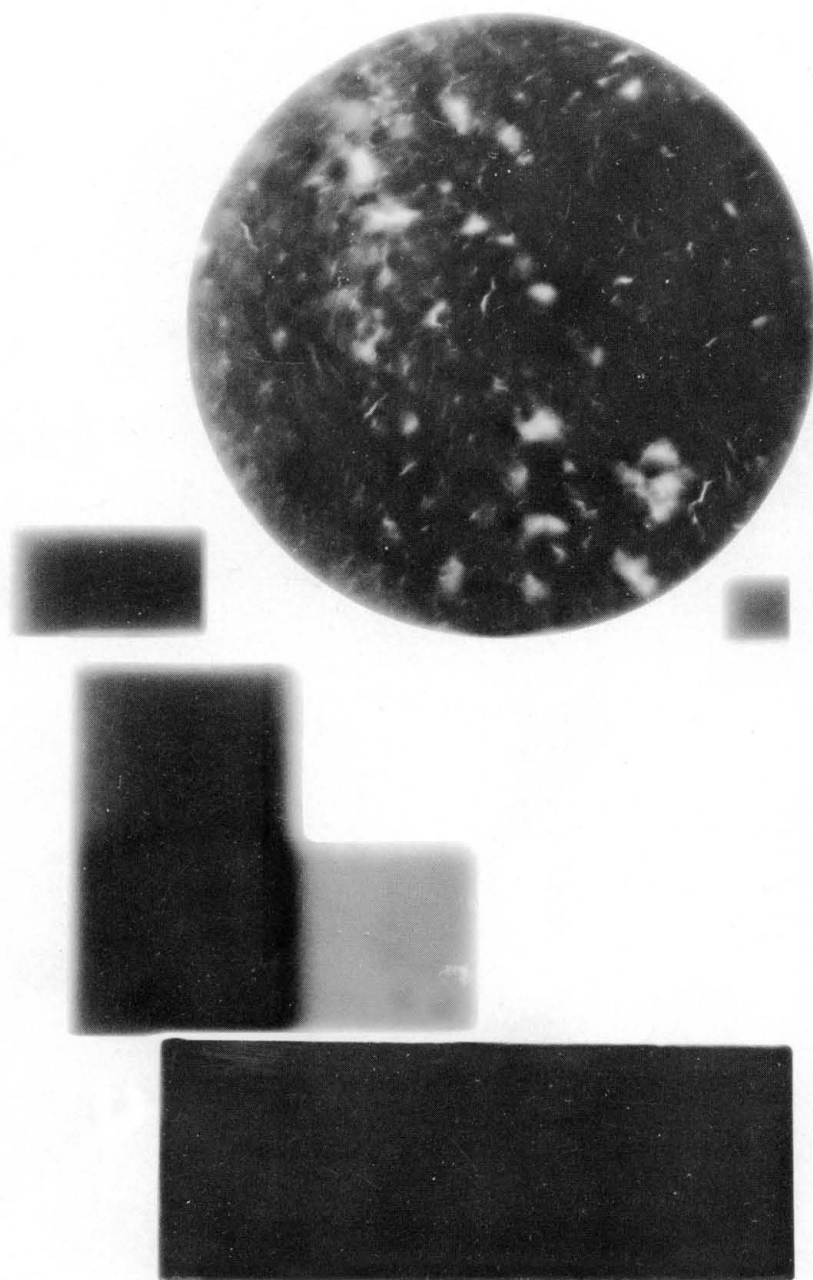


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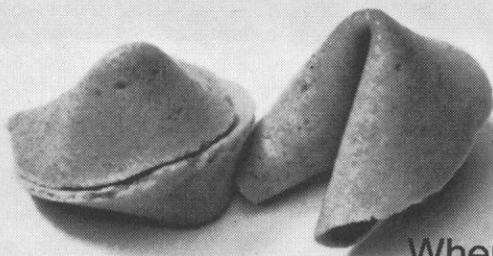
19 April 1968

Vol. 160, No. 3825

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

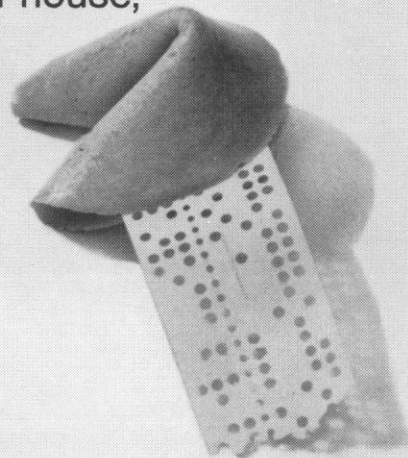


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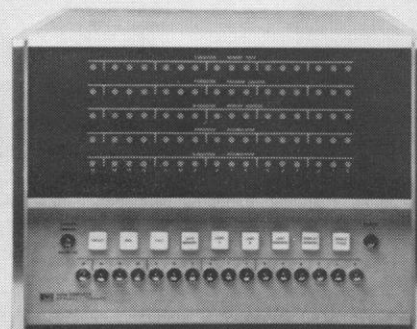


