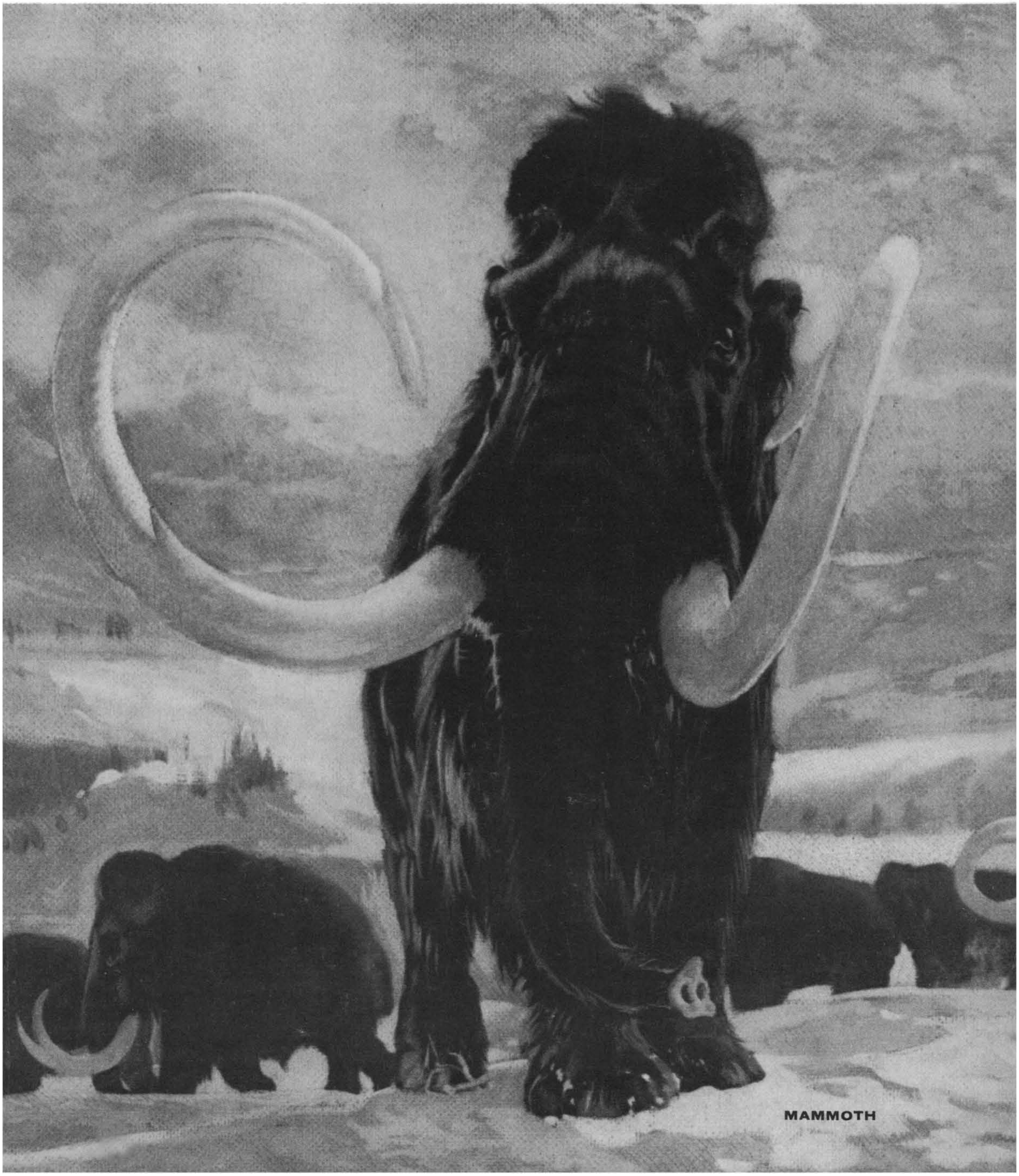
SCIENCE

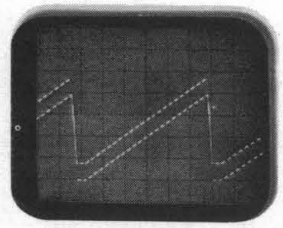
16 June 1967
Vol. 156, No. 3781

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

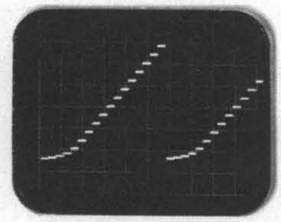


4 ways to view displays with the Tektronix Type 564

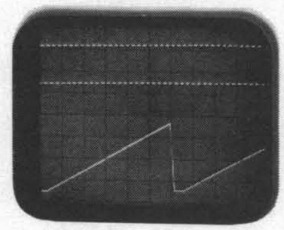
split-screen storage oscilloscope



Entire screen can be used for a stored display.



