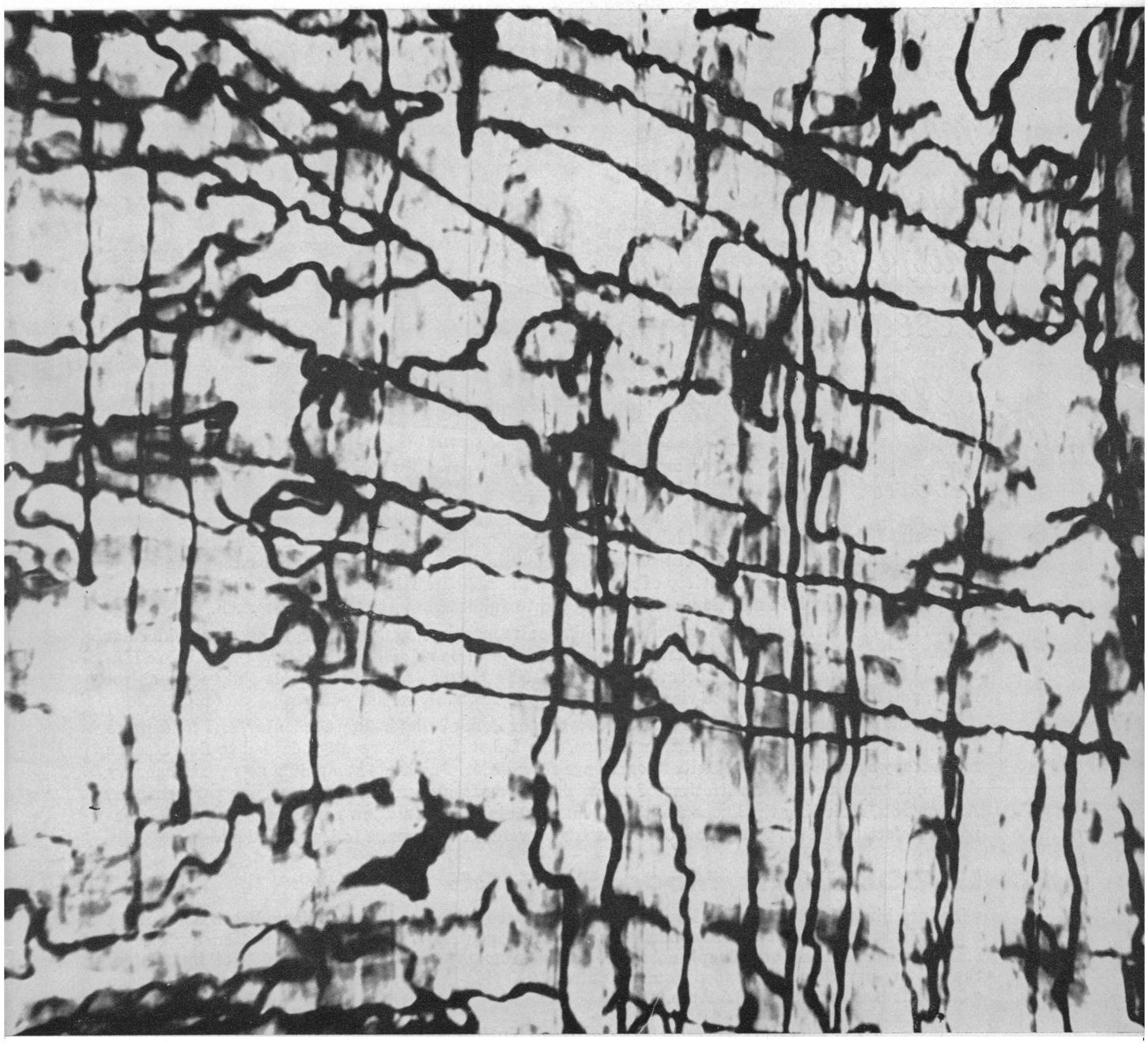
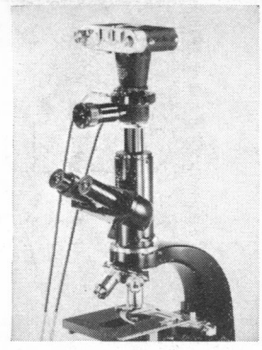
SCIENCE

16 June 1961

Vol. 133, No. 3468

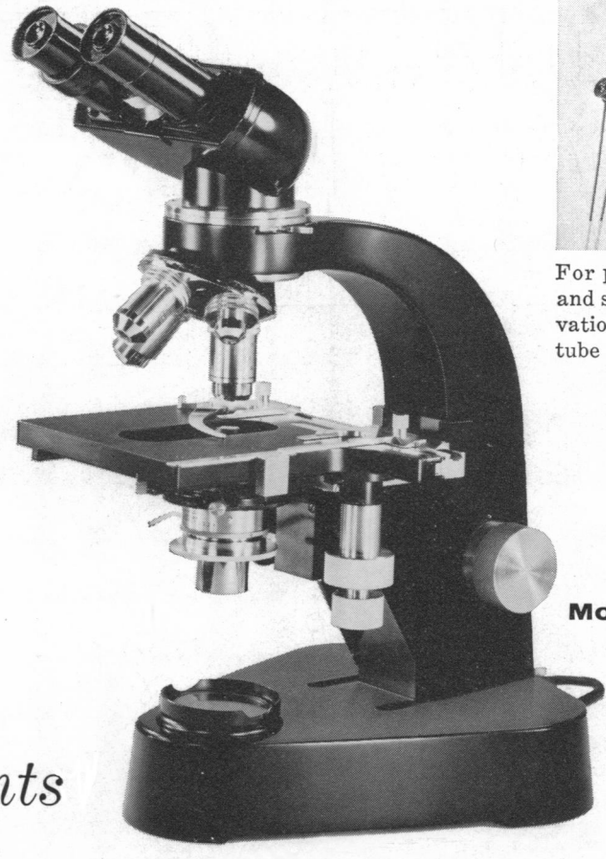
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





For photomicrography and simultaneous observation, binocular photo tube "FS" is available

the laboratory microscope which fulfills research requirements



Model S 48/76

the new LEITZ LABOLUX IIIa

The Leitz Labolux IIIa is a new laboratory microscope with built-in illumination and the famous Labolux ball-bearing focusing control, which combines both coarse and fine focusing in a single knob. Available with a wide variety of accessories, the Labolux IIIa is recommended for all routine laboratory work and, in addition, can be equipped to fulfill the most exacting research.

A variety of interchangeable tubes is available: monocular, binocular or trinocular (binocular viewing plus photo tube for photomicrography). Tubes can be rotated 360° so that the Labolux IIIa may be faced away from the observer, for increased accessibility to all controls and to the object stage, and to make "conference-viewing" by two consultants more convenient.

Among the condensers available are the Abbe type, the Berek 2-diaphragm condenser, and condensers for phase contrast and dark field observations. The Labolux IIIa is readily adapted to fluorescence microscopy by addition of the Leitz fluorescence accessories. The large stand, in a new contemporary design, is constructed for a lifetime of use with fatigue-free operation and precision performance. All controls, including the knobs for the mechanical stage, are in a low convenient position. High-power objectives have spring-loaded mounts for prevention of damage to lenses and slides.

LABOLUX IIIa, Model S 25/95

• inclined binocular tube S with knurled knob to adjust for proper interpupillary distance • built-in mechanical stage #25 • two-lens condenser #95 • substage unit with rack and pinion focusing accepts sleeve-type condensers • quadruple nosepiece with achromats 3.5X, 10X, 45X and 100X oil immersion, the last two having spring-loaded mounts • paired 10X wide-field eyepieces • horizontal carrying case • 3-step transformer, 6 V., 2.5 Amp.

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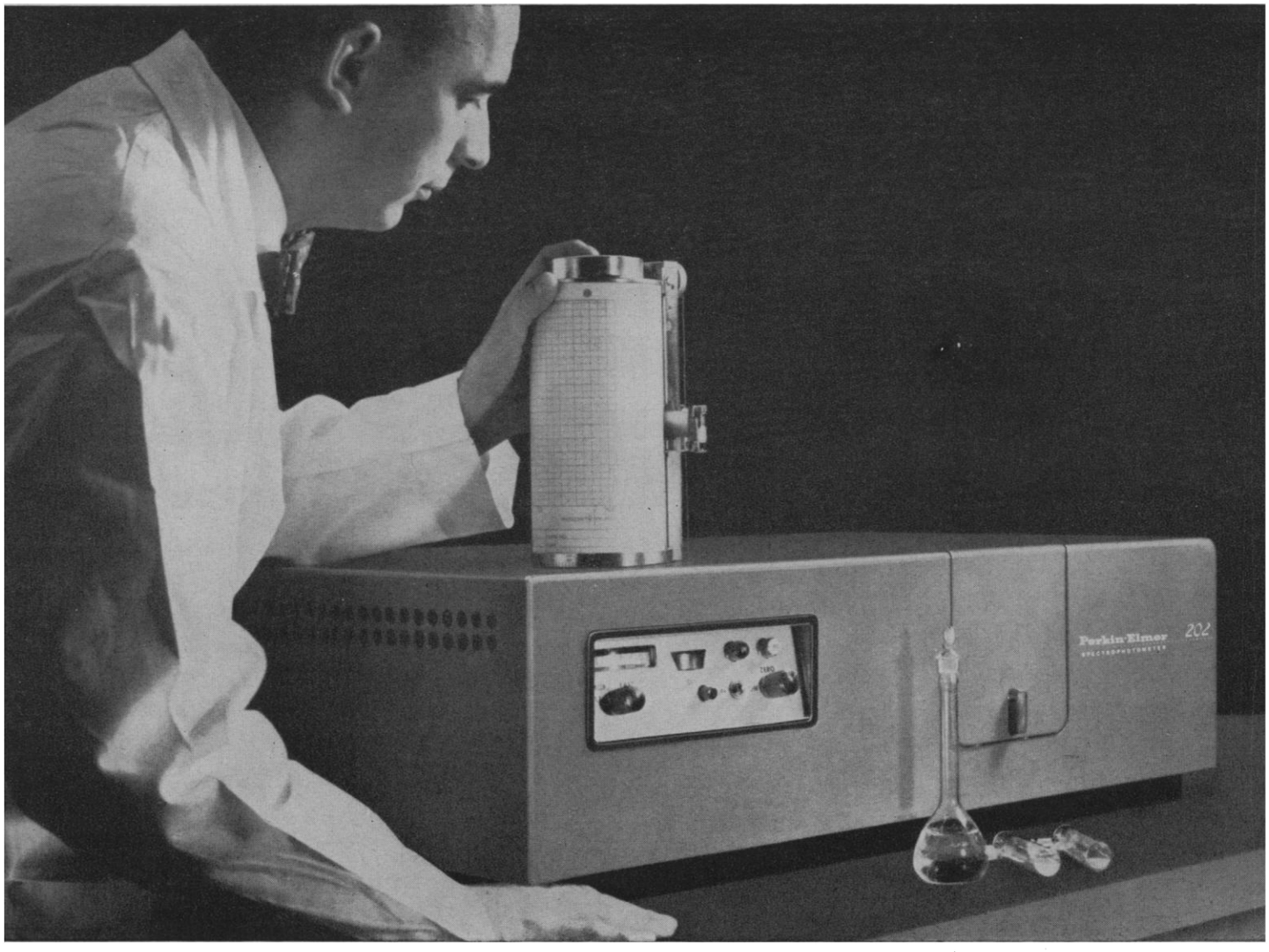


NEW SPECTROPHOTOMETER GIVES HIGHEST UV-VIS PERFORMANCE AT LOW COST

A new ultraviolet-visible spectrophotometer — the Perkin-Elmer® Model 202—provides photometric and wavelength capabilities you expect from more expensive instruments. Its low price brings it within the range of any lab budget.

The Model 202 covers two regions: 190 to 390mμ in the ultraviolet, and 350 to 750mμ in the visible. Two scanning speeds—two and eight minutes per scan—are available for survey or precise work.

Features:

- **EASE OF OPERATION:** Minimum controls, plus Automatic Gain Control and slit programming, makes the Model 202 easy to run. Records linearly in absorbance units (0 — 1.5).
- **OPTICAL NULL RECORDING:** For high accuracy in quantitative analysis, plus high reproducibility.
- **AUTOMATIC GAIN CONTROL:** An exclusive feature, automatically increases energy of the system in high absorption areas. Makes the most difficult differential analyses routine.

NOTEBOOK-SIZE CHART: Spectra of each range recorded on standard 8½x11 chart, with large ordinate for accuracy. Linear wavelength presentation. Specifications are:

	ULTRAVIOLET	VISIBLE
Resolution	0.2mμ at 250mμ	1.5mμ at 600mμ
Photometric accuracy in absorbance units	±.01	±.01
Photometric reproducibility in absorbance units	.005	.005
Wavelength accuracy	±0.5mμ	±1.0mμ
Wavelength reproducibility	0.3mμ	0.5mμ

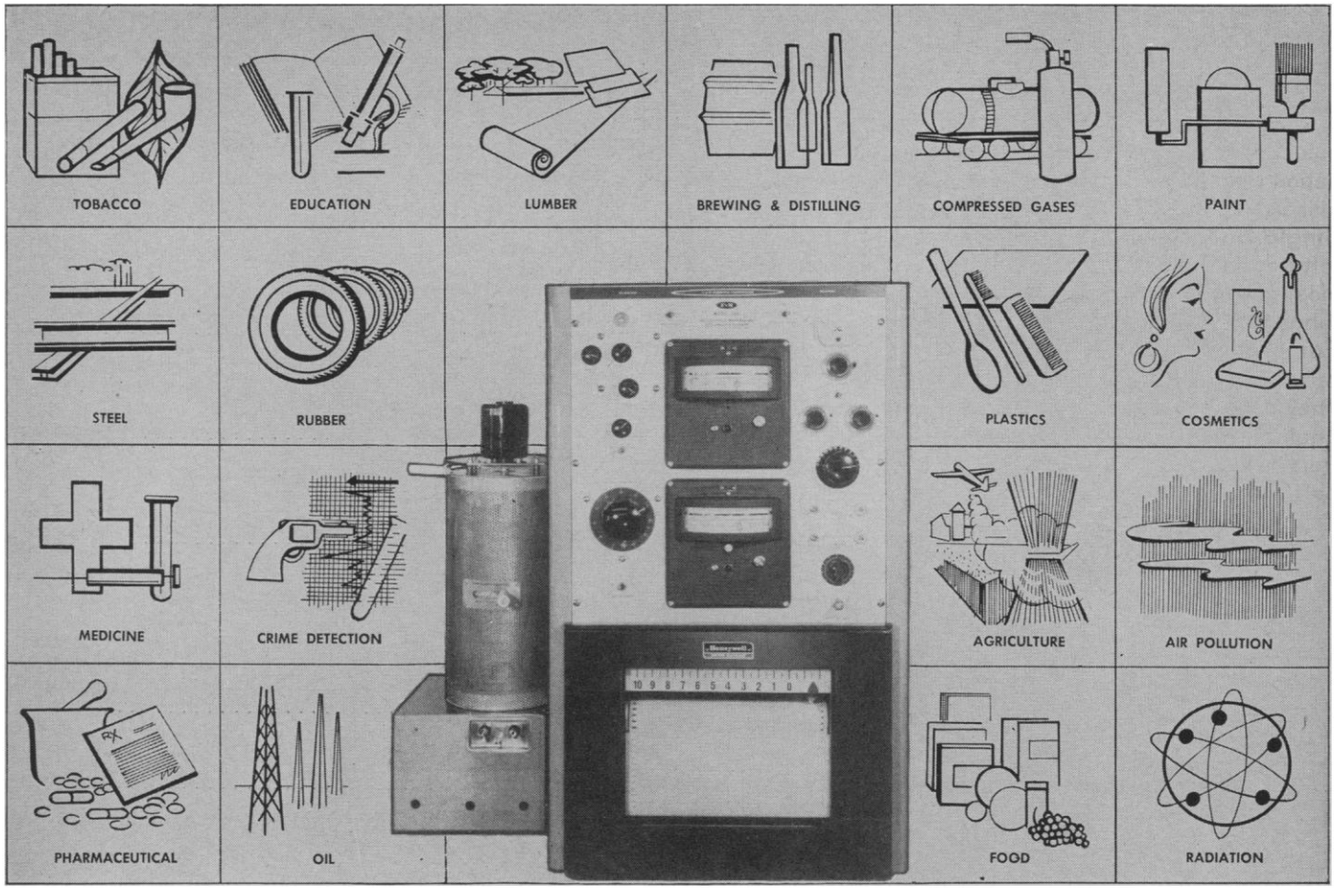
For literature and spectra, write to Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Connecticut.

INSTRUMENT DIVISION
Perkin-Elmer *Corporation*
NORWALK, CONNECTICUT

16 June 1961, Volume 133, Number 3468 **SCIENCE**

Cover

Capillary network at the juncture between vertical and longitudinal muscle bundles in the tongue of the rat. The blood vessels are revealed by their specific reactivity for alkaline phosphatase (× 420). [Richard A. Ellis, Brown University]



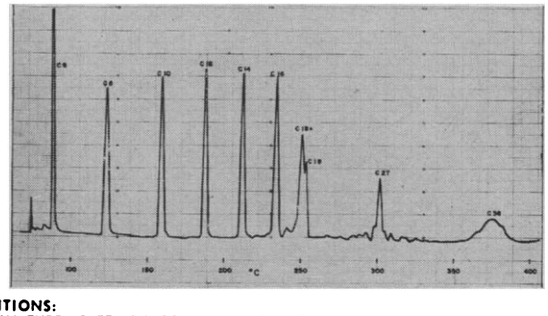
For Research and Development in all Industries

MODEL 500 LINEAR PROGRAMMED HIGH TEMPERATURE GAS CHROMATOGRAPH

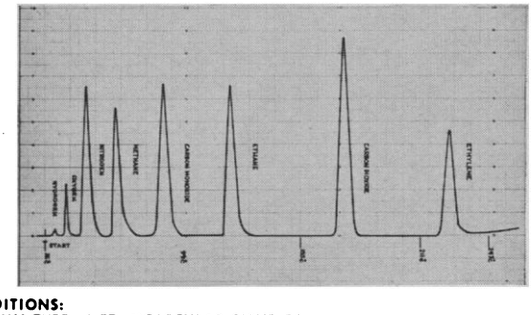
The technique of linear programmed temperature gas chromatography combined with high temperature operation makes possible these previously difficult analyses: (1) wide boiling mixtures; (2) gases (H_2, O_2, N_2, CO, CO_2 and light hydrocarbons); (3) trace quantities of high boiling residues in low boiling solvents; (4) correlation of retention times with analytical distillation data; and (5) temperature sensitive materials.

Two such analyses are shown below. Note that with programming, both separations required only one column. Without programming, the methyl ester separation would have required a fixed high column temperature with a loss in resolution of the lower boiling components. In the separation of gases at a constant column temperature, ethane, carbon dioxide and ethylene would not have eluted. To chromatograph this mixture at constant temperature, two columns and two samples are necessary.

With a Model 500, column scouting is easily performed because columns can be changed and baselines re-established in ten minutes. Heating from room temperature to 300°C takes about 10-15 minutes (27 minutes to 500°C) and cooling back to room temperature takes about the same time. Model 500 has separate and independent temperature controls, each to 500°C, for column, detector, and injection port. In addition, eighteen linear heating rates from 0.29 to 42°C/min. provide a wide selection for optimum column conditions.



CONDITIONS:
COLUMN TYPE: 2 FT. SILICONE GUM RUBBER
COLUMN TEMP. PROGRAMMED AT 5.6°C/MIN. FROM 75°C to 400°C.
This is a typical programmed temperature chromatogram demonstrating a separation of methyl esters with widely differing boiling points. Observe the sharp peaks, shaped nearly alike.



CONDITIONS:
COLUMN TYPE: 4 FT. MOLECULAR SIEVE 5A
COLUMN TEMP. PROGRAMMED AT 4.0°C/MIN. FROM 35°C TO 247°C.
By programming column temperature, H_2, N_2, O_2, CO, CO_2, ethane, and ethylene all separate on a single column in one run. Using the same column, the programmed temperature technique works equally well for the separation of nitrous and nitric oxide in the presence of these gases.

***Similar analytical advantages with Model 500** apply to the other industries illustrated above. Write for our bulletins on Model 500. These describe in detail all the specialized analyses.*

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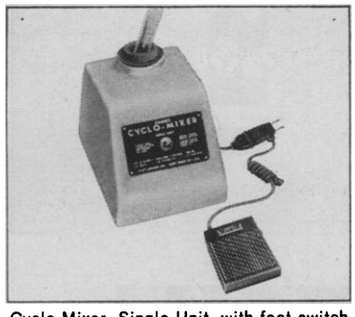

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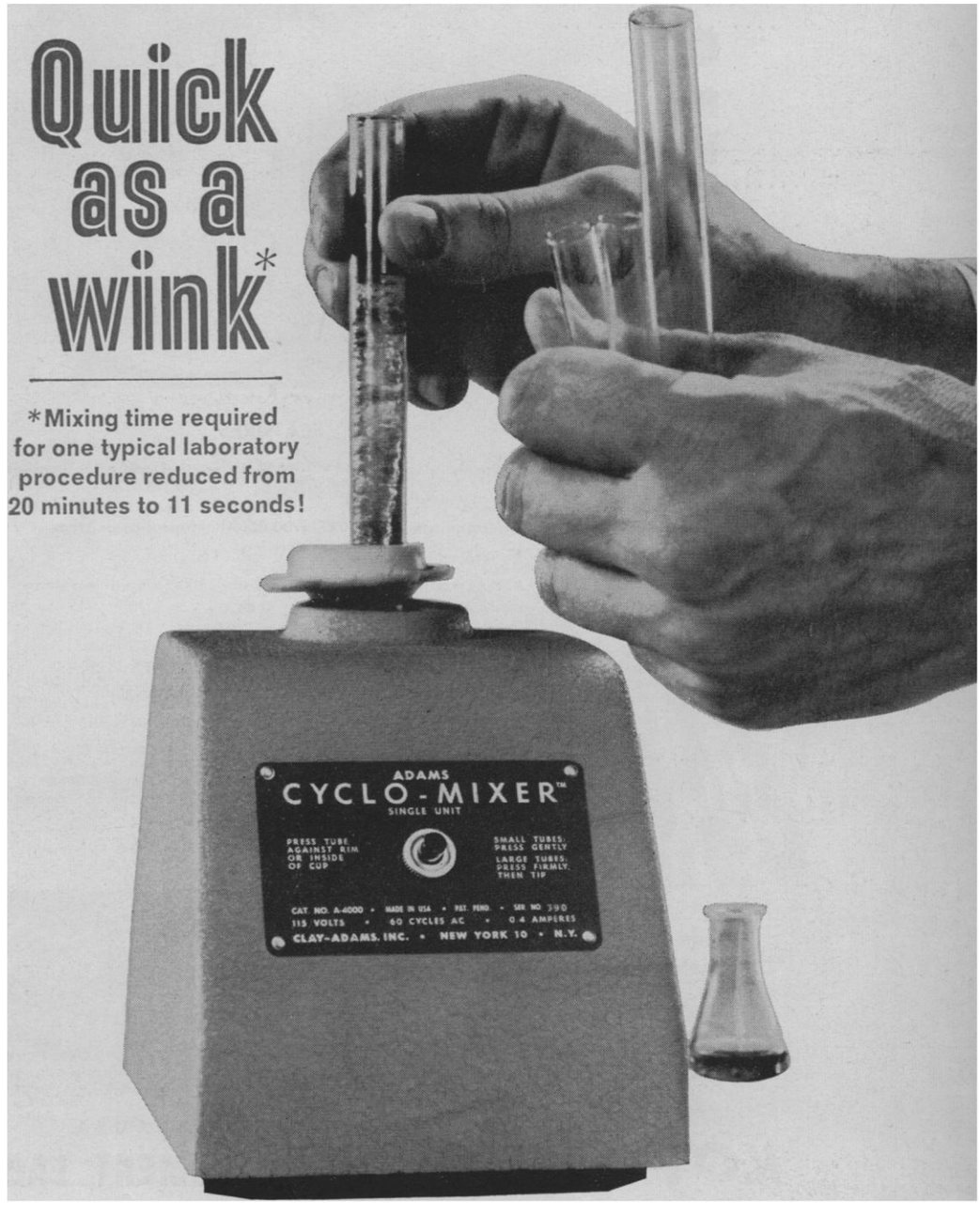

