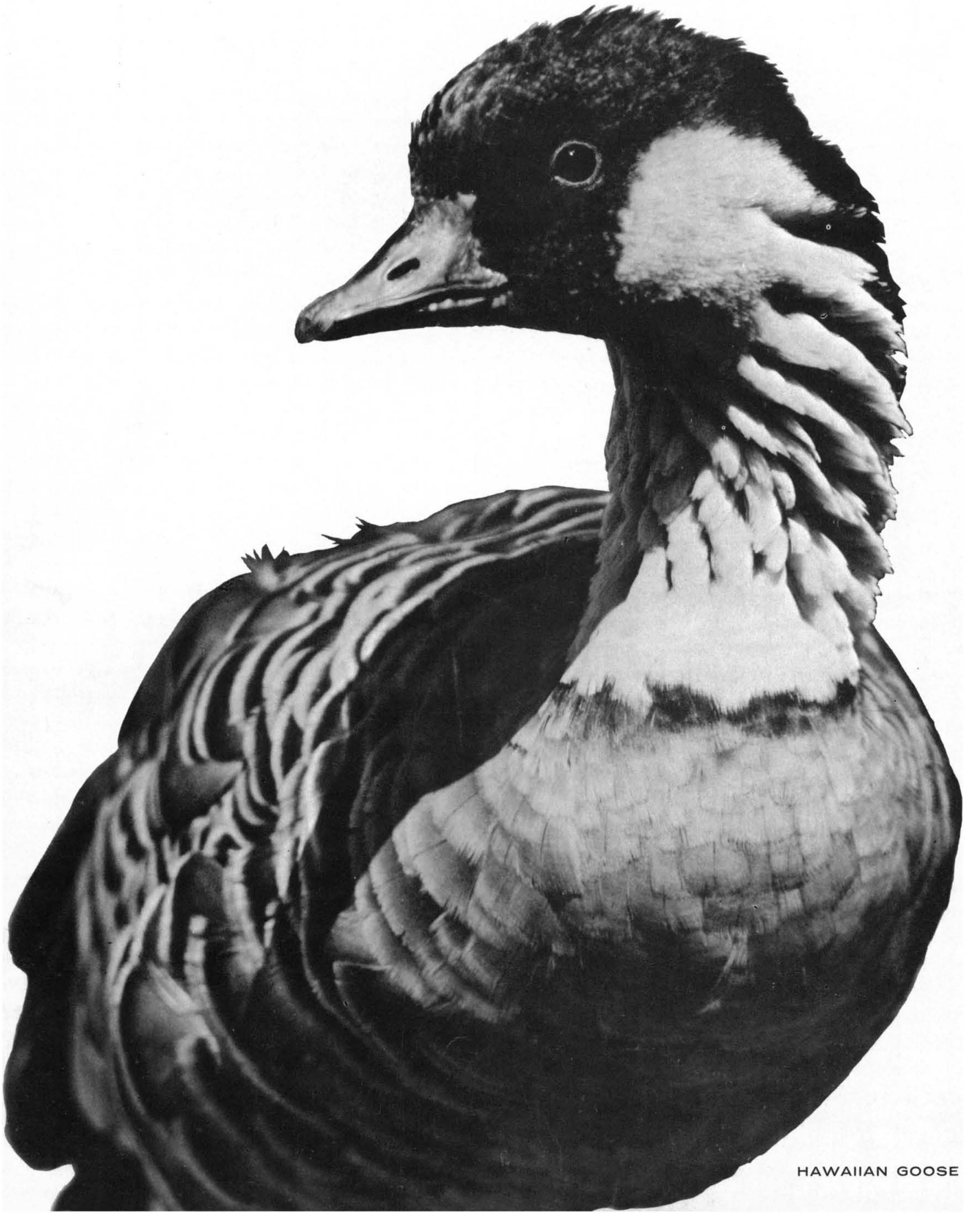
SCIENCE

20 January 1967

Vol. 155, No. 3760

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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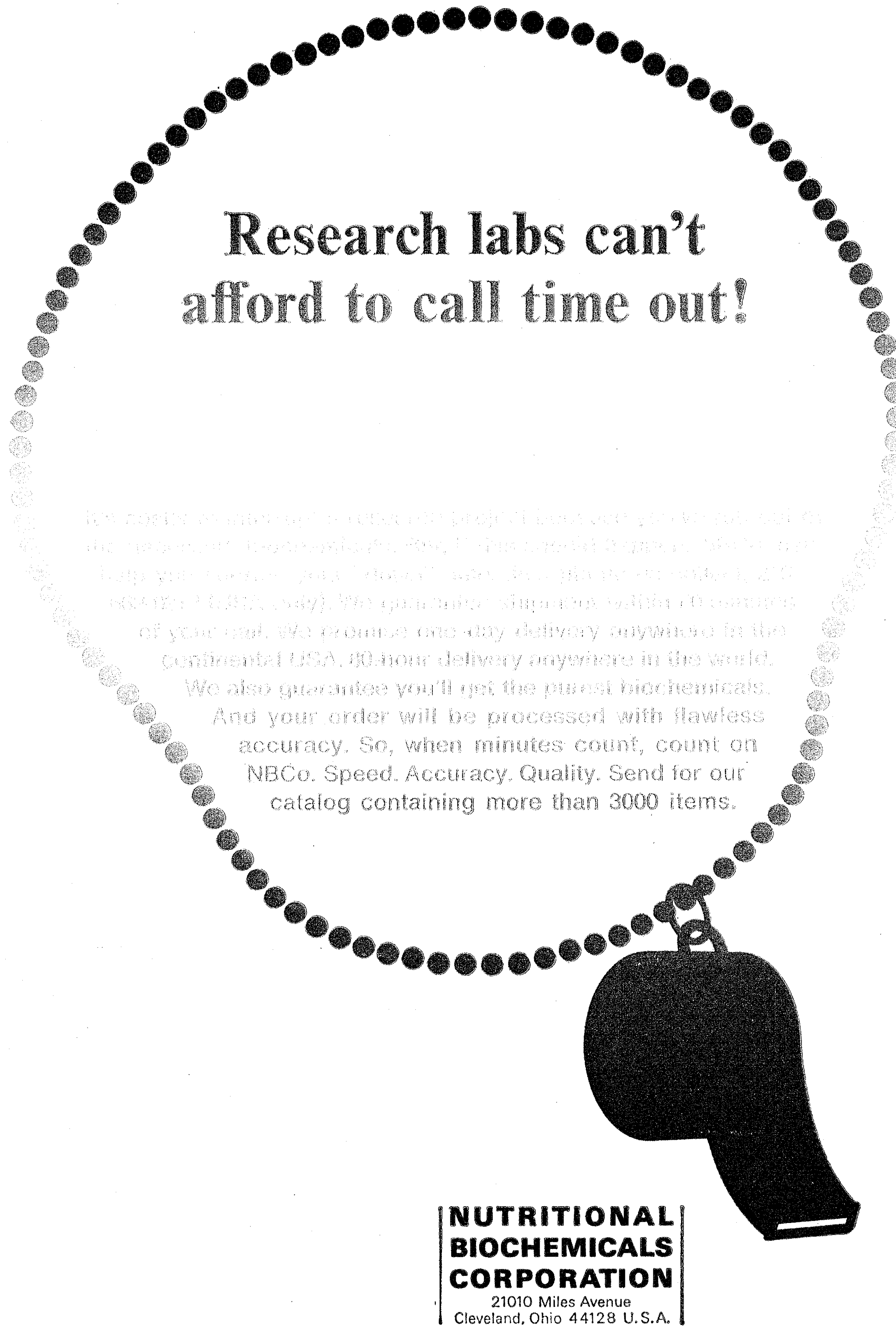

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SCIENCE

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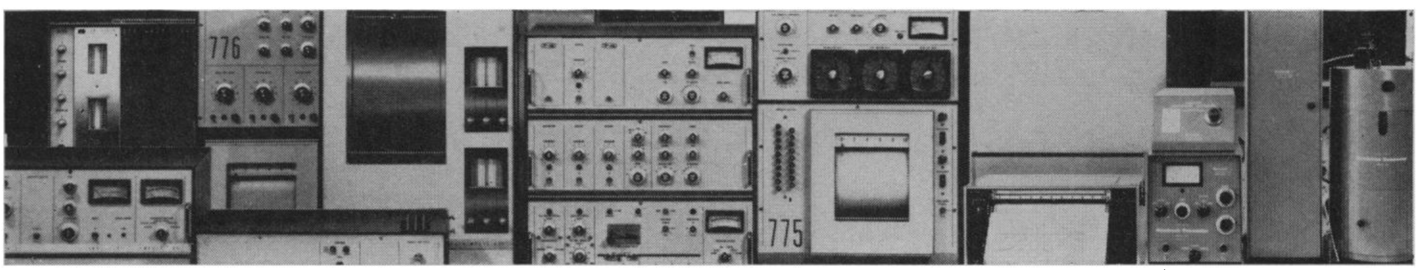
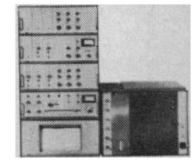
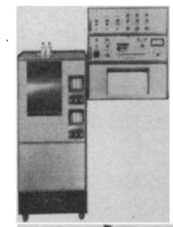
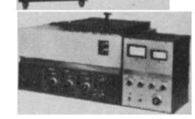
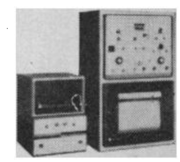
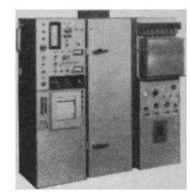
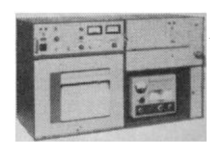
COVER

The population of Hawaiian Goose (or Nene) in the wild had declined from 25,000 in the 1800's to less than 50 about 10 years ago. There are now about 285 in the wild (approximately 200 on the islands of Hawaii and 85 on Maui, respectively, State of Hawaii). These birds had been the victims of overhunting, wild dogs and pigs, and mongooses. International and U.S. protective measures have been initiated to protect this endangered bird. See page 269. [Luther Goldman, U.S. Department of the Interior]


