SCIENCE

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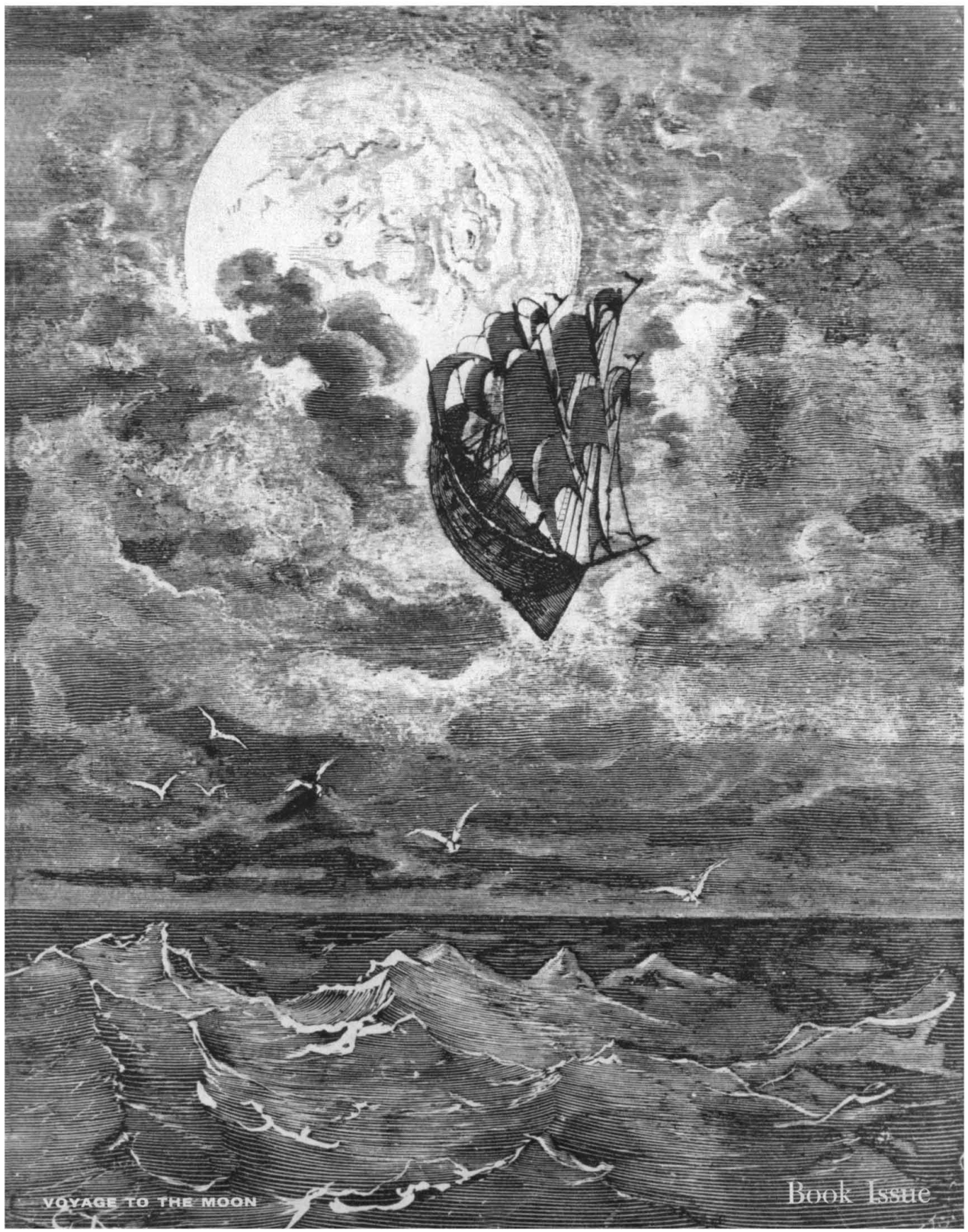
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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COVER

A mid-19th century illustration, "A Voyage to the Moon," depicted man's dream of lifting himself off the earth and venturing out toward the moon, the sun, the planets, and even the stars. See review of *The New Ocean: A History of Project Mercury*, page 774. [Paul Gustave Dore (Bella Landauer Collection, Library of Congress)]

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Physicists from the Scientific Research Staff at Ford Motor Company recently developed a device to demonstrate a new phenomenon in solid state physics.

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The phenomenon, known as inelastic electron tunneling, is capable of seeing minute amounts of molecular material which are in the adsorbed state, having attached themselves to the surface of a thin, insulating film. Experiments have shown that less than a single layer of these impurities can be detected.

In the experiment, an electron current is passed through the thin film on which the impurities have been adsorbed. The ability of the film to pass current was measurably affected by the presence of the impurity molecules.

Tunneling electrons were found to interact with vibrational states of molecules included at a metal-oxide interface. There were increases in the conductance G of the junction occurring at various characteristic voltages V. These voltages correspond to vibrational frequencies ν of molecules contained in the junction, i.e., $eV = h\nu$.

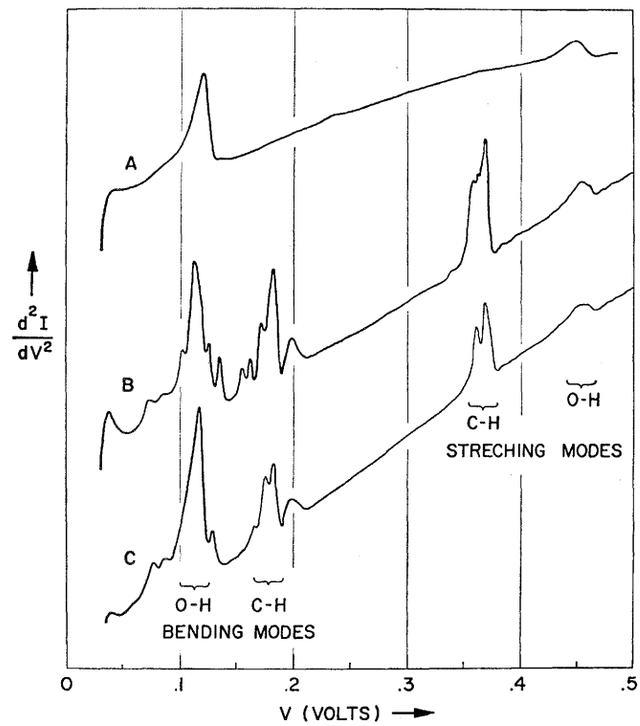
These increases represent changes in G of about 1% and correspond to the onset of new tunneling channels paralleling the bulk of the tunneling current. The characteristic voltages occur when molecular impurities are introduced in the junction, usually after formation of the oxide insulating barrier and before deposition of the top metal film. Coverage is estimated to be of the order of one monolayer.

A spectrum was obtained that was characteristic of the particular molecular species. The spectra reflect the internal molecular vibrations.

Traditional methods of obtaining this information have used infrared light of varying wave length to probe the sample. In this new method, electrons take the place of light waves and the voltage applied to drive current through the insulating film takes the place of wave length.

Compared to infrared absorption, electrons are effected more than a thousand times more efficiently in this method, which accounts for its high sensitivity.

Besides providing a new analytical tool, the Solid State Spectrometer permits experimentation on molecules in the adsorbed state, which will be of importance to the field of surface chemistry. It also represents an advance in understanding the basic processes related to electron tunneling in the solid state.



Recorder traces of d^2I/dV^2 versus applied voltage for three Al-Al oxide-Pb junctions taken at 4.2°K. The zero of the vertical scale is shifted for each curve and all three are normalized to the same arbitrary units. The largest peaks represent increases of 1% of G. Also indicated are intervals associated with the energy of IR active molecular vibrational modes. Curve A is obtained from a "clean" junction. Curves B and C are obtained from junctions exposed to propionic acid ($CH_3(CH_2)COOH$) and acetic acid (CH_3COOH) respectively. The spectra are independent of voltage polarity.

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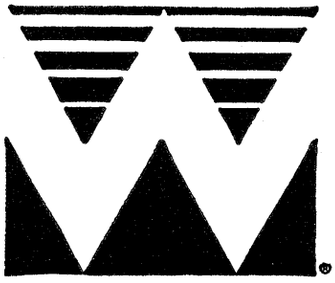

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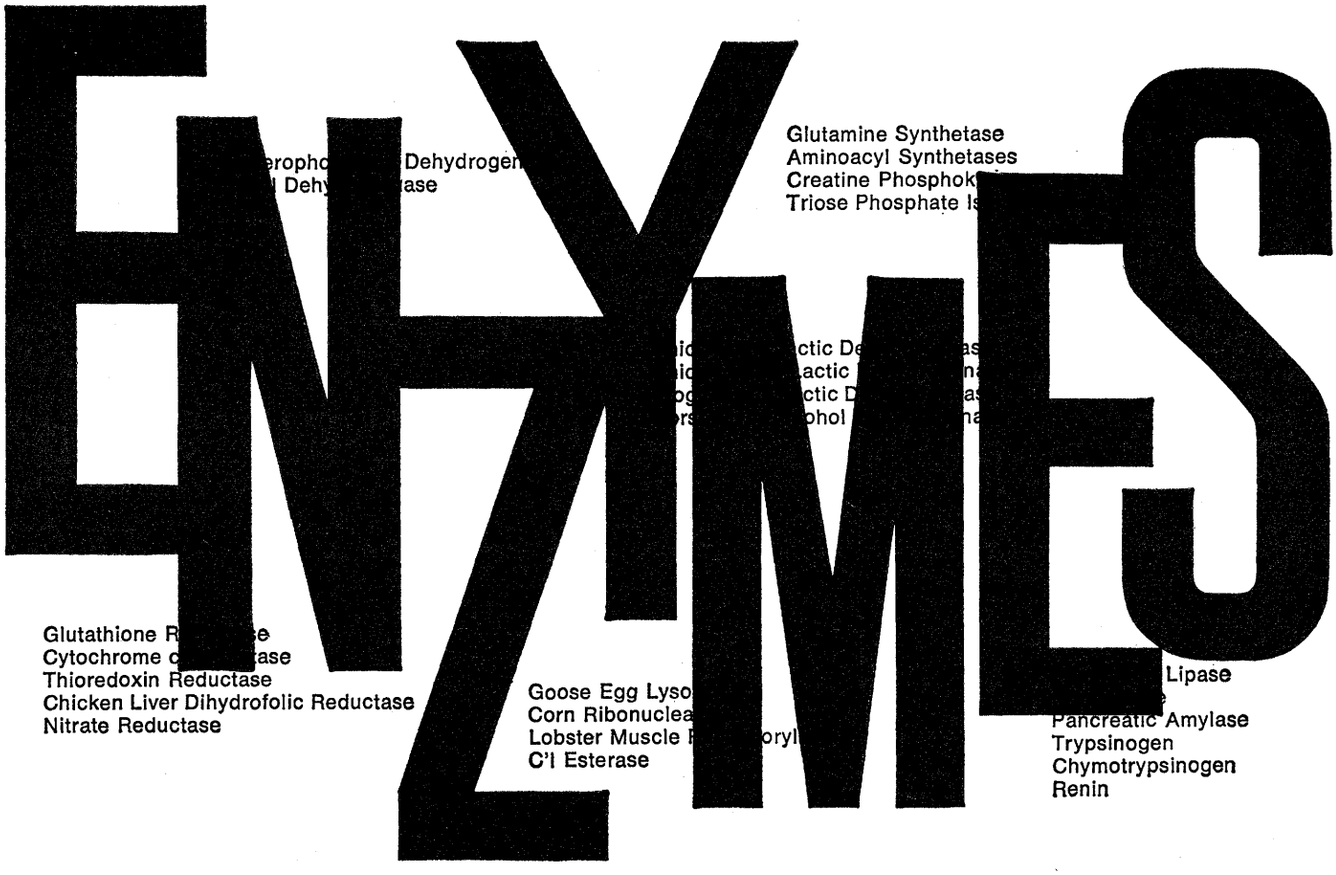