Entire screen can be used for a nonstored display.



Each half of split-screen can be used independently for stored displays.

The Tektronix Type 564 is virtually two instruments in one. It offers all the advantages of a storage oscilloscope plus those of a conventional oscilloscope.

Split-Screen Displays

An unique split-screen display area enables you to simultaneously use either half of the screen for storage and the other half for conventional displays, or use the entire area for stored or conventional displays.

Independent control of both halves of the screen permits you to take full advantage of the storage facilities. For example, you can use half the screen to store a reference waveform, the other half to display waveforms for comparison. You can erase or retain either half of the display area as you choose.

Bistable Storage Advantages

With bistable storage oscilloscopes, such as the Type 564 and Type 549, the contrast ratio and brightness of stored displays are constant and independent of the viewing time, writing and sweep speeds, or signal repetition rates. This also simplifies waveform photography. Once initial camera settings are made for photographs of one stored display, no further adjustments are needed for photographs of subsequent stored displays.

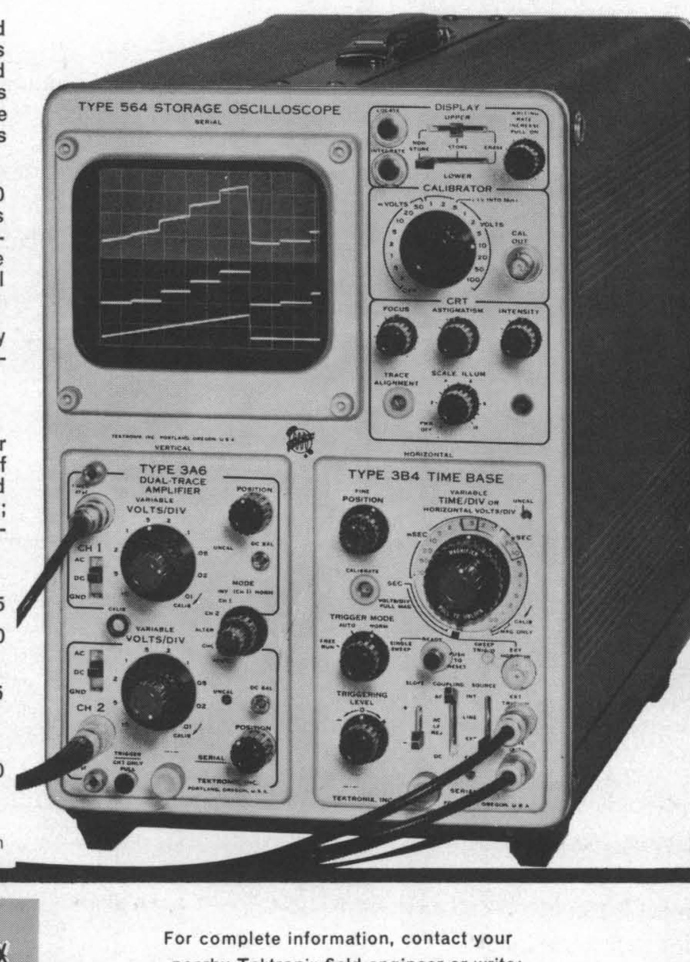
Storage time is up to one hour, and erase time is less than 250 milliseconds. An illuminated 8 cm by 10 cm graticule facilitates measurements and aids in taking photographs with well-defined graticule lines. Adding to the operating ease is a trace position locater that indicates, in a nonstore area, the vertical position of the next trace or traces.

Tektronix bistable storage cathode ray tubes are not inherently susceptible to burn-damage and require only the ordinary precautions taken in operating conventional oscilloscopes.

Plug-In Unit Adaptability

The Type 564 accepts Tektronix 2 and 3-series plug-in units for both vertical and horizontal deflection. Display capabilities of these units include single and multi-trace with normal and delayed sweep; single and multiple X-Y; low-level differential; dual-trace sampling; spectrum analysis, and many other general and special purpose measurements.

Either half of the split-screen can be used for a stored display, the other half for a nonstored display. (Shown below).



Type 564, without plug-in units	$875
Rack-Mount RM564 Similar electrical characteristics to Type 564. 7" high.	$960
Type 3A6 Dual-Trace Amplifier Unit DC to 10 MHz from 10 mV/div to 10 V/div. 5 display modes. Internal signal delay line.	$525
Type 3B4 Time Base Unit Sweep speeds from 0.2 μs/div to 5 s/div. Single sweep. Up to X50 direct-reading magnifier extends fastest sweep to 50 ns/div.	$400

U.S. Sales Prices FOB Beaverton, Oregon

Tektronix, Inc.