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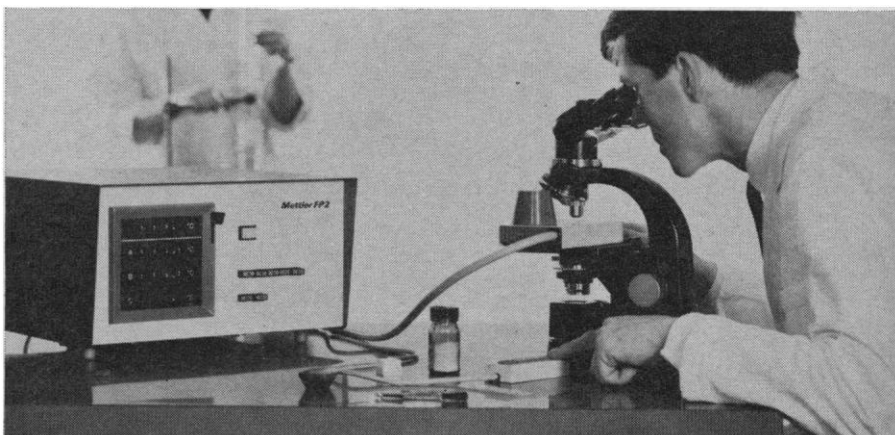
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The Mettler FP-2 is an automatically controlled microfurnace and digital indicator for use with standard laboratory microscopes in thermal microscopy. By greatly increasing precision, convenience and temperature control, the system makes the time-honored technique a highly reproducible research and analytical method.

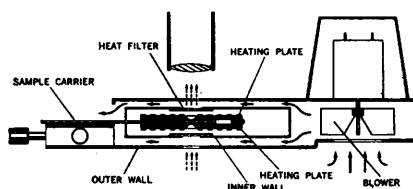
The system makes it easy to carry out studies which were considered difficult, and makes possible many studies which formerly were impossible. It enables the investigator to maintain precise control of sample temperature and to automatically record experimental data without ever looking away from the sample itself.

The instrument operates over the range of -20° to $+300^{\circ}\text{C}$, temperatures suitable for study of fusion phenomena of virtually all organic



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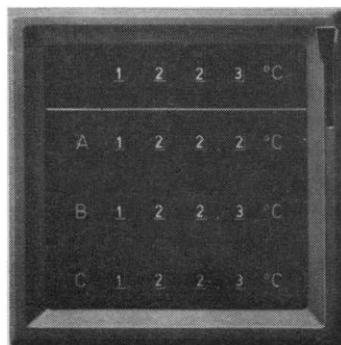
gram, a platinum resistance thermometer, a low-mass sample chamber for mounting on the microscope



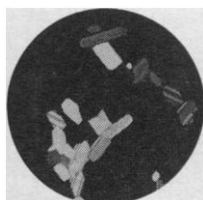
Schematic of sample chamber

and a remote pushbutton controller for increasing, decreasing, or maintaining the sample temperature at a specific value.

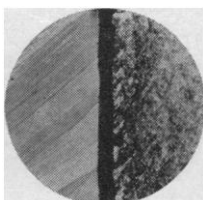
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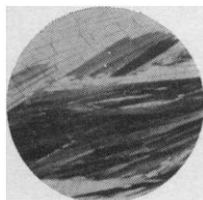
Digital readout of analytical data



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POLYMORPHISM

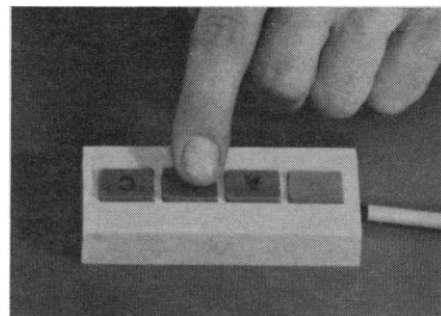


CONTACT THERMAL ANALYSIS

compounds and most inorganics. The system gives the researcher complete control over his sample temperature – increasing at a linear rate, decreasing, or holding at any single temperature. Three heating rates are provided: $10^{\circ}\text{C}/\text{minute}$ for orientation tests, $1^{\circ}\text{C}/\text{minute}$ for routine tests, and $0.2^{\circ}\text{C}/\text{minute}$ for precision measurements to $\pm 0.1^{\circ}\text{C}$.

