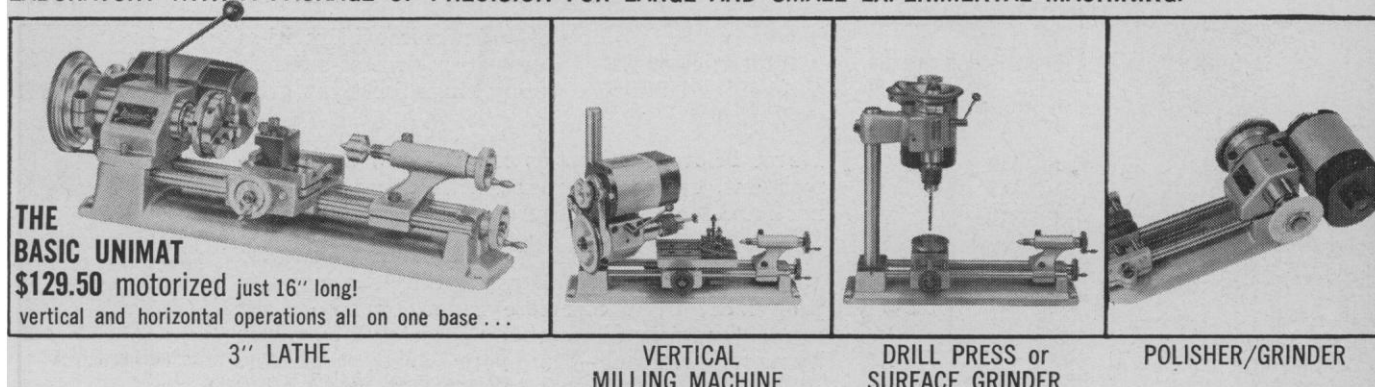
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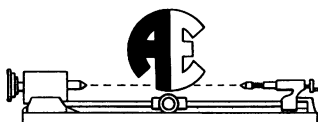
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*Edited by W. H. TALIAFERRO and  
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Volume 1, December 1961, 423 pp.,  
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Advances in

### MATHEMATICS

(Published in parts)

*Edited by HERBERT BUSEMANN*  
Volume 1, Fascicle 1, December 1961,  
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Proceedings of the IUB/IUBS Symposium,  
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*Edited by LUKE C. L. YUAN and  
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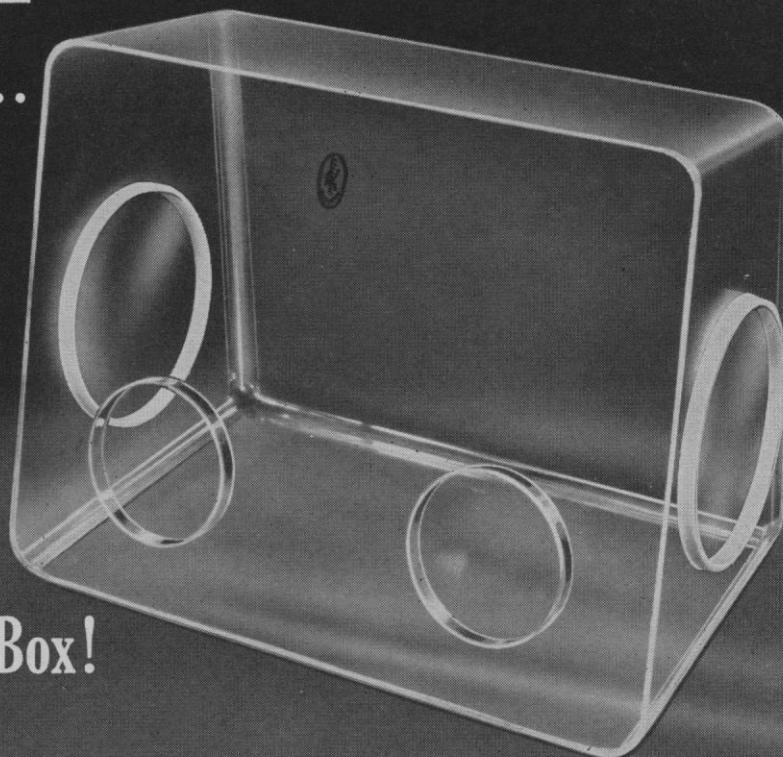
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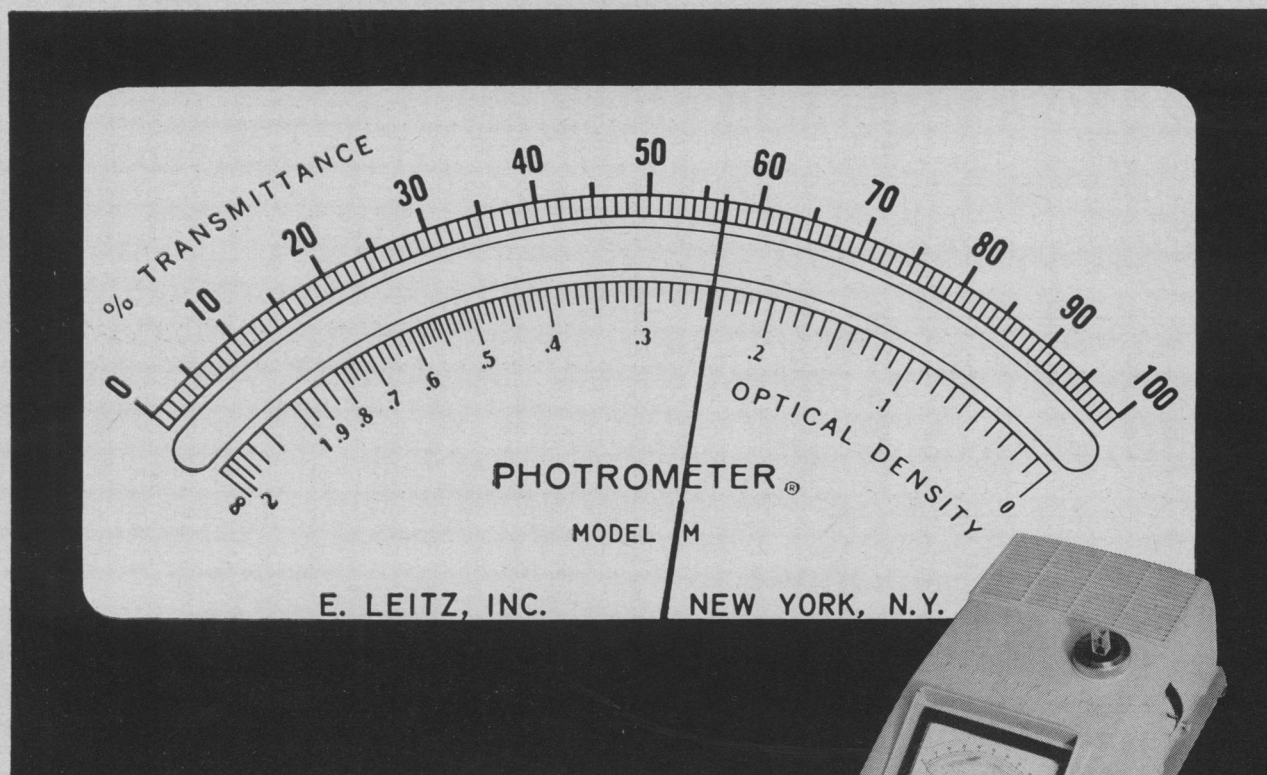
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Ref. 1. Fawcett, Ciotti, & Kaplan, *Biochimica et Biophysica Acta*, 54, 210-212, (1961).

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**2. TRIZMA® HCl**

The completely neutralized crystalline Hydrochloride of Tris. Another "First" for Sigma! Yields a pH of about 4.7 in aqueous solution, but has no buffering capacity as is. Useful buffering range is between pH 7 and pH 9. So adjustment is made with Trizma-Base or other alkali.

**3. TRIZMA® BASE  
and TRIZMA® HCl  
BLENDING**

For those who want to quickly prepare a Tris Buffer at any pH between 7.0 and 9.0, without using an acid or pH meter, we suggest they get thoroughly familiar with the convenience and flexibility of the Trizma Blending Tables and Curves which are now available. By mixing known quantities of crystalline Trizma-Base and Trizma-HCl, any desired pH will result. Simply change the proportion to change the pH. Extreme accuracy is possible if the reagents are thoroughly desiccated before weighing.

**4. TRIZMA® HCl  
PRE-SET pH**

This is quite an accomplishment (in our opinion). Imagine being able to dissolve a single Tris salt in water with complete confidence that it will yield a buffer at a certain pH! No need to check it with a pH meter (unless of course you want to see if your pH Meter is accurate!). Yet that is what you can do with our "pre-Set pH-Trizma".

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**5. TRIZMA®  
MALEATE**

Crystalline Tris-maleate. Another "First for Sigma!" Yields a pH of about 4.7 in aqueous solution, but has no buffering capacity as is. Adjustment is made with Trizma-Base or other alkali. The Maleate is better than the HCl salt for certain applications. For example, useful buffers can be prepared as low as pH 5.5. Also it is applicable when chlorides must be avoided.

**6. Temperature Effect  
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Effect**

Accurate Curves are available showing graphically how the pH will change as temperature or concentration is varied. In fact many laboratories would do well to familiarize themselves with the very significant "Temperature Coefficient" of Tris. All too frequently it is ignored and buffers standardized at room temperature are used at 37°C resulting in an inadvertent change in pH.

In the near future we hope to complete the blending tables for TRIZMA MALEATE and many other Tris salts of biochemical interest. If interest develops, we will also offer TRIZMA MALEATE PRE-SET-PH compounds.

Much of our work on Trizma has been condensed into our new free Technical Bulletin No. 106A which we hope will be ready by January 1, 1962. Inquiries, suggestions, and criticism are invited.

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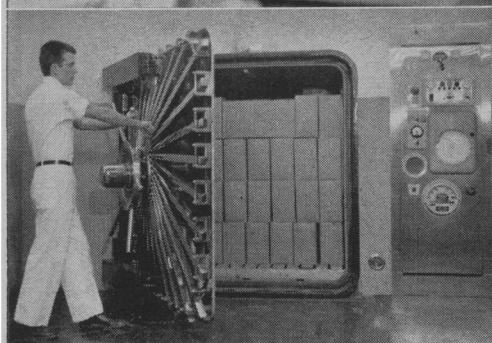
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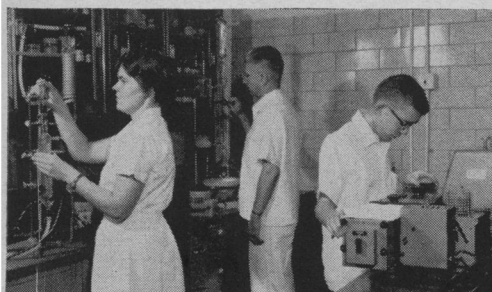




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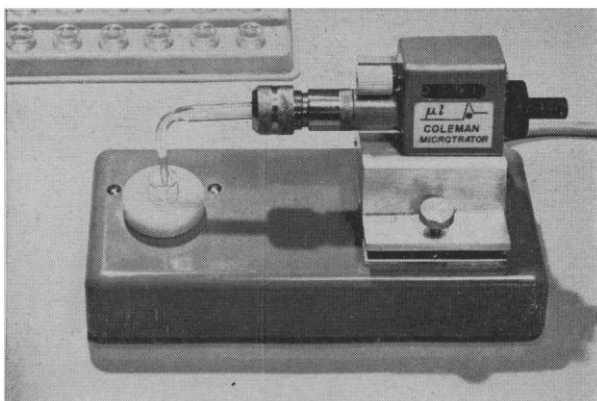
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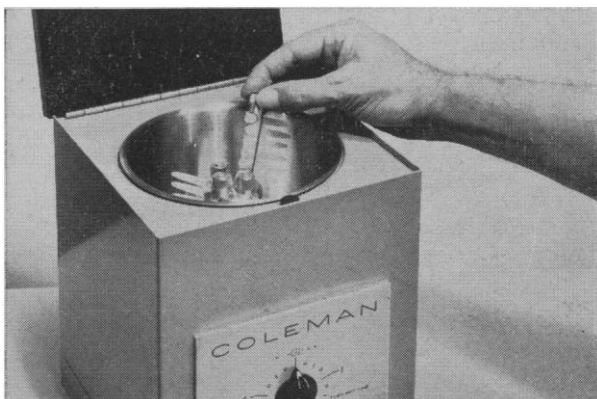
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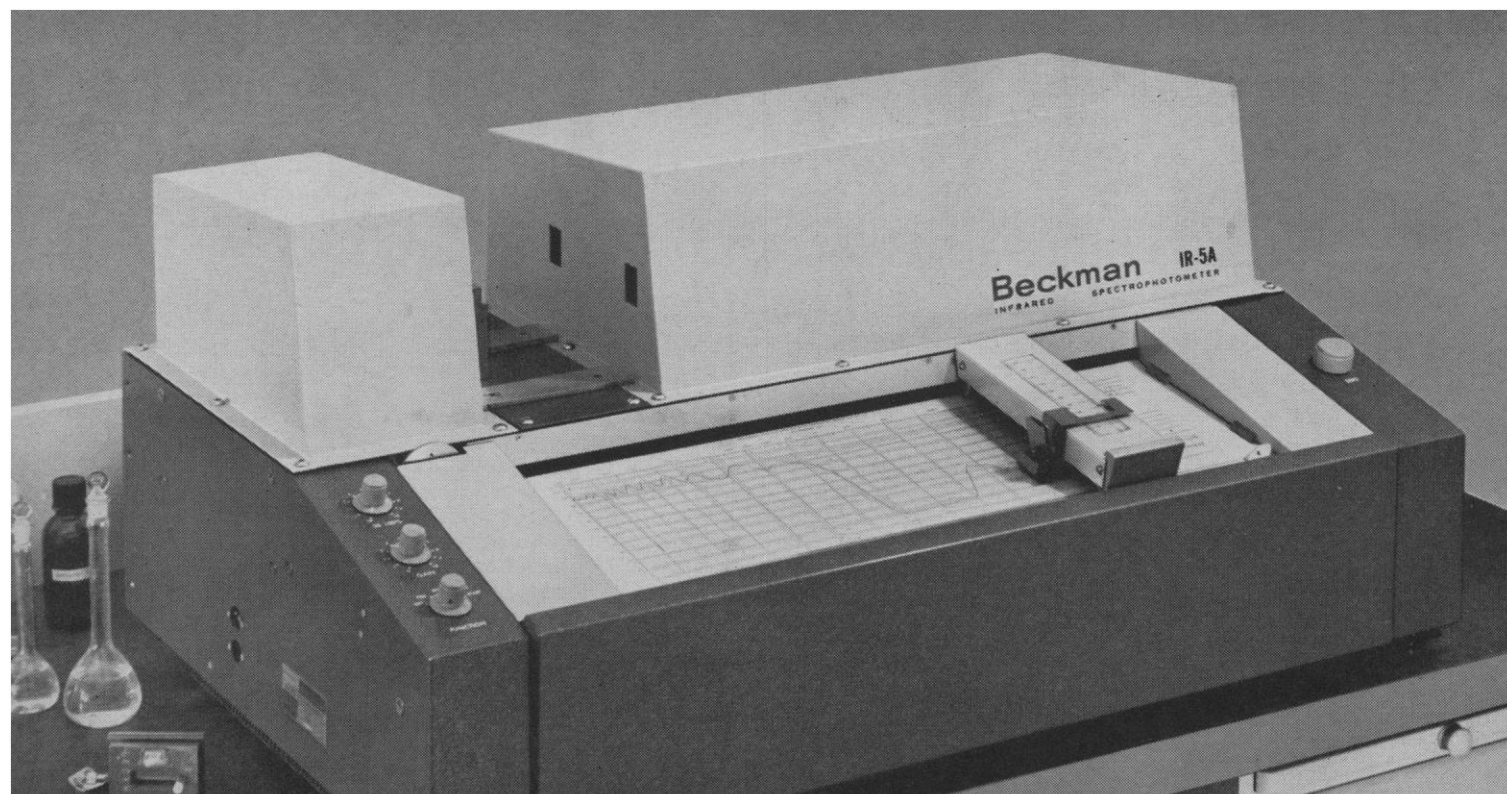
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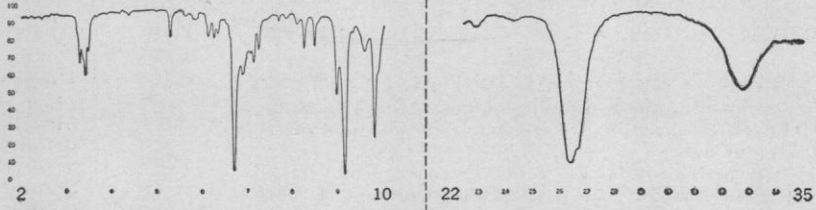


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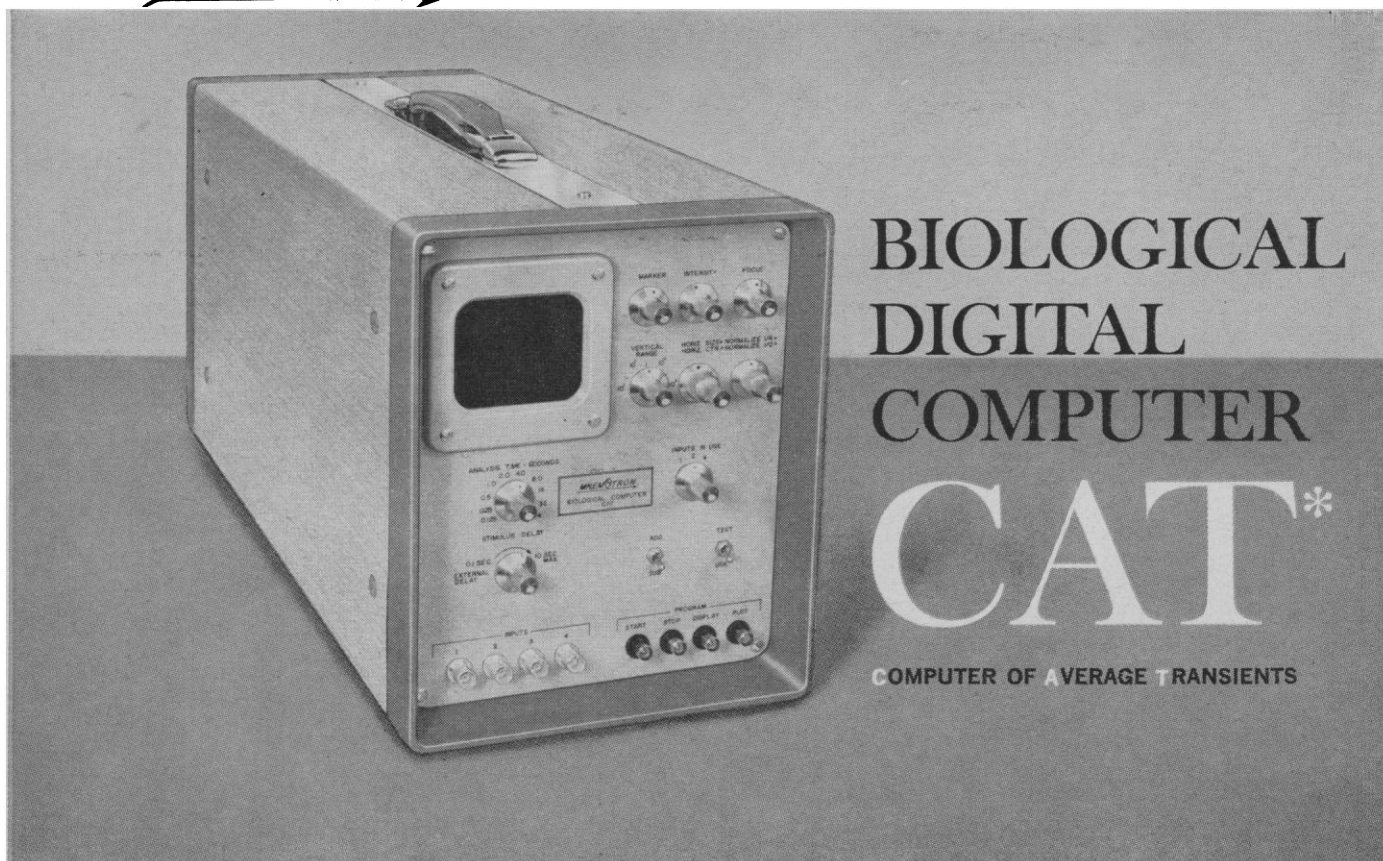
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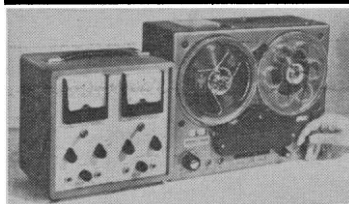
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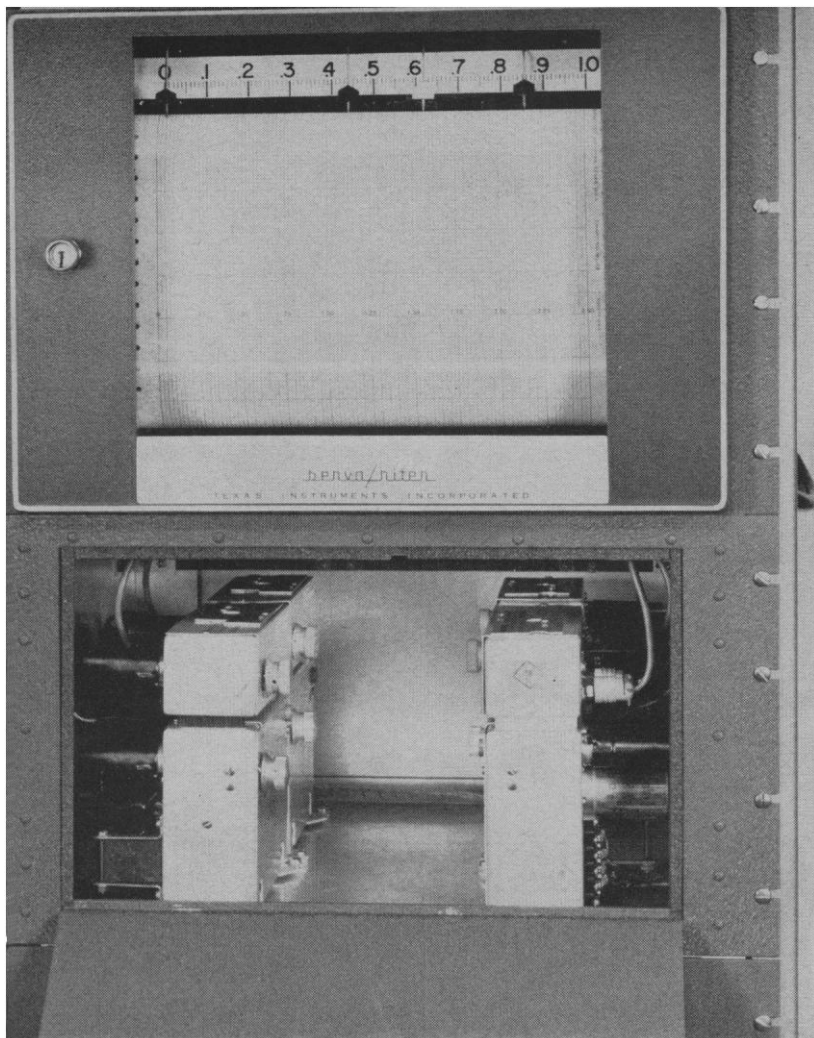
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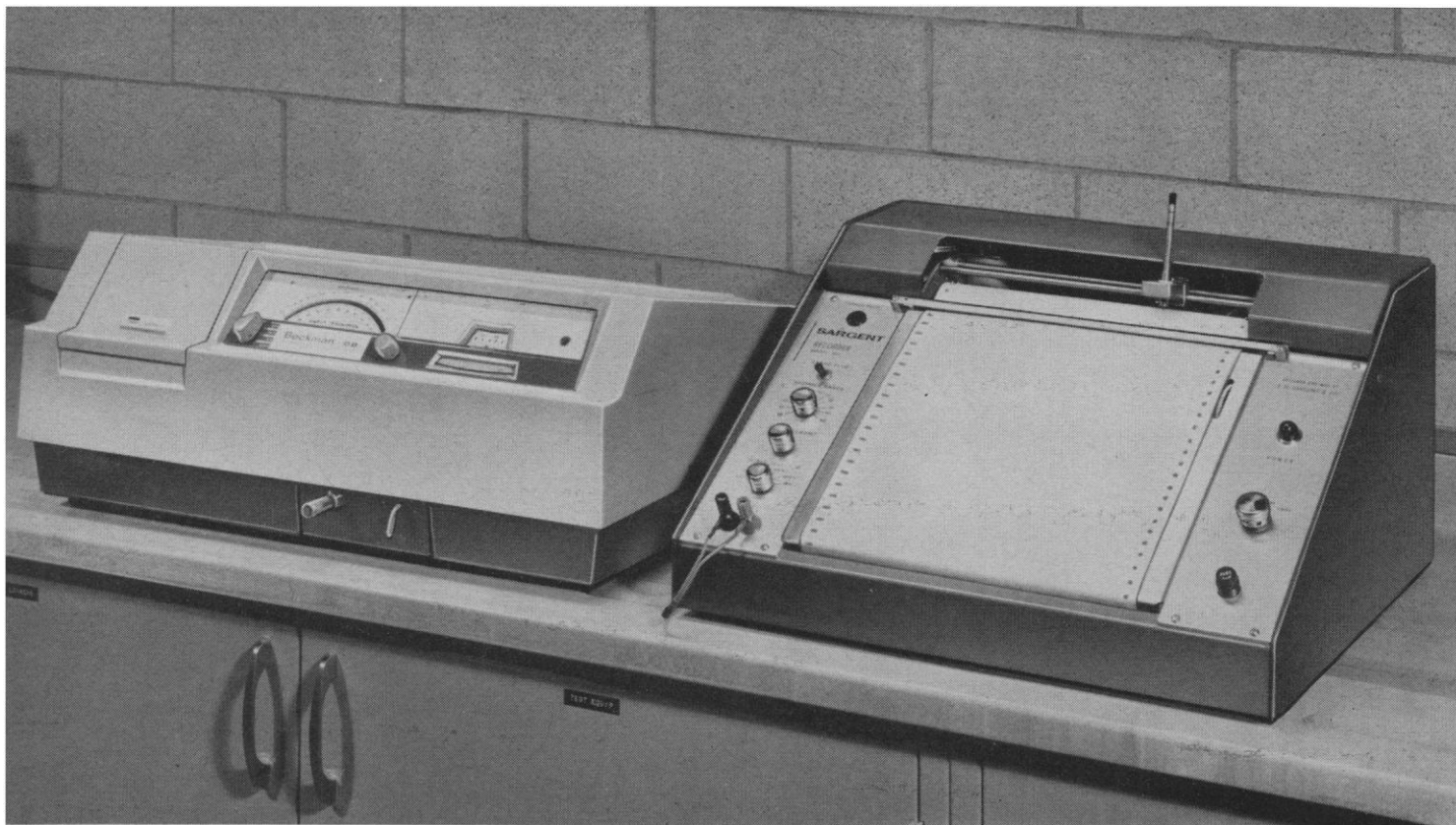
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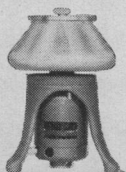
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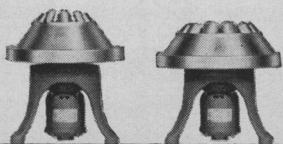


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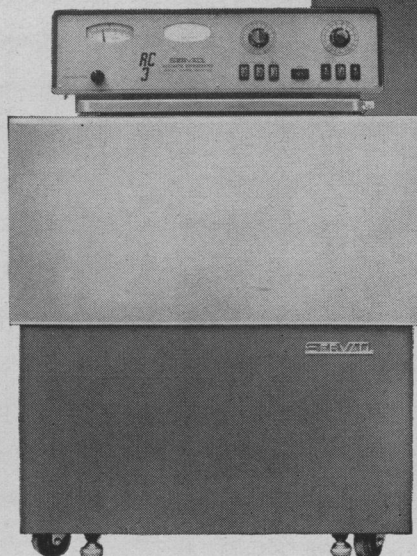
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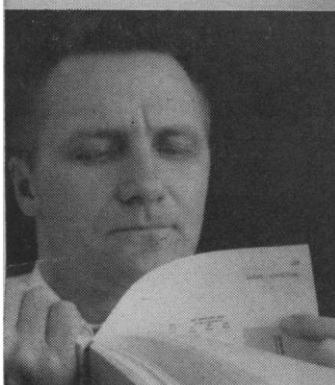
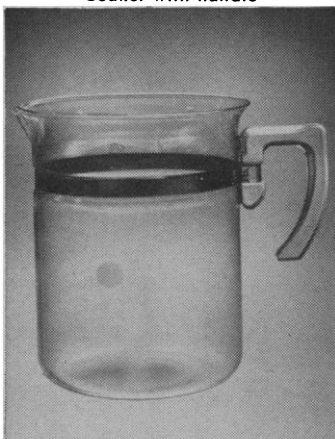
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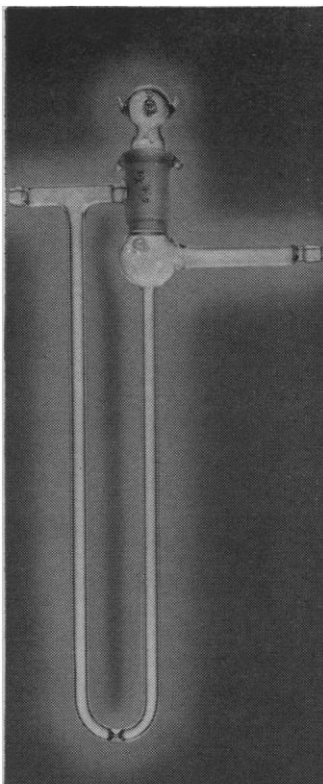


No. 1010  
Beaker with handle



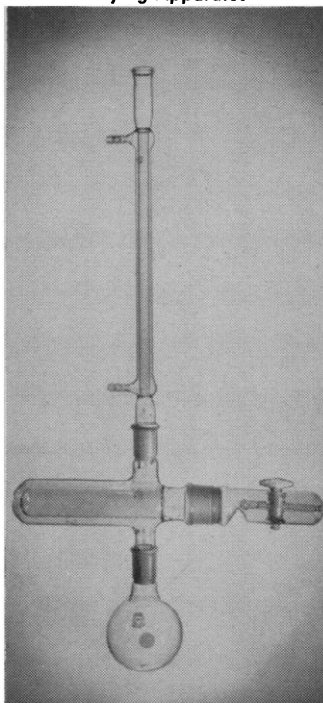
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Flowmeter