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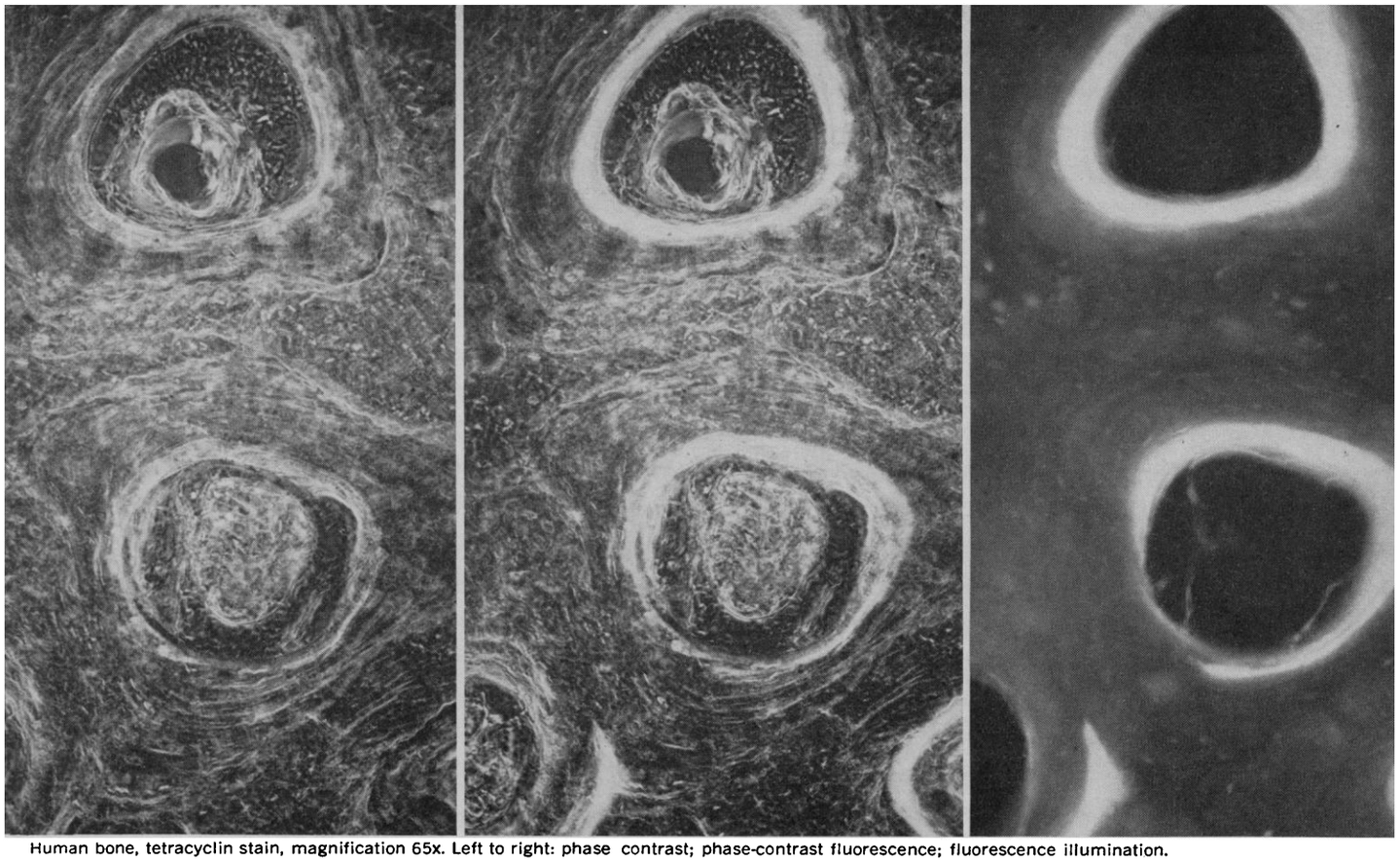

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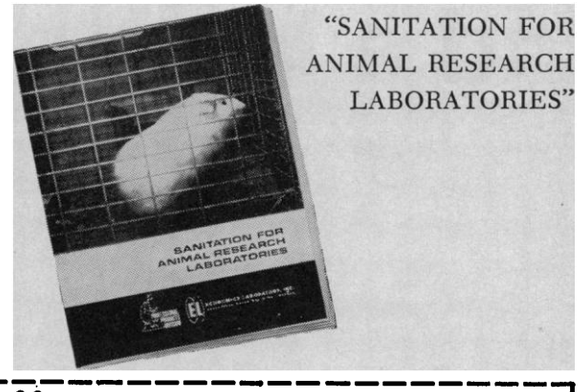

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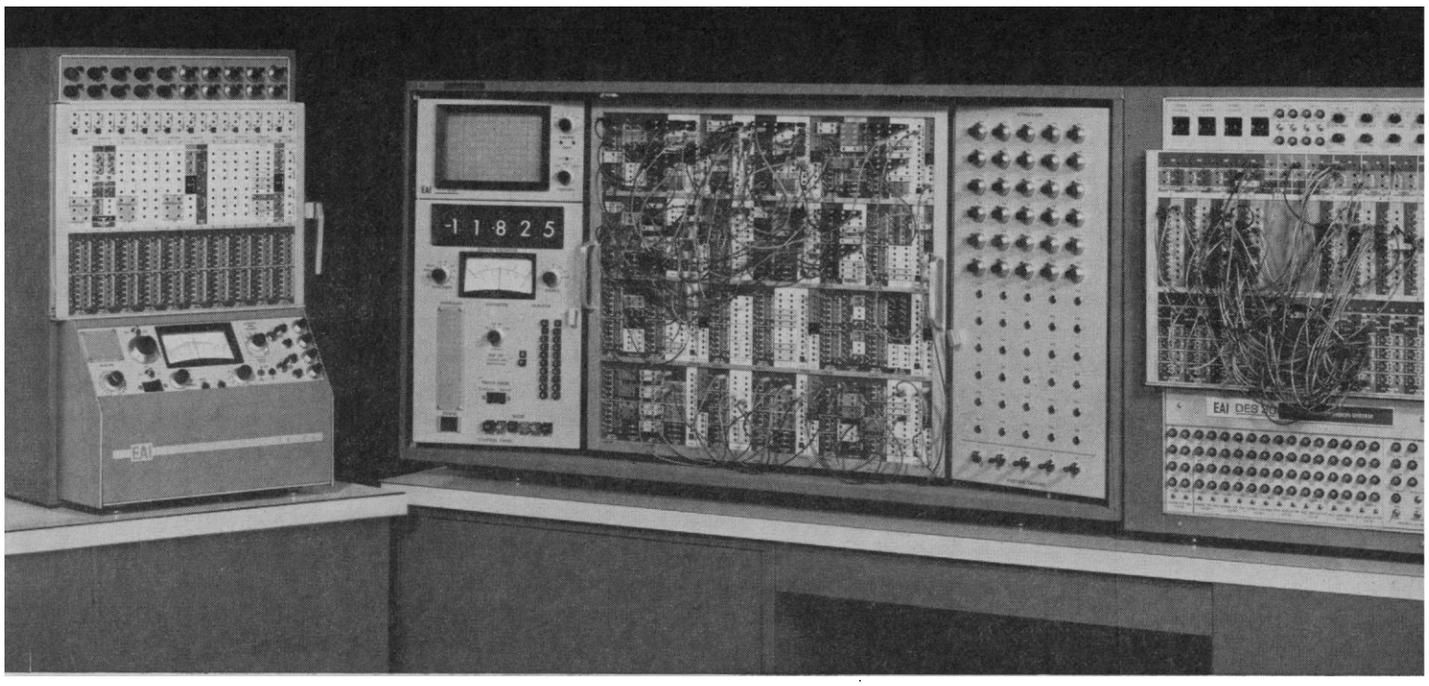

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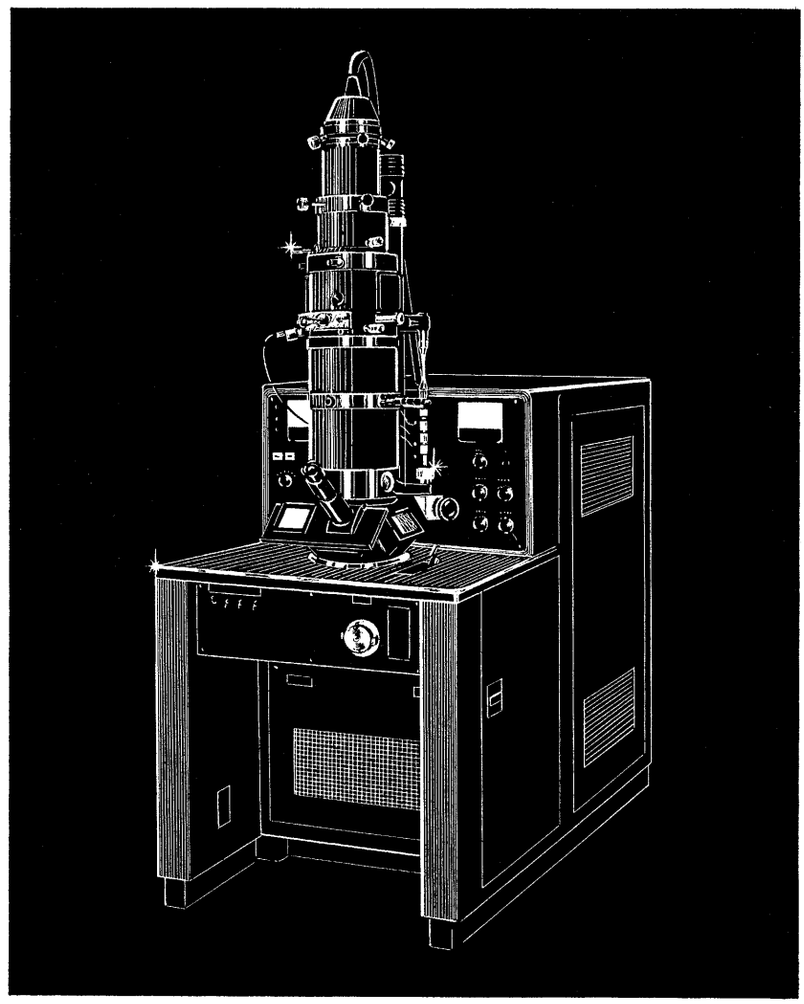

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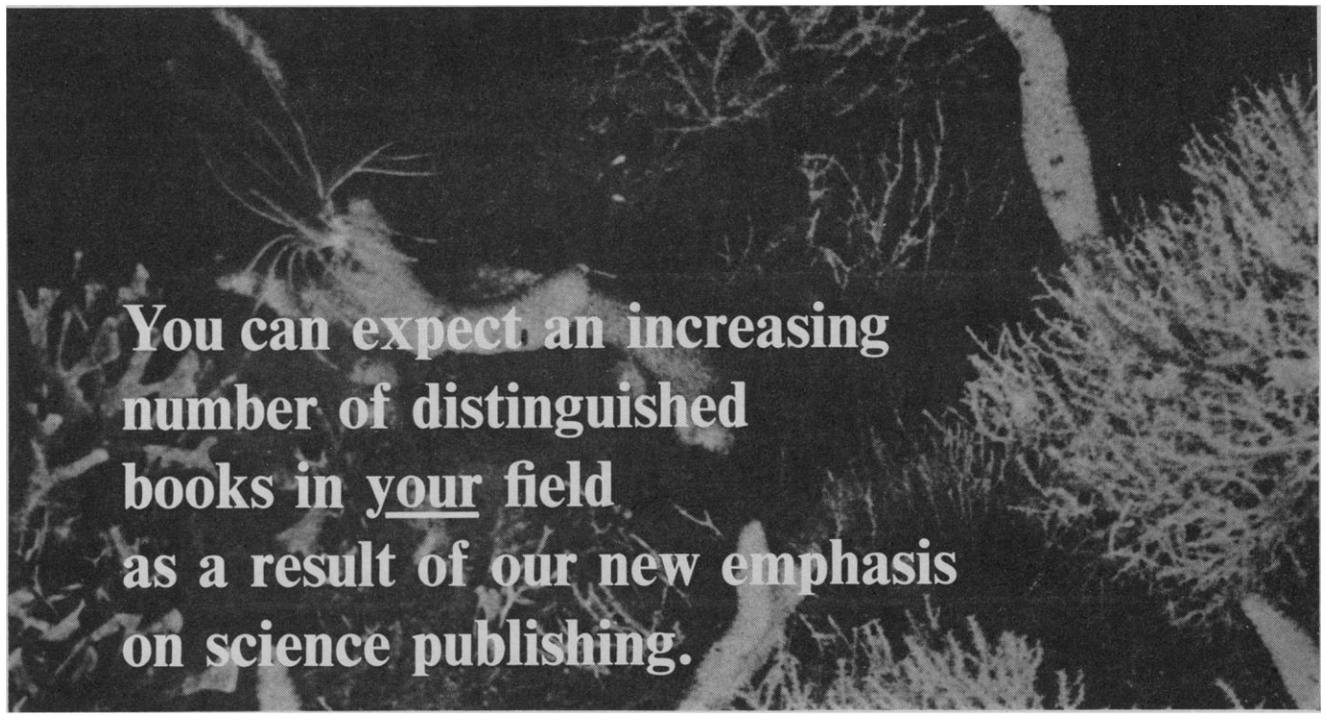

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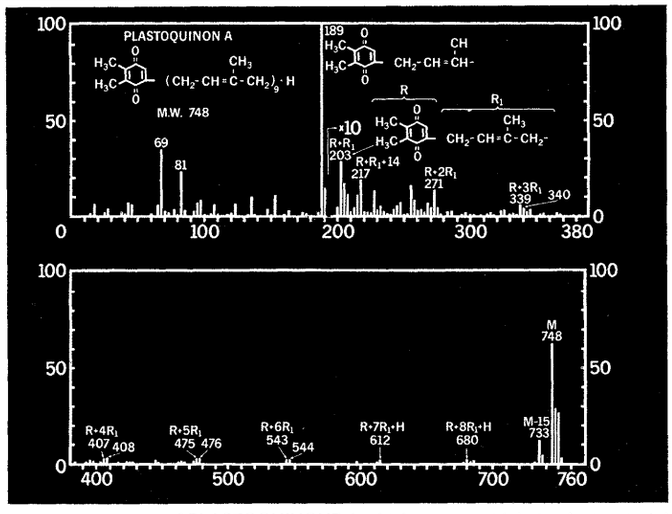