776
775

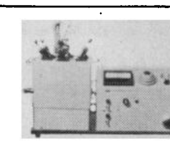
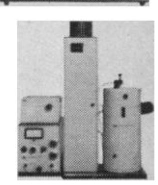
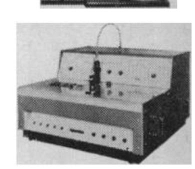
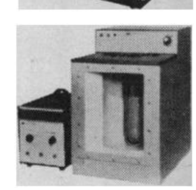
Gas Chromatographs

Type	Description	Detectors	Model	Price (not including recorder except where noted: f.o.b. Avondale)	Literature Key For more information, circle number on reader service card
Automated Research GC	Highest quality; performance equal to the strictest research requirements; simultaneous installation of any three detectors and simultaneous operation of any two with dual column compensation; fully versatile and automated.	Dual flame (Df)	5751A	$3300.00	3
		Dual thermal conductivity (Dtc)	5752A	3200.00	
		Electron capture (Ec)	5753A	3500.00	
		Df and Dtc	5754A	4300.00	
		Df and Ec	5755A	4350.00	
		Df and Dtc and Ec	5756A	5300.00	
High-Efficiency GC	Dual U-tube glass columns, high-efficiency gc system, multiple detector options... for the analysis of hard-to-chromatograph materials.	Df	402	3700.00	4
		Df and Ec (tritium)	402 + opt. 02	4295.00	
		Df and Ec (Ni^{63})	402 + opt. 03	4550.00	
Modular Laboratory GC	Low-cost dual-column instrument with modular design that permits easy addition of functional accessories.	Dual thermal conductivity	700-00	1100.00	5
		Dual flame	700-1099F	1700.00	
		Electron capture	700-3099F	1850.00	
		Micro cross-section	700-4099F	1650.00	
Thermal Conductivity Laboratory GC	Fully integrated dual-column instrument widely known as a laboratory workhorse.	Dual thermal conductivity	720R-2010	3925.00 (incl. recorder)	—
Preparative GC	True prep-scale instruments accommodate various sizes of prep columns between ⅜ and 4″ OD, with built-in analytical capability; automatic (775) and manual (776) versions.	Thermal conductivity	775	8800.00 (incl. recorder)	6
		Flame ionization	776	3500.00	7
Carbon Hydrogen Nitrogen Analyzer	For simultaneous micro-determination of carbon, hydrogen and nitrogen in organic materials; performs a complete elemental analysis in 10 minutes; accuracy and precision of results compare favorably with those obtained by classical methods.		185	6000.00 (incl. balance and recorder)	8

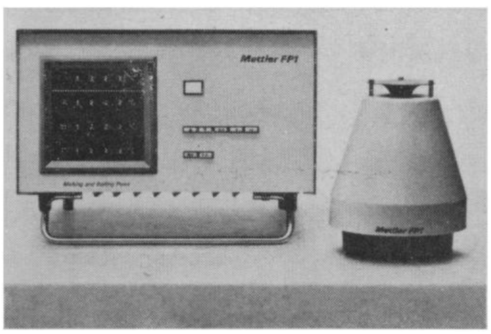
Instruments for Molecular Weight Determinations

Type	Description	Temp. Range	Model	Price (without accessories; f.o.b. Avondale)	Literature Key
Vapor Pressure Osmometer	For number-average molecular weight determinations between 100 and 25,000; consecutive readings every 2-3 minutes; aqueous or non-aqueous operation.	25° to 130°C	302	$ 2800.00	9
Membrane Osmometer	For number-average molecular weight determinations between 10,000 and 1,000,000; automatic readings in 3 to 10 minutes; for aqueous or non-aqueous operation.	Ambient to 65°C	501	$ 4375.00	10
		Ambient to 130°C	502	5125.00	
		5° to 65°C	503	5700.00	
Light-Scattering Photometer	For weight-average molecular weight and particle size determinations; automatic readings every 5 to 10 minutes.	Ambient to 150°C	701	$10,120.00	11
Auto-Viscometer	For viscosity-average molecular weight determinations to a precision of 0.005%; completely automated; optional printer-programmer.	Ambient to 150°C	5901B-5910A (incl. 4 detectors and constant temperature bath)	$ 4140.00	12

New Mettler FP-1 Determines Melting and Boiling Points Automatically

he Mettler FP-1 brings new significance nd efficiency to melting and boiling point eterminations. Once the instrument is rogrammed and started, determinations re completed and results displayed auto- ıatically. It completely eliminates the ıeed for an operator's constant attention nd close visual observation.

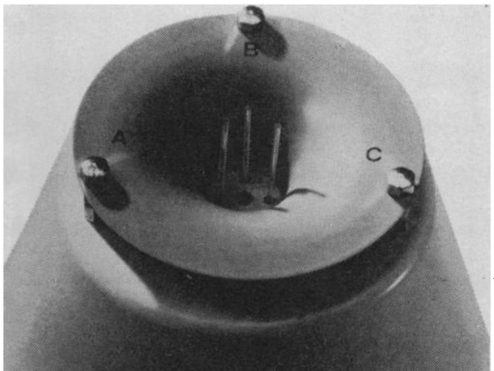


All it takes.

'he instrument combines a fully-transis- orized linear temperature program and :ontrol system, a precision platinum re- ;istance thermometer, electronic sensing)f the endpoint, and all-digital display)f results. It provides greatly improved ınalytical data, with greater speed and ɔrecision than any other system for deter- nining melting or boiling points.

.AULTIPLE DETERMINATIONS

The Mettler FP-1 can perform three melt- ing point determinations simultaneously, each with its result displayed in digital form. This not only increases operating efficiency, but makes the running of mixed melting points convenient and truly practical.

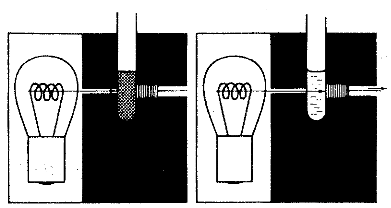


Three at a time.

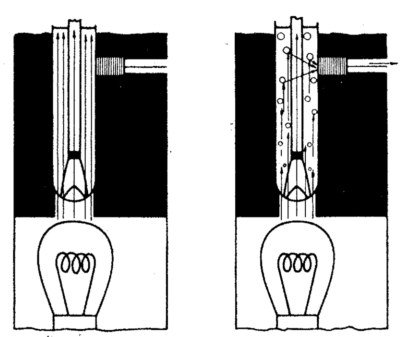
Overall performance is further enhanced by a high speed cooling fan which pro- vides rapid cool-down between runs.

OBJECTIVE RESULTS

As the sample in a melting point test changes from solid to liquid, its light ab- sorption decreases and it becomes trans- parent. The Mettler FP-1 detects changes in intensity of light transmitted through the sample to a precisely-calibrated photo- cell[1]. This sends an immediate stop signal to its digital counter when the melting point is reached.



Melting sensed electronically.



Boiling, too.

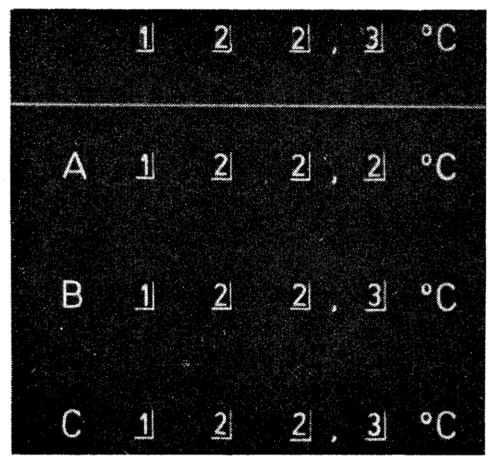
Boiling point determinations are made according to an adaptation of the classi- cal Siwoloboff method. Dark field illumi- nation enables a calibrated photocell to detect bubbles released by boiling. When bubbles are released with sufficient fre- quency to indicate true boiling, a digital counter registers the exact temperature.

Both melting and boiling point determi- nations thus are completely objective. There is no need for individual choice or estimation on the part of the operator.

[1] H. F. Stimson, "The International Temperature Scale", N.B.S. Jour. Res., 42, p. 209-217, (1949).

ALL-DIGITAL DATA

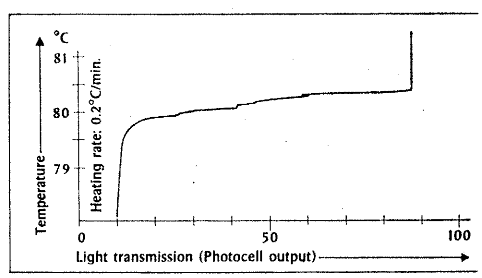
Digital readout eliminates subjectiv errors associated with reading mercur thermometers and interpreting recordin charts. In addition, it provides greatly im proved speed and accuracy when readin results. By means of a hold feature, result of a determination are retained on th readout panel until the instrument i cleared for its next run.



All numbers, no eyeball fatigue.

RECORDING CAPABILITY

Used with a standard time-base recorde the Mettler FP-1 can provide curves show ing changes in light transmission a sample temperature increases. This is useful aid in studying the dynamics c the melting process and in analyzing th purity of compounds.

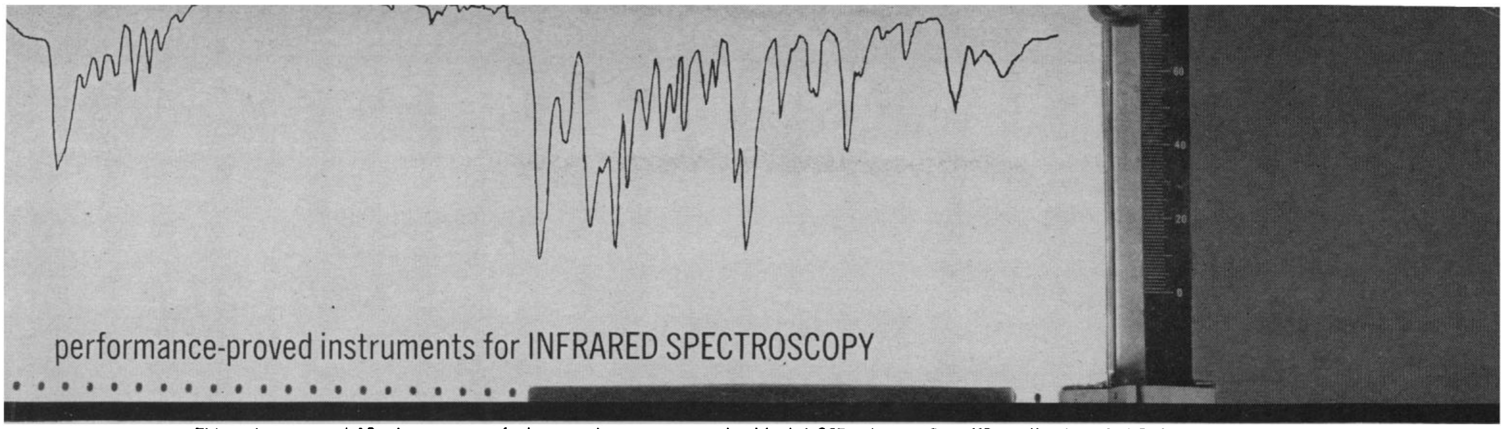


It even draws pictures.

