SCIENCE

28 April 1967
Vol. 156, No. 3774

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28 April 1967
Vol. 156, No. 3774

SCIENCE

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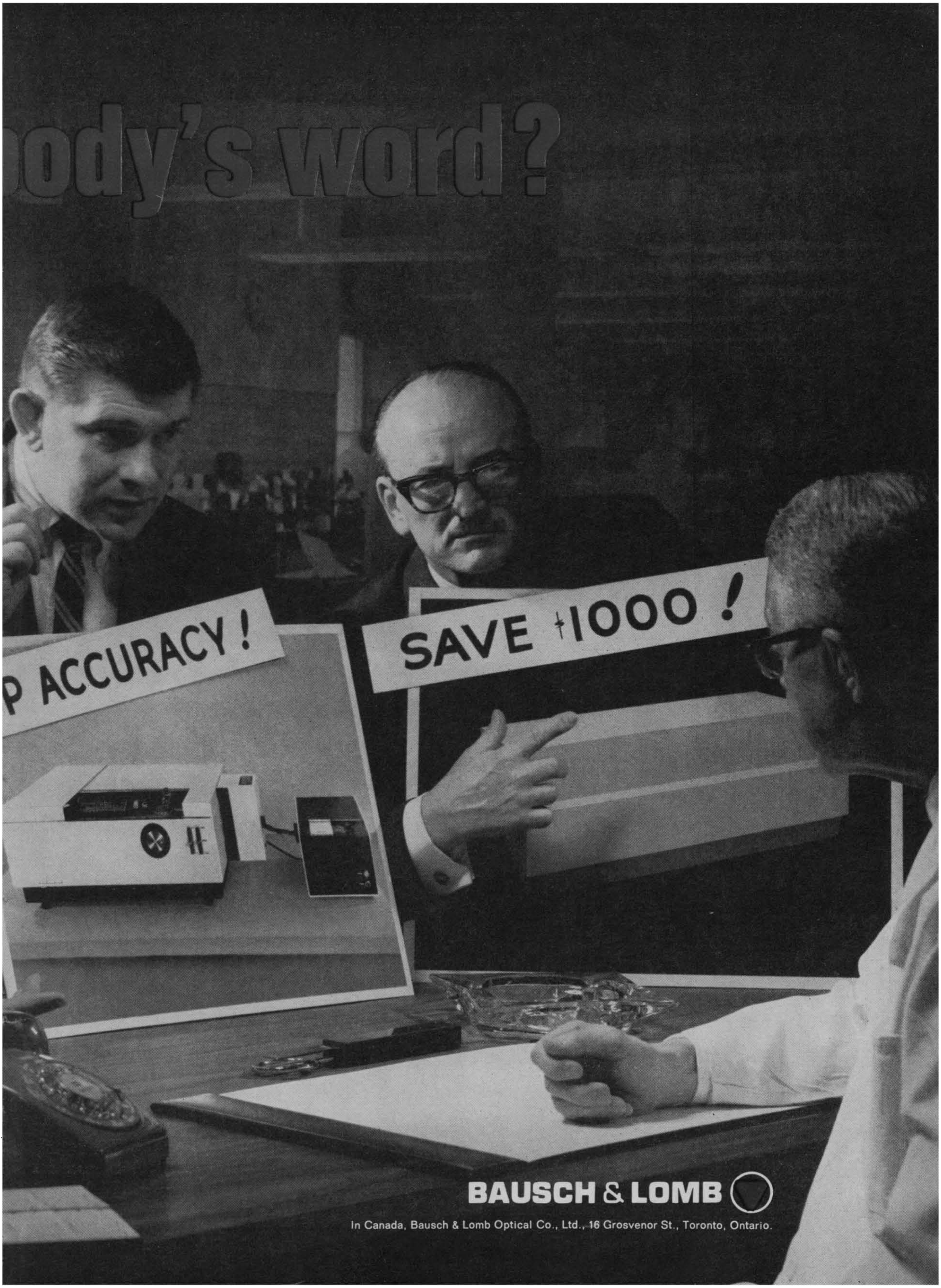
COVER

Structures from a Huronian sandstone of the Elliot Lake area, Ontario, Canada. The corrugated spindles of lithified sand, imbedded in troughs of ripple marks, are probably casts of organisms, or of tubes made by worm-like organisms more than 2000 million years ago (actual size). See page 500. [E. Thorpe, Geological Survey of Canada, Ottawa]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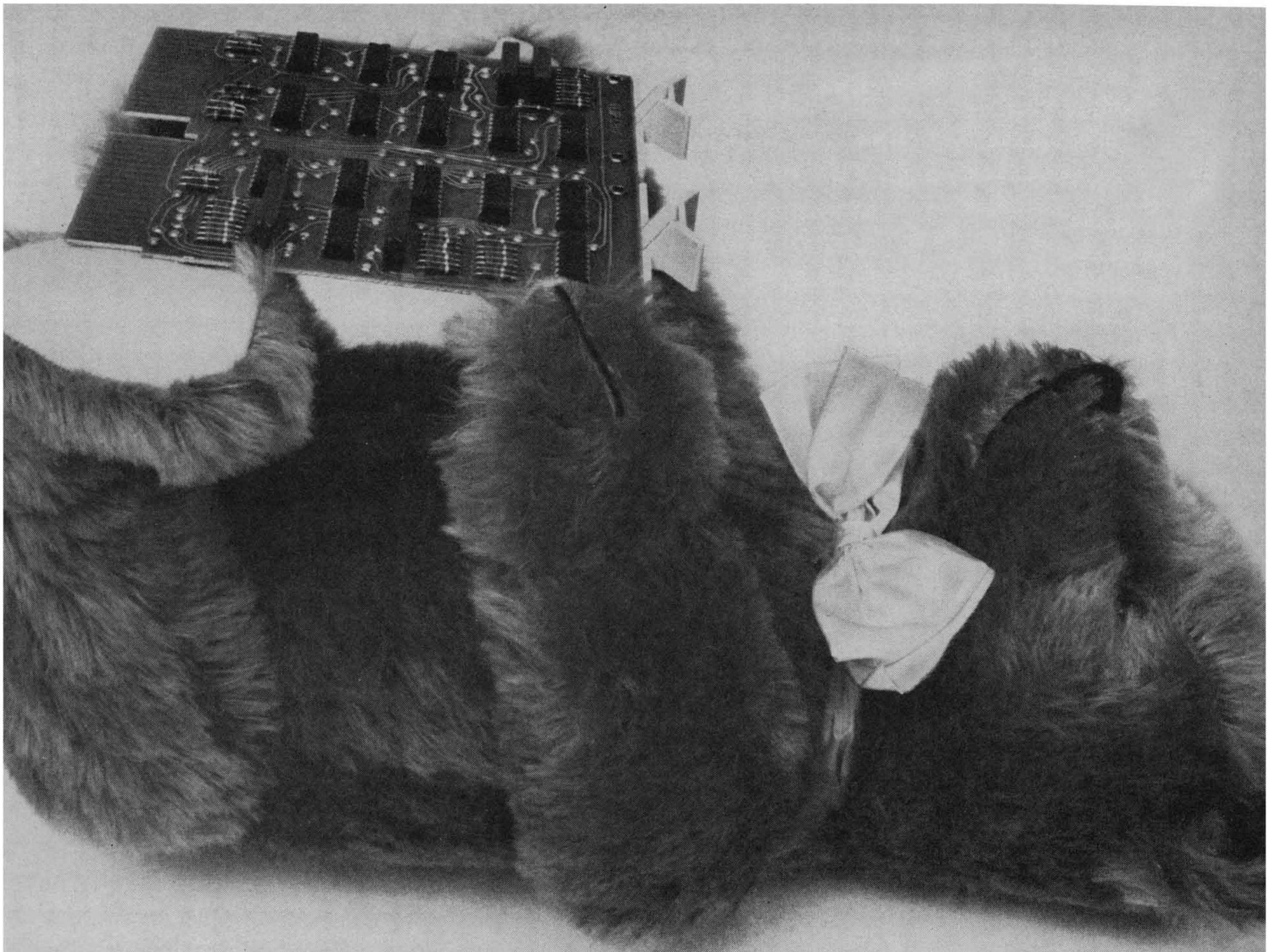

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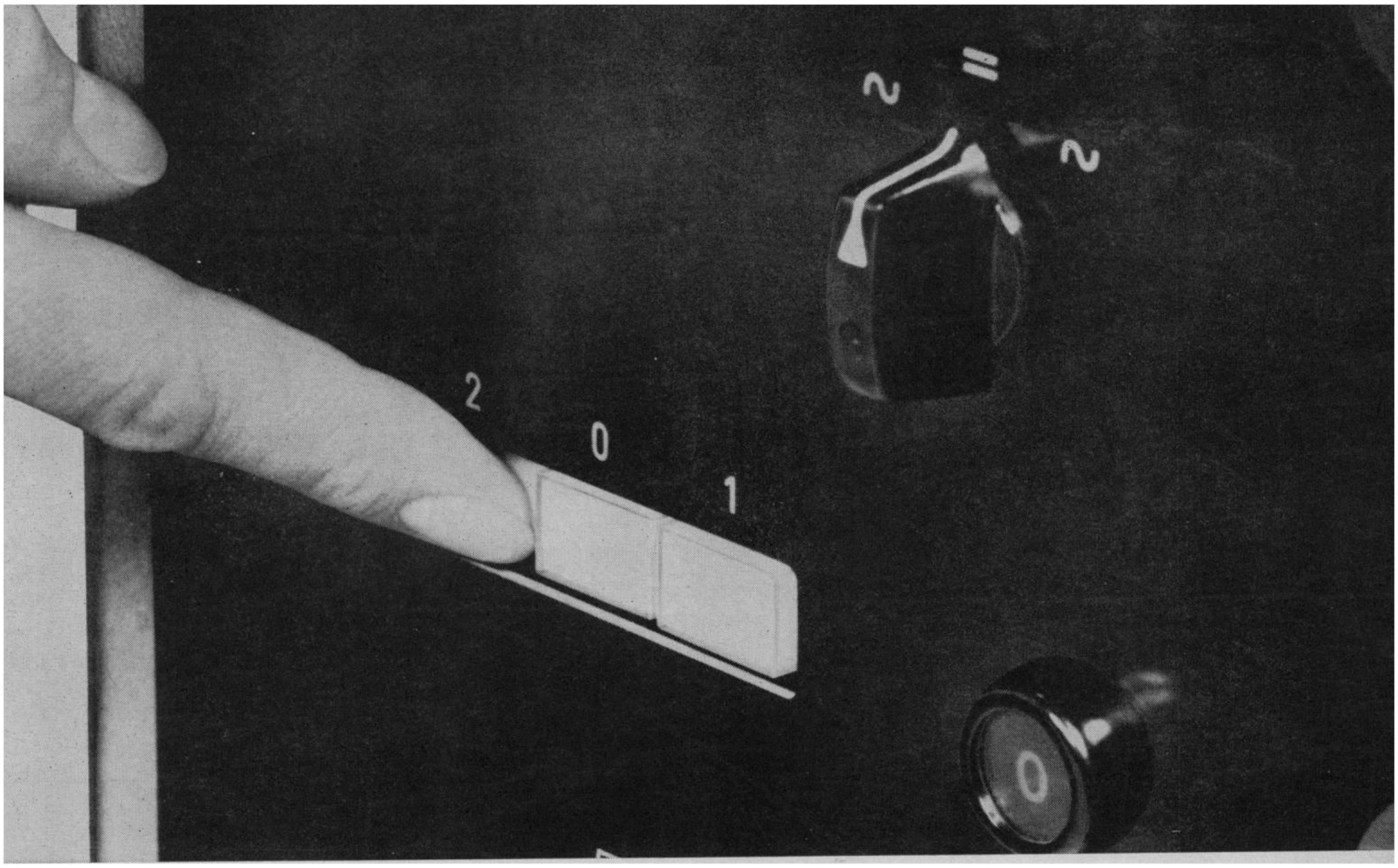

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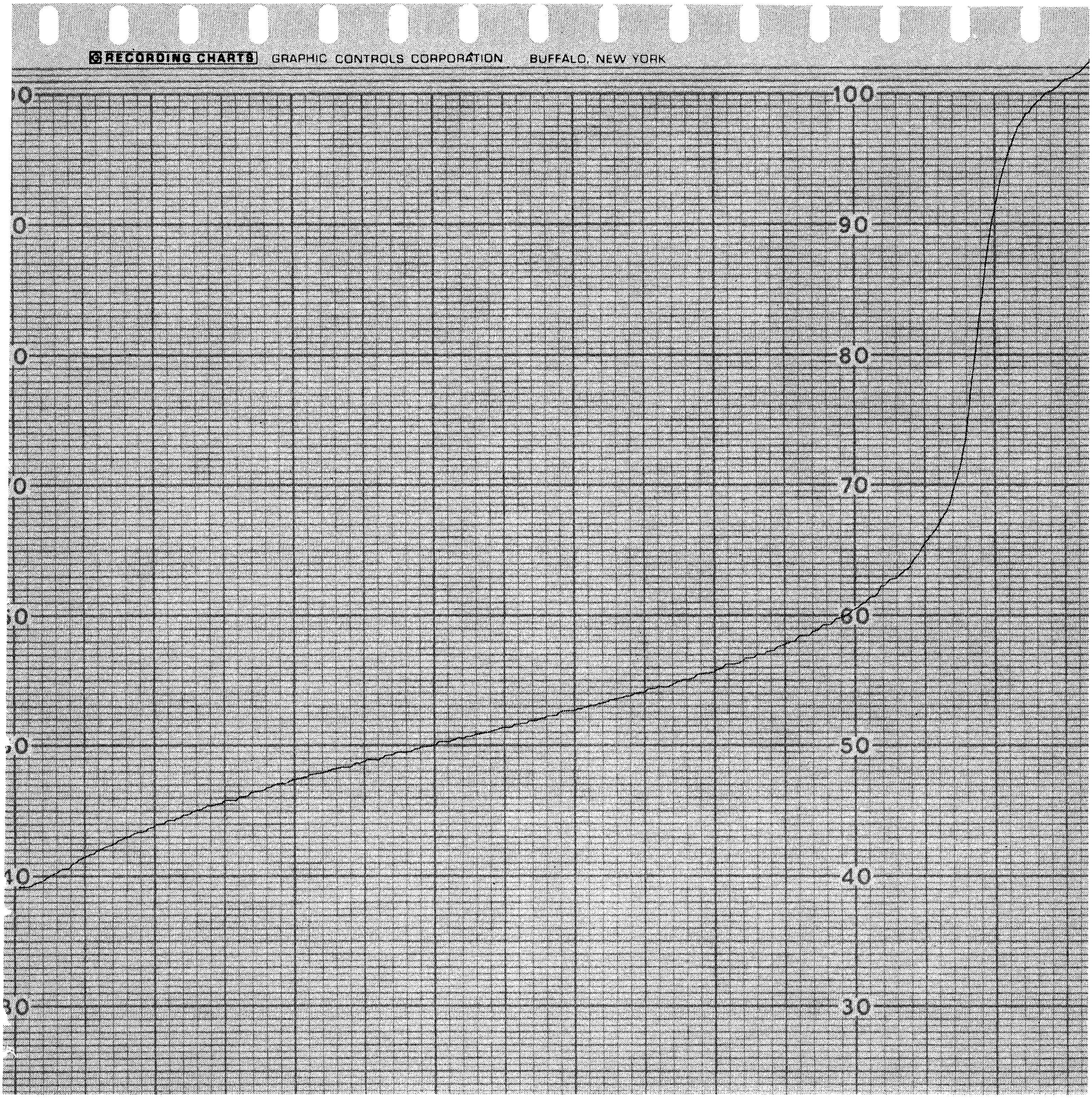