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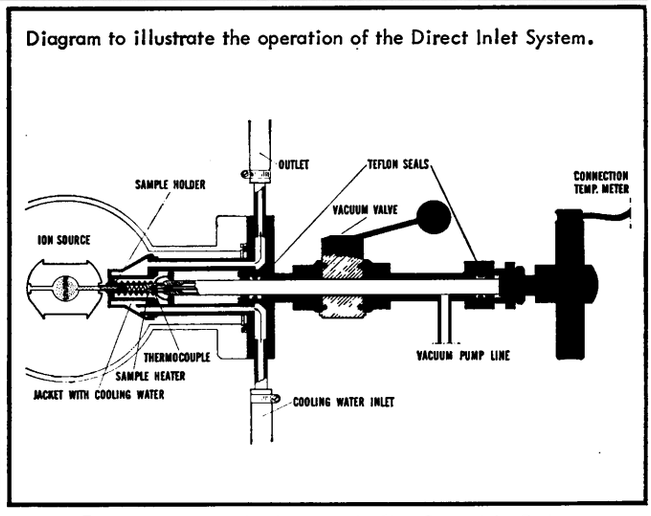

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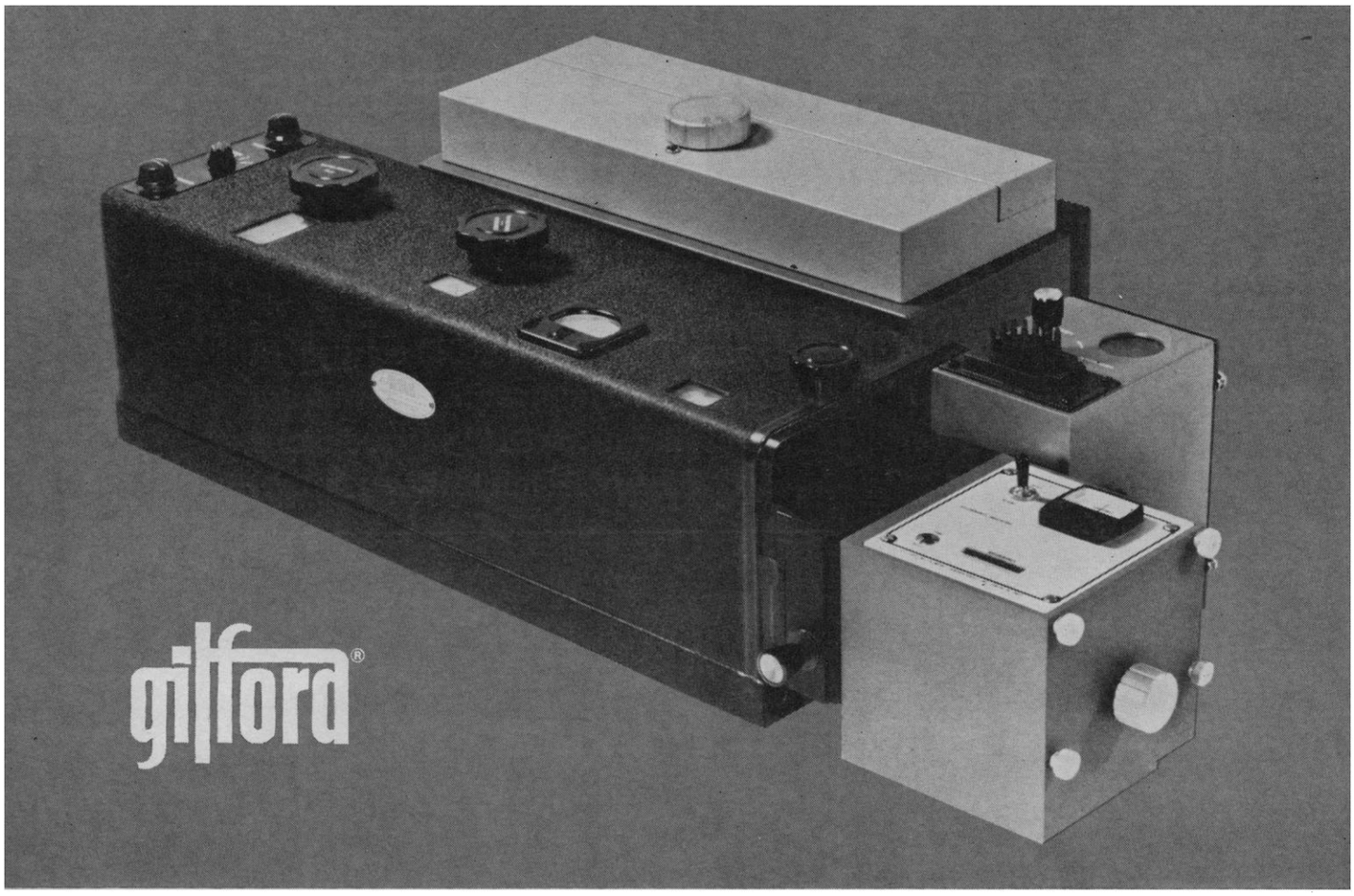

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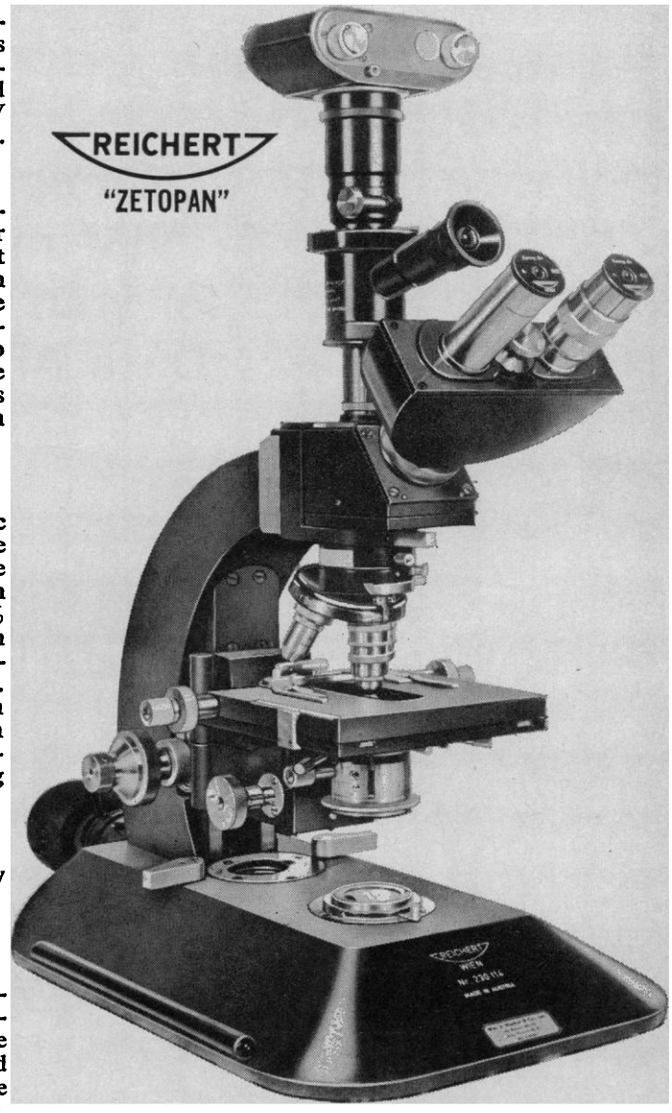
For the quantitative determination of reflectivity, absorptivity and extinction or fluorescence intensity and their variation with wave length by means of the new Reichert microphotometer (spectrophotometer) in combination with the "Zetopan". Specimen and measuring diaphragm are viewed simultaneously for infinitely reliable specimen detail location at all objective powers. An integrated photo multiplier assures linearity of indication far exceeding the measuring accuracy of 0.5%. This sensitivity permits measurements of the smallest structural constituents down to 0.5 micron.

AUTOMATIC PHOTOMICROGRAPHY

The new Reichert "Photo Automatic" is a fully automatic photomicrographic camera. It indicates the exposure time *prior* to actual exposure enabling the operator to decide whether the indicated exposure time is reasonable. A beam splitter directs 80% of the light to the camera and 20% to the focusing telescope. The frame size is 24 x 36 mm with readily interchangeable cassettes. A vibration-free magnetic shutter provides for exposures starting at 1/250 sec. with a range to any exposure time necessitated by film and specimen. The film speed setting can be varied between ASA 6 and 1600. The magnification of the built-in photographic eyepiece is variable from 6.3x to 10x eliminating the need for changing objectives.



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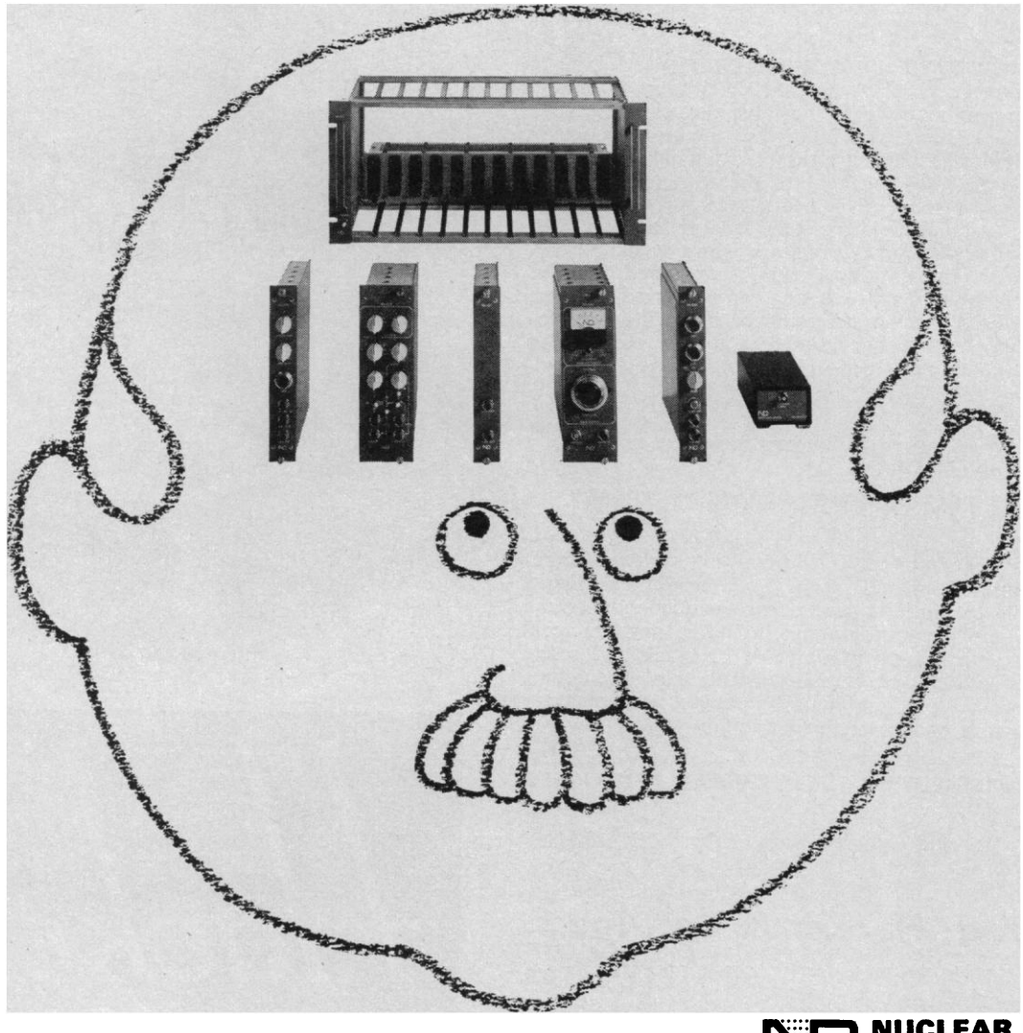

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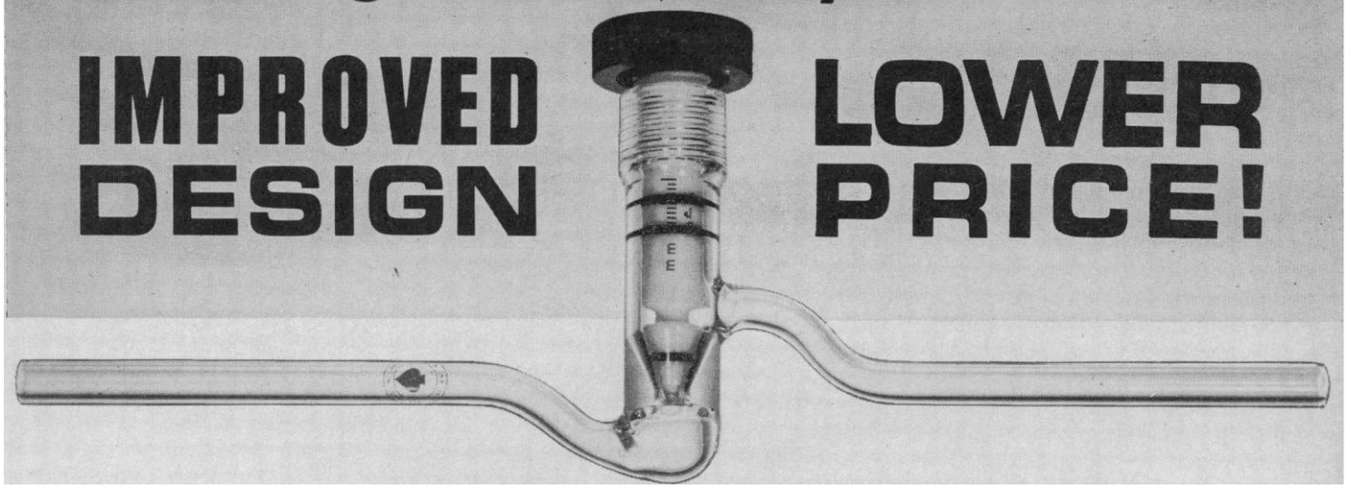
A Better High Vacuum Stopcock from ACE