LITERATURE AVAILABLE

Ask for literature describing the ne Mettler FP-1 or request a demonstratio or trial in your own laboratory. Writ Mettler Instrument Corporation, 20 Nassa Street, Princeton, New Jersey 08540.

Mettler



This uninterrupted 12-minute scan of phenacetin was run on the Model 257 using a .5mm KBr pellet in a 1x4 Refracting Beam Condenser. Sample volume was 1 microgram. A Refracting Beam Condenser was also placed in the Reference Beam.

FLEXIBILITY AT THE TOUCH OF A BUTTON— THE MODEL 257

Here is a high-resolution double-grating infrared spectrophotometer that gives you flow-chart recording and automatic control features not found in any other instrument in its moderate price range. The Model 257 offers·

- A wider range of scan speeds: 5, 12, and 48 minutes per run.
- Automatic reset—at the end of the run, monochromator automatically returns to 4000 cm^{-1}.
- Abscissa expansion, by factors of 2.5 and 10X, to spread out the close, sharp bands typical of grating spectra—particularly in the analysis of gases.
- Time drive, to permit the quantitative determination of kinetic changes in a sample, at one significant frequency, over a period of time.
- Variable slit control, allowing very narrow slits for high resolution, as well as the wide openings required for energy-limited analyses such as by ATR and micro-sampling.
- Visual mode and frequency indicators: you always have a positive indication of mode of operation and frequency position.

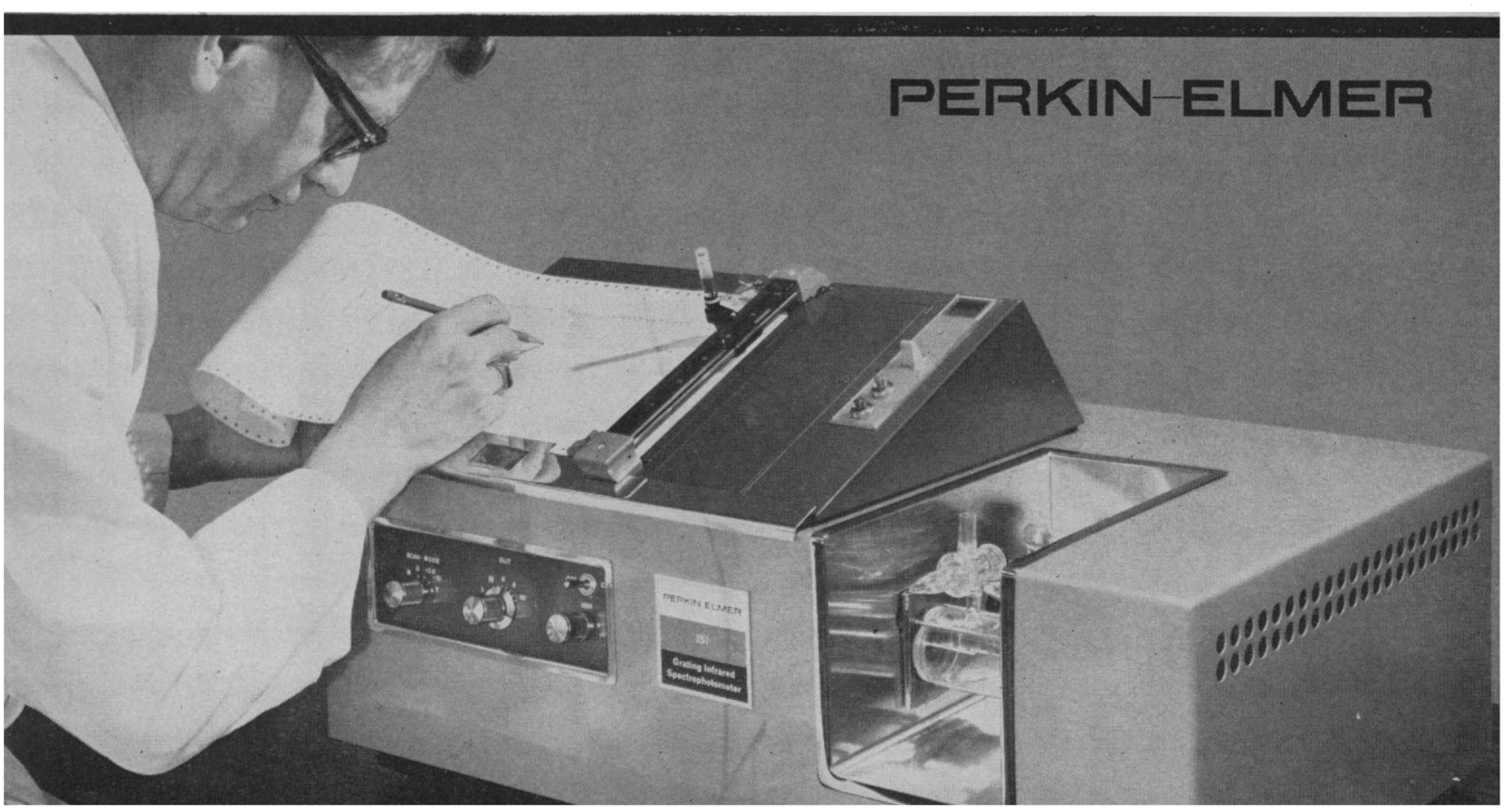
The Model 257's large f/5 aperture enables you to obtain accurate spectra even with very small samples. You can vary the slit program to suit the requirements of the analysis. Or you can keep the frequency fixed and record the changes in transmittance as a function of time.

You have a choice of three recording speeds—plus an extra-fast speed control that lets you move quickly from one spectral region to another.

You read your results on a flow chart recording system (linear transmittance vs. linear frequency) which is continuous in presentation. The chart is synchronized with the monochromator drive, and both start with a single pushbutton.

At the end of the run the monochromator setting automatically returns to the start position while the operator tears off the completed chart prior to recording the next spectrum. The chart is pre-calibrated; no alignment is necessary to start a new recording. You can make forty complete recordings on a single roll of chart paper. Because of the unique positive sprocket drive, abscissa accuracy is unaffected by humidity or temperature fluctuations.

For full details and sample spectra, write The Perkin-Elmer Corporation, **723** Main Avenue, Norwalk, Connecticut.



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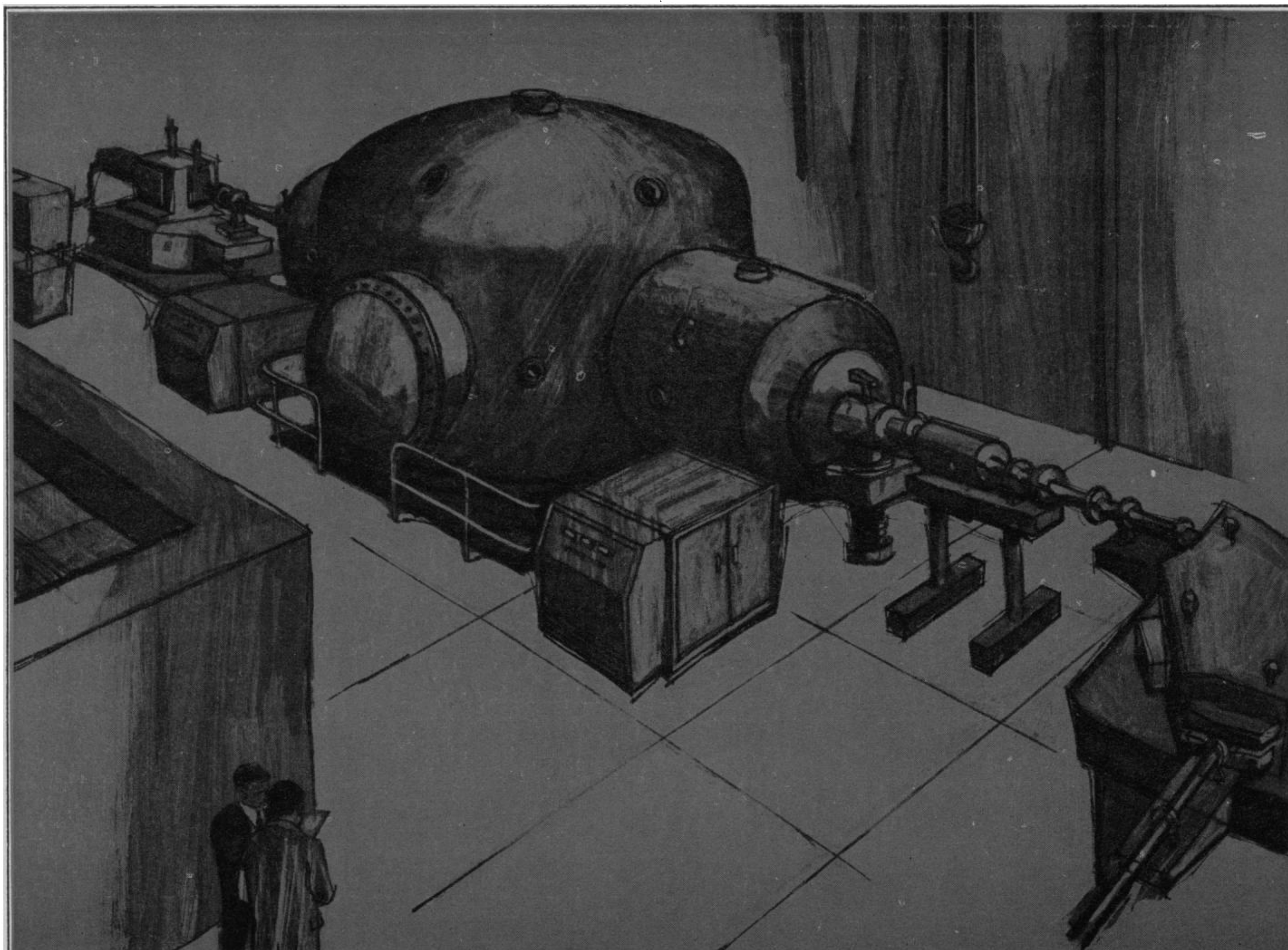