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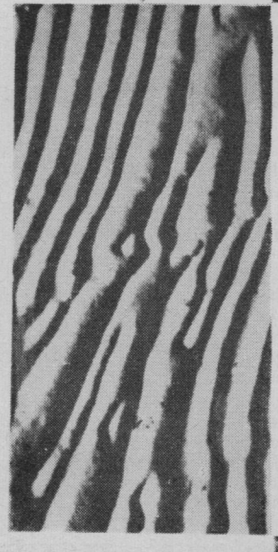
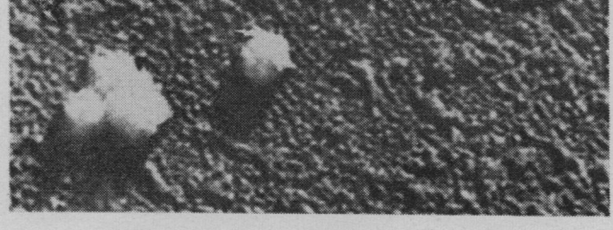


FEATURES

- Resolving power 30Å to 50Å in routine operation, optimal resolution 25Å
- Magnification 1,000X to 30,000X, adjustable in steps
- Accelerating voltage 60 kV ±0.01%
- High-voltage stability better than 10^{-4}, ripple less than 2.5×10^{-5}
- Specimen inserted under vacuum
- Specimen motion controlled from microscope platform
- Microscope may be tilted for stereo-photography
- Viewing port usable for diffraction patterns
- Uses standard 35 mm film (36 pictures) or ten 2" x 2" plates
- Dimensions of basic instrument: 14½" wide, 18" deep, 34½" high
- Low initial cost and minimal maintenance



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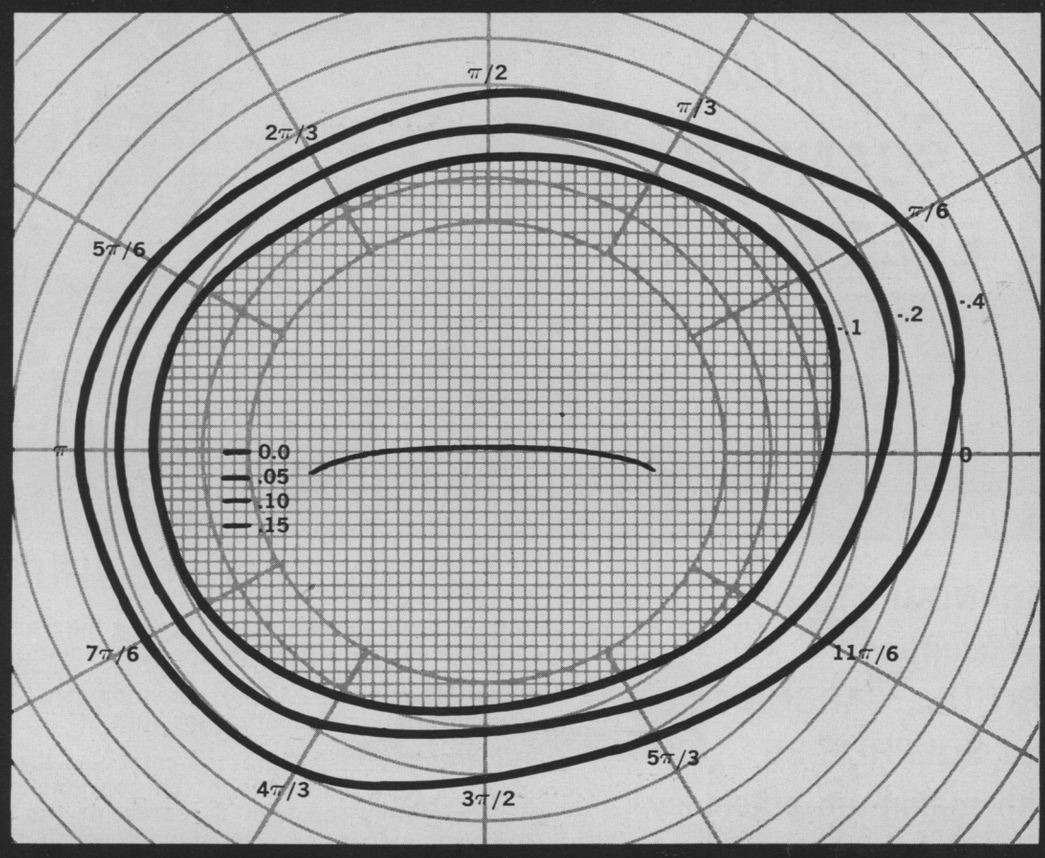
a picture of precision.....THIS IS THE L-128 LABORATORY MAGNET BY HARVEY-WELLS



STANDARD PERFORMANCE RATINGS-L-128

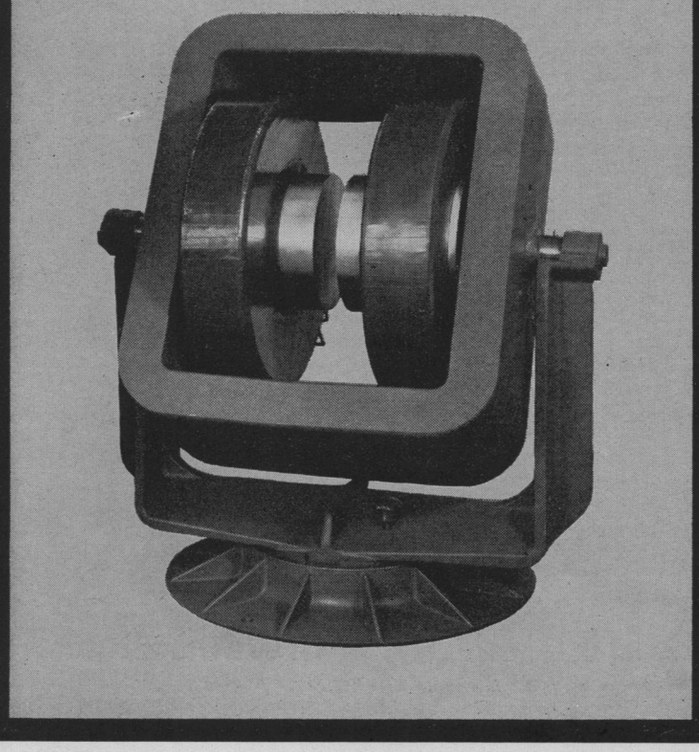
Gap Width
2.00 inches

Pole Diameter at Gap
12.00 inches

Field Strength
13,000 gauss

Homogeneity
Better than one part in 10^5 over a minimum volume of one cubic inch.

*Tapered Pole Caps are available to meet specific customer requirements of much greater field strength at no additional cost.



The homogeneity curve pictured here was plotted from a typical Harvey-Wells L-128 Electromagnet operating at 10950 gauss.

The concentric curves are full scale field plots in the median plane of a 12 inch diameter, 2 inch wide air gap. The inset curve shows the field strength in gauss over the central 2 inch region in the front to back median plane.

Guaranteed homogeneity is 1 part in 10^5 over a minimum volume of one cubic inch.

Homogeneity of the type shown here, in a magnet capable of producing 30 kilogauss*, makes the combination of the L-128 and its matching HS-1050 solid state power supply a most versatile and reliable electromagnet system.

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Magnetics Division, 43 Kendall St., Framingham, Mass.

Please send complete information on the L-128 Electromagnet

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COMPANY _____

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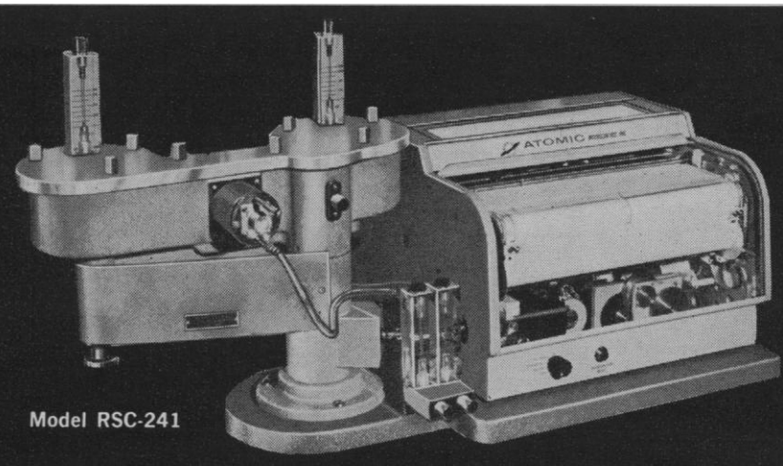
new! MOST Sensitive SCANNER EVER MADE!



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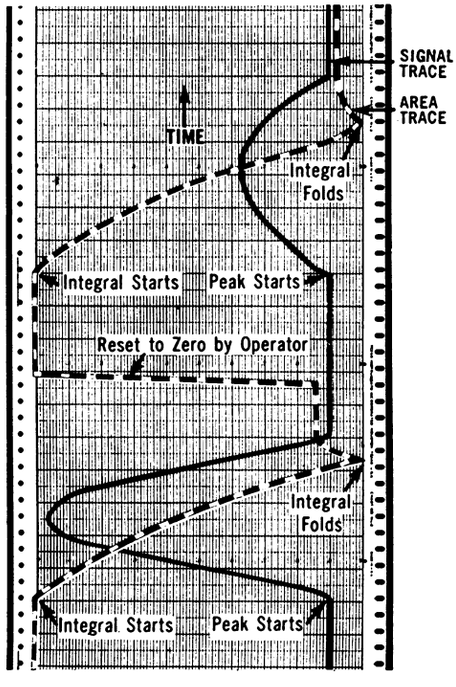

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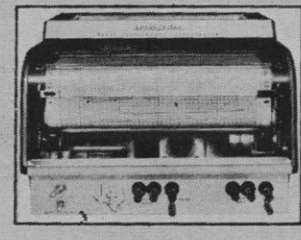
available separately



- Perfect mate to your existing radiochromatogram equipment
- Ideal for gas chromatography systems
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- Just imagine the wide variety of applications in your laboratory

Write for Bulletin S-241

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Model 8250 Spectrometer incorporating the All-Electronic Scaler Model 135, the Model 250 Amplifier-Analyzer and Model F-8 Fan Filter Assembly.

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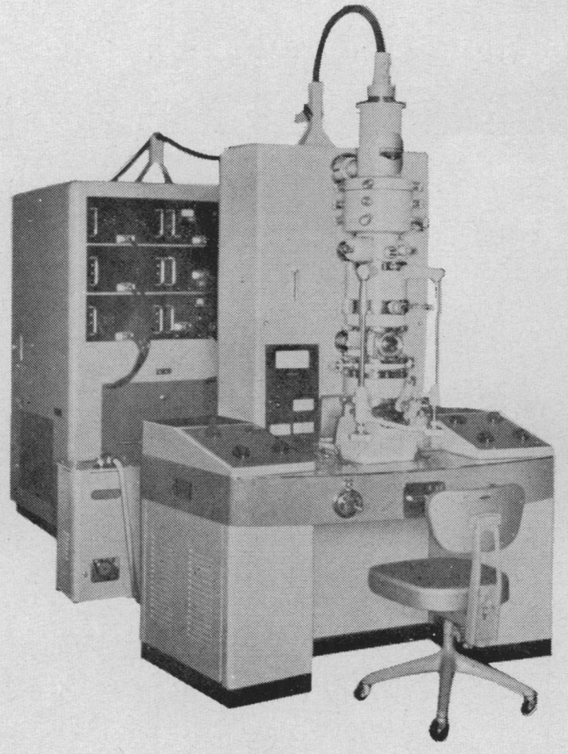

featuring the new HU-11

Hitachi, Ltd. of Japan, in advance of world-wide competition, announces the successful production of the HU-11, the latest in electron microscopes.

The new HU-11 is an enlarged, high efficiency electron microscope, guaranteed 8-10 Angstrom Unit resolution, capable of probing the very basic structure of matter. This is possible in the HU-11 because it is equipped with a chromatic aberration compensating lens system, a development uniquely Hitachi.

Other improvements include an enlarged specimen chamber facilitating handling of accessories, an exhaust system trap reducing contamination to a minimum (therefore eliminating the need to disassemble the column), increased exposure area of photography permitting recording of high resolution diffraction rays.

...and presenting the HS-6

Hitachi's outstanding HS-6, the permanent magnet electron microscope, is equipped with four lenses (condenser, objective, intermediary, projection) with a resolving power reaching 25 A.U. upwards and ensures an electron optical magnification continuously changeable from 2,000x to 20,000x.

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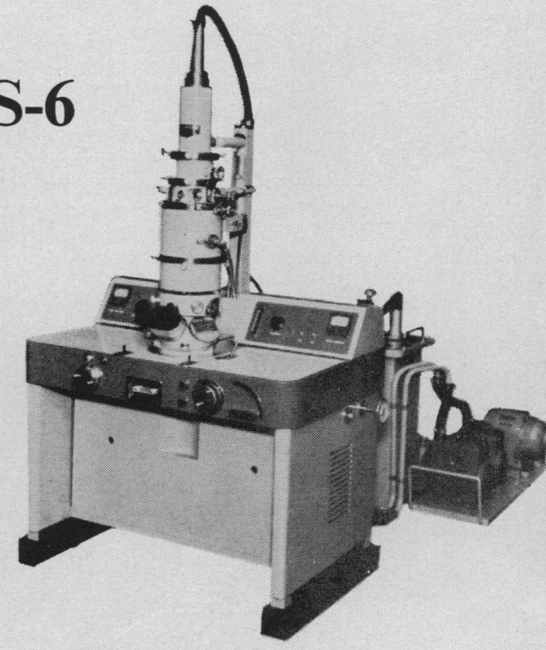
Simplicity of operation, mechanics and circuitry make the HS-6 the ideal instrument for researchers in the most sensitive medical and biological fields.



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Tokyo Japan
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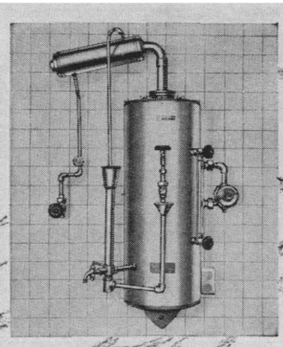

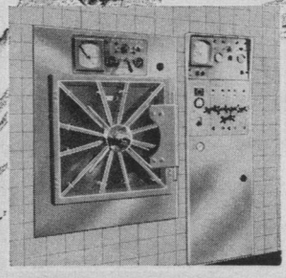

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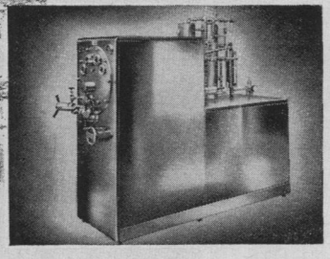

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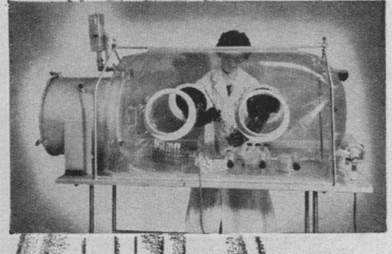

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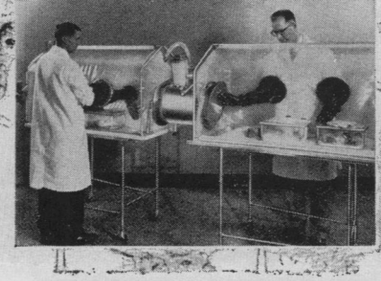

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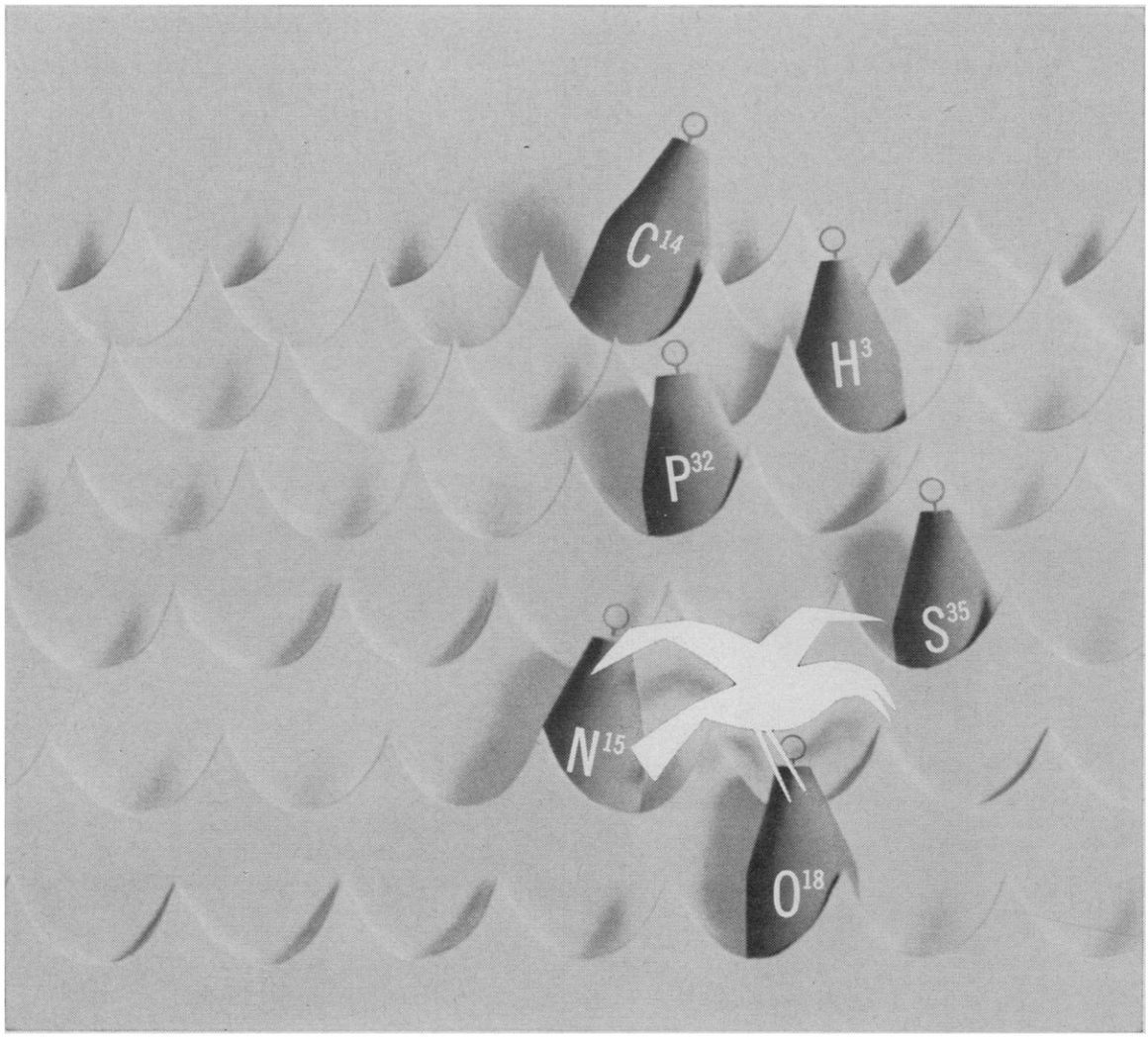

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Also available is a wide range of N^{15}-labeled compounds. And, through an arrangement with the Yeda Company at the Weizmann Institute, a number of O^{18}-amino acid derivatives can be prepared on special order. For a complete price list that includes our labeled compounds and a long list of unlabeled biochemicals, write to Dept. FB.

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NIKON model 6 OPTICAL COMPARATOR

for fast, accurate evaluation of ultracentrifuge photo plates

A major pharmaceutical manufacturer recently investigated the use of a Nikon 6 Optical Comparator for measuring and analyzing ultracentrifuge photo plates. The performance was so impressive, the unit was immediately purchased and added to the company's instrumentation facilities. The news travelled.

Within less than a month, a Nikon 6 Comparator was acquired by a large hospital, and shortly thereafter, by several other hospitals and by a food research laboratory. The Comparator, in each instance, demonstrated a marked superiority over equipment previously used—greater speed and convenience, and greater accuracy.

The Nikon 6 Optical Comparator is essentially a macro projector with a magnification range from 10x to 100x—extendable to 500x. Any object, thing, substance, specimen, photo plate or slide placed upon the stage, appears on its 12″ screen as a sharp, bright, magnified image, which can be observed by many people simultaneously —studied, evaluated and precisely measured. And all of this can be done comfortably in a normally lit room. The Model 6 Comparator is provided with surface as well as sub-stage illumination.

New laboratory applications for the Nikon 6 Comparator are being constantly reported. In addition to the analysis of ultracentrifuge data, its use has been extended to many phases of chromatography, evaluating fringe patterns and reading electrophoresis photo plates and cells.

You may have an inspection or measurement problem which lends itself to the unique capabilities of the Nikon 6 Optical Comparator. Why not tell us about it. Write to Dept. S-6.

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Designed and Manufactured by E. H. Sargent & Co.

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Sargent offers the Model SR to fill the need for a low cost recorder that features: maximum accuracy at a minimum cost; 250 mm width chart; fast balancing speed of 1 second; high sensitivity, high gain amplifier; and square cornering at 10,000 to 50,000 ohms input. This instrument provides the minimum required flexibility at the lowest possible cost.

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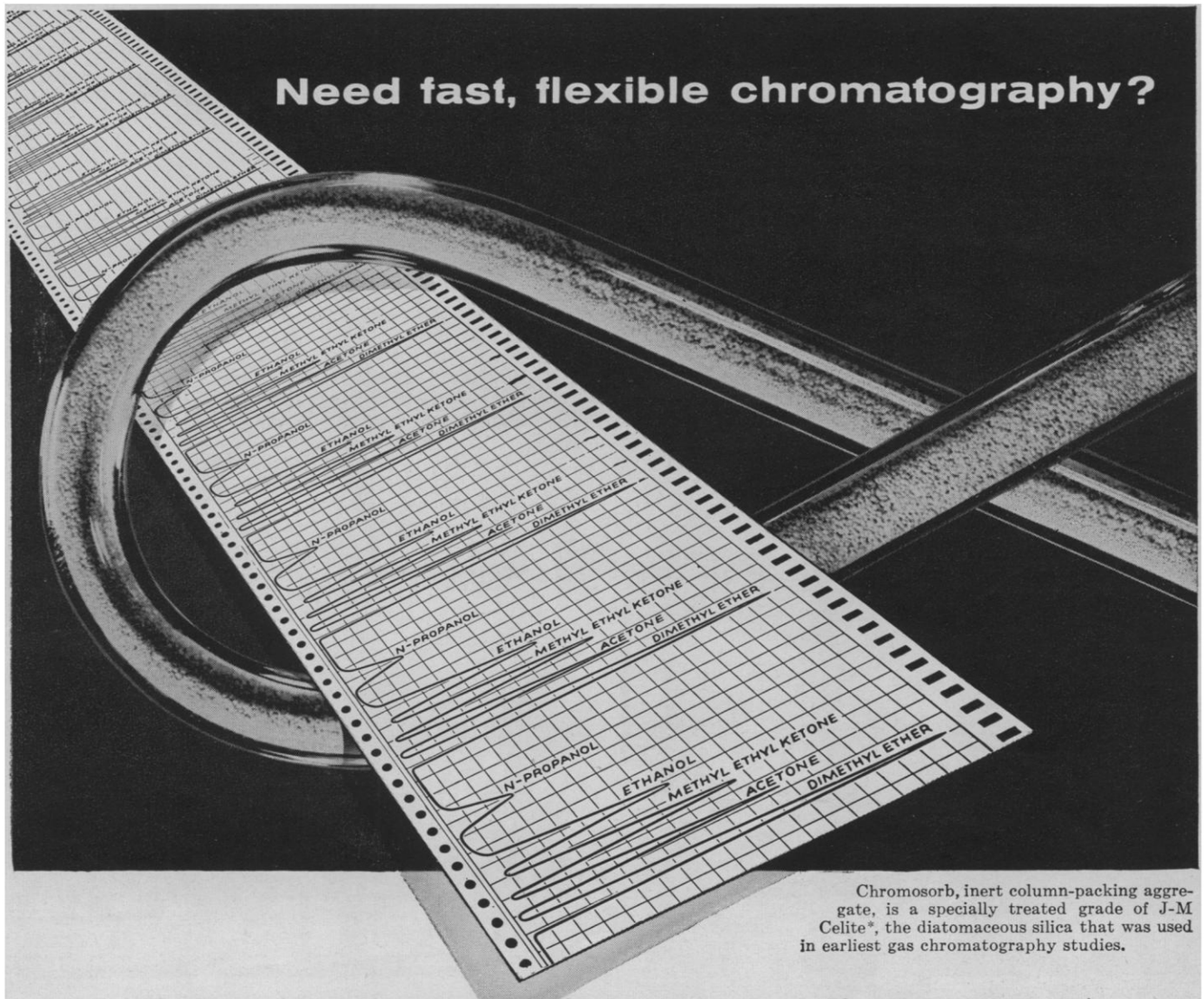

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As an aggregate in gas-liquid partition chromatography, J-M Chromosorb® gives high partitioning effect with maximum number of theoretical plates. Good resolution is obtained because it is chemically inert and won't adsorb components being passed through. You get uniform results, optimum reproducibility, and good flow of carrier gas without excessive pressure drop.