For complete information, contact your nearby Tektronix field engineer or write:
Tektronix, Inc., P.O. Box 500, Beaverton, Oregon 97005

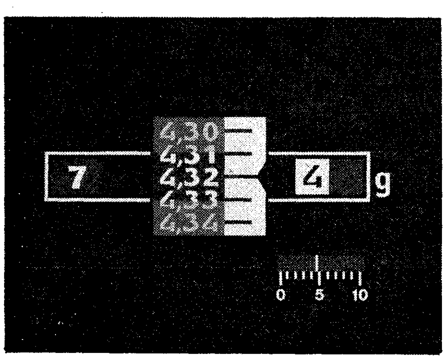
Four new P's in the Mettler pod: some stay level, some weigh backwards, and some even weigh conventionally

P160, P2000, P5 and P6 – these are the four new instruments we've added to our widely-accepted series of top-loading balances. They bring improved precision/capacity relationships while offering special advantages for particular applications.

WEIGH UP, WEIGH DOWN...
Perhaps the most unusual of the new group is the P160. It has the 160 g capacity of our finest analytical balances and the milligram precision of our best top-loader.

Its scale reads two ways. Operating conventionally, it tells you, with milligram precision, just how much weight you have on the pan.

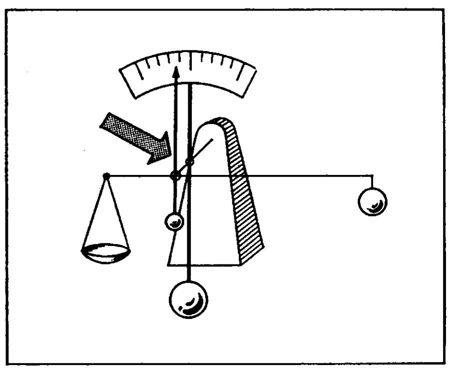
A turn of a knob wipes out all traces of conventionality – your scale now tells you, in positive values and with milligram precision, just how much weight the object on the pan has **lost**. This reversable scale is important in all work in-



Digital or analog, up or down

volving weight loss studies such as drying and evaporation experiments and determination of residues. It makes possible, for the first time, gravimetric titration, in which titrant is dispensed directly by weight instead of indirectly by volume. We have done some homework on this subject.[1]

...BUT NEVER SIDEWAYS
Some of the new P balances have the exclusive Mettler **level-matic** feature. This automatically compensates for slight changes in balance level which are due to work-



Secrets of level-matic

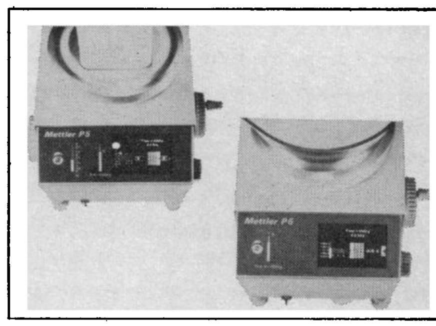
ing on a less-than-ideal balance table. Essentially a fail-safe system, it protects the unwary balance operator against himself. If tilt exceeds its compensation range, **level-matic** automatically covers the readout scale. Faulty readings are impossible.

Level-matic, available as an option on the P160 and P2000 instruments, is supplied as an integral feature on the larger P5 balance.

TWO KILOS IN A ONE-KILO CASE
The model P2000 stands out by not really standing out. It is a remarkably compact unit that offers twice the capacity and 60% more taring than other instruments in its precision and size class. It has 2-kilo capacity with precision and readability of ±0.05 g.

1) We've found 44 citations which suggest useful applications for, or advantages of, dispensing titrant by weight. If you'd like a copy, ask for Technical Information Bulletin 1014, "Gravimetric Titrimetry – a Review of the Literature."

MEET THE BIG BOYS
The P5 and P6 are the higher-capacity members of the new breed of P's. With comparable capacities, 5000 g and 6000 g respectively, the two units distinguish themselves in terms of performance and precision.



P5 and P6 – top-loading balances

The P6 offers fully automatic operation – place the sample on the pan and read the result – across its full capacity. It provides precision of ±0.25 g.

The P5, on the other hand, provides about another decimal precision – ±0.05 g – with automatic operation over its 1000 g optical scale.

FOR PRODUCT LITERATURE...
All the new Mettler balances are described in a new 10-page booklet. Get your copy from your laboratory supply dealer or request it from Mettler Instrument Corporation, 20 Nassau Street, Princeton, New Jersey 08540.