A microscope in the field
is worth two in the lab
...for some applications
There are many situations—away from the lab—where the opportunity for on-the-spot use of a microscope can be most valuable, even essential.
The veterinarian determining the sperm virility of a prize bull would certainly find this more practical than taking either the animal or the specimen to his laboratory. The public health man working on pest control or water pollution, can pack a prodigious amount of work into his field trips by simply screening and classifying samples on-the-spot; pre-selecting those warranting final study in the lab.
The Nikon H hand or field microscope was designed for just such applications. Notwithstanding its diminutive size (it's no larger than a 35mm camera) the Nikon H is a sophisticated, precision instrument. It is equipped with a 10X screw-in, wide-field eyepiece and a rotating nosepiece which accepts any three of the following parfocal, achromatic objectives: 4X, 10X, 40X and oil immersion 100X. The Nikon H also has a built-in Abbe double-lens condenser with iris diaphragm.
Illumination is provided by either daylight, or a built-in incandescent lamp powered by two self-contained penlight batteries. All controls for fine focusing, nosepiece rotation and slide manipulation are conveniently located, yet recessed to prevent accidental disturbance.
Among the most obvious applications for the Nikon H microscope is its use as an educational tool. There are others, equally self-evident. For the benefits to be derived from the capabilities of this unique little instrument are manifold. The Nikon H is supplied complete with oil applicator, carrying case and shoulder strap.
For details and specifications, write: Nikon Inc. Instrument Division, Subsidiary of Ehrenreich Photo-Optical Industries, Inc., Garden City, N.Y. 11533.

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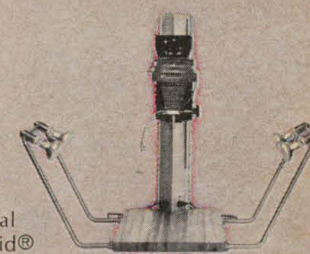

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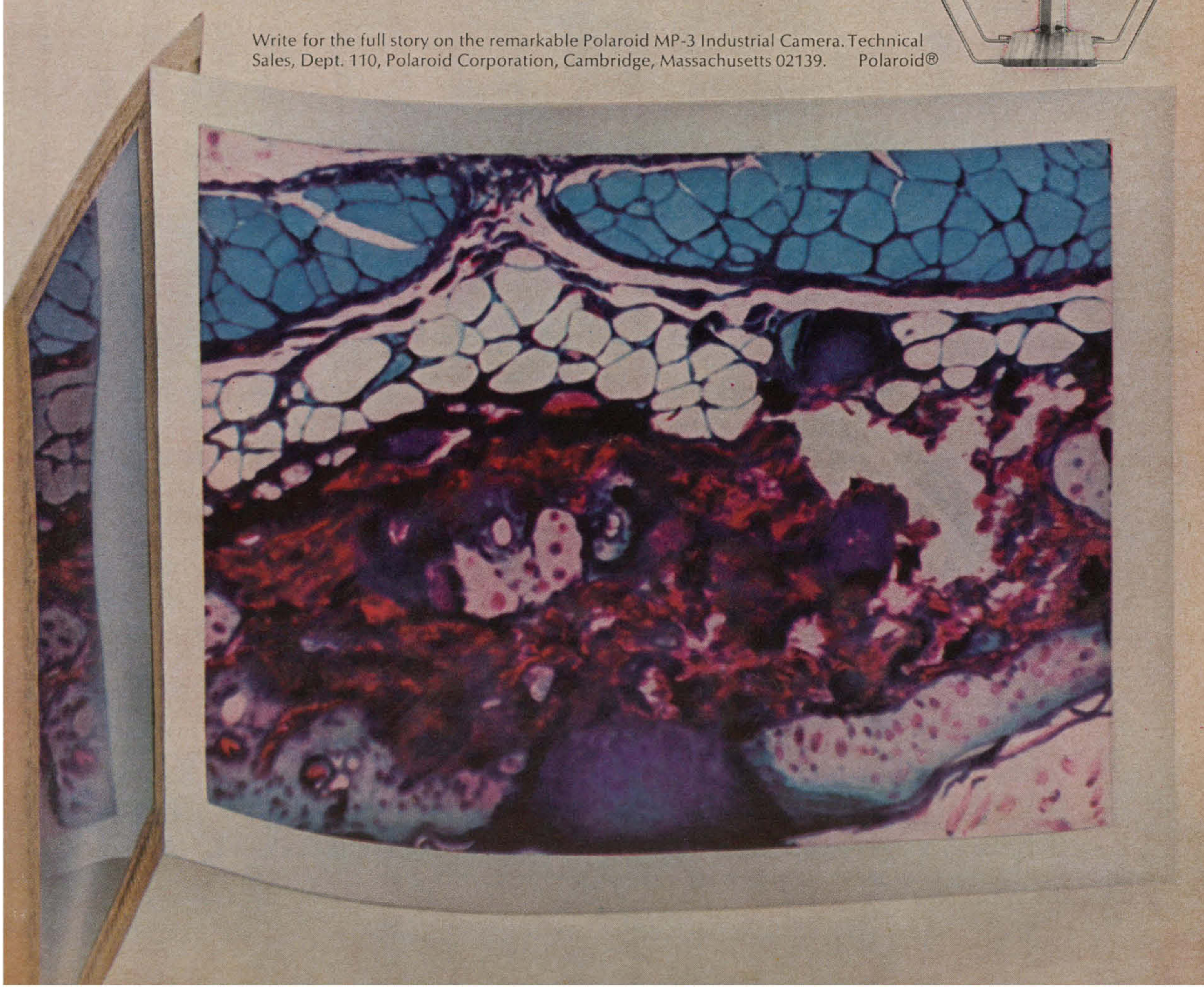

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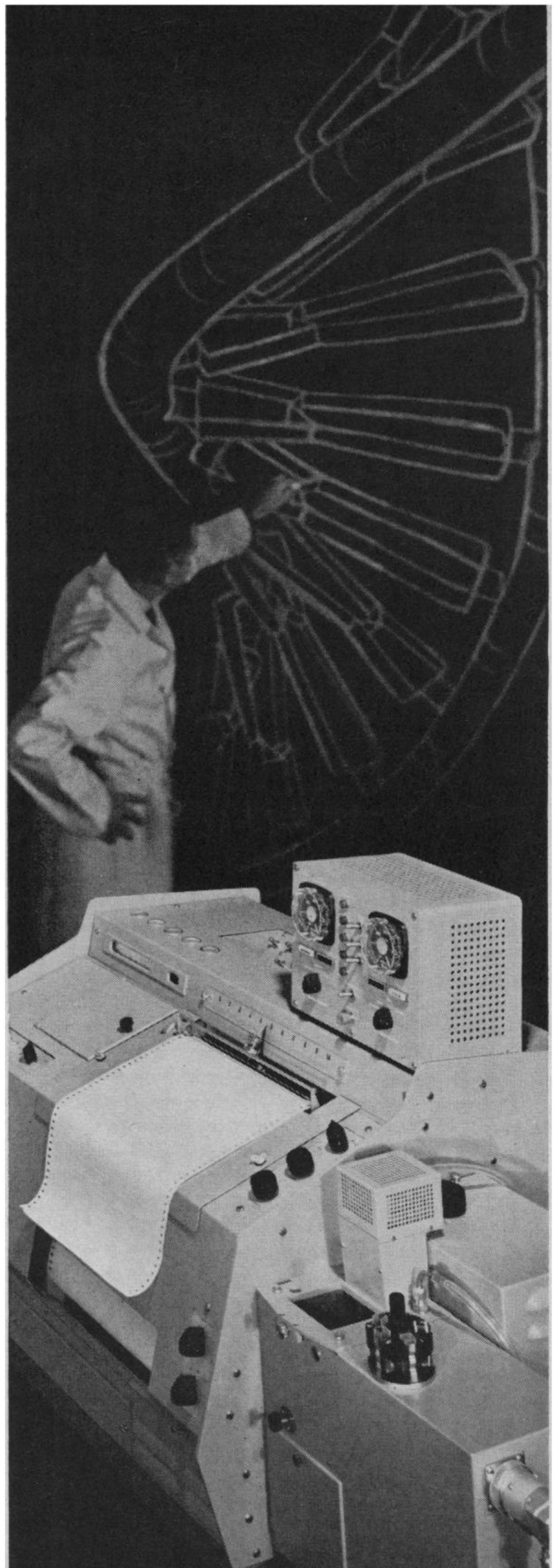

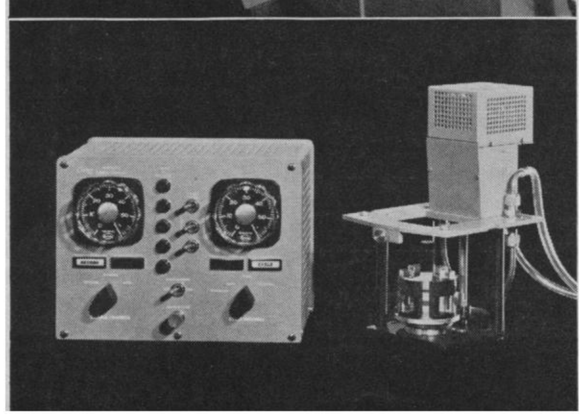

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other; granted that this has not been achieved universally nor without some friction. The University of Ottawa contributes her share to all levels of government, including the ministerial level, and, we believe, holds especial importance for the future of Confederation.