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For gas phase chromatography or where inertness is needed... Chromosorb

Typical Properties

Calcined diatomaceous earth aggregate.

Color	light pink
Free Fall Density—lbs./cu. ft. (avg.)	20-23
Specific Gravity—true	2.15
Water Absorption—cc./gr. (avg.)	2.4
Moisture—% by weight, maximum	1.0
pH (avg.)	6-7
Surface Area—sq. m./gm. (avg.)	3-5

For chromatographic studies... Chromosorb W

Typical Properties

Flux calcined diatomaceous earth aggregate.

Color	white
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Specific Gravity—true	2.30
Water Absorption—cc./gr. (avg.)	4.0-5.0
Moisture—% by weight, maximum	1.0
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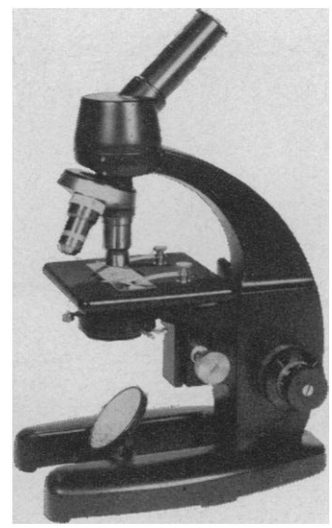

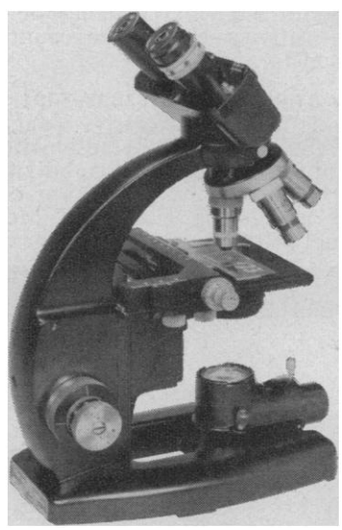

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IN CHROMATOGRAM SCANNING....

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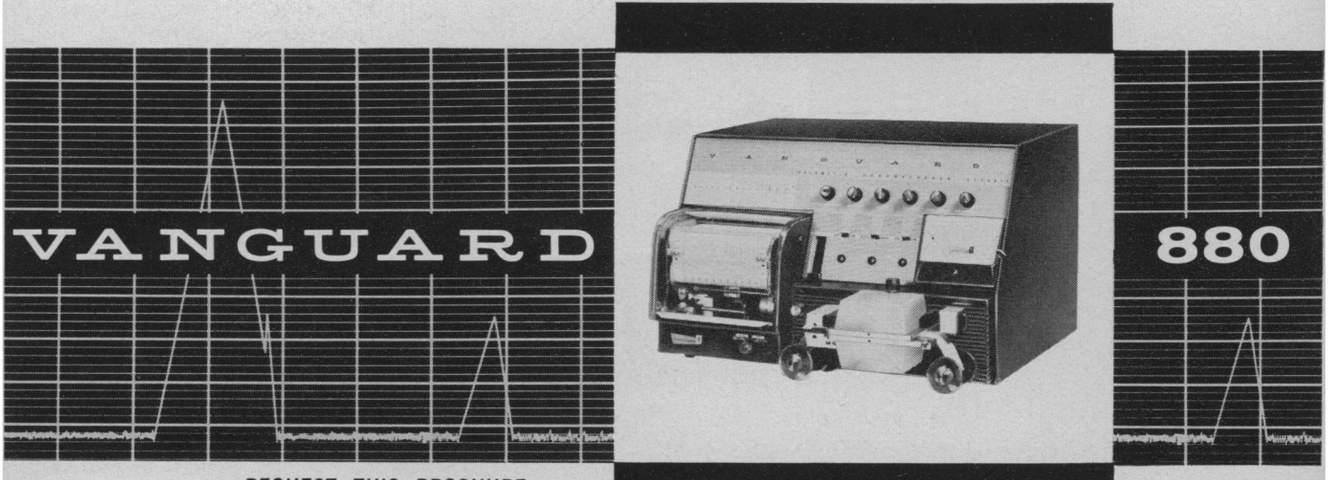
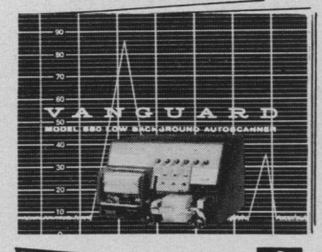


REQUEST THIS BROCHURE—See how you can achieve the highest detection efficiency available for chromatogram scanning. Booklet outlines distinctive features and lists all operational characteristics of the Model 880 AUTOSCANNER.



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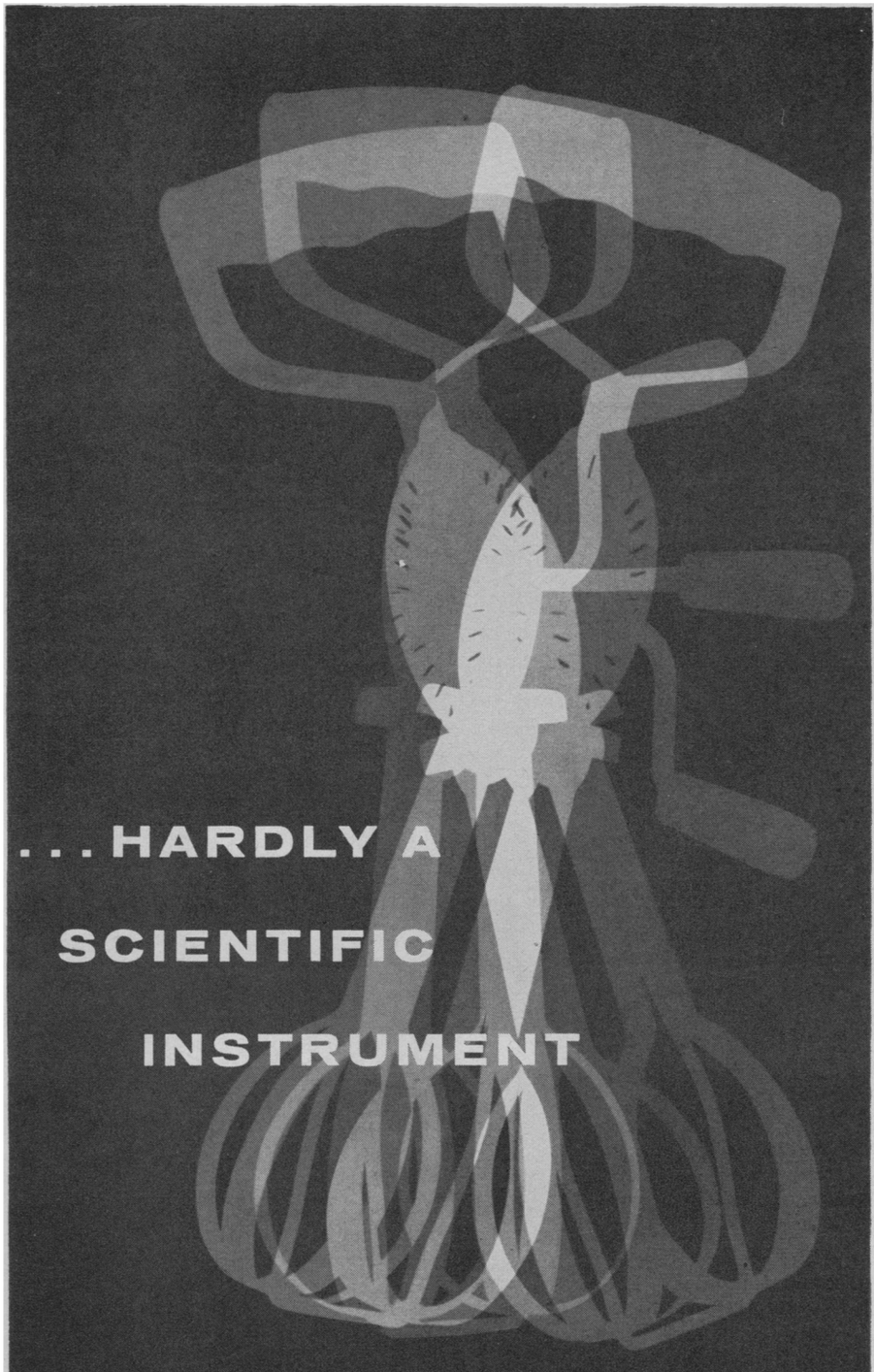

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And, though the LGP-30 can solve routine and theoretical math problems 30x faster than any man—it rents for little more than the salary of an additional engineer. Amazing? No, just well-designed, *advanced.* Let us tell you more about it. Write: Mr. Floyd Ritchie, Royal McBee Corporation, Port Chester, New York.

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PsycroTherm can be used as an Incubator, Shaker, Environmental Chamber, BOD Incubator, Refrigerator

THE PSYCROTHERM is a rigidly controlled environmental incubator with a continuous-duty shaking mechanism. Though it occupies comparatively little floor area, it has 10½ cubic feet of *usable* work space in the incubation chamber, where static and shake cultures can be incubated simultaneously or separately.

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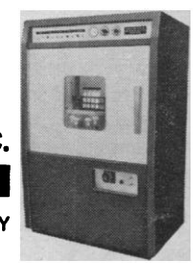

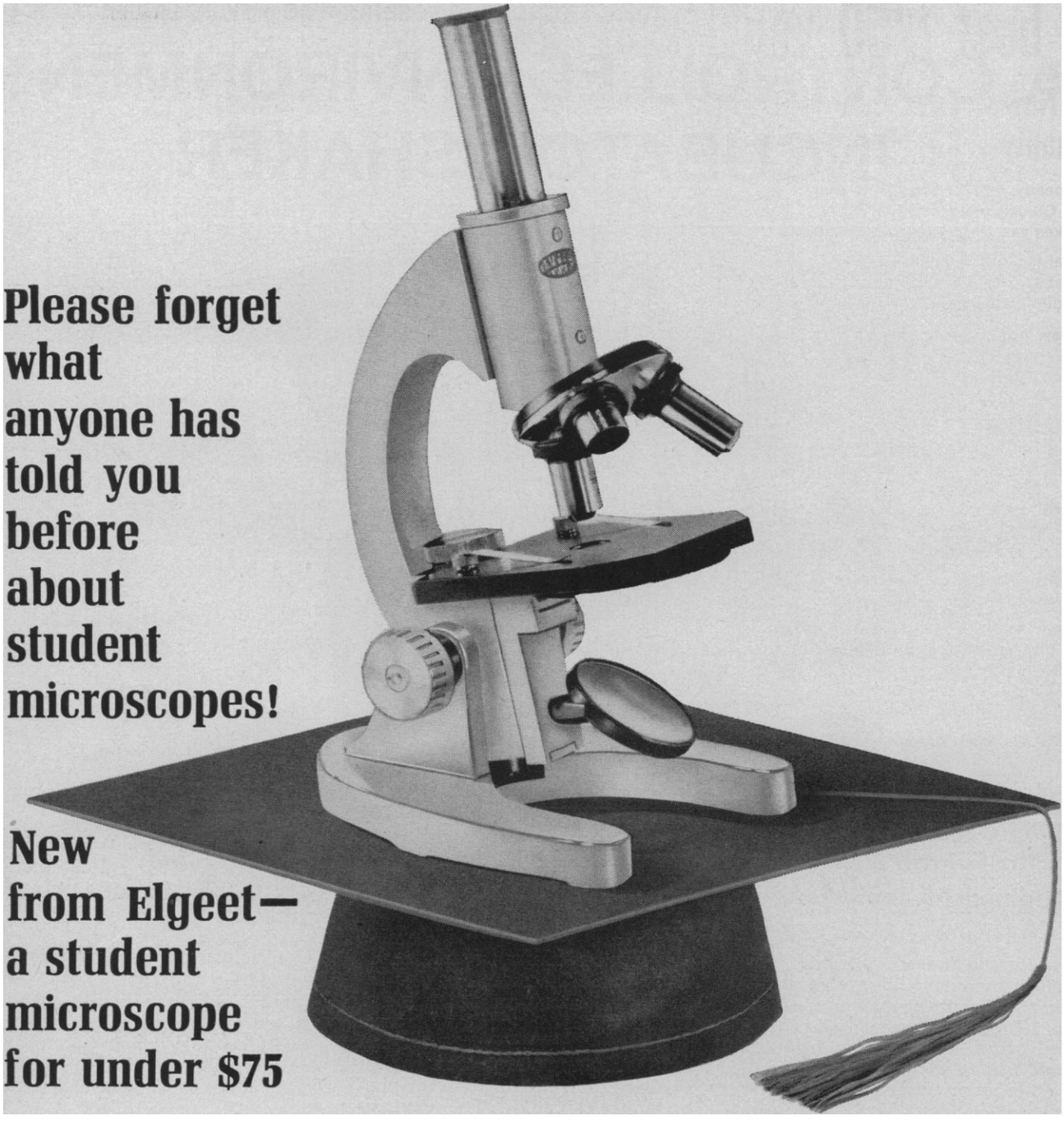

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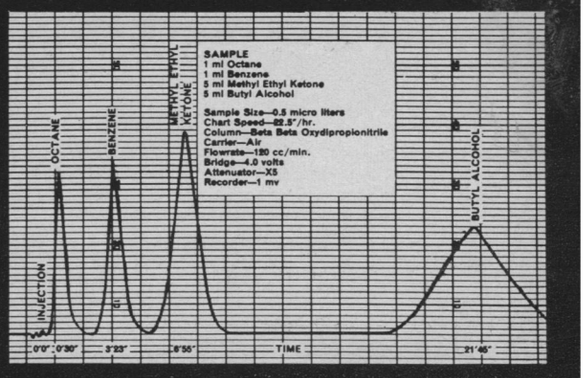

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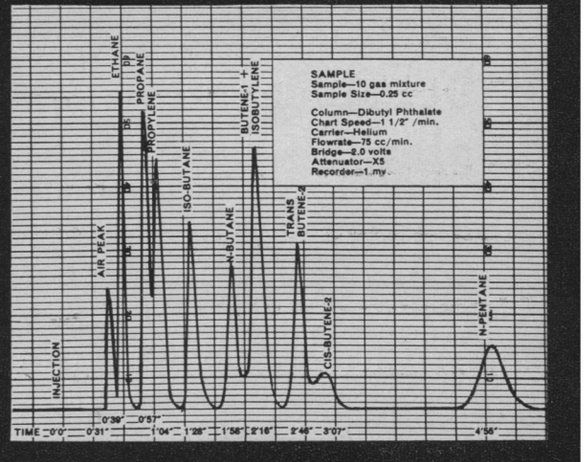

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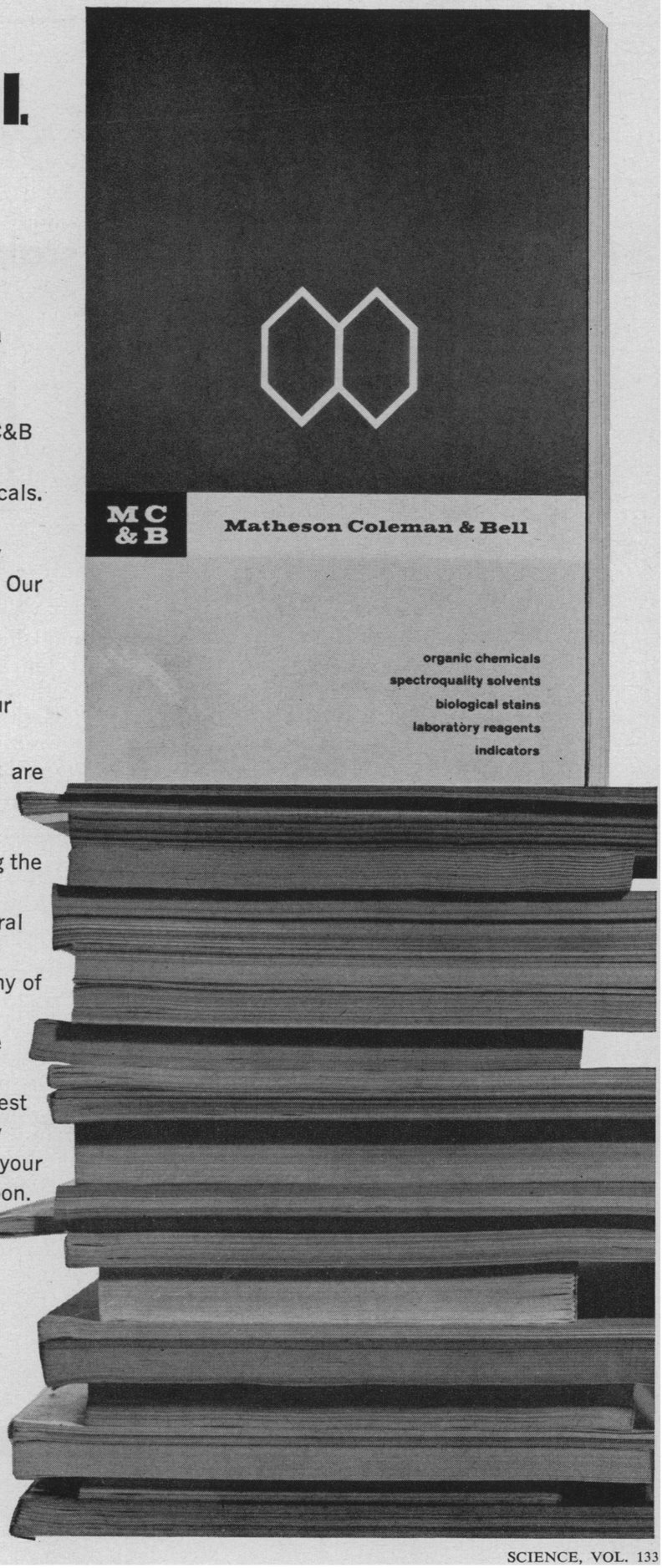

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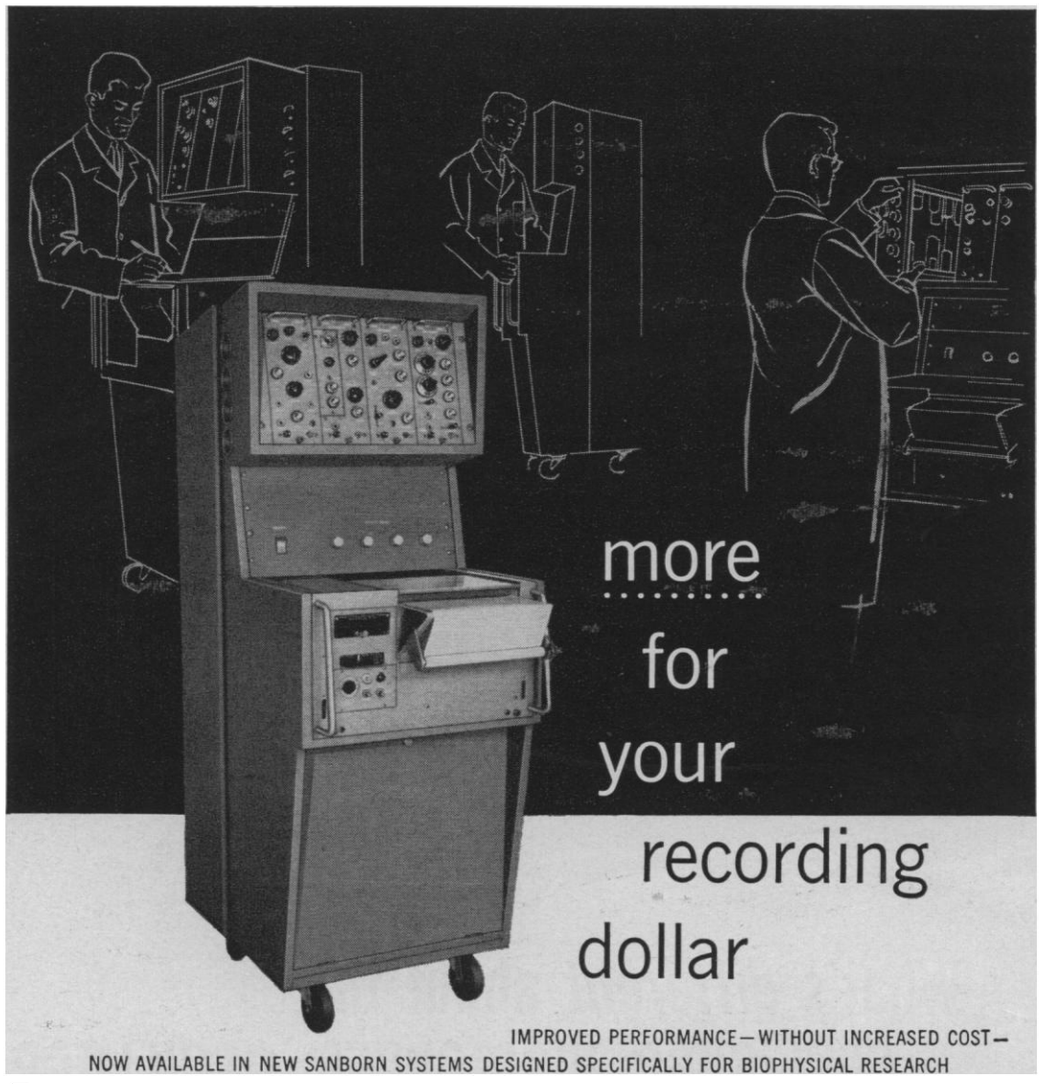

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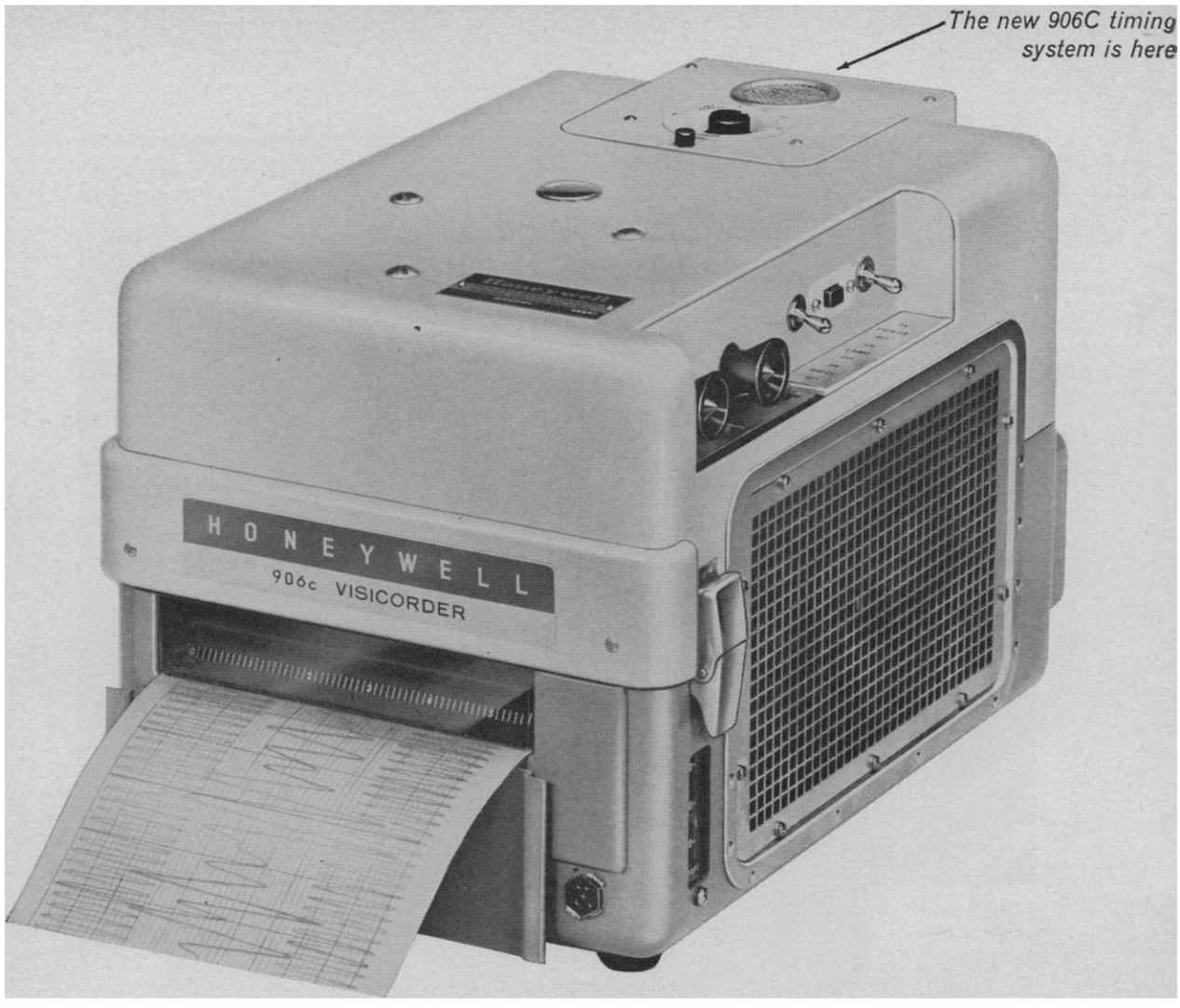