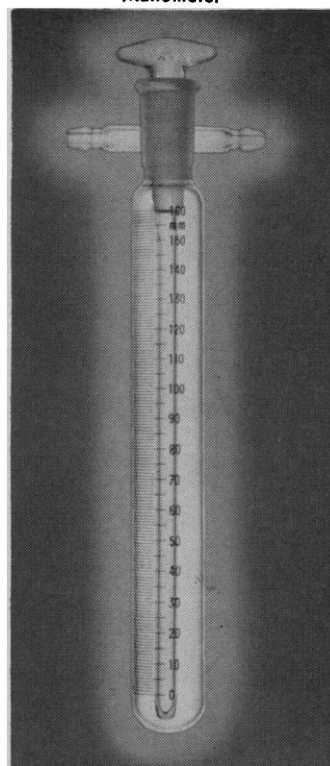
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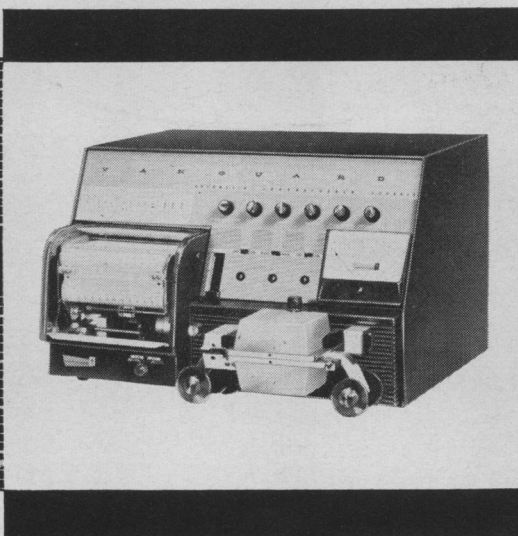
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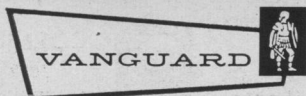
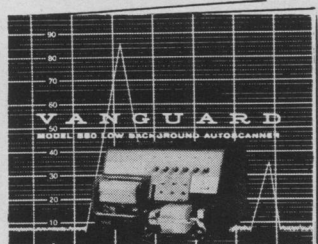
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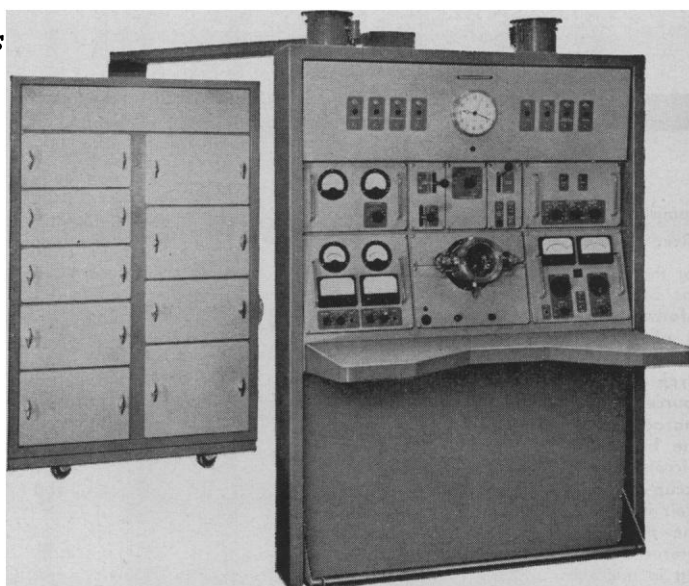
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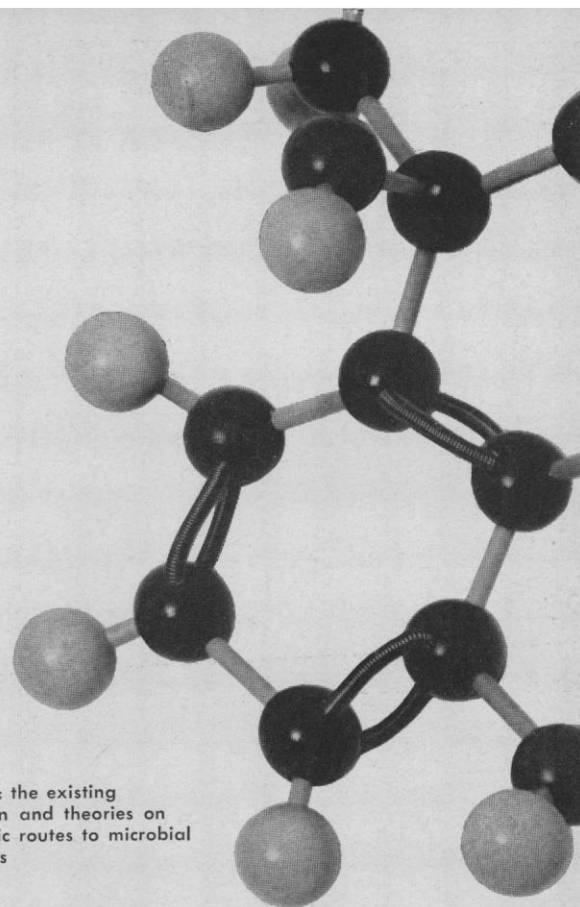
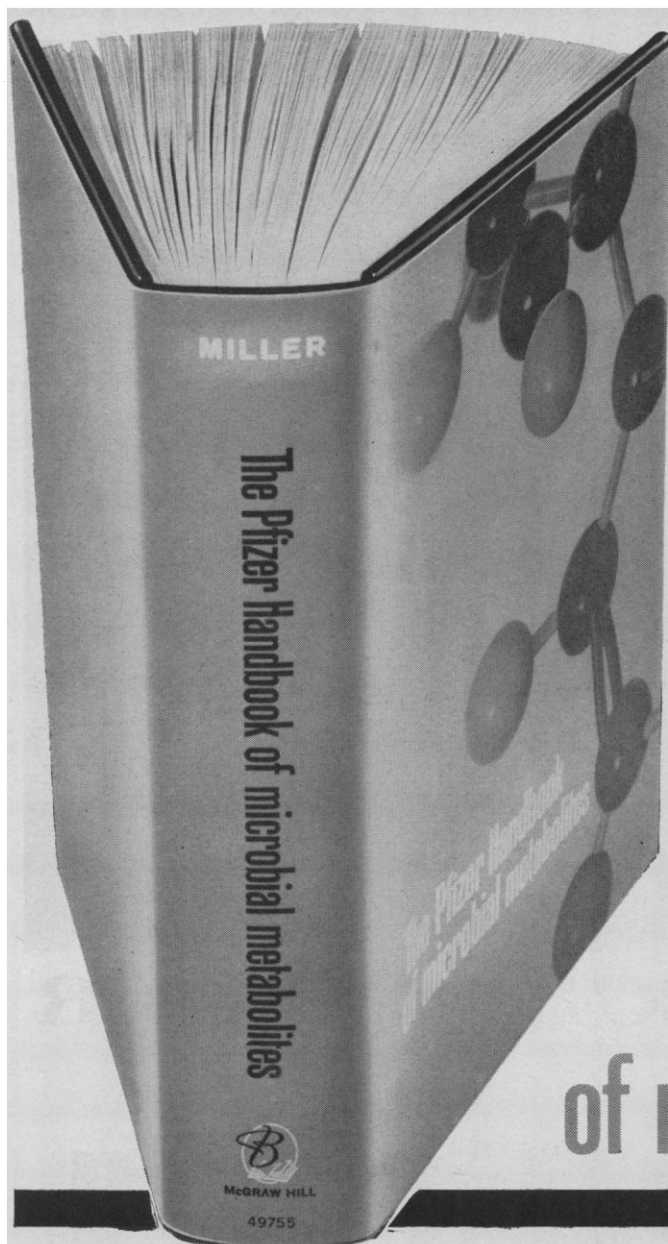


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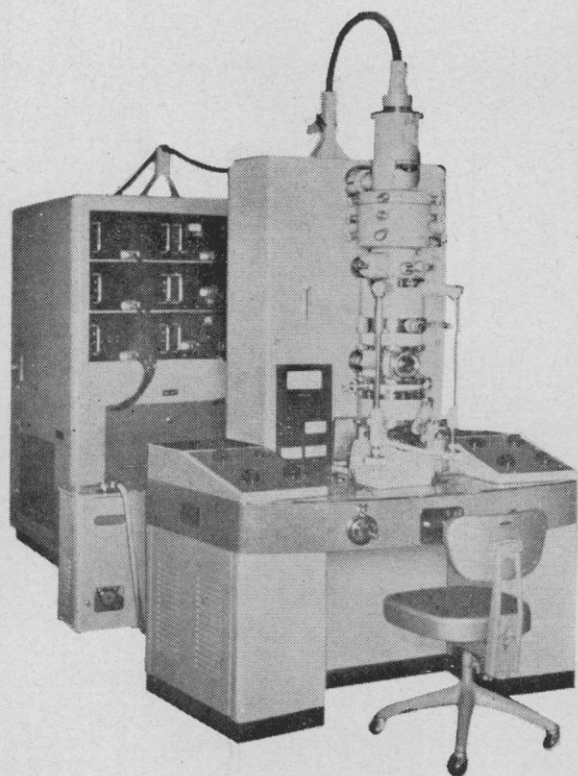
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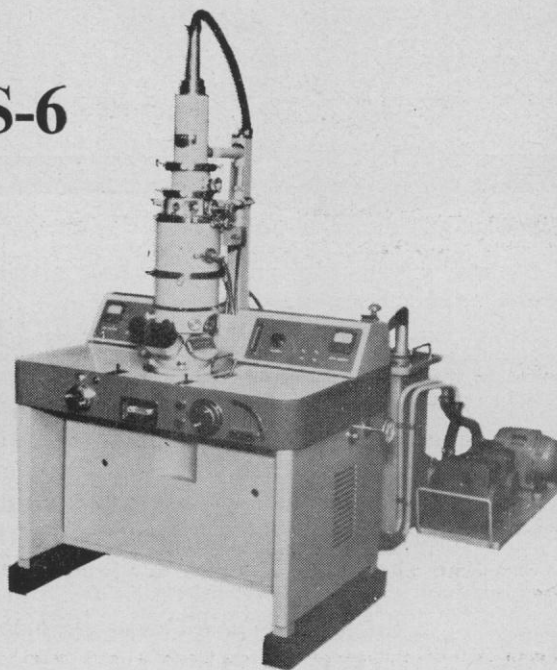
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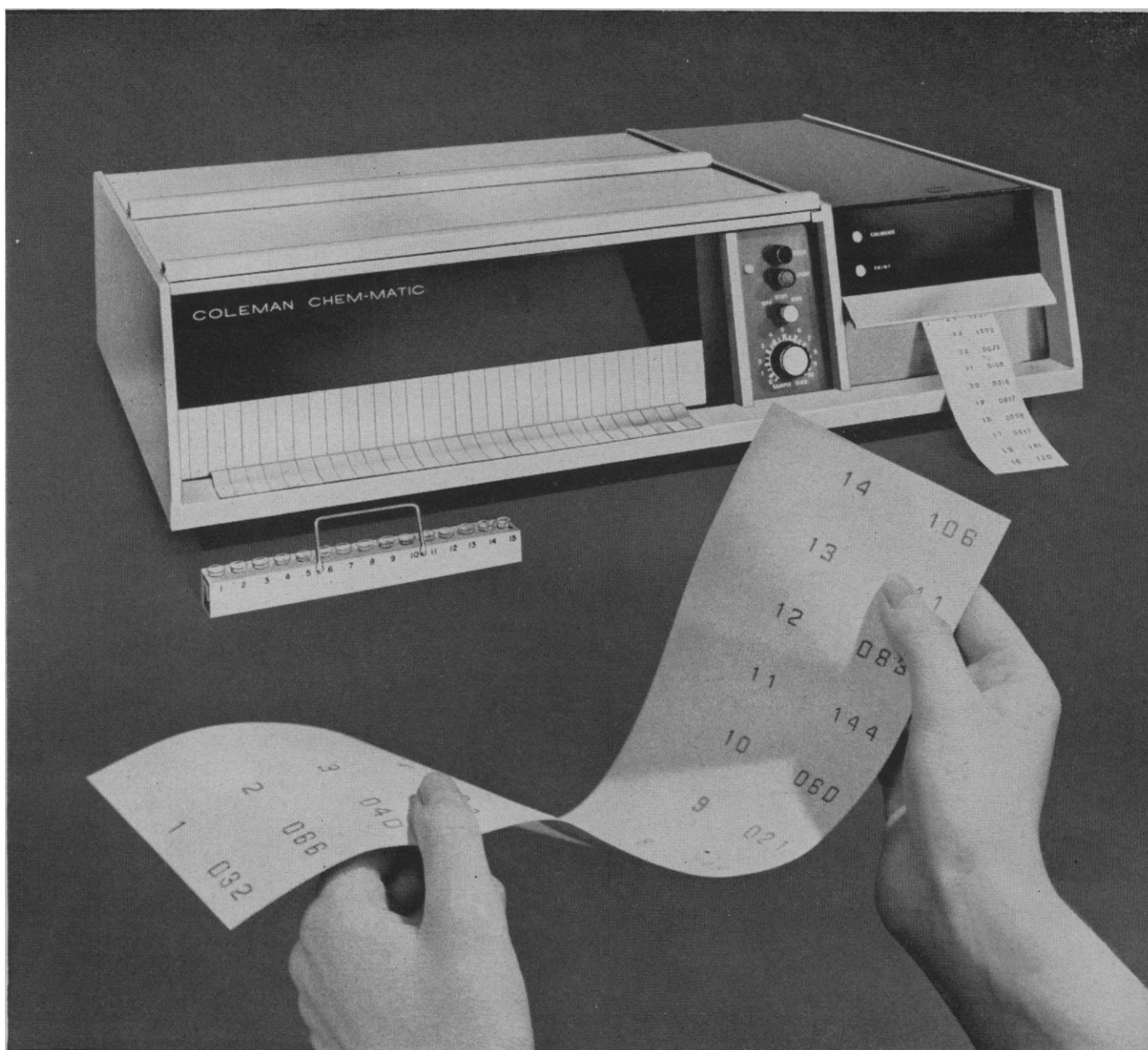
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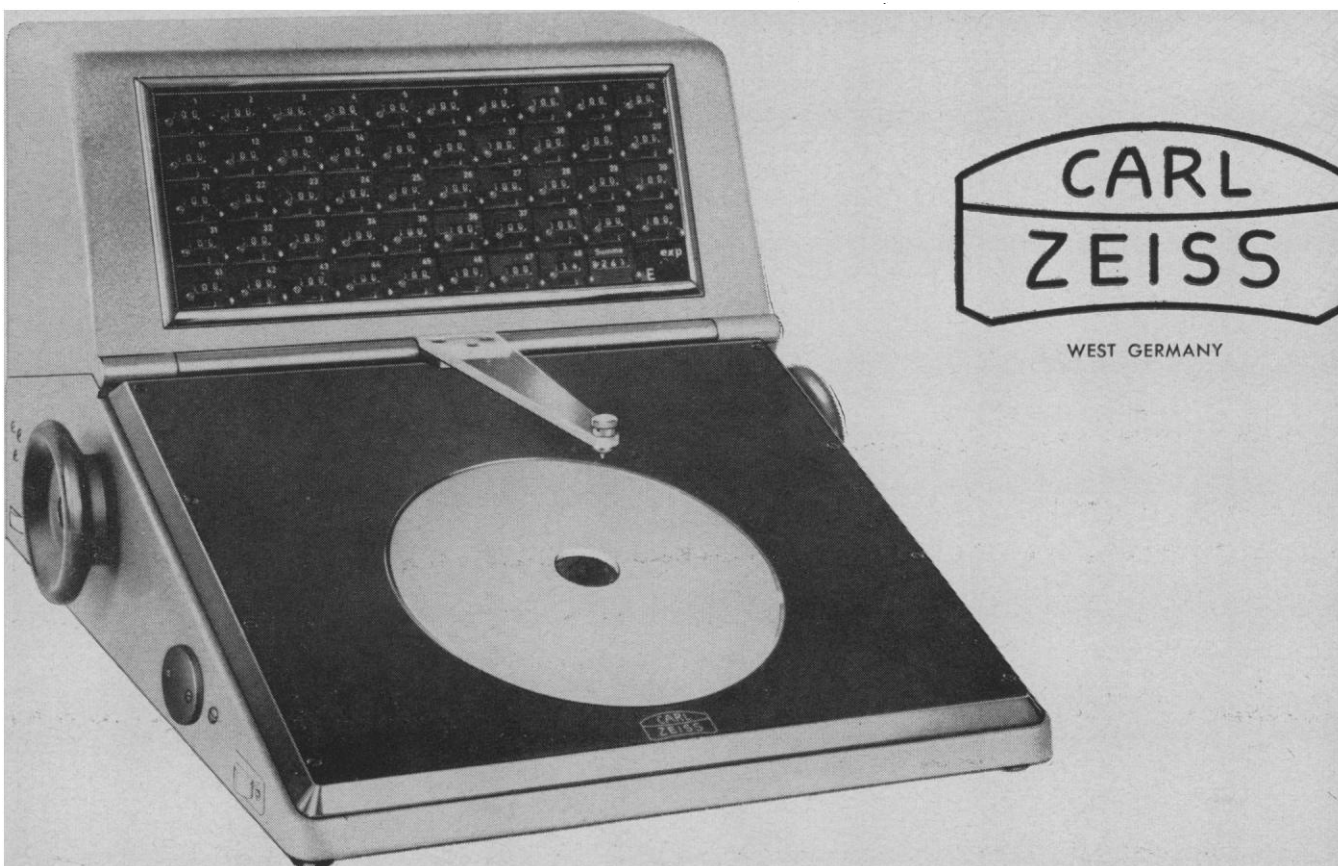
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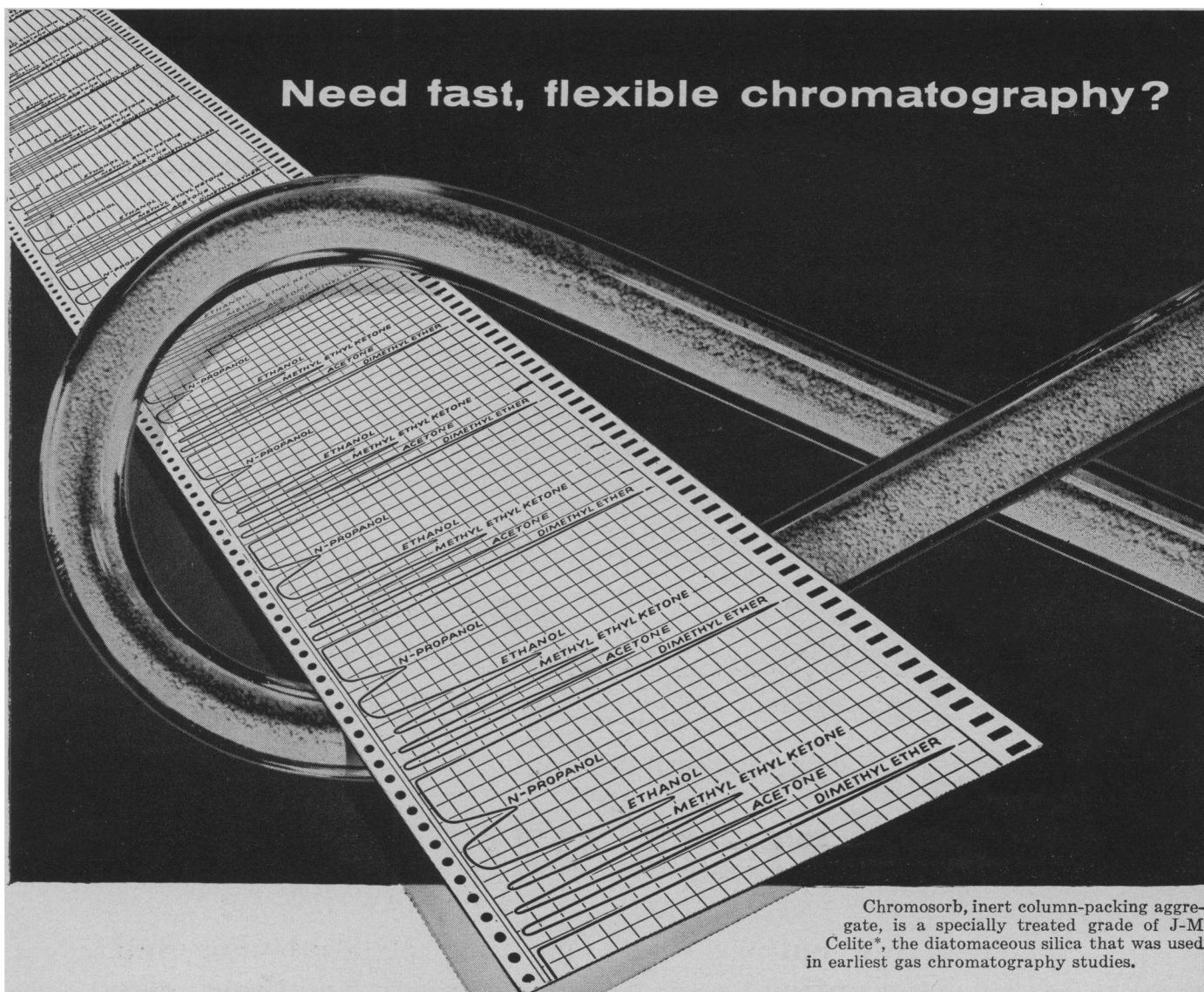
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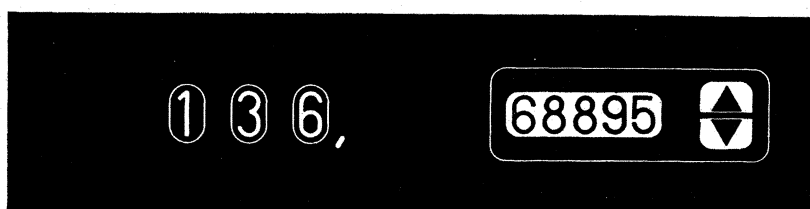
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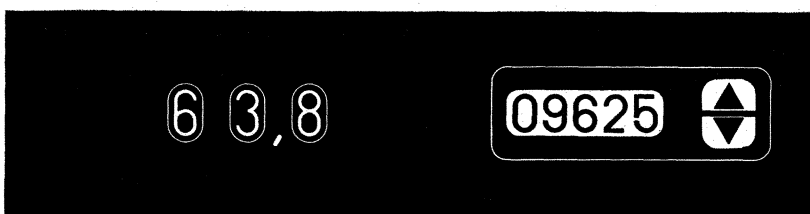
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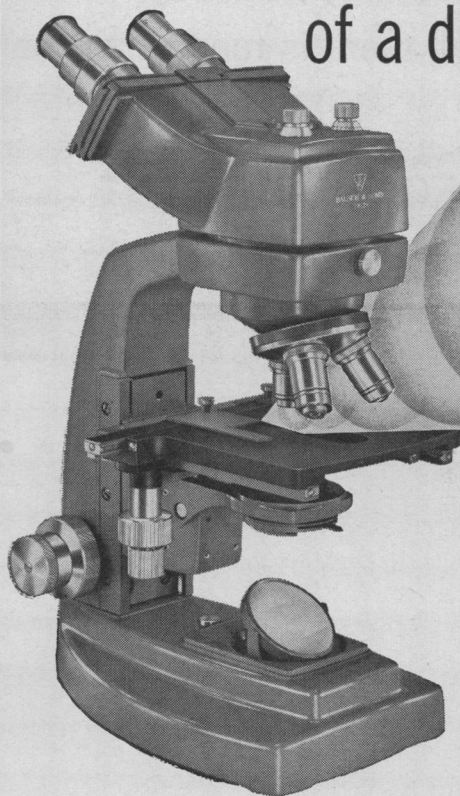


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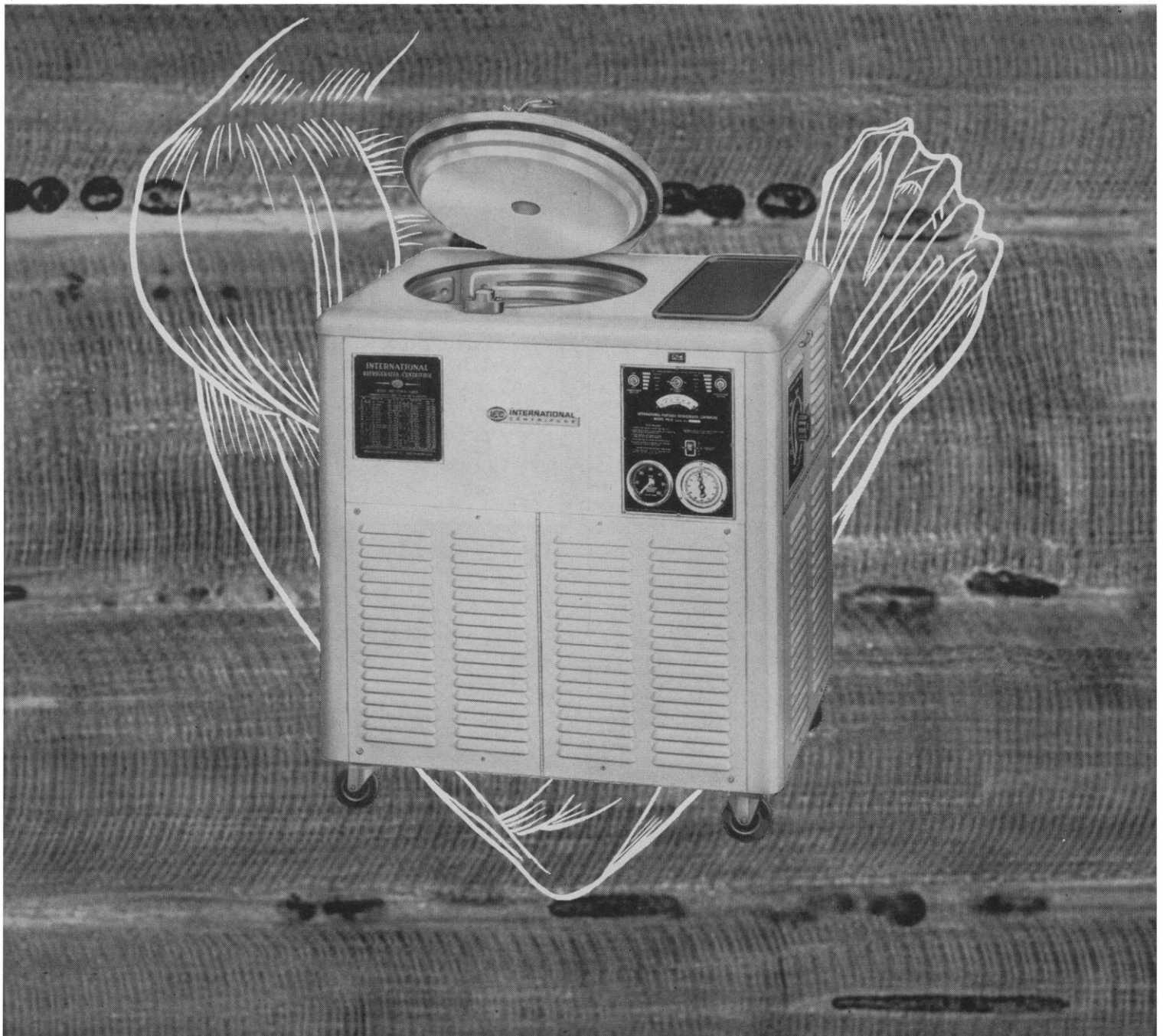
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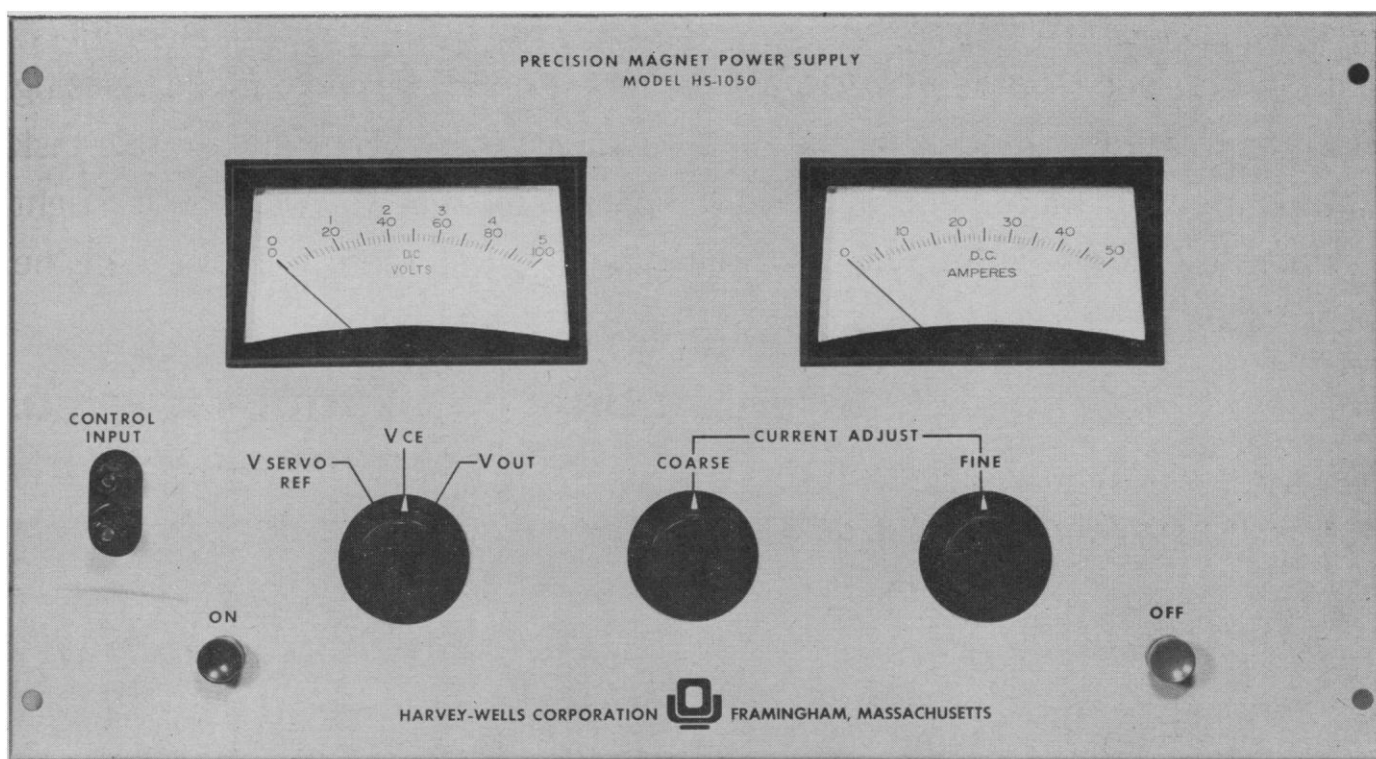
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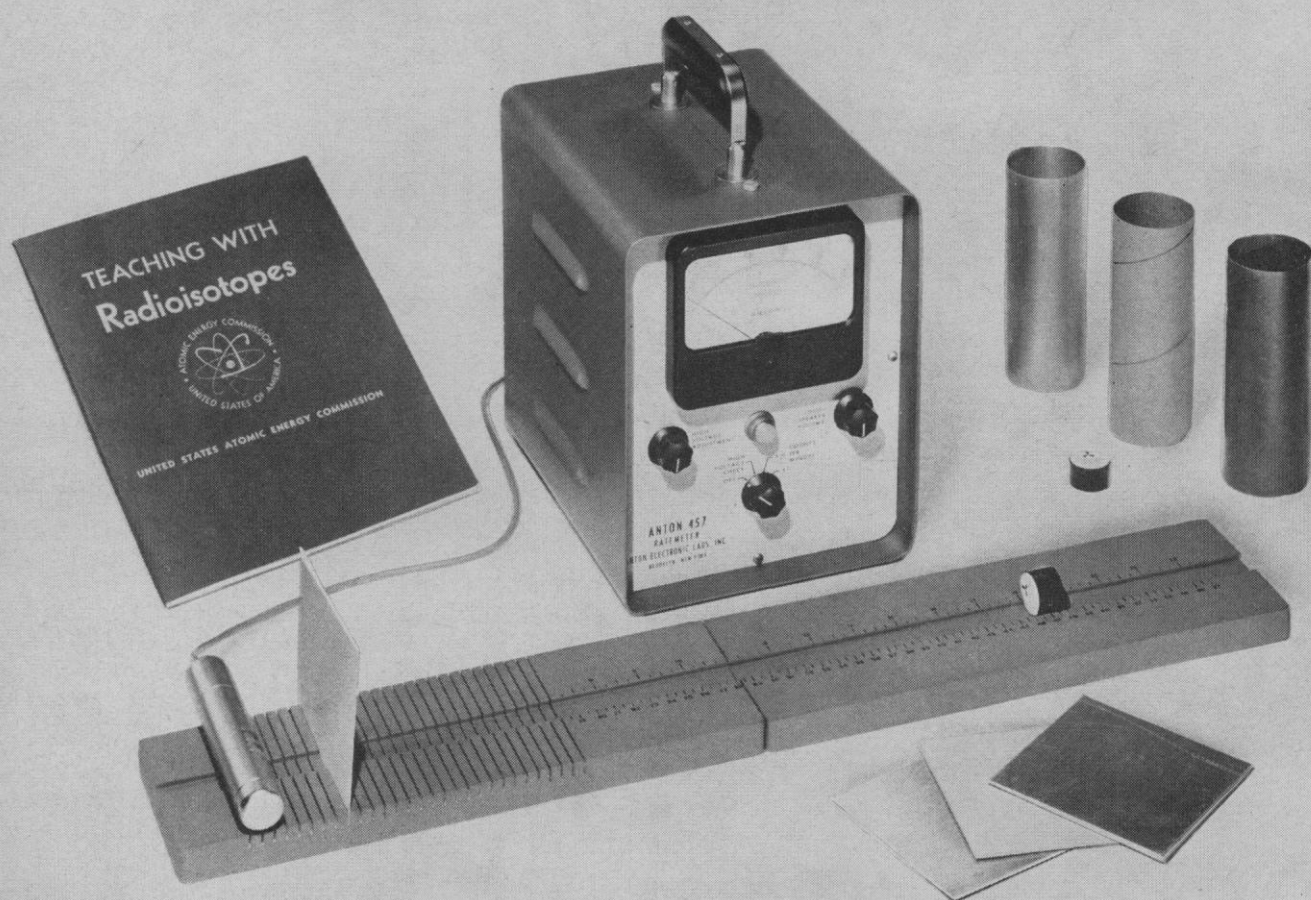
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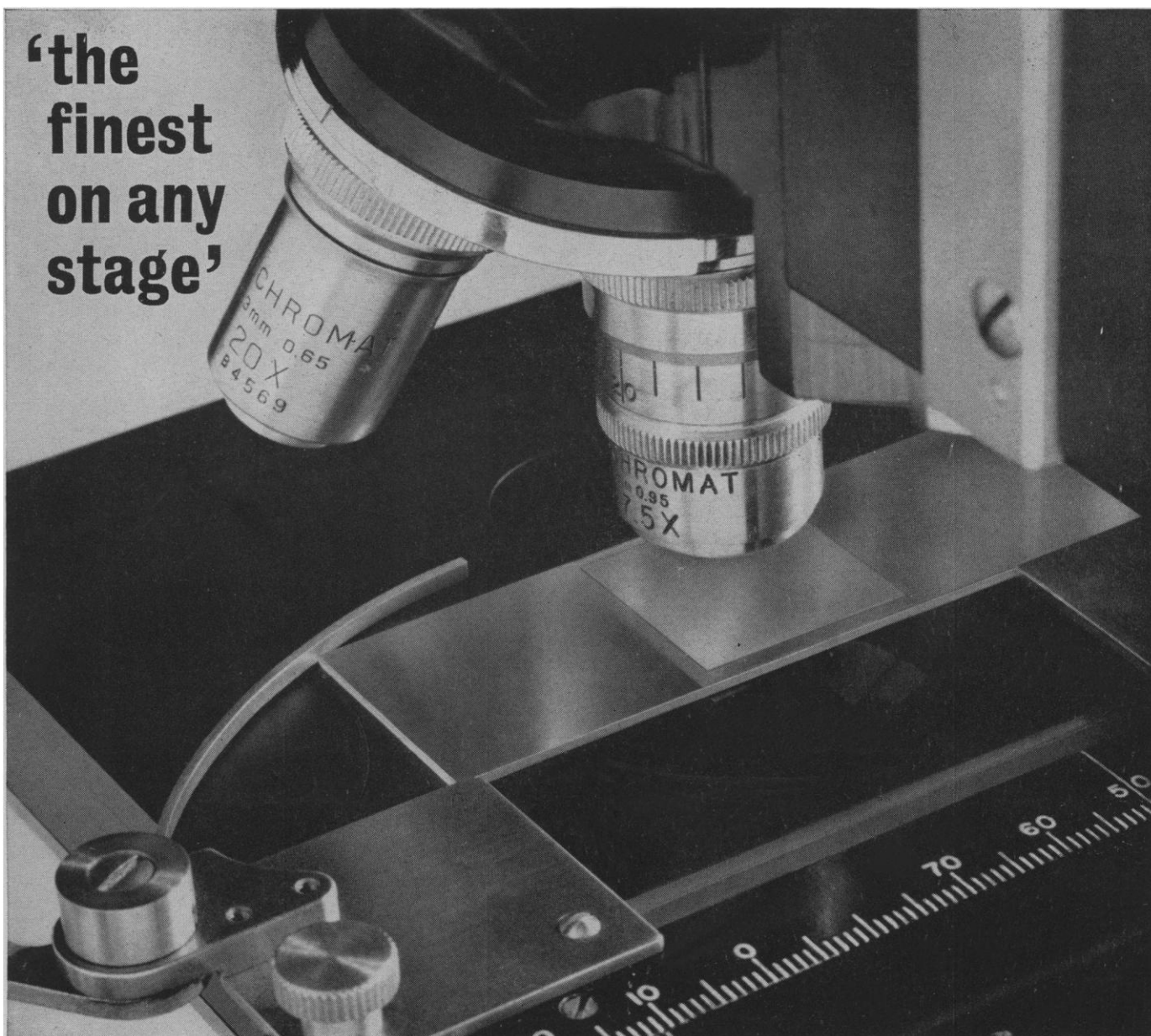
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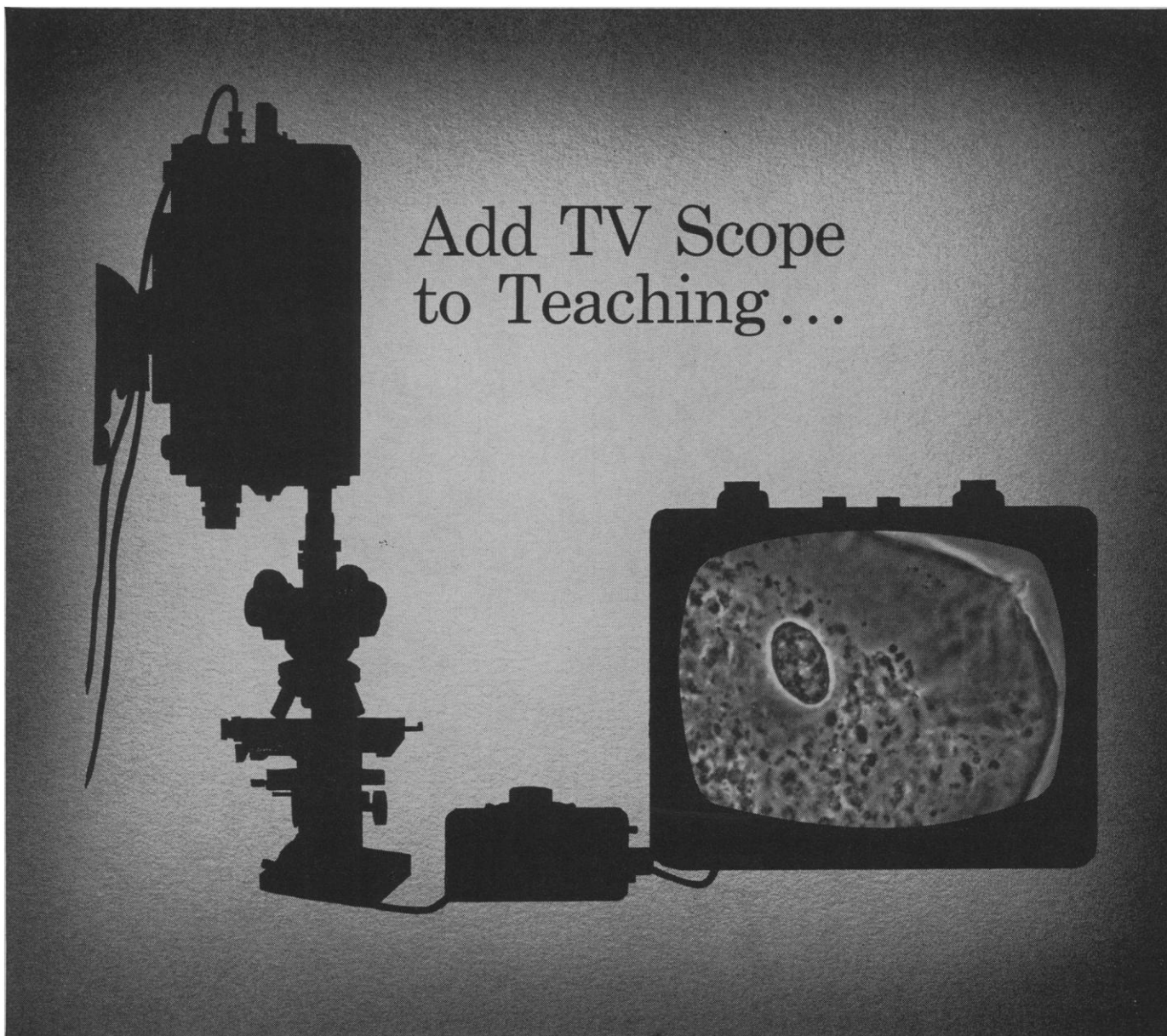
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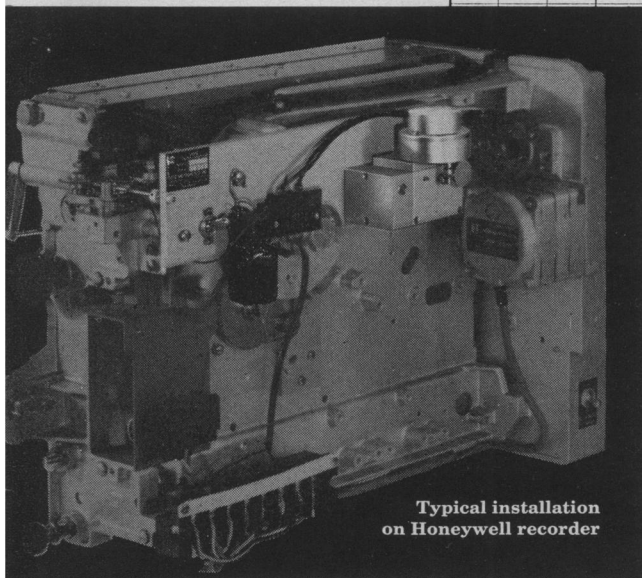
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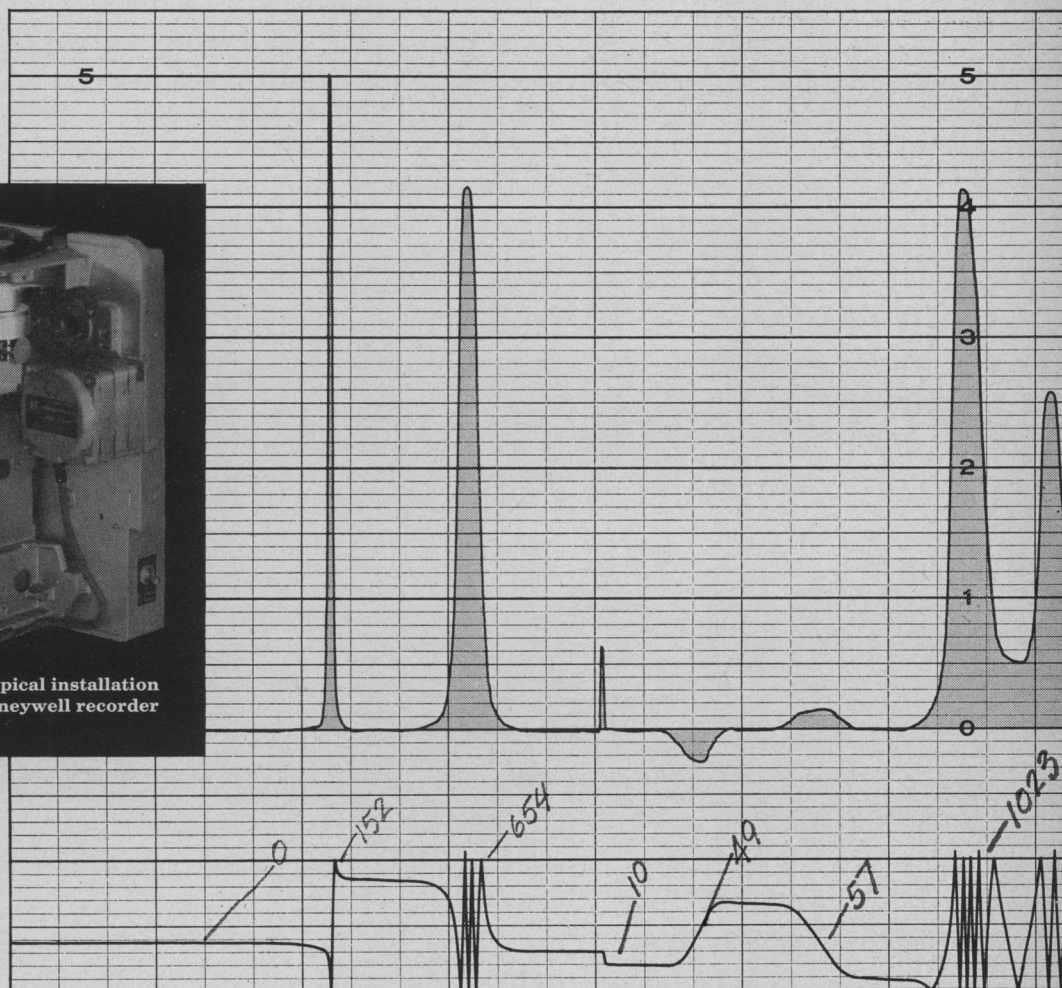
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Series 200 Disc Integrators are available from manufacturers of chromatographic or recording instrumentation, laboratory apparatus dealers, or from the manufacturer. Write for Bulletin S-200 for complete information.