EDWARD O. DODSON
Department of Biology,
University of Ottawa, Ontario, Canada

Parnassus Revisited

After self-administration of a drug, in the presence of a group of friends, a young English scientist reported:

> . . . a thrilling, extending from the chest to the extremities was almost immediately produced. I felt a sense of tangible extension, highly pleasurable, in every limb; my visible impressions were dazzling, and apparently magnified; I heard distinctly every sound in the room, and was perfectly aware of my situation. By degrees, as the pleasurable sensations increased, I lost all connection with external things; trains of vivid visible images rapidly passed through my mind, and were connected with words in such a manner as to produce perceptions perfectly novel. I existed in a world of newly-connected and newly-modified ideas; I theorised, I imagined that I made discoveries. When I was awakened from this semi-delirious trance . . . indignation and pride were the first feelings produced by the sight of the persons about me. My emotions were enthusiastic and sublime, and for a minute I walked around the room, perfectly regardless of what was said to me. As I recovered my former state of mind, I felt an inclination to communicate the discoveries I had made during the experiment . . . with the most intense belief and prophetic manner, I exclaimed . . . *"Nothing exists but thoughts! the universe is composed of impressions, ideas, pleasures, and pains."*

"Wild enjoyment" persisted for more than 2 hours. Marihuana? LSD? Mescaline? No, the drug was nitrous oxide; the scientist was Humphry Davy; the time was 1799 (*1*). Southey and Coleridge are said to have been inspired more to laughter than to poetry at ensuing laughing-gas parties. These anticipated the "ether frolics" of the past century and the "pot parties" and "LDS-trips" of today.

The fact that simple N_2O can elicit subjective responses resembling those caused by complex molecules, like LSD and mescaline, should give added perspective on the action of hallucinogenic drugs. Researchers hampered by the

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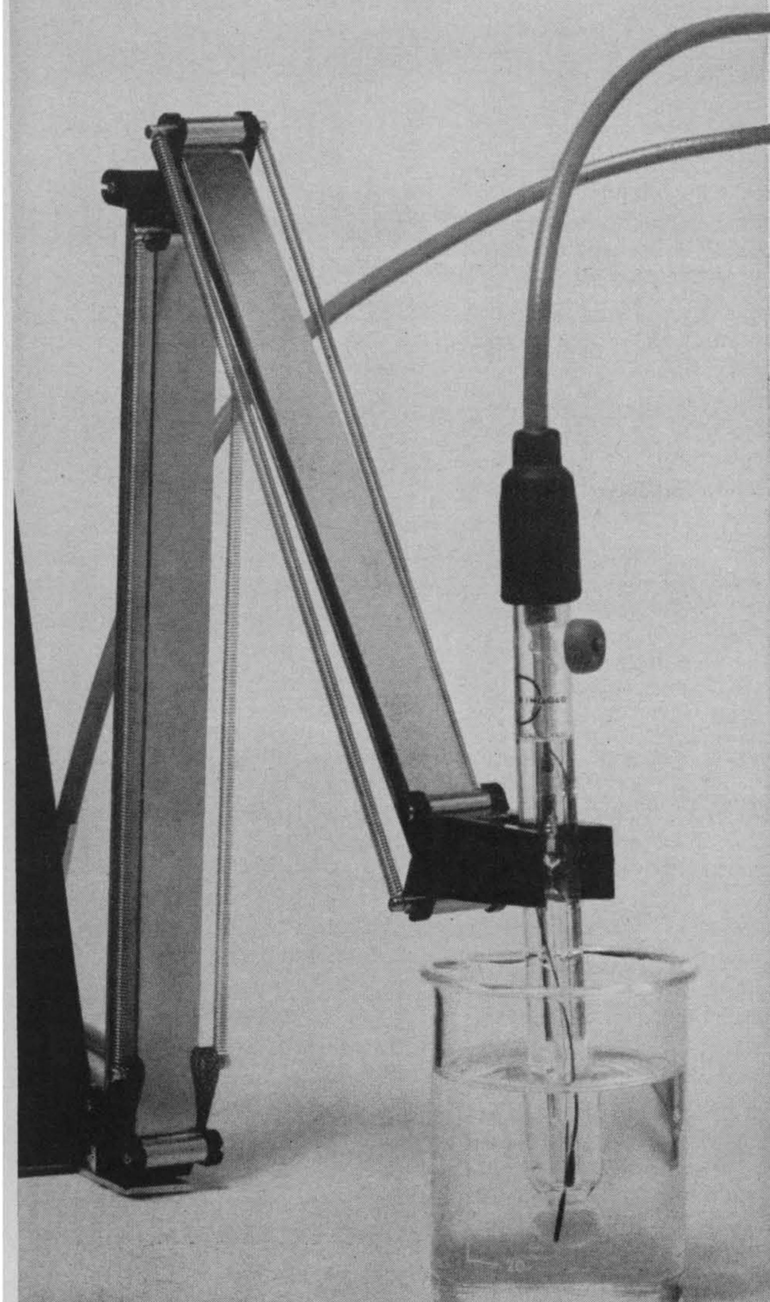

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current "shrouds around LSD" (Letters, 18 Nov.) may wish to reconsider nitrous oxide for provoking sensory perturbations. Nitrous oxide is not likely to compete with LSD or mescaline as an illegal chariot to Parnassus, because of its inconvenient form (compressed gas in cylinders), variability of action, and unpleasant side effects at times.

ARTHUR CHERKIN
Psychobiology Research Laboratory, Veterans Administration Hospital, Sepulveda, California 91343

Reference

1. J. Davy, *Memoirs of the Life of Sir Humphry Davy, Bart.* (Longman, Rees, Orme, Brown, Green, and Longman, London, 1836), pp. 98–99.

Save Enough Redwoods!

"Save-the-Redwoods" does not imply simply a need to preserve a species as interpreted by Fahnestock (Letters, 2 Dec.). The Save-the-Redwoods league was founded with the idea of purchasing and setting aside (by means of contributions from individual donors and matching funds from the state of California) remnants of the once extensive virgin redwood forest for the enjoyment of future generations. A single statistic does not tell the whole story: 50,000 acres (20,250 hectares) of virgin redwoods in existing state parks may appear to be a lot of acreage, but it is a pitifully small fraction (about 3 percent) of the existing coastal redwood stand in California and it is insufficient to absorb in reasonable fashion the hordes of people who visit the groves in increasing numbers each year. A visit to a redwood forest is, after all, meant to be a unique and vital experience, not the museum experience which Fahnestock advocates by preserving isolated groves.

The redwood is remarkably viable, it is true. However, its vaunted ability to survive storm, fire, and flood has not yet met its full measure in the locust-like depredations of man. Unfortunately, California's existing Forest Practices Act still lacks the teeth required to make operators comply with a minimum of good logging practices. The tendency today to log on ever steeper slopes with heavy tractors and machinery can only lead to a decrease in slope stability and accelerated erosion and runoff.

It cannot be stated categorically that

a grove will flourish and regenerate independently of its surroundings, as suggested by Fahnestock. Steep intervening ridges may be of little avail against weather modifications which are induced by regional deforestation.

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Rare Birds Identified

It was kind of *Science* to include Ripley's letter, "Save the Endangered Birds," (11 Nov.). It was most unfortunate, however, that a Mallard duck was chosen to illustrate the point of his letter. The Mallard is one of the most abundant waterfowl in the world, and the fact that its numbers decline somewhat during one breeding season does not mean that it is about to become extinct. This is not the type of bird for which the International Council for Bird Preservation is seeking aid, and if anyone seriously thought we were worrying about saving the Mallard, we would become a laughing stock. One biologist asked me, "What will you try to protect next, the Starling?"

The sort of birds with which the I.C.B.P. is concerned are the California Condor, of which about 50 remain in southern California; the Horned Guan (*Oreophasis derbianus*), very rare and local in cloud forests in southern Mexico and Guatemala; the Atitlán Grebe (*Podilymbus gigas*), of which a small population lives on Lake Atitlán, Guatemala; the Hawaiian Crested Honeycreeper(*Palmeria dolei*), very rare and restricted to Maui Island, Hawaii; the Japanese Crane, of which less than 200 remain in Japan plus a small population in Manchuria; the South Island Saddleback (*Creadion carunculatus*), restricted to a few tiny islets off South Island, New Zealand; the Cahow or Bermuda Petrel, breeding in very small numbers in Bermuda; the Spanish Imperial Eagle, reduced to about 100 in Spain with perhaps a few pairs in North Africa; and the Imperial Parrot (*Amazona imperialis*), confined to the high mountain forest of Dominica, West Indies.

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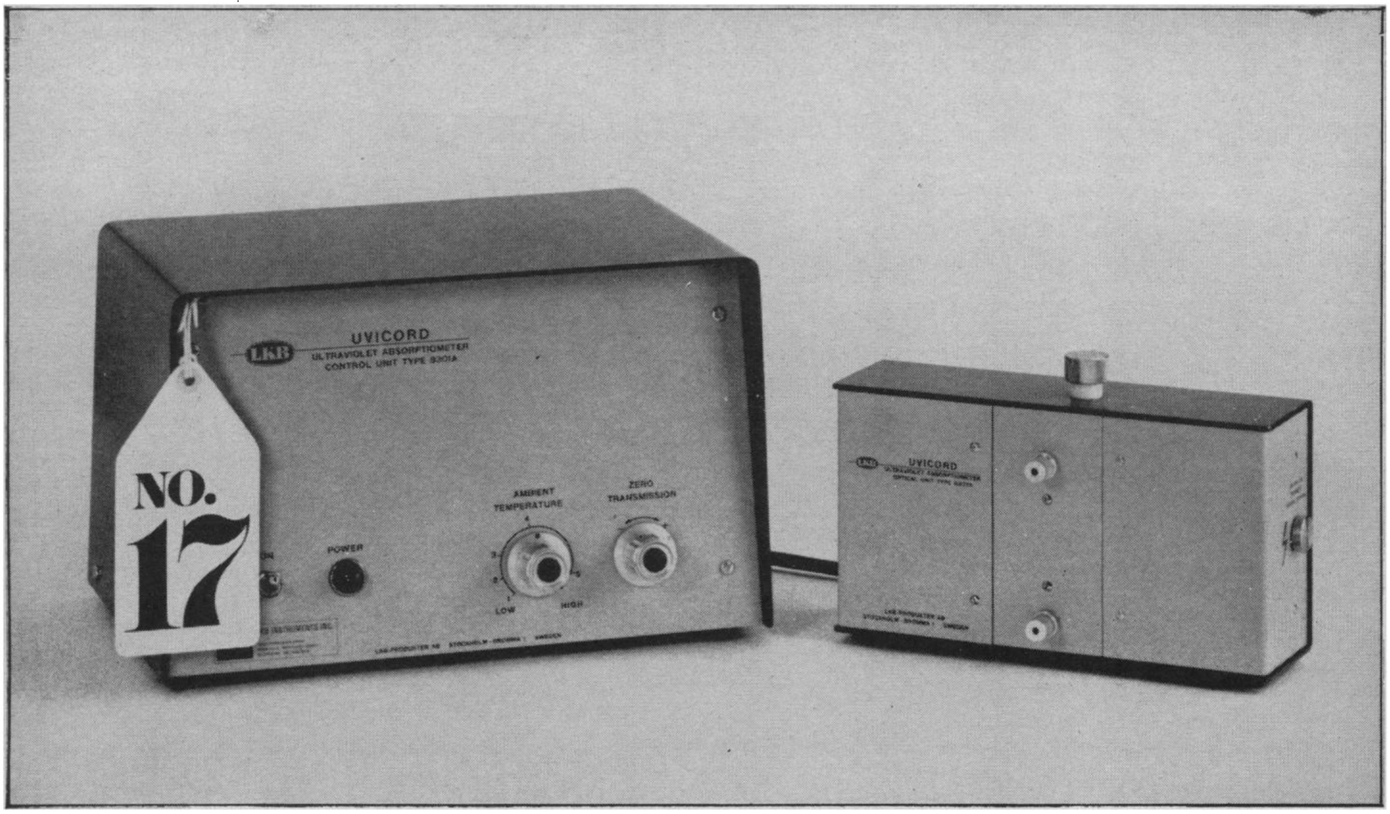