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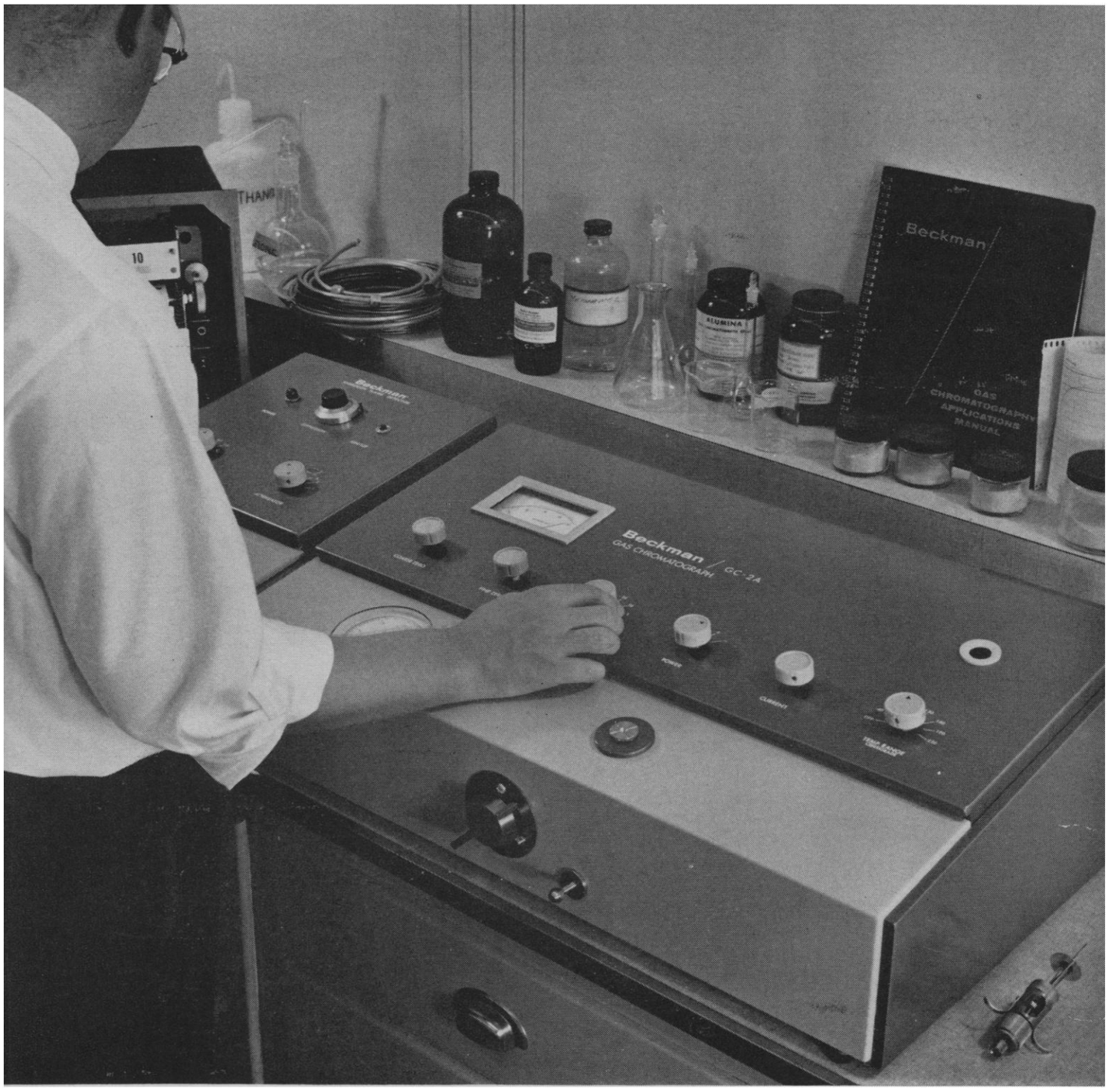

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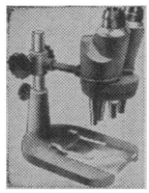

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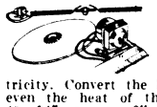

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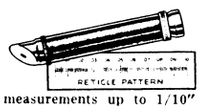

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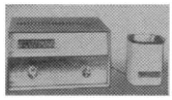

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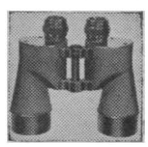

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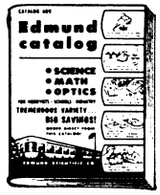

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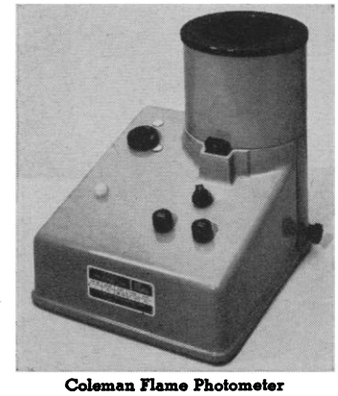
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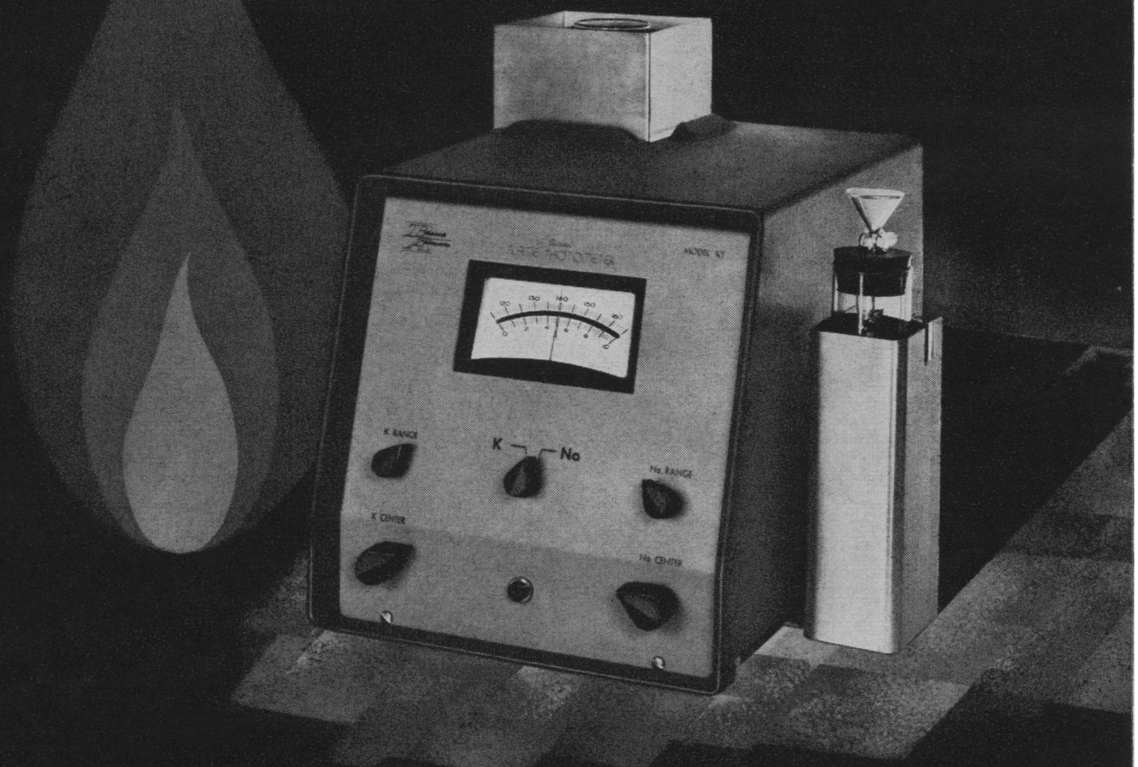

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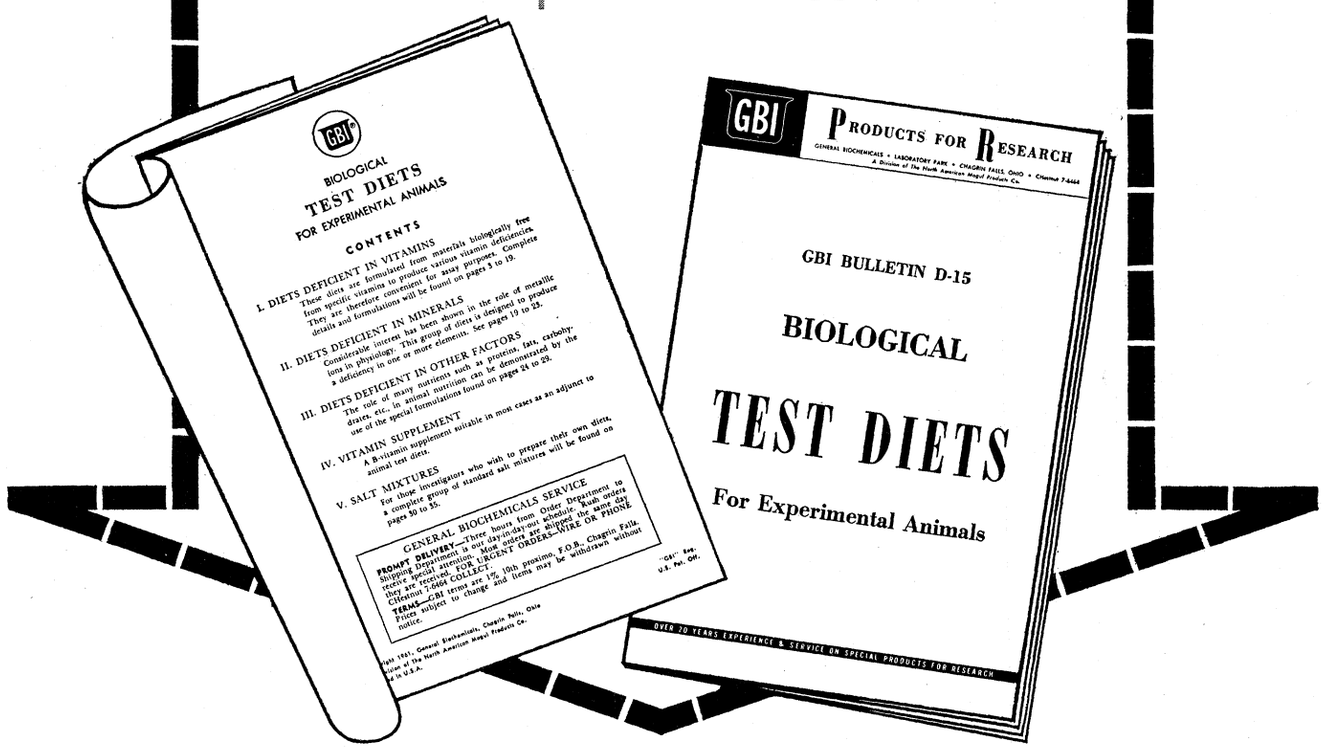

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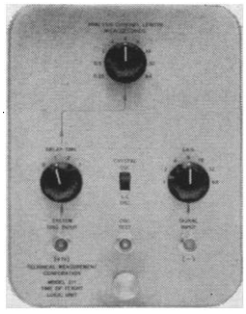

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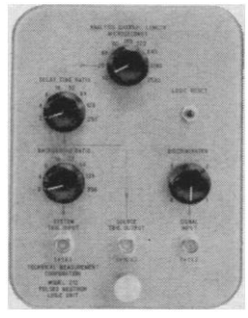

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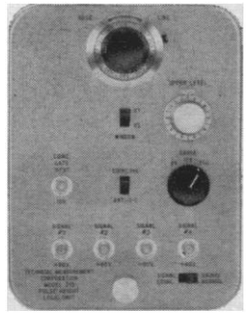

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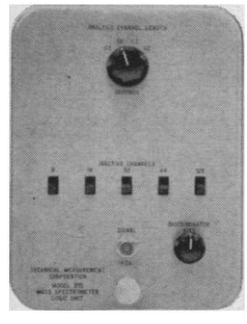

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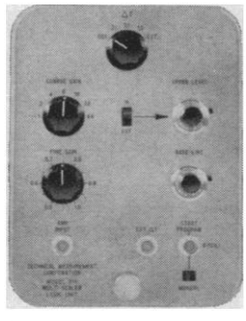

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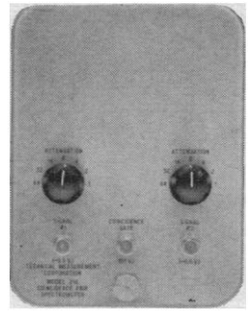

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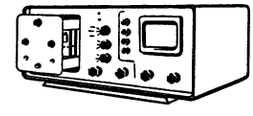

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A Matter of Perspective

If sending a man to the moon and bringing him back were entirely a scientific affair, then, as one suggestion has it, we ought to send a midget. Not only would the midget himself constitute a much smaller payload, but his requirements for food, oxygen, shielding from harmful radiation, and disposal of body wastes would be comparably reduced in scale.

Our present astronauts, it is true, do have the benefit of military training and discipline. But midgets who have had professional experience in circuses and carnivals will have absorbed the equally demanding traditions of show business. As for intelligence, Barnum's famous Tom Thumb was so bright that at the age of five he could be convincingly billed as an eleven-year-old.

This suggestion concerning our moon efforts would have been readily understood by the Eisenhower Administration. In those days American research in space was not regarded as part of a weight-lifting contest with the Russians. The problem was one of balancing the great costs of increased rocket power against the possibilities of miniaturization.

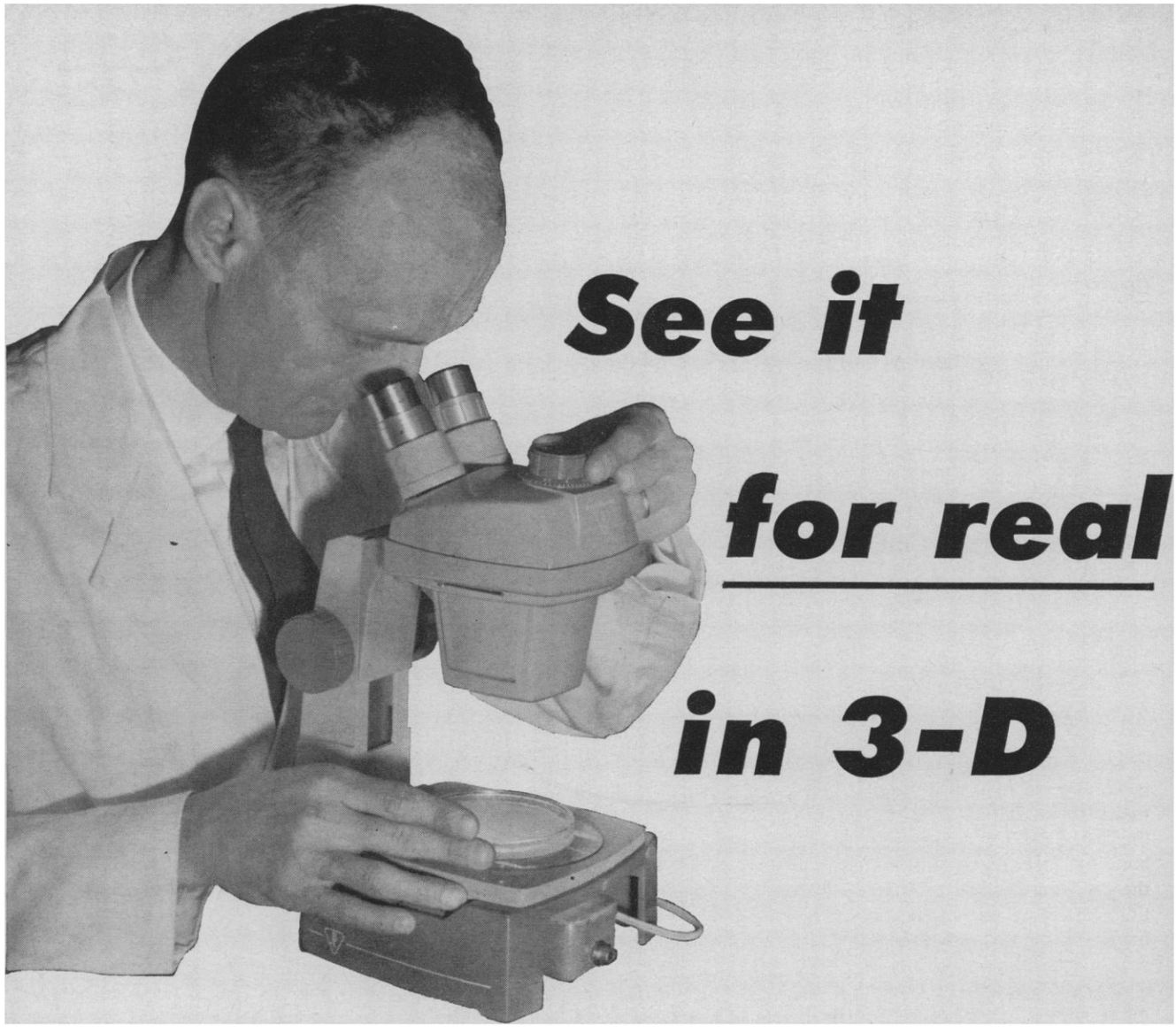
From such a viewpoint, we would have no cause to bow our heads in shame if we put one of the little troupers on the moon for a few days. He could do as much scientific work there as any normal-sized person. Besides, anyone concerned about national prestige who really looks into the matter can see that mere rocket power is not the best indicator of a nation's scientific prowess.

But times have changed. In the thinking that characterizes the Kennedy Administration, the trip is no longer regarded as entirely a scientific affair. There is a space race going on and we must win it in terms the judges can understand. The presence of an American midget on the moon, if followed by the appearance of a Russian of more ordinary dimensions, would still leave us running second.

In the matter of specifying costs, there is also a contrast between the two administrations. Under Eisenhower, no public statement was ever made concerning the cost of a lunar landing. Under Kennedy, we are given the bill. The cost (for a normal-sized person) over the next five years is put at $7 to $9 billion, with the total cost estimated at $20 to $40 billion.

Kennedy has kept his promise to discuss public issues honestly. Science stands to gain from the trip to the moon, possibly greatly. But the primary issue, as Kennedy says, is the effect of the undertaking on the struggle between the Soviet Union and the West. It may well be that midgets, like everyone else, should ask not what their country can do for them, but what they can do for their country. Their service, however, lies elsewhere.

Of course, even if we proceed on these terms we may still lose. The Russians, with their greater experience in matters concerning prestige and confidence, may turn around and send up the fattest fat-lady they can lay their hands on.—J.T.



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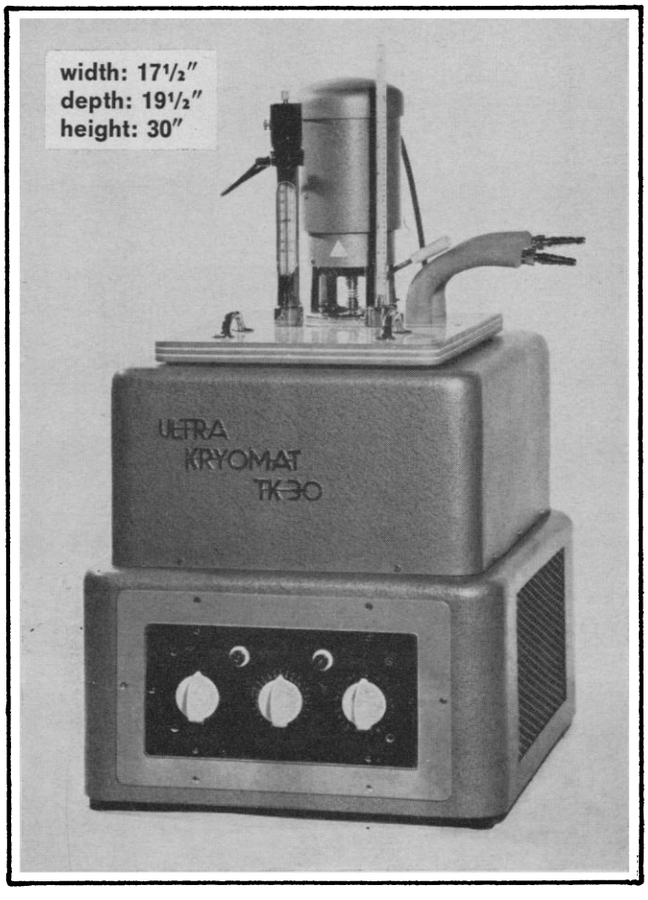