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Data recorded by pushbutton controller

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The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



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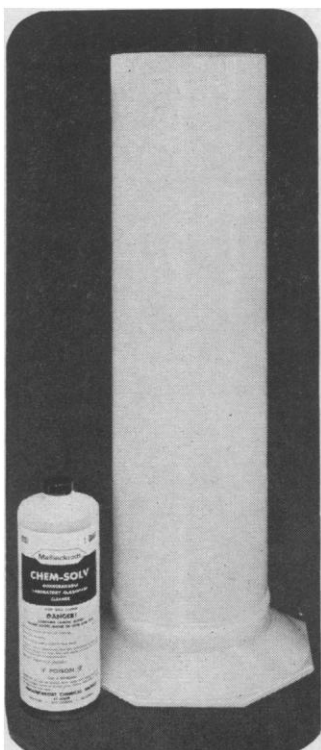
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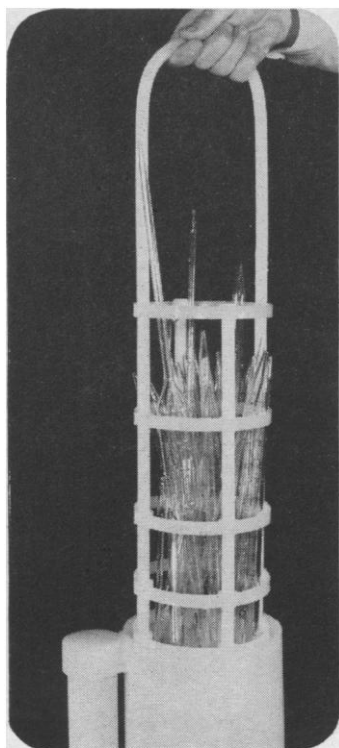
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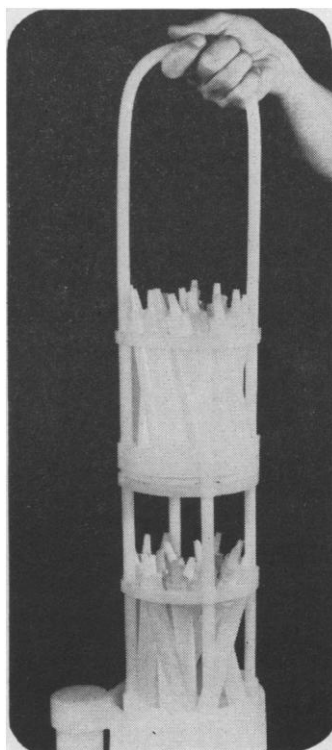
NEW Mallinckrodt system gets pipettes cleaner with no "siphon stall"



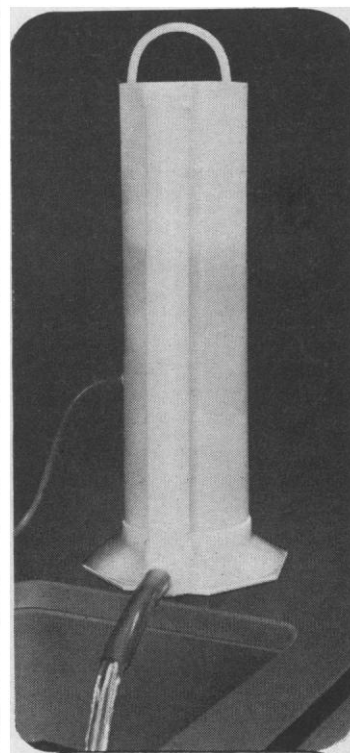
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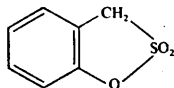
"Aha!" gloats the competitor as he scrutinizes our patent, "I have a far, far better idea than Kodak's." So his lawyer gets him a patent. Perhaps his improvement depends on our improvement. If he therefore asks for a license, he will not find us unreasonable on timing and royalties. And vice versa, we hope.

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α -Chymotrypsin titrator

Emil Thomas Kaiser, Associate Professor of Chemistry and Biochemistry at the University of Chicago, works up new titrating agents for enzymes. We too wish to be known for enzyme substrates. There is quite a difference, though, between Dr. Kaiser's team and us. The old familiar substrates that everybody routinely uses claim their interest less than ours. Their mission is to elucidate and incidentally innovate, ours to supply that others might rely.

In Burlington, Vt. last summer Kaiser spoke on "Enzyme Chemistry of Highly Reactive Cyclic Esters." We struck up conversation. It was about sultones, inner anhydrides of sulfonates, like the one from 2-hydroxy- α -toluenesulfonic acid,



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*We name it 5-Nitro-3H-1,2-benzoxathiole-2,2-dioxide.
**We name it 3H-1,2-Benzoxathiole-2,2-dioxide.