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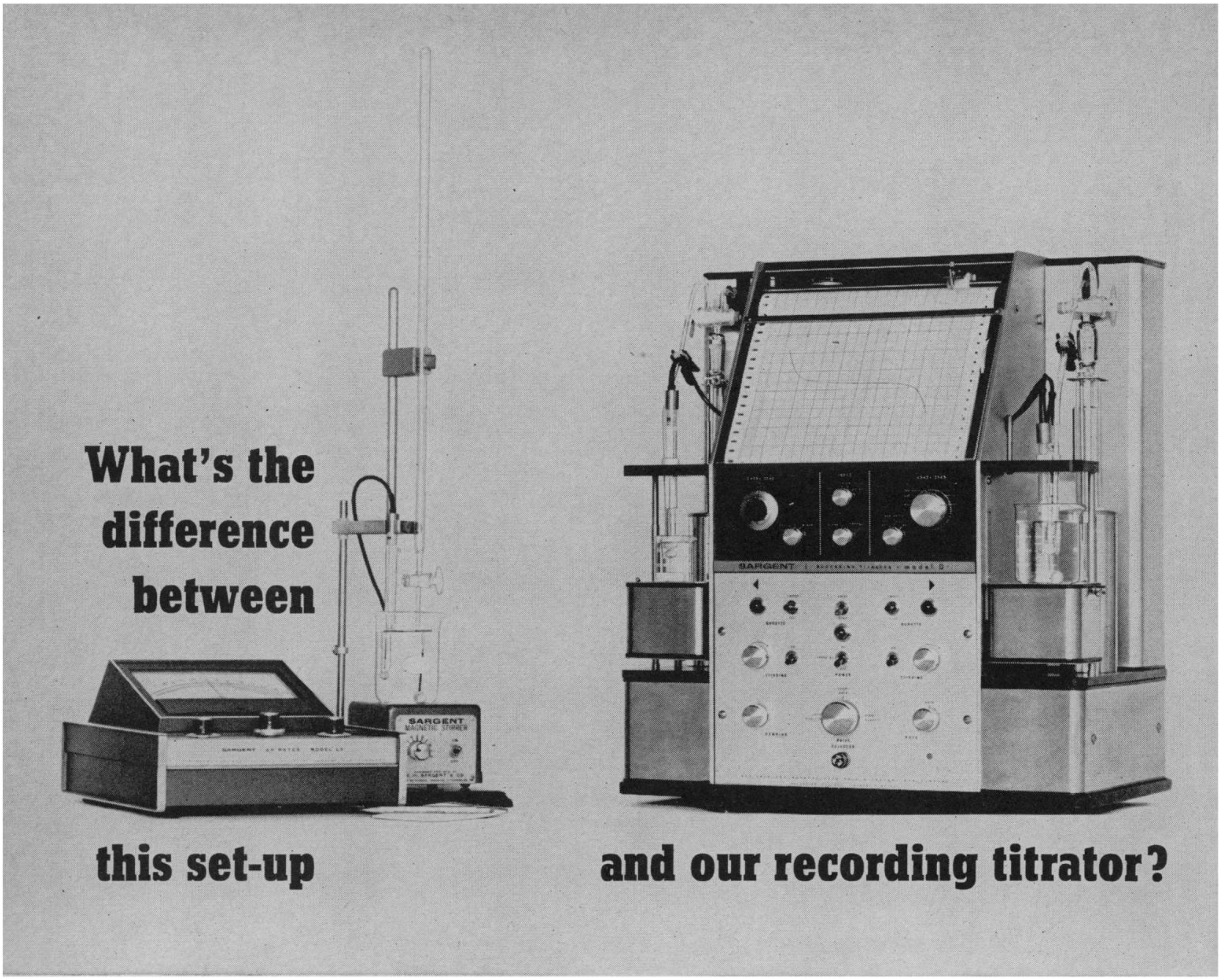

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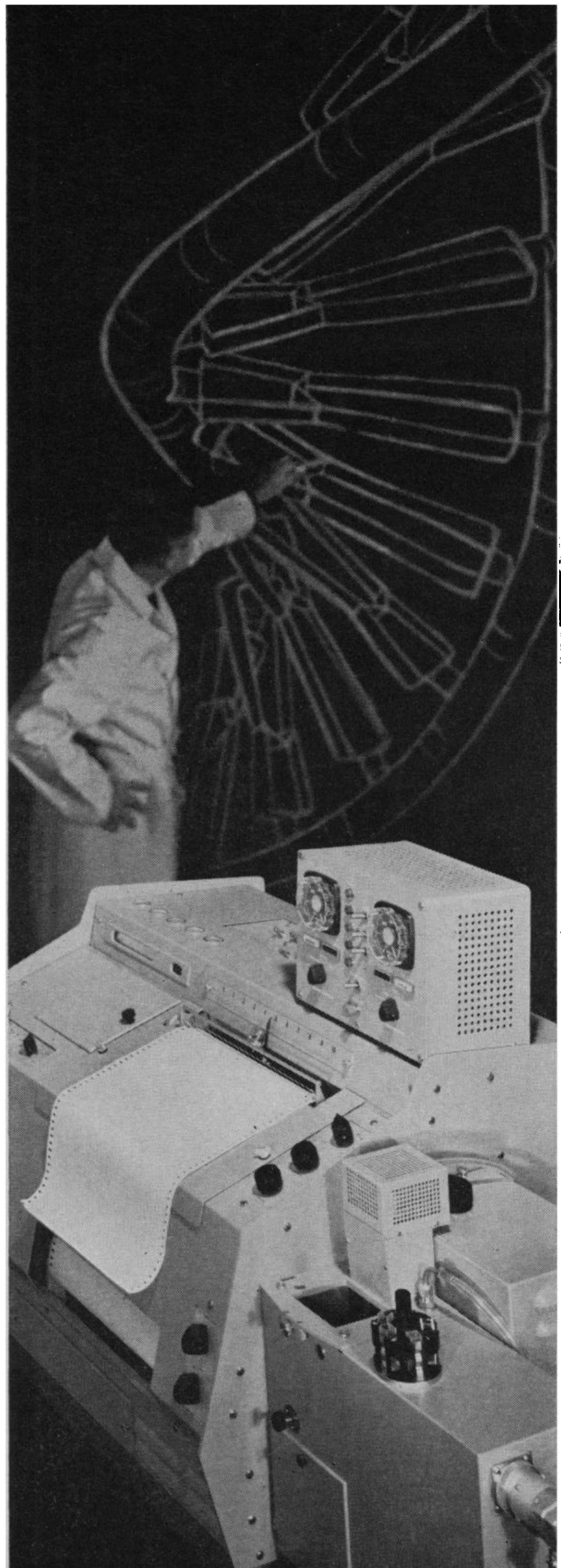

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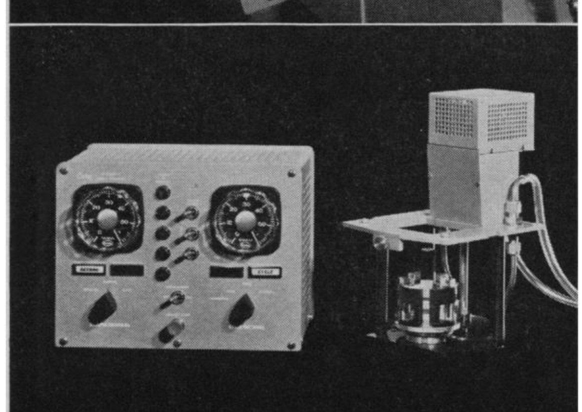

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The NS-625 was introduced for the first time at the recent Physics Show in New York. Deliveries have been and are being made. This unit has the fastest digitizing rate of any competitive unit currently available. The analog to digital converter is of the Wilkinson type, utilizing the peak detection technique.

The circuitry for each ADC is completely independent, allowing operation of each ADC from random, independent signals. Standard output levels for the data and control signals are: zero = 0 ±.5 volts, one = 6 ±.5 volts. An internal logic level interface board is included and can be optionally programmed to provide compatibility with most computer logic levels.

Self-contained coincidence circuitry provides for operation in two-parameter mode, with coincidence timing adjustable from .5 to 2.5 usec. Noncoincident events produce only 3 usec dead time.

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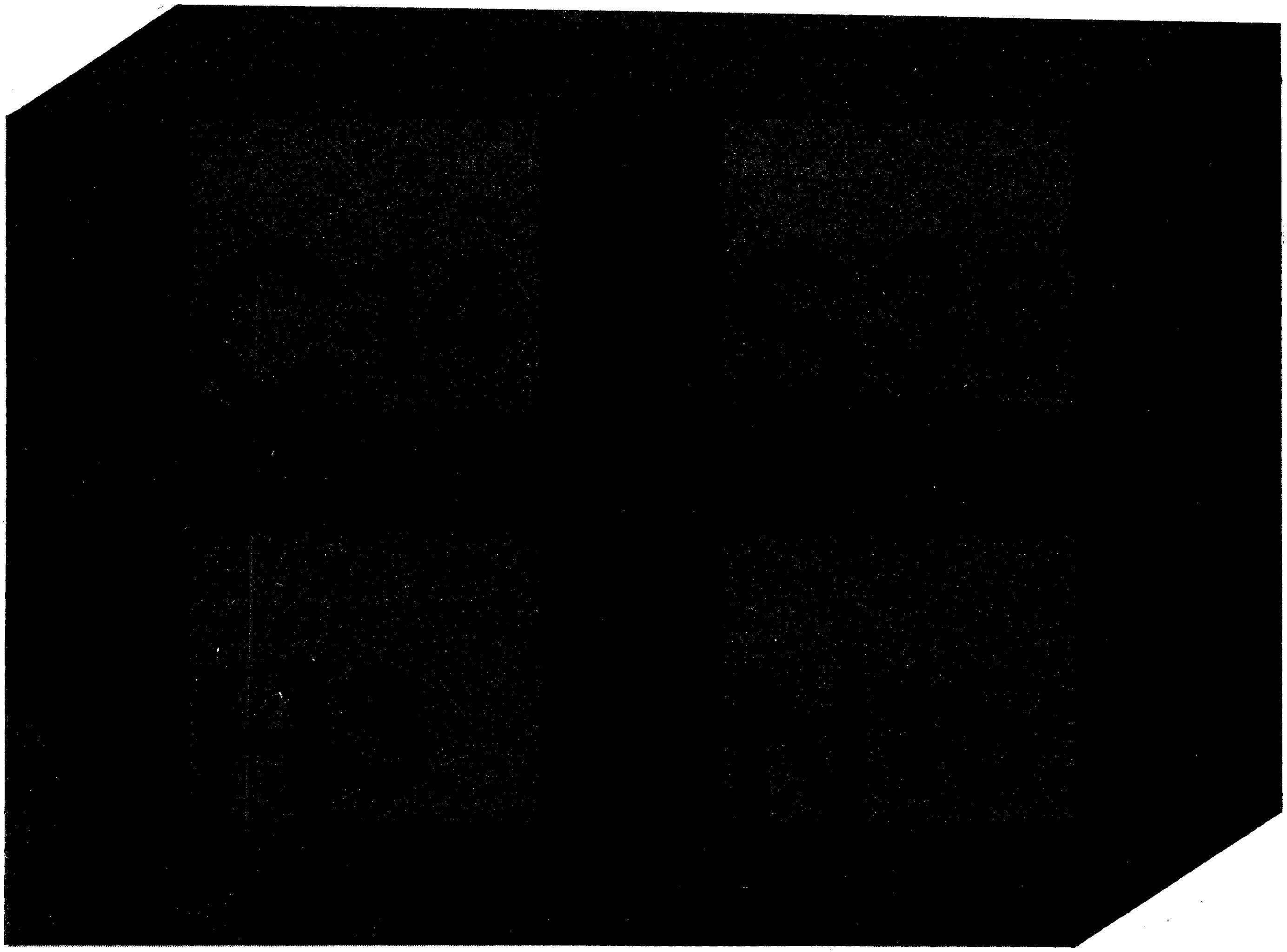

Labeled amino acids (How can the purchaser be protected from their decomposition?)

We synthesize dozens upon dozens of C^{14}, H^{3}, N^{15}, and S^{35} labeled amino acids, derivatives, and related compounds. (And hundreds of other isotopically-labeled biochemicals.) Every batch of everything has to meet the appropriate specifications before the people in Quality Control let the people in Production transfer *anything* to stock for sale. But neither group is off the hook at this point. Despite our efforts to minimize the decomposition of stocks in inventory (by low temperature storage, proper pH, and concentration, etc.), decomposition sometimes occurs. Every supplier has the problem. How does *this* supplier protect the purchaser?