There are at least 16 UV monitors already available (and one of them is even <u>ours</u>). Whatever possessed us to develop number 17?

Unbounded optimism. That, and the rather firm conviction that it was now time for a first-rate, fully quantitative flow analyzer for monitoring UV absorption at either 254 or 280 mμ.

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(So now there are at least 17 UV monitors, and *two* of them are ours.) For complete specifications on the Uvicord II, ask for bulletin **8300S11.**

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20 January 1967, Volume 155, Number 3760

SCIENCE

The Moral Sense of the Scientists

The recent meeting of the American Association for the Advancement of Science provided an impressive body of evidence that many scientists now are indeed worried about their social responsibility. The announced theme of the week's sessions was "How Man Has Changed His Planet," and the phrase provided far more than a take-off point for bragging. It was a symptom of the unease that permeated the meeting.

Thus Thomas F. Malone warned one session that the possible consequences of weather modification must be weighed "before we are called upon to deal with them." Malone, vice president of the Travelers Insurance Company, told his audience: "The point is that there is still time for reflective thought, for setting objectives, for weighing alternative courses of action—in short, to act responsibly."

In the kind of exhortation that had telling effect on its audience but could earn little space in newspapers, Malone went on: "If the exploration of weather modification adds one more small brick to the edifice that contains world conflict and supports world order, science will have served a noble purpose by enriching human life. The burden of responsibility for seeing that this happens is, I believe, on scientists."

It was not only the prospects of man's modifying weather, however, that aroused concern. Other aspects of man's effects on his environment—notably air and water pollution—also stirred it up.

Questions from the audience at a session on pest control, for instance, indicated widespread worry about the use of chemical pesticides whose residues last a long time, such as DDT. The questioners were looking for the kind of assurance they got from George L. Mehren, Assistant Secretary of Agriculture, that most Government research money in pesticides—the 1966 figure was 79 percent—is now going into nonchemical means.

The impact of science on man's social environment drew concern, too, as the sessions on the races of humankind showed. The most heated area of dispute was on the question of how scientific inquiry would do least to feed the fires of racial animosity. One school held that the best thing to do was stay away entirely from investigations of the differences between the races, which one scholar labeled "pseudoscientific"; the other held that inquiry should go forward but that researchers have the obligation to denounce erroneous interpretations drawn from it. Geneticist Theodosius Dobzhansky, an exponent of the latter argument, added: "And in our world a scientist has no right to be irresponsible." The audience applauded his sentiment.

But exactly what is the scientist's responsibility in the matter of racial differences? The day of arguments produced no consensus.

Nor were those attending the meeting allowed to forget the historical examples of how science had hurt, rather than helped, mankind. Loren C. Eiseley, a historian of science, taxed the 19th century's evolutionists with characterizing races other than those of Western Europe as inferior, rather than simply different. The tags have persisted, he noted.

And Lynn T. White, Jr., another historian, argued that "both our present science and our present technology are so tinctured with Christian arrogance toward nature"—the attitude that it exists for the service of man—that "the remedy must also be essentially religious." Science and technology, he said, cannot answer all the questions they raise.

—J. V. REISTRUP*

* This editorial is condensed from a column in the 5 January issue of *The Washington Post* and is used here by permission of the publisher.

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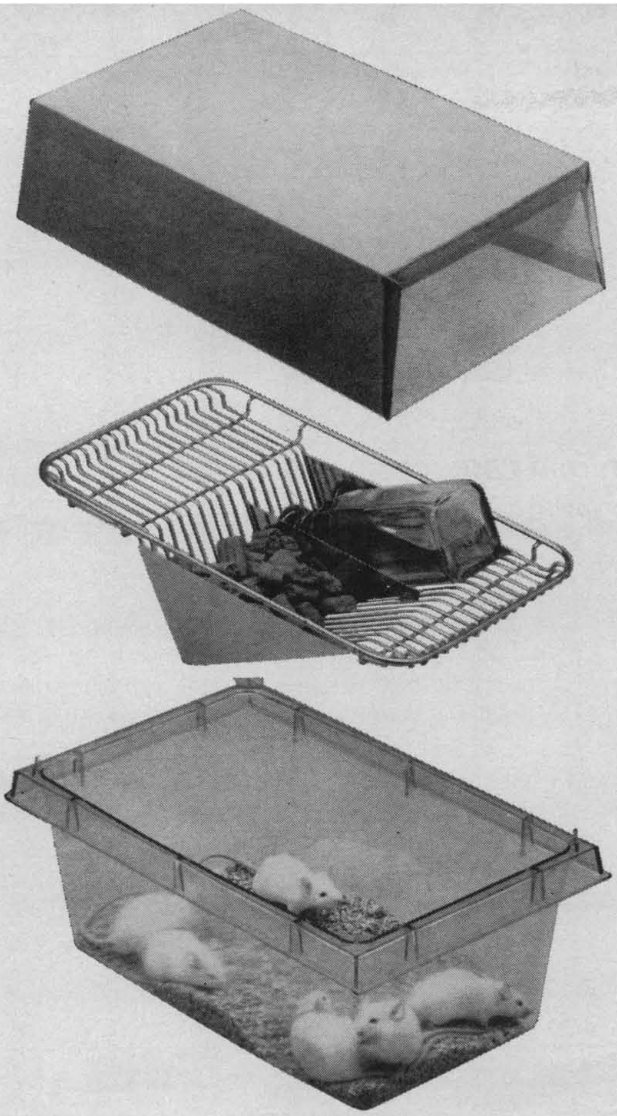

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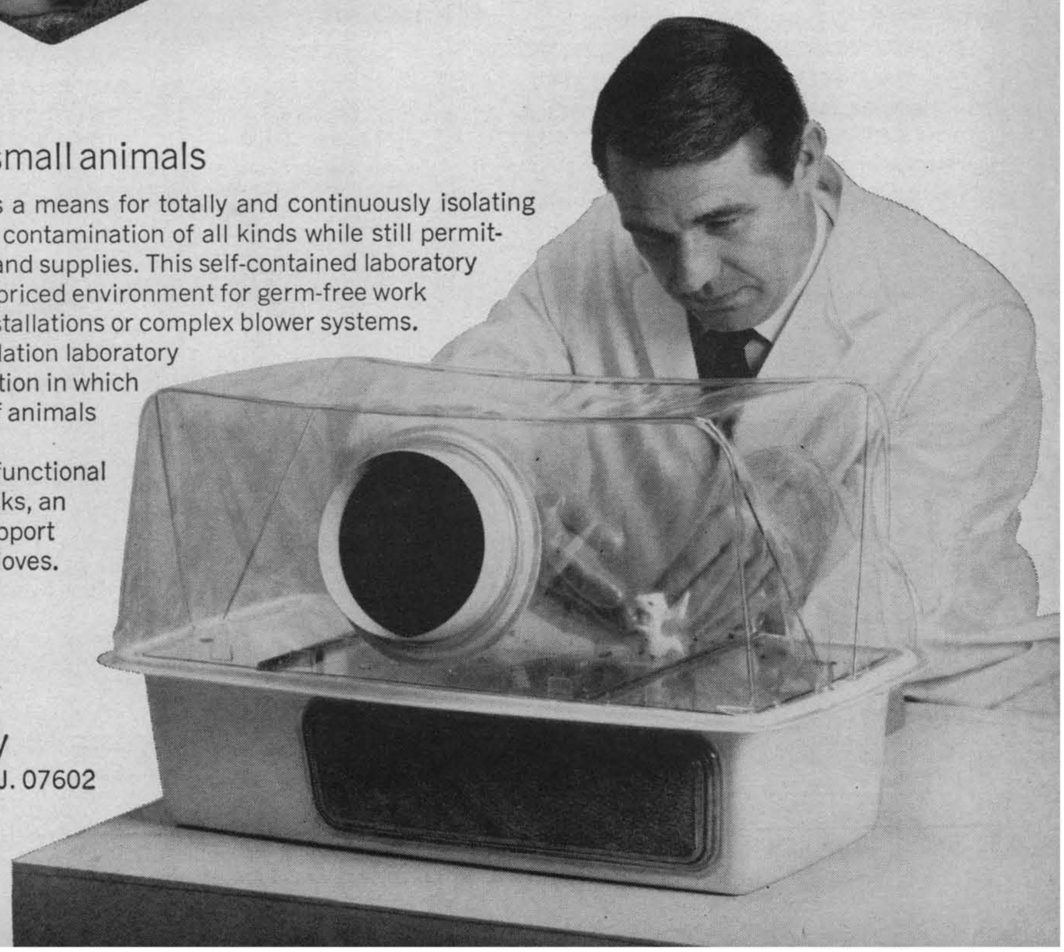

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pletely brittle ceramics fracture in a manner similar to glass, a reduction in flaw size and density is necessary. Improvements in semibrittle ceramics may be obtained by increased ductility or strength. Solid solution and precipitation hardening have been attempted, but grain size refinement and elimination of porosity appear to be the best avenues of approach. Finally, improvement in the ductile fracture resistance at high temperatures implies an improved creep resistance. At present, he said, it appears that high density polycrystalline ceramics containing a second phase may provide the most satisfactory properties.