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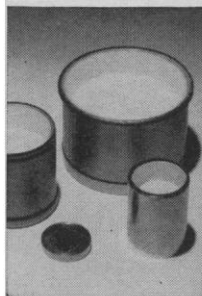
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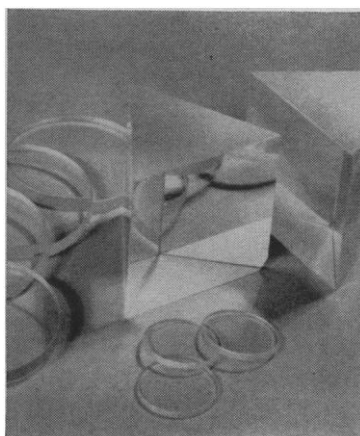
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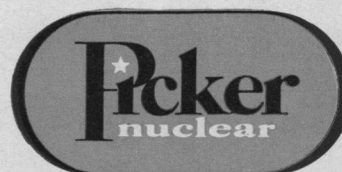
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## of the General Program of the AAAS Denver Meeting by first class mail – early in December

The *General Program* of the 128th Meeting of the AAAS in Denver, 26–31 December 1961, will be available to you, at cost, within the first week in December—whether you can attend the Meeting or not.

### Program Content

1. The two-session AAAS General Sessions. "Moving Frontiers of Science," Part I—Speakers: Howard A. Meyerhoff and Arthur R. von Hippel; Harrison Brown, presiding. Part II—Speakers: Halton C. Arp and E. W. Fager; Harrison Brown, presiding.
2. The 29th John Wesley Powell Memorial Lecture. Speaker: Glenn T. Seaborg; Paul M. Gross, presiding.
3. On "AAAS Day," the four broad, interdisciplinary symposia—Physics of the Upper Atmosphere; Geochemical Evolution—The First Five Billion Years; Existing Levels of Radioactivity in Man and His Environment; and Water and Climate—arranged by AAAS Sections jointly.
4. The Special Sessions: AAAS Presidential Address and Reception; Joint Address of Sigma Xi and Phi Beta Kappa by Harrison Brown; the Tau Beta Phi Address by John A. Logan; National Geographic Society Illustrated Lecture; and the second George Sarton Memorial Lecture by Joseph Kaplan.
5. The programs of all 18 AAAS Sections (specialized symposia and contributed papers).
6. The programs of the national meetings of the American Astronomical Society, American Society of Criminology, American Nature Study Society, American Society of Naturalists, American Society of Zoologists, Beta Beta Beta Biological Society, Biometric Society (WNAR), National Association of Biology Teachers, Scientific Research Society of America, Society for General Systems Research, Society of Protozoologists, Society of Systematic Zoology, and the Society of the Sigma Xi.
7. The multi-sessioned special programs of the American Astronautical Society (Hugh L. Dryden as dinner speaker), American Physiological Society, American Psychiatric Association, Association of American Geographers, Ecological Society of America, National Science Teachers Association, National Speleological Society—and still others, a total of some 70 to 80 participating organizations.
8. The sessions of the Academy Conference, the Conference on Scientific Communication, and the Conference on Scientific Manpower.
9. The sessions of the AAAS Cooperative Committee on the Teaching of Science and Mathematics, of the AAAS Committee on Science in the Promotion of Human Welfare.
10. Titles of the latest foreign and domestic scientific films to be shown in the AAAS Science Theatre.
11. Exhibitors in the 1961 Annual Exposition of Science and Industry and descriptions of their exhibits.

### Advance Registration

Advance registration has these decided advantages: (1) You avoid delay at the Registration Center upon arrival; (2) You receive the *General Program* in ample time to decide, unhurriedly, which events and sessions you particularly wish to attend; (3) Your name is posted in the Visible Directory as the Meeting opens.

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# APPLICATION FOR HOTEL RESERVATIONS

## 128th AAAS MEETING

### Denver, 26-31 December 1961

The hotels for the AAAS Denver meeting have established special, low rates and have reserved appropriately large blocks of rooms for this meeting. Thus everyone making room reservations for the AAAS meeting is assured substantial savings.

The list of hotels and the reservation coupons below are for your convenience in making your hotel reservation in Denver. Please send your application, *not* to any hotel directly, but to the AAAS Housing Bureau in Denver and thereby avoid delay and confusion. The experienced Housing Bureau will make assignments promptly; a confirmation will be sent you in two weeks or less.

If requested, the hotels will add a comfortable rollaway bed to any room, at \$3.00 per night. Mail your application now to secure your first choice of desired accommodations. All requests for reservations must give a definite date and estimated hour of arrival, and also probable date of departure.

#### AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

For a list of the headquarters of each participating society and section, see page 197, *Science*, 21 July. The Hilton is the AAAS headquarters hotel.

##### Rates for Rooms with Bath\*

Hotel	Single for one	Double for one	Double for two	Twin Beds for one	Twin Beds for two	Studio Twins	Suites
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\* All rooms are subject to a 2% Colorado State sales tax.

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Suite ..... Desired Rate ..... Maximum Rate .....

Number in party ..... Sharing this room will be: .....

(Attach list if this space is insufficient. The name and address of each person, including yourself, must be listed.)

First Choice Hotel ..... Second Choice Hotel ..... Third Choice Hotel .....

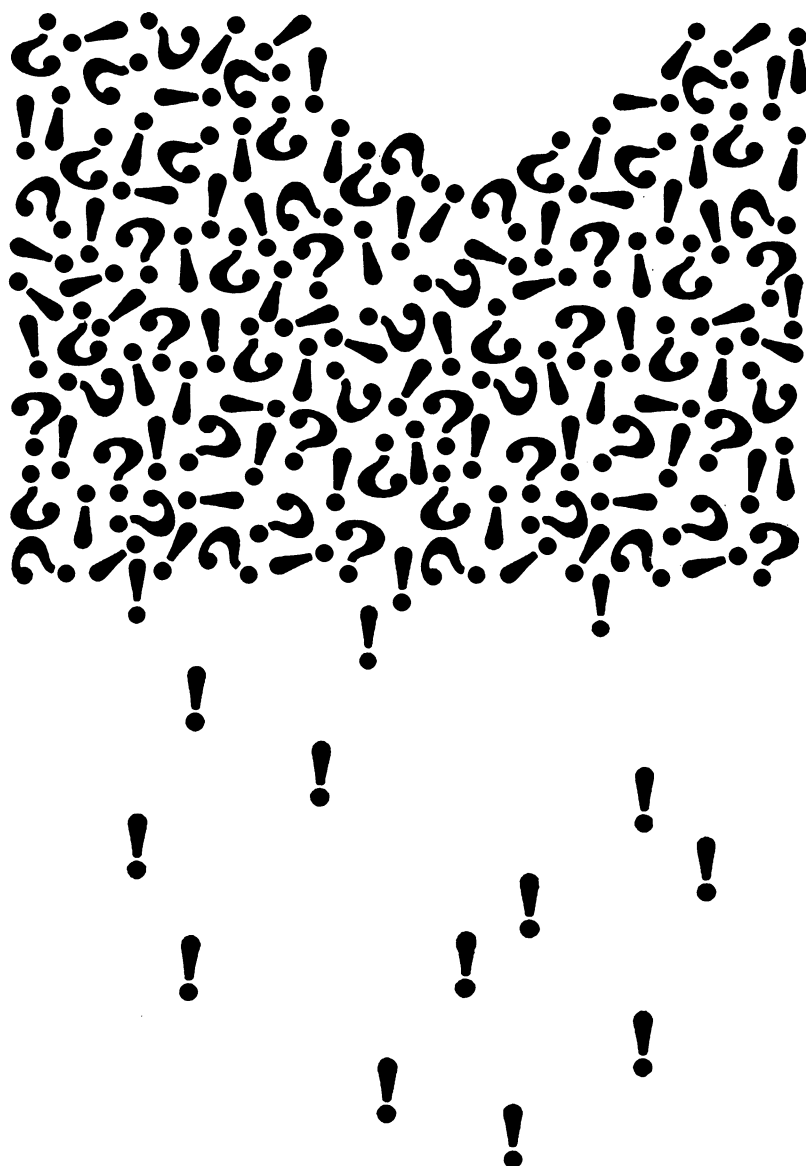
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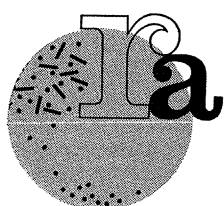
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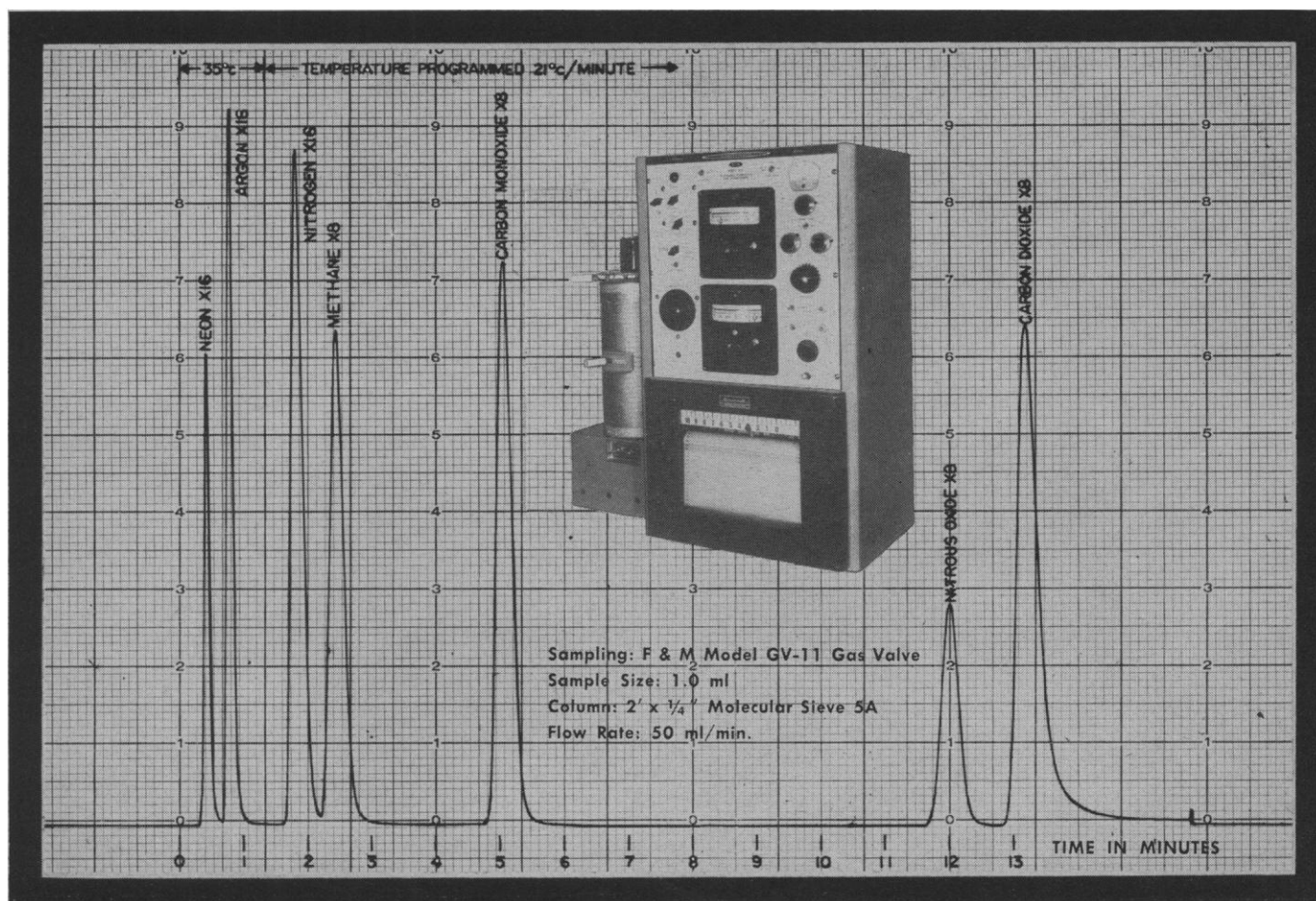
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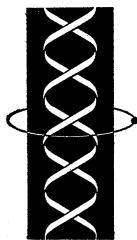
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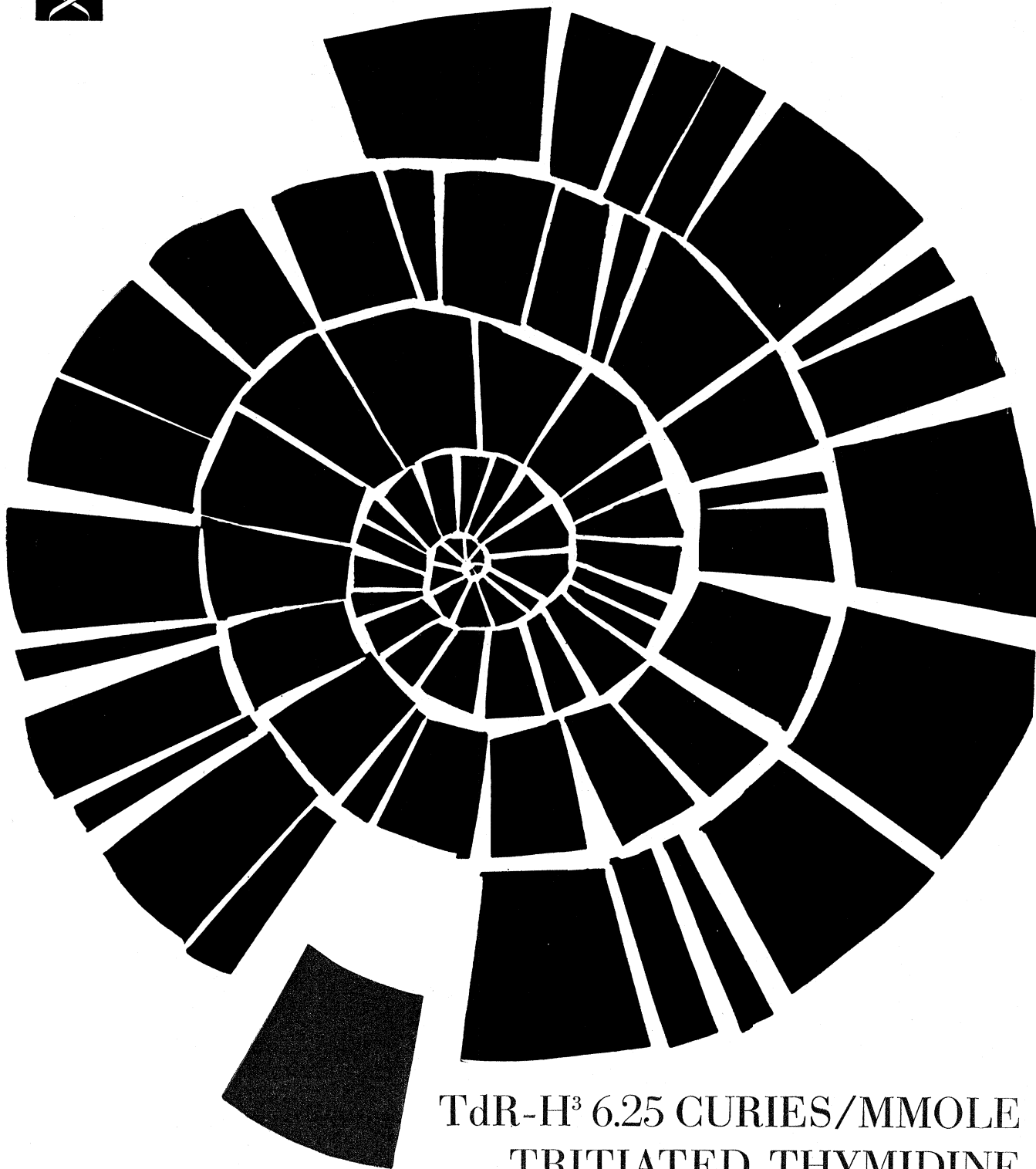
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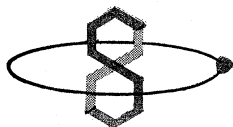
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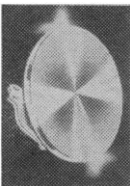
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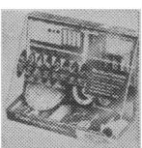
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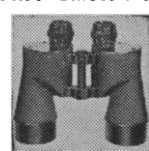


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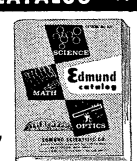
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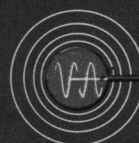
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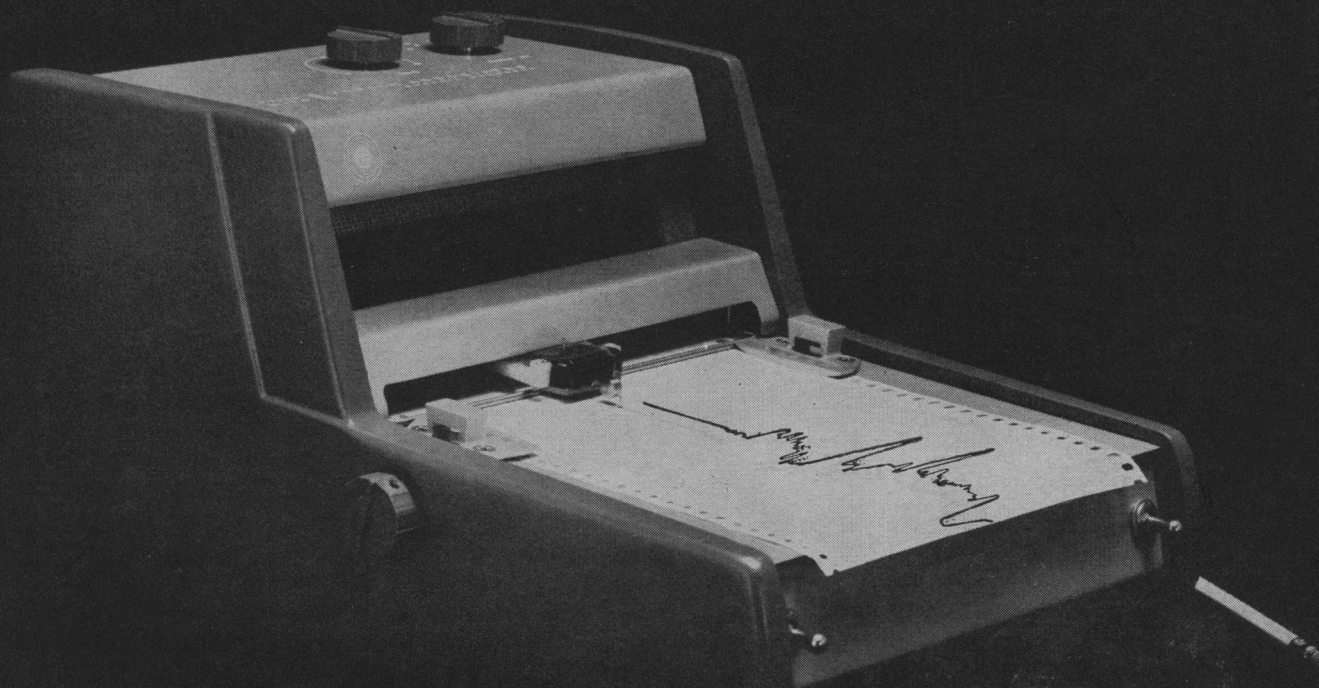
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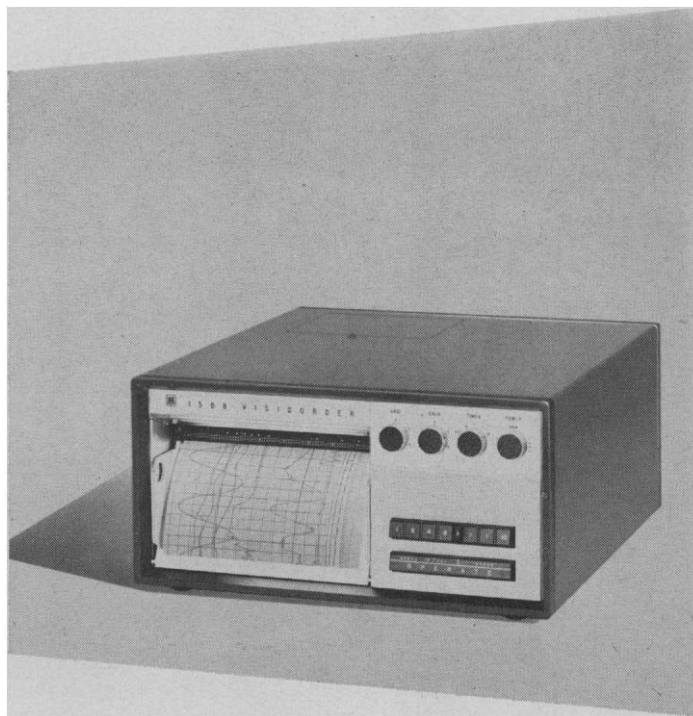
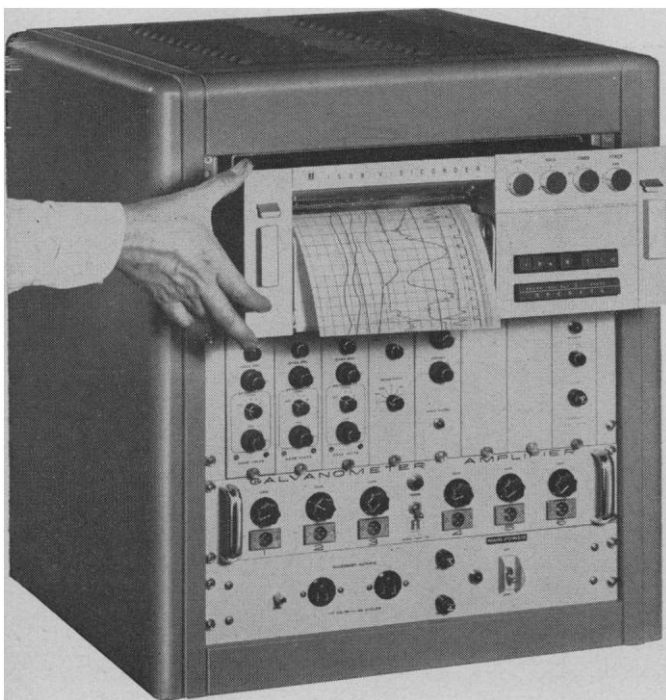
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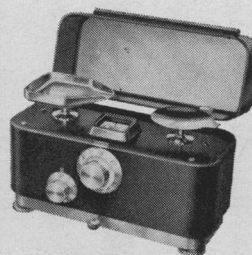
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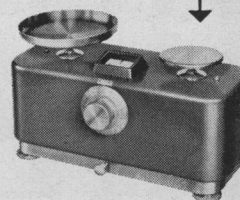


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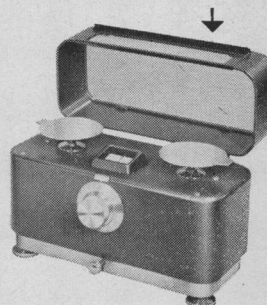


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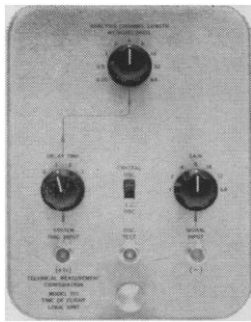
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DLT2 but has scoop for  
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material



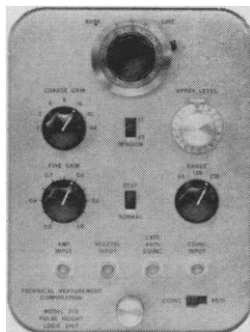
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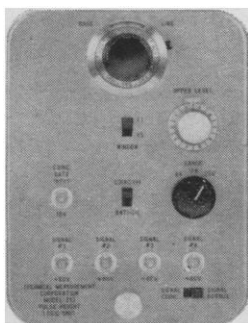




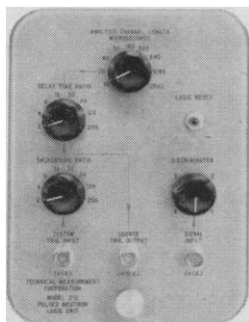
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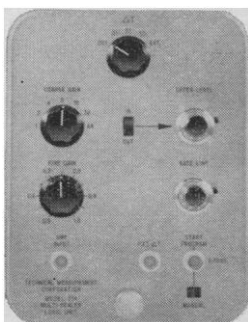
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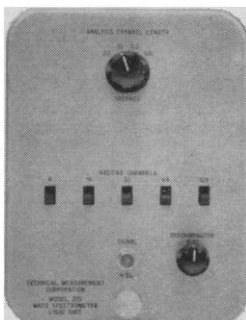
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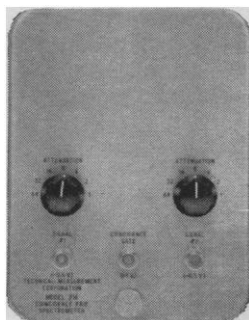


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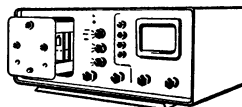
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## Poverty's Millionaires

It seems fair to assume, in thinking about technical assistance to underdeveloped regions, that a man whose daily diet consists essentially of two meals of rice, hot in the evening and the cold remains in the morning, needs no one to tell him that he wants more to eat. Yet that there are men in just this circumstance who do need such advice is one of the paradoxes of technical assistance described by Kusum Nair in her recent book *Blossoms in the Dust* (Duckworth, London). The author, an Indian journalist, spent a year, as she says, as a "nobody," visiting a sample of India's rural communities to determine the expectations and attitudes of some of the people on the receiving end of India's development effort.