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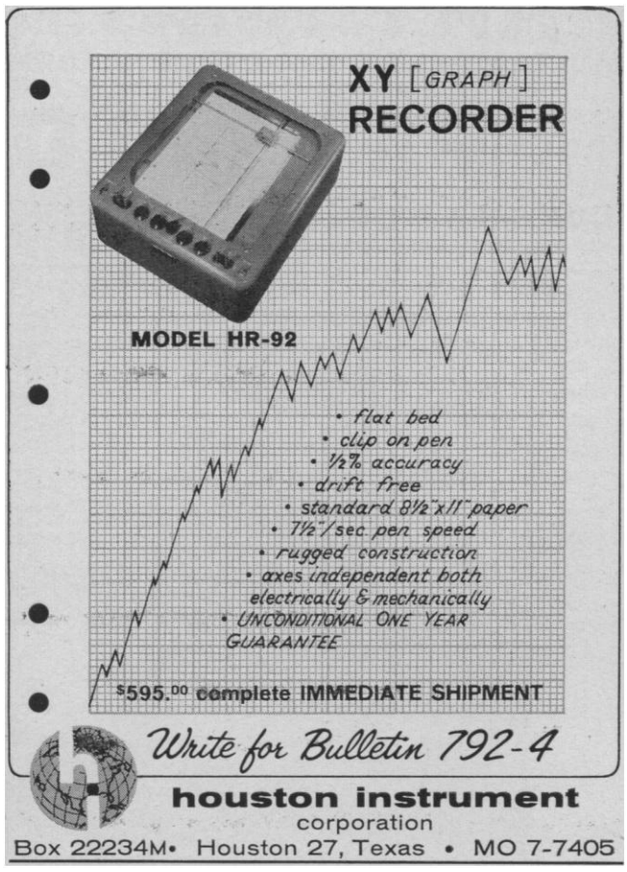
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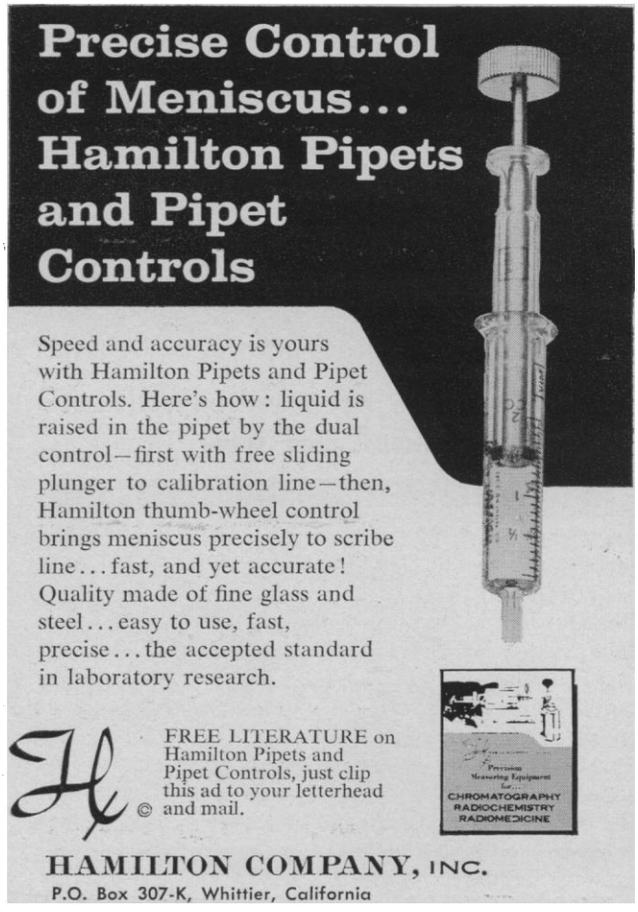
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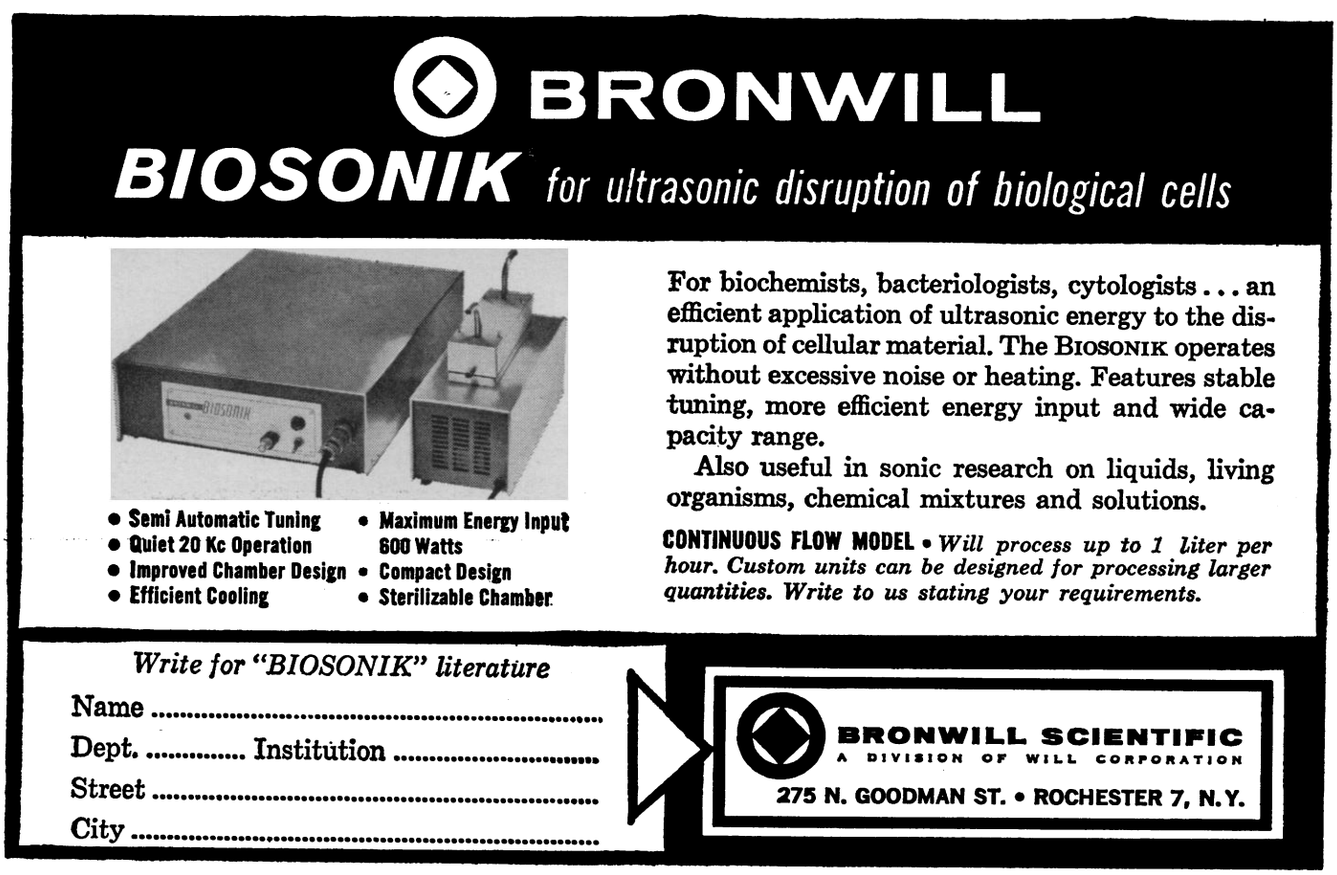
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ing at least as rapidly as population and to provide the basis for the social and economic changes which will bring births under voluntary control.

These questions are among the most serious facing the world today, and to give wide currency to such clearly nonsensical ideas as an infinite birth rate and Doomsday in A.D. 2027 contribute nothing to their solution.

ANSLEY J. COALE
Office of Population Research,
Princeton University,
Princeton, New Jersey

Essentially three arguments against our "Doomsday" thesis are presented in Coale's letter. They are: (i) nonsensicality for a parameter describing a finite physical system to approach infinity; (ii) misrepresentation of relationships between population growth rates, population densities, and technological status; and (iii) natural limitations of growth rates.

It is easy to dispose of these arguments.

1) In answering similar objections raised earlier we have tried to point out [*Science* **133**, 943 (1961)] that such singularities are usually interpreted as an indication of the system's instability in the vicinity of this singularity. In other words, a system may undergo drastic changes—for example, evaporation, rupture, disintegration—when passing through this critical state. Four examples were given, and references were cited. If this does not suffice, we recommend consulting the nearest physicist, who—we are convinced—will be glad to assist in overcoming this conceptual difficulty.

2) It is true that in many instances in various regions an inverse relationship between population density and population growth, or population density and technological status, may prevail, as Coale shows in numerous examples. However, an equal number of cases could be cited where the relationship is a direct one—for instance, if one compares the population density, growth rate, and technological standard of the population in New York with that, say, of the population in the Matto Grosso, or makes the same comparisons for the people of Japan and the people of Tierra del Fuego. Since our expressions for global population growth were derived for mean values over at least one generation—as explicitly stated at several points in our original article—it is obvious that our simple Eq. 11 is neither intended, nor able, to account for minute local and temporal fluctuations. On the other hand, if we apply "Coale's law" of the inverse relationship of population density with growth rate and technological know-how—as suggested in his letter—to the development of the human population as a whole over the last couple of millennia, we arrive at the peculiar conclusion that either Stone Age man was a technological wizard who carefully removed his technological achievements so as not to upset his inferior progeny, or that —if he was at the level at which most of us believe he was—our population dwindled from a once astronomical size to the mere three billions of today. Since we are neither archeologists nor demographers, we must leave the decision between these alternatives to the experts.

3) Four natural limits for growth rate are cited by Coale: period of gestation, onset and duration of fertility, and death. While Coale treats the first three physiological quantities as fixed quantities, unalterable through technological progress, and thus gives the endocrinologist an undeserved vote of

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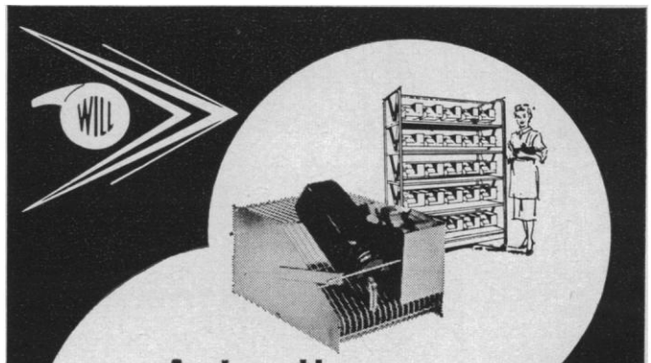

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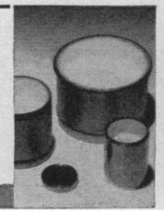

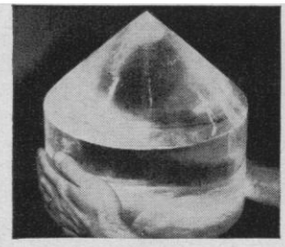

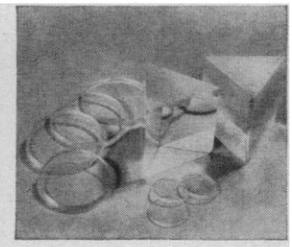

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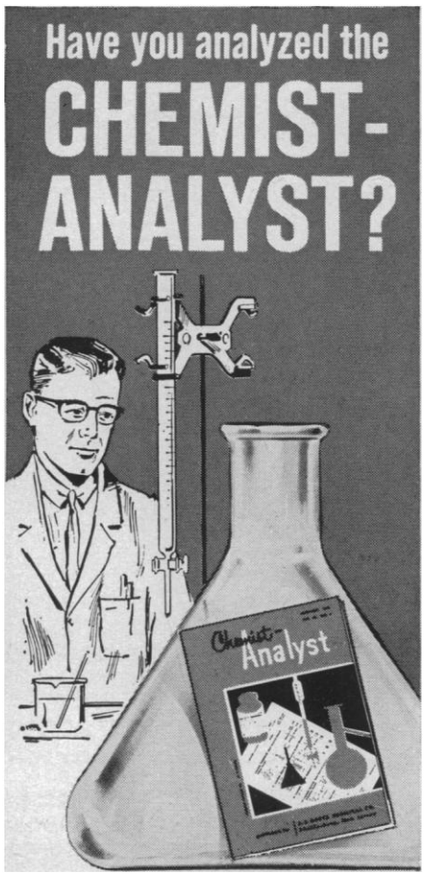

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no confidence, he puts his bets on the gerontologists, who, he theorizes, will eventually solve the problem of immortality; that is, the mean life span of man, t_m, will approach infinity. Noting with pleasure that Coale does not consider such a hypothesis nonsensical, and accepting for the sake of a fair argument his conjecture of an invariable global birth rate γ_0 throughout the history of man, we are now in a position to estimate man's life span as a function of time. Invoking our Eq. 7, which gives the productivity a (defined as $\gamma - 1/t_m$) in terms of dooms-time τ, we have

$$t_m = \frac{\tau}{\gamma_0 \tau - k}$$

Today, $\gamma_0 = 0.039$ per year (U.N.), $\tau = 67$ years, and with $k \approx 1$, the global mean life expectancy becomes 42 years. This seems to be a fair approximation (*1*) of present-day estimates ($40 \leqq t_m \leqq 45$) (*2*). This encourages us to take a step further and to determine the time when undertakers will be out of business. For $\tau = \tau^* = k/\gamma_0$, t_m approaches infinity, and when we use values as above; $\tau^* = 25.4$ years. In other words, around the spring of A.D. 2001 the "Perma-Life" pill will be on sale, and thereafter the population will grow merely according to an exponential.

Let us investigate what happens under these conditions, around doomsday $\tau \approx 0$, or $t =$ A.D. 2027. Expressing γ_0 in percentage per year, we have with our Eq. 11 and the suggested exponential the number of people N_D at doomsday:

$$N_D = 5.10^9 \gamma_0$$

and the annual population increase at that time

$$\left(\frac{dN}{dt}\right)_D = 5.10^7 \gamma_0^2$$

With Coale's permission, we take $\gamma_0 \approx 6$ percent and obtain the frightening result that in 67 years the world population amounts to 30 billion souls, and that this population produces in that year 1.8 billion immortal babies. In other words, a number of people equal to the entire world population in 1927 will thus be added in a single year.

A reader unfamiliar with demographic numerology should be cautioned that almost nothing changes in these figures if the immortality assumption is dropped, as Coale has shown elsewhere (*3*). However, drastic

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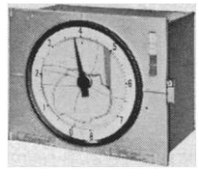

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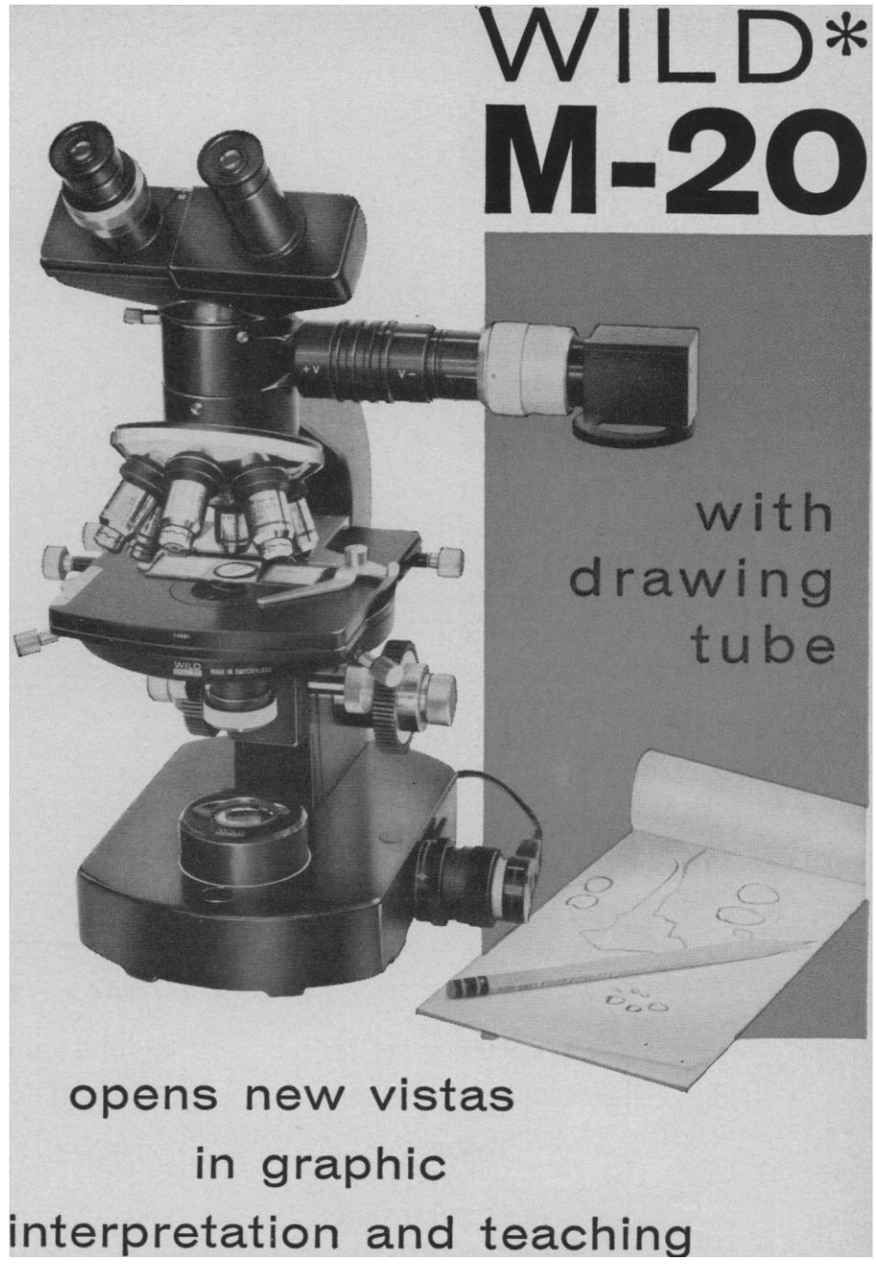
changes for the worse can be predicted if medicine should succeed in making only small advances in extending years of fertility, or if our culture should promote a shift to slightly earlier marriages.

We leave it to the poets to describe this terrestrial inferno, and to the anthropologists, sociologists, and psychologists to give their verdict on the stability of our human condition under such circumstances.

We hope that in this exchange of arguments about a few side issues the reader has not lost track of the real issue at stake—namely, whether or not the time has come when man must take control over his fate in this matter and attempt to launch perhaps the most ambitious, most difficult and most grandiose enterprise in his entire history: the establishment of a global control mechanism, a population servo, which would keep the world's population at a desired level. It is depressing to discover the complete lack of comprehension of the dimension of this problem in a leading demographer, who seriously believes that sending gadgets to the "underdeveloped" will quickly alter their ancient cultural habits. He even dares to cite the recent fast decline of the birth rate in Japan. Indeed, there were only three gadgets involved: a curet, a dilator, and penicillin. With these, in the years 1950 to 1956, about 12 million successful abortions were carried out, reducing the live-birth rate in Japan from 3 percent to 1.8 percent (*4*) and thus demonstrating—after Coale—the comforting principle of reduced birth rates with improved technical skill.

The tragic error made by Coale and others of his school of thought is to insist that mankind has to be treated—like fruit flies—as a set of independent elements whose only properties are their fertility and their mortality schedules, which are established *ad hoc* by looking into census figures. Very little indeed can be expected from such an approach, which not only fails to describe the past of the human population beyond a dozen generations (*5*) but also is invalid for projecting population trends over such short an interval as only one generation (*6*). Therefore, it does not come as a surprise that recognition of an obvious trait in man—namely, his capacity to form coalitions, the ability of two men *jointly* to do things which the two independently are never able to achieve—immediately leads to expressions which adequately describe human



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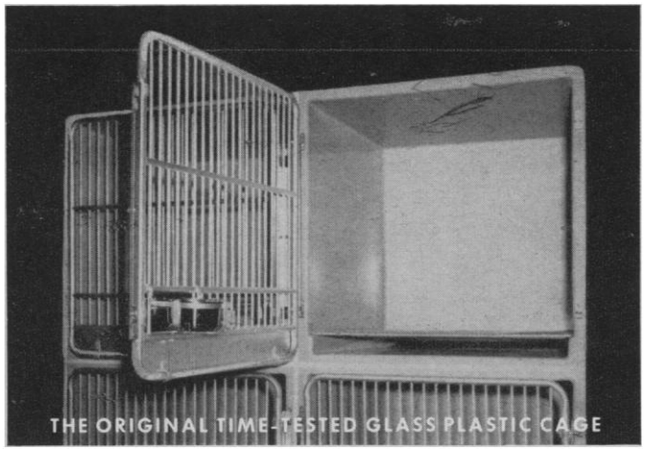

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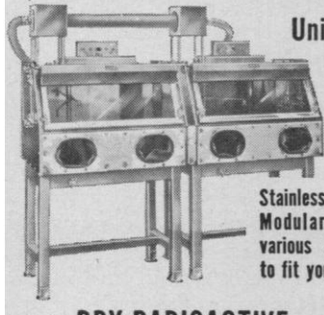

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population growth over several hundred generations, from the prehistoric past up to today. As we pointed out, the process which governed the growth rate for a couple of thousand of years and which is still acting today, exhibits a most dangerous intrinsic instability, which is now—so to say—around the corner. It is clear that this process has to be interrupted, and, as we believe we have shown, to suggest stepped-up industrialization is to propose to put out a fire with gasoline.

The real problem is that today we have to prepare each single member in a family of 3 billion to face soon a decision—namely, either to persist in enjoying his children and to pay for it by having no more than two and remaining mortal, or to reach for individual immortality and remain childless forever. In 20 years, of course, 4 billions will have to make this decision.

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References and Notes

1. A better approximation is of form $t_m = (1/\gamma_0) + (1/\tau\gamma_0^2)$, with $\gamma_0 = 0.034$. Compare with E. S. Deevey, Jr., *Sci. American* **203**, No. 3, 200 (1960). This, however, results in a slowly increasing birth rate.
2. H. F. Dorn, in *The Study of Populations*, P. M. Hauser and O. D. Duncan, Eds. (Univ. of Chicago Press, Chicago, 1959), p. 455.
3. A. J. Coale, in *Trans. Intern. Population Conf.* (Vienna, 1959), pp. 40–44.
4. P. H. Gebhard, W. P. Pomeroy, C. E. Martin, C. V. Christenson, *Pregnancy, Birth and Abortion* (Harper, New York, 1958), p. 219.
5. W. E. Howland, *Science* **133**, 939 (1961).
6. Official population projections for 1980 made in 1950 are now revised by adding a mere 500 million people to the old estimate. Compare *Population Bull. No. 1* (United Nations, New York, 1951), pp. 1–3, and *ECOSOC Report, Time* **77**, No. 16, 31 (1961).

Reciprocal Disarmament

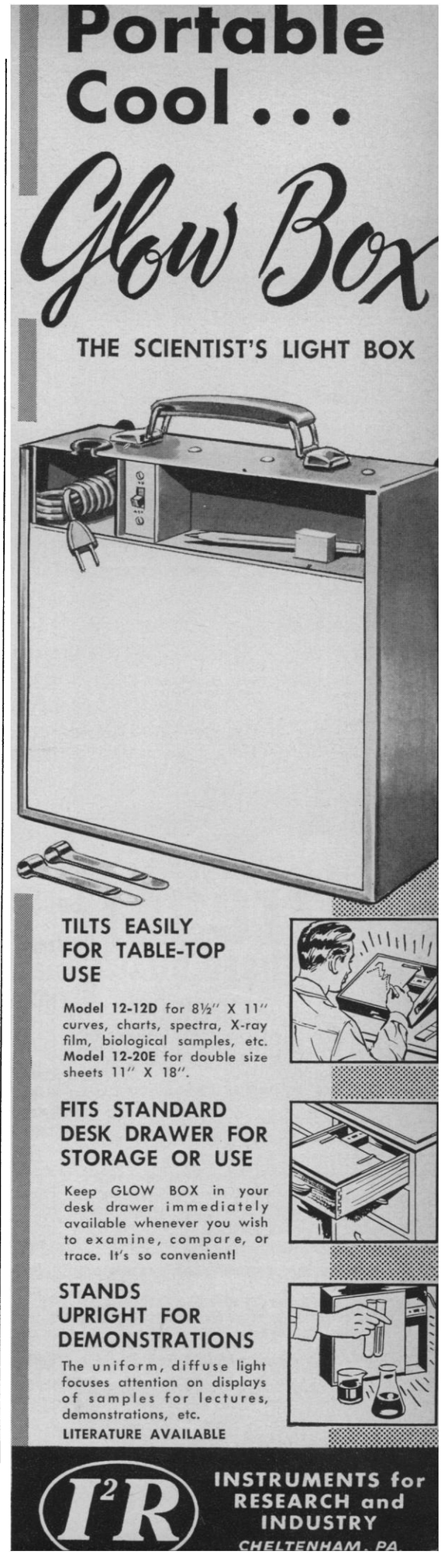
I have not as much hope today for the *advancement* of science as I have fear for its *retrogression*, or even extinction—a process in which (in my opinion) many scientists and technologists are aiding, either by their indifference to the diversion of scientific discovery to purposes of destruction or by active furtherance of such diversion. How sadly must the shades of Newton and Boyle, Thomson and Rutherford regard the great edifice they founded, threatened today by the indifference of their successors to its perversion. Today, as in Galileo's time, scientists dare not publish their results. The founders of science had to contend with the people's fear of sorcery. Not very different today is the reaction of a considerable section of a misunderstanding and revolted public. A few days ago, on television, I heard it suggested that we emulate Herod by killing all scientists at birth, but this I think would be going too far.

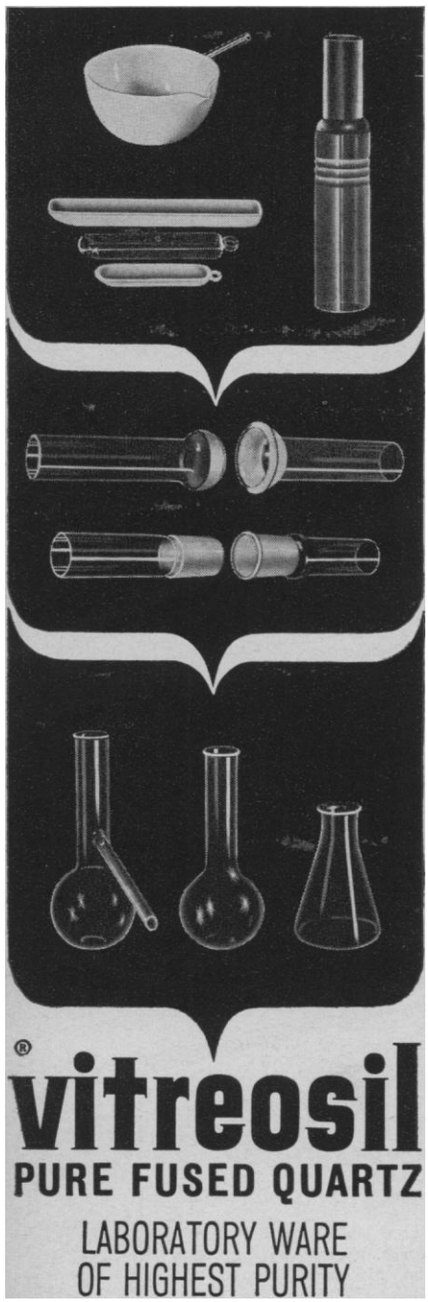
From a humanitarian standpoint I still believe that science is capable, if properly applied, of advancing the *real* happiness of mankind. In this matter I don't say that scientists have any particular responsibility, for actually science in its inception had to force itself, so to speak, upon the world. But now that it has grown to the point where its discoveries threaten the very existence of man, the case is very different. Scientists cannot escape responsibility for the results of their work, nor should they dare, if they have joy in discovery or if they value their own lives, to take a passive attitude toward war or to leave the control of atomic energy to politicians.