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COVER

Molars of mastodons and mammoths have been recovered by fishermen from at least 40 sites on the continental shelf off the northeastern United States. Each site is within a broad area of relict sand deposited at a time of glacially lowered sea level. The number and distribution of the teeth indicate that these animals ranged the shelf in large numbers about 25,000 to 6,000 years ago. See page 1477. [Drawing by Z. Burian from *Prehistoric Animals*; publisher, Paul Hamlyn, London; U.S. distributor, Harlem Book Co., New York. © Copyright 1960 by Artia]

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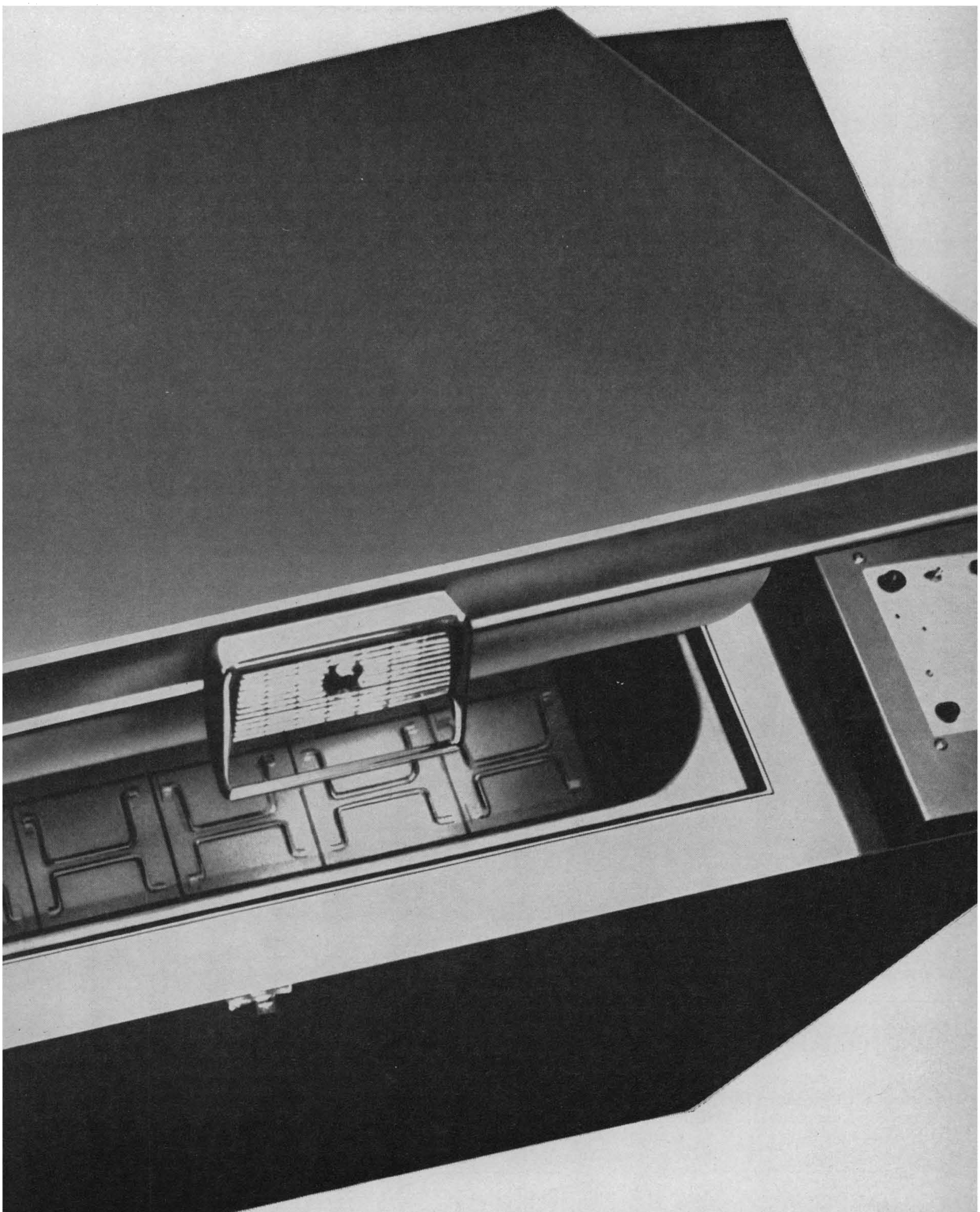