IMPROVED DESIGN



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- **All glass and Teflon - very easy to operate, can be annealed.**
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8115 HIGH VACUUM STOPCOCK. Variable opening **A:** 0-5 mm. **B:** 0-10 mm. Smooth acting semi-needle valve permits fine adjustment of opening. "O" ring makes positive closure against a precision formed heavy glass seat. Reference marks on body and handle aid repetitive setting. The stem is made of long life Teflon and is triple sealed within heavy walled glass housing, accurately threaded. All glass construction permits annealing. Side arms are also of heavy walled glass. Supplied with plain side arms 120 mm. long. **8115-A** (variable opening 0-5 mm.) **$22.50, 8115-B** (variable opening 0-10 mm.) **$24.50.**

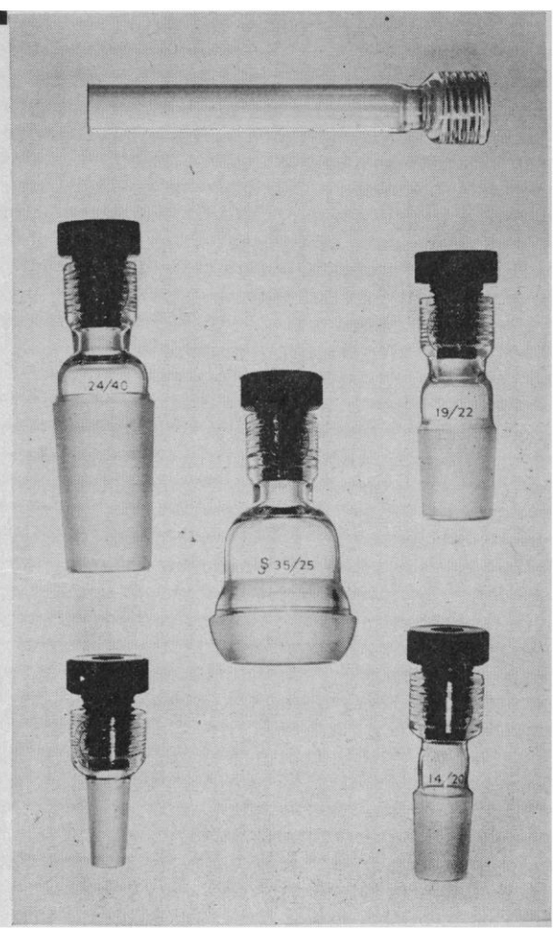
Threaded Glass/Nylon Thermometer Adapters from Ace

Convenient application • Suitable for vacuum • Wide range of sizes.

5028 ADAPTER, Thermometer Vacuum. Inner joint at bottom and threaded plastic bushing at top which tightens into glass piece to form an "O" ring compression seal with thermometer. Plastic bushing comes complete with Viton A "O" ring. ⧩ 10/30 size will accommodate thermometers up to 6.5 mm. diameter, and all others will accommodate 7 mm. diameter thermometers. Suitable for vacuum applications.

Joint	⧩ 10/30	⧩ 14/20	⧩ 19/22	⧩ 24/40	⧎ 18/9	⧎ 35/20	⧎ 35/25
Glass Bottom	2.85	2.90	2.95	3.15	3.25	3.40	3.40
Plastic Bushing	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Complete	**4.35**	**4.40**	**4.45**	**4.65**	**4.75**	**4.90**	**4.90**

Threaded section with tubing 4" long x ½" O.D. **$1.50.**



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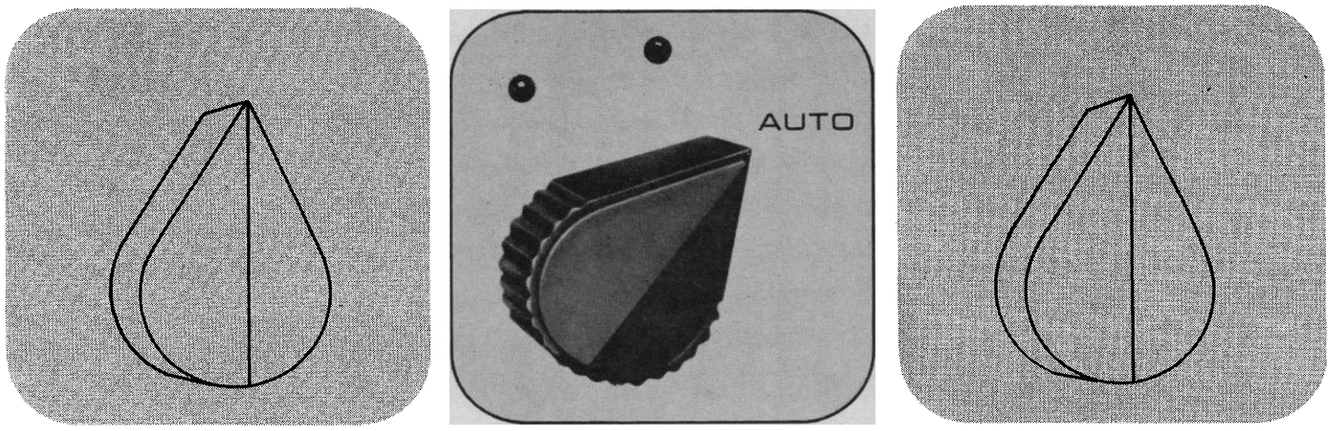


Why are Canalco's UV flow monitors the only ones with automatic scale expansion?

Frankly, we can't imagine why no other manufacturer offers this feature. After all, it's the only way you can have maximum usable sensitivity at all times—even in unattended, overnight operation—with perfect assurance that the recorder's pen won't go off scale and lose vital information.

In addition to automatic 3X expansion, Canalco Wide-Track UV Flow Analyzers also have six other important features that combine to give you extra sensitivity of detection plus reliable, versatile, drift-free performance. Among them are:

■ dual phototube ratio circuitry for accurate linear Transmittance recording, in spite of line voltage or lamp intensity fluctuations. (By the way, linear T recording gives *twice the pen deflection* of linear Absorbance recording at low optical densities, just where you need sensitivity the most. Furthermore, the Wide-Track 3X scale gives direct quantitation; over this chart range, linear T and linear A differ less than 1% T.)

■ both single-cuvette and dual-cuvette models are available. With two cuvettes, you can flatten your baseline out even if solvent absorption changes, as in gradient elutions;

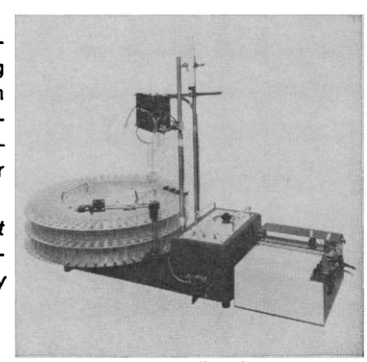
■ you have a choice of *five* optical path lengths, up to 20 millimeters (twice the length, four times the sensitivity our competitors offer);

■ Canalco Wide-Tracks come complete with wide-chart recorder (7½ inches of calibrated grid), including side-of-chart event marking pen to correlate peaks with fraction collector tubes. (Marker pen connection plugs directly into Canalco, Warner-Chilcott and Research Specialties fraction collectors; connection to other makes is also simple.)

■ single-wavelength operation gives optimum sensitivity for both proteins and nucleotides, eliminates filter and source changing;

■ extension cable kits facilitate mounting sensing heads in cold rooms, with recorder conveniently outside. No temperature compensators are required for coldroom use.

Get the full facts about the four models in Canalco's Wide-Track family Write today!



Wide-Track Flow Analyzer with Canalco Fraction Collector

CANALCO

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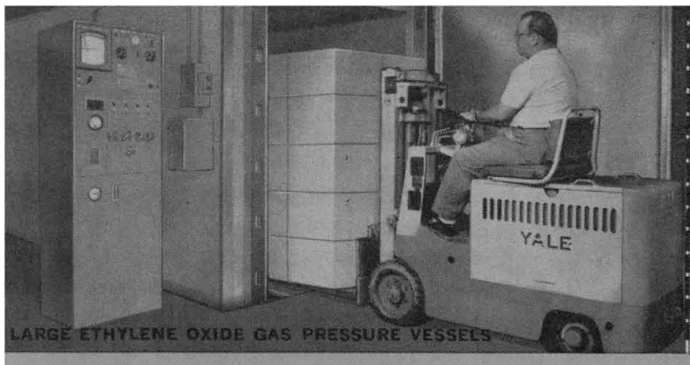
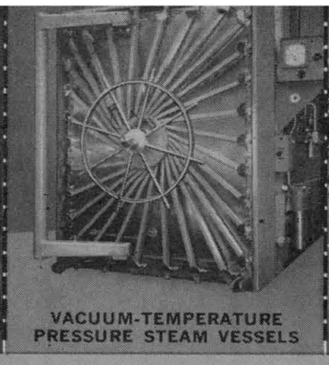


LARGE ETHYLENE OXIDE GAS PRESSURE VESSELS



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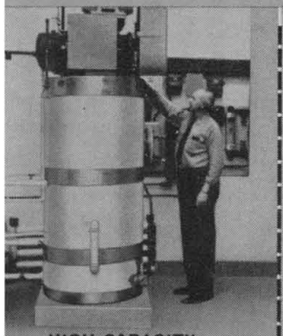
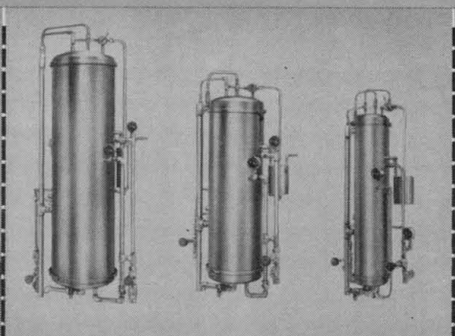
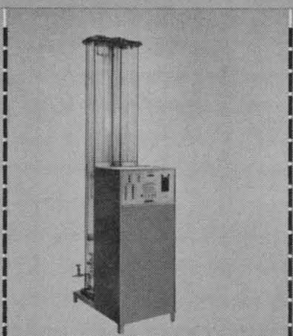


HIGH-CAPACITY POR COMPRESSION STILLS



UltraPure STAINLESS STEEL PRESSURE STILLS



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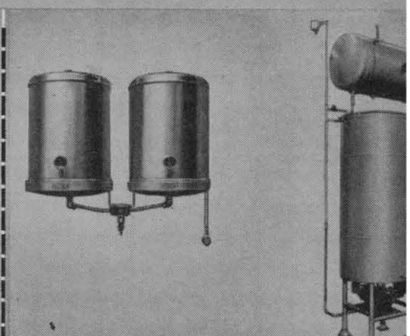

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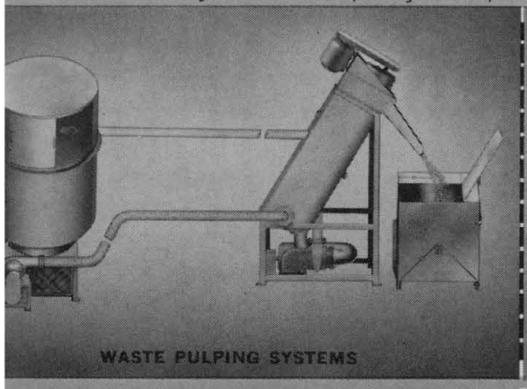
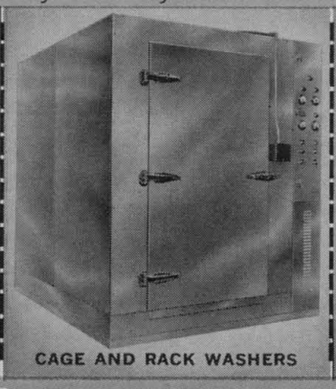
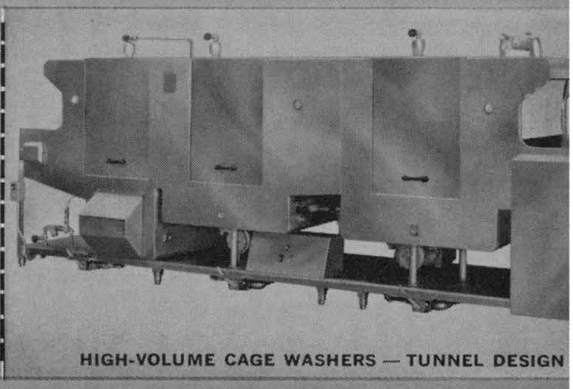


WASTE PULPING SYSTEMS



CAGE AND RACK WASHERS



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May, 1967

FISHER PRODUCT REPORT

News about instruments, apparatus and reagent chemicals that make your work quicker, surer, safer and easier.

At its price ($325), you can't beat the new Fisher Vacuum Oven for usable sample space (313 sq. in.). Besides, it's lined with stainless steel.

And if this isn't enough, the new Model 48 can be operated under vacuums down to 30" Hg, responds to temperature changes of ±1.0° over a range of 40°C to 200°C. You can use this compact unit efficiently as a vacuum-drying oven; as a controlled-atmosphere or ordinary air-filled chamber for static drying; and as a purged-atmosphere chamber.