EASTMAN 10231 the 1961 model chymotrypsin titrant N-*trans*-Cinnamoylimidazole (which attacks the same active site but is more restricted in pH range), and as EASTMAN 9601 the uncyclized but otherwise analogously structured chymotrypsin titrant α -Bromo-4-nitro-*o*-cresol, where Br did what SO₃H now does better.

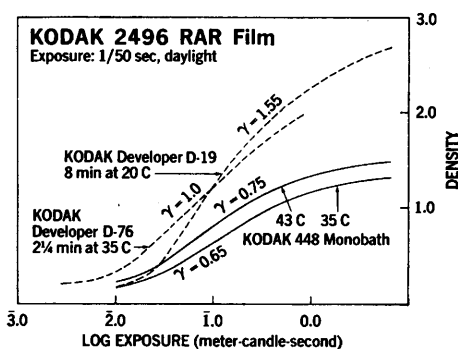
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The Tektronix Type 564 is virtually two instruments in one. It offers all the advantages of a storage oscilloscope plus those of a conventional oscilloscope.

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 locator 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.

Type 564, without plug-in units \$ 925

Rack-Mount RM564 \$1025

Similar electrical characteristics to Type 564. 7" high.

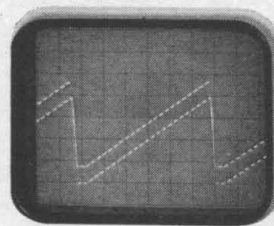
Type 3A6 Dual-Trace Amplifier Unit \$ 525

DC to 10 MHz from 10 mV/div to 10 V/div. 5 display modes. Internal signal delay line.

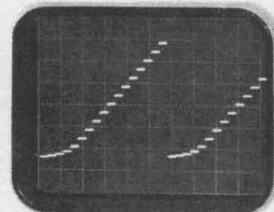
Type 3B4 Time Base Unit \$ 425

Sweep speeds from 0.2 μ s/div to 5 s/div. Single sweep. Up to X50 direct-reading magnifier extends fastest sweep to 50 ns/div.

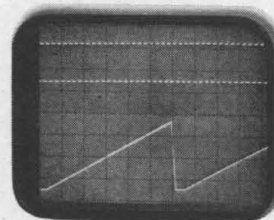
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Entire screen can be used for a stored display.

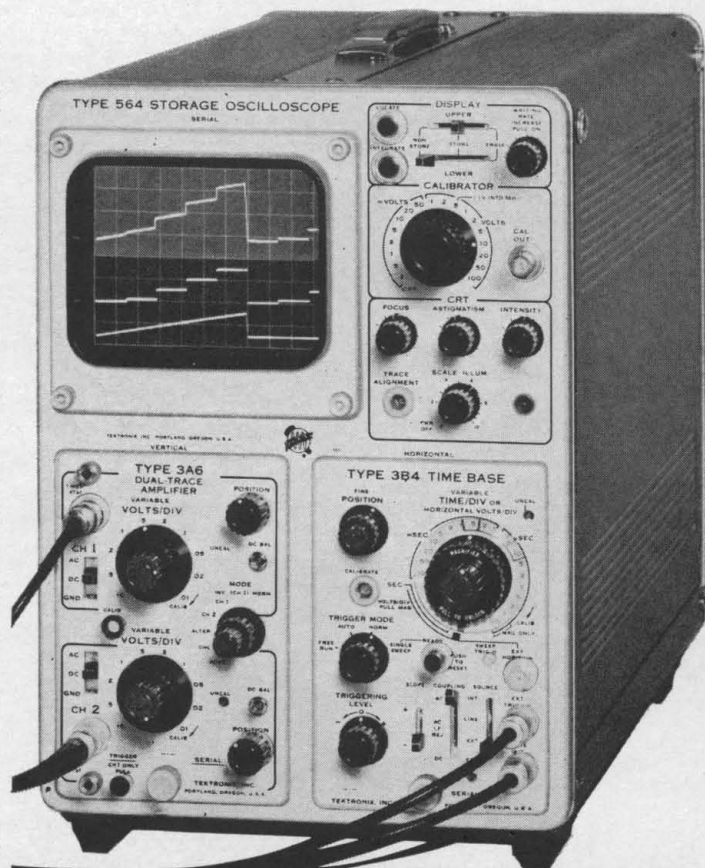


Entire screen can be used for a nonstored display.