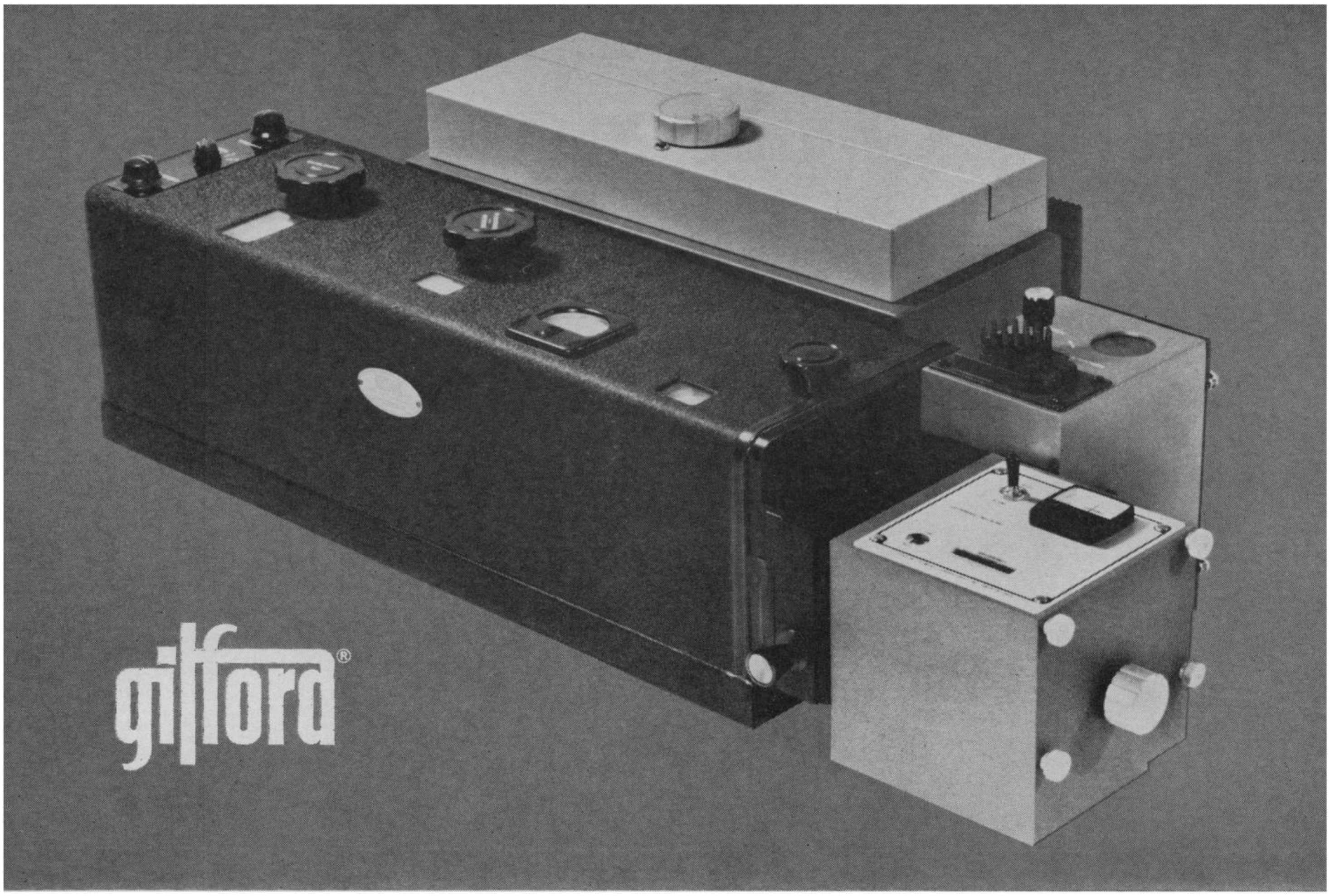

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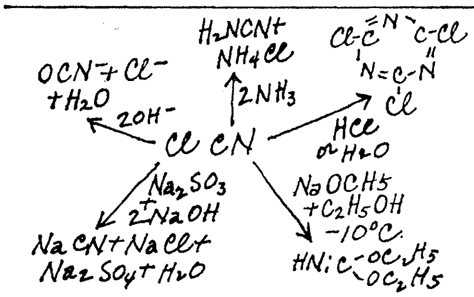
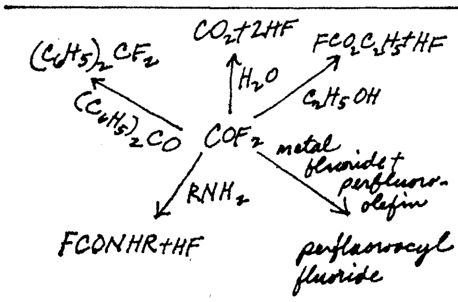
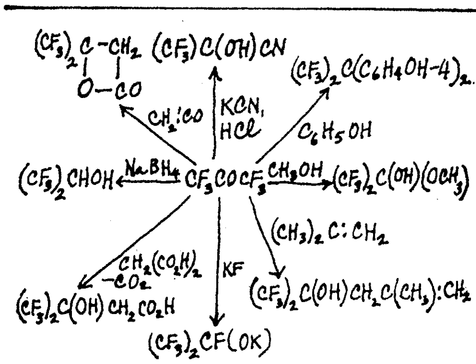


Cyanogen Chloride/ClCN
A colorless, toxic gas having an irritating odor and producing lacrimation. We supply it in No. 4 and 5 steel cylinders as a liquefied gas under its own vapor pressure of about 25 p.s.i.g. at 70° F. Minimum purity 97 mole %. It boils at 55.6°F. (13.1°C.) and freezes at 20.3°F. (-6.5°C.). Cyanogen chloride is used as an intermediate in organic synthesis, and as a warning agent in fumigant gases. For manual flow control, Matheson needle valves No. 55-660 and, for No. 5 cylinders, No. 58 are available.