The 5/32"-thick, stainless-steel interior and a removable stainless-steel shelf and auxiliary tray guard against corrosion. All controls are conveniently located at the front just below the door, which has a see-through window of half-inch, shatterproof glass. There's a thermometer just inside the door where it's easy to read. Hose connections for the vacuum and purging lines are on the back. Available for 115-volt or 230-volt operation.

If you are hankering after a multipurpose vacuum oven, our free product bulletin will convince you the new Fisher Model 48 is the most for your money. (a) ☐

Newest Fisher Isotemp Oven hangs on useless wall space to free useful counter space.

With this latest in the famous Fisher family of Isotemp® laboratory ovens mounted on your lab wall, you gain more than 3 running feet and nearly 7½ square feet of usable bench top. To say nothing about the gain in convenience. It's a gravity-convection oven with a roomy double-door chamber having a capacity of more than 3 cubic feet. Temperature from 50°C to 200°C is maintained within ±2°. You'll receive all the details on this $375 space liberator when you ask for our product brochure. (b) ☐

P.S. The Fisher family of Isotemp ovens includes standard gravity-convection and forced-draft types in Junior (1-cubic-foot capacity) and Senior (3-cubic-foot capacity) sizes. Outstanding family features: the "Safety Sentinel" thermostat that protects against overheating; simple controls; magnetic latches on full-width doors; durable construction; remarkable constancy and uniformity of temperature. There is even an Isotemp incubator. Let us know, and we'll send you the family dossier. (c) ☐

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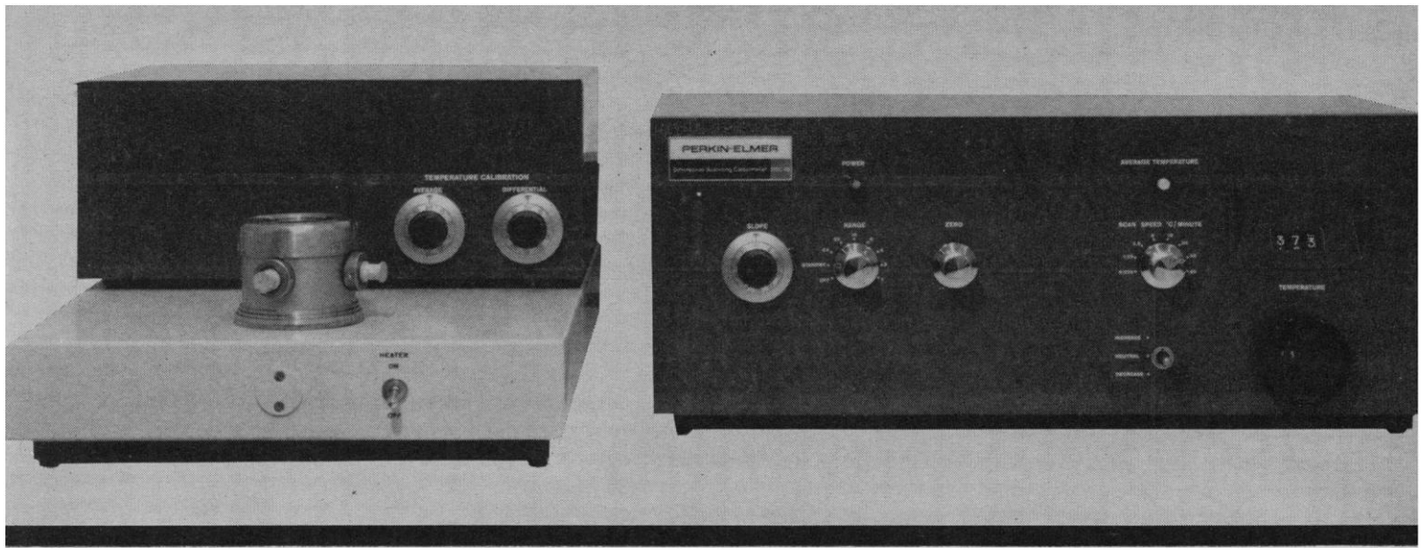

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How would you like to have a thermal analysis instrument that gives you all these—

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- The fastest controlled heating and cooling rates. Heat to and equilibrate at any temperature to 500°C in less than a minute. Run down to and up from —100°C without elaborate, troublesome coolant systems.
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Detailed information on purity is in Thermal Analysis Newsletter No. 5. Heat capacity is in Newsletter No. 3. Write for these two informative reports today to Instrument Group, Perkin-Elmer Corporation, 723 Main Avenue, Norwalk, Conn. 06852.

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*Patent applied for

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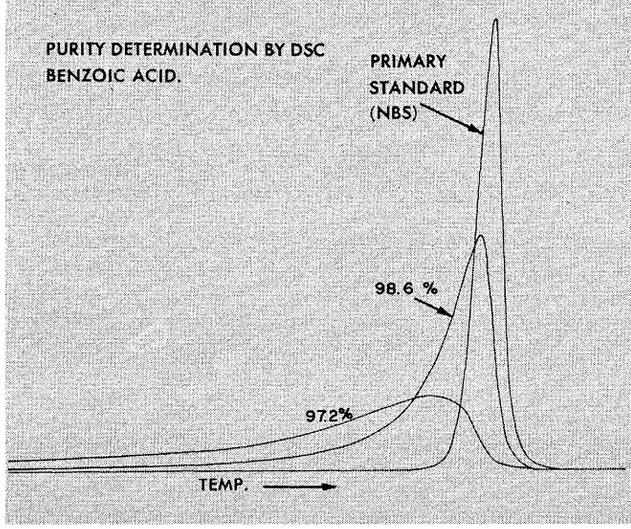
BENZOIC ACID.



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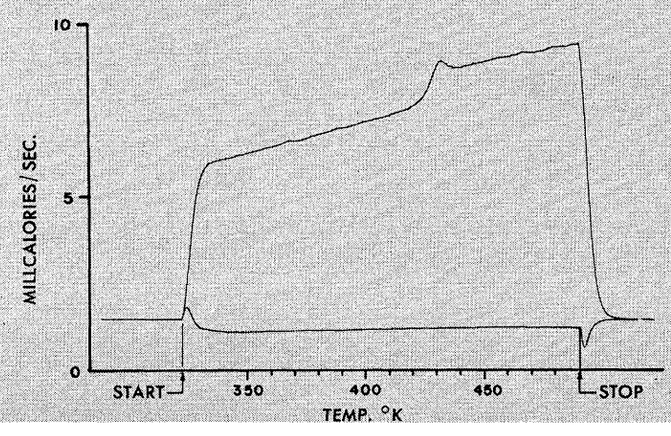

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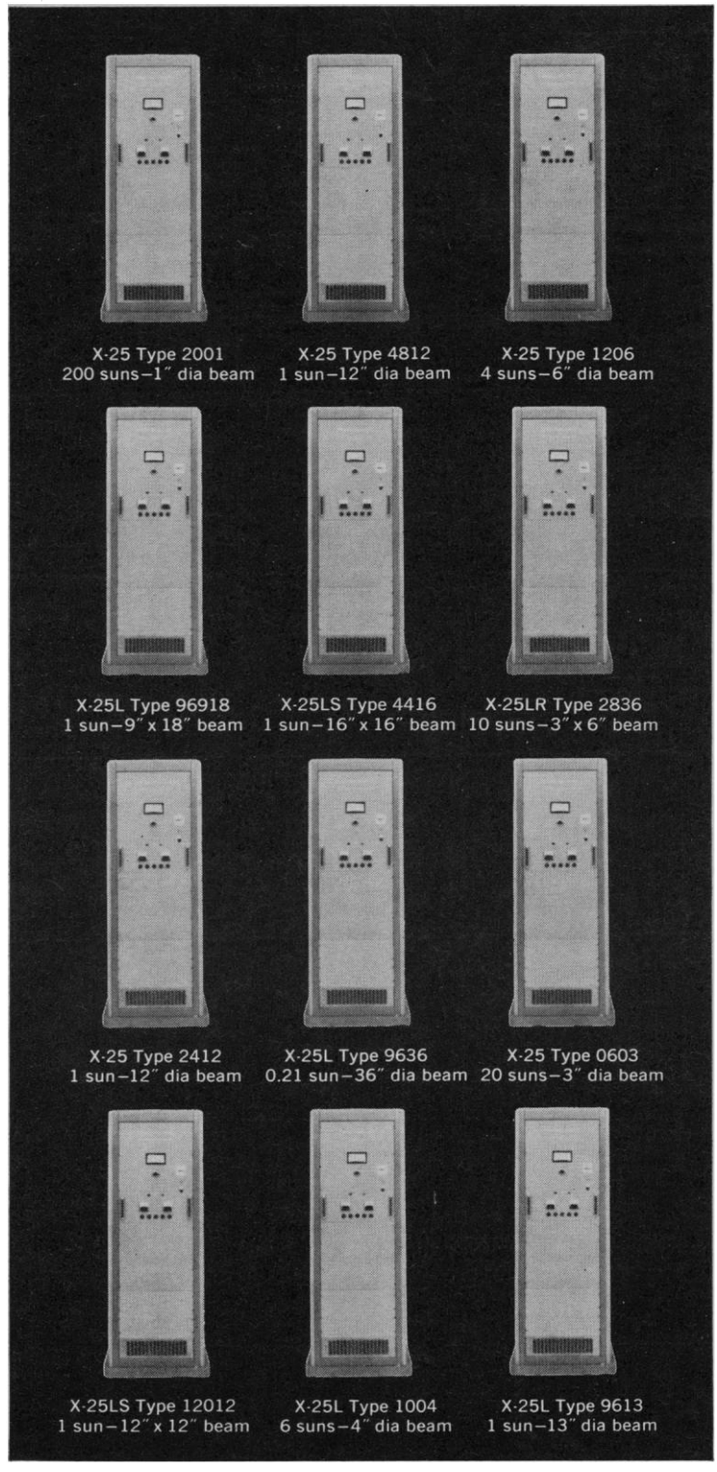

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Basic Radiation Biology

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NEW 1967 BOOK. This introductory text is designed to provide readings in the general principles of radiation biology for students who have a limited background in radiation physics and modern biology. Simple illustrations and a straightforward narrative style are used throughout this thorough, but not exhaustive, presentation. Experiments, when used, are cited as examples of general principles and important techniques. Part I, Review of Pertinent Physics, includes origins and types of ionizing radiations, interactions of radiation with matter, and measurement of radiation dose. Part II, Interactions of Radiations with Living Systems, includes two chapters on cytogenetics, target theory and interpretation of survival data, the oxygen effect, radiation effects on immunity and treatment of irradiated organisms.

Just Published—

Atlas of Human Histology

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243 Pages, 7″ x 10½″. 111 Original Color Plates. 189 Figures. $9.50

3rd (1967) EDITION. With 10 new full page plates, and 7 new figures added to existing plates, the new edition continues to be the ideal auxiliary text for the beginning student. The exceptional illustrations are composite color drawings of what the student sees only after a study of several slides. The sequence of presentation conforms to that of the major textbooks, the terminology is updated to the recent Nomina Anatomica, and a table of contents has been added.

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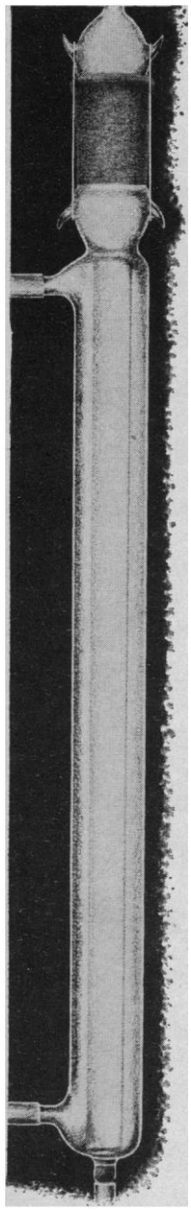

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* Three Easy Prices Too!
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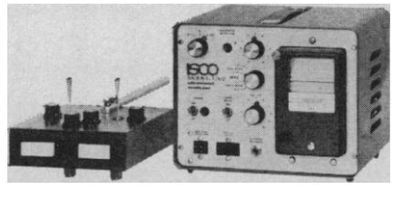
Lesson No.1

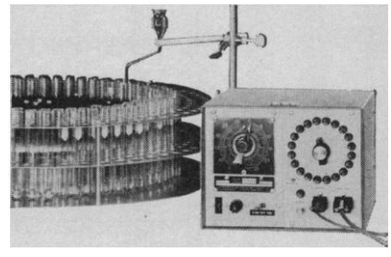
Begin by pumping your solvent into the column in a smooth concentration or pH gradient. ISCO's new programmed gradient pump, the DIALAGRAD, will handle this perfectly. In fact any simple or complex gradient formed by combining two liquids can be dialed directly into the DIALAGRAD. Program duration and pumping rates are easily adjustable over very broad ranges. No more mixing numerous solutions to guessed-at concentrations.

Lesson No.2



Now to identify your fractions. Use an ISCO UA-2 or 222 Ultraviolet Analyzer to get quantitative results with no need for further assay. Select linear absorbance, single or dual-beam monitoring at either 254 or 280 mμ or both. Absorbance recording minimizes need for base-line compensation and allows direct integration of chart record. As each UV absorbing fraction is recorded it is also automatically deposited in a separate collecting tube.

Lesson No.3



Collecting the effluent is then a simple task when ISCO fraction collectors are used. Choose from any of four basic models offering timed or volumetric control. Some have lift-off reels that can be changed as often as they fill, and when not collecting can be used as convenient storage racks. Extras such as drop counters and volumetric dispensers make things even easier. No after-school sessions necessary when you use ISCO equipment.