In the example just cited, Kusum Nair asked the untouchables of one community—they were the persons who, for hire, actually worked in the fields—how much land they would want if the government were to give it to them free. The replies: Samu, five in the family, 1 1/3 acres; Rangarajan, five in the family, 2 acres; Manickam (the exception), six in the family, 5 acres; Srinivasan, four in the family, 2 acres; and so on and on. Actually, these replies were calculated not on the basis of ownership but on that of a system of tenant farming. The acreage asked for was supposed to provide, for each member of the tenant's family, the requisite two square meals of rice a day, and to allow for giving about half the produce to the owner of the land.

The section of the country to which this community belongs is at least distinguished by its enthusiasm for irrigation. In another section, one in which millet is grown and in which rain is the traditional source of water, the great majority of land owners would not use the water made available for irrigation by a new hydroelectric project, even when despairing project officials offered to let it into the fields for them. With a yield sufficient for local consumption, the owners are more impressed by the increased cost and effort required for increased production—the use of irrigation, for example, also requires the use of fertilizer—than by the resulting increase in production.

Although the book is concerned with India's problems with her rural communities, the lesson taught by what the author calls "poverty's millionaires" may apply as well to American programs of technical assistance to other countries. The lesson is that when the technical mission returns from the field with its recommendations as to where to place the dam and where to string the power lines, the job of planning is only half done. Attention must be paid not only to the physical resources of a region and to how those resources might be utilized, but also to the attitudes held by the natives of the region and to how those attitudes might be changed.

Moreover, just as there is no universal development plan suitable for all regions, so there is no universal method of persuasion suitable for all communities. The book catalogs a great variety of responses to technical assistance, including among them even enthusiasm. It is heartening to note that in one particularly primitive section of India there were villagers who, in rice cultivation, as soon as they were introduced to the plow, demanded the bulldozers of which they had dimly heard, in order to clear land more rapidly.—J.T.

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Anybody who draws the obvious conclusion has failed fully to engage his brain cells in thought. The answer to the question depends on the sensitivity of the film. Once that is known, one can say how much of a dose the worker has probably had less than.

Social ethics in advanced countries require the assumption that the worker has actually *had* that much radiation. This is known as the "administrative" dose. Records are kept as in a bank. When administrative and physical doses add up to a critical figure, the worker is shifted to a different job. He may habitually spend every Saturday night cruising the center line of a busy highway at 80 m.p.h. Nevertheless, the critical figure assumes that he wants to live forever and become the progenitor of an infinite line of biologically perfect descendants. Pressure to squeeze it down will never let up, we hope.

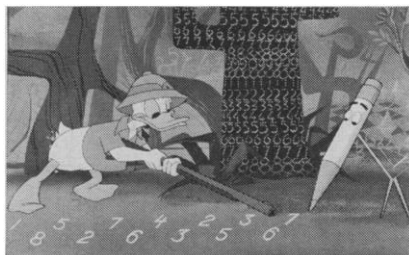
Without relaxation of solicitude, we have taken steps to cut down the waste of his job experience. By reducing the administrative dose (which is the only kind of radiation dose he really ought ever to get on the job), we can keep him in his slot longer. It is within our power. All we have to do is make more sensitive film. This we have now done. It is called *Kodak Personal Monitoring Film, Type 3*.

The packet it comes in also includes a piece of low-sensitivity film. Its sensitivity is so low that it can measure 1800 roentgens, a horrible thought. The lower limit of dose measurement for the high-sensitivity film in the packet runs somewhere below 10 milliroentgens. The vague phrasing of that statement doesn't mean that the exact value is unimportant. The main point of this discussion is the importance of

the figure. It's just that its precise determination depends on such a complexity of factors that we won't try to explain it here.

*If interested, prepare yourself by studying pp. 10-53 to 10-75 of Radiation Hygiene Handbook (McGraw-Hill Book Company, Inc., 1959). Then bring your knowledge up to date by requesting a data sheet on Kodak Personal Monitoring Film, Type 3 from Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y.*

### 8mm audio-visuals



© Walt Disney Productions

On Sunday evening, September 24th, a new associate of ours named Walt Disney broadcasted from 168 television stations a film called "Mathmagicaland." It featured an artificial duck he owns named Donald. The film illustrated the mathematical unity of nature and man, while the duck quacked in order to reassure 20,000,000 viewers that there is no harm in such a discussion.

Lots of kids who were too young for it will be ready next fall. Movies can teach conic sections as easily as pie-throwing. Moviemakers with lesser resources than Disney can also teach laudably. What bothers the classroom teacher about 16mm movies is how to get the one she wants when she wants it instead of seven weeks later. Nobody is to blame. The can of film has too many classes to visit, but relief is on the way.

Enter the *Kodak Sound 8 Projector*. It projects 8mm movies with commentary from a magnetic sound stripe on the film.

The greatly reduced cost and bulk of 8mm film and equipment are what got home movies off the ground. The improvement of sharpness and color in the 8mm Kodachrome II Film introduced this year is making movies really soar as entertainment in the home. In the

schoolroom 8mm sound movies can be expected to simulate the effect of the paperback on the book business. The teacher will be able to handle a teaching film more like a weekly magazine and less like a shipment of gold bullion.

*Keep your eye and ear on 8mm audio-visuals. If thinking of producing some yourself, you are welcome to talk it over with Advisor on Non-Theatrical Films, Eastman Kodak Company, Rochester 4, N. Y.*

### Chemical tuning

Labs without IR spectrophotometers properly consider themselves underprivileged.

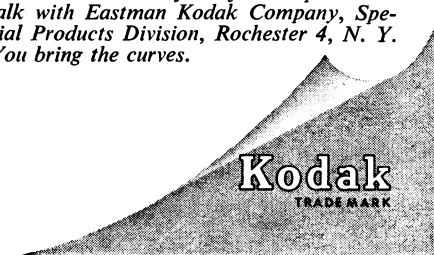
This cute remark could well launch a commercial for spectrophotometers, except that we sell none. We sell what physicists know as optical interference filters, and we are trying here to bridge the conceptual gap from spectrophotometers to these filters.

The filters offer means to exploit in a chemical plant the physical phenomena that spectrophotometers exploit in the laboratory. Suppose, for fantasy's sake, that you wanted to flood a reaction *preferentially* with energy of exactly that frequency to which a certain carbon-nitrogen bond responds. An interference filter system could probably be made for the job.

An interference filter is tunable in manufacture for wavelengths from  $0.4\mu$  to  $12\mu$ . Unlike gelatin or glass filters, its curve doesn't depend on what colorants happen to be available. It can provide a single spectral spike of transmittance but is not limited to that. It can also be designed to cut out energy below a stated frequency or above a stated frequency. It can cut very sharp. It is thermally, chemically, and mechanically rugged. It costs a great deal less than a laser (which, while it can emit Niagaras of monochromatic energy, must work with the quantum states that nature has in stock). It can be large. It can be designed to monitor a process stream continuously for the presence or absence of any substance possessing a suitable energy-absorbance curve.

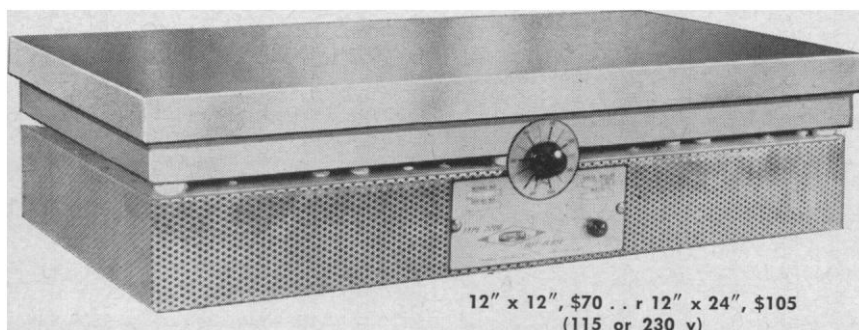
*It can be the subject of an inspirational talk with Eastman Kodak Company, Special Products Division, Rochester 4, N. Y. You bring the curves.*

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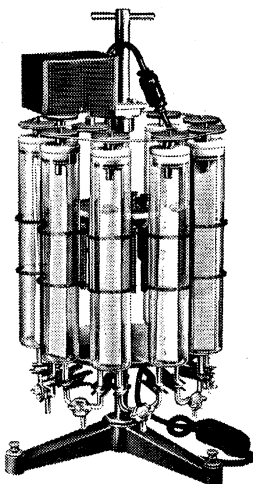
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*Stränge*. The permafrost at midsummer may be as little as 0.5 meter below the surface of the peat.

Two other types of peatland are the peatland which develops on wooded slopes, usually in moist birch types at various altitudes, and the *Hangmoor*, which occurs on slopes of various gradient and is dependent on a continuous supply of up-slope ground water.

Except for some high, rough plateaus, Norway is a country of rugged relief, of fjords where the mountains and valleys reach the sea, of alpine tundra, snow fields, and glaciers—all in strong contrast to the prevailing low relief of Finland.

Although vegetation was dealt with to some extent by the IPE group, especially that of salt marshes and alpine tundra, in Norway particular attention was paid to the occurrence of rare species representing various floristic elements: the Circumboreal, the Siberian, the American, the Arctic, and the South and Central European. The interest was more in flora than in the structure of vegetation. Exceptions were the snow-bed communities in the alpine zone, which had been studied by Gjaerevoll, and the salt marshes and alpine fields, which Nordhagen had studied.

Considerable interest was aroused by the differences between the *Carex nardina-Kobresia myosuroides-sociation* in these regions and that familiar to phytosociologists who had worked in the European Alps. Interest centered also in the flora of dolomitic mountains such as Jøvaren, Børselv, and Duken, the latter at North Cape.

Both of the local committees had prepared printed guides, background papers, and reprints pertinent to the excursion, and all aspects of the travel, meals, and accommodations had been carefully worked out. The Finnish committee supplemented their guidebook with daily handouts of mimeographed plant lists and analyses of vegetation for each of the many botanizing stops. These excursions are occasions for research as well as botanical sight-seeing, and the Swiss Committee in recent years has published a series of contributions from the participants, sometimes running to several hundred pages. In addition, many of the participants publish general or scientific accounts of their experiences in their national periodicals.

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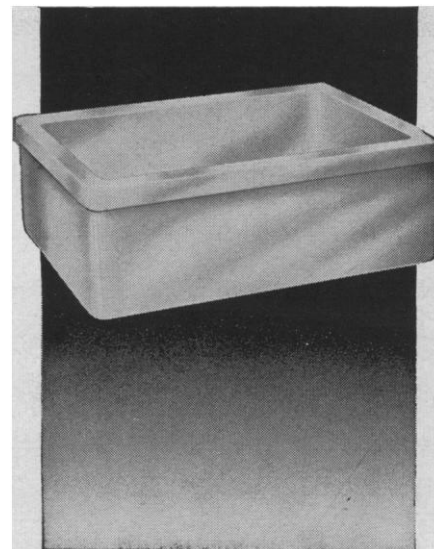
## Topology

Before an ominous background of ever-increasing international tensions, mathematicians have recently completed a highly successful international symposium on topology and its relation to modern analysis and algebra. The symposium, which was held from 1 to 8 September in Prague, was sponsored jointly by the International Mathematical Union and the Czechoslovak Academy of Sciences.

It was interesting, and of course no surprise, to find that a large proportion of the slightly more than 100 participants came from Communist bloc countries. Only two or three of the persons in attendance had also been at the International Colloquium on Differential Geometry and Topology, held in connection with the celebration of the 50th anniversary of the Swiss Mathematical Society in Zurich last year (1). Specifically, there were 12 symposium participants from the U.S.S.R.; 25 from Poland; 24 from the United States; one each from Great Britain, Cuba, Mexico, Bolivia, West Germany, and Italy; two each from Japan, India, Holland, and Austria; three each from East Germany, Yugoslavia, and Hungary; six from France; and eight from Romania. The six French delegates were all young mathematicians affiliated with the National Center of Scientific Research. It is impossible in this brief account to give the names of all the American participants. Among them were M. H. Stone, who spoke on "Some topological aspects of conformal mapping"; Einar Hille, whose paper was entitled "Remarks on transfinite diameters"; and Angus E. Taylor, who reported on "The boundary of the spectrum of a linear operator."

A large group of Czechoslovak mathematicians were both generous and tireless in their efforts to have all things go smoothly, and one could not fail to be impressed by the obvious and earnest desire of the local symposium participants to be friendly, cooperative, and helpful.

The International Hotel was headquarters for the symposium; it was there that most of the scientific sessions were held, and that most of the foreign participants were housed. Some of the rooms were equipped with radios, and participants obtained news broadcasts from Munich on the Voice of America, and also from Moscow. At the hotel, prepaid Cedok (official Czechoslovak



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The symposium was opened on 1 September with words of welcome from professors Novák (chairman of the organizing committee), Kosesnik (vice president of the Czechoslovak Academy of Sciences), and Katetov (vice chairman of the organizing committee). After these greetings, a memorial assembly was held in tribute to E. Cech,

At the first scientific session a keynote speech was presented by P. S. Alexandrov (U.S.S.R.). This was followed by addresses on "Relations of topological spaces" (A. D. Wallace, U.S.) and "Applications of topology to foundations of mathematics" (R.

The topic of the symposium was the present status of the theory of topological spaces. The discussion of applications to functional analysis and modern algebra, which came up in a number of the papers, made the work seem somewhat less abstract than the developments discussed at the Colloquium on Differential Geometry and Topology in the summer of 1960. The symposium participants were supplied with abstracts which had been prepared in advance, and with periodic reviews of the program of the day. The *Proceedings* of the symposium will be published by the organizing committee.

Among the activities planned for hours when scientific sessions were not in progress were all-day tours to Karlsbad and Marienbad, world-famous spas in Western Bohemia. Although one caught occasional glimpses of large industrial developments, these tours were mainly through agricultural and vacation areas in the western part of the country.

At the final session on 8 September, Alexandrov, Stone, and Kuratowski spoke briefly on the accomplishments and the importance of this international symposium. Katetov, speaking in the name of the Czechoslovak mathematicians, then brought the scientific sessions to a close.

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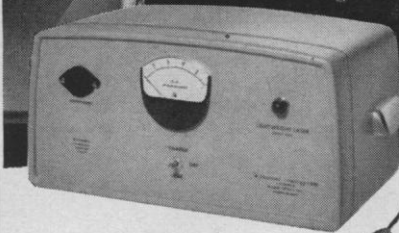
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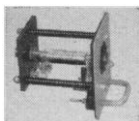


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The members of the organizing committee for this highly significant and cooperative endeavor were as follows: J. Novák, chairman; M. Katetov and K. Kuratowski, vice chairmen; Z. Frolík, secretary; S. Schwarz and K. Koutsky. The administrative secretary was Mrs. K. Trojanová.

LAURA GUGGENBUHL

Hunter College,  
City University of New York, New York

#### Reference

1. L. Guggenbuhl, *Math. Teacher* 54, No. 5 (1961).

### Poultry Science

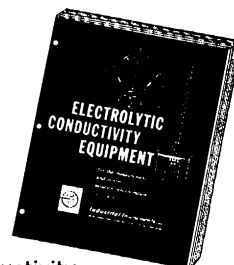
In 1940, 4½ pounds of feed was required to add 1 pound of live weight to a broiler; in 1961, slightly more than 2 pounds of feed was sufficient. This is a remarkable achievement, and it may have more real significance in the cold war than a space spectacular. But this is not an easy point to make—least of all with the 700 members of the Poultry Science Association who assembled at the Pennsylvania State University from 8 to 11 August in their 50th annual meeting.

In point of fact, T. C. Byerly, deputy administrator of the Agricultural Research Service, told the poultry scientists in the annual presidential address, 2 pounds of feed for a pound of broiler isn't really anything to boast about in terms of real energy conversion rates. Nor was this only the view of the presiding officer; among the 340 papers presented were many indicating that the 2-pounds-of-feed barrier was destined to go the way of the 4-minute mile.

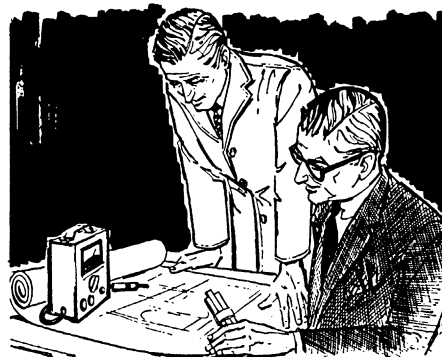
Byerly outlined a long series of besetting problems for the researcher. These included the growing incidence of avian leukosis, a virus-transmitted disease that is now the major killer of laying flocks; lack of understanding of the genetics of disease resistance and of the effect of photo-periodism in poultry; incomplete understanding of ovulation and egg production; and lack of any significant advances, to date, in the processing of poultry.

The meetings were grouped in eight divisions—pathology, nutrition, physiology, genetics, environment, marketing, instruction, and extension. At a general session on the opening day, Eric A. Walker, president of the Pennsylvania State University, commented on the fate of the education bill in Congress.

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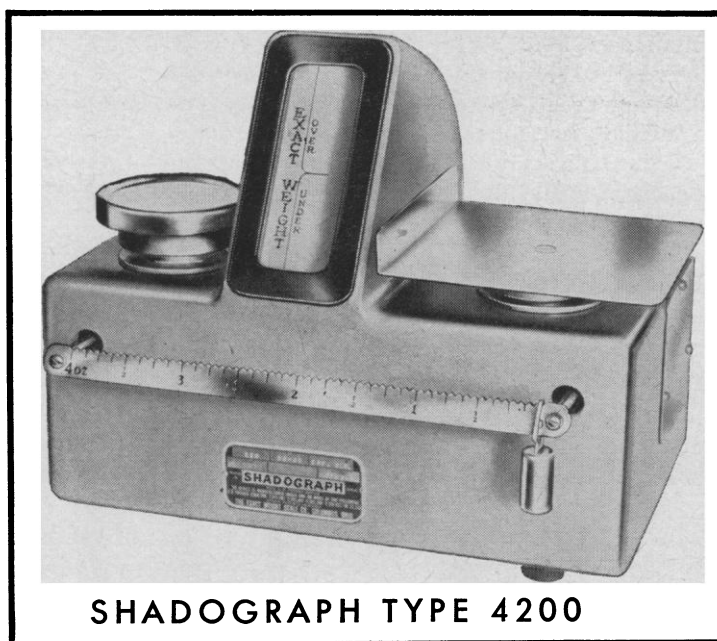
He strongly challenged the cliché that federal aid to education is a new and radical departure (George Washington strongly supported a national university!) and cited the agricultural research program, which dates back to 1887, as the classic example of effective federal aid to education. Local initiative and direction and wide latitude in the use of funds were hallmarks of this program, and the results have been outstanding.

The Poultry Science Association provides an excellent example of cooperation between universities and affiliated industries, and the annual awards dinner becomes an occasion of considerable interest, inasmuch as the winning plaques are accompanied by substantial amounts of cash. The Borden award, consisting of a plaque and \$1000 for "original distinctive work demonstrating sound research in poultry nutrition," went to F. W. Hill (University of California). The Pfizer extension teaching award of \$1000 for "an outstanding program of work . . . in poultry extension" was presented to Harry C. Whelden, Jr. (University of Maine). M. L. Sunde (University of Wisconsin) received the \$1000 American Feed Manufacturers Association award for research in poultry nutrition. The Ralston Purina teaching award, also of \$1000, for excellence in teaching, went to Jack Long (Purdue University).

The biennial award of \$1000, given by the Institute of American Poultry Industries for outstanding work in poultry- and egg-products technology over a 3-year period, was presented to Daniel Fromm (North Carolina State College). The Poultry Science Research award of \$200 for outstanding research during the past year was awarded to James V. Craig (Kansas State University).

F. H. Wilcox (University of Maryland), was selected as the winner of the \$1000 August Hande award for the outstanding U.S. paper submitted in the World's Poultry Congress Paper Prize. The travel grant of \$1000 from the Poultry Science Association was awarded to Donald de Fremery (Western Regional Research Laboratory, Department of Agriculture).

New officers elected by the association were as follows: C. S. Shaffner (University of Maryland), president; R. G. Jaap (Ohio State University), first vice president; J. C. Driggers (University of Georgia), second vice president; and C. B. Ryan (Texas Agricultural and Mechanical College), secretary-treasurer. T. C. Byerly, L. Z. Eggleton, and M. L. Sunde were elected



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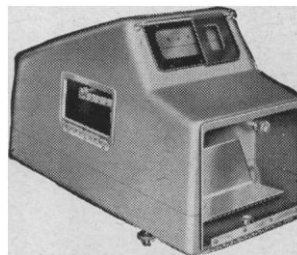
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directors. The association will meet at the University of Illinois in 1962, at Oklahoma State University in 1963, and at the University of Minnesota in 1964.

Elected as fellows of the association were B. B. Bohren (Purdue University), E. W. Callenbach (Lebanon, Va.), J. R. Cavers (Ontario Agricultural College), I. Michael Lerner (University of California), and A. E. Tomhave (University of Delaware).

A. J. G. MAW

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## Forthcoming Events

### December

17-18. International Congr. of Comparative Pathology, 9th, Paris, France. (L. Grollet, Comité International Permanent des Congrès de Pathologie Comparée, 63 Avenue de Villiers, Paris 17°)

19-23. Inter-American Congr. of Psychology, 7th, Monterrey, Mexico. (G. M. Gilbert, Psychology Dept., Long Island Univ., Brooklyn 1, N.Y.)

22-29. Plant Tissue and Organ Culture, intern. symp., New Delhi, India. (P. Maheshwari, Univ. of Delhi, Delhi)

26-28. History of Science Soc., annual,

Washington, D.C. (J. C. Greene, 1121 Iowa Ave., Ames, Iowa)

26-31. American Assoc. for the Advancement of Science, annual, Denver, Colo. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington 5)

The following 45 meetings are being held in conjunction with the AAAS annual meeting.

AAAS Cooperative Committee on the Teaching of Science and Mathematics (J. R. Mayor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C.). 27 Dec.

AAAS Southwestern and Rocky Mountain Division (M. G. Anderson, New Mexico State Univ., University Park). 26-30 Dec.

Academy Conf. (J. G. Arnold, Jr., Loyola Univ., New Orleans, La.). 27-28 Dec.

Alpha Epsilon Delta (N. F. Witt, Univ. of Colorado, Boulder). 28-29 Dec.

American Astronautical Soc. (M. Pitkin, Martin-Denver Co., Denver, Colo.). 28-29 Dec.

American Astronomical Soc. (H. J. Smith, Yale Observatory, 135 Prospect St., New Haven, Conn.). 26-30 Dec.

American Economic Assoc. (K. E. Boulding, Univ. of Michigan, Ann Arbor). 26 Dec.

American Educational Research Assoc. (D. D. Feder, San Francisco State College, San Francisco, Calif.). 30 Dec.

American Nature Study Soc. (S. G. Baldwin, Danville, Ill.). 27-30 Dec.

American Physiological Soc. (R. E. Smith, Univ. of California, Los Angeles). 29 Dec.

American Political Science Assoc. (J. Korb, Social Science Foundation, Univ. of Denver, Denver, Colo.). 27 Dec.

American Psychiatric Assoc. (D. A. Hamburg, Stanford Medical Center, Palo Alto, Calif.). 27 Dec.

American Soc. of Criminology (G. H. Barker, Dept. of Sociology, Univ. of Colorado, Boulder). 29-30 Dec.

American Soc. of Naturalists (E. W. Caspari, Univ. of Rochester, Rochester, N.Y.). 27 Dec.

American Soc. of Zoologists (R. L. Watterson, Univ. of Illinois, Urbana). 27-30 Dec.

American Sociological Assoc. (C. Taeuber, Bureau of the Census, Washington, D.C.). 29 Dec.

American Statistical Assoc. (J. A. Niederjohn, Ideal Cement Co., Denver, Colo.). 29-30 Dec.

Association of American Geographers (M. J. Loeffler, Univ. of Colorado, Denver). 26-28 Dec.

Association for Computing Machinery (W. F. Cahill, Goddard Space Flight Center, Greenbelt, Md.). 28 Dec.

Beta Beta Beta Biological Soc. (Mrs. F. G. Brooks, Box 515 Ansonia Station, New York 23). 26-27 Dec.

BIO (Biomedical Information-Processing Organization) (R. S. Ledley, Natl. Biomedical Research Foundation, Silver Spring, Md.). 27 Dec.

Biometric Society, WNAR (F. Graybill, Statistical Laboratory, Colorado State Univ., Fort Collins). 28 Dec.

Committee on Desert and Arid Zones Research, Southwestern and Rocky Moun-

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# 2

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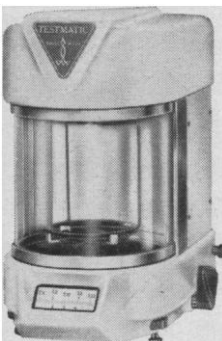
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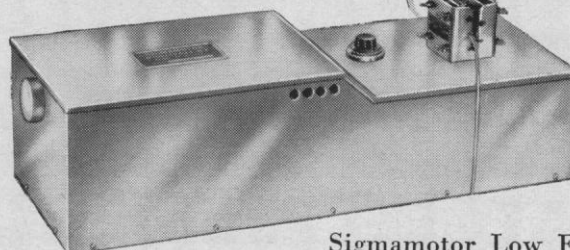
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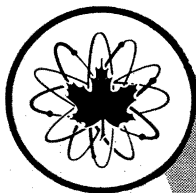
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tain Div. of AAAS (T. L. Smiley, Univ. of Arizona, Tucson). 30 Dec.

Conference on Scientific Communication (C. D. Leake, Ohio State Univ., Columbus). 30 Dec.

Conference on Scientific Manpower (T. J. Mills, Natl. Science Foundation, Washington, D.C.). 27 Dec.

Ecological Soc. of America (R. S. Miller, Univ. of Saskatchewan, Saskatoon, Canada). 27-29 Dec.

Institute of Management Sciences (M. M. Flood, Mental Health Research Inst., Univ. of Michigan, Ann Arbor). 29 Dec.

Mathematical Assoc. of America, Committee on Undergraduate Program in Mathematics (R. J. Wisner, Michigan State Univ., Oakland, Rochester). 30 Dec.

Metric Assoc. (R. P. Fischelis, 502 Albee Bldg., NW, Washington, D.C.). 27-30 Dec.

National Assoc. of Biology Teachers (Miss M. Beuschlein, Chicago Teachers College, Chicago, Ill.). 27-30 Dec.

National Assoc. for Research in Science Teaching (Miss E. M. Selberg, Colorado State College, Greeley). 27-30 Dec.

National Assoc. of Science Writers (H. B. Nichols, U.S. Geological Survey, Washington, D.C.). 27 Dec.

National Geographic Soc. (R. Gray, National Geographic Soc., Washington, D.C.). 30 Dec.

National Science Teachers Assoc. (Miss M. Gardner, Natl. Science Teachers Assoc., Washington, D.C.). 27-30 Dec.

National Speleological Soc. (W. R. Halliday 1117 36 Ave., East, Seattle, Wash.). 29 Dec.

Philosophy of Science Assoc. (C. W. Churchman, Univ. of California, Berkeley). 29 Dec.

Scientific Research Soc. of America (D. B. Prentice, 51 Prospect St., New Haven, Conn.). 29 Dec.

Sigma Delta Epsilon (Miss E. B. Thurman, Natl. Institutes of Health, Bethesda, Md.). 28 Dec.

Society for General Systems Research (R. L. Meier, Univ. of Michigan, Ann Arbor). 29 Dec.

Society for Industrial and Applied Mathematics (D. L. Thomsen, Jr., I.B.M. Corp., White Plains, N.Y.). 29 Dec.

Society of Protozoologists (N. D. Levine, College of Veterinary Medicine, Univ. of Illinois, Urbana). 27-30 Dec.

Society of the Sigma Xi (T. T. Holme, 51 Prospect St., Yale Univ., New Haven, Conn.). 29 Dec.

Society of Systematic Zoology (C. F. Lytle, Tulane Univ., New Orleans, La.). 27-30 Dec.

Tau Beta Pi Assoc. (R. H. Nagel, Univ. of Tennessee, Knoxville). 29 Dec.

United Chapters of Phi Beta Kappa (C. Billman, 1811 Q St., NW, Washington 9). 29 Dec.

27-29. American Economic Assoc., New York, N.Y. (J. W. Bell, AEA, Northwestern Univ., Evanston, Ill.)

27-29. American Folklore Soc., Cincinnati, Ohio. (T. P. Coffin, 110 Bennett Hall, Univ. of Pennsylvania, Philadelphia 4, Pa.)

27-29. American Geophysical Union, 1st western natl., Los Angeles, Calif. (A. N. Sayre, U.S. Geological Survey, Washington 25)

27-29. American Physical Soc., Los Angeles, Calif. (K. K. Darrow, 538 W. 120 St., New York 27)

27-29. Western Soc. of Naturalists, Eugene, Ore. (I. A. Abbott, Hopkins Marine Station, Pacific Grove, Calif.)

27-30. Institute of Mathematical Statistics, annual, New York, N.Y. (D. C. Riley, American Statistical Assoc., 1757 K St., NW, Washington 6)

28-29. American Chemical Soc., Div. of Industrial and Engineering Chemistry, Newark, Del. (Scientific Liaison Office, Natl. Research Council, Sussex Dr., Ottawa, Canada)

28-29. Linguistic Soc. of America, annual, Chicago, Ill. (A. A. Hill, Box 7790 University Station, Austin 12, Texas)

28-29. Northwest Scientific Assoc., Spokane, Wash. (E. J. Larrison, Univ. of Idaho, Moscow)

28-30. Archaeological Inst. of America, Detroit, Mich. (L. A. Campbell, 5 Washington Square N., New York 3)

28-30. Phi Delta Kappa, Bloomington, Ind. (R. S. Merkel, Indiana Central College, Indianapolis 27)

#### January

2-3. California Assoc. of Chemistry Teachers, San Luis Obispo, Calif. (R. Major, 1736 N. Sierra Bonita Ave., Hollywood 46, Calif.)

8-12. International Heat Transfer Conf., Institution of Mechanical Engineers, London, England. (Secretary, IME, 1 Birdcage Walk, Westminster, London, S.W.1)

8-12. Society of Automotive Engineers, annual, Detroit, Mich. (R. W. Crory, SAE, 485 Lexington Ave., New York 17, N.Y.)

8-13. Central Treaty Organization, Role of Science in Natural Resources, Lahore, Pakistan. (Office of Intern. Conferences, Dept. of State, Washington 25)

9-11. Reliability and Quality Control, 8th natl. symp., Institute of Radio Engineers and American Inst. of Electrical Engineers, Washington D.C. (Scientific Liaison Office, Natl. Research Council, Sussex Dr., Ottawa, Ont., Canada)

9-12. Radioactive Isotopes in Clinical Medicine and Research, 2nd symp., Bad Gastein, Austria. (R. Höfer, Garnisongasse 13, Vienna IX, Austria)

9-19. Synoptic Meteorology Code Problems, World Meteorological Organization, Toronto, Ont., Canada. (WMO, 41 Avenue Giuseppe Motta, Geneva, Switzerland)

11. Role of Hormones in Protein Synthesis, Assoc. of Vitamin Chemists, Chicago, Ill. (H. S. Perdue, Abbott Laboratories, N. Chicago)

15-17. American Pomological Soc., Toronto, Canada. (G. M. Kessler, Dept. of Horticulture, Michigan State Univ., E. Lansing)

17-19. Instrument Soc. of America, winter conf. and exhibit, St. Louis, Mo. (W. H. Kushnick, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.)