Ever since war became spatially three-dimensional, politicians have been promising to control it by traditional methods—attempting by *diplomacy* to prevent *nationalism* from asserting its prerogatives by *military force*. For half a century now these three forces have been cooperating to bring about the present crisis. A practitioner of the scientific method cannot be content to adhere to custom until the bombs begin to drop. Because one method fails, will he refuse to try another?

I believe it's time to try a new experiment. Regarding diplomacy, Henry Kissinger says: "It is not an accident that the diplomatic stalemate has become more intractable as weapons have grown more destructive . . . the increasing horror of war has made the progress of negotiations more difficult." Jerome Wiesner in *Daedalus* specifically states the difficulties and dangers of diplomatic disarmament conferences. Shall we trust our existence to such methods much longer? (Let us hope that the two conferences now arranged will produce results; nevertheless, let us be prepared for failure.)

Long experience of human affairs tells us that in all complex attempts at accomplishment there comes a time when discussion must cease and action must begin. Because of this experience all organizations have executives, one of whose qualifications must be courage to act. In the past, executive intervention in international affairs has often meant the start of a war. But since we





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are assured that war today is "unthinkable," let us now think how our President could initiate the attainment of world peace.

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Doubtless in implementing this process we would make some mistakes, but we would not be making the supreme mistake of talking until it is too late.

IRVING F. LAUCKS
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On Educating the Public

Perhaps I may add something useful to James E. McDonald's letter [*Science* **133**, 1271 (21 Apr. 1961)]. Stung by repeated references to the callousness and indifference of scientists in the face of a threat of all-out nuclear war, and alarmed by the misinformation published by people who might be expected to know better, we at this university undertook a twofold project to educate the public. The first part of the project consisted of a series of 26 lectures on radiation and fallout, given in the extension department at a popular level. We are fortunate, being situated in Ottawa, which is the scientific as well as the political capital of Canada, in being able to call on experts from many different fields, ranging from the physicists and biologists at Atomic Energy of Canada, Limited (Chalk River), to the strategical and tactical experts associated with the armed forces. The second part of the project consisted of a series of dispassionate half-hour programs on television in which as much information

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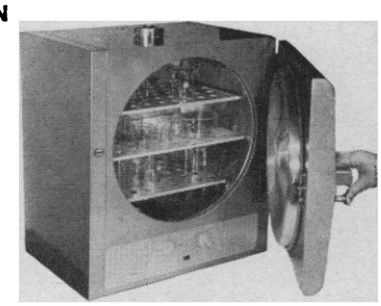

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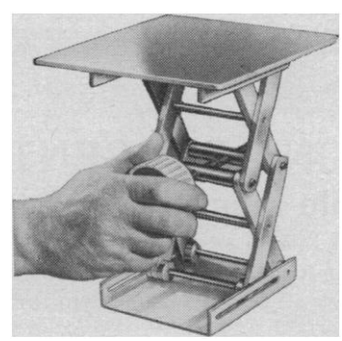

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as could usefully be presented through this medium was provided.

As a result of these two projects I have come to the following conclusions. First, and most disturbing, there is a very strong tendency among scientists who are specialists in the field of radiation damage to imagine that other scientists who are not specialists in the field are well informed upon the subject. This is certainly not the case, and in the preparation of our television programs we have had to wade through a plethora of material, usually confusing and badly presented, in order to obtain some sort of rational picture suitable for presentation to our colleagues and the general public. Some of the facts are certainly well summarized in McDonald's letter, but I have no confidence that more than a very small proportion of the scientific fraternity really understands the significance of the problem.

Second, it is quite obvious that the public as a whole does not wish to be informed upon this subject. In my naiveté I confidently expected that for such an exciting series of lectures, given by national experts, we should have a full lecture theatre. In fact, the number of registrations in this city of 250,000 inhabitants was fewer than 100; the attendance fell markedly as the series progressed, and this was no reflection on the lecturers, some of whom gave really outstanding presentations. As far as our television audience is concerned, we have reason to believe it is negligible; it is, of course, impossible for a person to judge his own performance, but we believe that our presentation has not been inadequate. The program is put on at a time of day when TV viewing is at a minimum (12 noon on Sunday), and this in itself is perhaps some commentary on the value placed on educational TV.

Third, it is rather easy to write a striking novel or film script on the subject of a global catastrophe, but it is not so easy to write one on the basis of our present knowledge of fallout. There was some beauty in *On the Beach*, but it is difficult to imagine a novel based on life during a nuclear attack that would be anything but sordid and depressing. I think this is the reason such a novel has not been written.

There is no doubt that the public has many misconceptions. To choose an example at random, despite the care that we took to deal accurately with the problem of radioactive dust in the lungs, it has been inferred by some of our audience that in minimizing this hazard we were, in fact, not quite telling the truth. I am afraid that the plain fact is that the problem is seen by the public in terms of black and white, whereas it is, of course, in tones of the subtlest gray. I see no hope whatever of reaching an understanding with the general public on this or any other aspect of modern military technology, and I think that perhaps we educators are wasting our time in thinking that such education is possible.

JOHN HART
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Changes in Liver Function

A recent report by du Buy and Showacre (*1*) ends as follows: "Also, further information might be obtained about the locus of action of tetracyclines in cases where complications occur resulting from prolonged therapy—for example, liver degeneration (*10*)—or about the primary site of action of these compounds in susceptible microorganisms."

An examination of the cited reference by the Army Medical Center group

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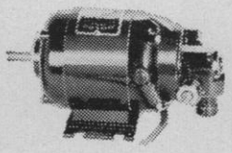

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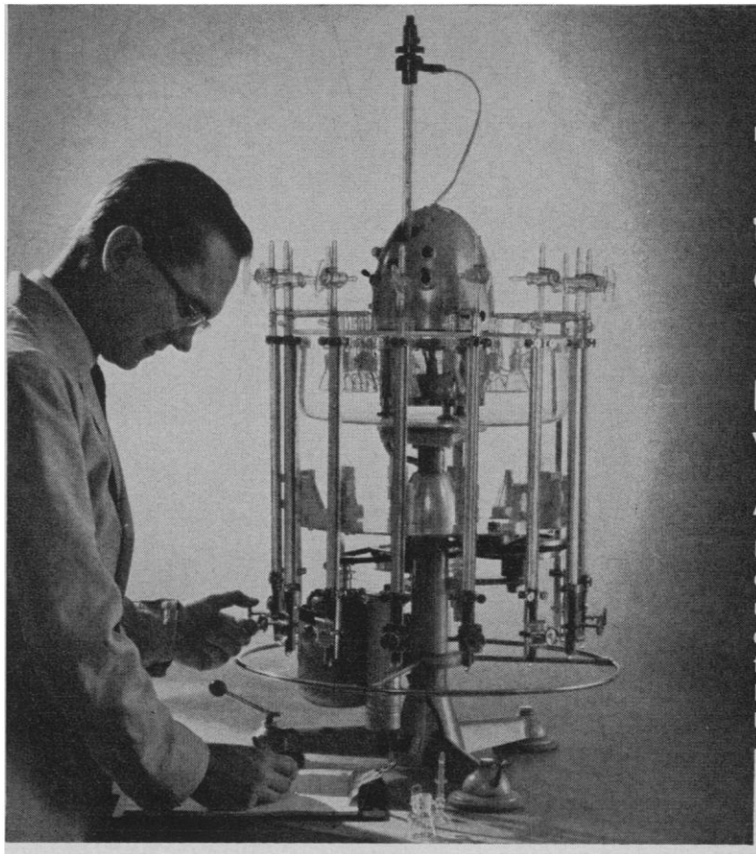

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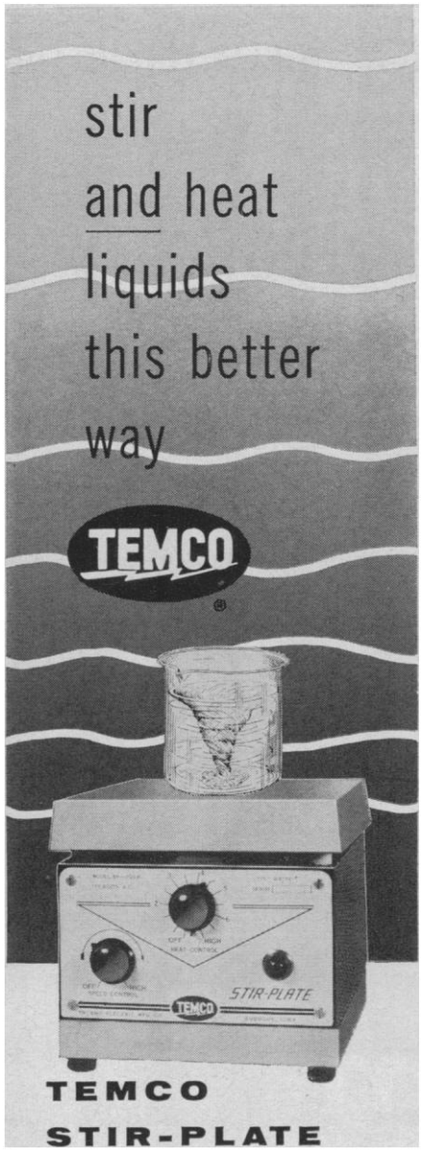

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(*2*) shows no mention of liver degeneration resulting from tetracyclines. On the contrary, this reference states that "one might consider the possibility" that chlortetracycline rather selectively depresses liver function, "but there is nothing to suggest such a possibility." The reference relates to a decline in the excretion of urobilinogen caused by changes in the intestinal flora resulting from the administration of chlortetracycline, and the authors support the concept that urobilinogen is formed by the action of intestinal bacteria on urobilin.

In other studies at the Army Medical Center (*3*), no significant changes in liver function resulted from the administration of chlortetracycline to rats, dogs, and human subjects, and other investigators have reported the alleviation of dietary hepatic necrosis in rats by this antibiotic (*4*). The various findings were reviewed by Hines (*5*).

THOMAS H. JUKES
American Cyanamid Company, New York, New York

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4. P. Gyorgy, J. Stokes, Jr., H. Goldblatt, H. Popper, *J. Exptl. Med.* **93**, 513 (1951).
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Reference (*10*) in our report should have been to an article by V. M. Sborov and D. A. Sutherland, "Fatty liver following aureomycin and terramycin therapy in chronic hepatic disease" [*Gastroenterology* **18**, 598 (1951)] instead of the article cited. These workers observed a temporary change in liver fat after Aureomycin and Terramycin therapy in chronic hepatic disease, and they compared these liver changes with other side effects reported in the literature to follow administration of tetracyclines.

Reference might also have been made to Yesner and Kunkel (*1*) or to Lepper *et al.* (*2*). The latter reported that, after administration of large intravenous doses to a number of patients, in addition to oral doses, in liver sections "there was much small vacuolization of the cytoplasm, with irregular fragmentation." In such cases the microscopic observation of changes in mitochondria in living liver cells by the technique described by us might supply further information regarding the nature of the changes leading to

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fatty metamorphosis (reversible fatty degeneration or, preferably, infiltration) of the liver. Regarding the nomenclature used, see (*3*). We, of course, did not intend to imply that in tetracycline therapy, as presently used, permanent liver damage will occur.

H. G. DU BUY
J. L. SHOWACRE
National Institute of Allergy and Infectious Diseases, Bethesda, Maryland

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3. W. Boyd, *The Pathology of Internal Diseases* (Lea and Febiger, Philadelphia, rev. ed., 1940), p. 339.

Anonymous Reviewers

The letter by R. F. Shaw in *Science* [**133**, 1275 (1960)] impels me to raise another issue connected with the publication of scientific manuscripts—namely, the anonymous reviewer system. The anonymous reviewer system does well enough nine times out of ten, but it is intrinsically objectionable. What editor would pay attention to an anonymous communication? Why should the author of a scientific manuscript submit to such anonymous communications? Indeed, why should any objective reviewer hesitate to put his name to his opinion? Are not scientific book reviews signed?

SAMUEL RAYMOND
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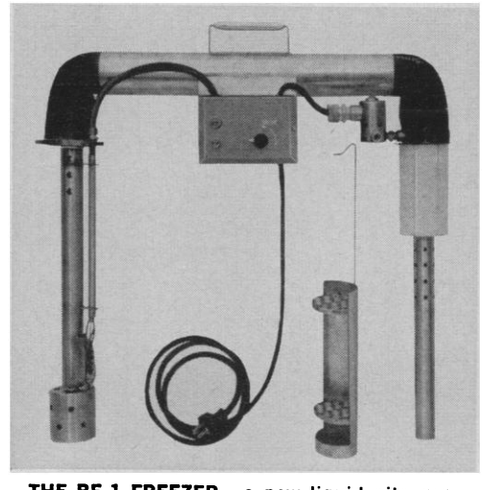

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It is perhaps correct and certainly prudent at this time to assume that there is no threshold dose as far as "primary" carcinogens are concerned. However, there are a number of "secondary" carcinogens, the carcinogenic activity of which is consequential to some other effects of these chemicals. For example, a substance when administered in large quantities may precipitate out from the urine and form bladder stone. The bladder stone in turn irritates the bladder, and as a result malignant tumor may develop.

A pharmacological action may also be the cause of cancer. For example, substance *X* inhibits the formation, release, or activity of thyroxin. This inhibition, among other things, raises the blood level of thyrotropic hormone. Malignant tumors in the thyroid may then develop, as a result of excessive stimulation by the thyrotropic hormone and possibly other factors. Since the solubility of a substance in the urine and the thyroxin-depressant action as well as other, similar pharmacological actions are readily definable and a "no-effect" level can be established, it appears that a noncarcinogenic dose exists in these cases. In other words, a safe dose for use of these chemicals as food additives may be worked out by the procedure adopted for chemicals possessing other types of toxicological action.

It may be argued that this proposal is not helpful because the mode of action of most carcinogens is unknown. However, if this distinction were more generally recognized, there would be incentive for scientists to carry out further research along this line.

F. C. Lu

Food and Drug Directorate, Department of National Health and Welfare, Ottawa, Canada

Indexing

Taken in the context of mechanical handling of information, the point raised by John R. Clark (*1*) has important implications. Given a lexicon of those words not to be indexed, electronic computers can create concordances from any portion of a paper, from the title up to the full text. A rapid, relatively inexpensive method of preparing a concordance is to make use of the words contained in the title of a paper. The keyword-in-context index, which was first proposed by Luhn (*2*) and which is now exemplified by the *Chemical Titles* current awareness service of the American Chemical Society, illustrates the use of titles in this manner.

Regarded analytically, a title may therefore be considered to be a collection of terms that help a reader to classify the paper in his mind, together with a set of connectives to show the relation of the terms to one another. Thus, if titles are to be used for machine preparation of concordances, the burden of providing suitable terms is in the hands of the author and the journal editor. Provision of suitable terms should be, not a "slight extra burden," but the key consideration in titling a paper.

Authors might, for instance, write down the terms they consider most suggestive of the content of their papers, then supply the necessary connectives in order to form the title. Of course, if the author has prepared 50 new chemical compounds he cannot list all of them in the title. As a general rule, one might say that he should use the most specific generic term (or small group of generic terms) available to him.

In terms of a thorough subject index, Clark has made the problem appear to be overly simple. The author of a paper is an authority on the work he has done, but there are problems of semantics, synonymy, specificity versus generality of terms, and nomenclature with which the untrained author cannot be expected to cope. The amount of time necessary to train an indexer is not available to scientist-authors. In addition, an author would find it time-consuming to try to decide which terms would be of interest to scientists in fields other than his own. Fleischer and Hooker have illustrated this point with regard to abstracts (*3*).

"Suitable standard systems of indexing" seem to be a practical impossibility for authors where traditional subject indexes are concerned. Authors do have the opportunity to improve titles so as to make machine-prepared concordances more effective.

Robert R. Freeman

Chemical Abstracts Service, Ohio State University, Columbus

References

1. J. R. Clark, *Science* **133**, 1040 (1961).
2. H. P. Luhn, *Am. Document.* **11**, 288 (1960).
3. M. Fleischer and H. Hooker, *J. Chem. Educ.* **33**, 27 (1956).

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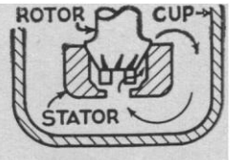

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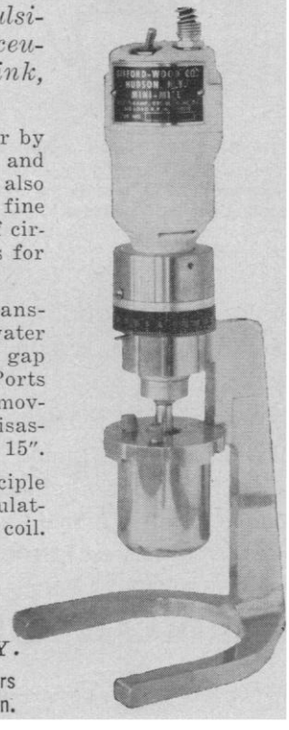

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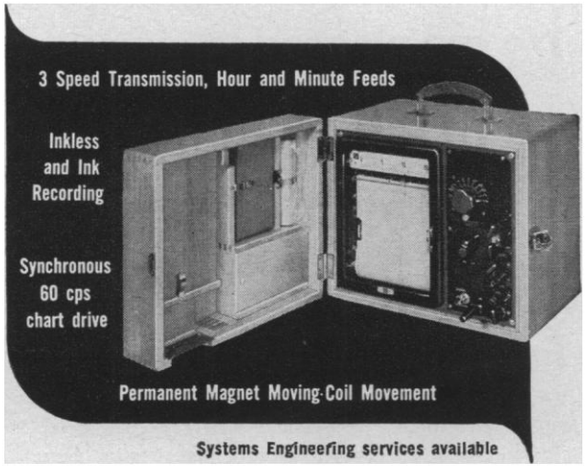

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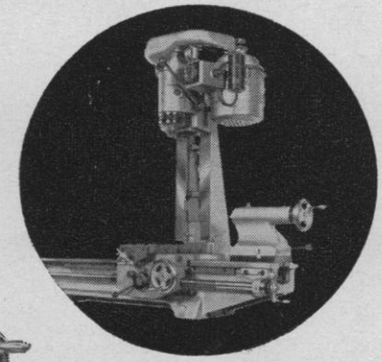

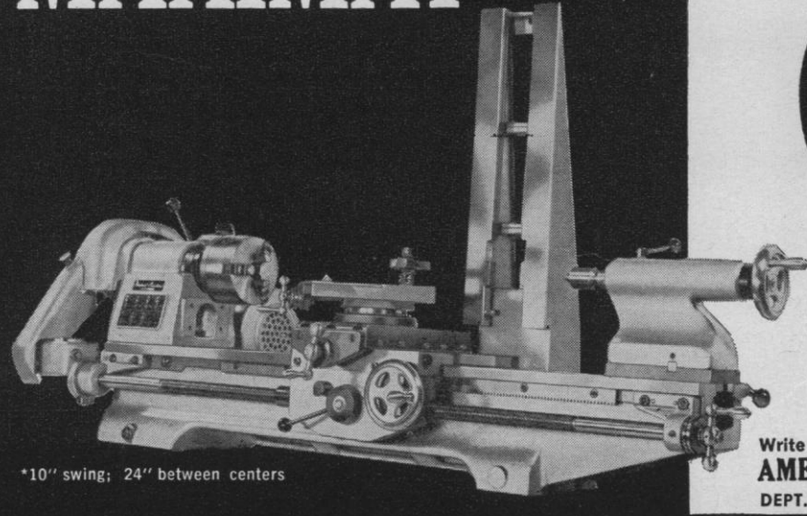

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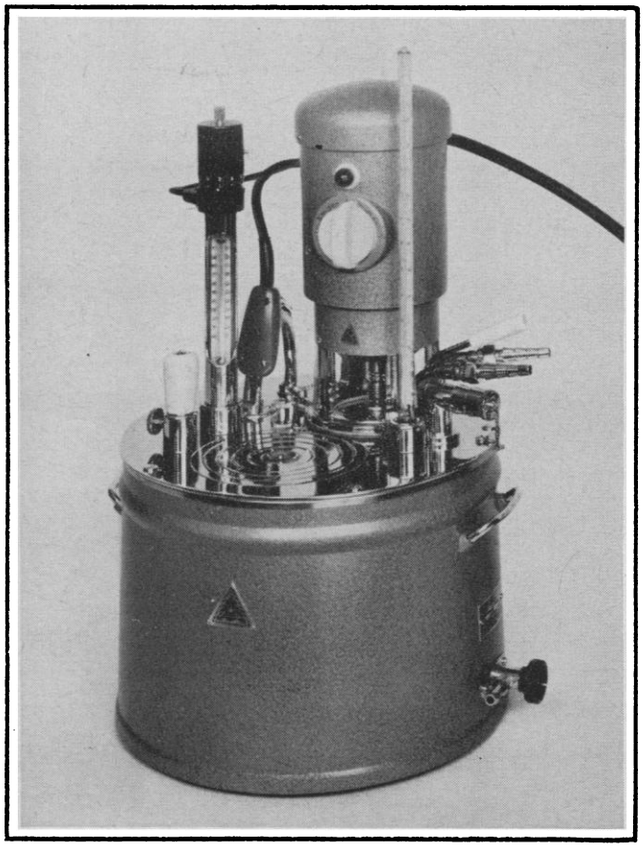

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(1) Taborsky, G., J. Biol. Chem., 234, 2652, (1959).

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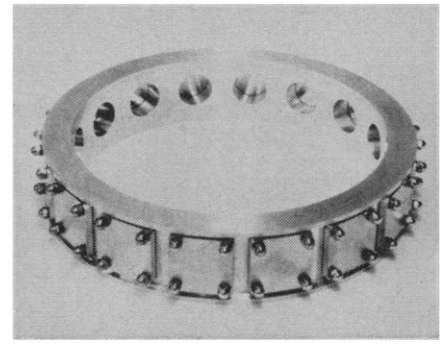

Fig. 1. Vacuum evaporator accessory.

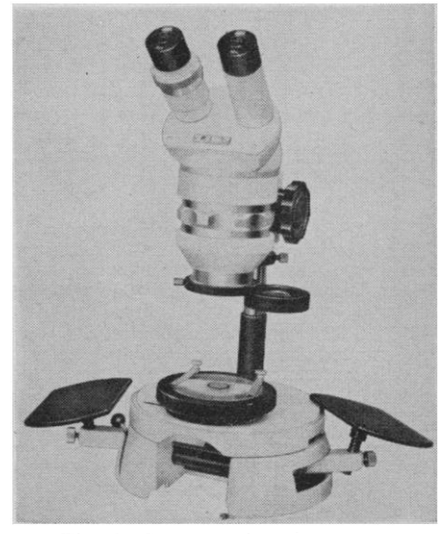

Fig. 2. Stereoscopic microscope.