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

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



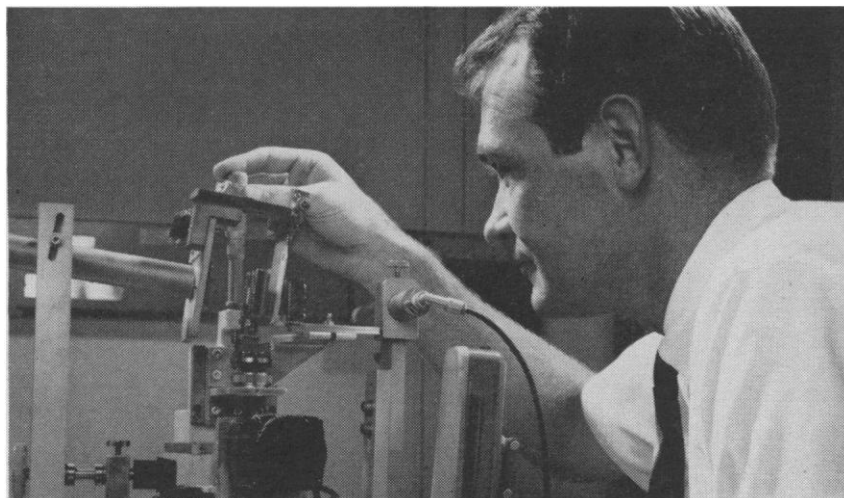
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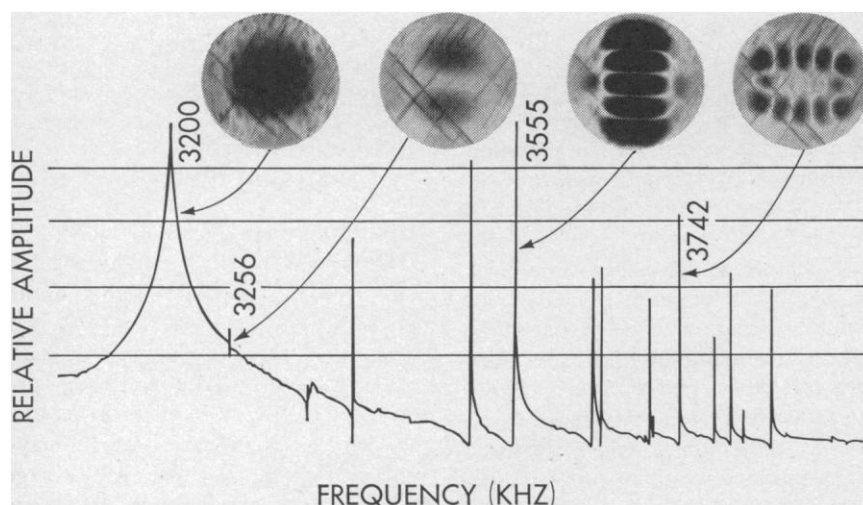
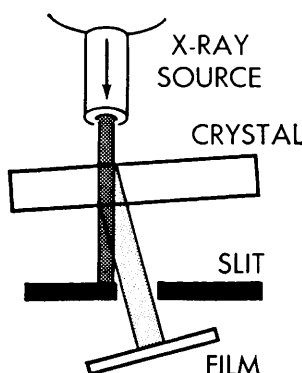
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Report from
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The Anatomy of Vibrating Crystals



William J. Spencer with equipment for detecting vibrational modes. Through sloped tube, left, X-rays strike crystal (in frame at center of apparatus). A portion of beam is diffracted by the crystal (drawing, right) and passes through the slit. The main X-ray beam is stopped at the edge of the slit. During exposure, crystal and film are driven from left to right so that entire crystal area is photographed. The X-ray beam is set at a particular angle to the crystal (the Bragg angle), which for good crystals produces a diffracted intensity greater than at other orientations. Vibrating the crystal reduces destructive interference and increases diffracted-beam intensity.



X-ray photographs of a crystal showing four modes of vibration selected from the many modes indicated by the resonance peaks on the curve. Dark areas are due to displacement antinodes in the vibrating quartz disk. Diagonal lines are intrinsic crystal-lattice defects.

In modern amplifiers, filters, and oscillators, piezoelectric crystals are widely used to select signals at certain frequencies. Such crystals—of quartz, for example—provide electronic selectivity because of their ability to convert electric waves into mechanical waves, and mechanical waves back into electric waves, at certain resonant frequencies. For any particular application, the principal resonant frequency is determined by the size and geometry of the crystal, but in addition to this principal vibrational mode, the crystal will vibrate in a number of other modes.

To suppress these unwanted resonances, they must first be identified. And until recently we did this by observing patterns created when a crystal, coated with a fine powder, is vibrated at high intensity. Since the powder collects where the crystal surface is stationary, a vibrational pattern or mode is revealed. But the pattern at such high signal levels may not correspond to the modes produced at the lower signal levels of actual operation.