Carbonyl Fluoride/COF_2
A colorless, toxic, strongly irritating gas. Shipped in steel cylinders as a liquefied gas under its own vapor pressure of about 800 p.s.i.g. at 70°F. Minimum purity 97 mole %. It boils at -117.6°F. (-83.1°C.) and freezes at -173.2°F. (-114.0°C.). Carbonyl Fluoride is used as an intermediate in organic synthesis. For manual flow control Matheson needle valves No. 55-660 and for lecture bottles, No. 58 are recommended.



Hexafluoroacetone — CF_3COCF_3
A colorless, nonflammable, hygroscopic gas, of moderate toxicity. It is a highly versatile ketone for organic synthesis and for the preparation of such diversified products as stable fluids, solvents, adhesives, monomers, copolymers, and agricultural and pharmaceutical chemicals. Shipped in steel cylinders as a liquefied gas under its own vapor pressure of about 70 p.s.i.g. at 70°F. Minimum purity 99.5%. It boils at -18.4°F. (-28°C.) and freezes at -200.2°F. (-129°C.). For automatic pressure regulation, we recommend Matheson regulators No. B15-660 or No. B15C-660 and for manual flow control needle valve No. 61-660. For lecture bottles, use needle valve No. 32 or 59.

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pressure on secondary students must be shared by many agencies. . . . In my research on "student class loads" 17 years ago ("Incompatibility between class load and study time in the typical American minor seminary," Fordham University, 1950), I detected the beginnings of this academic pressure in widely divergent areas of study. It would be useful to learn to what extent the pressures of education are contributing factors in the mounting disorders on the college and university campus. Is the student actually rebelling against a mechanistic structuring of American education rather than the American philosophy of life?

EVERETT F. BRIGGS

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Crafts: Forerunners of Science

There is an analogy between the model for the geographical expansion of science into "colonial" areas which Basalla has described ("The spread of Western science," 5 May, p. 611) and the intellectual expansion of science into traditional areas of technology. Just as geographically outlying areas provided new facts and observations about nature that stimulated the growing biological and geological sciences, so did the established crafts provide a veritable museum of mechanical effects and chemical reactions to test theoretical notions and suggest new areas for research in the physical sciences. The works of Hooke and Boyle are full of references to artisans' "secrets." The intimate concern with crafts in 18th-century France exemplified by the *Encyclopédie*; the reexamination of the smelters' and assayers' quantitative separatory operations by chemists in Sweden and Germany; and the extension of analysis from metallic minerals to rocks in general impelled by the desire to duplicate imported Chinese porcelain—all these were essential preliminaries to the "Chemical Revolution." A century and a half later, practical knowledge of the alloying, crystallization, and deformation of metals assisted the birth of a physics of solids. Like the colonial, the craftsman was close to a rich and varied nature and, at first, did not philosophize too much.

Basalla's second phase too was matched (at least in the field with which I am most familiar—metallurgy), by a period in which the colonial tech-

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OCEANOGRAPHY

1961. Fourth Printing: September 1966. Invited lectures presented at the International Oceanographic Congress held in New York in 1959.
Edited by Mary Sears. 666 pp., 146 illus., indexes.
$14.75. AAAS members' cash orders: $12.50.
Chapters:

I. History of the Oceans
Authors: Gustaf Arrhenius, J. B. Bernal, Sir Edward C. Bullard, Maurice Ewing, Edwin L. Hamilton, G. E. Hutchinson, Mark Landisman, A. I. Oparin.

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IV. Boundaries of the Sea
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L. H. N. Cooper, Edward D. Goldberg, Johannes Krey, G. E. Lucas, Lars Gunnar Sillén, John H. Steele.

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nologists developed a derived but useful science. However, metallurgists in the 19th century not only used the methods derived from analytical chemistry to select their raw materials and control their operations, but they also kept alive an interest in structure and structure-sensitive properties that were utterly beyond the pale until the 1950's, as far as physicists were concerned. Eventually, however, the local science grew in stature to meet a parental science of ever-widening significance, and boundaries disappeared. Ferrous and nonferrous metallurgy merged within the framework of chemical thermodynamics; then ceramics and other inorganic materials joined them within a new branch of physics, that of the solid state.