By reassaying *every* batch of *every* radiochemical in the house *every* ten weeks. Or oftener. Any batch showing a breakdown in excess of 3% from specification is withdrawn from stock. No maybes. This reassay program protects you (and us, of course) from low purity material. And the reassay data also goes into the Product Analysis Report with all of the other analytical information pertaining to the material you receive. Rather reassuring.

Now back to our labeled amino acids, derivatives and related compounds. We have an unusually wide selection of these (actually, with 133 different compounds it appears to be the *widest*) with the highest specific activities available anywhere, and with purity consistent with the sophisticated demands of today's research. Examples: L-Phenylalanine-C^{14} (360 mc/mmole), L-Leucine-C^{14} (240 mc/mmole), L-Leucine-4, 5-H^{3} (45 c/mmole), L-Tyrosine-3, 5-H^{3} (40 c/mmole).

Then too it seems appropriate to tell you that we also offer: (1) labeled amino acid kits, (2) labeled amino acid mixtures of various kinds, (3) carefully standardized solutions of C^{14} amino acids to simplify precise measurement of amino acid acceptor activity, and (4) a wide selection of *unlabeled* amino acids and derivatives. Finally: we now pack our C^{14} and H^{3} labeled amino acids in a vial with a special closure which has both a self-sealing rubber diaphragm (when removal by syringe is preferred), plus a reclosable screw-cap to enable removal by pipet.

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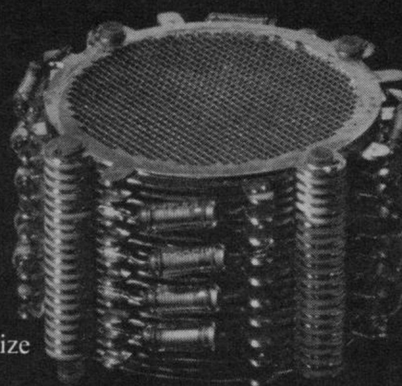

actual size

Do not throw this particle multiplier away if the gain drops. We'll reactivate it for you. And reactivate it for you. And reactivate it...

A particle multiplier for the pulse counting or current measurement of electrons, ions, and UV and x-ray photons that actually can be reactivated? And more than once?

Yes. Read on.

First off, we guarantee: at delivery, a gain better than 10^6 at 3 KV. (And, at a slightly higher voltage, 10^8 electrons per electron in pulse counting—with low noise.)

We then guarantee: to reactivate the unit if the gain drops below 10^6 at 3.5 KV.

We also guarantee: that if under normal operation reactivation is required within one year of purchase, this first reactivation will be gratis.

We further guarantee: subsequently to reactivate the unit at a small charge.

Now, having made so much of reactivation, we really should also emphasize the remarkable fundamental *stability* of this particle multiplier. We have yet to see its equal in terms of resistance to gain degradation.

Another important point: our MM-1 Focused Mesh Particle Multiplier forms a surprisingly compact, compatible, *complete system* when combined with our PAD-1 Fast Precision Pre-amplifier-Amplifier-Discriminator and our HV-2 High Voltage Power Supply. A brief description of all three components of this system comes next.

MM-1 Focused Mesh Particle Multiplier (Patented)

This is a high-gain, twenty-stage structure about one fourth as long as typical multipliers (we show it above in its actual size: 2″ diameter by 1¼″ long). The MM-1 is also bakeable (max. 400° C in vacuum), lightweight (3.6 oz.), rugged (has functioned in missiles in flight), and has a fast output rise time. It comes complete with integral voltage divider chain.

PAD-1 Fast Precision Pre-amplifier-Amplifier-Discriminator

PAD-1 is a transistorized, charge-sensitive, low-noise device with a signal delay time of less than 15 nanoseconds and an output pulse of four volts at 50 ohms with a rise time of less than 5 nanoseconds. The discriminator has exceptionally low jitter for timing applications. The unit is compact (only 4″ long by 2″ wide by 1½″ high) for mounting in close proximity to the MM-1.

HV-2 High Voltage Power Supply

A small package (a mere 4″ long by 3¼″ wide by 2⅞″ high) which supplies a stable well-filtered voltage that effectively satisfies the high voltage power supply needs of the system.

To recapitulate all this in a single sentence: we offer a *complete system* for the pulse counting of electrons, ions, or hard photons which is based on our exceptionally stable, uniquely reactivateable (and so guaranteed), high-gain, small-sized MM-1 Particle Multiplier coupled with our PAD-1 and HV-2 units. Current measurements may be made using the MM-1 and the HV-2 combination.

A final reasuring afterthought. We guarantee *this* too: the quality of our workmanship, the quality of the materials we've used. Completely. And with no time limit.

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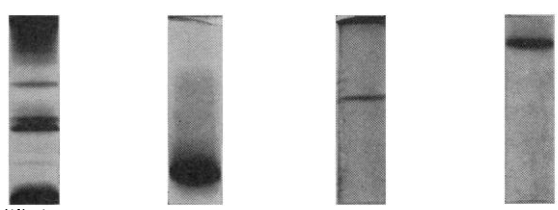
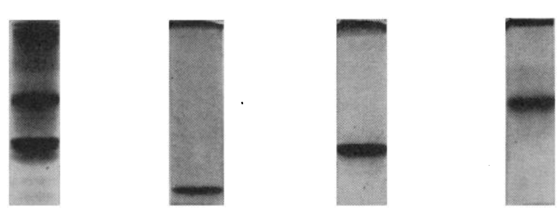
Many researchers have seen analytical Disc Electrophoresis reveal heterogeneity in fractions thought to be pure, prepared by conventional separation techniques. Now, the high-resolution capabilities of the Disc technique can be put to work on the preparative scale to eliminate this heterogeneity in samples of useful size. More than a hundred investigators are already using Prep-Disc for separations of proteins, enzymes, polynucleotides, polypeptides and hormones. Here are just a few of the many materials Prep-Disc is purifying:

isolated insulin granule proteins	horse spleen ferritin
fibrinogen	staphylococcus enzymes
prothrombin	cytochrome
other blood factors	various plant enzymes and proteins
macroglobulins	RNA
$\alpha 1$ and $\alpha 2$ globulins	tumor tissue proteins
transferrin	phosphorylases and dehydrases from bacterial extracts
mycobacterum tuberculosis proteins	beta glucuronidase
milk proteins	saliva proteins
histones	mucosal cell extracts
ribosomal proteins	polypeptides (PTH)
glycoprotein	body fluid proteins
serum lipoprotein	carbonic anhydrase
L-asparaginase	placental lactogens
pituitary gonadotropins	isocitric dehydrogenase
LDH	5-carboxymethyl protein derivatives
denatured collagen	

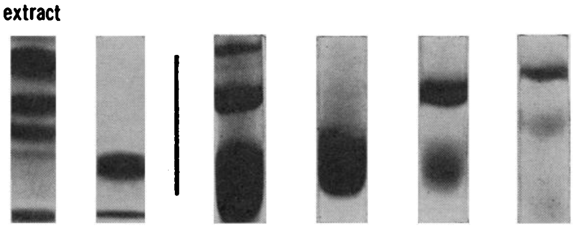
EVIDENCE: Shown here are typical examples, in the form of high-resolution analytical-Disc Electrophoresis patterns, of separated fractions taken from Prep-Disc columns. Each set shows starting material, plus one or more purified components separated from it.



Whole rabbit serum — post-albumin — transferrin — slow alpha

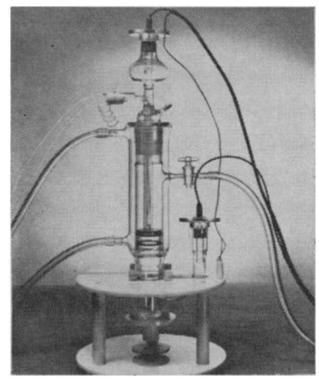


Bacterial cell extract — Fraction 1 — Fraction 4 — Fraction 6



Mucosal cell extract — Fraction 1 — Horse spleen ferritin — Fraction 1 — Fraction 2 — Fraction 3

APPARATUS: The Canalco Prep-Disc equipment offers unique advantages over any other form of large-scale gel electrophoresis apparatus. Included:



Prep-Disc Apparatus

- a fully visible, externally adjustable elution slit eliminates clogging and optimizes wash-off for highest fraction concentrations;
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- interchangeable gel columns of three sizes allow gel preparation outside the basic apparatus. You can prepare for a run while one is already in progress;
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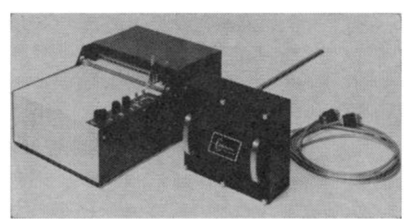
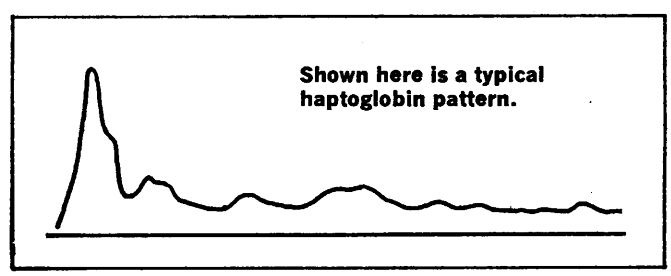


WIDE-TRACK FLOW ANALYZER Canalco's Wide-Track flow monitors are a useful adjunct to the Prep-Disc technique, providing a record of fraction elution. ←



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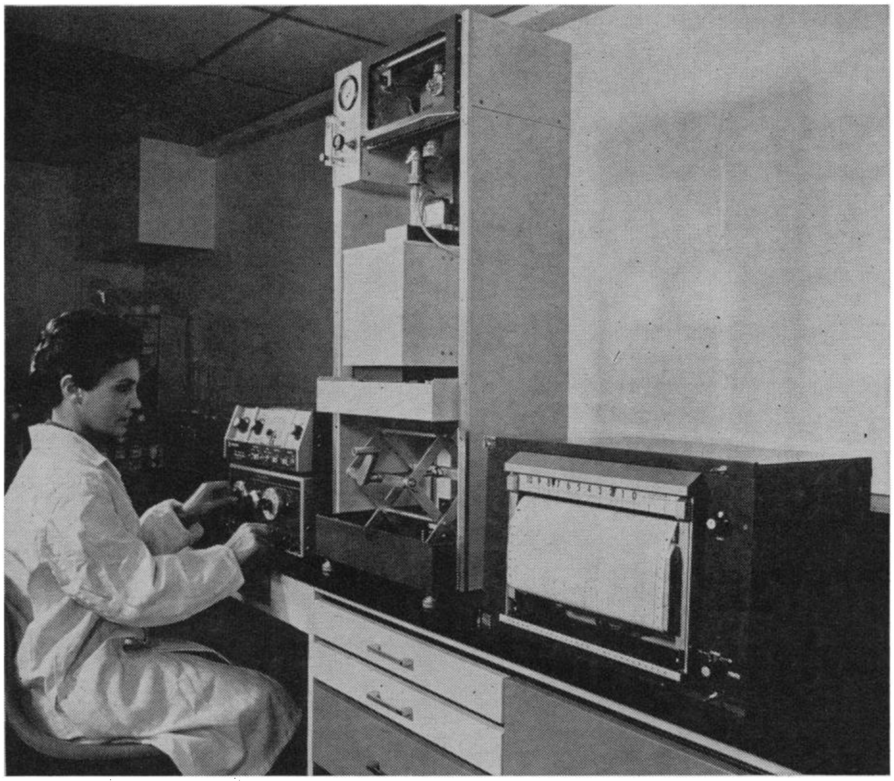
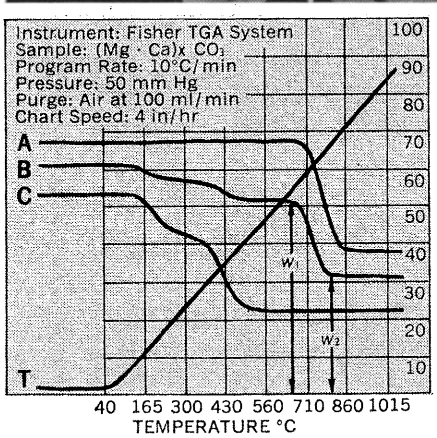


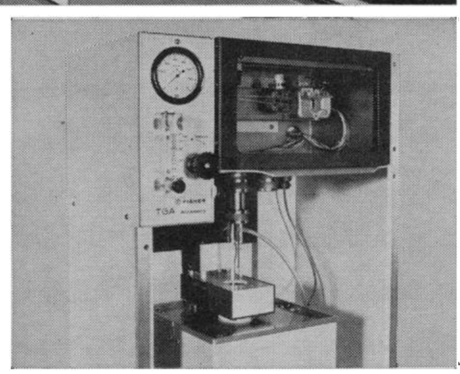


The simultaneous determination of magnesium and calcium occurring in mixed carbonates is illustrated by curves A, B and C. Curve A shows the loss of CO_2 at 675°C from pure $CaCO_3$ and Curve C shows a similar loss of CO_2 at 355°C from $MgCO_3$. Curve B is representative of a typical dolomite sample with mixed carbonate composition.

The decomposition of $CaCO_3$ results in a weight loss, $w_1 - w_2$, yielding CaO which can be calculated as:

$$w(CaO) = \frac{56}{44}(w_1 - w_2) = 1.272\,(w_1 - w_2)$$

and by the difference, MgO is calculated as $w(MgO) = w_2 - w(CaO)$.



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Micro-TGA with the new Fisher system offers major improvements in the quality of the data produced. Reactions are more sharply defined than with large samples; temperatures are more accurate and reproducible. With the vastly improved resolution of smaller samples, faster scanning speeds can be employed. In short, more curves can be run during each day, with better quality results and with the results available more quickly.

The complete Fisher TGA System—an advanced programmer, a furnace and the weighing cabinet—costs only $1770. Use it with a Cahn RG Electrobalance® for thermogravimetric studies of micro samples, in vacuum or controlled atmospheres, static or flowing. Use it for DTA with the addition of a few inexpensive accessories. Add a Cahn Time Derivative Computer and use it for derivative TGA.