Recently, however, W.J. Spencer, at the Bell Telephone Laboratories location in Allentown, Pa., has used X-ray diffraction as an accurate and flexible method of observing vibrational amplitude under realistic conditions. The new method depends on the fact that the intensity of diffracted X-rays is extremely sensitive to distortion of the crystal lattice. The transmission of the rays is greater through vibrating regions of a crystal, and this darkens such areas on the X-ray film. Stationary regions are light.

Vibration amplitudes of less than a millionth of an inch are easily observed. Thus, we obtain a quick, sensitive photographic record of displacement associated with any crystal resonance under conditions simulating actual use. This technique helps us design better filters for the Bell System.



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It probably would be useless for us to reiterate here the facts of the population-food-environment crisis which have been so eloquently stated by LaMont Cole, Karl Sax, William Vogt, William and Paul Paddock, James Bonner, and many, many others. Surely, however, there must be some way to make this committee of the National Academy of Sciences aware that the population growth rate *will* reach zero (or, more likely, go negative) in the future regardless of how much support that goal has from people or governments. The question is: how soon and by what means will the growth rate reach zero or go negative? We have just returned from a discouraging day rich in platitudes, fuzzy thinking, technological optimism, and lack of consideration of environmental problems at the "Second International Conference on the War on Hunger." The conference reinforced our belief that the world is committed to the "death rate solution"—one in which population growth ends largely because of a rising death rate. The response of the population committee deepens our feeling of hopelessness. One might have hoped that this committee would feel a duty to get the establishment working on a crash program leading to a "birth rate solution." Instead they produce a pompous commentary on Davis' well-reasoned article. Most of us, gentlemen, do not need reminding about the political realities. Why aren't you, in your position of prominence, doing everything in your power to change them?

PAUL R. EHRLICH
 RICHARD W. HOLM

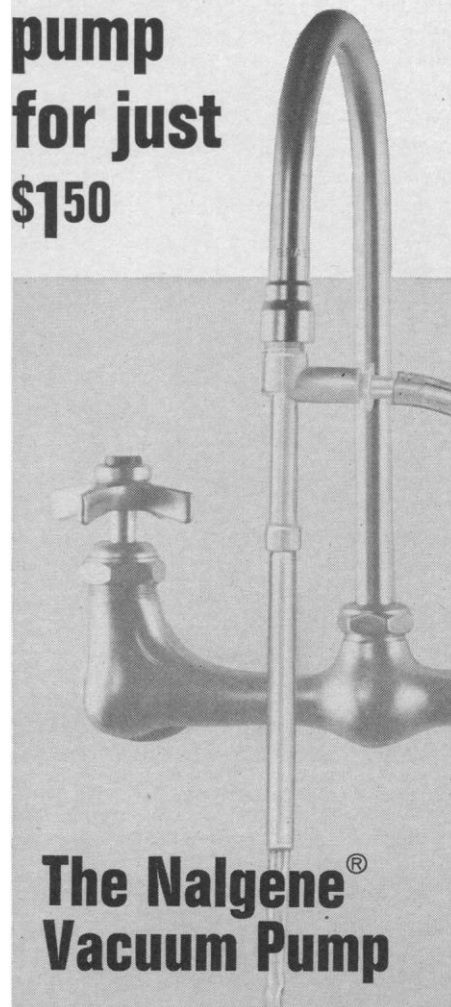
*Department of Biological Sciences,
 Stanford University, Stanford, California*

The letters on population control ignore the second opening in the population pool: death. The current medical attempts to keep people alive forever recall the main reason for burgeoning populations: a drastic decrease in death rates without a corresponding drop in birth rates. So, we will plan to limit births. Fine. Should we then simultaneously encourage research to keep people alive still longer? It seems likely that there is some point where it is best, from a collective view, to let old people die to make room for new, hence more adaptable, individuals. Any serious attempt to curb population must consider this uncomfortable question.

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Davis makes a compelling case that present family planning programs alone will not succeed in curbing population growth. He calls for expanded social research and experimentation so that governments may take effective measures to influence couples to have small families—the goal being the public control of the size of the population. The same conclusion was reached at the September meeting in Caracas on Population Policies in Relation to Development in Latin America jointly sponsored by the Organization of American States, the Pan American Health Organization, and the Population Council, Aspen Institute for Humanistic Studies with the cooperation of the government of Venezuela. The meeting was attended by 145 representatives of Western Hemisphere countries.