Perhaps the next stage will be to treat biological and synthetic organic materials along with inorganic ones, within a broad science that relates everything to hierarchical arrays of electrons, photons, and atomic nuclei, partially disordered and marvellously interwoven.

In both geographical and technological colonies, it is not the development of local independent and competitive systems that marks maturity; rather, it is the merging of all into a worldwide scheme that has regions but little regionalism.

Where are the colonial regions to serve science today? Where they have always been, I think—in the arts, both fine and practical. Where else do psychology, biology, and information theory meet with the physics and chemistry of materials to exploit and so to reveal the nature of complex structure?

CYRIL STANLEY SMITH
Department of Humanities, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139

More on the Stoical Cat

Pittenger's cats were not imperturbable, as your caption suggested, but merely unperturbed (Letters, 12 May). Domesticated cats do not twitch at familiar sounds, from which I infer that his subjects lived in very interesting households.

But let him invent a new sound, and he will spot a twitch. Or, of course, an old sound that means danger or food.

A. E. BROWN
29 Oak Ridge Avenue, Summit, New Jersey

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America's system to promote and protect the free exchange of written words. Copyright has made possible the complex of scientific and technical journals which provide America and the world of science with a ready means of communicating new ideas and recent findings in every field. Today, photocopying and the computer threaten to destroy the system of copyright, and with it the journal and book industry it has fostered.

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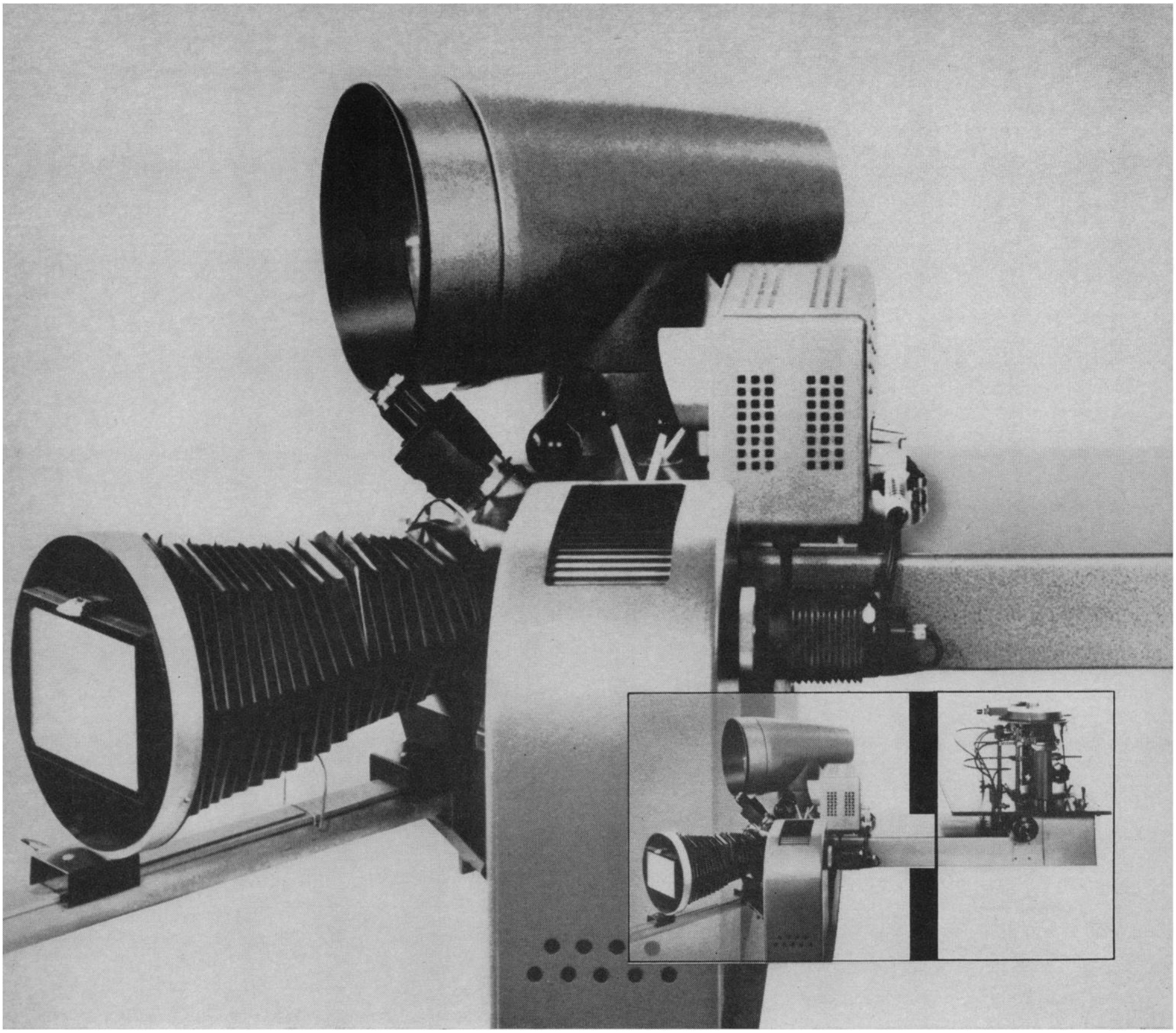

Microscopy of "hot" materials - at a distance

Radioactive and highly toxic materials may be easily and safely examined with the new Leitz MM5-RT Metallographic Microscope. The MM5-RT is a completely integrated single assembly consisting of two basic units operating on both sides of a shielded wall.