In an analysis of the brittle-to-ductile transition in polycrystalline metals, T. L. Johnston (Ford) placed major emphasis on factors related to the plastic resistance associated with grain boundaries and the effects of plastic anisotropy. Utilizing a generalized form of the Griffith criterion, he said it can be readily shown that several individual factors may be made reasonably quantitative and that the nature of plastic response can be predicted. Specifically, it can be shown that a critical factor relates to the length of a plastic shear zone which is constrained by an elastically loaded matrix. As this length increases, the Griffith inequality is satisfied and brittle failure occurs; however, the use of decreased grain sizes or the refinement of dislocation or twin distribution can further tend to "homogenize" the plastic flow and to decrease the magnitude of the shear zone. Of considerable importance in the consideration of plastic resistance is the availability of favorably oriented slip systems in an unsheared crystallite. This factor takes a semiquantitative form in the expression of the Von Mises criterion, which states that plastic deformation of a polycrystal will proceed with relative ease if each grain possesses five independent slip systems. In the case of hexagonal-close-packed lattices, for example, if slip is confined to basal slip, each grain will have an average of two systems, so that the grain boundaries will serve as effective barriers for plastic flow and brittle fracture may result. He demonstrated that if the product of applied tensile stress, grain size, and plastic shear resistance reaches a value proportional to modulus and surface energy, brittle fracture will result. Similarly, the appropriate variation (in temperature) with any of these "intrinsic" variables will provide a situation where the material is ductile as would be the case where high temperature promotes the ease of cross slip and an attendant decrease in grain boundary resistance.

N. S. Stoloff (Rensselaer Polytechnic Institute) reviewed the effects of solutes on the fracture behavior of metals, discussing the influence of various alloy additions on the different factors entering the expression of the fracture criterion. He said that a detailed study on such a problem is complicated from the outset, since it may be difficult to isolate individual parameter changes because a given alloying element can produce multiple (and sometimes competing) effects. However, since there has been considerable research in this field, several general conclusions can be drawn. It is clear that the Cottrell-Petch theory of fracture, including modifications to take into account slip character, provides an adequate qualitative picture of alloying effects, but it is not yet possible to unambiguously predict the influence of a given solute on the transition temperature of a base metal.

In his discussion of tensile failure, C. J. McMahon (University of Pennsylvania) emphasized the role of microstructure and the mechanisms of crack initiation and propagation. For brittle fracture, he demonstrated that the probabilities of both initiation (P_i) and propagation (P_p) must contribute to the total fracture probability, and that these factors may affect properties to widely differing degrees. For example, in iron-containing carbides, cleavage microcracks can be nucleated readily at low stress by carbide cracks, but fracture will not occur (except at very low temperatures) until P_p has been raised by work hardening. Here P_p controls fracture. In the case of polycrystalline and single crystal chromium below the ductility transition temperature, it has been demonstrated that fracture is very definitely initiation-controlled and that large ductility can be achieved by rendering potential crack sources inoperative.

S. Sternstein (Rensselaer Polytechnic Institute), in a discussion of fracture in polymeric materials, noted the differences between values of the surface energy calculated from "first principles" and those determined experimentally from an application of the Griffith criterion. The main conclusion from a series of experiments on controlled crack formation and propagation relates to the fact that the "crack size," as normally considered in the Griffith relation, must be modified. Previous work had suggested that the excess values of surface energy (sometimes high by a factor of 100 to 1000) might be rationalized in terms of a thin layer of plastic deformation or reorientation near the fresh fracture surface. However, this assumption, he said, is inconsistent with what might normally be expected in an examination of the temperature-dependence of the surface energy. Sternstein and coworkers have, on the other hand, determined that the discrepancies observed can be rationalized in terms of a crack-tip size which is modified by a parameter dependent on the history of the crack. For example, they have shown that where cracks are introduced into polymers at different temperatures and then the polymers are fractured at the same temperature, the fracture characteristics are markedly different.

Superposed on this "static" behavior, it is important to consider the dynamic effects observed in the fracture of polymers, and the related fact that the size of the region around the crack tip will depend, in part, on the rate at which the crack tip grows. Thus, there is a cyclic problem: the size of the region at any instant will govern its growth at that instant, but the growth will in turn determine the ability to grow in the next instant of time, since the stress-concentration factor will be changing with time. He concluded that, in general, the rheological response of the material will be linked to the ability of the material to undergo a plastic deformation and that this link is achieved through a time-dependent stress-concentration factor.

Bernard Rosen (Southern Research Institute), continuing the discussion of failure in polymeric systems, spoke on homogeneous fatigue processes, in particular, the salient micro-failure habits of a class of polymeric bodies that are both fully amorphous and soft. These supercooled liquids are taken as being composed of long and linearly-chained molecules, including unvulcanized rubbers, synthetic leathers, and soft organic glasses. Through a qualitative description of the effect of tensile forces on the reorientation of long chain molecules, he discussed models which may account for "work-hardening" and optical and mechanical anisotropies in

polymers. An interesting consequence of this analysis is the observation that it can be easier to initiate a new crack than it is to propagate an already existing crack.

Turning to what is termed "homogeneous submicrocavitation," he pointed out that two types of analyses may be attempted: a consideration of a solid body complicated by liquid-like responses (the approach chosen by Sternstein), or a consideration of a liquid body complicated by solid-like responses (Rosen's choice). The model is developed through the introduction of a cavitation process (the existence of which has been supported through permeation experiments) which produces exceedingly small voids within the matrix. The subsequent failure may occur through either of two mechanisms: (i) a dense population of such cavities, or (ii) the presence of a few independent cracks. Whether one of these mechanisms dominates will depend strongly on the period of loading and the time required for relaxation. Rosen carried the argument, again in a qualitative sense, to the description of slipping of chain-like molecules and primary-bond scission of chains, thereby building a "molecular plane of reasoning" to obtain a self-consistent, though still qualitative, description of the flow and fracture of soft polymeric bodies.

In addition to the formal papers presented at the conference and the question-and-answer periods, two highly informative panel discussions, held in connection with the general considerations of fracture in a variety of different solids, provided a deeper insight into the limitations imposed when one attempts to translate one disciplinary approach to another field, while at the same time providing an atmosphere in which it was possible for the various backgrounds—metallurgy, ceramics, physics, chemistry—to supply "hints" to the solution of old problems.

The proceedings of this Fourth Symposium on Fundamental Phenomena in the Materials Sciences, including the papers presented, the question-and-answer periods, and the panel discussions, will be published by Plenum Publishing Corporation, 227 West 17 Street, New York 10011.

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JULES J. DUGA
Battelle Memorial Institute,
Columbus, Ohio

Forthcoming Events

January

28–30. **Radiology,** southern conf., Point Clear, Ala. (M. Eskridge, P.O. Box 4097, Mobile, Ala.)

28–1. American Acad. of **Allergy,** Phoenix, Ariz. (J. O. Kelley, 756 North Milwaukee St., Milwaukee, Wis. 53202)

29. **Mössbauer Effect Methodology,** 3rd annual symp., New York, N.Y. (P. A. McNulty, New England Nuclear Corp., 575 Albany St., Boston, Mass. 02118)

29–3. **Power,** mtg., Power Group, Inst. of Electrical and Electronics Engineers, New York, N.Y. (E. C. Day, IEEE, 345 E. 47 St., New York 10017)

30. American Soc. of **Heating, Refrigerating, and Air Conditioning Engineers,** semi-annual mtg., Detroit, Mich. (Miss J. I. Szabo, 345 E. 47 St., New York 10017)

30–1. **Personnel Radiation Dosimetry,** symp., Chicago, Ill. (J. H. Pingel, Argonne Natl. Laboratory, Bldg. 301, 9700 S. Cass Ave., Argonne, Ill. 60439)

30–2. American **Physical** Soc., annual mtg., New York, N.Y. (The Society, Executive Secretary, Columbia Univ., New York 10027)

30–2. American Assoc. of **Physics Teachers,** New York, N.Y. (A. B. Arons, Physics Dept., Amherst College, Amherst, Mass.)

30–3. **Zodiacal Light and the Interplanetary Medium,** intern. symp., Honolulu, Hawaii. (F. E. Roach, Aeronomy Lab., Inst. for Telecommunication Sciences and Aeronomy, Environmental Science Services Administration, Boulder, Colo. 80302)

31–2. Ciba Foundation symp. on **Cell Differentiation,** London, England. (Ciba, 41 Portland Pl., London W.1)

31–3. **Reinforced Plastics,** 22nd conf., Soc. of the Plastics Industry, Washington, D.C. (The Society, 250 Park Ave., New York 10017)

31–4. American College of **Radiology,** mtg., Los Angeles, Calif. (American College of Radiology, 20 N. Wacker Dr., Chicago, Ill.)

February

1–3. Southwestern Federation of **Geological** Soc., Hobbs, N.M. (American Assoc. of Petroleum Geologists, P.O. Box 979, Tulsa, Okla. 74101)

1–3. **Neural Regulation of Food and Water Intake,** conf., New York, N.Y. (P. J. Morgane, Communication Research Inst., 3430 Main Highway, Miami, Fla. 33133)

4–11. Pan American **Medical Women's Alliance,** 10th congr., Lima, Peru. (R. Quiroz B., Los Castanos 395, San Isidro, Lima)

5–6. American Soc. for **Testing and Materials,** natl. symp., Toronto, Ont., Canada. (ASTM, 1916 Race St., Philadelphia, Pa.)

5–10. American Soc. for **Testing and Materials,** winter mtg., Detroit, Mich. (ASTM, 1916 Race St., Philadelphia, Pa.)