The recommendation was made that “a population policy should not be adopted in an isolated or unilateral fashion, but should be part of the total phenomenon of development . . . a coherent set of decisions making for a rational strategy, adopted by the public sector in accordance with the needs and desires of the community, to develop, conserve, and use human resources by influencing the probable size and growth of the population, its age make-up, mortality rates, the formation and composition of families . . . in order to facilitate . . . economic growth and enable the people to share in the responsibilities and benefits of progress” (1). The OAS was asked to provide technical support to the Committee on Inter-American Progress on population trends and variables. So far, Colombia has the most extensive program of population research. Mendoza-Hoyos of the Association of Colombian Faculties of Medicine said, “Population fertility will not be fully understood unless we know the psycho-physiological factors involved in sexual behavior and contraceptive practices. Nor can variations in fertility be understood unless marriage, family, the formation and dissolution of conjugal unions are taken into account. These . . . are determined to a great extent by cultural patterns” (2).

RAYMOND B. ALLEN
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1. *Final Report of Meeting on Population Policies in Relation to Development in Latin America*, REPO/II/17, English rev. (OAS, PAHO), mimeo., p. 6.
2. H. Mendoza-Hoyos, *Proc. Third PASB Conference on Population Dynamics*, June 1967 (Pan American Health Organization, Washington, D.C.).

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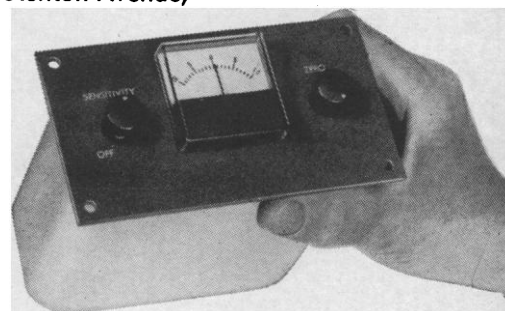
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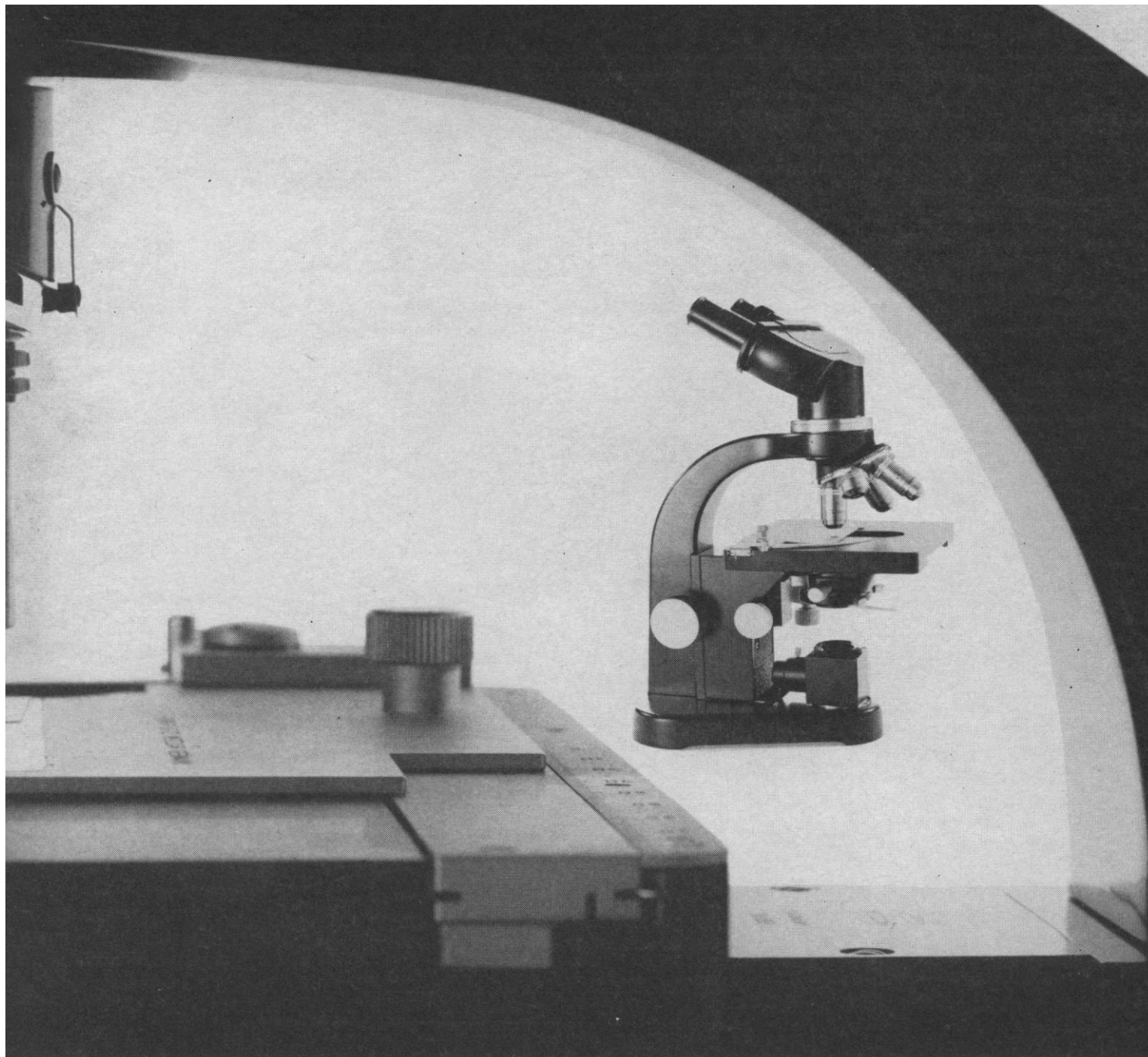
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Progress toward Abatement of Air Pollution