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Embarrassing questions to ask our salesmen about the β/γ Liquimat® liquid scintillation counter.

Prior to beginning the actual questioning, you might consider initiating the discussion with the following preamble or something akin to it:

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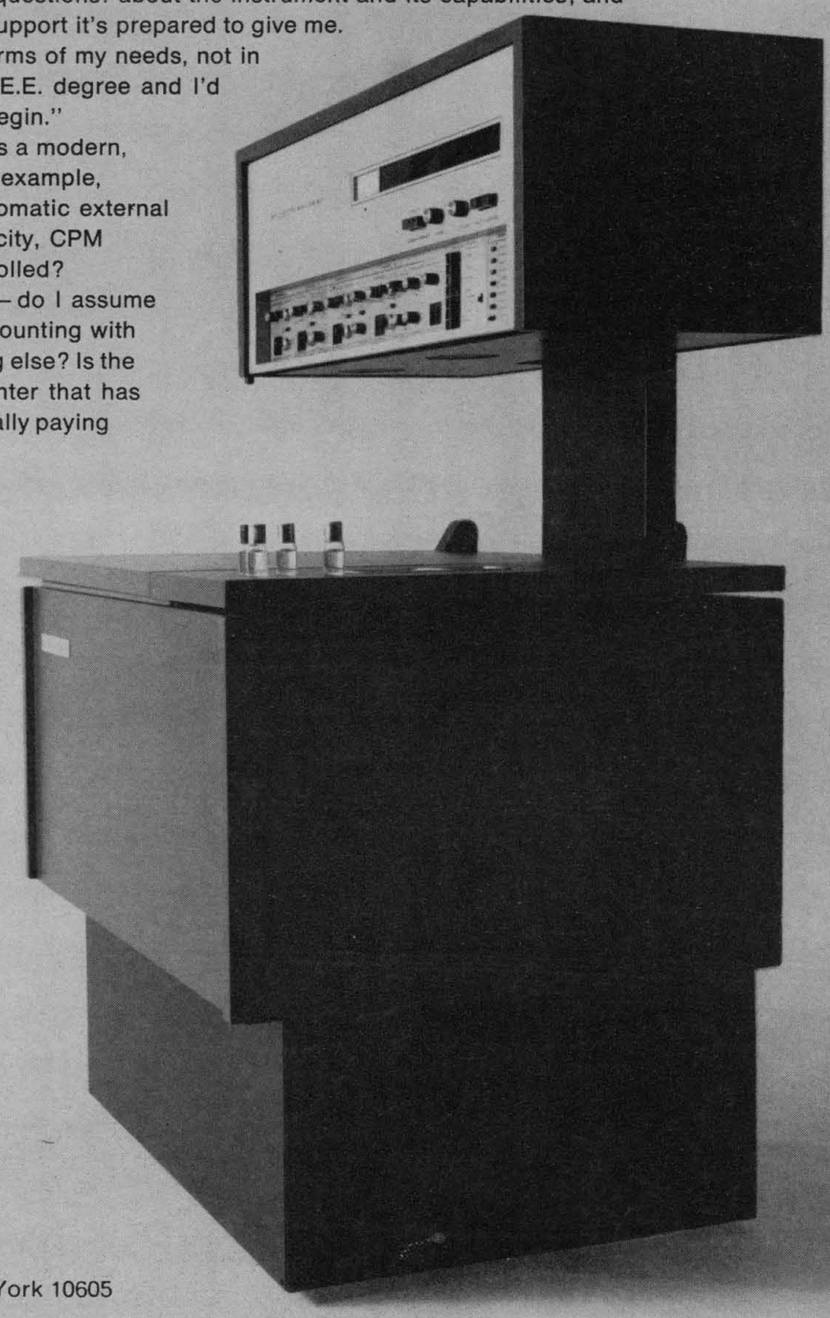

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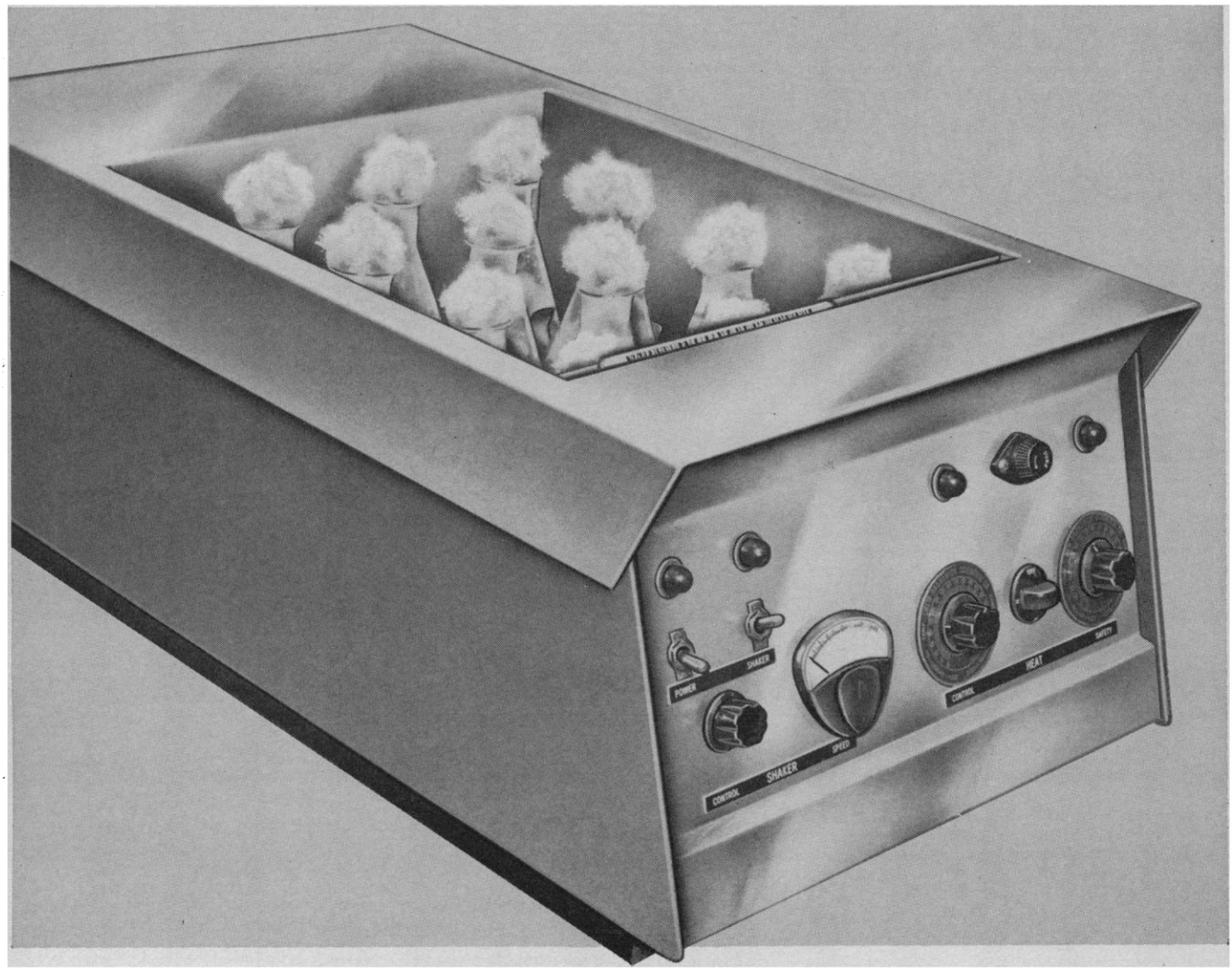

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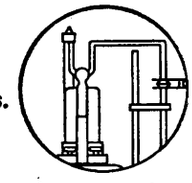

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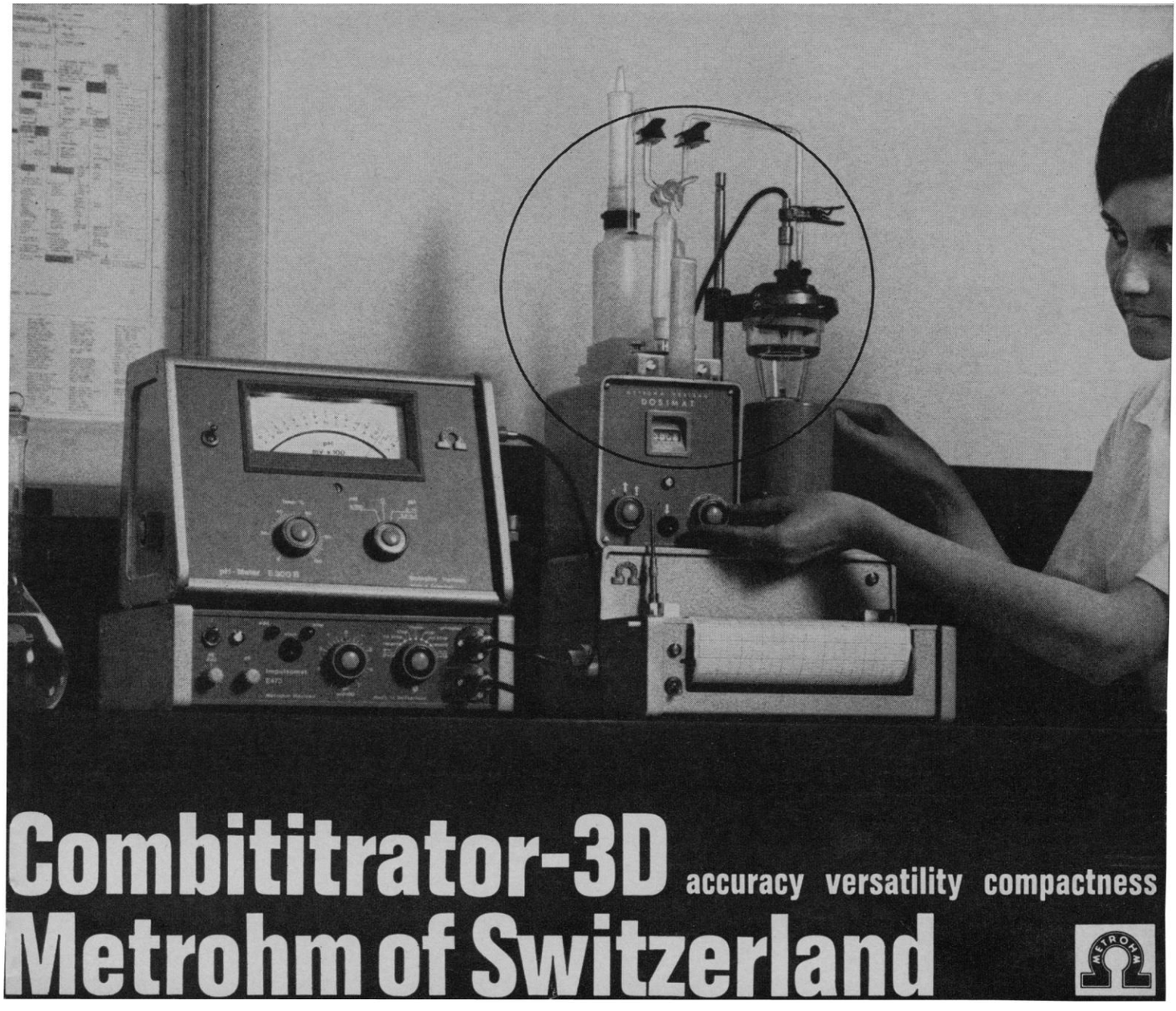

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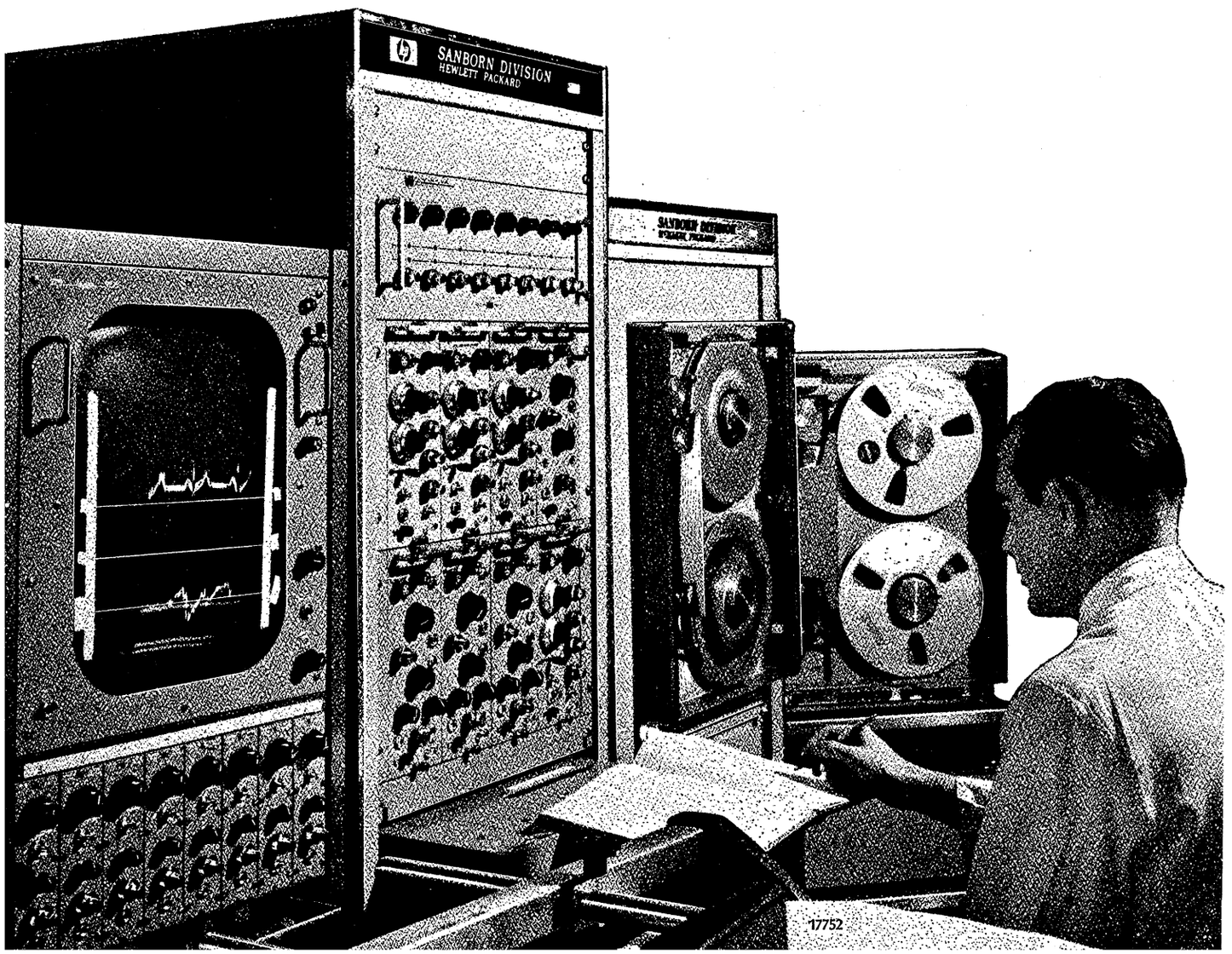