The system's new Model 360 Programmer develops linear heating rates of 0.5, 1, 2, 2.5, 5, 10, 20 and 25°C/minute from ambient to 1200°C, for either TGA or DTA applications. Provision is made for continuously recording the sample temperature as well as the changes in sample weight. Attenuation and Suppression Controls prevent off-scale readings when monitoring high temperatures. Additionally, separate weight and temperature indications will disclose any erroneous effects associated with the heating rate or thermocouple response. Potentiometric strip-chart record permits almost infinite time-axis expansion for isothermal studies. The Electrobalance provides the greatest sensitivity (0.0001 mg) available in a commercial recording balance, with a capacity of 2500 mg and maximum recordable weight change of 1000 mg. Solid-state circuits make the entire system reliable and durable.

If you'd like to learn more about the many features of the economical new Fisher TGA System, write for our bulletin. Fisher Scientific Company, 1397 Fisher Building, Pittsburgh, Pa. 15219.

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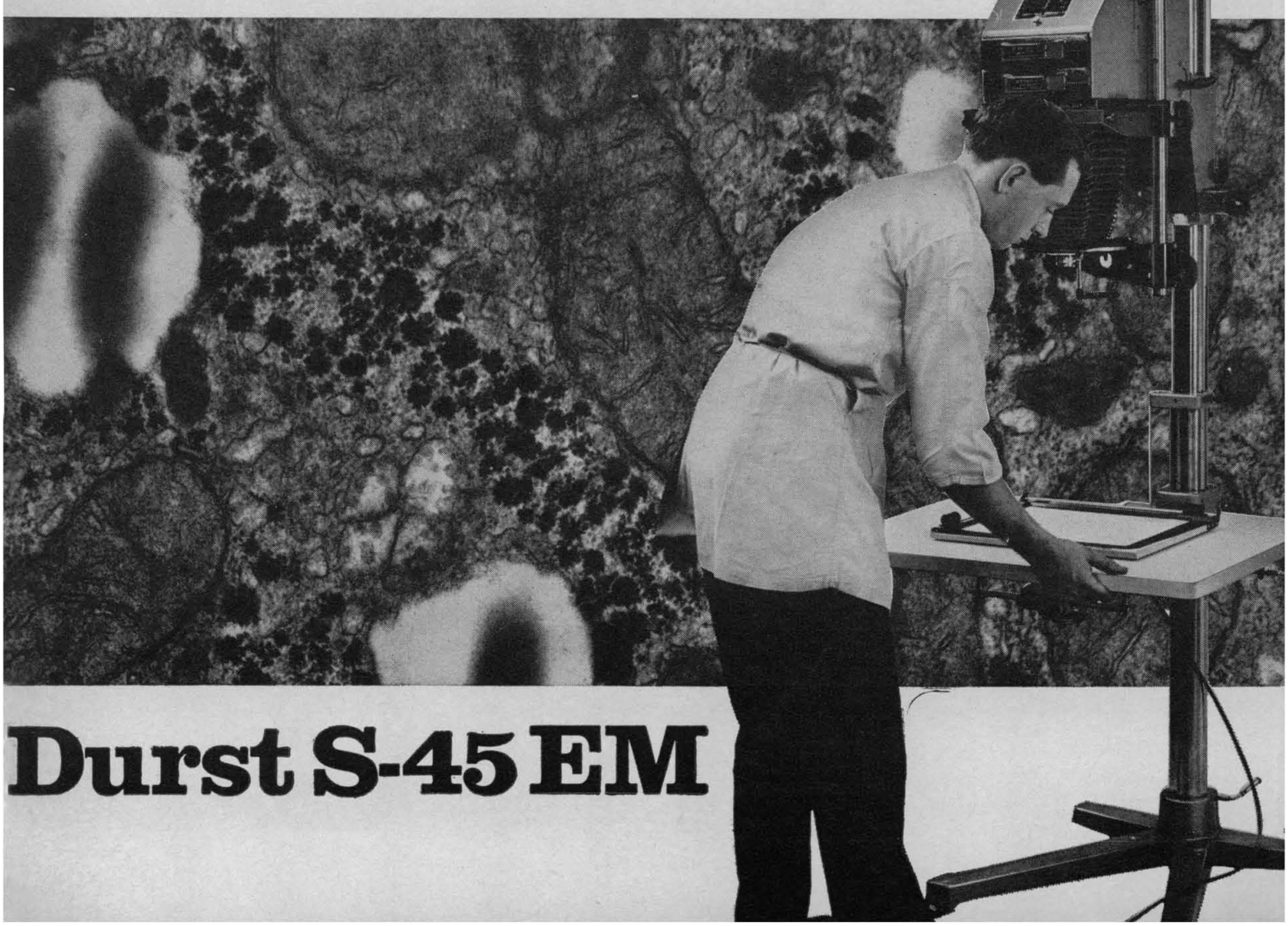

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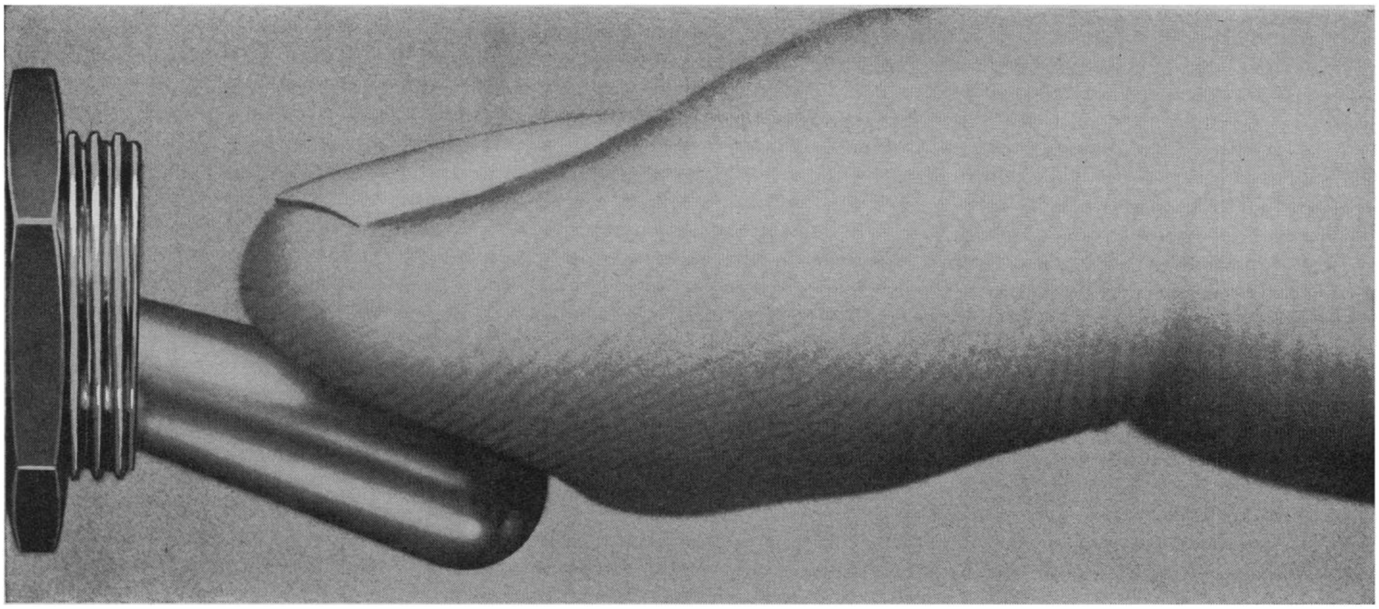

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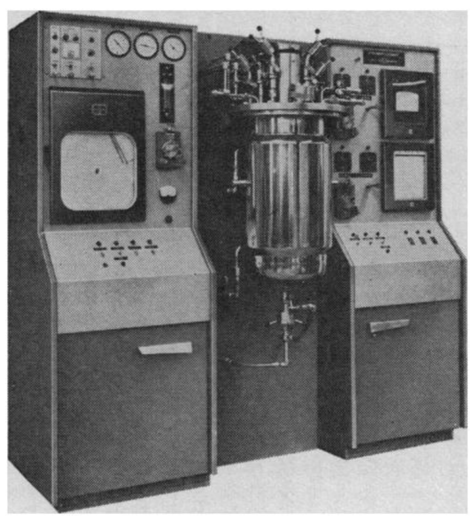

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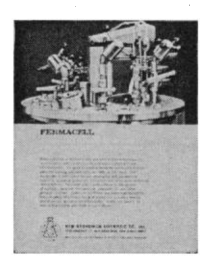

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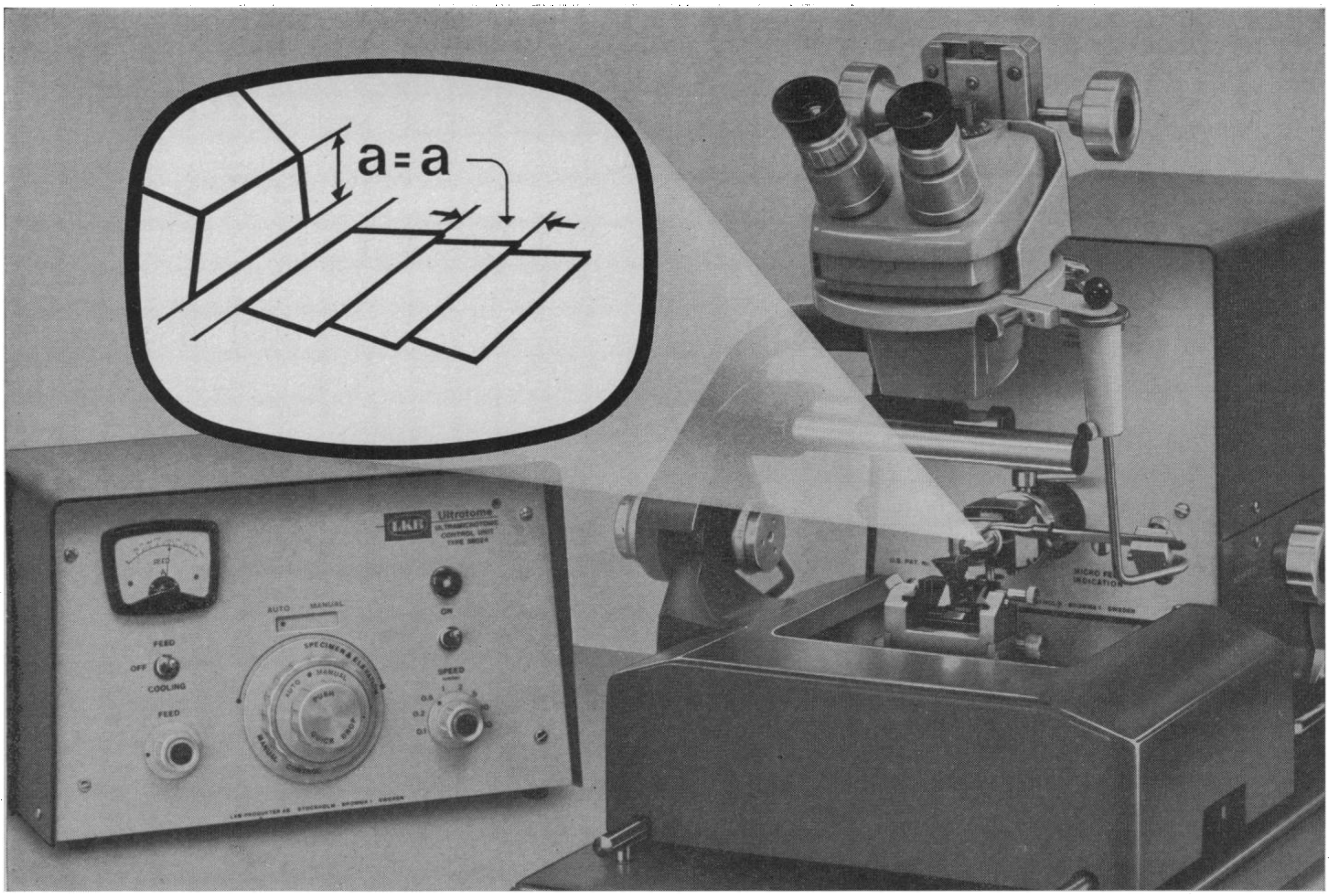

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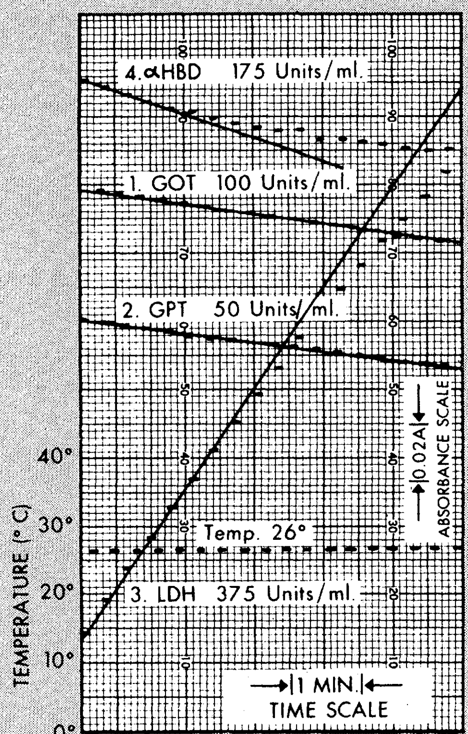

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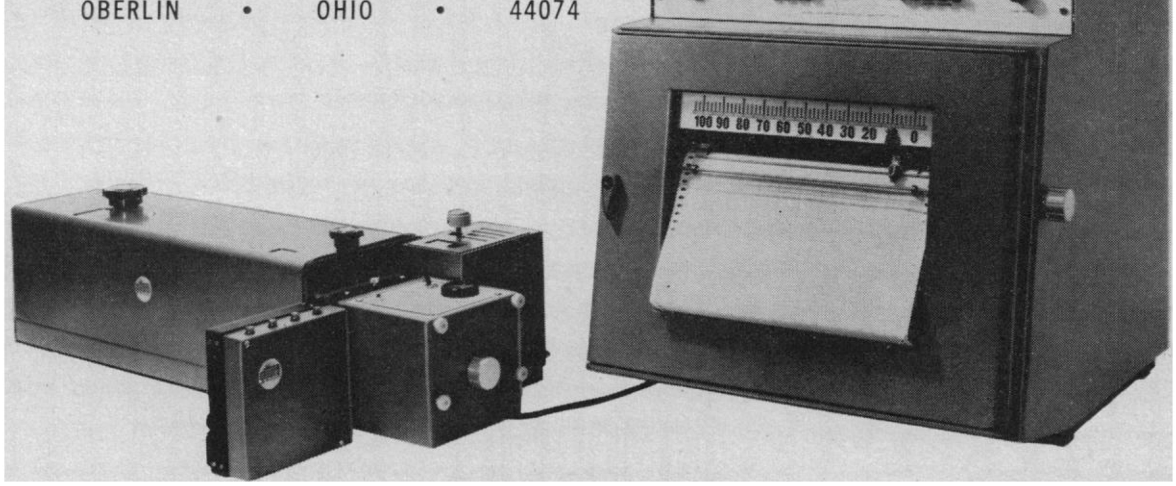