18-31. Tropical Cyclones, inter-regional seminar, World Meteorological Organization, Tokyo, Japan. (WMO, 41 Avenue Giuseppe Motta, Geneva, Switzerland)

22. American Ethnological Soc., New York, N.Y. (N. F. S. Woodbury, Arizona State Museum, Univ. of Arizona, Tucson)

(See issue of 1 December for comprehensive list)



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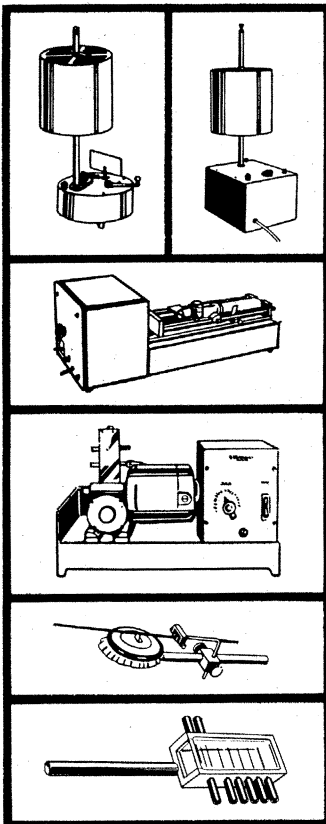
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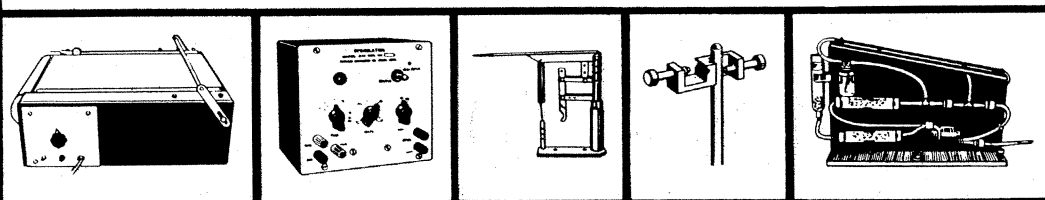
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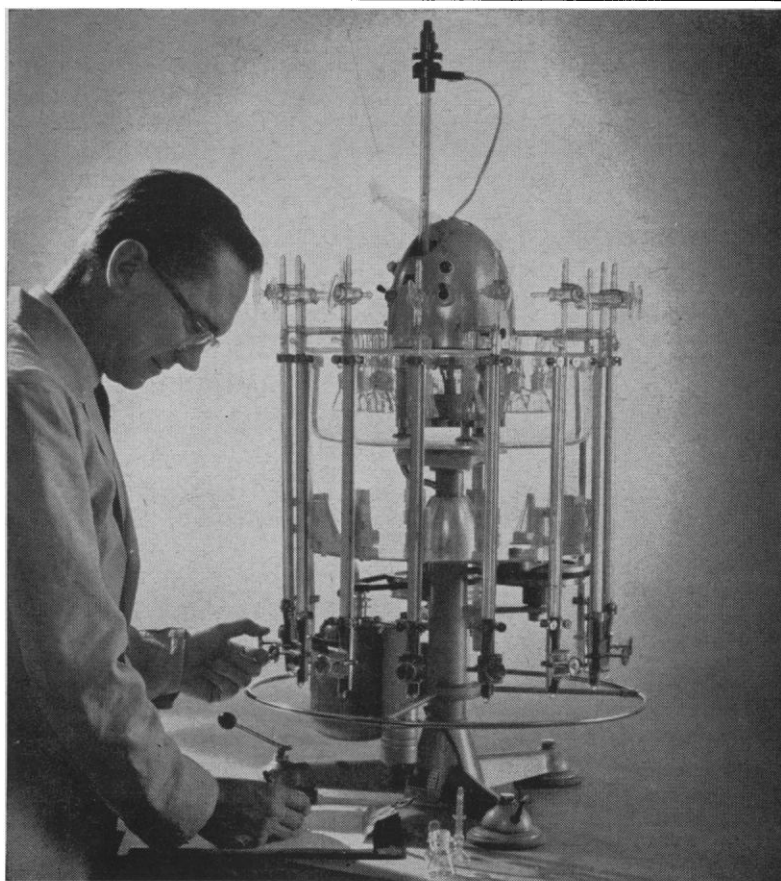
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provide phase sensitive a-c output signals proportional to the tilt angle. The instrument is hermetically sealed and fluid filled for damping and resistance to shock and vibration. A bellows is provided for fluid expansion. Excitation is 10 volts, 1000 cy/sec. Sensitivity is  $20 \text{ mv} \pm 2 \text{ mv/min}$ , up to 10 min;  $20 \text{ mv} \pm 3 \text{ mv/min}$  up to 20 min. While designed to be operated in a controlled-temperature-environment, the sensor is said to be usable over a wide temperature range with less accuracy. (General Precision, Inc., 1150 McBride Ave., Little Falls, N.J.)

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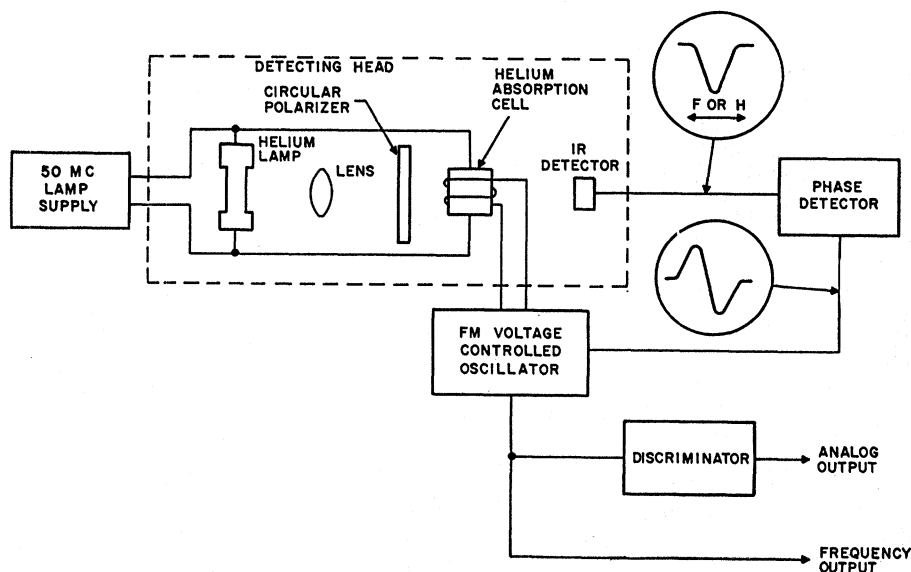
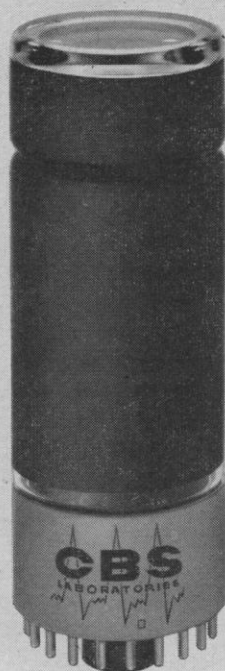


Fig. 1. Metastable helium magnetometer.

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Finally, the reference and postmix samples are placed in the instrument and the switch is set to "compute volume." The instrument automatically corrects for instrumental background again, subtracts sample activity indicated by the reference sample, and computes the blood volume making corrections for radioactive decay of the dose. Blood volume is indicated by a pointer-type meter with a 4-in. scale. Accuracy is said to be  $\pm 5$  percent. (Atomium Corp., 940 Main St., Waltham 54, Mass.)

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face, a wiper mechanism can be provided which will wipe the prism surface periodically. Prism mounting heads can be provided for lines with a diameter of from 0.25 to 2 in. (Waters Associates, 45 Franklin St., Framingham, Mass.)

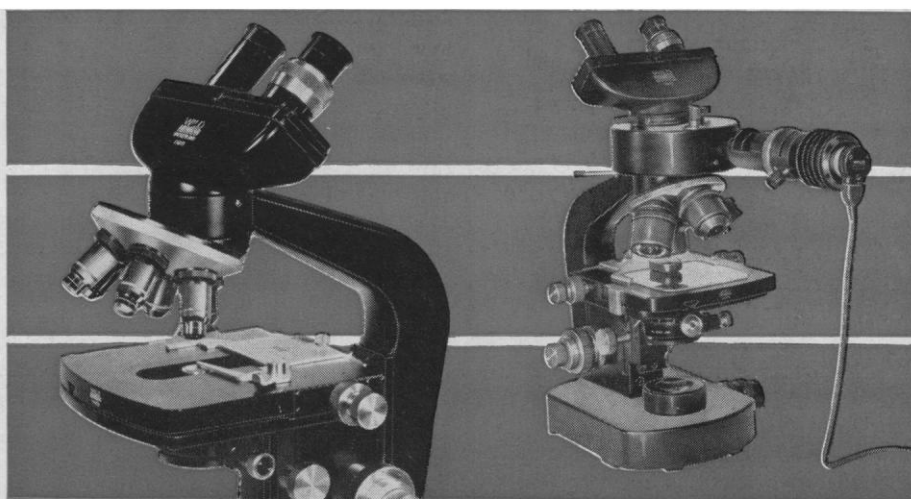
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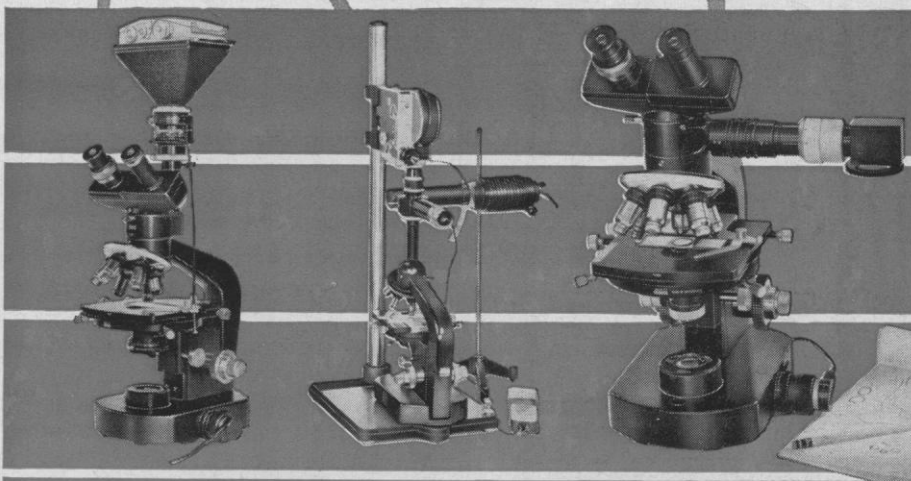
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Can any other microscope offer so much versatility, precision and utility? Your own evaluation of this superb Swiss crafted instrument will provide the answer.

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157 MacLaren St., Ottawa, Ontario



and-direction joystick control mounted on the control panel permits the operator to position the carriage at any desired location. (Gerber Scientific Instrument Co., 89 Spruce St., Hartford, Conn.)

Circle 7 on Readers' Service card

**Electron-microprobe display console** is to be used with electron-beam microprobe analyzers. It will display the location and concentration of up to four separate x-ray spectra simultaneously. Alternatively, one channel may be used to display back-scattered electrons. The console provides the raster drive for

both the electron microprobe beam and the cathode-ray tubes. The x-axis deflection is a linear sawtooth wave form with sweep time adjustable between 1 and 30 sec per line. The y-axis deflection is a stepped voltage signal synchronized with the retrace of the x-axis sweep. The raster may consist of 8, 16, or 32 lines. Stabilized d-c amplifiers are used to amplify the signals derived from scanning the sample, and a stable d-c coupling circuit is used to control the grids of the cathode-ray tube. (Elcor, Inc., 1225 W. Broad St., Falls Church, Va.)

Circle 8 on Readers' Service card

**Potentiometer tester**, the type 2398, supplies x and y d-c signals representing potentiometer shaft resistance and rotation, respectively, to the manufacturer's x-y recorder or any other recorder of similar input characteristics. Operating in two switch-selected ranges, 1 ohm to 1 megohm and 10 ohms to 10 megohm, the instrument provides 120-db resistance measurement capability. Eight precise resistors provide calibration checks at each 20-db point. Rotation range is 0 to 360 deg. Recording time is variable from 15 to 60 sec for full rotation depending on the slope of the curve. The y-axis of the recorder is driven by a signal representing the logarithm of test resistance. The signal is the output voltage difference from two model 60B logarithmic converters, each of which provides a d-c output proportional to the log of an a-c or d-c input. Accuracy of the log R portion of the system is said to be  $\pm 0.4$  percent of full scale, and accuracy of angular rotation  $\pm 0.2$  percent of full scale. (F. L. Moseley Co., 409 N. Fair Oaks Ave., Pasadena, Calif.)

Circle 9 on Readers' Service card

**Ultrasonic generator** is a hand-held device the tip of which radiates ultrasonic energy. Liquid or other material may be processed while in a small beaker or test tube by inserting the tip. The device requires no special handling and is said to provide no electrical or acoustic danger. Frequency of operation is 25 kcy/sec. Eight power levels are provided. The excitation unit is connected by cable to the hand-held probe. (Heat Systems Co., 777 Northern Blvd., Great Neck, N.Y.)


Circle 10 on Readers' Service card

**Micropositioner** is an optical mechanical device for measuring small angles in the laboratory or field. The device is a prism coupled for rotation to a micrometer head. Each division of the micrometer readout corresponds to 0.1 sec of angular displacement of the reflecting prism. Maximum angular displacement is 16.7 min about a vertical axis. Accuracy is said to be 0.25 sec (r.m.s.). (Optomechanisms Inc., Industrial Park No. 1, Plainfield, N.Y.)

Circle 11 on Readers' Service card

**A d-c voltage reference** has seven panel dials to provide seven-digit resolution in three ranges from 0 to more than 1000 volts, positive or negative. Output voltage is said to be accurate to within  $\pm 0.01$  percent of the dial setting

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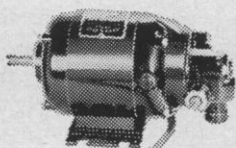
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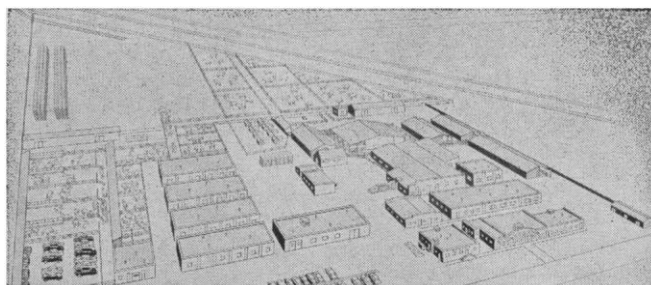
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• Thyatron tube operated controller gives stepless operation • Input: 110-120 V., 60 cy. single phase • Output: 0-120 V., 200 ma. DC to armature • 1/50 H.P. ball bearing, right angle, gear head, shunt wound, DC motor • Reversible • Armature shaft is extended • Armature speed 0 to 4000 R.P.M. • Motors in gear ratios: 6, 18, 30, 36, 60, 100, 300, 540, and 1120:1 in stock.

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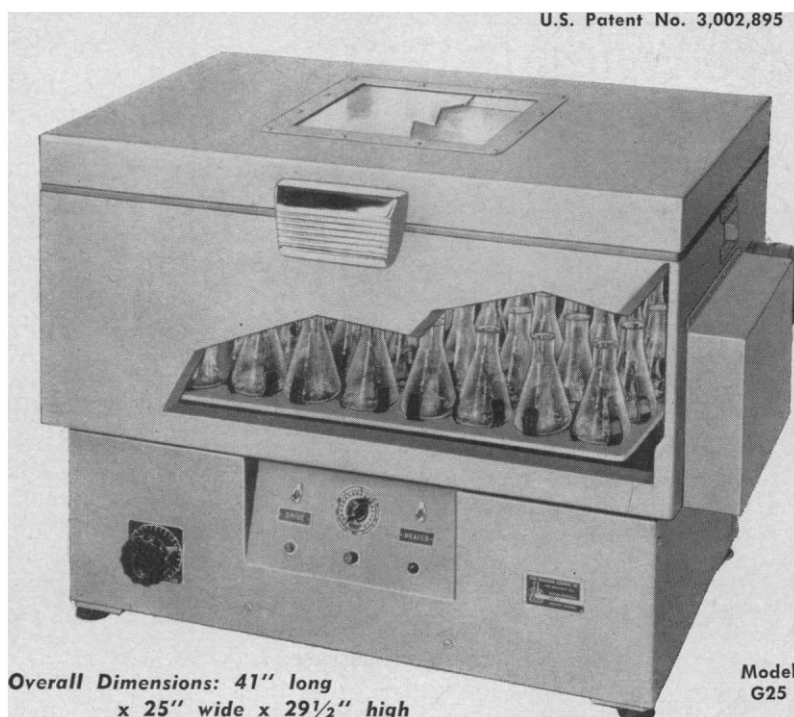
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Model G25 is a controlled temperature incubator with continuous shaking action. Agitation speed is continuously variable from 140 to 400 rpm. A heavy-duty motor drives the triple-eccentric-shaft stabilizer assembly which distributes positive, rotary motion to every flask on the 18"x30" platform. This rugged apparatus provides cool, quiet, and smooth-running operation with heavy workloads. Circulating heated air, the fully insulated unit maintains constant temperature; from ambient to 60°C.,  $\pm \frac{1}{2}^{\circ}\text{C}$ . It is adaptable for tubes, bottles, and other glassware, and is thoroughly reliable under continuous operation. Alternate speed ranges and connections for gassing are also available.



Overall Dimensions: 41" long  
x 25" wide x 29½" high

Model  
G25

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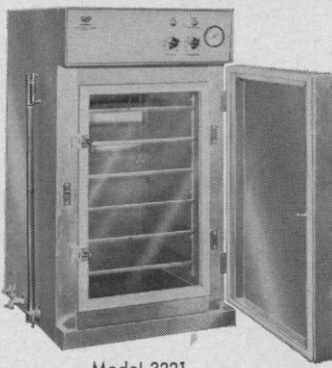
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National Appliance offers a complete line of apparatus from small, specially designed research models to large, custom-built incubation rooms.

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and stable within 50 parts per million. Output current up to  $\pm 25$  ma is provided. Noise and ripple are stated to be less than 0.0001 percent, peak-to-peak, of the dial setting. (Cohu Electronics, Inc., Box 623, San Diego 12, Calif.)

Circle 12 on Readers' Service card

**Stable light source** consists of a solid-state power supply that maintains a selected tungsten-filament lamp at constant intensity. The lamp assembly is nested within the power-supply case for convenient transport or storage. Candle-power ripple is said to be less than  $\pm 0.0001$  percent. Warm-up time is 10 min at room temperature. The electrical requirement is 100 to 135 volts, 60 cy/sec. (Quantametric Devices, Inc., P.O. Box 1107, Binghamton, N.Y.)

Circle 13 on Readers' Service card

**Multiple coincidence unit** is a fully transistorized instrument that accepts up to five input signals and delivers three simultaneous output signals. The main chassis contains three independent fast-slow coincidence circuits and up to five plug-in circuit boards for processing signals from as many as five radiation detectors. Coincidence resolving time is adjustable from 0 to 180 nsec. The three coincidence circuits, each of which represents a different set of coincidence conditions, can be used to direct data to three separate sections of the analyzer memory, making it possible to study three aspects of a decay scheme at the same time. (Cosmic Radiation Labs., Inc., Bellport, N.Y.)

Circle 14 on Readers' Service card

**Instrument transformer**, for measurement of amplitude and wave form at voltages up to 300 kv, features rise time of 20 nsec and drop of 0.1 to 0.0005 percent per  $\mu$ sec. Over-all dimensions are 8 by 2 $\frac{3}{4}$  by 9 $\frac{1}{2}$  in. (Pearson Electronics, Inc., 707 Urban Lane, Palo Alto, Calif.)

Circle 15 on Readers' Service card

**Projection microscope** provides magnification up to 1500 with optional oil-immersion objectives. The instrument may be used in horizontal or vertical position. A prefocused 100-watt lamp is the light source. Heat-absorbing filters are built into the light-condensing system. A polarizing filter provides variable illumination intensity. The instrument can also be used for direct viewing. (National Instrument Co., Baltimore 15, Md.)

Circle 16 on Readers' Service card

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*MINI-MILL macerates, homogenizes, emulsifies ... for research in cosmetics, pharmaceuticals, paint, resins, coatings, polish, ink, soap ... also bacteria, tissues, cells.*

MINI-MILL provides intense mechanical shear by blades on the bottom of the rotor (see drawing) and cutting edges of serrations on rotor and stator, also hydraulic shear as material is forced through a fine gap, 3 to 125 mils, adjustable while running. Self circulating. Also used with 120  $\mu$  diam. glass beads for further breakdown.

Rotor speed: 0 to 22000 rpm with variable transformer. Mixing cups are immersed in cooling water in a steel container (not illustrated). Micrometer gap adjustment. Contact surfaces are stainless steel. Ports for introducing or removing material without removing cup ... also for steam or inert gas. Quickly disassembled for sterilization. Overall height—approx. 15".

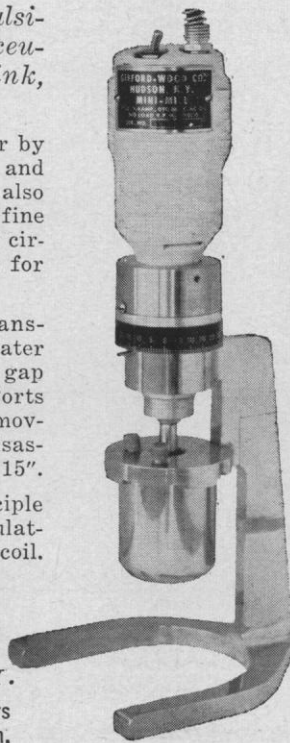
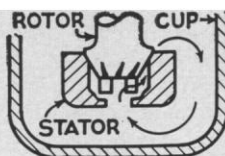
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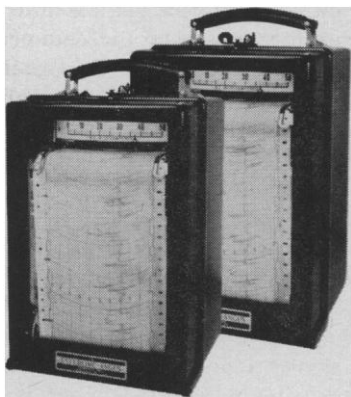
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*On some of the above, the recorder is used direct. On others it operates in conjunction with additional equipment.*

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0-1 Milliamperes	1400 ohms	½ sec. (B)
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Circle 17 on Readers' Service card

**Linear actuator** provides positioning accuracy said to be repeatable to within  $\pm 0.0025$  in. without feedback. Rated thrust is 500-lb tension and compression with maximum thrust 1000 lb. Stroke is continuously adjustable from 0 to 6 in. An optional potentiometer can be provided for position indication. (Lear Incorporated, Electromechanical Division, 110 Ionia Ave., NW, Grand Rapids 2, Mich.)

Circle 18 on Readers' Service card

**Marker generator** furnishes intensity-modulated time markers synchronized to the oscilloscope trace of the manufacturer's models 160B and 170A oscilloscopes. Marker intervals are 10, 1, or 0.1  $\mu$ sec. Marker duration is a function of the adjustable intensity but is said always to be less than 40 percent of the marker interval. The markers may also be used to trigger external equipment. Wave form is a positive-polarity clipped sine wave with amplitude adjustable from 0 to 1 volt (peak) into open circuit. (Hewlett Packard Co., 1501 Page Mill Rd., Palo Alto, Calif.)

Circle 19 on Readers' Service card

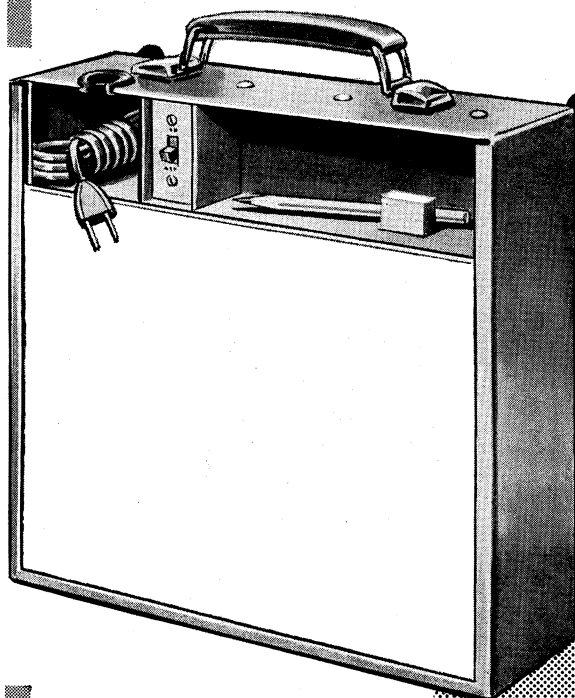
**Metering pump** provides controlled flows from 0 to 158 ml/min with flow adjustable at any time. The pump is a diaphragm type; all parts coming in contact with the liquid being pumped are fabricated of chemically resistant plastic. Dimensions of the device are 9 by 10 by 7 in. Other models are available with capacities of 0 to 100 ml/min and 0 to 12.5 ml/min. (Cole-Palmer Instrument and Equipment Co., 7330 N. Clark St., Chicago 26, Ill.)

Circle 20 on Readers' Service card

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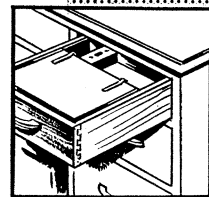
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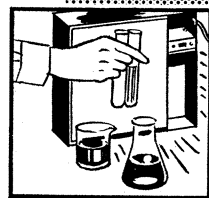
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**Optical gage** incorporates a precisely ruled scale as the measuring element. Accuracy is said to be  $\pm 2.5 \times 10^5$  in.; range of measurement is 0 to 3 in. No correction for temperatures is required over the range 50° to 90°F. Maximum temperature correction over the range 31° to 105°F for a 3-in. dimension in steel is 0.0001 in.

The instrument is supplied with an anvil adapter that will accept a standard anvil or special fixture. A 3.5-in. diameter circular anvil and a 4- by 6-in. rectangular anvil are available as op-

tional equipment. An optional foot-control switch frees the operator's hands for manipulating parts. (Bausch and Lomb Inc., Rochester 2, N.Y.)

**Circle 21 on Readers' Service card**

**Computing audiometer** combines a standard audiometer and typewriter, modified for audiological use, and a computing system said to be no larger than an over-night traveling bag. Simulating manual audiometry, the computer varies the frequency and amplitude of pure-tone signals in graduated

steps and stores the patients' responses. Up to ten tests are given at any one frequency. If a response pattern is recognized before ten tests, the computer prints out the score and goes on to the next scheduled frequency. The computer can detect errors resulting from tension, tinnitus, or failure to understand instructions. If a pattern of errors is found that casts doubt on the validity of the hearing threshold, the data are discarded for that frequency and a question mark is printed on the audiogram. The computer can be programmed to follow any variation in techniques desired by the audiologist. (Belton Hearing Aid Co., 2900 W. 36 St., Chicago, Ill.)

**Circle 22 on Readers' Service card**

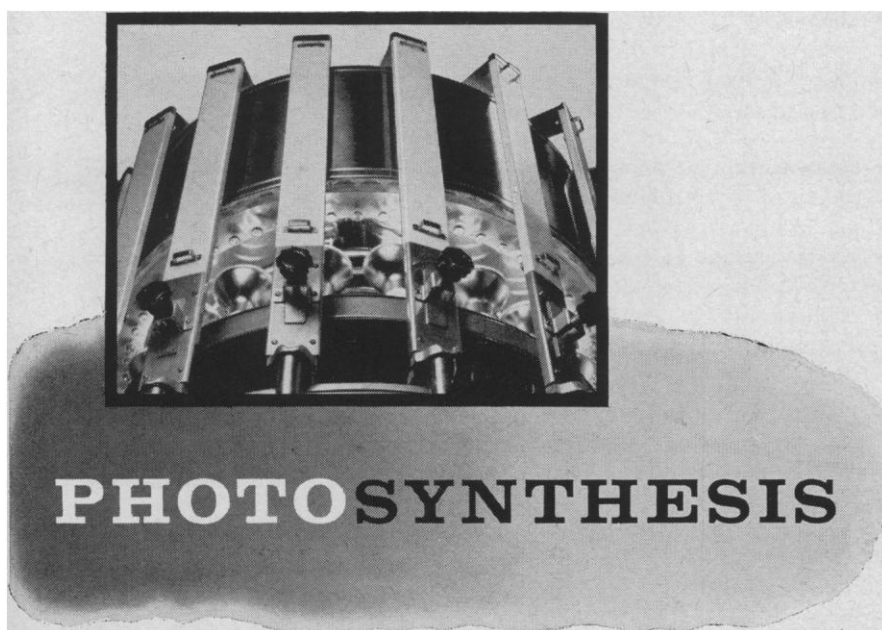
**Cathode-ray tube** for direct optical printing on light-sensitive materials uses fiber optics to conduct light from the phosphor to the atmospheric side of the face plate. Since the light is not dispersed in passing through the individual light pipes, the recording medium can be placed immediately adjacent to the face of the tube without supplementary optical systems. The tube is magnetically shielded and uses low-voltage acceleration, low-voltage electrostatic focus, and low-voltage electrostatic deflection. (Litton Industries, 960 Industrial Rd., San Carlos, Calif.)

**Circle 23 on Readers' Service card**

**Cryogenic thermometer** is designed for measurement in the liquid-helium range from 1.5° to 5.0°K. The temperature-sensitive element is a doped-germanium *p-n* resistor that measures approximately 235 ohms at 4.2°K. Sensitivity is said to be greater than 50 ohms per degree Kelvin at this temperature, and accuracy better than  $\pm 0.050^\circ\text{K}$ . The units are mounted in a glass-to-metal hermetically sealed platinum enclosure. Temperature is read from a calibration chart that can be provided with each thermometer element. (Radiation Research Corp., Westbury, N.Y.)

**Circle 24 on Readers' Service card**

**Sonar depth ranger** is designed to measure the distance from the ocean bottom of a grab, a coring tool, a camera, or other oceanographic equipment. Accuracy is said to be within 3 feet. The instrument can be attached at any point on the steel supporting wire between the ship and the equipment at the end of the wire. When lowered, it sends back two signals. One



## WARBURG APPARATUS

by **GME**

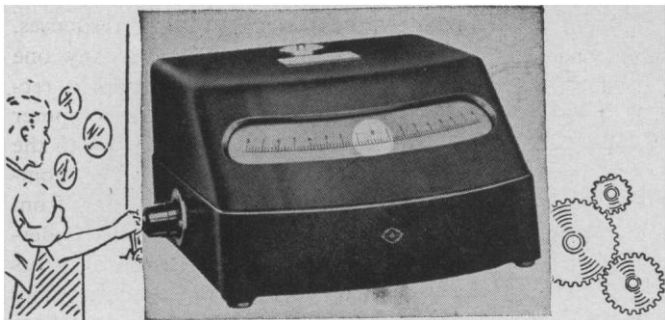
This version of the GME-Lardy Circular Warburg apparatus has a specially constructed water bath with a transparent plastic bottom. 30-watt reflector spotlights are suitably placed beneath the bath, providing 1000 to 1400 foot-candles on each flask.

- Excursion continuously variable from 0 to 5 cm.
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- Temperature range ambient to 50° C.
- Accommodates 18 manometers, 16 of them with lights
- Accurate temperature control, better than  $\pm .02^\circ\text{C}$ .
- Diameter: 26 inches

Unlimited rotation when lights are not used. Refrigerated models also available, as well as a somewhat smaller model with accommodations for 14 manometers, 12 of them with lights.

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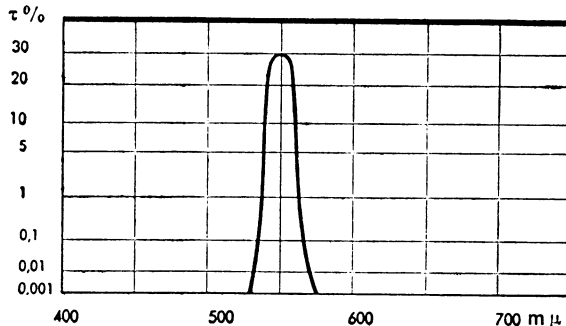
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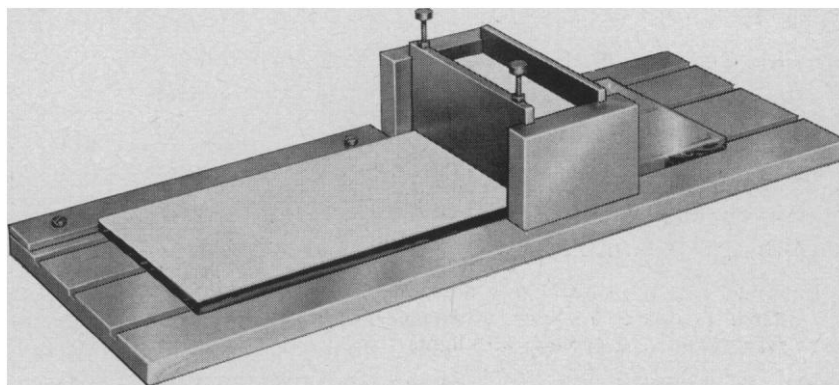
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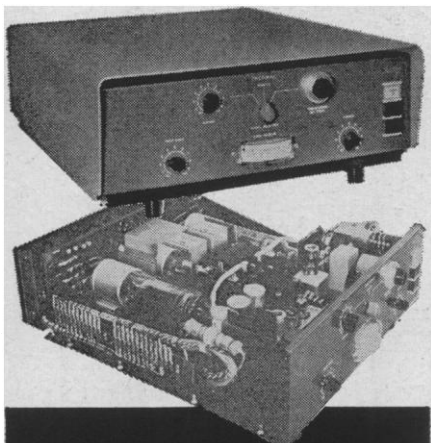
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BERKELEY 10, CALIF.

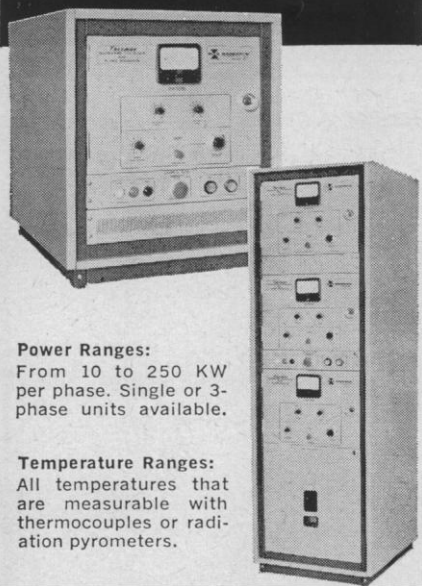


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**Power Ranges:**  
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All temperatures that  
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is direct and the other is reflected from the ocean floor. Comparison of the time required for the two signals to reach the receiving equipment provides the desired measurement of distance from the bottom.