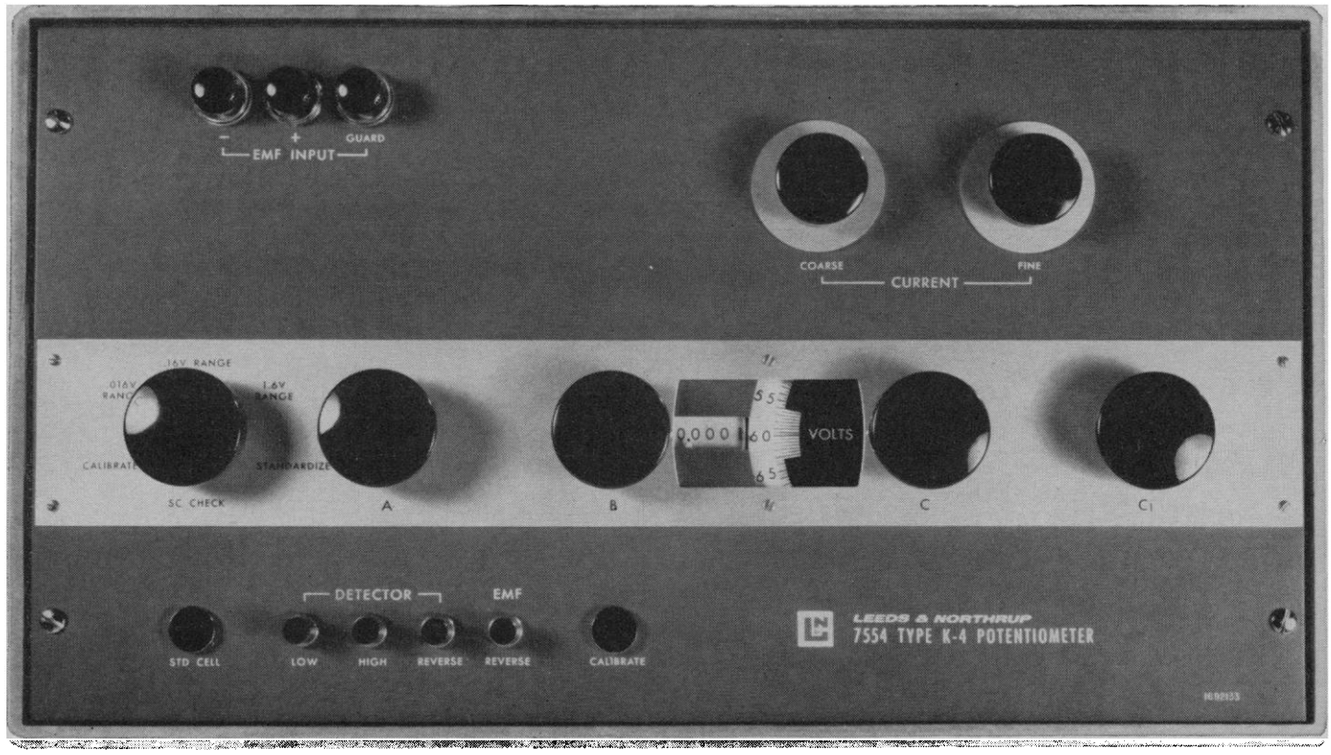

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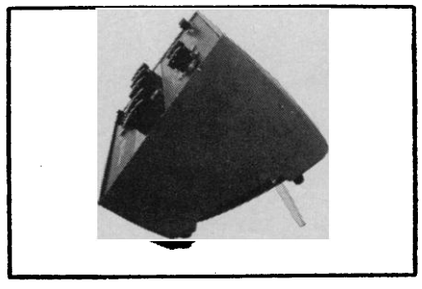

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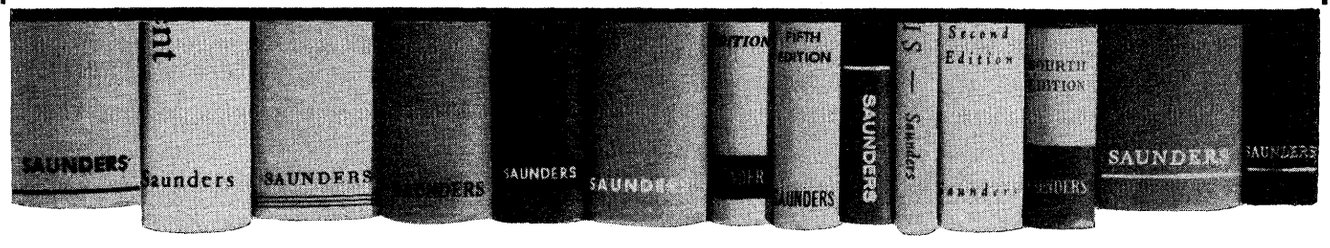

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process than if we diffuse our resources on the environmental factors, which are not readily amenable to manipulation. Student attitudes towards life and school have been shown to affect strongly performance in academic studies. These attitudes can be altered directly by good teachers and possibly take root in the relatively short span of the school years (especially if effective "pre-school" programs for ages 3 to 6 are developed and implemented).

ALEXANDER M. MOOD
MURRAY SPITZER
DAVID S. STOLLER
FREDERIC D. WEINFELD
National Center for Educational Statistics, Department of Health, Education, and Welfare, Washington, D.C. 20202

. . . Nichols contends in his review (i) that no inferences can be drawn from the USOE data regarding the effects of desegregation on Negro achievement, and (ii) that the data show differences in educational opportunity (that is, quality of schooling) to be of no importance as a factor in racial differences in achievement. I think his conclusions are unwarranted in both instances.

Regarding the first point: It is true that the USOE data consists entirely of correlations between measurements at a single point in time, and that only a longitudinal study of achievement, involving repeated measurements of pupils who were randomly assigned to different types of schools, could provide a definitive test of the effects of desegregation. However, when longitudinal studies are not feasible, carefully designed *ex post facto* research can and should be used as a basis for drawing qualified inferences about causality. To deny this would be to discard much—perhaps most—of the accumulated empirical knowledge of the social sciences.

In the USOE survey, cross-tabulations on indicators of socioeconomic status showed that differences in Negro achievement associated with extent of desegregated schooling were not accounted for by measured family-background factors. Admittedly, there may have been important background factors that were not measured. But such assumed differences among families of similar socioeconomic status would have to account for the following obtained trends:

1) The earlier the grade during which the child first experiences desegregation, the stronger the apparent gain in achievement.

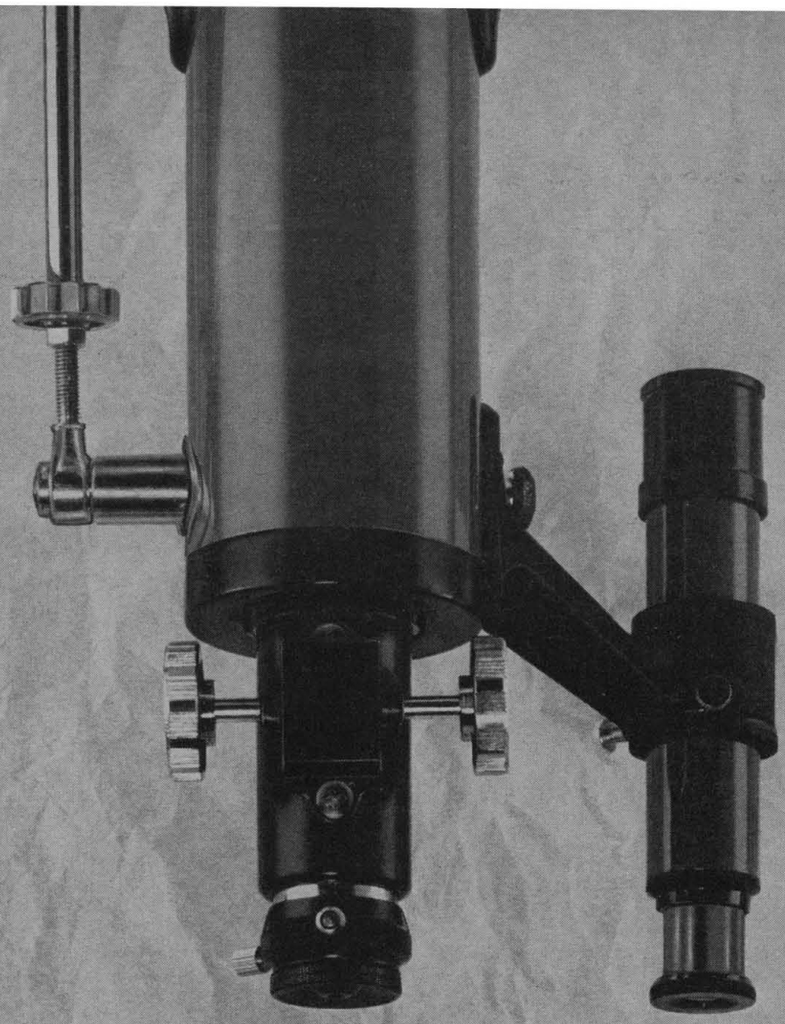
2) The greater the proportion of white classmates at the time of testing, the stronger the apparent gain in achievement.

3) The higher the grade in school, the closer the relationship between proportion of whites in a school and Negro achievement.

It seems to me unreasonable to argue that these relationships merely reflect undetected differences in the family backgrounds of Negro pupils. I am informed that in further cross-tabulations of the data, done for the U.S. Civil Rights Commission, Negro pupils were divided into two groups according to educational level of their own families, and into three according to educational level of their classmates' families, and that for virtually all combinations of categories there were linear trends toward higher Negro achievement as (i) proportion of white classmates increased and (ii) the grade in which desegregation was first experienced was lowered.

For his opinion that the data show the differences in average performance of racial groups not to be the result of differences in educational opportunity, Nichols cites two lines of evidence: (i) the racial gap in achievement, as measured by standard scores on tests, remains quite constant in the Northeast at different grade levels; (ii) the proportions of total variance in achievement accounted for by between-school differences and within-school differences remain constant at different grade levels.

First of all, it should be noted that in the South the racial gap does grow larger at higher grade levels, a showing consistent with the notion of a cumulative effect of inferior educational services. Why in the South, but not in the Northeast? One regional difference is obvious. In the South, racial comparison is tantamount to comparing Negro schools and white schools, since over 90 percent of Negro children in the South are in *de facto* segregated schools. But in the North almost 50 percent of all Negro pupils are in predominantly white schools. Therefore, the data cited by Nichols (racial averages in test scores) are not relevant to the question of the effects of school quality on racial differences in the North. The relevant data would have to compare performance through time of Negro children in predominantly



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Negro schools with white performance in predominantly white schools, and of course, for the sake of completeness, Negro children in white schools, and white children in Negro schools. (As I indicated above, the effect on Negro pupils of attendance in white schools does appear from the USOE report to be cumulative. Moreover, an additional tabulation by the Civil Rights Commission shows that in the 12th grade the average northern Negro child of low socioeconomic background in a school with a predominantly low-status Negro enrollment is reading at the 7th-grade level, whereas the comparable Negro child in a high-status white school is reading at the 11th-grade level.) Note also that the percentage of Negroes in predominantly white schools in the North increases greatly (about doubles) in the higher grades. If the white schools are better schools (and they clearly are in at least one important respect—the verbal ability of teachers), this factor could easily wash out any tendency toward enlargement of the racial gap at higher grades.

Nichols' second argument is that if differences in school quality contribute to racial differences in average achievement, between-school differences in average performance, relative to within-school differences in individual performance, should increase with increasing grade level. This assumes there are no factors within schools that have a cumulative effect on differences between pupils. If differences within schools were also increasing with grade level, increasing differences between schools would not be apparent, since the relative contributions to total variance would tend to remain unchanged.