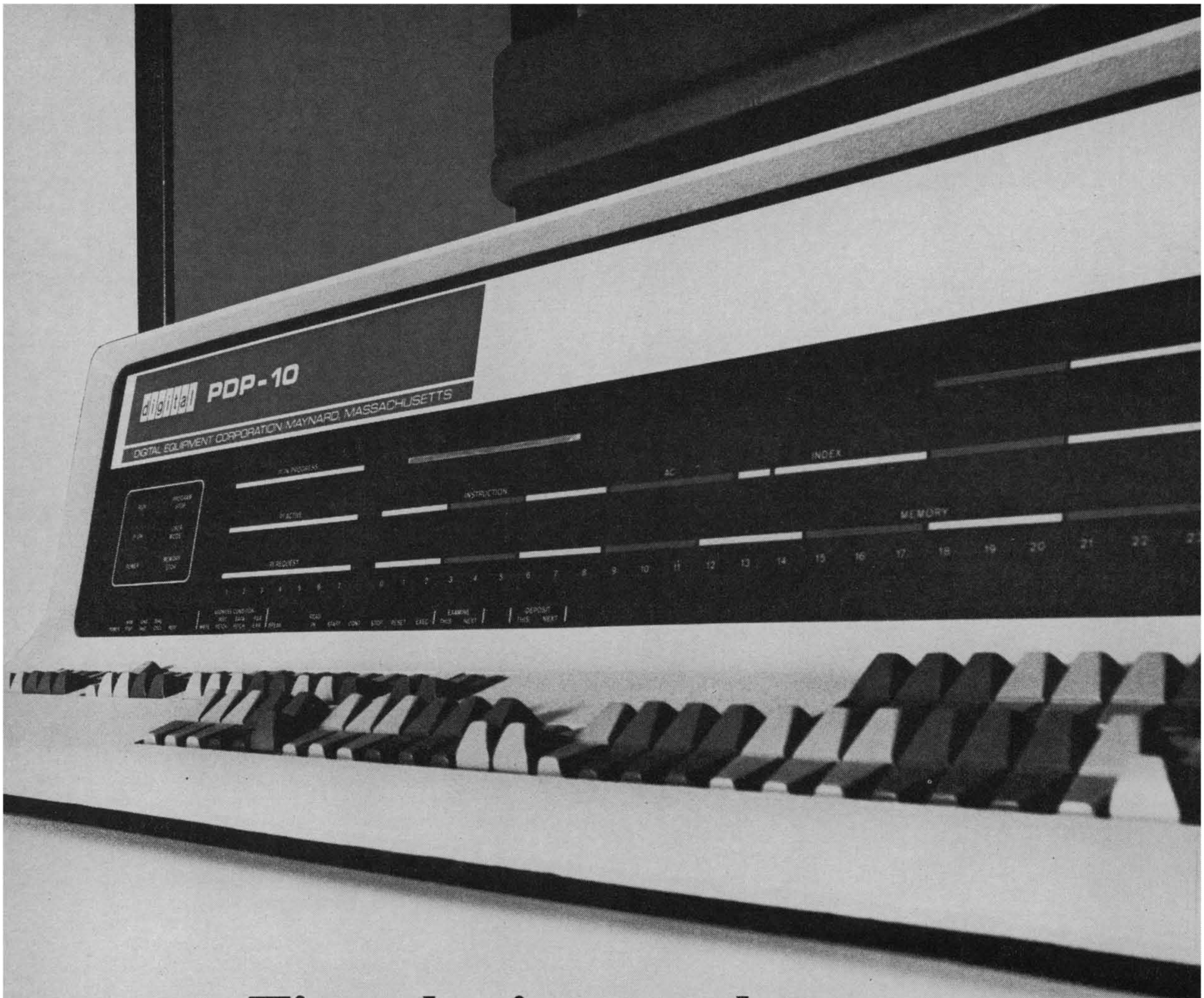

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Greenberg referred to Mississippi as "one of the underdeveloped lands," apparently the inference being that this state is not really a part of these United States. If one limits his view to our country, looks at mass statistics nationally, and uses journalistic license freely, this might be a rough approximation of fact. Mississippi is rich relative to most of the world, and if one really studies the state in some depth, he will find that both the poverty and ignorance here are concentrated in certain areas and groups. The situation in Mississippi is quite analogous to that in Washington, D.C. These conditions are not . . . descriptive of Jackson or of Millsaps College. This city, in fact, has one of the highest educational levels in the United States, measured by average years of schooling completed by its populace. Its per capita income approaches the national average. Furthermore, Millsaps can hold its head high among the better schools of this nation.

McNamara was invited here to participate in a 2-day academic convocation. The other principal speakers were the chairman of the board of United States Steel, Roger Blough, and the governor of Tennessee, Buford Ellington. This convocation was conducted in the highest academic tradition and was in no sense a cheap commercial venture. It is true that it occurred just prior to a major fund-raising effort to be undertaken by Millsaps in response to a Ford Foundation Challenge Grant. These grants are recognition of the institution's potential as a center of educational excellence. But no one attending these events was asked for money. Only passing reference was made to the Ford grant in the course of the program at which Mr. McNamara spoke. Certainly, we would not be a part of a scheme to invite him here to make a personal gift or to award some largesse from the Defense Department. He was invited because of his position of high distinction in this nation. The convocation provided the area with an educational uplift which few of its people have ever experienced. . . .

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McNamara appears to have been misinformed when he compared university enrollments in Europe with those of the United States. Specifically, he stated: "Here we have more than four million students in college and this represents some 40 percent of our college-age population."

For the comparison to be valid, one must restrict the data to universities. Indeed, the Secretary spoke of students "at the university level" when presenting his enrollment figures of 10, 7, and 7 percent of college-age populations in the United Kingdom, Germany, and Italy, respectively. The facts as reported by the Bureau of Census and the U.S. Department of Health, Education, and Welfare ("Digest of Educational Statistics," publication OE-10024-63) appear to be that in 1962 we had in the United States 2043 "institutions of higher education" with an enrollment of about 4,207,000. Included in these totals were 142 universities with an enrollment of about 1,725,000. Of our total population, about 20 million may be considered as a fair estimate of our college-age population (18 to 25 in the United States; 20 to 27 in Europe). From this it follows that 8 to 9 percent of our college-age population was in universities—a figure of the same order of magnitude as the percentages reported by the Secretary for four European countries.

If the Secretary wishes to boast about our facilities for higher education and the opportunities afforded to our young people for advanced study, he should not equate HEW's "institutions of higher education" and universities. In fact, the 2043 institutions of higher education on the HEW list (publication DE-54003-60) include innumerable junior colleges, religious seminaries, Bible colleges, and institutes of physiatrics, chiropody, and others. Admittedly, these institutions of higher education are higher than something, but they are appreciably lower on the educational totem pole than any European university.

A more meaningful comparison might have emerged from data on 11 West European universities collected in Switzerland by the Labhardt Commission (*Eidgenössische Expertenkommission für Fragen der Hochschulförderung*, Bern, 29 June 1964). For the population segment 20 to 29 years of age, the Swiss study revealed that only 1.44 to 4.09 percent of the college-age populations in the West European countries were attending universities, as compared with 7 percent in the United States.

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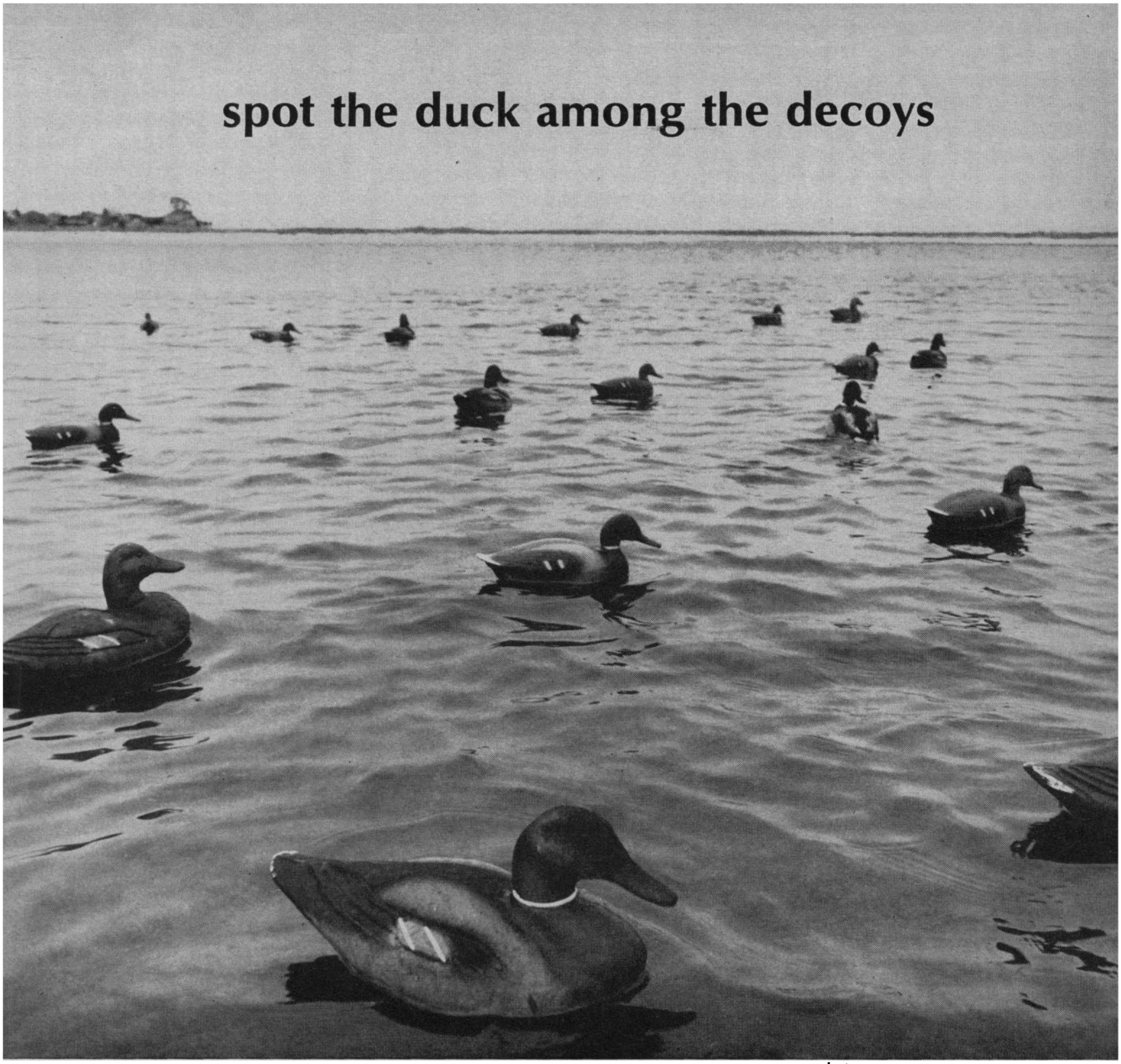
Frustrations of Eastern Science

As head of a university department for several years in East Germany, I read with interest Jordan's article, "Coordinated planning in science in Communist Europe" (17 Feb., p. 796). Although scientific work is respected and encouraged in the Eastern countries, I found it seriously handicapped by generally poor living conditions, lack of freedom, restriction of traveling, lack of equipment and Western publications, and interference by party and state.

The authorities are ignorant of the requirements of research. They think that all problems can be solved by "planning" and by "collective" work. The latter concept involves endless formal discussions. "Planning" involves prognosticating minute details; that is, the smallest amounts of chemicals required in the future. The thought processes of the scientist should be based on "dialectic materialism." All members of the department—including the charwoman—should participate in forming the plan. Then the plans are permanently changed, approved, or disapproved by anonymous boards, and very often directed toward impossible aims, such as making the country independent of Western imports. Nevertheless, the scientist works as an individual, though under much more difficult conditions than in the West.

On international levels, generalized programs exist, but the individual scientist knows very little about them. Furthermore, especially recently, the centrifugal forces of the Eastern camp are felt: planning on an international level becomes more and more difficult. Each state looks after its own interests and the resolutions are rarely implemented. Indeed, contacts exist mainly on the government level. It is difficult for the scientist to travel, and, for all practical purposes, contacts are based on personal relationships. Yet these personal relationships are much rarer than in the West. Each journey requires the sanction of the government, which is difficult to obtain. I traveled once to Moscow after waiting 7 months for my visa which restricted me to the area of that city. I was invited to visit Moscow State University but, when I attempted to visit departments of the Academy of Sciences, I was not permitted to contact the scientists directly. Such contacts were made through the authorities who asked me, "You work for a university—why do you wish to



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visit departments of the Academy?" In spite of state and international planning, there is, in practice, much less scientific cooperation between the socialist states than between the capitalist ones.

K. DEUTSCH
Department of Biological Sciences, University of Aston, Birmingham, England

Prior Preparation Pays

I should like to suggest the following addendum to Bragg's recommendations ("The art of talking about science," 30 Dec., p. 1613) for improving the quality and efficiency of seminars. At the bottom of the usual seminar announcement there should be listed one or two references to recent journal articles relevant to the seminar topic. This opportunity to brush up on an old, or be introduced to a new, area of research would greatly assist students who often lose the train of thought at seminars because they are unfamiliar with terms or ideas which the speaker assumes everyone knows and understands. I am sure that this small modification of standard practice would greatly increase the efficiency of seminars and attention of participants.