The instrument is completely self-contained with its own batteries, electronic power, and control units in water-tight steel cases that are designed to withstand pressures of up to 9 tons/in<sup>2</sup>. (Edgerton, Germeshausen & Grier, Inc., 160 Brookline Ave., Boston 15, Mass.)

Circle 25 on Readers' Service card

**Photomicrographic camera** automatically estimates exposure time, with either detail or field-integrating mechanisms. A multiplier phototube is used to sense illumination. The current produced by the tube charges a capacitor to a predetermined voltage. A gas-discharge tube then starts to discharge the capacitor operating a relay and opening and closing a vibration-free shutter. The film is then automatically transported by one frame. The self-contained 35-mm camera has interchangeable cassettes to hold any type of film desired. Interchange of magazines is said to require 2 sec. (E. Leitz, Inc., 468 Park Ave. South, New York 16, N.Y.)

Circle 26 on Readers' Service card

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**Scratch depth gage** (see Fig. 2) permits measurements to be made with accuracy said to be  $\pm 0.0001$  in. or  $\pm 5$  percent of depth, whichever is greater, for indentations ranging in depth from 0.0002 to 0.016 in. Scratch width can be determined to  $\pm 0.001$  in. from 0.001 to 0.050 in. The same ranges apply to the measurement of raised portions. The instrument operates by projecting an image of a wire of small diameter at an angle against

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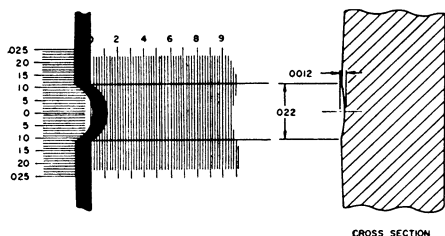


Fig. 2. View of scratch and projected shadow as seen through the eyepiece of a scratch depth gage.

the scratch. The operator views the distorted image against a set of scales. (Bausch and Lomb Inc., Rochester 2, N.Y.)

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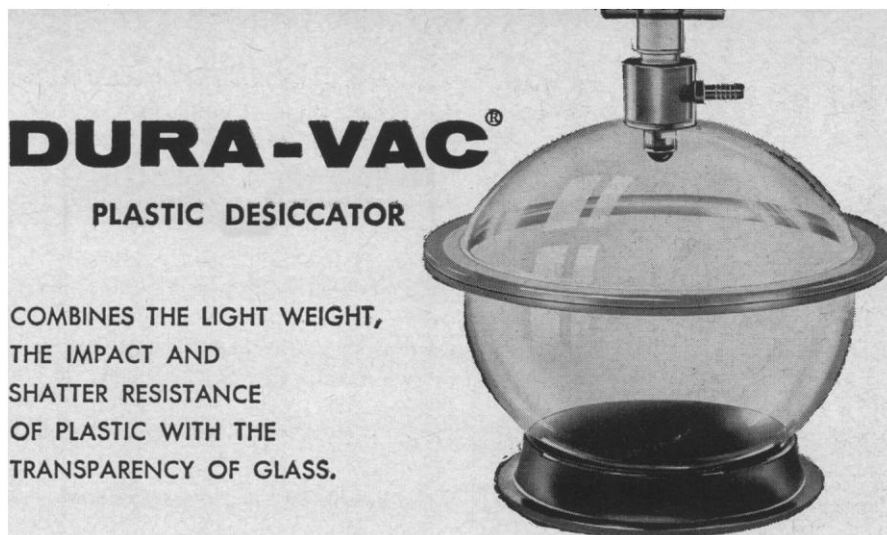
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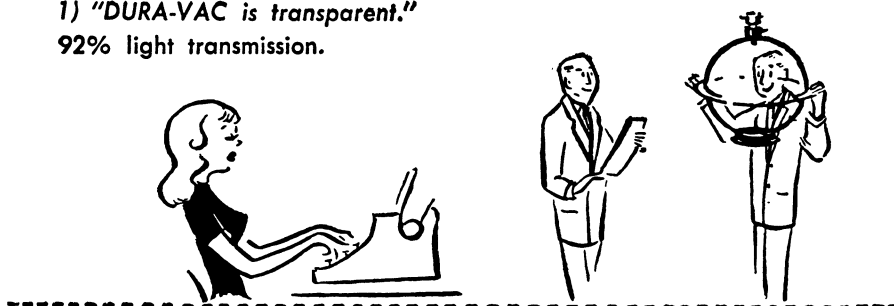
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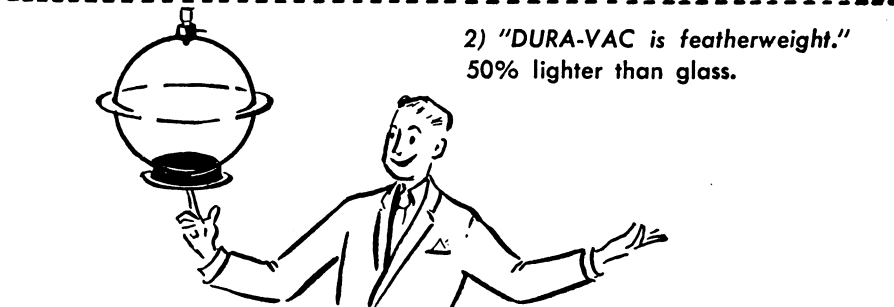
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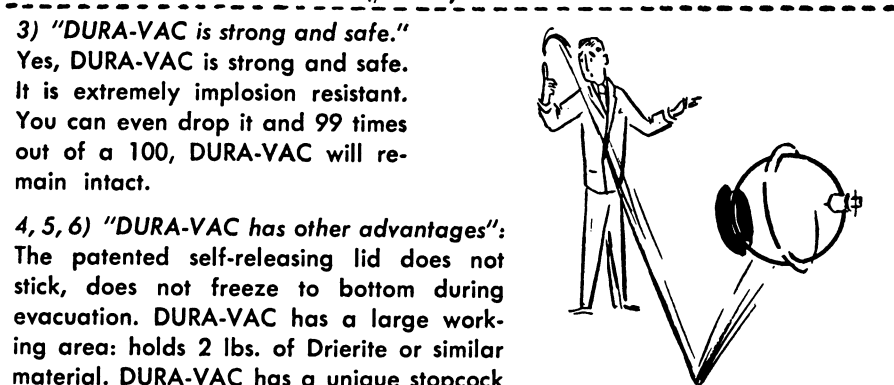
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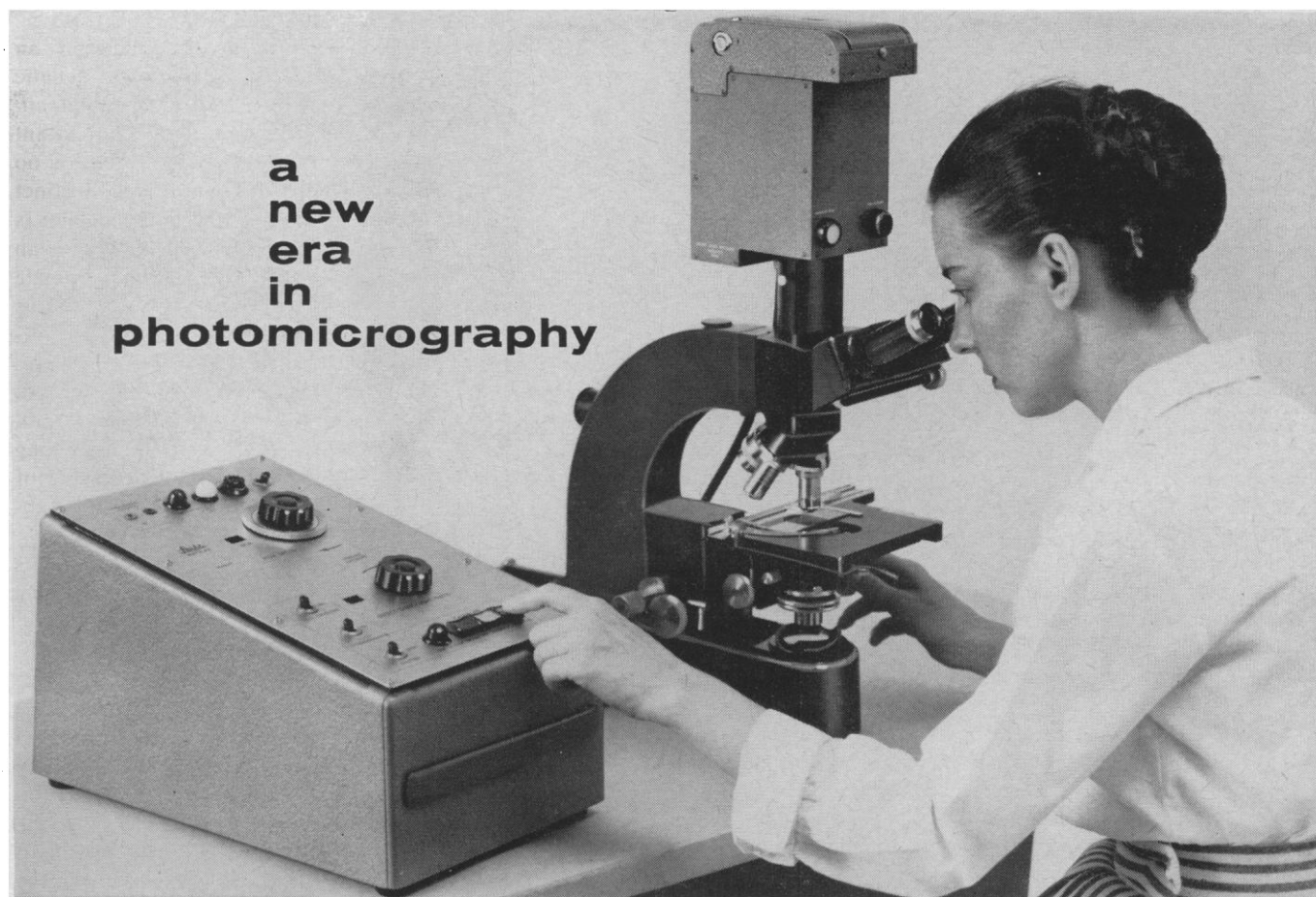
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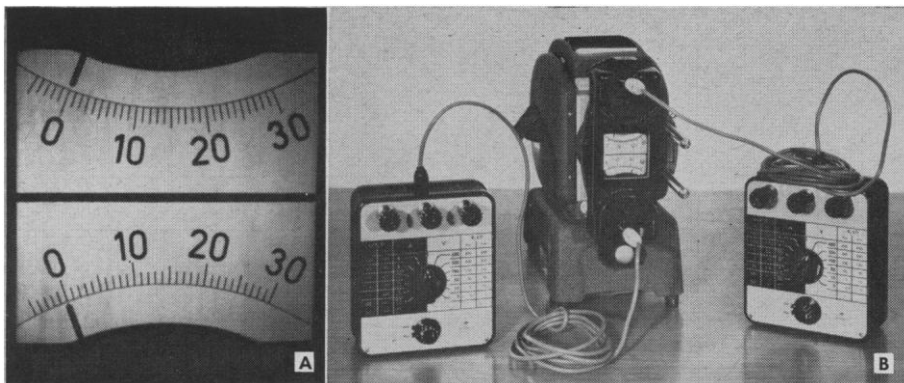
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Hurrah for H. J. Muller's article, "Human evolution by voluntary choice of germ plasm"!

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VERNER W. CLAPP

*Council on Library Resources,  
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Muller's article on human evolution has just come to my attention.

While I salute Muller's forthright acknowledgment of hereditary psychic differences and the need for eugenic intervention, I cannot help questioning the method he proposes. It seems hardly likely that nature will submit tamely and indefinitely to a permanent fraud — and what other word could be used to describe a systematic deception of instinct? After all, sexual pleasure and attraction and the desire for and love of progeny are adaptive, or they would not exist. Remove their proximate basis, and these feelings, too, will in time disappear.

In his rationalistic scheme Muller assumes that men and women will continue to choose their mating partners by, among other things, "sexual love," even though the act of procreation will have lost all meaning. He assumes that the procreative organ of the "superior" male will obediently continue to yield up its precious genes in response to loveless, mechanical stimulation. He assumes that "parents" will continue to shower love and affection on pre-adopted children who are strangers to them emotionally, intellectually, and physically. He assumes all this because man "has a right to depart from the haphazard method . . . of natural circumstances."

He may have the right (conferred by Muller?), but does he have the power? I think not.

H. GEORGE CLASSEN

*420 Hinton Avenue, Ottawa, Canada*

H. J. Muller states, "there is no physical, legal or moral reason why the sources of the germ cells used should not represent the germinal capital of the most truly outstanding and eminently worthy personalities known." This statement is true enough if use is distinguished from abuse. However, Muller seems to overlook this fundamental distinction. He wishes to allow a "salutary separation" of the promotion of genetic quality from the choice

of conjugal partner and the consequent determination of the size of the family. Such a separation, far from being "salutary," would be destructive of the natural basis of human society. This basis is clearly acknowledged by Muller when he says, "It is . . . 'first nature' for men and women to be fond of children and to want to care for them, and more especially, those children with whom they have become closely associated and who are dependent upon them."

The firmest bond between parents and children is the physical bond established by choice of the conjugal partner and use of the conjugal act by which the children are generated. Abuse of the human way of generating a family may induce legislators to place legal obstacles in the way of a practice which destroys paternity and deprives the child of a natural father with a father's rights and duties based on the physical bond. Indeed, the physical bond by which parents and child are most intimately associated and by which the child is dependent upon the parents both for being and for well-being in this world is the natural foundation of the moral requirement that genetic quality be promoted through the choice of conjugal partner and consequent determination of the size of the family. This way may not be perfect from every point of view, but it is clearly the best. "What God has joined together, let no man put asunder."

WILLIAM H. KANE

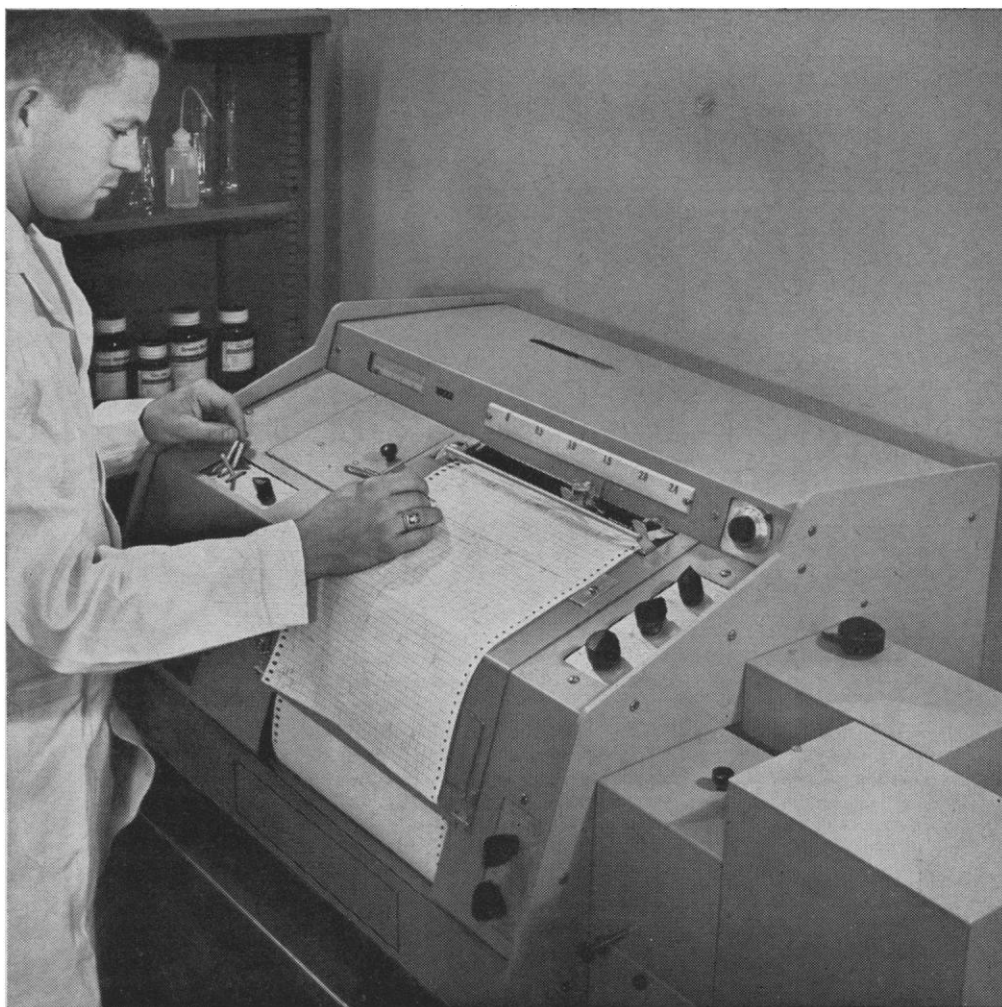
*Albertus Magnus Lyceum,  
River Forest, Illinois*

I wish to point out what seems to be an inconsistency in Muller's article. Speaking of the advent of improved contraceptive procedures (p. 645), Muller states, "Still more practicable means of contraception seem at last to be on the way, thanks to the efforts of a handful of devoted scientists, and they cannot come too soon, for it is imperative to make similar benefits possible in the less developed [geographic] regions."

If one accepts the argument that civilization as it advances is nullifying the beneficial genetic aspects of natural selection (and the truth of this premise is implicit in Muller's whole proposition), then it is quite clear that the least developed areas are the source of the world's best genes, for it is there that mortality is enormous, and the most fecund societies are barely holding their own. Furthermore, these areas are the least affected by the negative

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genetic influence of civilized warfare and atomic radiation.

I would like to suggest that until such time as society is prepared to deal with eugenic problems in a proper scientific manner, nothing be done to disturb this reservoir of superior genes.

THEODORE D. PERRINE  
1103 Lewis Avenue,  
Rockville, Maryland

Both Florey and Jackson question the possibility of agreeing on "the most desirable human qualities." It is true that in exercising germinal choice, just as in framing the pattern of a child's education, the making of value

judgments by his elders is a basic prerequisite. In both areas their responsibility is increased, not diminished, by the need for making such judgments, and the most serious deliberation is called for. Fortunately, however, most human beings practically everywhere have already attained the stage where they recognize the primacy for humanity of the major social proclivities and intellectual faculties, as well as of physical well-being. And although they will of course make mistakes, it is in general possible for them to recognize not only gross defects in these respects but likewise, at the other end of the scale, exceptional excellence.

On the other hand, anything like complete agreement is as undesirable as it is impossible in such an open-ended situation, and this is a major reason why the choices should be voluntary, not imposed. While Jackson might promote his seemingly Napoleonic ideal of "the intelligent, fearless, and strong," who wants to be top dog "in the class," and might continue to question the very existence of natural warmth of fellow feeling and of maternal affection, nevertheless it is to be anticipated that the ordinary citizen who is idealistic enough to engage in germinal choice at all will tend to favor a more sympathetic, otherly-oriented yet creative type. Moreover, later generations can be guided, in their future choices, by comparing the fruits of these different judgments.

The same two critics also question the effectiveness of any such selection in achieving the ends sought. As I stated in my article, "there is always an enormous amount of uncertainty concerning the outcome in . . . so cross-breeding an organism as man, especially since the most important traits of man are so greatly influenced by his cultural environment." It is wishful thinking to believe that the progress of genetics can greatly reduce this uncertainty in the foreseeable future, with regard to traits of positive value. Those who elected to engage in germinal choice would realize in advance that this uncertainty applies to every individual case. But they would prefer this risk, as being a much lesser one than that which usually attends the ordinary course of reproduction. And the resultant over-all trend would be in the direction that most of them had chosen.

At the same time, those who still held the naive belief that heredity plays little or no role in the determination of individual differences in man would of course continue to procreate in their own way. But it would be highly inconsistent of them to regard the exercise of germinal choice on the part of the others as endangering the genetic constitution of the population. It is a bit late in the day, however, for anyone still to disregard the evidence for the importance of genetics in the determination of individual differences in respect to either the physical, the intellectual, or the emotional make-up of human beings.

Classen does not question the genetic basis of parental and sexual emotions but fears that this basis will eventually wither when the activities these emo-



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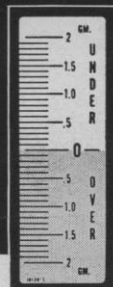
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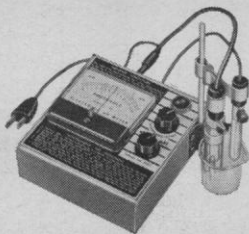
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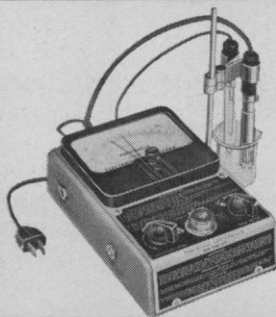


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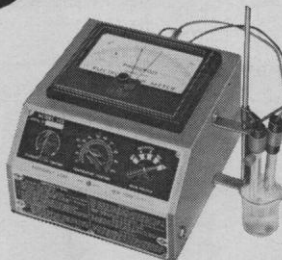


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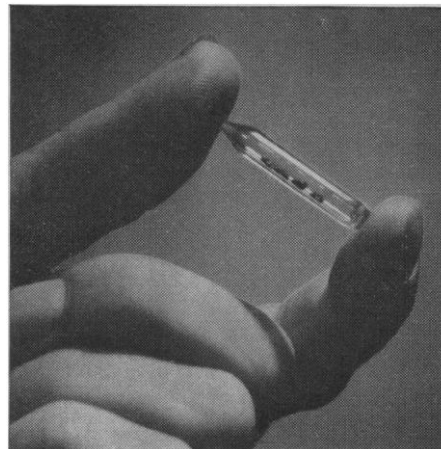
tions lead to are diverted toward somewhat different objectives. He should recognize that loss does not follow disuse directly in the Lamarckian way but only in consequence of the relaxation of selection. However, when the selection is artificial, it tends to follow the objectives of those making the selection. The great majority of people probably value and recognize the importance of both the parental and the sexual drives in the formation of well-rounded human personalities and in the orientation of people's striving toward worthy achievement and humane living. But even if they did not recognize this connection they would tend to base their selection upon criteria of character and accomplishment not likely to be met by persons who were ill equipped in these emotional respects. For these drives no longer serve only their original ends but have become basic to much else in human functioning.

Classen, Kane, and Jackson all make the mistake of assuming that children who are pre-adopted are (to quote Classen) "strangers [to their elders] emotionally, intellectually, and physically." Surely it is a calumny on humanity to assert (with Kane) that "the firmest bond between parents and children is the physical bond." As Calvin Kline once put the matter in a personal communication, the product of man's brain and heart, engendered through his conscious choice and exerted in the interests of the child himself, enlists his devotion as deeply and as truly as the product of his loins. And how can we decide, on the mere basis of what is "natural," which morality is the higher, so long as all man's living is a turning of the artificial into the natural? Of course Jackson can point to some foster parents and adopted or pre-adopted children of today who are ashamed of their situation, but that is because the parents had not embraced the new morality; they had simply been involuntarily inadequate, and they and their physician had carried out the whole transaction in an atmosphere of guilt. In contrast to this, follow-ups of cases conducted in a better spirit—which, however, are also kept secret, in compliance with present mores—have given evidence of highly gratifying results.

Perrine appears to grant my argument [given more fully in *Perspectives in Biology and Medicine* (Autumn 1959) and, along with discussions by others, in *Daedalus* (summer 1961)] that modern civilization, when associated with our present reproductive

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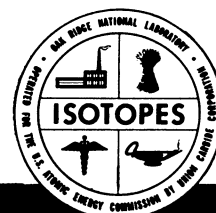
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mores, is genetically debasing. However, he makes this into an argument for letting the technically underdeveloped peoples remain underdeveloped, in order to conserve their genes, rather than joining in my plea for higher mores of reproduction. If he really believes in his thesis, why does he not recommend that we abandon our machine technology and higher living standards so as to conserve our genes also? Or does he realize that if we manage to hold back technological development elsewhere, instead of aiding it, we ourselves will inevitably become engulfed in the overflowing global ghetto, and that the solution he proposes will thereby be arrived at throughout the world?

The only rational and humane position is quite the contrary. That is, the avoidance of world catastrophe demands the extension of technology everywhere, and its application not only to production but also to reproduction. The latter measure involves, most urgently, the effective quantitative limitation of population, and it also involves, no less inescapably in the long run, the adoption of mores and techniques that recognize the importance of genetic quality and permit its enhancement by voluntary means.

HERMANN J. MULLER

Department of Zoology,  
Indiana University, Bloomington

### Public Opinion in the U.S.S.R.

"You Americans don't know anything about the Soviet Union. You think bears still wander the streets of Moscow." How many times we heard this in Russia!

How right the Russians were is brought out by K. B. Krauskopf's article in *Science* [134, 539 (25 Aug. 1961)].

Krauskopf's discussion of Soviet public opinion seems both true and shocking, as for example in the fact that Russians believe: "How happy the world could be, if only America weren't so belligerent!"

But in other respects one sees in this article an American scientist, not specifically trained in Soviet politics, taken in like many American tourists. They resemble Catherine the Great, impressed by a few model villages her minister Potemkin wanted her to think were typical of the whole Crimea.

Krauskopf reiterates what high-rank-

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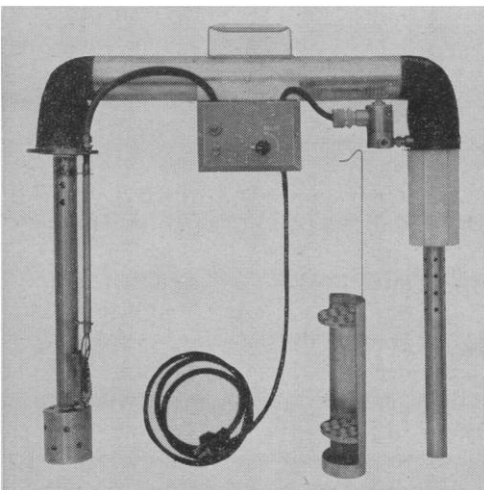
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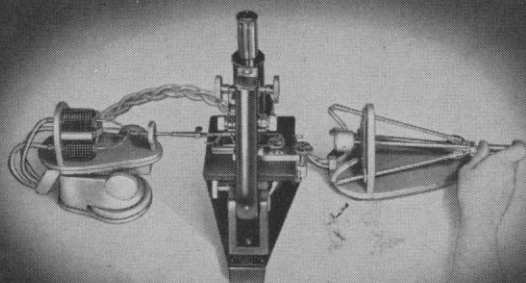
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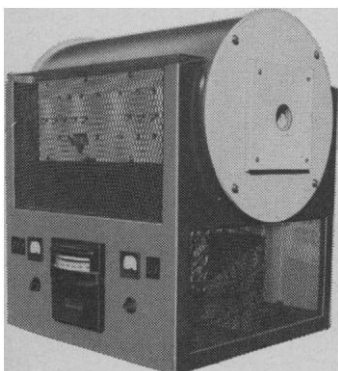


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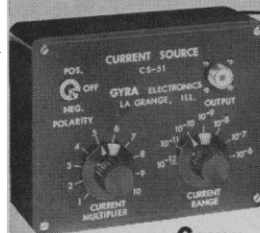


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ing Soviet scientists told him, and—despite the fact that their line was identical with what any Soviet Intourist Guide is trained to tell foreign visitors—he accepts this story as the real beliefs of these men.

Students, journalists, diplomats, and others who have lived in the Soviet Union know that many, if not most, Soviet citizens have serious reservations about the Communist regime. But these views are confided to foreigners only after a long period of trust and friendship. No Russian, particularly one with a good job, will risk his future by idle talk with foreigners.

Three of Krauskopf's assertions conflict harshly with the facts.

1) "That freedom of speech now exists in Russia is amply attested by our conversations, which were held in public places as well as private, and always without the slightest show of apprehension. . . . Neither the Russians nor I had any idea at the time that these impressions would ever be written down."

Of course, if Soviet scientists sit down and regurgitate only the Intourist line, they have nothing to fear from their government (or their colleagues, who could report them). Further, they could even expect to be rewarded for their loyalty to the regime. But in dormitories, in shops, in restaurants, and even in their homes, Soviet people still close the doors, turn up their radios, and speak in low tones when they say anything which deviates slightly from the official line. The possible penalty if they are caught? Expulsion from the Young Communist League, their school, or their job or possible arraignment on false charges.

Krauskopf says there are only common criminals in Soviet labor camps today. However, Russians will tell you that the men earlier convicted of political crimes are now simply relabeled thieves and are continuing to serve time.

And when Krauskopf says there is no fear of arbitrary arrest in Russia, he may be referring to his geologist friends, who are away exploring virgin forests; he cannot be talking about big cities, where we have seen children whisked away in police cars for talking with foreigners.

2) Krauskopf says his geologist friends have "a deep enthusiasm for communism." They have "a sense of mission . . . of being part of a progressive movement that will make the world a better place."

No doubt there are missionary ideal-

ists in the Communist as in the Christian world. But Russians themselves, coming from all walks of life, will tell you that the people, particularly the young people, aren't what they used to be. In the 1930's the Young Communist League volunteered to build the Moscow subway. But Russians today—much like the Americans—are mainly interested in a secure job, a nice home, and TV, a major difference being that they watch soccer instead of baseball! Many Soviet geologists, far from being missionaries of communism, are known

to have taken up geology so they could escape the big-city politicians who molest the lives and study of laboratory scientists.

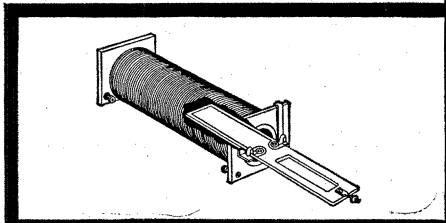
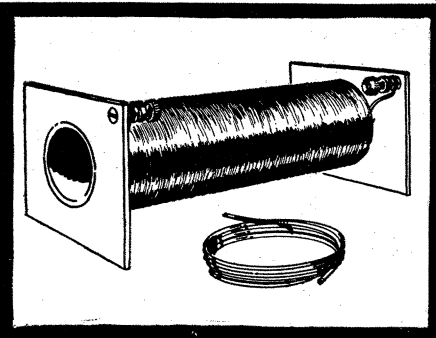
Many Russians agree that Soviet brains and imagination go first into mathematics, physics, and chemistry and last into economics, philosophy, and history. It is the former group which questions the old party doctrines and the latter group which attempts to refute mechanically the "revisionists'" ideas. "We need new forms of art and literature to express the complexities of

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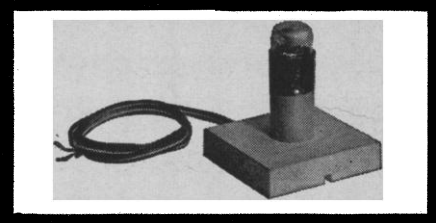
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the new world we're discovering," scream the physicists in public debates. But the philosophy students, whose careers will be in high school teaching of Marxism answer merely with dead dogmas.

Geologists are a breed unto themselves, as bright perhaps as physicists, but more rugged and individualistic. After hours, the physicist may attend a concert, whereas the geologist hunts Siberian bears or climbs mountains in Central Asia.

3) Krauskopf's "acquaintances seemed quite sincere in regarding [the

Soviet] way of choosing candidates as actually more democratic than the American method."

This was seemingly true of Soviet students forced by their Young Communist League to go from door to door urging the workers in the city to go to the polls early on voting day. But—as many students told us—the whole process is a farce, because there is but one candidate on the ballot. The voter can cross out the candidate's name and write in another, but this is a futile and risky business.

Even ardent Communists told us—

when they believed they weren't overheard—that they look forward to "free elections" some day in Russia. Americans in Russia in 1936 heard rumors that the new Stalin Constitution that year would provide for more than one candidate at elections. It didn't, however, and nothing more hopeful has appeared officially than the new Communist Party Program, which looks forward to the "dictatorship of the proletariat's" changing to a "state of the people."

If one meets Soviets on something more than a one-shot, semiofficial basis, he gets an impression very different from Krauskopf's. He learns that the Russians' ideas are more like the Americans' than Krauskopf suggests. The Russians' system of government, however, is not.

The U.S.S.R. is a long way from having freedom of speech, freedom from arbitrary arrest, free elections, and even equality of opportunity.

None of this means the Soviet Union is ripe for revolution. Most Russians are basically proud of their country and scientific achievements. This pride is one reason for the Soviet citizen's reluctance to criticize his government in front of foreigners.

But Russia is ripe for reform—from within—and the Soviet government and people know this!

WALTER C. CLEMENS, JR.