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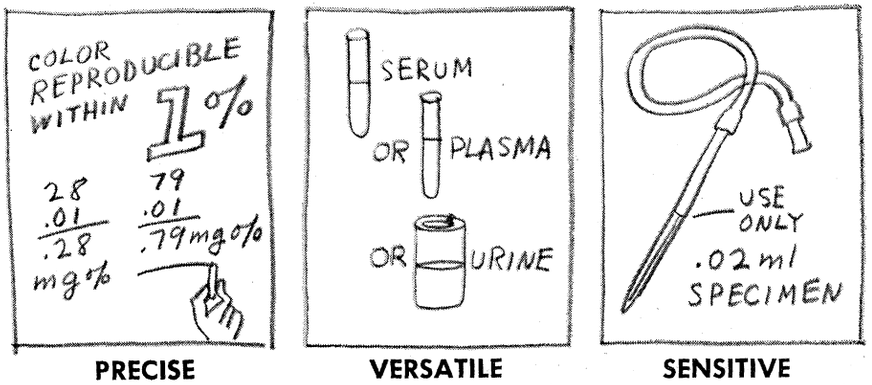

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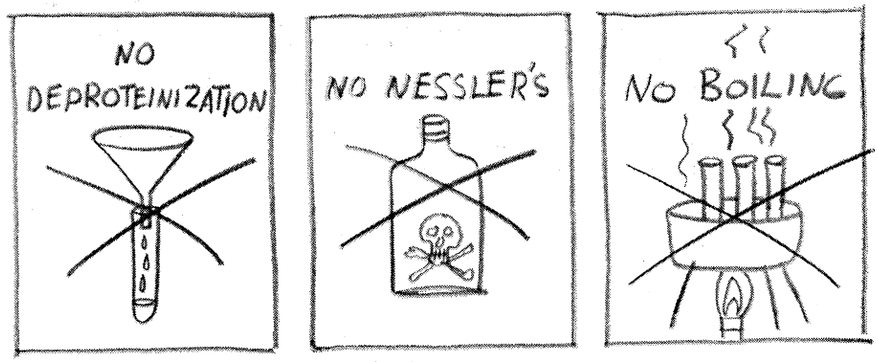

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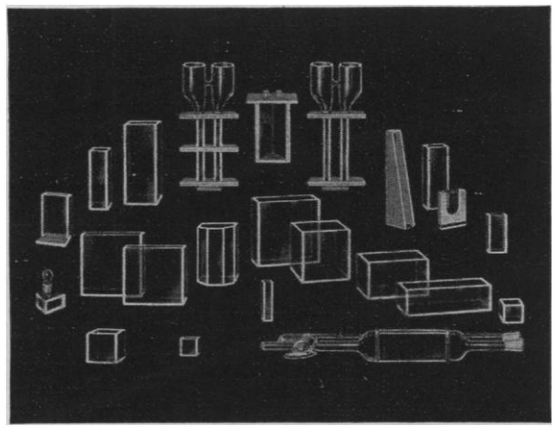

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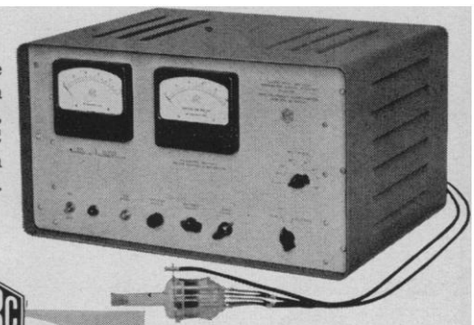

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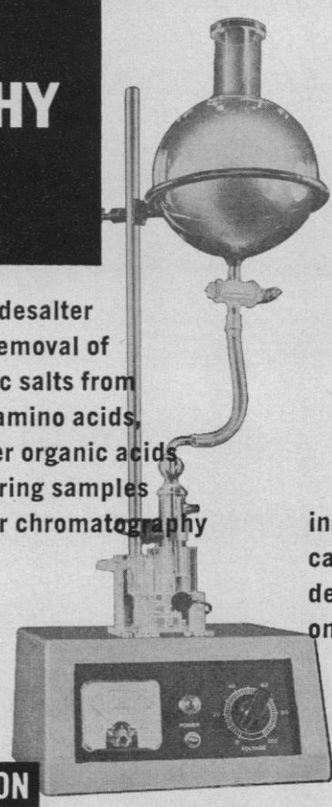

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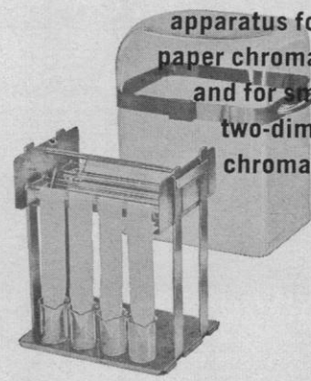

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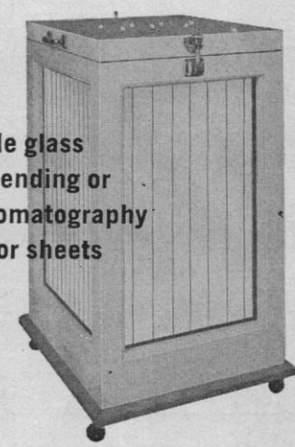

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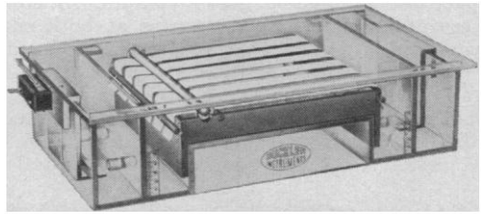

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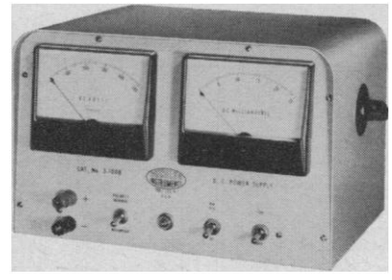

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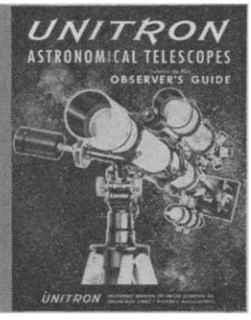

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■ SPRAY EVAPORATOR uses a rotating, stainless-steel spray agitator that picks up the solute and solvent and sprays them evenly onto the heated walls of the flask. The small droplets are flattened on the walls of the flask. The agitator is driven by a constant-speed, sparkproof motor. A side funnel permits addition of material during operation; a needle valve for adjustment of rate of addition is optional. The system is said to be vacuum tight. (Nester and Faust, 2401 Ogleton Road, Newark, Del.)

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■ INFRARED RADIOMETER is a miniaturized filter-type instrument weighing less than 3 lb. Incoming radiation to the radiometer is modulated by a segmented chopping wheel and passed through a filter to a calcium-fluoride lens that focuses the radiation on a lead-sulfide detector. The detector output is ampli-

fied with synchronous rectification which serves to isolate the measured radiation from spurious unmodulated energy. The instrument can withstand accelerations up to 20 grav and severe environmental conditions. (Block Associates, Inc., 385 Putnam Ave., Cambridge 39, Mass.)

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■ STATISTICAL SAMPLERS for teaching concepts of probability consist of sealed boxes containing numbered or colored spheres. A set of three samplers permits the student to perform surveys and tests. Each experiment is tied to a sampling box that enables the student to take and record results of repeated experiments. (John W. Morse, 124 West Lake Rd., Penn Yan, N.Y.)

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■ BLOOD FLOWMETER permits measurement of flow through intact vessels in the range 5 ml to 10 lit./min. A gated sine-wave circuit synchronized with a pulsing electromagnetic field is said to eliminate inductive transients and to permit data to be recorded continuously. Zero flow is recorded by de-energizing the flowmeter magnet. (Quality Precision Products, Inc., 3700 S. Broadway, Los Angeles 7, Calif.)

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■ TORQUE TABLE for measuring the torque characteristics of hydraulic pumps and motors uses no bearings, slip rings, brushes, or other friction sources. The table is a reaction dynamometer that senses torque by means of flexures to which are affixed bonded strain gages. A specially designed piping system is said to permit measurements independent of flow rate and pressure of the hydraulic supply. Output of the strain gages is compatible with conventional strain-gage readout systems. Models are available in ranges from 50 in. oz to thousands of inch pounds. (Lebow Associates, Inc., 14857 W. Eleven Mile Rd., Oak Park 37, Mich.)

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■ INTEGRATING RECORDER for gas-chromatography applications integrates the area under each peak as the chromatogram is recorded. When the recorder pen leaves the zero line to start a peak, the integrator pen leaves its zero line and plots the cumulative area under the peak. When the integrator pen has traveled the full chart width, corresponding to 1000 counts, the pen automatically reverses. The integral reading is then the additional distance traveled by the pen in the return direction plus 1000. Integration counts of 10,000, 20,000, and 40,000 per minute are obtained by shifting gears. The integral curve can be started from either

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■ SURFACE FINISH METER, a portable instrument, measures the surface roughness of metal or plastic parts. A small pickup is designed for hand operation or for use with a mechanical tracer. Two holders enable the pickup to measure the roughness of holes ¼ in. in diameter or larger and of outside surfaces with a diameter of 1/32 in. or greater. An automatic drive accessory provides a reciprocating mechanical motion of 0.032 to 0.9 in. for the pickup. The instrument's amplifier consists of a feedback-stabilized tube and transistor circuit. It is battery operated; battery life is said to be 700 hr. (Marduth Products, 1387 Ledge Rd., R.D. 1, Hinckley, Ohio)

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

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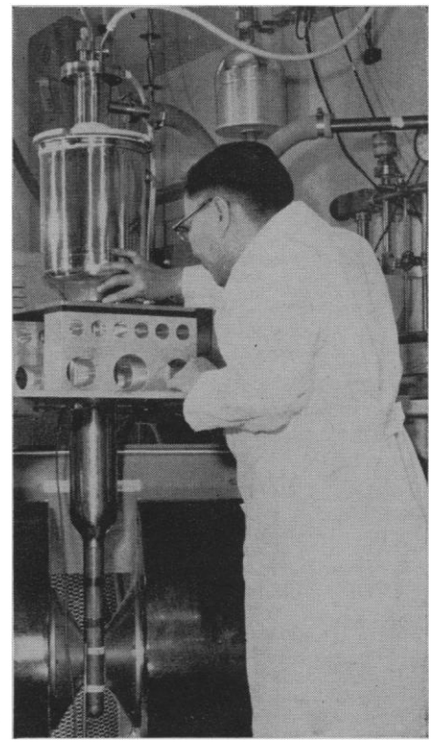

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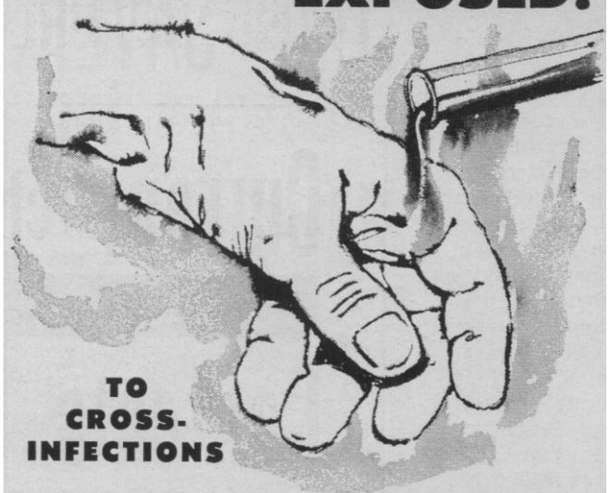

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Meetings

Plant Physiologists

On 6–8 February the southern section of the American Society of Plant Physiologists met with the Association of Southern Agricultural Workers at Jackson, Mississippi. All the sessions were well attended. The program included 28 contributed papers and a symposium on photosynthesis.

Chairman of the symposium was Hans Gaffron, of Florida State University. Papers were presented by André Jagendorf (McCollum-Pratt Institute, Johns Hopkins University), Birgit Vennesland (University of Chicago), and Roderick K. Clayton (Oak Ridge National Laboratory). The proceedings will be published, and copies will be available from the secretary-treasurer at a cost of $1.

The annual Plant Physiologists' breakfast was held on 8 February. An award of $25 for the best paper given by a graduate student was made to Theodore Holmsen (University of Florida) for a paper on geotropism in *Zea mays*. Award of a copy of volume 11 of the *Annual Review of Plant Physiology* was made to Coleman Ward (Virginia Polytechnic Institute) for his paper on effects of potassium levels on orchard grass and red clover in sand culture. The annual breakfast address was given by Harold Evans (North Carolina State College) on the essentiality of cobalt for leguminous plants grown under symbiotic conditions.

Officers elected for 1961 were as follows: chairman, Howard E. Joham (Texas Agricultural Experiment Station); vice-chairman, Robert D. Powell (University of Florida); and secretary-treasurer, Joseph C. O'Kelley (University of Alabama). Elected members of the executive committee are Howard Teas (University of Puerto Rico), Wayne C. Hall (Texas Agricultural Experiment Station), and Robert Burns (U.S. Department of Agriculture, Experiment, Ga.). Teas is the southern section representative to the American Society of Plant Physiologists.

JOSEPH C. O'KELLEY
University of Alabama, Tuscaloosa

Forthcoming Events

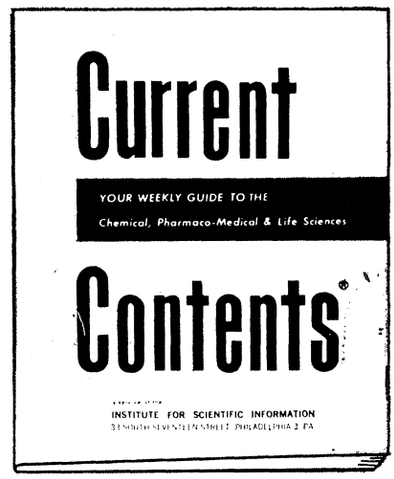
July

9–14. Bio-Medical Electronics, 4th intern. conf., New York, N.Y. (H. Schwan, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia)

9–15. American Library Assoc., annual conf., Cleveland, Ohio. (D. H. Clift, 50 E. Huron St., Chicago, Ill.)

9–15. International Dental Federation,

TIME SAVERS



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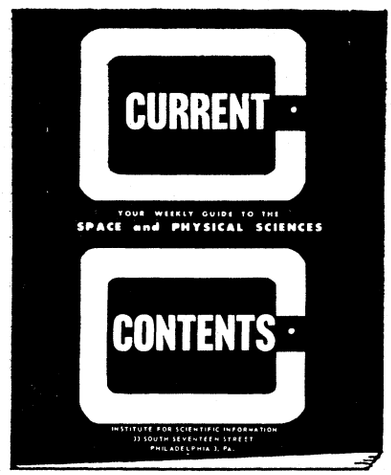

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49th annual session, Helsinki, Finland. (Office of Secretary General, IDF, 35 Devonshire Place, London, W.1, England)

10. Bibliographical Soc. of America, Cleveland, Ohio. (E. Wolf II, Library Co. of Philadelphia, Broad and Christian Sts., Philadelphia 47, Pa.)

10–14. Institute in Technical and Industrial Communications, 4th annual, Fort Collins, Colo. (Director, Inst. in Technical and Industrial Communications, Colorado State Univ., Fort Collins)

10–14. International Congr. of Dietetics, 3rd, London, England. (Miss D. F. Hollingsworth, British Dietetic Assoc. 251 Brampton Rd., London, S.W.3)

10–14. International Diabetes Federation, 4th congr., Geneva, Switzerland. (B. Rilliet, Secretary General, 4 Boulevard des Tranchees, Geneva)

10–14. Optical Instruments and Techniques, conf., London, England. (K. J. Habell, Natl. Physical Laboratory, Teddington, Middlesex, England)

10–20. Plant Exploration and Introduction, technical meeting on, Food and Agriculture Organization of the U.N., Rome, Italy. (Intern. Agency Liaison Branch, Office of the Director General, Viale della Terme di Caracalla, Rome)

11–25. World Meterological Organization, 3rd South American session, Rio de Janeiro, Brazil. (WMO, 1 Avenue de la Paix, Geneva, Switzerland)

12–18. Radioactivity in Food and Agriculture, Expert Committee on the Organization of Surveys for FAO, Rome, Italy. (Intern. Agency Liaison Branch, Office of the Director General, Viale della Terme di Caracalla, Rome)

13–14. Data Acquisition and Processing in Biology and Medicine, conf., Rochester, N.Y. (Office of Public Information, Univ. of Rochester, River Campus Station, Rochester 20)

15–18. Life Insurance Medicine, 7th intern. congr., Lisbon, Portugal. (L. de Carvalho Cancella, Secretary, Parede, Portugal)

16–18. British Congr. of Obstetrics and Gynaecology, 16th, Bristol, England. (Secretary, British Congr. of Obstetrics and Gynaecology, University Dept. of Obstetrics, Southmead Hospital, Bristol)

16–21. International Conf. on Medical Electronics, 4th, with Electrical Techniques in Medicine and Biology, 14th annual conf., New York, N.Y. (L. E. Flory, RCA Laboratories, Princeton, N.J.)

16–22. International Soc. for Clinical and Experimental Hypnosis, Rio de Janeiro, Brazil. (ISCEH, 33 E. 65 St., New York 21)

17–22. Soil Mechanics and Foundation Engineering, 5th intern. conf., Paris, France. (E. Caminade, Secretaire General, 23 rue de Cronstadt, Paris 15)

18–20. Pulmonary Structure and Function, Ciba Foundation Symp. (by invitation only), London, England. (Ciba Foundation, 41 Portland Pl., London, W.1)

18–21. Inorganic Polymers, intern. symp., Nottingham, England. (General Secretary, Chemical Soc., Burlington House, London, W.1, England)

21–22. World Power Conf. (members only), Moscow, U.S.S.R. (Central Office, 201-2 Grand Buildings, Trafalgar Sq., London, W.C.2, England)

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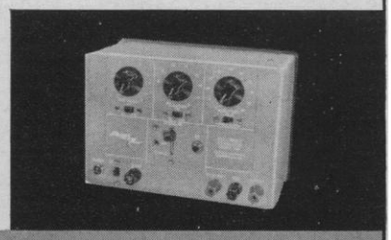

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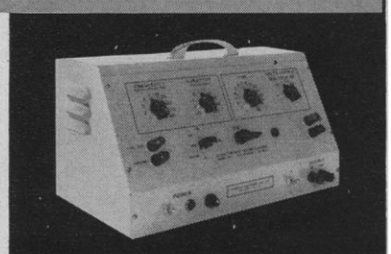

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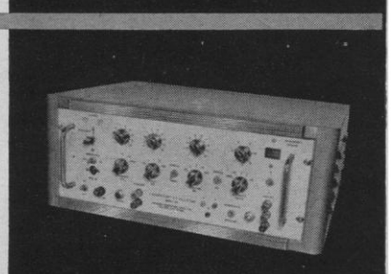

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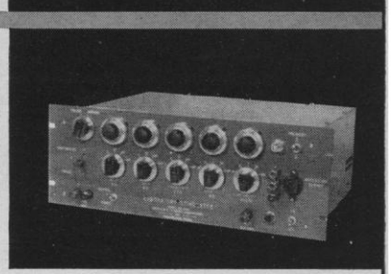

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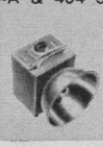

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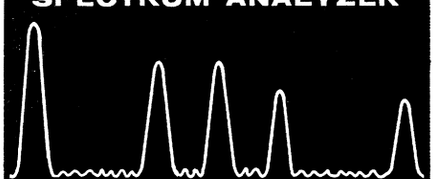

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23–28. Otolaryngology, 7th intern. congr., Paris, France. (H. Guillon, Secretary General, 6 Avenue Mac-Mahon, Paris 17)

24–28. Nematology Symp., 6th intern., Ghent, Belgium. (J. van den Brande, Soc. of European Nematologists, Rijkslandboushogeschool, Coupure links 235, Ghent)

24–29. Medical Electro-Radiological Societies, Latin Federation of, 5th congr., Paris, France. (C. Proux, Secretary, 9 rue Daru, Paris 8)

24–30. Urology, 12th intern. congr., Rio de Janeiro, Brazil. (J. Silva de Assis, Secretary, P.O. Box 1275, Belo-Horizonte, Brazil)

26. International Commission for the Prevention of Alcoholism, 7th annual meeting, Washington, D.C. (International Headquarters, 6840 Eastern Ave., NW, Washington 12)

26–28. Detection and Assay of Hormones by Immuno-Clinical Means, Ciba Foundation Colloquium (by invitation only), London, England. (Ciba Foundation, 41 Portland Pl., London, W.1)

27–1. Macromolecular Chemistry, intern. symp., Montreal, Canada. (Organizing Committee, P.O. Box 816, Sarnia, Ontario, Canada)

28–29. Linguistic Soc. of America, Austin, Tex. (A. A. Hill, Box 7790, University Station, Austin 12)

30–2. Soil Conservation Soc. of America, Lafayette, Ind. (H. W. Pritchard, 838 Fifth Ave., Des Moines 14, Iowa)

30–3. International Psycholanalytical Congr., 22nd, Edinburgh, Scotland. (Miss C. de Monehaux, 53 York Terrace, Regents Park, London, N.W.1, England)

31–4. Biophysics, 1st intern. congr., Stockholm, Sweden. (B. Lindström, Dept. of Medical Physics, Karolinska Institutet, Stockholm 60)

31–4. Differential Equations in Non-Linear Mechanics, Air Force Acad., Colorado Springs, Colo. (J. P. Lasalle, 7212 Bellona Ave., Baltimore 12, Md.)

31–11. Physics of the Solar System and Re-entry Dynamics, conf., Blacksburg, Va. (Bureau of Public Relations, Virginia Polytechnic Inst., Blacksburg)

31–12. Electric Power and Problems of Nuclear Power, seminar, U.N. Economic Commission for Latin America, Mexico, D.F. (A. Dorfman, Chief, Energy and Water Resource Program, Avenue Providencia 871, Santiago, Chile)

August

1–26. Functional Analysis, 8th American Mathematical Soc. summer institute, Stanford, Calif. (P. D. Lax, AMS, 190 Hope St., Providence 6, R.I.)

2–5. International Conf. of Pure and Applied Chemistry, 21st, Montreal, Canada. (R. Morf, Hoffmann-LaRoche, S.A., Grenzachterstrasse 124, Basel, Switzerland)

3–5. Canadian Chemical Conf. and Exhibition, 44th, Montreal. (Chemical Inst. of Canada, 48 Rideau St., Ottawa 2, Ont.)

5–9. International Rorschach Soc., 5th congr., Fribourg-en-Brisgau, Germany. (A. Friedemann, Chemin des Pêcheurs 6, Bienne, Switzerland)

6–10. Occupational Medicine and Toxicology, 3rd Inter-American conf., Miami,

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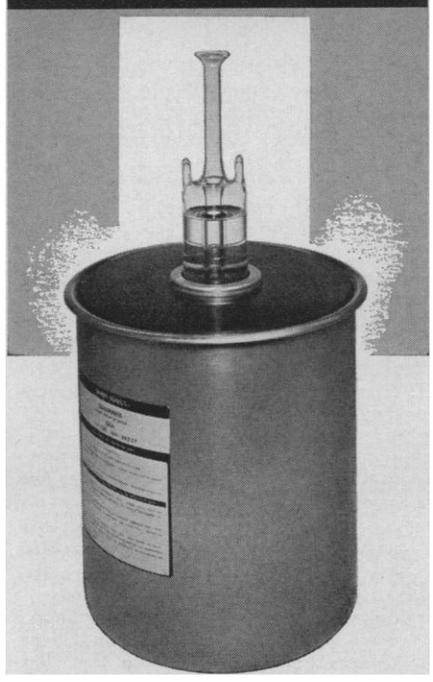

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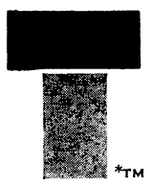

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Fla. (W. B. Deichmann, School of Medicine, Univ. of Miami, Coral Gables, Fla.)

6–12. Atmospheric Ozone and General Circulation, symp., Arosa, Switzerland. (H. U. Duetsch, 20 Carl Spittelerstrasse, Zürich 53, Switzerland)

6–12. Chemical and Thermodynamic Properties at High Temperatures, symp., Montreal, Canada. (N. F. H. Bright, Natl. Research Council, Ottawa, Canada)

6–12. International Congr. of Pure and Applied Chemistry, 18th, Montreal, Canada. (L. Marion, Natl. Research Council, Ottawa 2, Canada)

7–9. Guidance and Navigation Conf., American Rocket Soc., Palo Alto, Calif. (J. J. Harford, ARS, 500 Fifth Ave., New York, N.Y.)

7–9. International Committee of Electro-Chemical Thermodynamics and Kinetics, 13th meeting, Montreal, Canada. (N. Ibl, Eidg. Technische Hochschule, Laboratorium für Physikalische und Elektrochemie, Universitätsstrasse 6, Zürich 6, Switzerland)

7–9. Space Age Astronomy, intern. symp., Pasadena, Calif. (D. W. Douglas, Jr., Douglas Aircraft Co., Inc., Santa Monica, Calif.)

7–10. National Medical Assoc., New York, N.Y. (J. T. Givens, 1108 Church St., Norfolk, Va.)

7–11. High Temperature Chemistry and Thermodynamics, symp., Montreal, Canada. (L. Brewer, Dept. of Chemistry, Univ. of California, Berkeley)

7–11. Seminar on Fast and Intermediate Reactors, International Atomic Energy Agency, Vienna, Austria. (IAEA, 11 Kärtner Ring, Vienna 1)

8–11. Poultry Science Assoc., State College, Pa. (C. B. Ryan, Texas A & M College, College Station)

8–16. Society of Protozoologists, Prague, Czechoslovakia. (N. D. Levine, College of Veterinary Medicine, Univ. of Illinois, Urbana)

10–16. International Congr. of Biochemistry, 5th, Moscow, U.S.S.R. (N. M. Sissakian, Leninsky prospekt, 33, Moscow, B-7.1)

10–16. International Union of Biochemistry, 4th general assembly, Moscow, U.S.S.R. (R. H. S. Thompson, IUB, Dept. of Chemical Pathology, Guy's Hospital Medical School, London, S.E.1, England)

12–19. Fast Reactions, summer school, Cambridge, England. (Secretary of the Summer School, Dept. of Physical Chemistry, Lensfield Road, Cambridge)

13–18. Microchemical Techniques, intern. symp., University Park, Pa. (H. J. Francis, Jr., Pennsalt Chemical Corp., P.O. Box 4388, Chestnut Hill Post Office, Philadelphia 18, Pa.)