ALBERT' TONCHEE
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Canada's Science Council: Incomplete Representation

Most Canadian scientists will greatly appreciate Carter's article ("Canada: science advisors to propose priorities," 2 Sept., p. 1083) in which the organization and responsibilities of the Science Council and Scientific Secretariat of Canada were outlined. However, there is a considerable gap in the representation of the Council; in spite of the fact that the province of Alberta is one of the leading provinces in Canada and that it has two active universities and an internationally recognized Research Council, it has not a single representative on the Science Council. As Carter pointed out, the representation from Quebec is considerable: seven council members. Apart from demographic implications, this emphasizes the peculiar political overtones which the organization and functions of the Council may yet express. The prairie provinces are notably under-represented in Parliament by members of the Liberal party, the party presently in power in Ottawa.

The omission from the Science Council of representatives from Alberta is even more puzzling because the University of Alberta at Edmonton was the third largest recipient of research grants for operating funds, which are awarded by the National Research Council. It is logical that research in the processing of raw materials should be undertaken in this province which is Canada's major producer of oil and natural gas and is the site of an extensive petrochemical industry. The conventional sources of oil and gas may well be supplemented in the future through the processing of northern oil sands. Alberta also contributes significantly to the agricultural yields of the country.

Carter notes that the Council may devote itself to social and economic problems, which include the northern regions. The University of Alberta is the most northerly university in Canada, with a great concern for the problems of development of industries and communities in the north, and Edmonton is the southern terminus of the Alaska Highway. If, in fact, as stated in the article, there is a strong sentiment in the Council for increasing support for R & D work in industry and universities, the omission from the Council of representation from this science-rich province is a deplorable oversight or ploy.

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JOHN R. MCGREGOR
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Rabbits First—Then Humans

In reference to Reynolds' claim that Sturgis was the first to discover and describe the fact that administered estrogens can suppress ovulation (Letters, 17 Mar.), I would like to point out that Makepeace, Weinstein, and Friedman (*Amer. J. Physiol.* **119**, 512) described this fact in 1937, or 3 years earlier than Sturgis did. However, Makepeace *et al.* worked with the rabbit, so Sturgis may still have been the first to notice the effect in humans.

GORDON STEIN
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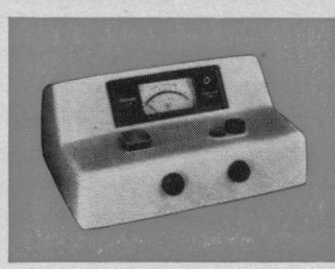

28 April 1967, Volume 156, Number 3774 SCIENCE

The Succession at NIH

The choice of a worthy successor to James Shannon, director of the National Institutes of Health, is a matter of profound importance to medical research scientists. It is also a matter of concern to other scientists and of consequence to all humanity. Research funded by NIH brings knowledge and medical progress that gradually will be applied everywhere. Such progress can relieve suffering not only in this generation but in generations to come. Measured against the annual cost of all medical care in this country ($43 billion), the amount NIH devotes to support and conduct of medical research is not large (about $0.8 billion). Of this, a smaller sum is used for support of research at medical schools and in universities. These funds, however, constitute a substantial fraction of all the money available for support of all academic research.

Finding a proper replacement for Shannon will be especially difficult because his directorship is a tough act to follow. Shannon has been able to bring about an exponential expansion in the total budget of NIH, from $82 million in 1955 to $1.2 billion in 1966. A key factor in achieving this has been his facility in the art of the possible.

Shannon has done more than increase quantity. He has built quality. This is evident in the extramural program at academic institutions and was obvious in the excellent program for support of research overseas which for a time included many of the best foreign investigators. It is especially evident in the intramural research program at Bethesda. Shannon has been able to build good research teams and programs because he understands research, has judgment as to what is significant, and can quickly perceive where new opportunities lie. He has these abilities because early in his career he devoted nearly 2 decades to distinguished personal research activities.

During most of his regime Shannon was able to keep detailed government management of grant funds to a minimum. He preferred to operate on what amounted to an honor system. However, university administrators and faculties were not always diligent, and there was slight but highly visible carelessness. It became necessary to institute more control over funds. Overzealous accountants at universities have used the new regulations as an excuse for prodigious empire building. One of the pressing tasks of the next director of NIH will be to arrest and reverse this agency's contribution to the bureaucratization of the universities.

The next director will also face the difficult problem of trying to strike the right balance between increasing knowledge and applying it. Shannon has been energetic in fostering applications, but he has also been deeply convinced that the key to medical progress is better understanding of biological processes. Today there are widespread demands for quick solutions of difficult medical problems. A successor succumbing to the political pressures of the moment could, with a few ill-judged moves, destroy much of what Shannon has built.

The choice of a successor to Shannon will not be easy. It is one of the most important tasks John Gardner will face during his tenure as Secretary of Health, Education, and Welfare.—PHILIP H. ABELSON

International Radiation Protection Association Congress

Opening ceremonies of this congress included two invited papers: one, an historical paper by K. Z. Morgan outlining the development of health physics as a profession; and the other by E. E. Pochin outlining the concept of permissible dose rates for tissues and organs with respect to genetic and neoplastic effects, and pointing out how these, rather than other impairments, might be limiting with respect to establishment of permissible concentrations of radionuclides in specific tissues.

A detailed report was made on a criticality at the Venus reactor at Mol, 30 December 1965. The reactor is a D_2O-moderated nuclear model of the Vulcan reactor. The criticality supposedly occurred when a technician failed to follow verbal instructions given him shortly beforehand. Of interest were the orders themselves, for these were in violation of the written operating procedures of the reactor. The criticality spike consisted of about 15 Mw-sec (4.5×10^{17} fissions), and resulted in no special damage to the reactor. The technician involved in the accident was pulling out one of eight hand-regulated control rods when the prompt criticality occurred; he noted the Cerenkov glow and heard the criticality alarms. By dropping the rod, he effectively halted the prompt criticality. He was the only person exposed.

The initial dosimetry evaluation was made by the criticality badge worn by the technician. The film portion of this badge indicated an exposure of about 700 roentgens to the trunk; the threshold foils indicated a fast-neutron dose, based on sulfur, of 55 radiation absorbed doses (rad). The thermal- and intermediate-neutron dose was far lower than the latter value. Final dosimetric data revealed the following: Entry dose, thorax: 400 rad; exit dose, thorax: 275 rad; midsection dose: 700 rad; gonadal dose: 1000 rad; marrow dose: 500 to 1000 rad to 48 percent of marrow; and maximum dose to left foot: 4700 r. These dose estimates are for electromagnetic radiation only; the neutron contribution was an additional 10 percent. The necessity for phantoms for duplicating exposure conditions was particularly emphasized; also, the film badge was shown to be a reasonable means of quickly estimating the whole-body exposure.

The medical aspects of this case were presented in detail. The patient followed the classical radiation syndrome and was hospitalized for 120 days, primarily because of the damage to his foot. A frank burn resulted shortly after the exposure, and in spite of all efforts, it was necessary to amputate the foot 25 weeks after exposure. Less than 9 months after the accident, the patient could not be located and was believed to have left the area. Attempts to find him have not been successful, although the presumption is made that he is still living and in reasonably good physical condition. Thus, future study of this individual was precluded.

External personnel dosimetry was a subject of prime interest during the technical sessions. Two comparisons of the film badge and thermoluminescent dosimeters (TLD) were cited. Generally, the only conclusions that were reached regarding the use of TLD (LiF) for personnel monitoring were that this system is not yet ready for widespread operational use and that it probably should be used in conjunction with other systems. It was felt that the systems of thermoluminescence dosimetry need additional study.

Papers on film dosimetry emphasized sophisticated instrumentation for calibration and readout. Such instrumentation implies that film dosimetry is still firmly entrenched as the primary personnel dosimeter. Surprisingly, no one specifically pointed out errors and inaccuracies associated with film dosimetry.

More significant were the papers dealing with internal dosimetry. C. R. Richmond and J. E. Furchner (Los Alamos Scientific Laboratory) compared differences between species with respect to radionuclide metabolism. They related the retention integral (or equilibrium factor) for a given radionuclide to body weight, basal metabolic rate, and the calories per gram per day. In all cases, smooth curves were obtained, implying that data from smaller mammalian species could be extrapolated to humans. Of particular importance was the statement that young animals have faster metabolic rates, and hence shorter effective residence time. If this can be extrapolated to humans, then a better quantification of the effects of internally deposited nuclides can be obtained, particularly for the accident situation involving a mixed population.

The dosimetry of β-emitters deposited in bone was discussed by F. W. Spiers (Leeds University, U.K.). In view of the fact that the relevant tissues lie within or close to the trabeculae, the importance of an accurate dosimetric

model was cited. By using such a model, it was shown that Maximum Permissible Body Burden (MPBB) for critical tissues may be too restrictive in several cases; specifically mentioned were Ca^{45} and Sr^{90}.

Two noteworthy presentations regarding pulmonary clearance of PuO_2 were made. L. J. Casarett (University of Rochester) showed how retention time varies as a function of particle size. As an example, the Mass Median Diameter (MMD) of particles within rat alveoli was cited as being log-normal with time, with 0.14-μ particles being retained the longest. For dogs, the comparable value was 0.11 μ.

The translocation from lung and excretion of Pu were greater by an order of magnitude for PuO_2 prepared by calcination at 350°C as opposed to 950°C, according to a study made by W. J. Bair (Battelle). Similarly, metals oxidized at 123° and 450°C showed greater translocation than the PuO_2 prepared by calcination at 950°C. Fecal excretion was greatest for the oxide calcined at 350°C, and least for that calcined at 950°C; the two directly oxidized metals were intermediate. Urinary excretion varied by nearly two orders of magnitude for the four materials studies. The results of this study point out that large errors in estimates of lung burden can be made on the basis of excretion data unless the chemicophysical state of the material and the physiology of the material in that state are known.

Results of studies by B. A. J. Lister (Harwell, U.K.) on the practical evaluation of inhaled radioactive materials were based primarily upon actual data. He found a correlation between alpha activity in nose blowings and in fecal samples after inhalation of insoluble α-emitters. These data suggest that lung burden can be predicted on the basis of nose blowings or nose wipes immediately after the exposure. According to Lister, the ratio of the nose blow to lung burden would be 500, or 80 microcuries on a nose blow sample would correspond to 0.16 microcurie in the lung, which was considered the maximum permissible lung burden. (This latter consideration would be correct only if the material is assumed to remain in the lungs, and if it is uniformly distributed in a mass of 10^3 g. New data would imply that this level is too great by a factor of 8, since a portion of these insoluble particles ultimately deposit in the pulmonary lymph nodes, with a much smaller mass.)

Lister also pointed out that a better estimate of lung burden could be made on the basis of fecal excretion, in the so-called plateau region of the excretion curve. This occurs from 10 to 50 days after exposure. The ratio of retained lung burden to average daily fecal excretion was found to be 2000.

Support for the very recent lung model of the International Congress of Radiation Protection (ICRP) was presented by P. L. Zeimer and co-workers (Purdue University) who studied two cases of inhalation exposure to europium oxide. The observed somewhat more rapid excretion from the first compartment, but in general their data agreed quite well with that of the ICRP Task Group. Excretion followed a $t^{-0.9}$ power function (t, days).

A report of an accidental exposure of three men to an insoluble mixture of Pu-Am was reported by A. Brodsky and N. Wald (University of Pittsburgh). Whole body counts, based on the 60-keV Am^{241} x-ray, were used to estimate the lung burden. Diethylenetriamine-pentaacetic acid (DTPA) was ef-

fective only in removing the soluble portion of the contaminant from the lung.

Perhaps the most valuable single presentation was the invited paper of F. D. Sowby (ICRP representative, U.K.) entitled "The 1965 Recommendations of the ICRP." In a rather candid presentation, Sowby pointed out certain changes in philosophy which led to the 1965 recommendations. Such changes are:

(i) a more general concept (in recognition of the growing number of experts in the field of radiation protection); (ii) the assumption of linearity, rather than (as previously) a threshold; (iii) the concept of dose limit, as applied to members of the population, and inclusion of population exposures in the general fabric of the recommendations; and (iv) a redefinition and more encompassing definition of occupational exposure.

RONALD L. KATHREN
Lawrence Radiation Laboratory,
University of California,
Livermore 94550

Calendar of Events

Courses

Built-In Test Equipment for the **Maintenance** of **Complex Electronic Systems.** New York, N.Y., 24–28 July. Tuition, $225. (D. M. Goodman, School of Engineering and Science, 401 W. 205 St., New York 10034)

Cancer Chemotherapy. Memorial and James Ewing Hospitals and Sloan-Kettering Institute for Cancer Research, New York, N.Y., 23–28 October. Designed for physicians; limited to 100 participants. Tuition, $100. (D. A. Karnofsky, Memorial Hospital, 444 E. 68 St., New York 10021)

Coelenterate Ecology. University of Hawaii, 19 June–8 Sept. Designed for 15 students fulfilling minimum requirements for graduate division at the University. Participants will receive $300 stipend and round-trip airfare from place of residence in United States. Six graduate credits in Zoology 600. *Deadline: 1 May.* (P. Helfrich, Summer Training Program, Hawaii Inst. of Marine Biology, Univ. of Hawaii, 2538 the Mall, Honolulu 96822)

Color Measurement. Clemson Univ., 31 July–4 Aug. For participants with background in colorants and basic knowledge of physics and mathematics. Tuition, $125. (H. J. Keegan, Color Measurement Seminars, School of Industrial Management and Textile Science, Clemson Univ., Clemson, S.C. 29631)

Ecological Approach to Study of Life. Humboldt State College, 26 June–4 Aug. (Summer Sessions Office, Humboldt State College, Arcata, Calif.)