DIANE S. CLEMENS

*Department of Political Science,  
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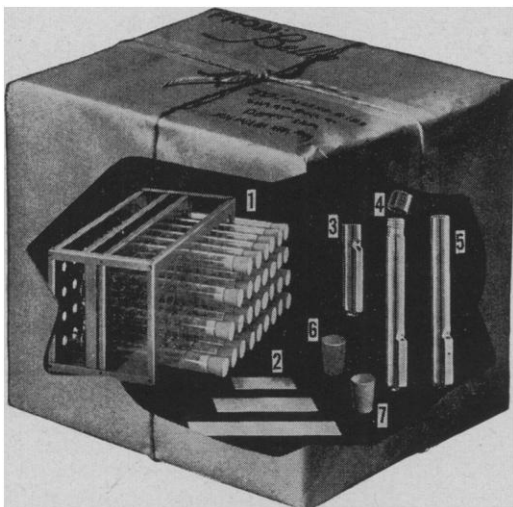
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The sagest remark I have heard about the conflicting reports that visitors bring back from the Soviet Union is the simple statement, "Everything you hear about Russia is true." The country is so large and complex that almost any reported observation may well be true in some degree or for some part of the population. I have no doubt that the Clemenses' descriptions of Russian attitudes are accurate, and I welcome them as an antidote to the quite different impressions I received. To build up a reasonable picture of the Soviet Union requires, I am convinced, that we piece together fragmentary bits of information from many sources. The Clemenses' observations should very probably be given more weight than mine, because they have made a special study of Russia. They have toured the country on several occasions, and Dr. Clemens has spent a year as a student at Moscow University. The Clemenses also object quite properly that I am a scientist ven-

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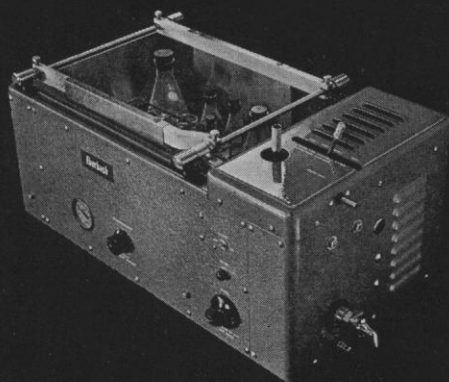
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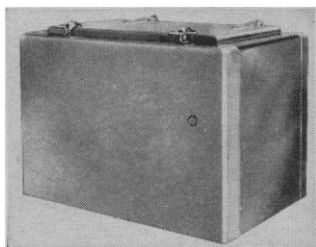
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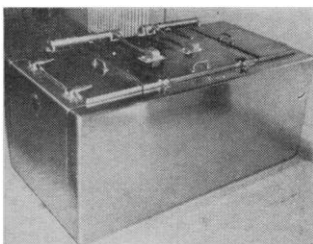
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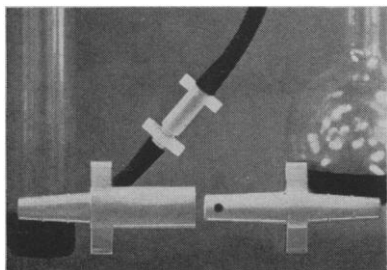
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turing to express opinions in a field where I have no special competence.

Nevertheless, I feel that their scorn for my unbounded naiveté is a little extreme. I would grant immediately that much of what my geologist friends told me is similar to the current Communist party line. Does it follow that my friends were necessarily being hypocritical? I have heard Intourist guides in action, and I have heard some geologists who sound like them—parroting stock answers to questions, with minds closed to argument, obviously unwilling to trust a foreigner with their real thoughts. But this is altogether different from the long and intimate discussions I had with men whom I learned to know over periods of several days. We explored various issues thoroughly, with no holds barred; sometimes they would score a point, and sometimes they would concede that I had picked on a weakness of their Communist regime. The "enthusiasm for communism," which so horrifies the Clemenses, was a commitment to the basic tenets of communist ideology, but it did not prevent my friends from admitting, and even pointing out voluntarily, weaknesses in governmental procedures and problems that the Communists have not yet solved. How, after all, does one tell when one's companion is being sincere? Is he sincere only, as the Clemenses imply, when he whispers dissatisfaction with his government under cover of a blaring radio? It may be—I can't really prove it otherwise—that I was continually hoodwinked by clever agents instructed to deceive me, that every Russian can by second nature "smile and smile and be a villain." To show why I believe differently would require a tedious cataloging of little incidents of interpersonal relationships. Tedious also would be a recitation of the many ways in which my activities did not follow a prearranged official plan—as the Clemenses imply they did by comparing them with the Crimean tour of Catherine the Great. One of the chief reasons I felt that my observations might indeed have some validity was the fact that (outside of the carefully prearranged official visits to laboratories and institutes) so much of what happened was entirely spur-of-the-moment, following either my whims or those of my companions.

The Clemenses are so eager to discredit me that they permit themselves some deliberate misquotations. For example: "Krauskopf says there are only

common criminals in Soviet labor camps today." Krauskopf did not, and never would, make any such statement; he quoted it as the opinion of two geologists, and at the end of the paragraph specifically emphasized that he had no direct information as to the truth of the assertion.

Again, regarding electoral procedures, the Clemenses have apparently willfully misunderstood me, in order to make their point that some ardent Communists yearn for free elections. It may well be true—I should be surprised if it weren't—that some Communists would like to see free elections in their country, but the point I tried to make was that in the eyes of my acquaintances the democratic process operates during the choosing of candidates in the assemblies (Soviets), not in the official balloting.

If I am to be accused of naiveté, I can perhaps claim with equal justice that the Clemenses have fallen victim to the all-too-familiar American stereotype: Russians resemble Americans; Americans don't like communism; hence Russians can't really like communism; and therefore we may infer a deep general resentment from the few examples of Russians who are willing to express their dissatisfactions to us. For as long as I can remember (and I think my memory goes back considerably further than the Clemenses') I have listened to would-be Russian experts describe the unhappiness and smoldering resentment within the Soviet Union. For years I have seen our newspapers magnify every hint of economic difficulty, every local flare-up of workers or peasants. And yet the Soviet Union, despite monstrous mistakes of its government, has grown steadily more prosperous; it has fought a bitter war and emerged stronger than ever; and under its influence communism has spread to one part of the world after another. This does not impress me as the work of a sullen, unwilling populace. It seems a reasonable inference, however unpalatable it may be, that communism has a genuine appeal to a large number of people; and it might be more realistic if we would accept this and try to see wherein the appeal lies, so that we can combat it, rather than delude ourselves with wishful thinking about the extent of popular dissatisfaction.

Regarding the validity of the Clemenses' conclusions about one segment of Russian opinion, there is no question in my mind. But I fail to see what pur-



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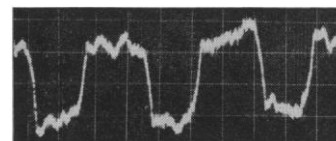
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pose is served by their vicious attack on observations of a group of Russians different from those in the circle of their acquaintance. The views I recorded were not the only ones I heard, but those that stood up under reasoned argument and that formed a pattern consistent with Communist ideology. They were expressed with every show of sincerity. We cannot agree with these opinions, of course, and we need not believe that their supposed factual basis is wholly correct. But as expressions of the way of thinking of one group of Russians, they should hardly be branded as false merely because they differ from the views expressed by the Clemenses' more critical Russian friends.

KONRAD B. KRAUSKOPF  
Department of Geology, Stanford  
University, Stanford, California

## Dynamic Teaching

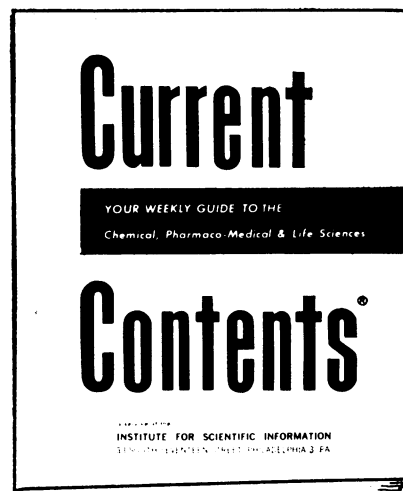
Probably few college teachers or others will take exception to a conclusion reached in the editorial "The system" [*Science* 134, 159 (21 July 1961)] that more than lip service should be accorded the proposal that teaching be made an even more rewarding career than it now is. However, an unfortunate fallacy is evident in the argument, in my opinion. The fallacy lies in the sharp distinction made between "teaching" and "research" at the university level. If "teaching" is rated "second class" by "the faculty," it may be because of the image of a stagnant pedant evoked by the term *teaching*.

Is it necessary to relearn constantly that students learn by their own efforts? Usually these efforts to learn (by listening, by talking, by reading, and, most trying, by writing for the consideration and criticism of others) can only be stimulated to a greater or lesser degree by teachers. Teachers who feel that they are still learning and who are as enthusiastic about the work of others in their discipline as they are about their own contributions are more apt to make the classroom situation the dynamic one that it should be.

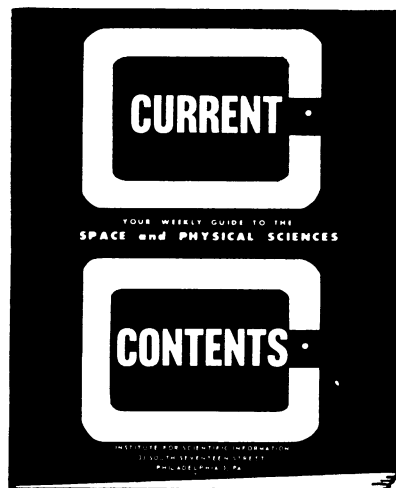
Perhaps the hardest types of work men can do are to think and to submit their thoughts in writing; to observe and then to report accurately their observations. To carry out these processes with "students" is a learning and teaching process for all concerned.

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of the sombre picture drawn by the writer of the editorial—that is, at the invalidity of separating research from college teaching—one cannot do better than to read the article by Charles A. Fenton in the *Bulletin of the American Association of Professors* entitled “The sweet sad song of the devoted college teacher” [46, 361 (1960)].

STANLEY MARCUS

Department of Bacteriology,  
University of Utah College of  
Medicine, Salt Lake City

### Keynes' Theories of Economics

In recent issues of *Science* considerable space has been given to a writer who has been consistently glorifying the policies being announced by the current administrators of the federal government. He has been praising the applications of Keynes' theories of economics being made by those administrators. Particularly he has been stressing the belief that these “cheery” theories will provide a remedy for the problems of unemployment in the United States.

In appraising this writer's reports, scientists may wish to consider the statement [*Science* 128, 1610 (1958)] of Harvard's outstanding economist, the late Sumner Slichter, that “. . . technological research had developed sufficiently by 1937 to make Keynes' theory of employment obsolete on the day of its publication. . . .”

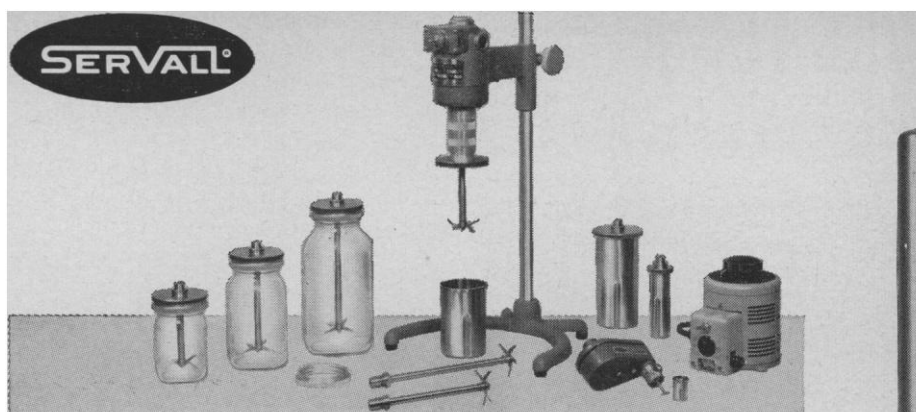
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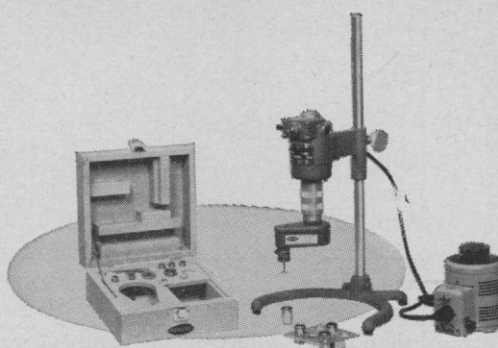
### Strontium-90 in Wheat Flour

An interesting possibility that a substantial fraction of strontium-90 contamination in wheat flour in 1960 arose from wind-blown soil particles adhering to the head of the wheat plant has been raised by Ichikawa, Abe, and Eto in their report in *Science* [133, 2017 (1961)]. This possibility does not seem consistent with their data.

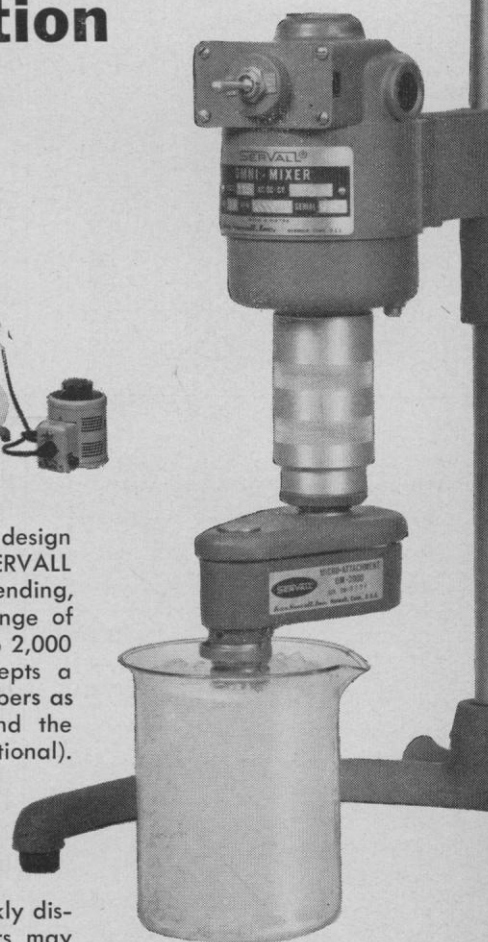
They considered that the apparent direct absorption of strontium-90 into wheat flour in 1960, compared with that in 1959, was too large to be accounted for by current fallout, since the fallout rate while the wheat heads were exposed was only one-fifth of that during the comparable period in 1959. However, if their data on strontium-90



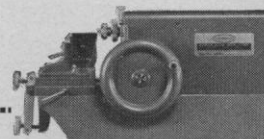
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contents of wheat leaf, husk, and bran are treated in the same way as the data for wheat flour, it is seen that the direct absorption of strontium-90 into the leaf and bran is consistent with the decreased fallout rate, while absorption into the husk agrees with the result for flour. If absorption of strontium-90 from wind-blown soil particles is a factor, then the content in husk, bran, and flour should all have been affected in the same way.

These calculations require the questionable assumption that the fraction absorbed by the wheat plant is constant from year to year. The retention and subsequent absorption of fallout probably varies greatly with the time and intensity of rainfall in relation to the age of the plant.

RONALD G. MENZEL  
U.S. Agricultural Research Service,  
Beltsville, Maryland

My associates and I find Menzel's criticism very important and instructive. Though the contribution of wind-blown soil particles to the strontium-90 content in plants and the physiological mechanism of the phenomenon are not

yet clear, it seems that the contribution of the soil particles does not necessarily affect the various parts of the plant in the same way. For example, at the time of ear shooting, husk and bran have already completed most of their growth, but the tissue which will eventually become wheat flour does most of its growing after ear shooting. Therefore, it seems likely that the strontium-90 derived from a soil particle that has adhered to the ear can be effectively incorporated into the "flour" tissue during its growth, together with other nutrient minerals. After the increase in mass of the "flour" tissue and the subsequent death of the husk tissue, rainout activity and direct absorption of strontium-90 become dominant factors, affecting the bran much more than the "flour" tissue. Therefore, the contribution of soil particles to bran can be assumed to be much less than the contribution to flour. Of course this is a possible assumption, though the mechanism would be more complicated. The phenomenon should be investigated further.

The relationship between fallout activity and contamination levels in plants

has been utilized for analyzing food-chain contamination due to fallout. Of course, the influence of the rainfall pattern and the growing stage of the plant should be taken into consideration for the analysis. But it seems possible to assume that the rate of direct absorption of current fallout activity from year to year does not vary so much, if the same crops, harvested in the same season, are used.

RYUSHI ICHIKAWA  
National Institute of Radiological  
Sciences, 250, Kurosuna-cho,  
Chiba-shi, Japan

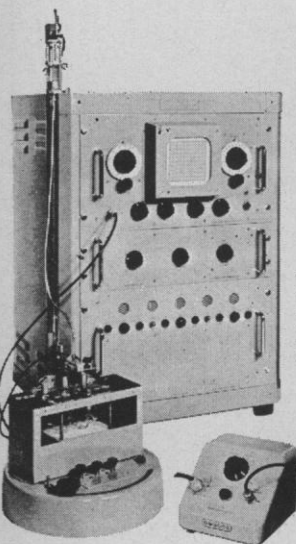
## Water Resources

A recent issue of *Science* [134, 658 (8 Sept. 1961)] carried a brief item, "Salt-free water," which states that an "economical method for converting sea water to fresh water would be immensely useful for this country, which faces a water shortage in the decades ahead. . . ." (italic mine). Appearing as it does in a scientific journal, this statement would seem to sanction the claims of the water-supply alarmists that the United States will run out of water within the next 40 years.

There is no disagreement over predictions of a steadily increasing use of water in the decades ahead, but the prophets of desiccation of our water resources imply that water used is water used up. A conservative estimate indicates that our net need for water will be about 117 billion gallons per day by A.D. 2000, or 18 percent of the supply likely to be available by that time on a sustained-yield basis. The Select Committee on National Water Resources published a figure of 156.3 billion gallons per day, based upon similar assumptions.

An increasing use of water means merely a greatly increased *reuse* of water. This reuse will require improved methods for in-plant recycling of water, and for treatment prior to final discharge to protect the interests of downstream users. Thus, the cost of water and of waste treatment will rise, but there will be nearly as much water available as there ever was.

Research on desalting ocean and brackish water is an important federal project, but it should be evaluated in proper perspective. An economical method for recovering fresh water from the ocean would be an undoubted boon to water-short areas, but it is illusory



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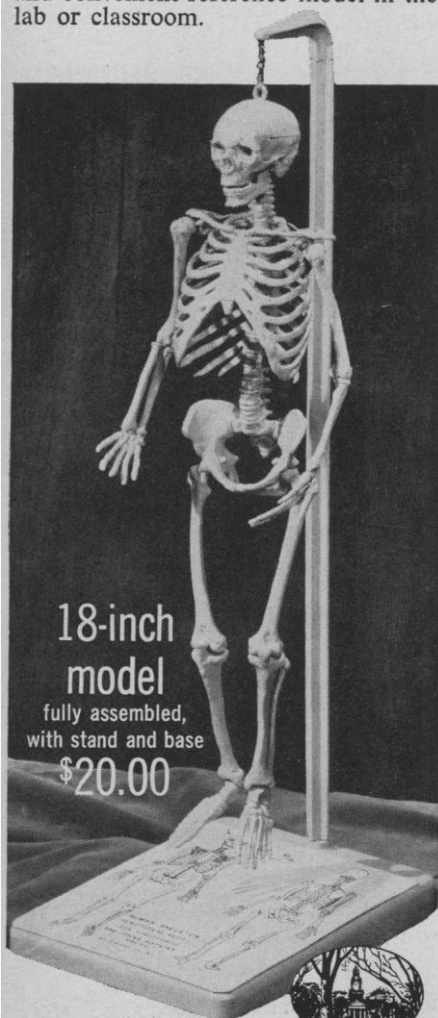
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Mellon Institute,  
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### Racism and

#### "The Mankind Quarterly"

In *The Mankind Quarterly* there appeared, some time back, an article by Henry E. Garrett (1) entitled "Klineberg's chapter on race and psychology." It constitutes an unwarranted criticism of Klineberg's pamphlet *Race and Psychology*, published by UNESCO in 1952 (edition 2, in English, 1956). Garrett departs from the main theme to make various assertions about the biological, mental, and moral "inferiority" of Negroes and about the obvious degeneration of mixed-breed groups.

To quote from Garrett's review (1, p. 21): "The weak, disease-ridden population of modern Egypt offers dramatic evidence of the evil effects of a hybridization which has gone on for 5000 years. In Brazil, coastal Bahia with its negroid mixtures is primitive and backward as compared with the relatively advanced civilization of white southern Brazil. In the West Indies, the civilization is advanced almost exactly in the degree to which the populations are unmixed with the Negro. Haiti is an unhappy example of what the Negro can do when left to govern himself."

And from page 22 of the same article: "Klineberg states flatly that 'no racial factor has been discovered to be responsible' for crime. As usual, the fault lies in the social environment. Undoubtedly social factors are important, but it is hard to see how such influences can excuse the literally scandalous crime rate of the Negro in the United States. In 1954, the FBI reported (Dept. of Justice, Vol. 25, No. 2) the following ratios of Negro to white crimes: For murder, the Negro/white ratio is 16:1; for robbery, 13:1; for prostitution and vice, 16:1; for rape, 6:1. These ratios hold despite the fact that the Negro constitutes only 10% of the general population. It requires a degree of



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imagination not possessed by the reviewer to see no 'racial factor' in these figures" (italics mine).

These and many other statements of the same tenor which appeared in Garrett's review prompted the just reaction of several anthropologists. Biological racism, to judge from the first issue of *The Mankind Quarterly*, is being revived, with arguments as feeble as they are erroneous; the harmful effects of unscientific racism during the past decades are only too well known.

The reaction, as qualified as it is moderate, to Garrett's paper, may be read in Skerlj (2) and Comas (3).

Now the second issue of *The Mankind Quarterly* has appeared. The editorial therein, commenting on reaction to the magazine, includes the following:

"A few abusive letters have, however, also been received, although their numbers are negligible in comparison with those which have expressed pleasure at the production of *The Mankind Quarterly*. Whatever the status of the writers of these letters, they can be considered little better than cranks."

No names are given, but undoubtedly the comments are directed to those anthropologists who are not in accord with this resurgence of racism. Certainly the well-established scientific standing and personality of the two authors mentioned above (Skerlj and Comas) cannot logically be associated with the assertions in the editorial.

There is no question that in the field of science opposing points of view arise, because of differences in knowledge or background or because of adherence to schools based on different interpretations of the same data or on premises which cannot be harmonized, and so forth. However, this is not the case here. Racial differences exist. These differences should be and are being studied. A whole branch of anthropology is concerned with this study in an effort to determine what the differences are and how they may be used—to understand them from every possible angle (genetic, morphological, social, and so forth) but always within the framework of serious and scientific investigation. The 1952 UNESCO Statement on Race is quite clear on this point.

There is such a thing as freedom of research and freedom of teaching. What should not be allowed is what *The Mankind Quarterly* has set out to do—that is, to use science, or rather pseudoscience, to try to establish postulates of racial superiority or inferiority based on



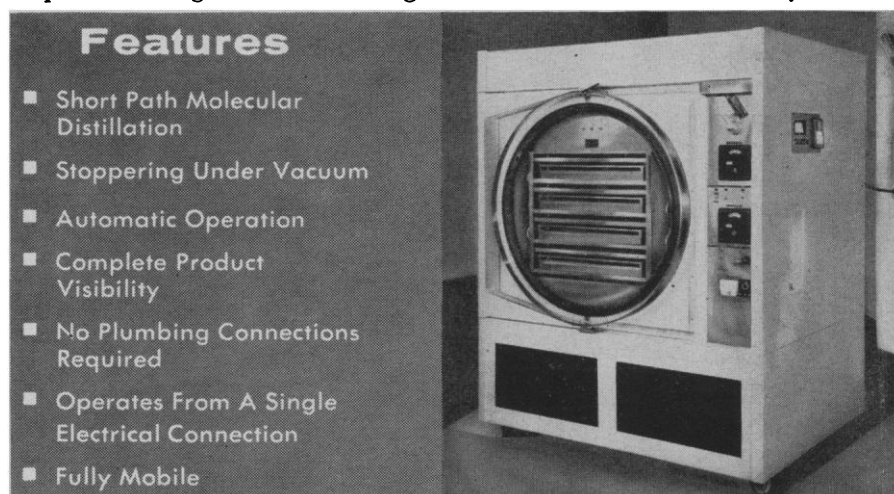
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biological differences, when the traits may prove to be good or bad, advantageous or not, depending on the environment in which they exist and the purpose and end they serve (4).

I am now formally addressing *Science*, as the official voice of the American Association for the Advancement of Science, to ask that the Association urge the scientists who are accessible to it (I would suggest, among others, Medawar, Haldane, Simpson, Huxley, Neel, Wright, Dunn, Dobzhansky, and de Beer), United States citizens or not,

to take action, in the name of the Association, against this unwelcome, ill-founded, unbiological outgrowth of racism (5).

The purpose of this note is not to initiate a discussion of whether or not there are scientific bases for establishing racial differences of biological order which carry concepts of superiority or inferiority. What is known about adaptation, genetics, mutations, or selection today refutes the a priori views of those who, like Garrett, are intent on maintaining pseudoscientific racism. I

have no other purpose than to denounce this attitude of men of science who, with strange antiscientific spirit, distort facts, as Archbishop Wilberforce did a century ago, when he was so well exposed by Thomas Huxley in the memorable Oxford session on evolution.

It seems pertinent, therefore, to quote, however briefly, from a few scientists whose views contrast with Garrett's position.

Medawar (6) wrote: "Attempts at selection are, in fact, torn between conflicting interests: the characters we are hoping to establish and fix in the population—height or weight, perhaps, or, in the fruit-flies that are so often used for these experiments, bristliness—may well find their most extreme expression in the true-breeding homozygous form; but that is not going to be much consolation if these homozygous forms are inferior in fitness, and are therefore at constant disadvantages compared with the forms that do not breed true. Artificial selection and natural selection pull opposite ways." That is, as Hulse (7) has clearly stated, the concept of race, to have any scientific utility, must be based on genotype rather than on phenotype.

I quote now from Caspari (8): "Heterozygotes frequently have adaptive values superior to either homozygote. This phenomenon of 'heterosis' makes it possible for two alleles to remain in a population, and in this way maintains the genetic variability and adaptability of population. Heterosis is frequently expressed in a lower phenotype variability of heterozygotes."

Penrose wrote:

"No genetical evidence has so far appeared to indicate that the human race is not all one species. In other words, unions between males and females from any different national geographical or cultural groups can all be fertile and their offspring normal. Matings of Europeans, Africans, Americans, Indians or Oceanics with all kinds of Asians are biologically successful, as indeed are crosses between these groups. . . . (9, p. 121).

"In the case of 'race mixture,' therefore, the result is just that we get a new or unusual combination of alleles at a number of different loci; there is no theoretical reason why such new combination should be disadvantageous. . . . (9, pp. 121-122).

"It is clear from the trend in recent decades that, in future, more and more mixtures of the older, isolated, human groups are to be expected. The result



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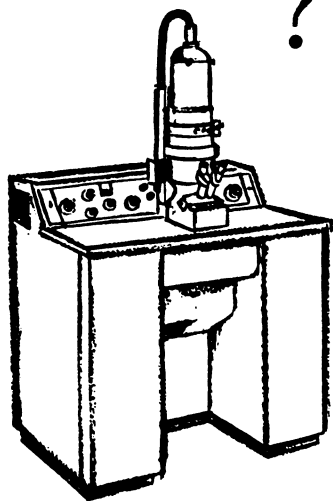
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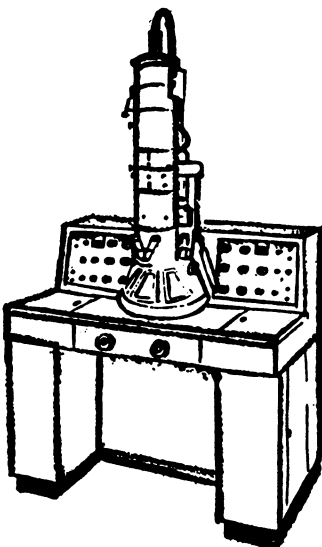
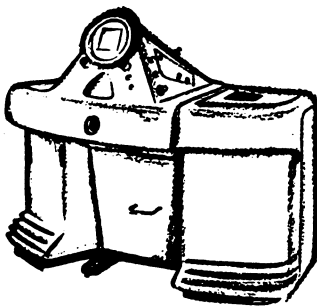
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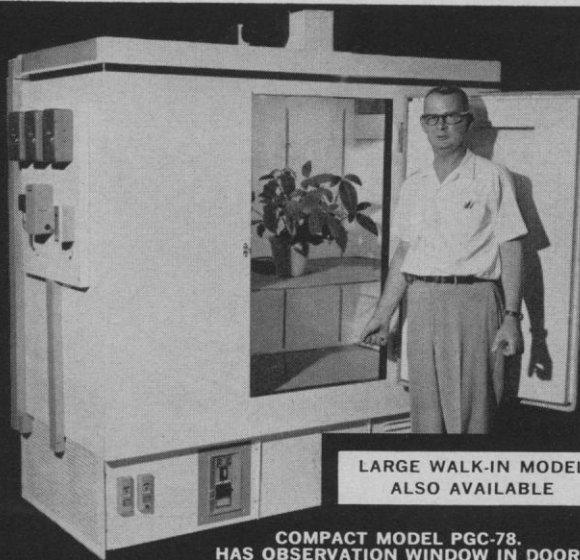
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will be an increase of variety within populations for many generations, in the sense that many new combinations of genes will be produced. On the whole this can be regarded as a favourable development because it will increase the number of man's possible inborn reactions, whether physical or psychological, to his rapidly changing civilized environment" (9, p. 122).

Finally, from the 1951 UNESCO Statement on Race, signed by 14 eminent geneticists and anthropologists, I quote the following:

"Furthermore, so far as it has been possible to analyze them, the differences in physical structure which distinguish one major group from another give no support to popular notions of any general 'superiority' or 'inferiority' which are sometimes implied in referring to these groups" (p. 12).

"Studies within a single race have shown that both innate capacity and environmental opportunity determine the results of tests of intelligence and temperament, though their relative importance is disputed" (p. 13).

Should all the scientists, then, who subscribed to the 1951 Statement on Race, and also Skerlj, Comas, Medawar, Simpson, Penrose, Caspari, and others, be considered "little better than cranks"?

Indeed, *The Mankind Quarterly's* attitude is so harmful that I hope the AAAS takes some action.

*Note added in proof:* While this letter was in press, the July–September 1961 issue of *The Mankind Quarterly* (2, No. 1) has appeared. In it the same extreme racial trend is followed. Among other papers, it contains a review by A. James Gregor of Comas's *Racial Myths*—a review which is full of totally unjustified personal attacks and insinuations of a political type, without basis and completely outside the framework of the problem under discussion.

SANTIAGO GENOVES

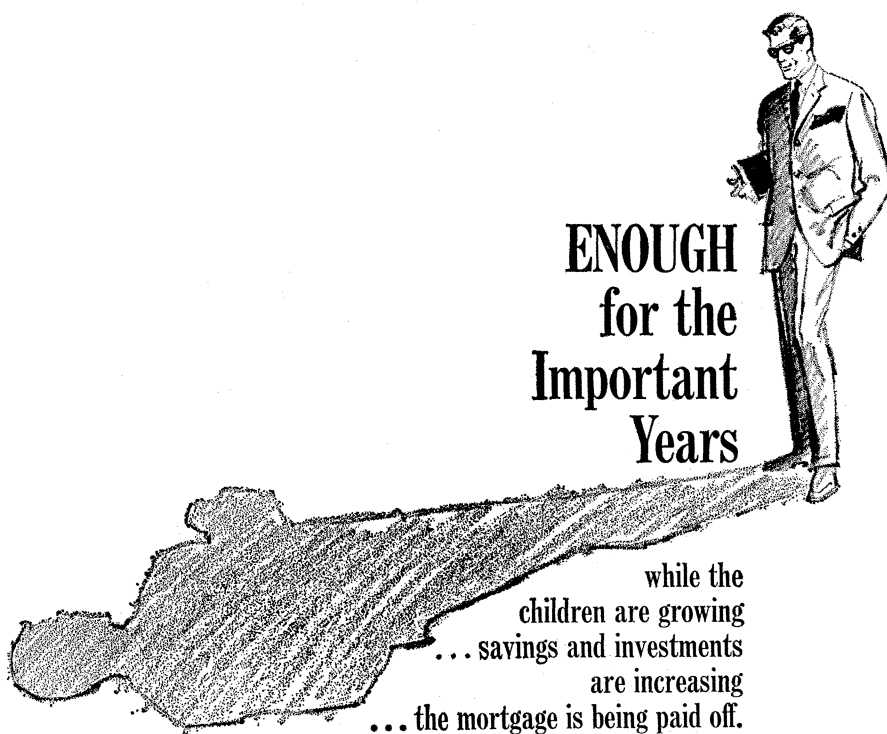
*Institute of History, University of Mexico, Ciudad Universitaria*

#### References and Notes

1. H. E. Garrett, *The Mankind Quarterly* 1, No. 1, 15 (1960).
2. B. Skerlj, *Man* 60, 172 (1960).
3. J. Comas, *Current Anthropol.* 2, 303 (1961).
4. Another article by Garrett, "The equalitarian dogma," appeared in the April 1961 issue of *The Mankind Quarterly*. It was reproduced in *Perspectives in Biology and Medicine* [4, 480 (1961)] and in the *Negro Digest* [12, 38 (1961)]. It has been unfavorably commented on by M. J. Herskovits in the *Negro Digest* [12, 43 (1961)], and by G. A. Harrison in *Man* [61, 189 (1961)].
5. I cite two examples of action taken in the past. In 1951 the American Association of Physical Anthropologists and some 20 other learned societies formally condemned a measure adopted by the board of directors of the University of California as "violating the rights of academic freedom and tenure." In 1955 the same association declined to participate in the meeting of the AAAS in Atlanta, Georgia, because of racial discrimination in that state.
6. P. B. Medawar, *The Future of Man: The Reith Lectures, 1959* (Methuen, London, 1960), p. 54.
7. F. S. Hulse, *Human Biol.* 32, 63 (1960).
8. E. Caspari, "Genetic basis of behavior," in *Behavior and Evolution*, A. Roe and G. G. Simpson, Eds. (Yale Univ. Press, New Haven, Conn., 1958), pp. 103–127.
9. L. S. Penrose, *Outline of Human Genetics* (Heinemann, London, 1959).