13–18. Theoretical Aspects of Magnetohydrodynamics, seminar, University Park, Pa. (Conference Center, Pennsylvania State Univ., University Park)

13–19. International Assoc. of Applied Psychology, 14th congr., Copenhagen, Denmark. (Congress Secretariat, 19 Sankt Pederstraede, Copenhagen K.)

13–19. Training for Research in the Processes of Vision, 1st intern. conf., Rochester, N.Y. (Office of Public Information, River Campus Station, Rochester)

14–17. Calorimetry Conf., intern., Ottawa, Canada. (J. E. Kunzler, Bell Telephone Laboratories, Murray Hill, N.J.)

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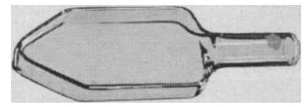

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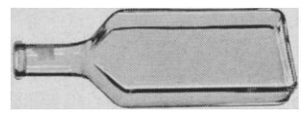

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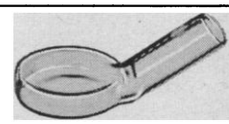

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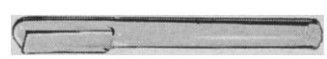

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14–19. International Medical Conf. on Mental Retardation, 2nd, Vienna, Austria. (Miss E. Langer, Div. of Maternal and Child Health, State House, Augusta, Maine)

14–19. Symposium on Radiation, Vienna, Austria. (World Meteorological Organization, 1 Avenue de la Paix, Geneva, Switzerland)

14–25. Israel Medical Assoc., 5th world assembly, Jerusalem, Israel. (Beth-Harofeh, 1 Heffman St., Tel-Aviv, Israel)

14–26. Plant Pathology, conf., Lafayette, Ind. (J. F. Schafer, Dept. of Botany and Plant Pathology, Purdue Univ., Lafayette)

14–26. World Eucalyptus Conf., 2nd, São Paulo, Brazil. (Intern. Agency Liaison Branch, Office of the Director General, Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome, Italy)

15–17. International Assoc. of Milk and Food Sanitarians, Jekyll Island, Ga. (H. L. Thomasson, P.O. Box 437, Shelbyville, Ind.)

15–18. Technical Assoc. of the Pulp and Paper Industry, 12th testing conf., Montreal, Canada. (TAPPI, 155 E. 44 St., New York 16)

15–24. International Astronomical Union, 11th general assembly, Berkeley, Calif. (D. H. Sadler, Royal Greenwich Observatory, Herstmonceux Castle, Hailsham, Sussex, England)

16–18. Hypersonics Conf., intern., Cambridge, Mass. (J. J. Harford, American Rocket Soc., 500 Fifth Ave., New York, N.Y.)

18–21. Association of American Geographers, East Lansing, Mich. (M. F. Burrill, 1785 Massachusetts Ave., NW, Washington 6)

19–30. Agricultural Economists, 11th intern. conf., Cuernavaca, Mexico. (J. Ackerman, Farm Foundation, 600 S. Michigan Ave., Chicago, Ill.)

20–23. International Ergonomics Assoc., 1st congr., Stockholm, Sweden. (T. Olson, Dept. of Industrial Physiology, G.C.I. Lidingövägen 1, Stockholm)

20–24. American Veterinary Medical Assoc., Detroit, Mich. (H. E. Kingman. AVMA, 600 S. Michigan Ave., Chicago 5, Ill.)

21–23. International Hypersonics Conf., Cambridge, Mass. (F. Ridell, Avco Research Laboratory, 301 Lowell St., Wilmington, Mass.)

21–24. Biological Photographic Assoc., Chicago, Ill. (Mrs. J. W. Crouch, Box 1668, Grand Central P.O., New York 17)

21–24. International Conf. on Photoconductivity, Ithaca, N.Y. (E. Burstein, Dept. of Physics, Univ. of Pennsylvania, Philadelphia)

21–26. International Congr. of Psychotherapy, 5th, Vienna, Austria. (W. Spiel, Lazarettg. 14, Vienna 9)

21–26. World Traffic Engineering Conf., Washington, D.C. (Intern. Road Federation, 1023 Washington Bldg., Washington 5)

21–27. International Assoc. of Dental Students, congr., London, England. (D. H. Clark, Royal Dental Hospital, Leicester Sq., London, W.C.2)

21–31. United Nations Conf. on New Sources of Energy, Rome, Italy. (United Nations, New York, N.Y.)

21–2. International Congr. of Practical Medicine, Merano, Italy. (Bundesärztekammer, 1 Hädenkampfstrasse, Cologne, Germany)

21–6. Pacific Science Congr., 10th, Honolulu, Hawaii. (Secretary General, 10th Pacific Science Congr., Bishop Museum, Honolulu)

22–25. International Pharmacological Meeting, 1st, Stockholm, Sweden. (A. Wretlind, Karolinska Institutet, Stockholm 60)

22–30. International Conf. on Protozoology, Prague, Czechoslovakia. (N. D. Levine, College of Veterinary Medicine, Univ. of Illinois, Urbana)

23–25. Gas Dynamics, symp., biennial, Evanston, Ill. (J. J. Harford, American Rocket Soc., 500 Fifth Ave., New York, N.Y.)

23–26. Electron Microscope Soc. of America, Pittsburgh, Pa. (Miss M. L. Rollins, Agricultural Research Service, U.S. Department of Agriculture, P.O. Box 19,687, New Orleans 19, La.)

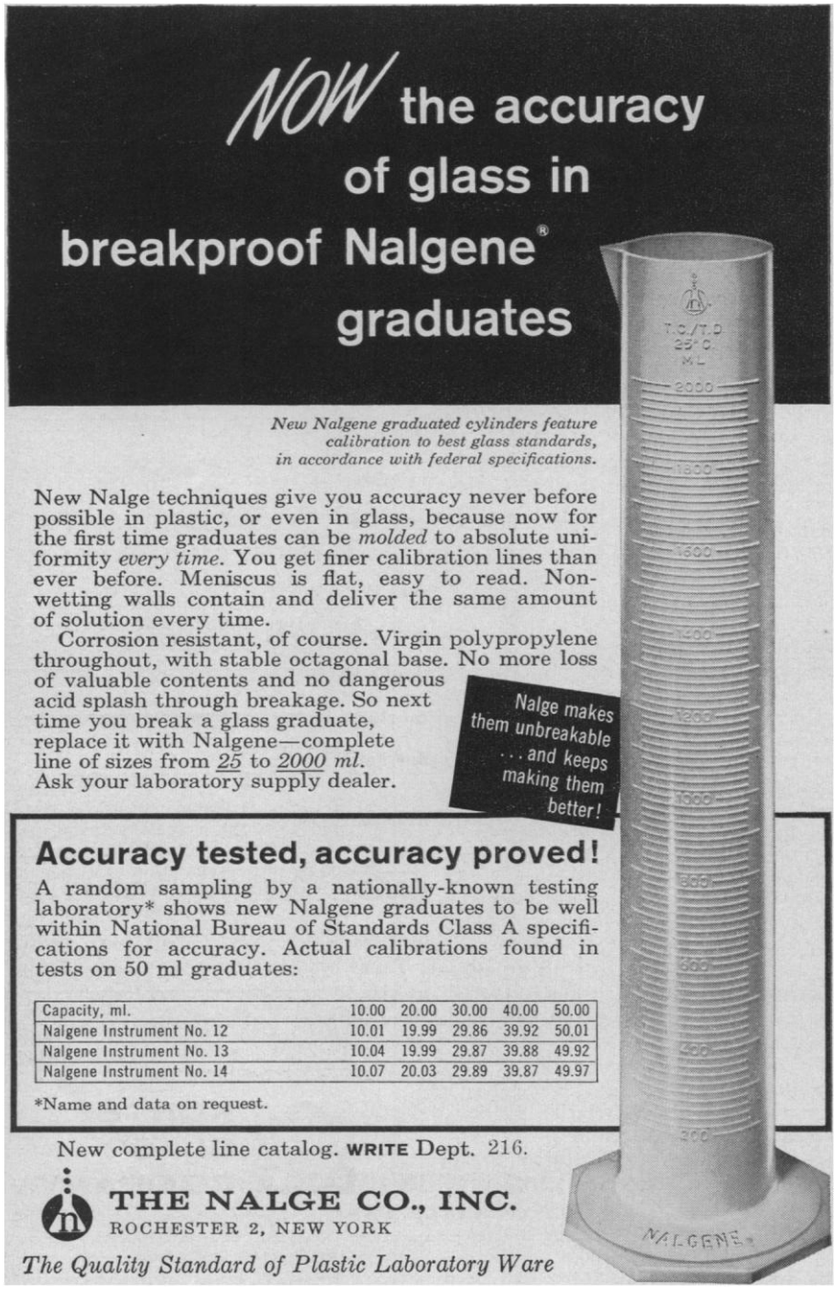
23–26. Institute of Management Sciences, 8th annual intern., Brussels, Belgium. (W. Smith, Inst. of Science and Technology, Univ. of Michigan, Ann Arbor)

23–1. Radioisotopes in the Biological Sciences, conf., Intern. Atomic Energy Agency, Vienna, Austria. (IAEA, 11 Kärtner Ring, Vienna 1)

24–26. Physiology of the Hippocampus, intern. colloquium, Montpellier, France. (Mme. Mineur, Centre National de la Recherche Scientifique, 13 Quai Anatole France, Paris 7)

26–1. Radiology, 10th intern. congr., Montreal, Canada. (C. B. Peirce, Suite 204, 1555 Summerhill, Montreal 25)

26–2. History of Science, 5th intern.



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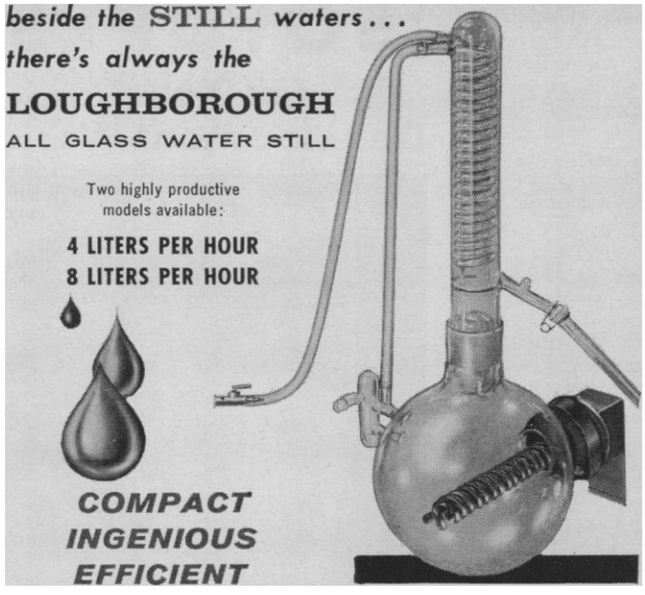

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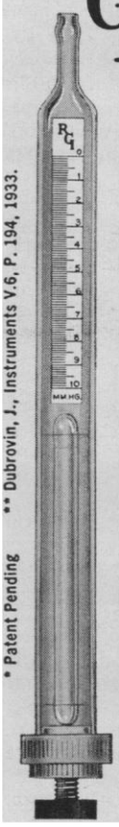

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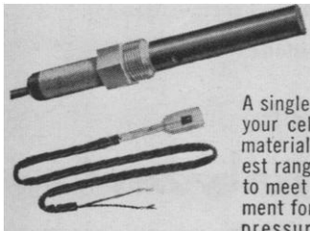

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congr., Ithaca, N.Y., and Philadelphia, Pa. (Secretary, 5th Intern. Congress of the History of Science, Cornell Univ., Ithaca)

27–29. International Congr. of Group Psychotherapy, 3rd, Paris, France. (W. Warner, P.O. Box 819, Grand Central Station, New York 17)

27–29. Psychosomatic Aspects of Neoplastic Disease, 2nd annual conv., Paris, France. (L. L. LeShan, Intern. Psychosomatic Cancer Study Group, 144 E. 90 St., New York 28)

27–31. American Soc. of Plant Psysiologists, Lafayette, Ind. (C. O. Miller, Indiana Univ., Bloomington)

27–1. American Congr. of Physical Medicine and Rehabilitation, Cleveland, Ohio. (D. C. Augustin, 30 N. Michigan Ave., Chicago 2, Ill.)

27–1. American Inst. of Biological Sciences, annual, Lafayette, Ind. (J. R. Olive, AIBS, 2000 P St., NW, Washington 6)

27–1. Coordination Chemistry, 6th intern. conf., Detroit, Mich. (S. Kirschner, Dept. of Chemistry, Wayne State Univ., Detroit 2)

28–30. Mathematical Assoc. of America, Stillwater, Okla. (H. L. Alder, MAA, Univ. of California, Davis)

28–30. Oak Ridge Inst. of Nuclear Studies, 8th annual summer symp., Gatlinburg, Tenn. (Symposium Office, University Relations Division, Oak Ridge Inst. of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.)

28–30. Scandinavian Symp. on Fat Rancidity, 3rd, Sandefjord, Norway. (E. Törnudd, Gaustadallen 30, Blindern, Norway)

28–31. American Assoc. of Clinical Chemists, natl., New York, N.Y. (B. Klein, Chemistry Dept., Kingsbridge V.A. Hospital, Bronx, N.Y.)

28–31, American Soc. for Pharmacology and Experimental Therapeutics, Rochester, N.Y. (K. H. Beyer, Merck, Sharp and Dohme Research Laboratories, West Point, Pa.)

28–31. Botanical Soc. of America, Lafayette, Ind. (B. L. Turner, Dept. of Botany, Univ. of Texas, Austin 12)

28–31. Chemical Physics of Nonmetallic Crystals, intern. conf., Evanston, Ill. (O. C. Simpson, Argonne National Laboratory, 9700 South Cass Ave., Argonne, Ill.)

28–1. Heat Transfer Conf., intern., Boulder, Colo. (S. P. Kezios, American Soc. of Mechanical Engineers, 29 W. 39 St., New York 18)

28–1. Ionization Phenomena in Gases, 5th intern. conf., Munich, Germany. (Secretariat, Oskar von Miller Ring 18, P.O. 463, Munich 1)

28–1. Radioactive Metrology, symp., Oxford, England. (B. W. Robinson, Applied Physics Division, National Physical Laboratory, Teddington, Middlesex, England)

28–1. Rockets and Astronautics, 3rd intern. symp., Tokyo, Japan. (Japanese Rocket Soc., 1-3, Ginza-Nishi, Chuo-Ku, Tokyo)

28–2. European Soc. of Haematology, 8th congr., Vienna, Austria. (H. Fleischhracker, Frankgasse 8, Billrothhaus, Vienna 9)

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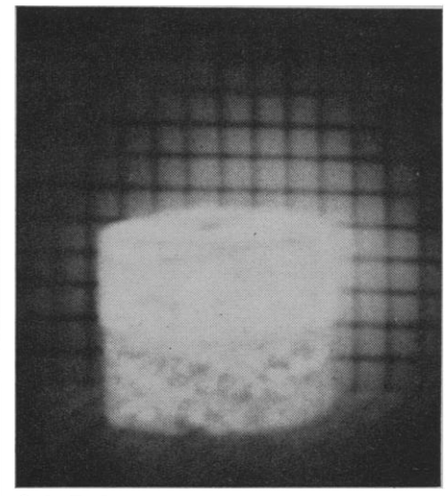

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28–2. Detonation Waves, intern. colloquium, Gif-sur-Yvette, France. (G. M. Ribaud, Centre National de la Recherche Scientifique, 13 Quai Anatole France, Paris 7, France)

28–2. Mechanics of Turbulence, intern. colloquium, Marseilles, France. (A. Favre, Faculté des Sciences, Université, Marseilles)

29. American Soc. for Horticultural Science, Lafayette, Ind. (R. E. Marshall, Dept. of Horticulture, Michigan State Univ., East Lansing)

29–1. American Mathematical Soc., 66th summer meeting and 40th colloquium, Stillwater, Okla. (J. W. T. Youngs, AMS, 190 Hope St., Providence 6, R.I.)

29–1. Society for Industrial and Applied Mathematics, Stillwater, Okla. (G. Kaskey, Remington Rand UNIVAC, P.O. Box 500, Blue Bell, Pa.)

29–6. Planning of Experiments, intern. colloquium, Paris, France. (D. Dugue, Institut de Statistique de l'Université, 11 rue Pierre Curie, Paris 5)

29–7. International Statistical Inst., 33rd session, Paris, France. (G. R. Chevry, 29 Quai Branly, Paris 7)

30–1. Semiconductor Conf., 3rd annual, Los Angeles, Calif. (W. V. Wright, Electro-Optical Systems, Inc., 125 N. Vinedo Ave., Pasadena, Calif.)

30–2. American Sociological Assoc., St. Louis, Mo. (T. Parsons, Dept. of Social Relations, Harvard Univ., Cambridge, Mass.)

30–2. Experimental Research on Shell Structures, colloquium, Delft, Netherlands. (A. L. Bouma, Dept. of Civil Engineering, Technological Univ., Delft)

30–5. Mental Health, 6th intern. congr., Paris, France. (Miss E. M. Thornton, World Federation for Mental Health, 19 Manchester St., London, W.1, England)

31–2. Exfoliative Cytology, intern. congr., Vienna, Austria. (Office of the Secretary of the Congress, 666 Elm St., Buffalo 3, N.Y.)

31–2. Gynaecological Cytology, 1st intern. congr., Vienna, Austria. (R. M. Graham, Roswell Park Memorial Inst., 666 Elm St., Buffalo 3, N.Y.)

31–4. Preventive and Social Medicine, meeting, Evian, France. (Societé Française de Medecine Preventive et Sociale, 1 rue de Courcelles, Paris 8, France)

31–6. American Psychological Assoc., 69th annual, New York, N.Y. (J. G. Darley, 1333 16th St., NW, Washington 6)

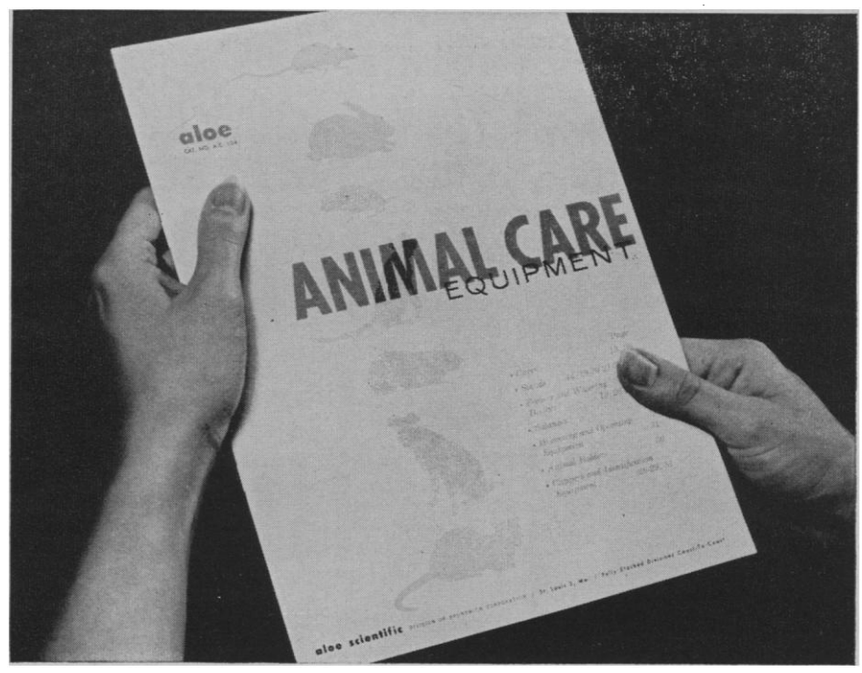
September

1–5. Danube Research, intern. symp., Budapest, Hungary. (Biological Sciences Group, Hungarian Acad. of Sciences, Roosevelt Tèr. 9, Budapest V)

1–9. Topology and Its Methods in Other Mathematical Disciplines, symp., Prague, Czechoslovakia. (Organizing Committee, Ke Karlovu 3, Prague 2)

1–10. International Pharmaceutical Students' Federation, 7th congr., Munich, Germany. (U. Peto, 10 Groffstr., Munich 19)

2–7. International Assoc. for Quater-



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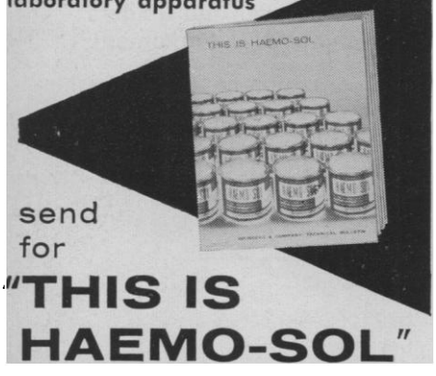

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nary Research, Warsaw, Poland. (R. Galon, Secretary General, INQUA, Geographical Inst. Univ., Torun, Poland)

2–9. International Soc. of Surgery, 19th congr., Dublin, Ireland. (T. C. J. O'Connell, 35 Fitzwilliam Pl., Dublin)

3–7. International Assoc. for Hydraulic Research, 9th congr., Belgrade, Yugoslavia. (H. J. Schoemaker, Waterloopkundig Laboratorium, Raam 61, Delft, Netherlands)

3–8. American Chemical Soc., 140th meeting, Chicago, Ill. (A. T. Windstead, National Meetings Dept., ACS, 1155 16 St., NW, Washington 6)

3–9. International Federation of Gynaecology and Obstetrics, 3rd world congr., Vienna, Austria. (V. Grünberger, Medizinische Akademie, Alserstrasse 4, Vienna 9)

3–10. Inter-American Congr. of Radiology, 7th, São Paulo, Brazil. (W. Bomfim-Pontes, Rua Cesario Motta 112, São Paulo)

4. World Federation for Mental Health, 14th annual, Paris, France. (WFMH, 19 Manchester St., London, W.1, England)

4–6. International Assoc. for Shell Structures, colloquium, Brussels, Belgium. (Prof. Dutron, 127 Avenue Adolphe Buyl, Brussels 5)

4–6. International Symp. on the Earth Storm, Kyoto, Japan. (T. Nagata, Science Council of Japan, Ueno Park, Tokyo)

4–7. Neuropathology, 4th intern. congr., Munich, Germany. (W. Haymaker, Armed Forces Inst. of Pathology, Walter Reed Army Medical Center, Washington 25)

4–7. Rheumatology, 10th intern. congr., Rome, Italy. (C. B. Ballabio, Clinica Medica Generale, Via F. Sforza 35, Milan, Italy)

4–8. Low Energy Nuclear Physics, intern. conf., Manchester, England. (L. J. B. Goldfarb, Physics Dept., Univ. of Manchester, Manchester)

4–8. Pharmaceutical Sciences, 21st intern., congr., Pisa, Italy. (Intern. Pharmaceutical Federation, 11 Alexanderstraat, The Hague, Netherlands)

4–8. Plasma Physics and Controlled Nuclear Fusion Research, conf., Salzburg, Austria. (Intern. Atomic Energy Agency, United Nations, New York, N.Y.)

4–9. International Assoc. for Analog Computation, 3rd intern. sessions, Belgrade, Yugoslavia. (D. Strujic, Decanska 14/IV, Belgrade)

4–9. International Congr. of Angiology, 4th, Prague, Czechoslovakia. (Z. Reinis, 4th Medical Clinic, Prague 2/499)

4–9. International Symp. on Fundamental Problems in Turbulence and Their Relation to Geophysics (by invitation), Marseilles, France. (Intern. Union of Geodesy and Geophysics, 53 Avenue de Breteuil, Paris 7)

4–9. Laurentian Hormone Conf., Hoberg's Resort, Lake County, Calif. (Committee on Arrangement of the Laurentian Hormone Conference, 222 Maple Ave., Shrewsbury, Mass.)

4–13. Inter-African Conf. for Food and Nutrition, 4th, Bukavu, Congo Republic. (Commission for Technical Cooperation in Africa South of the Sahara, Pvt. Mail Bag 2359, Lagos, Nigeria)

4–14. Anglo-American Aeronautical Conf., 8th, London, England. (Inst. of