Elements of Simulation. State Univ. of New York at Buffalo, 5–9 June. Intended for those with bachelor's degree in engineering, mathematics, or statistics. Course fee, $175. (Office of Continuing Education, SUNY at Buffalo, N.Y. 14214)

Engineering Economics, I and II. Inst. of Gas Technology, 8–19 May and 11–22 Sept. Designed for engineers and accountants who prepare analyses for corporate decision-making on capital goods acquisition and replacement. No background in accounting or economics neccessary. Fee for each session, $400. (Engineering Economics, Inst. of Gas Technology, 3424 S. State St., Chicago, Ill. 60616)

Estuarine Science. Chesapeake Biological Laboratory, Univ. of Maryland, 26 June–4 August. Courses for credit in ichthyology, invertebrate zoology, and special problems in zoology. (D. Flomer, The Laboratory. Box 38, Solomons, Md. 20688)

Fundamentals of Optics. Univ. of Rochester, 10–21 July. For persons with bachelor's degree in physics or engineering. Tution and academic expenses, $400. (Fundamentals of Optics, Inst. of Optics, Bausch & Lomb Bldg., Univ. of Rochester, Rochester, N.Y. 14627)

Fundamental Problems in Statistical Mechanics. Noordwijk ann Zee, Netherlands, 20 June–8 July. For Ph.D. level students. [Course Registrar, Netherlands Universities Foundation for international Cooperation (Nuffic), 27 Molenstraat, The Hague]

Genetics and Physiology of Bacterial Viruses. International Laboratory of Genetics and Biophysics, Naples, Italy, 21 Aug.–16 Sept. Limited to 16 postgraduate students in mathematics, physics, chemistry, and biology. Fellowships covering travel and living expenses available. (The Laboratory, Casella Postale 3061, Naples)

Inorganic Materials Preparation and Characterization. Pennsylvania State Univ., 18–29 Sept. Designed for solid-state physicists, chemists, and engineers at postdoctoral level. (Conf. Center, Pennsylvania State Univ., Univ. Park)

Integrated Circuits. Univ. of Michigan, 29 May–2 June. Course describes integrated circuit fabrication, design, evaluation, and application. Non-credit course designed for scientists and engineers. Fee, $175. (Engineering Summer Conf., West Engineering Bldg., Univ. of Michigan, Ann Arbor 48104)

Lasers—Theory, Technology, and Applications. Univ. of Michigan, 7–18 Aug. Fundamentals of gas lasers, impurity lasers, semiconductor lasers, coherent optics and holography; detailed consideration of specific lasers and their applications. Non-credit course designed for scientists and engineers. Fee, $300. (Engineering Summer Conf., West Engineering Bldg., Univ. of Michigan, Ann Arbor 48104)

Magnetic Thin Films. Univ. of Calif., Los Angeles, 19–23 June. Designed for persons with bachelor's degree in engineering or science. Fee, $225. *Deadline: 12 June.* (Engineering Extension, Room 6266, Boelter Hall, Univ. of California, Los Angeles 90024)

Mechanics of Fibrous Structures. University of Manchester, England, 3–7 July.

(Registrar, University of Manchester, Institute of Science and Technology, Sackville St., Manchester)

Operations Research for Public Systems, Massachusetts Inst. of Technology, 5–9 Sept. Methodology discussion in public health, education, transportation, and urban planning. (Director, Summer Session, Room E19-356, M.I.T., Cambridge 02139)

Physical Measurement and Analysis. Massachusetts Inst. of Technology, 13–23 June. Tuition, $400. (Director, Summer Session, Room E19-356, M.I.T., Cambridge 02139)

Practical Astrodynamics. Univ. of California, Los Angeles. 10–21 July. Fee, $300. (R. E. Garrels, Room 6532, Boelter Hall, Univ. of California, Los Angeles 90024)

Radiation Effects of Semiconductors. Univ. of Michigan, 5–16 June. Study of effects of nuclear and space radiations in semiconductors and effects upon semiconductor circuit components. Non-credit course designed for scientists and engineers. Fee, $300. (Engineering Summer Conf., West Engineering Bldg., Univ. of Michigan, Ann Arbor 48104)

Radiation Shielding. Kansas State Unv., 26 June–28 July. Designed for university staff members in nuclear engineering, applied mathematics, and physics departments and advanced graduate students or industrial and government personnel. (W. R. Kimel, Dept. of Nuclear Engineering, Kansas State Univ., Manhattan 66502)

Semiconductor Circuits. Univ. of Michigan, 22–26 May. Presents tools for analysis and design of electronic circuits using newer semiconductor devices. Fee, $175. Non-credit course designed for scientists and engineers. (Engineering Summer Conf., West Engineering Bldg., Univ. of Michigan, Ann Arbor 48104)

Statistical Communication Theory. Univ. of Michigan, 7–18 Aug. Includes theory of probability, and random processes and application to communication systems. Topics include least-squares filtering, detecting theory, modulation theory, information theory, and coding. Fee, $300. Non-credit course for scientists and engineers. (Engineering Summer Conf., West Engineering Bldg., Univ. of Michigan, Ann Arbor 48104)

Theoretical Physics. Brandeis Univ., 19 June–28 July. Subject is scattering theory. (Secretary, Physics Summer Inst., Brandeis Univ., Waltham, Mass. 02154)

Forthcoming Meetings—May

8–9. **"Power-Play** for **Control of Education,"** Education Commission of the States, Denver, Colo. (The Commission, Suite 822, Lincoln Tower Bldg., 1860 Lincoln St., Denver 80203)

8–10. International Conf. of **Mechanics of Composite Materials**, Philadelphia, Pa. (T. Ryan, Space Sciences Lab., General Electric Co., P.O. Box 8555, Philadelphia 19101)

8–10. American **Oil Chemists'** Soc., 58th annual, New Orleans, La. (The Society, 35 E. Wacker Dr., Chicago, Ill. 60600)

8–10. **Static Electrification,** 2nd conf., Inst. of Physics and Physical Soc., London, England. (Meetings Officer, The Society, 47 Belgrave Sq., London, S.W.1)

8–11. G-MTT 1967 Intern. **Microwave** Symp., Boston, Mass. (Inst. of Electrical and Electronics Engineers, 345 E. 47 St., New York 10017)

8–11. **Molecular Association in Biology,** intern. symp., Paris, France. (B. Pullman, Director, Institut de Biologie Physico-Chimique, 12, rue Pierre Curie, Paris 5^e)

8–12. American Soc. of **Civil Engineers,** Seattle, Wash. (W. H. Wisely, The Society, 345 E. 47 St., New York 10017)

8–12. **Color Measurement** Seminar, Clemson Univ., Clemson, S.C. (H. J. Keegan, School of Industrial Management and Textile Science, Clemson Univ., Clemson 29631)

8–13. **Nuclear Activation Techniques** in **Life Sciences,** symp., Intern. Atomic Energy Agency, Amsterdam, Netherlands. (J. H. Kane, Conferences Branch, Div. of Technical Information, Atomic Energy Commission, Washington, D.C. 20545)

9–11. **Electron, Ion, and Laser Beam** Technology, 9th annual symp., Institute of Electrical and Electronics Engineers, Berkeley, Calif. (C. Susskind, Electrical Engineering, Univ. of California, Berkeley 94720)

9–11. **Packaging Industry** Technical Conf., New York, N.Y. (Office of Technical Activities Board, Inst. of Electrical and Electronics Engineers, 345 E. 47 St., New York 10017)

11–12. Canadian **Operational Research** Soc., 9th annual conf., Ottowa, Ont., Canada. (Chairman, The Society, Box 120, R.R. No. 1 Ottawa, Ont.)

12–13. Association of University **Radiologists,** annual mtg., Philadelphia, Pa. (S. Rogoff, Dept. of Radiology, Univ. of Rochester Medical School, Rochester, N.Y. 14620)

12–13. **North Carolina Acad.** of **Science,** Duke Univ., Durham. (J. A. Yarbrough, Meredith College, Raleigh, N.C. 27602)

12–13. Northern and Southern societies for **Electron Microscopy,** joint mtg., Anaheim, Calif. (R. F. Bils, Hancock Foundation, Univ. of Southern California, Los Angeles 90007)

14–19. Institute of **Food Technologists,** 27th annual, Minneapolis, Minn. (The Institute, 221 N. LaSalle St., Chicago, Ill. 60601)

14–19. Society of **Photographic Scientists and Engineers,** annual conf., Chicago, Ill. (W. S. Dempsey, Itek Corp., 1735 Eye St., NW, Washington, D.C. 20006)

15. **Biomacromolecules,** symp., New York Soc. of Electron Microscopists and New York Univ. School of Medicine, New York, N.Y. (S. S. Breese, Jr., Plum Island Animal Disease Lab., Box 848, Greenport, Long Island, N.Y. 11944)

15–17. **Aerospace Electronics** Conf., 19th annual conf., Dayton, Ohio. (Inst. of Electrical and Electronics Engineers, Dayton Office, 1414 E. 3 St., Dayton 3)

15–17. **Diagnosis** and **Treatment** of **Deposited Radionuclides,** intern. symp., Richland, Wash. (T. Bauman, The Symposium, P.O. Box 999, Richland 99352)

15–17. **Chemical** and **Petroleum** Instru-

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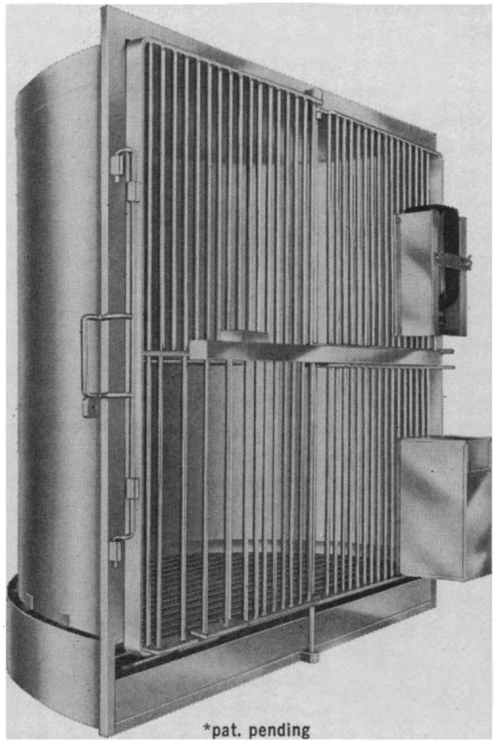
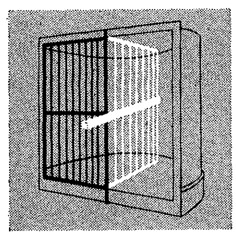


The rotating "squeeze-door" is easily operated by a long horizontal handle that provides considerable leverage in restraining the animal. Rotating smoothly, the door sweeps the entire cage in a 180° arc to guide the animal to the desired position at the front of the cage.



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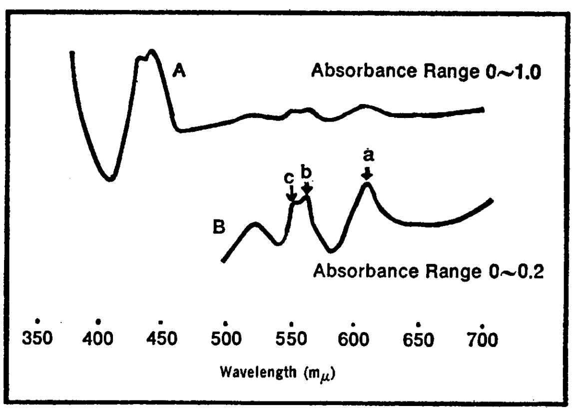

DIFFERENCE SPECTRA BETWEEN OXIDIZED AND REDUCED FORMS OF MITOCHONDRIA IN SUSPENSION. Curve A: Recorded in the absorbance scale of 0~1.0; Curve B: Recorded in the scale of −0.1~+0.1 (Small letters show absorption bands of cytochromes a, b and c.) Recorded on the Shimadzu MULTIPURPOSE RECORDING SPECTROPHOTOMETER (MPS-50L).

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8030 Georgia Avenue, Silver Spring, Maryland 20910 mentation Symp., 8th natl., Instrument Soc. of America, St. Louis, Mo. (S. A. Young, Honeywell, Inc., 2146 Hampton St., St. Louis 63139)

15–17. **Biomedical Sciences** Instrumentation Symp., 5th natl., Instrument Soc. of America, Albuquerque, N.M. (The Society, 530 William Penn Pl., Pittsburgh, Pa. 15219)

15–17. **Radioecology**, 2nd natl. symp., Univ. of Michigan, Ann Arbor. (F. C. Evans, Dept. of Zoology, Univ. of Michigan, Ann Arbor)

15–17. **Technical Literature Abstracting** and **Indexing**, 3rd annual institute, Washington, D.C. (Director, Center for Technology and Administration, American Univ., 2000 G St., NW, Washington, D.C. 20006)

15–18. Mid-America Symp. on **Spectroscopy**, 18th annual, Chicago, Ill. (W. K. Baer, Nalco Chemical Co., 6216 W. 66 Place, Chicago 60038)

15–18. Society of **Plastics Engineers**, 25th annual technical conf., Detroit, Mich. (R. D. Forger, The Society, 65 Prospect St., Stamford, Conn. 06902)

15–19. Society of **Photographic Scientists** and **Engineers**, annual conf., Chicago, Ill. (R. J. Mazor, Nugent-Williams Studies, Inc., 120 N. Pulaski Rd., Chicago)

15–20. **Space Technology** and **Science**, 7th intern. symp., Tokyo, Japan. (S. Nozawa, ISTS-Tokyo, 1967, Japanese Rocket Soc., Yomiuri Newspaper Bldg., 1, 3-chome, Ginza-Nishi, Chuo-ku, Tokyo)

15–26. Workshop in **Heat Transfer Computer Programs**, Univ. of California, Los Angeles. (Engineering Extension, Room 6266, Boelter Hall, Univ. of California, Los Angeles 90024)

16–18. National **Telemetering** Conf., San Francisco, Calif. (L. Winner, 152 W. 42 St., New York 10036)

16–19. Society for **Experimental Stress Analysis**, Ottawa, Ont., Canada. (B. E. Rossi, The Society, 21 Bridge Sq., Westport, Conn. 06882)

16–20. **Solid Inorganic Phosphates**, intern. colloquium, Toulouse, France. (Secretariat du Colloque International sur les Phosphates Mineraux Solids, Dept. de Chimie Inorganique, Faculté des Sciences, 38, rue des Trente-Six Ponts, 31-Toulouse)

17–22. **Fresh Water from the Sea**, 2nd European symp., Athens, Greece. (A. A. Delyannis, P.O. Box 1199, Athens-Omonia)

18. **Washington Acad.** of **Sciences**, mtg., Washington, D.C. (R. P. Farrow, Natl. Canners Assoc., 1133 20th St., NW, Washington, D.C. 20036)

18–19. Midwest Symp. on **Circuit Theory**, Purdue Univ., West Lafayette, Ind. (B. J. Leon, School of Electrical Engineering, Purdue Univ., West Lafayette)

18–19. Southern **Textile Research** Conf., Hilton Head Island, S.C. (A. L. Smith, Chatham Manufacturing Co., Elkin, N.C. 28621)

20–24. Recent and Ancient **Deltaic Deposits**, seminar, Louisiana State Univ., Baton Rouge. (J. M. Coleman, Coastal Studies Inst., Dept. of Geology, Louisiana State Univ., Baton Rouge 70803)

21–24. American Inst. of **Chemical En-**

gineers, mtg., Salt Lake City, Utah. (F. J. Van Antwerpen, The Institute, 345 E. 47 St., New York 10017)

21–26. **Nondestructive Testing**, 5th intern. conf., Montreal, P.Q., Canada. (Conf. on Nondestructive Testing, P.O. Box 95, Verdun 19, P.Q.)