#### The Scientist and World Affairs

The inference to be drawn from Florence Moog's comment on the present state of affairs [*Science* 134, 797 (1961)] is that the world is no longer our business, as scientists, and we had best retreat to our cracked and yellowed ivory towers and leave the affairs of the world to those who are presumed to know more about them. I agree that we are perilously close now to "the flaming ramparts of the world, when the thundering regions of the sky will fall



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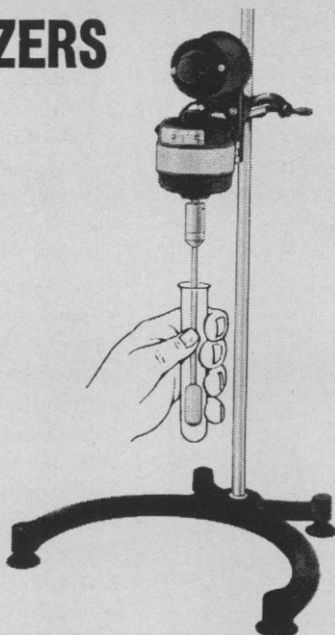
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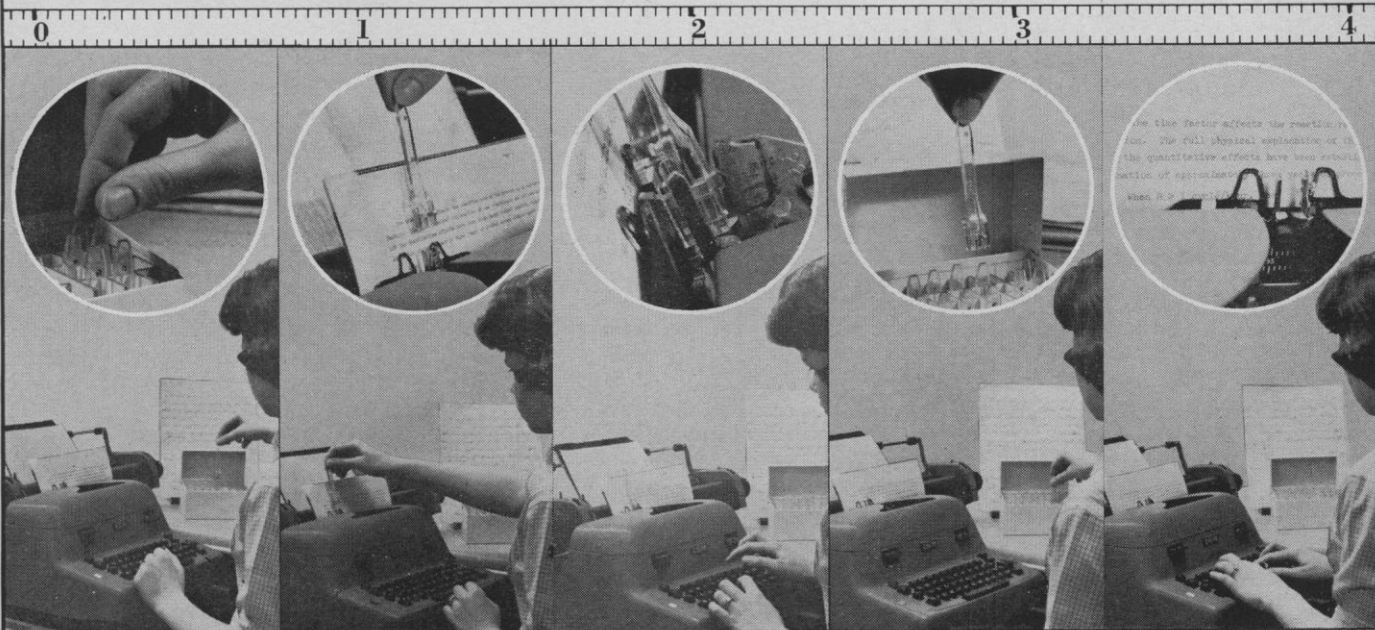
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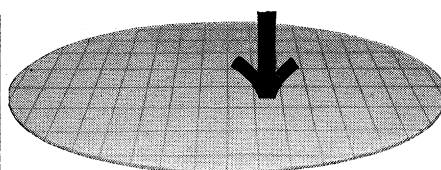
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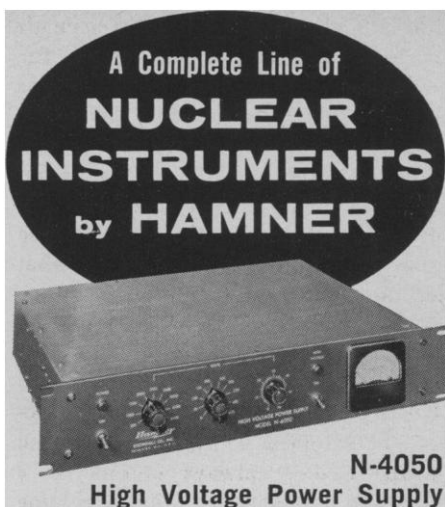
upon us and the earth will slip beneath our feet," but this is no reason for starting a stampede to a nunnery—or monastery. Of course science, by itself, cannot claim to answer "the important questions," any more than art, religion, economics, or politics in themselves can solve the problems of the world. These terms are simply abstractions of what men do as their way of life.

Some years ago Moog took me to task because I obviously thought this was not the best of all possible worlds [*Am. Scientist* **35**, 541 (1947)] and defended "progress" (which, as is well known, I have always considered a snare and a delusion) with a ringing quotation from *Pippa Passes*. Now she seems willing to agree that it is indeed a bleak world, that perhaps, as I previously intimated, we are throwing a relentlessly dynamic ecosystem out of balance with our tamperings [*Am. Scientist* **35**, 395 (1947); **36**, 314, (1948)]. While I take small consolation in having been one of the first to take a dim view of the atomic age [*Science* **103**, 236 (1946)] I still think we should try to cultivate our gardens rather than retreat to them and watch the weeds take over. As scientists we are at least members of an international community and contributors to the only open synthesis mankind has so far devised. Theorems or gadgets will not save the world or answer its questions; if it is to be saved at all it will be through human consent and understanding, and we have a small duty, as scientists, toward that end. The world may be too much with us, late and soon, but even when cast overboard in mid-ocean a man will try to swim. Moog seems to be advising us to fold our arms and sink mutely to the bottom. Obviously, Browning is no longer her favorite poet. She might try Lucretius: "No night ever followed day, or dawn followed night, but has heard mingled with [children's] sickly wailings the lamentations that attend upon death and the black funeral."

JOEL W. HEDGPETH

*University of the Pacific,  
Pacific Marine Station,  
Dillon Beach, California*

Aside from the assertion that Browning was ever my favorite poet, I am not in disagreement with most of what Hedgpeth has to say. His attitude toward the social responsibilities of scientists is not different from mine. My letter did not say, nor did I mean it to imply, that I think that scientists should turn their backs on the "affairs of the



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world"; and I know from numerous kind comments I have received that other people did not read the letter that way.

Were I inclined to the ivory tower, surely I would not be a member in good standing of the American Civil Liberties Union, Americans for Democratic Action, the Congress of Racial Equality, the National Association for the Advancement of Colored People, and several similar organizations; I would not have helped to circulate the Pauling petition; nor would I have contributed much time, over the past 2 years, to the editing of the bulletin published by the Greater St. Louis Citizens' Committee for Nuclear Information. I think that Hedgpeth has developed a curious allergy that makes him break out into a rash of disagreement at the very sight of my name.

FLORENCE MOOG

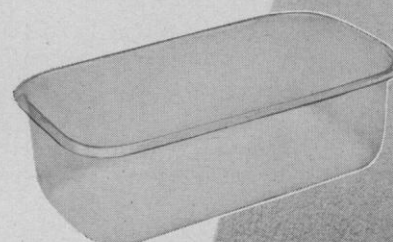
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### Chemical Analysis by Mass Spectroscopy

In his very interesting article on the use of x-ray fluorescence analysis as a tool for chemical analysis in biology (1), Theodore Hall has included a table entitled "Capabilities of some methods for assay of chemical elements." Among these methods he lists mass spectroscopy. His Table 1 indicates that the minimum concentration detectable by this technique, "in the specimen fed to the device," is about  $10^{-6}$  parts per million.

This statement, he says in his reference 31, rests upon data given in a 1955 paper by M. G. Inghram (2). It is, however, a slight misinterpretation of Inghram's statement. It is the purpose of the present letter to make more clear the actual range of usefulness of mass spectroscopy. In brief, a sensitivity of one part in  $10^{12}$  may well be attained in the near future, but it as yet has not even been approached by any commercial instrument. Nevertheless, present-day analytical mass spectrometers and spectrographs are indeed highly sensitive instruments; in fact, spark-source-equipped mass spectrographs are now pushing down into the one-part-per-billion ( $10^{-9}$ ) region, in favorable cases. Some of the best electron-bombardment-source gas analysis instruments also approach this sensitivity. With a "tandem" instrument

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(in which the ion beam passing through the image slit of the first spectrometer is again resolved into components of different mass-to-charge ratio in a second analyzer) the Knolls Atomic Power Laboratory research group has in fact demonstrated (3) an abundance sensitivity, in the low mass region, approaching  $10^{11}$ . So it seems that the possibility of determining impurities present at the  $10^{-12}$  level does in fact exist.

However, the sensitivity cited by Hall has been achieved only in certain isotope dilution experiments. And such

experiments in general require some chemical processing of samples, usually with rather extensive preconcentration. In fact, the usable sensitivity of this technique is in general limited by contamination and instrumental background problems, the highest sensitivities being reported for nuclides that do not occur at all naturally, or that are of very small natural abundance, especially in laboratory and reagent environments.

Hall's Table 1 appears to state that mass spectroscopy *in toto* is appropri-

ate to the analysis of only 68 elements. This statement likewise applies just to the isotope dilution technique, where the limiting factor is, of course, whether there exists an isotope of the element to be determined which is suitable for use as the internal standard (that is, which is in reasonably good supply and which is either stable or, if radioactive, of long enough half-life to permit one to perform the desired experiment). No such limitation applies when the spark, the crucible, or certain other ion sources are used. The  $N$  range of mass spectroscopy thus includes all the elements which have isotopes of long enough half-life to survive during the very short transit from ion source to detector. There is no  $Z$  limit for the instrument. And mass spectroscopy of course yields data on isotopic composition as well as on elemental abundance.

The minimum weight of element detectable by the technique may, in favorable cases, be well below the  $10^{-12}$  grams listed by Hall; and, while the technique must in general be classed as destructive, amounts consumed in several ionization techniques are so small that it can, in these cases, be considered at least as nondestructive as, say, the electron-probe microanalyzer mentioned by Hall. Our organizations are in fact working jointly on the development of a mass spectroscopic analog of this device, which, we believe, will be able to exceed the sensitivity limit of the secondary x-ray microprobe by several orders of magnitude, while not being subject to its "blind spot" limitations.

LEONARD F. HERZOG

Department of Geophysics,  
Pennsylvania State University,  
University Park

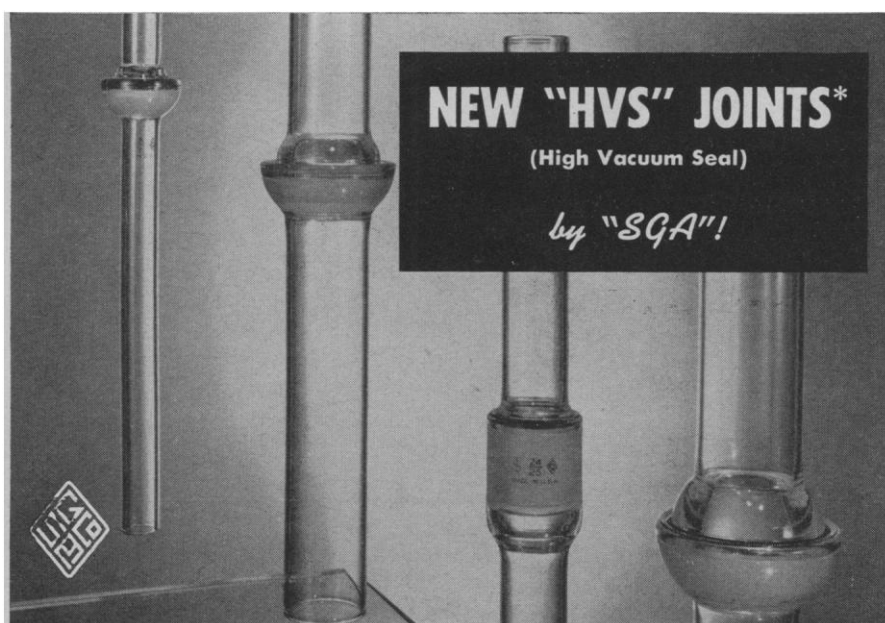
DONALD J. MARSHALL

Nuclide Analysis Associates,  
State College, Pennsylvania

#### References

1. T. Hall, *Science* **134**, 449 (1961).
2. M. G. Inghram, in *Trace Analysis*, J. H. Yoe and H. J. Koch, Eds. (Wiley, New York, 1957).
3. F. A. White, F. M. Rourke, J. C. Sheffield, "A three-stage research mass spectrometer," *U.S. Atomic Energy Comm. Research and Development Rept. No. KAPL-1843* (1958).

The foregoing comment by Herzog and Marshall is a much fuller and better exposition of the capabilities of mass spectroscopy than appears in my article, partly because it is impossible to delineate a method's scope with one line in a table plus a brief footnote, and partly because I am not a mass spec-



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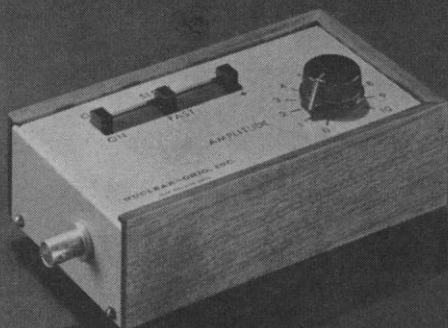
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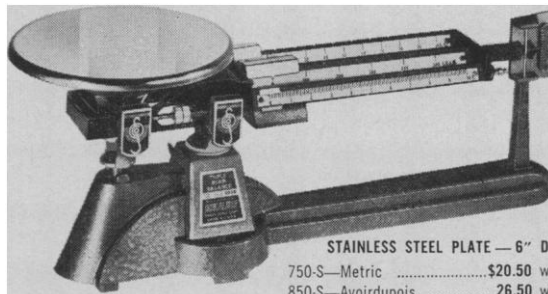
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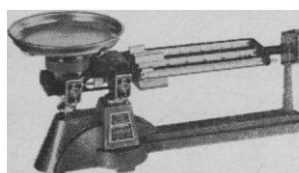
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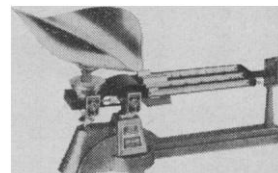
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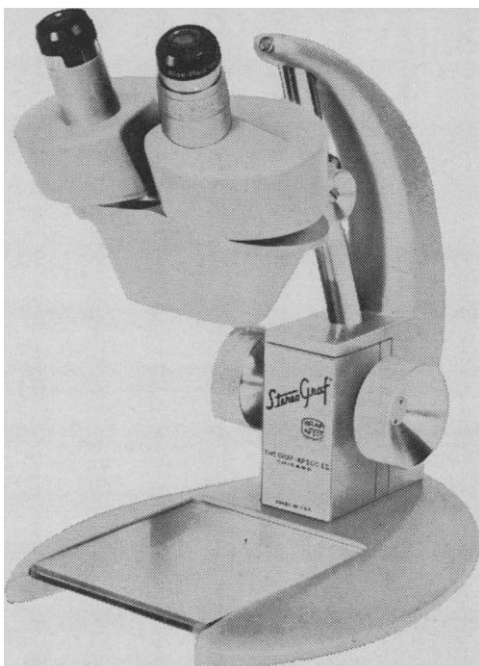


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troscopist. I must accept their main point: at present one cannot analyze directly down to a concentration of  $10^{-12}$  for a wide range of elements in biological materials.

In extenuation, it should be noted not only that Table 1 in my article was characterized in the text as quite approximate but that the entry for mass spectroscopy posed a special problem. For most of the methods listed in Table 1 I drew on performance figures achieved during extensive biological research. For mass spectroscopy there is no comparable literature, and the technique has not had the benefit of comparable intensive biological trial. The inherent sensitivity of the method would be obscured by listing limits representing the present degree of mastery of contamination. I tried, rather, to tabulate the outstanding inherent sensitivity, leaving the implication that the method should play a larger role in biological trace work. This implication seems to be confirmed by the remarks of Herzog and Marshall.

May I add a few brief comments. I did not refer to commercial instruments, and I did not mean to imply that the isotope dilution method of

mass spectroscopy (with its approximately 68 suitable isotopes) was the only method suitable for trace work.

I cannot quite agree with Herzog and Marshall's comment on nondestructive analysis. One hopes to analyze identified microentities; hence, much of the advantage of nondestructiveness is generally lost if the unconsumed and the analyzed regions are not identical. The degree of destructiveness of the electron microprobe is not yet established, but even if it destroys a circular area 1 micron in diameter, with the surroundings remaining recognizable, I believe conventional mass spectroscopy cannot hope to match it in nondestructiveness. Of course, mass spectroscopy with a microfocused ion beam could conceivably be similarly nondestructive.

With respect to "blind spots" I should mention that several laboratories are now seeking intensively to extend x-ray spectroscopy down to atomic number 6.

In summary, I think that the exposition by Herzog and Marshall should be stimulating to trace-element biologists, and I hope we may have even more detailed evaluations of the capabilities of the mass spectrometric method.

At this point I would like to make amends for an unrelated omission in my recent article: With respect to zinc concentrations in malignant prostatic tissue, although I did not seek to give a comprehensive bibliography, I should have listed a relatively early work, "The occurrence of zinc in the human prostate gland," by C. A. Mawson and M. I. Fischer [*Can. J. Med. Sci.* **30**, 336 (1952)].

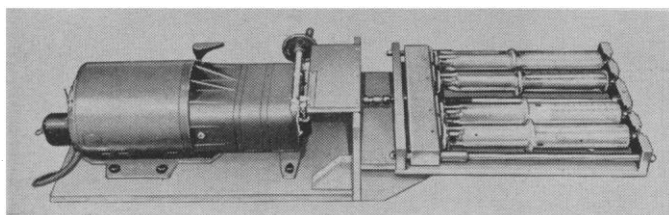
THEODORE HALL

Biophysics Division,  
Sloan-Kettering Institute, New York

### Sparing of Folinic Acid by Thymidine

In the recent report "Sparing of folinic acid by thymidine," by Groszowicz and Mandelbaum (1), it is quite clear that several important literature references are lacking.

The synergistic action of folinic acid and thymidine in stimulating the growth of *Pediococcus cerevisiae* (*Leuconostoc citrovorum*) ATCC 8081 was first noted by Bardos *et al.* (2). Furthermore, the finding that thymidine increased the



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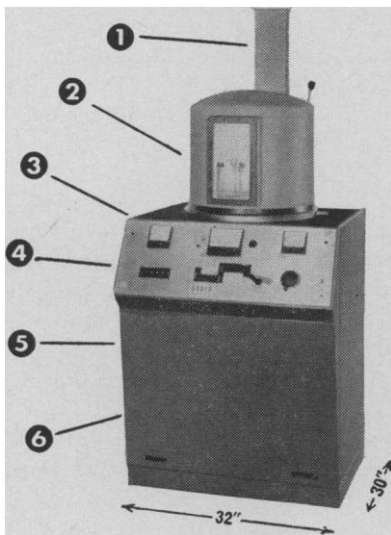
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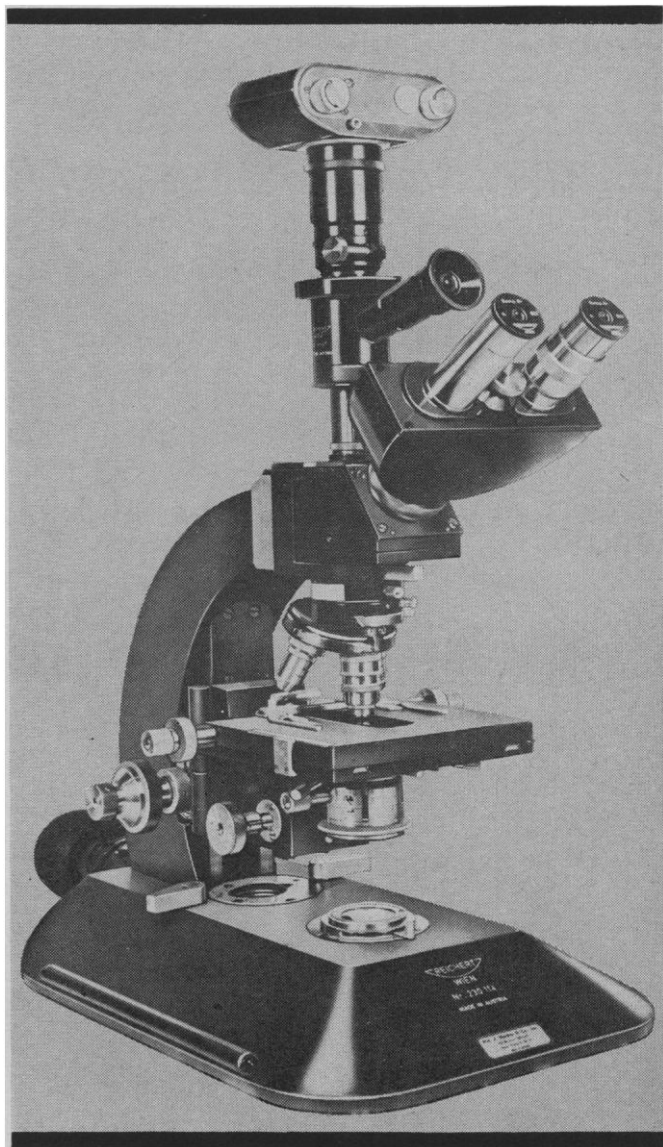
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growth of *P. cerevisiae* in the presence of high concentrations of pteroylglutamic acid (folic acid) was originally made by Broquist *et al.* (3).

The sparing of folic acid by thymidine has interested several authors. Broquist *et al.* published a figure on this phenomenon (4, p. 402, Fig. 2), although a concentrate from liver was used as a source of folic acid. A most thorough investigation on this subject has been published by Ellison and Hutchinson (5, p. 467); in their report both "the sparing effect of thymidine on the response of *P. cerevisiae* to citrovorum factor" (5,

p. 473, Fig. 4) and "the sparing effect of citrovorum factor on the response of *P. cerevisiae* to thymidine" (5, p. 473, Fig. 5) are given. Review articles have also mentioned that thymidine will reduce the requirement of *P. cerevisiae* for folic acid, a finding which is of importance in the assay for folic acid of natural materials containing thymidine (6, 7).

In connection with studies of the synergistic growth effects on *P. cerevisiae* of folic acid plus thymidine and of folic acid plus thymidine, the effect of folic acid plus folic acid is also of interest. This has been investigated by

Hendlin *et al.* (8), who found that media supplemented with subminimal levels of folic acid or N<sup>10</sup>-formyl folic acid (rhizopteringlutamate) gave a threefold to fourfold increase in the response of *P. cerevisiae* to folic acid.

Another interesting finding concerning *P. cerevisiae* is the growth-inhibiting effect of deoxyuridine noted by Bolinder and Kurz (9). The growth-promoting effect of suboptimal amounts of folic acid (leucovorin) was inhibited noncompetitively by deoxyuridine. However, the growth-promoting effect of suboptimal amounts of thymidine (0.1 to 3  $\mu$ g per 10-ml tube) was competitively inhibited by deoxyuridine, and an inhibition index of about 30 was obtained after 48 hours of incubation at 37°C. No inhibition occurred when leucovorin or thymidine were present in amounts sufficient to promote optimal growth of *P. cerevisiae*.

ARNE E. BOLINDER

Division of Food Chemistry,  
Royal Institute of Technology,  
Stockholm, Sweden

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I am embarrassed about not having seen the paper of Broquist *et al.* (1) prior to submitting our report for publication. Bolinder is certainly justified in bringing the information to light; however, I consider that he makes too much of an issue of it. I believe I have good knowledge of the literature, although it is quite difficult nowadays to keep up with all the published works in a given field. With reference to this subject, I have corresponded with some of the workers in the field, asking for their interpretations of the differences in the results obtained. Moreover, I showed our results to E. L. R. Stokstad, a coauthor of Broquist's (1), and he did not mention having obtained results similar to ours some 10 years ago.

My failure to see the article of Broquist (Bolinder's references 2, 5, and

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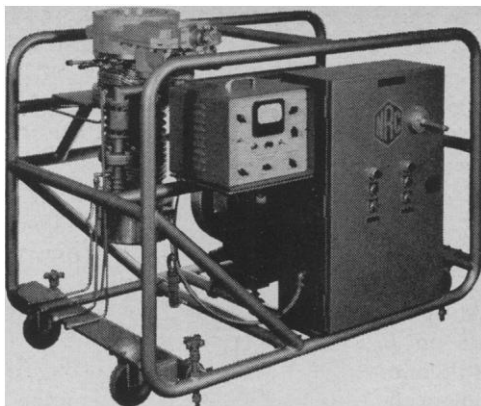
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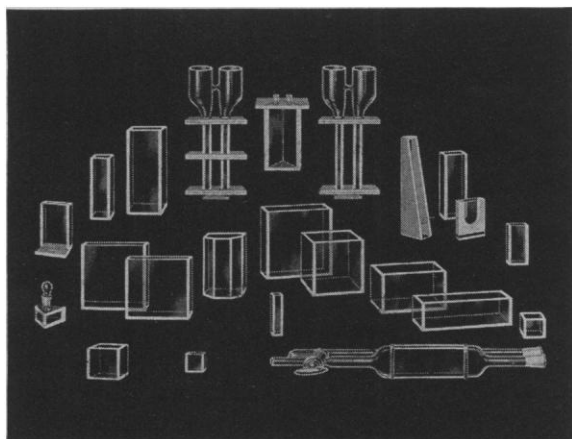
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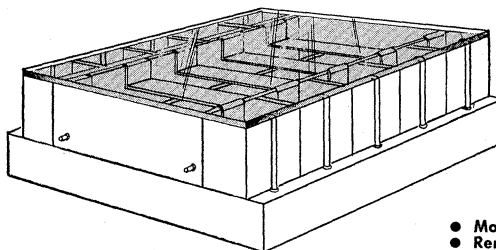
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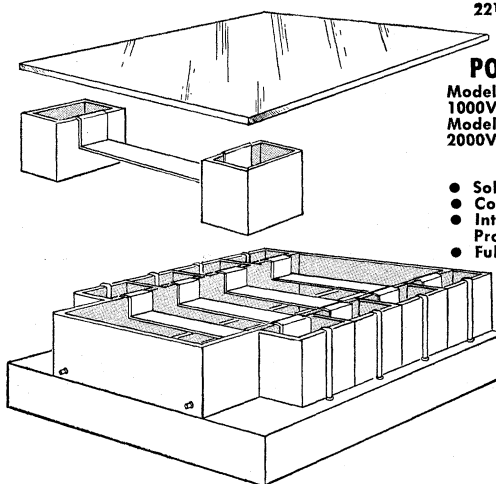
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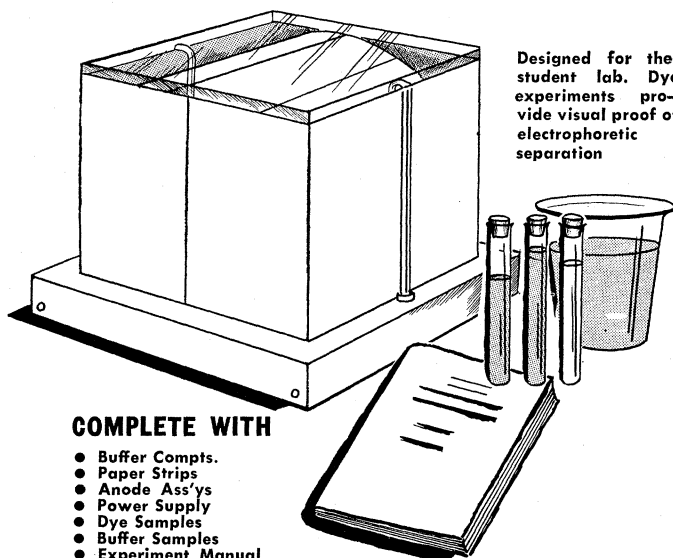
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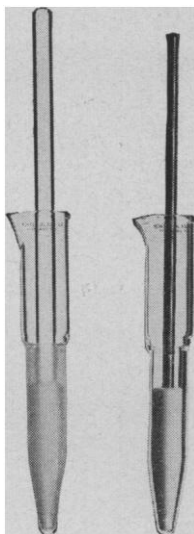
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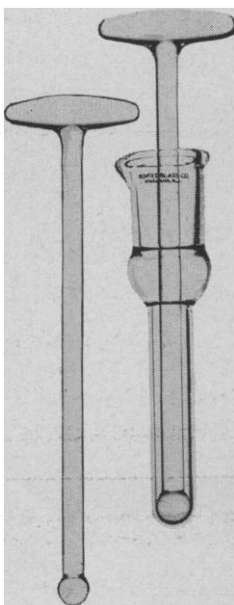
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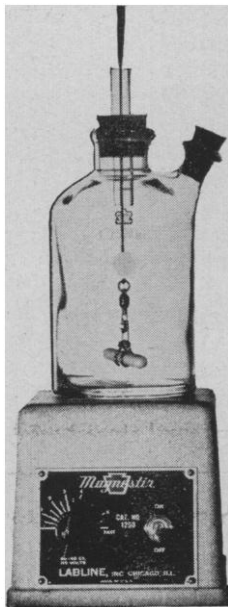
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6 are much less relevant) is due to the fact that it dealt with different aspects of folic acid (the title is "Some biological and chemical properties of the citrovorum factor") and therefore slipped my attention. I learned about the synergistic effect of folinic acid and thymidine from the recent review of Girdwood (2). This was, however, after our article had already been printed.

In retrospect I feel that our "rediscovery" of the sparing of folinic acid by thymidine served a good purpose, as many workers, like ourselves, did not know about the previous publication. I base this statement on the fact that there is quite a demand for reprints of our article. Thus, in spite of oversight on my part, our paper served to disseminate useful scientific information.

I feel that if *Science* as well as other journals would put more emphasis on the importance of identifying articles by proper headings, a slip of this sort would become a rarity.

With regard to the information presented in our report I would like to emphasize that in addition to the phenomenon of synergism, our findings demonstrate for the first time the quantitative aspects of the effect with pure compounds (the chemical authenticity of "folinic acid" was not established in the articles of Broquist *et al.* and the others). Moreover, in our system thymidine alone is ineffective, while it produced growth in their experiments (Bolinder's references 2 and 3).

NATHAN GROSSOWICZ

Department of Bacteriology,  
Hebrew University-Hadassah  
Medical School, Jerusalem, Israel

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#### Migrant Asian Students

The influx in recent years of Asian students in our universities has often presented problems of adjustment, owing perhaps as much to inadequately informed advisers as to the radically new cultural and academic patterns facing many of these students. Counselors of graduate students and, more especially, faculty members involved in educational exchange programs may on rare occasions have failed to notice

the very wide discrepancies in academic preparation or in scholastic and social adaptabilities among visiting students, and awkward situations may have arisen from this circumstance.

Because the great majority of these students eventually return home as teachers and professionals to environments where readaptation is frequently equally difficult, it seems to me important that our university faculties should consider certain sociological aspects of these student migrations. Their complex repercussions may not be more than superficially apparent to many scientists in the United States. Yet these are problems which in the long run are bound to produce far-reaching effects in countries in the throes of rapid social change, and in ways now difficult to foresee.

The problems facing the universities and university students in one such underdeveloped country of crucial importance, India, have been succinctly and, in my opinion, ably and sympathetically discussed in a recent issue of a periodical which my colleagues in the sciences are apt to overlook. I should like to urge those interested in the potentially wider results of their teaching and counseling efforts to read "Indian students," by Edward Shils, in the British journal *Encounter* [17, No. 3, 12 (1961)].

BALAJI MUNDKUR

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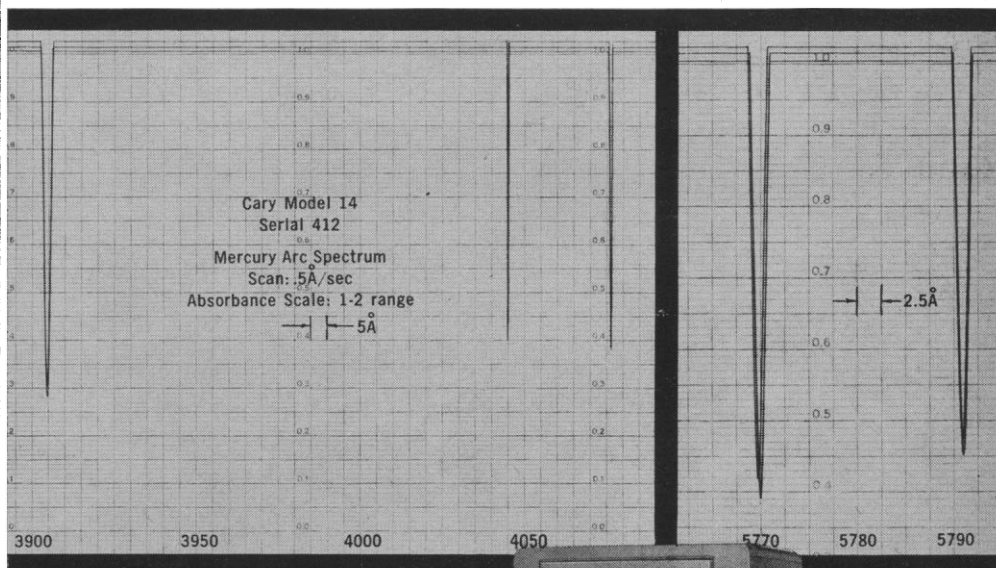


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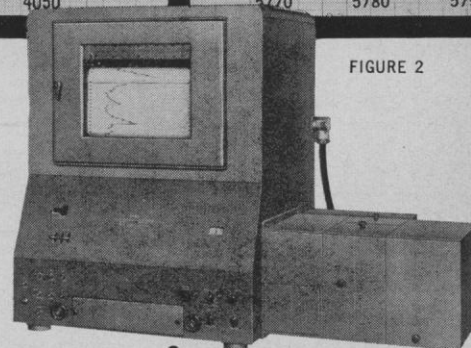


FIGURE 2

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