For many years air pollution steadily grew more severe. Photochemical smog of the type so prevalent in Los Angeles was noted with increasing frequency in many states. In some metropolitan areas such as New York a different kind of pollution problem arose from interactions involving particulate matter and SO₂. Primary sources of SO₂ are coal and residual oil, both of which often have a sulfur content higher than 2 percent.

During November 1966 an unusual weather condition led to very heavy pollution around New York City. Excessive morbidity and mortality were attributed to the episode. At the urging of Mayor Lindsay the major local electric power utility, Consolidated Edison, agreed to limit the sulfur content of the fuel it burned. Beginning in October 1967 the utility started to use residual oil having a sulfur content of no more than 1 percent. A federally sponsored abatement council recommended that by October 1969 the sulfur content of fuel oil for space heating should be limited to 0.37 percent. However, it was realized that sufficient fuel oil with this low sulfur content would not be available in time. The deadline was accordingly abandoned, but a new one will be set soon.

Standards in neighboring New Jersey are more definite. By May 1968 no fuel oil containing more than 1.0 percent of sulfur may be purchased for use, and the allowable content drops to 0.3 percent by 1 October 1971. The new standards will have sizable economic consequences. Unless desulfurization of flue gas becomes fairly cheap and effective, the use of oil in New York will be curtailed. The cleaner fuel oil will be more expensive, and the oil companies will be forced to build new refining facilities costing hundreds of millions of dollars.

The efforts of the mayor and his pollution control administration have been successful in eliciting the cooperation of other large consumers of fuel besides Consolidated Edison. As a result SO₂ emissions in New York City have already fallen by 25 percent.

Another major area in which progress has been made is that of the control of emissions from automobiles. The principal pollutants from this source are hydrocarbons, CO, and NO. A complex interaction between sunlight, the hydrocarbons, and nitrogen oxides leads to photochemical smog.

As J. K. Patterson has said,* "The unwonted automotive emissions are not the inevitable result of the gasoline engine combustion process." The combustion of gasoline to form CO₂ + H₂O can be carried out, in an automobile, to give very little CO and unburned hydrocarbons. However, "the simplest, lowest cost, most foolproof way of providing flexible engine performance is to supply a little more fuel . . . under some operating modes than would be necessary if the engine combustion conditions were ideal." The automobile manufacturers, under federal pressure, have been finding ways to improve combustion efficiency and ways to suppress the emission of hydrocarbons. Thus the vehicle of 1960, before emission was subject to control, emitted an exhaust containing 3.5 percent of CO and 900 parts of hydrocarbons per million. The 1968 models must meet standards of no more than 1.5 percent of CO and 275 parts of hydrocarbons per million.

If the momentum for abatement of pollution is to be maintained, the public must continue to demand improvements. However, where significant progress is being made, the pollution control agencies and the companies involved merit more recognition and commendation than they have received thus far.—PHILIP H. ABELSON

* J. K. Patterson, "Progress in Conserving the Air," address presented 9 March 1968 in Houston, Texas, before the National Wildlife Federation. Dr. Patterson is Coordinator for Conservation Technology, Esso Research & Engineering Company.

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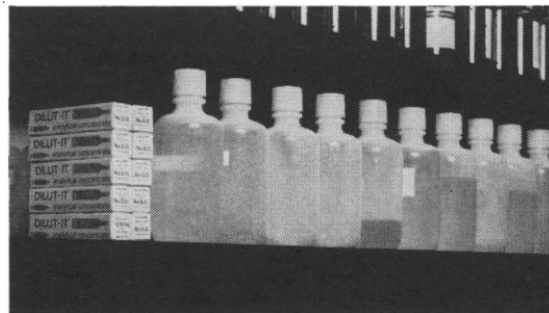
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