22–24. Conference on **Frequency Generation and Control for Radio Systems**, London, England. (J. L. Regan, Inst. of Electrical Engineers, Savoy Pl., London, W.C.2)

22–25. Institute of **Electrical** and **Electronics Engineers**, joint technical conf., Cleveland, Ohio. (Office of Technical Activities Board, The Institute, 345 E. 47 St., New York 10017)

22–25. New Aids for **Management Decision Making**, Washington, D.C. (Director, Center for Technology and Administration, American Univ., 2000 G St., NW, Washington, D.C.)

22–25. **URSI–IEEE**, spring mtg., Ottawa, Ont., Canada. (R. S. Rettle, Natl. Research Council, Ottawa 2)

22–26. **Drug Metabolism**, 2nd workshop, George Washington Univ., Washington, D.C. (Dept. of Pharmacology, School of Medicine, George Washington Univ., 1337 H St., NW, Washington, D.C. 20005)

22–26. **Radiosterilization of Medical Products**, symp., Intern. Atomic Energy Agency, Budapest, Hungary. (J. H. Kane, Conferences Branch, Div. of Technical Information, Atomic Energy Commission, Washington, D.C. 20545)

23–25. National **Tuberculosis** Assoc. and American **Thoracic** Soc., annual mtg., Pittsburgh, Pa. (NTA, 1740 Broadway, New York 10019)

23–31. **Water for Peace**, intern. conf., Washington, D.C. (R. C. Hagan, Dept. of State, Room 1318, 2201 C St., NW, Washington, D.C.)

24–26. Fourteenth Canadian **High Polymer** Forum, Laval Univ., Quebec City. (J. F. Henderson, Research and Development Div. Polymer Corp. Ltd., Sarnia, Ont., Canada)

24–27. **Teratology** Soc., 7th annual mtg., Estes Park, Colo. (M. D. Runner, Inst. for Developmental Biology, Univ. of Colorado, Boulder 80302)

25–26. **Drug Information** Assoc., 3rd annual, Philadelphia, Pa. (P. de-Haen, The Association, 11 W. 42 St., New York 10036)

26–27. **Surface Physics**, 5th annual symp., Washington State Univ., Pullman. (E. E. Donaldson, Dept. of Physics, Washington State Univ., Pullman 99163)

29–1. **Special Libraries** Assoc., New York, N.Y. (B. M. Woods, The Association, 31 E. 10 St., New York 10003)

29–2. Congress of **Canadian Engineers**, Montreal, P.Q., Canada. (Office of Technical Activities Board, Inst. of Electrical and Electronic Engineers, 345 E. 47 St., New York 10017)

31–2. American Soc. for **Quality Control**, 21st annual technical conf. and exhibit, Chicago, Ill. (R. W. Shearman, The Society, 161 W. Wisconsin Ave., Milwaukee, Wis. 53203)

31–2. **Instrument Soc.** of America, 13th natl. analysis instrumentation symp., Los Angeles, Calif. (The Society, 530 William Penn Pl., Pittsburgh, Pa. 15219)

BOOKS RECEIVED

(*Continued from page 499*)

The Analysis of Information Systems. A programmer's introduction of information retrieval. Charles T. Meadow. Wiley, New York, 1967. 319 pp. Illus. $11.50.

Analysis of Straight-Line Data. Forman S. Acton. Dover, New York, 1966. 283 pp. Illus. Paper, $2. Reprint, 1959 edition.

An Analysis of Time-Shared Computer Systems. Allan Lee Scherr. M.I.T. Press, Cambridge, Mass., 1967. 143 pp. Illus. $5.

The Atomic Debates: Brodie and the Rejection of the Atomic Theory. W. H. Brock, Ed. Leicester Univ. Press, Leicester, England, 1967. 196 pp. Illus. 35s. Three studies.

Attracting Birds: From the Prairies to the Atlantic. Verne E. Davison. Crowell, New York, 1967. 270 pp. Illus. $6.95.

Augmented Plane Wave Method. T. L. Loucks. Benjamin, New York, 1967. 270 pp. Illus. Paper, $4.95; cloth, $9.

Basic Data of Plasma Physics, 1966. Sanborn C. Brown. M.I.T. Press, Cambridge, Mass., ed. 2, 1967. 320 pp. Illus. $8.50.

Basic Switching Circuit Theory. Moshe Krieger. Macmillan, New York, 1967. 268 pp. Illus. $9.95.

Beyond the Observatory. Harlow Shapley. Scribner, New York, 1967. 222 pp. $4.50.

Biology. Samuel Rapport and Helen Wright, Eds. New York Univ. Press, New York, 1967. 284 pp. Illus. $4.95.

Niels Bohr: His Life and Work as Seen by His Friends and Colleagues. S. Rozental, Ed. North-Holland, Amsterdam; Interscience (Wiley), New York, 1967. 355 pp. Illus. $9. Twenty-one papers.

La Cellule, M. Durand and P. Favard. Hermann, Paris, 1967. 223 pp. Illus. Paper, 30 F.

Chinese Lineage and Society: Fukien and Kwangtung. Maurice Freedman. Humanities Press, New York, 1966. 219 pp. Illus. $6.75. London School of Economics Monographs on Social Anthropology, No. 33.

A Concise History of Mathematics. Dirk J. Struik. Dover, New York, ed. 3, 1967. 205 pp. Illus. Paper, $2.

Current Aspects of Biochemical Energetics. Fritz Lipmann Dedicatory Volume. Nathan O. Kaplan and Eugene P. Kennedy, Eds. Academic Press, New York, 1966. 500 pp. Illus. $16.50. Thirty-four papers.

Cutting and Grinding Fluids: Selection and Application. R. K. Springborn, Ed. American Soc. of Tool and Manufacturing Engineers, Dearborn, Mich., 1967. 180 pp. Illus. Paper.

Desalination by Reverse Osmosis. Ulrich Merten, Ed. M.I.T. Press, Cambridge, Mass., 1967. 301 pp. Illus. $10. Eight papers.

The Determination of Crystal Structures. vol. 3, *The Crystalline State*, H. Lipson and W. Cochran. Cornell Univ. Press, Ithaca, N.Y., ed. 3, 1967. 422 pp. Illus. $14.

The Dissemination of Health Information. A case study in adult learning. Jacob J. Feldman. Aldine, Chicago, 1967. 286

pp. Illus. $6.95. National Opinion Research Center Monographs in Social Research.

Early Behavior: Comparative and Developmental Approaches. Harold W. Stevenson, Eckhard H. Hess, and Harriet L. Rheingold, Eds. Wiley, New York, 1967. 315 pp. Illus. $9.75. Eleven papers.

Early Theories of the Universe. James A. Coleman. New American Library, New York, 1967. 160 pp. Illus. Paper, 75¢.

An Easy Introduction to the Slide Rule. Isaac Asimov. Fawcett, Greenwich, Conn., 1967. 160 pp. Illus. Paper, 60¢. Reprint, 1965 edition.

The Economics of Location. August Lösch. Translated from the second revised German edition by William H. Woglom and Wolfgang F. Stolper. Wiley, New York, 1967. 548 pp. Illus. Paper, $2.95.

Economics of Outdoor Recreation. Marion Clawson and Jack L. Knetsch. Published for Resources for the Future. Johns Hopkins Press, Baltimore, 1967. 348 pp. Illus. $8.50.

Education and Morals: An Experimentalist Philsophy of Education. John L. Childs. Wiley, New York, 1967. 313 pp. Paper, $1.65.

Educational Psychology in the Classroom. Henry Clay Lindgren. Wiley, New York, ed. 3, 1967. 706 pp. Illus. $8.50.

Electric and Magnetic Fields. Stephen S. Attwood. Dover, New York, 1967. 487 pp. Illus. Paper, $3. Reprint, 1956 edition.

Electronic and Magnetic Behavior of Materials. Allen Nussbaum. Prentice-Hall, Englewood Cliffs, N.J., 1967. 167 pp. Illus. Paper, $2.95; cloth, $5.95. Prentice-Hall Series in Materials Science.

Energy Conversion by the Photosynthetic Apparatus. A symposium held in June 1966. Margaret Dienes, Ed. Brookhaven Natl. Laboratory, Upton, New York, 1967 (order from Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.). 524 pp. Illus. Paper, $3. Thirty-nine papers.

Engineering at Cambridge University, 1783–1965. T. J. N. Hilken. Cambridge Univ. Press, New York, 1967. 289 pp. Illus. $8.50.

Engineering Economy. E. Paul DeGarmo. Macmillan, New York, ed. 4, 1967. 544 pp. Illus. $10.95.

Engineering Mechanics: Statistics and Dynamics. Irving H. Shames. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1967. 768 pp. Illus. $13.95.

Equivalent Circuits of Electric Machinery. Gabriel Kron. Dover, New York, 1967. 308 pp. Illus. Paper, $2.25. Reprint, 1951 edition.

Essays in the History of Embryology and Biology. Jane M. Oppenheimer. M.I.T. Press, Cambridge, Mass., 1967. 384 pp. Illus. $12.50.

Ethics for an Industrial Age: A Christian Inquiry. Victor Obenhaus. Wiley, New York, 1967. 352 pp. Paper, $1.95. Reprint, 1965 edition.

Fifth International Seaweed Symposium. Proceedings (Halifax, N.S.), August 1965. E. Gordon Young and J. L. McLachlan, Eds. Pergamon, New York, 1967. 442 pp. Illus. $15. Fifty-eight papers.

Finite Deformation of an Elastic Solid.

Francis D. Murnaghan. Dover, New York, 1967. 148 pp. Illus. Paper, $1.85. Reprint, 1951 edition.

Flesh of Steel: Literature and the Machine in American Culture. Thomas Reed West. Vanderbilt Univ. Press, Nashville, Tenn., 1967. 173 pp. $4.50.

Flotation Properties of Rare Metal Minerals. Igor N. Plaksin, Ed. Translated from the Russian edition (Moscow, 1965) by R. E. Hammond. Primary Sources, New York, 1967. 95 pp. Illus. $8.75.

Foundations of Iron and Steel Metallurgy. W. H. Dennis. Elsevier, New York, 1967. 254 pp. Illus. $7.50.

Four-Legged Australians. Adventures with animals and men in Australia. Bernhard Grzimek. Translated from the German edition (Munchen, 1966) by J. Maxwell Brownjohn. Hill and Wang, New York, 1967. 312 pp. Illus. $7.95.

Fracture of Structural Materials. A. S. Tetelman and A. J. McEvily, Jr. Wiley, New York, 1967. 711 pp. Illus. $17.95. Wiley Series on the Science and Technology of Materials.

Fundamental Physics. Jay Orear. Wiley, New York, ed. 2, 1967. 492 pp. Illus. $8.95.

Fundamentals of Silicon Integrated Device Technology. vol. 1, *Oxidation, Diffusion and Epitaxy*. R. M. Burger and R. P. Donovan, Eds. Prentice-Hall, Englewood Cliffs, N.J., 1967. 511 pp. Illus. $15.

Gastric Pepsin, Mucus, and Clinical Secretory Studies (*Ann. N.Y. Acad. Sci.* **140**). Edward M. Weyer, Ed. New York Acad. of Sciences, New York, 1967. 268 pp. Illus. Paper, $8. Twenty papers given at a conference held in March 1966.

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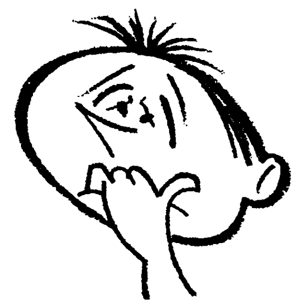

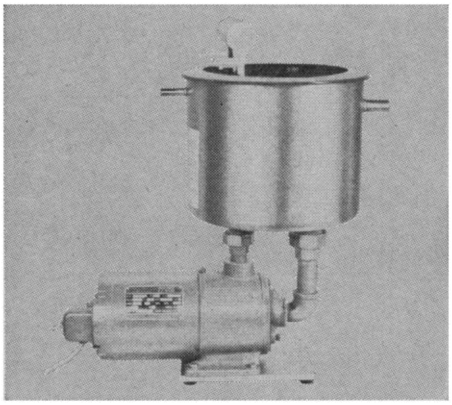

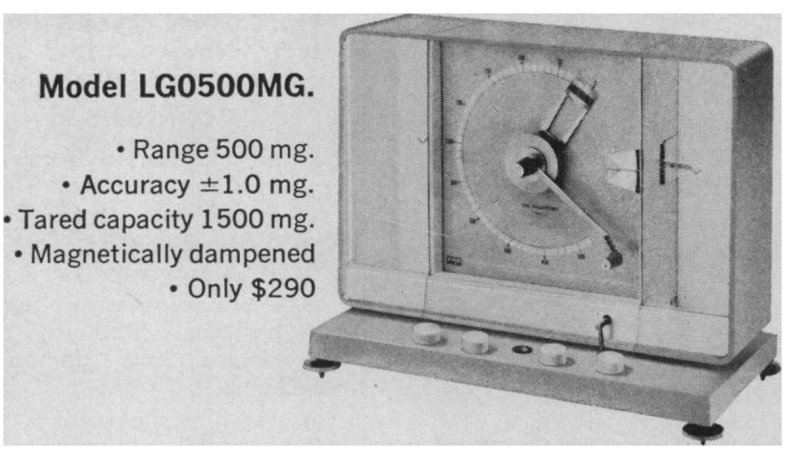

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