An inverted stage, objective lenses and driving mechanisms are combined in the *examination unit* that can be positioned in a sealed, isolated, radiation-proof chamber. The Le Chatelier-type stand, with vertical illumination from below, permits examination of relatively large specimens in bright-field, dark-field and polarized light. Optical elements in this emission zone are of radiation-resistant glass. Both the light path and the optical path are sealed by radiation-proof glass.

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16 June 1967, Volume 156, Number 3781

SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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Industry and Environment

In the 2 June issue of *Science*, the Autonetics Division of North American Aviation advertised its interest in employing scientists and engineers interested in helping "to make the desert bloom, the streets safe, the teacher more effective." A year ago, at the Twentieth Anniversary Celebration of Cornell's Department of Engineering Physics and Graduate School of Aerospace Engineering, Arthur Bueche, vice president in charge of the General Electric Research and Development Center, promised that "industrial companies must take a broad and imaginative look at the truly big and exciting challenges of the future." His examples included the rebuilding of cities, control of our environment, and education as a continuous and life-long process. Other persons might have included crime, transportation, and environmental health.

Government, universities, and industry must all help solve these problems, but not all of their responsibilities nor the interrelationships among them have emerged clearly. Government action can force industrial participation through tax incentives or by setting standards (for example, on air or water pollution), and so far these have been the chief forms of government-industry interaction on the problems of improving the quality of the environment. Government agencies might do more. For example, because most of the cost of polluting land, air, and water or of destroying the convenience and amenities of a city are passed on to others instead of being borne by those whose actions bring about these results, government agencies might conduct the studies necessary to determine the total costs of such changes more accurately, to provide a firmer basis for analyzing requirements, comparing alternative actions, and making decisions. The universities, too, could contribute more effectively, through analyzing problems and conducting necessary research.

But the industrial role is in some ways the most interesting, for practicable solutions can probably best come from industry, especially from the segments of industry that can apply extensive research-and-development competence to work on large social and environmental systems. But how is industrial effort to be enlisted? Perhaps some problems can be handled through the traditional, competitive, market economy. For example, establishment of government standards would create substantial markets for apartment-house incinerators, exhaust controls, and other devices designed to minimize air pollution. Industry, or at least its military component, has also adapted to situations in which there is only one major customer, the federal government. Perhaps some problems can be handled in this fashion. (Is crime control an example?) But neither the traditional market place nor the single-customer mechanism is sufficient. If it be agreed that the experience and skill of industry in solving large-scale technological problems will be necessary to solve large-scale environmental and social problems, means must be found for generating industry's interest and for rewarding effective work. Interest is already evident, as the first paragraph illustrates, but some of the appropriate incentives are still to be found. Among the developments to be looked forward to will be new social, economic, political, or organizational inventions that will motivate vigorous industrial competition to improve the quality of the environment.—DAEL WOLFLE

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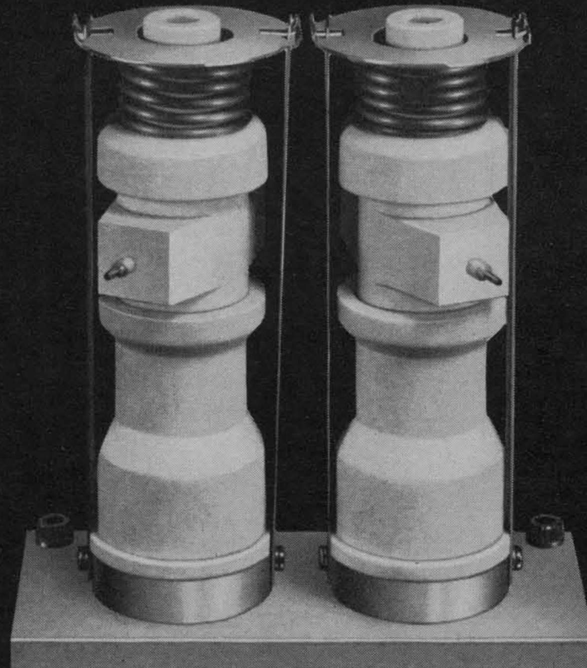

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