6–7. **American Chemical Soc.,** 2nd Mid-Atlantic mtg., New York, N.Y. (S. M. Gerber, Ciba Co., Fairlawn, N.J. 07410)

6–8. **Flight Test, Simulation, and Sup-**

port, conf., Cocoa Beach, Fla. (Meetings Manager, American Inst. of Aeronautics and Astronautics, 1290 Sixth Ave., New York 10019)

6–8. Society of **Rheology**, winter mtg., Santa Barbara, Calif. (M. C. Shen, North American Aviation Science Center, 1049 Camino Dos Rios, Thousand Oaks, Calif. 91360)

7–8. **Sanitary Engineering**, 9th conf., Urbana, Ill. (J. H. Austin, 203 Engineering Hall, University of Illinois, Urbana 61801)

7–9. Institute of **Electrical and Electronic Engineers**, winter conv., Los Angeles, Calif. (Office of Technical Activities Board, 345 E. 47 St., New York 10017)

8–10. Canadian Inst. of **Surveying**, annual mtg., Ottawa, Ont. (Secretary, 157 McLeod St., Ottawa)

13–17. Australia–New Zealand Conf. **Soil Mechanics and Engineering**, 5th mtg., Auckland, New Zealand. (P. W. Taylor, Conf. Secretary, P.O. Box 6422, Auckland)

14–19. **Triplet State**, symp., American Univ. of Beirut, Beirut, Lebanon. (A. B. Zahlan, American Univ. of Beirut)

15–16. **Electron Probe Microanalysis**, conf., London, England. (Institute of Physic and the Physical Soc., 47 Belgrave Sq., London, S.W.1)

15–17. **Solid-State Circuits**, intern. conf., Philadelphia, Pa. (V. I. Johannes, Room 3E-323, Bell Telephone Labs., Holmdel, N.J. 07733)

15–24. **Scientific and Technical Films**, 4th intern. festival, Brussels, Belgium. (Centre Universitaire du Film Scientifique, 50 Ave. F. D. Roosevelt, Brussels 5)

16–18. **American Educational Research** Assoc., New York, N.Y. (L. Walters, 1201 16 St., NW, Washington, D.C. 20036)

17–18. **Thyroid**, 3rd Midwest conf., Columbia, Mo. (Executive Director, Continuing Medical Education, M-176 Medical Center, Univ. of Missouri, Columbia 65201)

18–22. American Acad. of **Allergy**, 23rd annual mtg., Palm Springs, Calif. (Executive Secretary, 756 N. Milwaukee St., Milwaukee, Wis. 53202)

19–23. American Inst. of **Mining, Metallurgical and Petroleum Engineers**, annual mtg., Los Angeles, Calif. (Executive Secretary, 345 E. 47 St., New York 10017)

19–25. **Biochemistry**, Chemical Inst. of Canada, conf., Ste. Marguerite, P.Q. (General Manager, 48 Rideau St., Ottawa 2, Ont.)

20–25. American Acad. of **Forensic Sciences**, mtg., Honolulu, Hawaii. (S. R. Gerber, 2153 Adelbert Rd., Cleveland, Ohio 44106)

21–24. **Offshore Exploration**, conf., Long Beach, Calif. (M. Richardson, Box 88, 2516 Via Tejon, Palos Verdes Estates, Calif. 90274)

22–24. **Biophysical** Soc., 11th annual mtg., Houston, Tex. (A. Cole, M. D. Anderson Hospital, Univ. of Texas, Houston 77025)

23–25. American **Physical** Soc., mtg., Austin, Tex. (K. K. Darrow, American Physical Soc., Columbia Univ., New York 10027)

26. **Psychoanalysis**, 5th annual conf., New York, N.Y. (D. M. Kaplan, 175 W. 12 St., New York 10011)

26–2. International **Anesthesia Research** Soc., 41st congr., Bal Harbour, Fla. (Executive Secretary, 227 Wade Park Manor, Cleveland, Ohio 44106)

27. **Thermoanalysis,** Chemical Inst. of Canada, symp., Toronto, Ont. (H. G. McAdie, Ontario Research Foundation, Toronto, Ont.)

27–1. American **Astronautical** Soc., mtg., Huntsville, Ala. (S. S. Hu, Northrop Space Labs., P.O. Box 1484, Huntsville)

27–1. Fundamental **Cancer Research,** 21st annual symp., Houston, Tex. (D. E. Frei, M.D., Anderson Hospital, Univ. of Texas, Houston 77025)

27–1. **Sounding Rocket Vehicle Technology,** conf., American Inst. of Aeronautics and Astronautics, Williamsburg, Va. (C. A. Sandahl, Mail Shop, 214A, NASA, Langley Station, Hampton, Va. 23365)

27–3. Australian **Dental** Congr., 18th Melbourne. (J. M. Newton, 53 Martin Pl., Sydney, Australia)

27–3. **High Energy Physics and Nuclear Structure,** intern. conf., Rehovoth, Israel. (M. Sela, Weizmann Inst. of Science, Rehovoth)

27–3. **Membrane Structure and Function,** symp., Chemical Inst. of Canada, Ste. Marguerite, P. Q. (K. K. Carroll, Collip Medical Research Lab., Univ. of Western Ontario, London, Ont.)

28–1. **Systems Effectiveness,** 2nd conf., Los Angeles, Calif. (A. M. Wilson, Engineering Dept., Electronic Industries Assoc., 2001 Eye St., NW, Washington, D.C. 20006)

March

1–3. **Effect of Malnutrition on Mental Development, Learning and Behavior,** intern. conf., Cambridge, Mass. (Dept. of Nutrition and Food Science, Massachusetts Inst. of Technology, Cambridge 02139)

1–3. **Particle Accelerator,** natl. conf., American Physical Soc., Washington, D.C. (J. A. Martin, Oak Ridge Natl. Lab., P.O. Box X, 4500S, S-103, Oak Ridge, Tenn. 37830)

2–4. **Nuclear Magnetic Resonance,** conf., Pittsburgh, Pa. (B. L. Shapiro, Dept. of Chemistry, Illinois Inst. of Technology, Chicago, Ill. 60616)

6–7. **High Speed Testing:** Rheology of Solids, 6th intern. symp., Boston, Mass. (R. H. Supnik, 4 Mercer Rd., Natick, Mass. 01760)

6–10. **Analytical Chemistry and Applied Spectroscopy,** conf., Pittsburgh, Pa. (G. L. Carlson, Mellon Inst., 4400 Fifth Ave., Pittsburgh 15213)

8–10. **Viscoelastic Response of Engineering Materials,** mtg., Boston, Mass. (R. H. Supnik, 4 Mercer Rd., Natick, Mass. 01760)

13–14. **Astronautics,** symp., Ottawa, Ont., Canada. (The Secretary, Canadian Aeronautics and Space Inst., 77 Metcalfe St., Ottawa 4, Ont.)

13–17. Use of **Plutonium as a Reactor Fuel,** intern. symp., Brussels, Belgium. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

14–15. **Space,** natl. mtg., Los Angeles, Calif. (D. P. Chandler, 3370 Miraloma Ave., Anaheim, Calif. 82803)

NEW BOOKS

(Continued from page 316)

pp. Illus. Paper, $5.50. Commonwealth and International Library.

The Binding Force. Daniel Berg *et al.* Walker, New York, 1966. 255 pp. Illus. $5.95.

Biological and Chemical Aspects of Oxygenases. Proceedings of the United States–Japan Symposium (Kyoto, Japan), May 1966. Sponsored by the United States–Japan Committee on Scientific Cooperation. Konrad Bloch and Osamu Hayaishi, Eds. Maruzen, Tokyo, 1966. 477 pp. Illus. $6.95. Thirty-eight papers.

Biologie Générale. vol. 1, Bases Physico-Chimiques de la Biologie. J. Tremolieres. Dunod, Paris, 1966. 441 pp. Illus. Paper, F. 28.

The Bone Dynamics in Osteoporosis and Osteomalacia. Harold M. Frost. Thomas, Springfield, Ill., 1966. 192 pp. Illus. $9.50.

Breeding for Milk Production in Tropical Cattle. P. Mahadevan. Commonwealth Agricultural Bureaux, Farnham Royal, England, 1966. 164 pp. Illus. $4.50.

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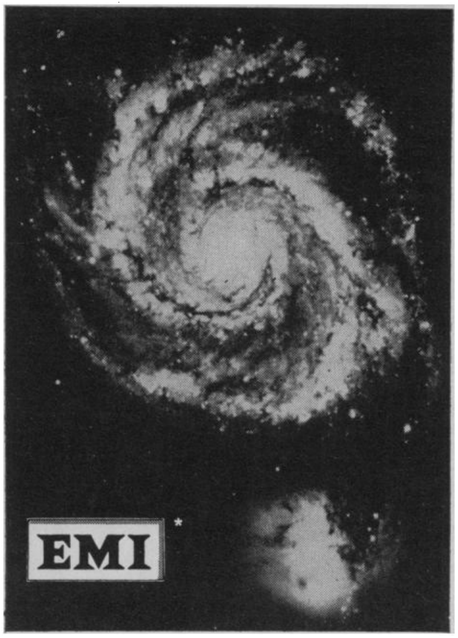

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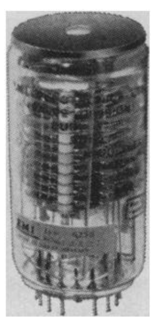

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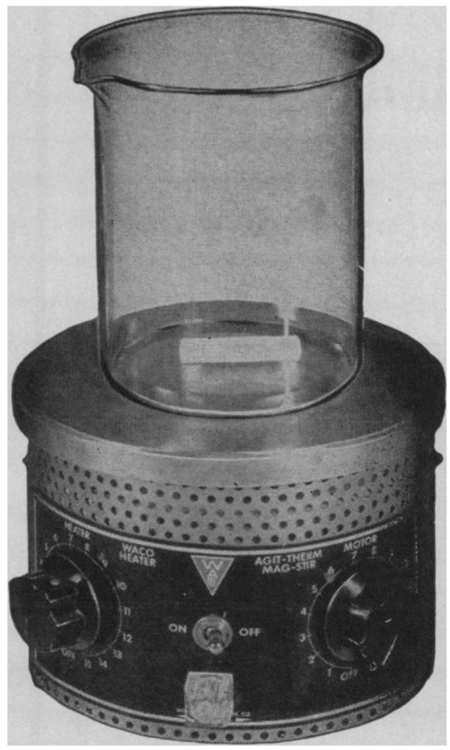

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