There is one likely candidate as a within-school factor having cumulative effects on performance—ability grouping. Over 60 percent of white and Negro children in the Northeast (80 percent of Negro children in the South) are in schools that practice some form of ability grouping. There is enough evidence of a "self-fulfilling prophecy" phenomenon associated with ability grouping to warrant rejecting the comparison of within-school and between-school variance as a test of whether differences in educational opportunity affect achievement.

In short, I find Nichols' conclusion—that variations in educational opportunity (including the opportunity to go to school with children of different backgrounds) have no material effect on Negro achievement—unwarranted on the basis of the evidence he presents. On the contrary, the Coleman data suggest the opposite.

IRWIN KATZ
Center for Research on Conflict Resolution, University of Michigan, Ann Arbor 48104

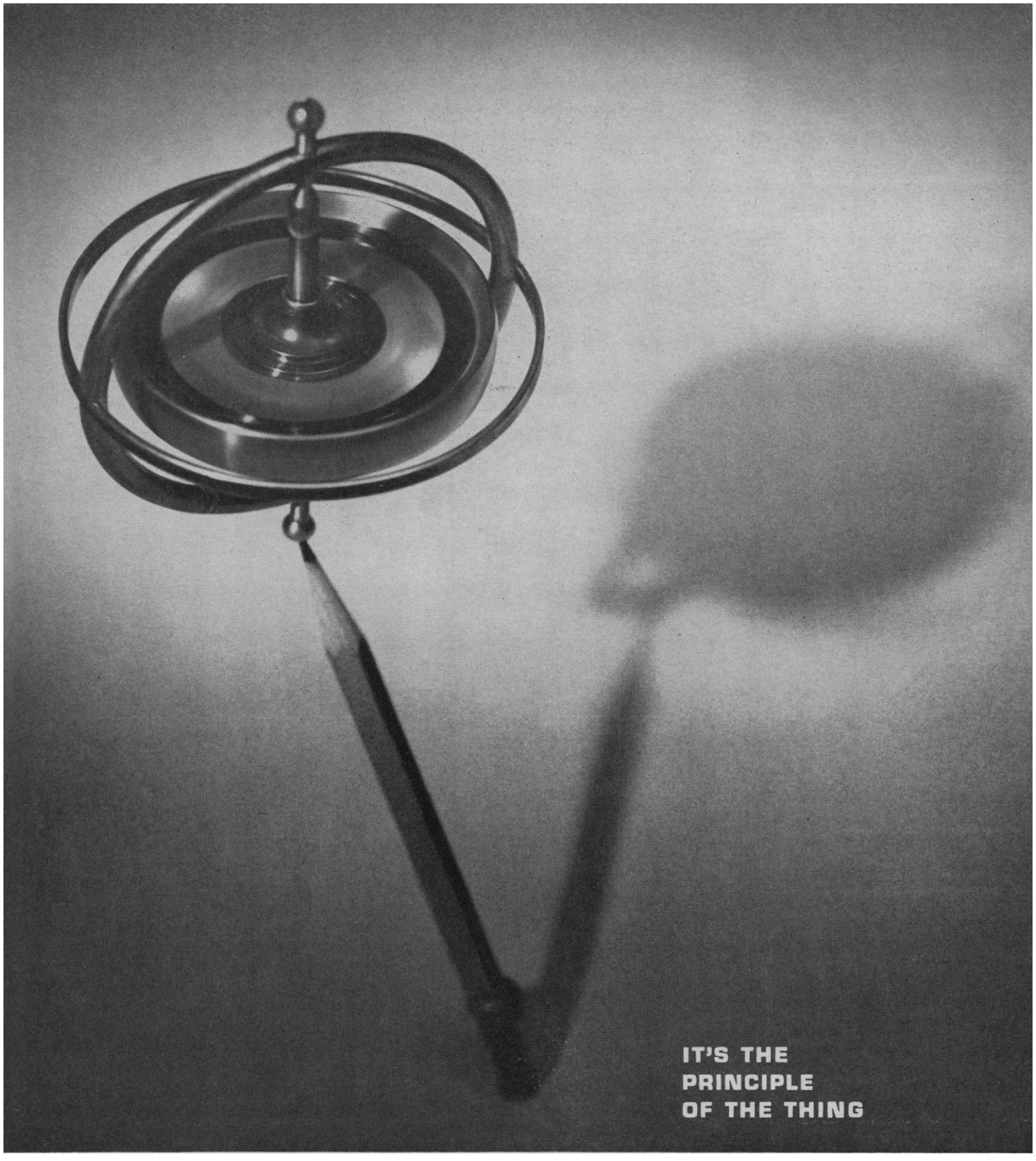
The two foregoing letters support the major conclusion of my review, which was that available data are inadequate to answer the important questions asked of them.

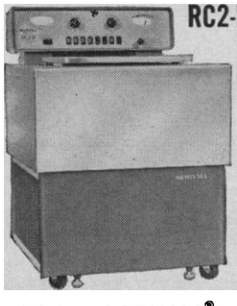
Mood, Spitzer, Stoller, and Weinfeld rightly emphasize the difficulty of isolating the role of differences among schools in bringing about individual differences in ability among students. However, they seem overly to minimize the significance of their regression analysis in which little relationship was found between student achievement and school quality when family background was statistically controlled. The conclusion of the report, "that schools bring little influence to bear on a child's achievement that is independent of his background and general social context" (p. 325), can be contested on methodological grounds, but I know of no better evidence that would suggest the opposite conclusion.

The increasing racial gap and increasing between-school variance with increasing grade level that might be expected if school differences were a major source of individual differences in student performance were not observed in the Coleman study. Katz and Mood *et al.* have indicated several reasons why this is not conclusive evidence for the absence of school effects. Student migration and dropout and differential test validity at the different age levels are additional sources of error that could obscure the evidence of school effects. But simply explaining away the negative evidence does not establish a strong case for the existence of substantial school effects.

Katz points out that "differences in Negro achievement associated with extent of desegregated schooling were not accounted for by measured family-background factors," but neither were they accounted for by measures of school quality or of racial balance. They could be accounted for either by the higher socioeconomic level of the other students in integrated schools (the conclusion of the USOE report) or by incomplete control of family background (a possibility mentioned in my review).

I agree with Katz that the data do





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not warrant the conclusion "that variations in educational opportunity . . . have no material effect on Negro achievement," but neither do they warrant the opposite conclusion.

The question of the extent to which differences among schools are responsible for differences in student performance is too important to rest on quibblings over inadequate evidence. At a time when we talk matter-of-factly about sending men to the moon, I find it hard to accept Katz's statement that "longitudinal studies (of educational effects) are not feasible." The Equality of Educational Opportunity survey has demonstrated that well-financed, large-scale studies can provide data relevant to important questions concerning educational effects; but, as a first attempt organized on a crash basis, it has raised more questions than it has answered. Much more research on a similar scale is needed, particularly studies incorporating longitudinal data. The great variation in educational practices in the U.S. provides a vast and continuing natural experiment. Analyses to isolate the effects of the many variables involved can be done at a relatively low cost. We can no longer afford to pass up such a research bargain.

In addition to evaluating the effects of existing differences in educational programs, promising new ideas should receive a fair trial. The educational establishment is so conservative, however, that it is extremely difficult to introduce changes. To get an innovation accepted, such a strong emotional argument for it must be advanced that it then becomes impossible to deny it to anyone who wants it. Thus, the effects of changes in the educational system are never evaluated. Proposed changes in educational programs should be tried in the natural setting, on an adequate scale, on an experimental basis with the control groups and measurements that are necessary to assess the effects of the change. Then a rational decision could be made either to expand or to abandon the program.

As Mood *et al.* point out, we have been questioning the differential effects of schools, not the absolute value of education. As a whole the schools have undoubtedly improved in effectiveness over the years. However, we may be nearing the upper limit on improvement that can be achieved by common sense and experience alone. Future enhancement of the effects of education will increasingly depend on the objective

evaluation of the effects of educational programs, so that the effective can be expanded and the ineffective abandoned.

ROBERT C. NICHOLS
National Merit Scholarship Corporation, 990 Grove Street, Evanston, Illinois 60201

Christian Impact on Ecology

In "The historical roots of our ecological crisis" (10 Mar., p. 1203) White helpfully pointed out that "Since the roots of our trouble are so largely religious, the remedy must also be essentially religious, whether we call it that or not. We must rethink and refeel our nature and destiny." Fine! A better general conclusion has rarely been formulated even though his handling of the historical data of Christianity and Scripture leaves much to be desired. He seems to feel that what Christians have said and done adequately represents Christianity. To speak of "orthodox Christian arrogance toward nature" is to miss the heresy and blasphemy and label it normative. Not everything Christians do is Christian in character. . . . The most undeveloped and misunderstood teaching of Scripture relevant here is the cultural mandate given Adam by God. White described some of the data of the mandate but missed the thrust, as have most Christians over the centuries. The cultural mandate makes man the responsible steward of the universe, not its spoiler and looter. Responsible stewardship, not exploitation, is the keynote. As steward of the universe, man is challenged to develop natural resources to benefit all creatures, aesthetically and materially, and by so doing to honor his Creator and Redeemer. Such Christian stewardship of natural resources does not include exploitation for selfish gain at the expense of society, nor pollution of land, air or water.

ERNEST S. FEENSTRA
Department of Pathology, Upjohn Company, Kalamazoo, Michigan

The historical impact of Christianity upon ecology has depended not on what we, individually, at present, may think that Christianity should have been, but rather upon what the vast "orthodox" majority of people who called themselves Christians have in fact thought it was. Feenstra, like St. Francis, is trying to reform Christianity.

But his proposal is far less radical than that of St. Francis. He seems to suggest an enlightened despotism of man over the rest of nature instead of St. Francis' democracy of all creatures.

LYNN WHITE, JR.
Department of History, University of California, Los Angeles 90024

. . . My only objection to White's presentation concerns the Sister Fire which he attributes to St. Francis of Assisi. Fire, for Francis, was Brother Fire, not Sister, at least in his *Cantico delle Creature*:

Laudato si', mi Signore, per frate focu per lo quale ennallumini la nocte, et ello e' bellu, et iucundu, et robustoso e forte.

While I embrace wholeheartedly Lynn White's proposal to set up a democracy of all God's creatures, I still favor the separation of the sexes.

RENATO BASERGA
562 Manor Road,
Wynnewood, Pennsylvania

White's stringent demonstration that today's ecological catastrophe results directly from the Judeo-Christian tradition can be expanded to include other catastrophies of similar or greater magnitude which occurred earlier in time. Martin [*Nature* **212**, 339 (1966)] has discussed at some length the early overkills which destroyed 40 percent of the mammalian fauna in Africa and 70 percent in North America. These overkills, which took place, respectively, 50,000 and 12,000 years ago, clearly demonstrate that the Judeo-Christian tradition is considerably older than generally assumed.

CESARE EMILIANI
SHALE NISKIN
Institute of Marine Science, University of Miami, Miami, Florida 33149

Economics of Reprints

I would like to answer the question posed by Mary E. Clark of the University of Newcastle in her letter, "Reprints unlimited" (17 Feb.). She wondered, "How does one identify those who are really interested when no information comes on the [reprint request] card?" The answer is simple: Have your institution pay for as many reprints as you consider necessary. Don't be too modest—if you feel that 2000 or 3000 would be a convenient number—

order them, and send them to all who request reprints and also to those who don't request them, if you believe the latter will make good use of them. This is the common system in many of the good American and a few European institutions. You may believe that the eventual waste of ten reprints is largely compensated by the one that is actually used, and this would not be true in any other system.

The purchase of a large number of reprints is as much a part of the cost of research as the purchase of a desk, a microscope, or a pencil. If your university questions why it should pay for your reprints, ask why it pays for your postage. Should this cause the administrators to begin an economy drive and revoke the practice of paying your postage, you will then have a still clearer picture of one reason for the "brain drain." I know very well the answer to your question, Dr. Clark, because I have plenty of experience, from both sides of the Atlantic.

MIGUEL MOTA
Department of Genetics,
Estação Agronómica Nacional,
Oeiras, Portugal

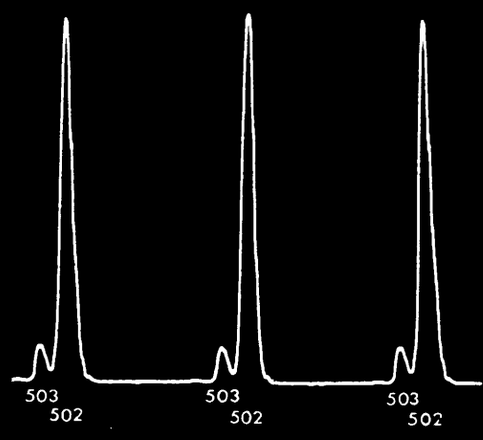
The Imperturbable Feline

Doty and Jones's report on learning-set formation in various mammals (24 Mar., p. 1579) reminds me of a paper prepared for *Science* by W. A. Rhoads and F. Turner of the UCLA School of Nuclear Medicine and me on learning in cats. The paper was never submitted because, like UFO and Grant Swinger reports, it might have been misconstrued as trivial.

Three cats were observed for 12 months in three widely separate areas of Los Angeles. The cats were two American shorthairs and a cross-eyed pedigreed Siamese. Specifically, ear-twitching was observed while the cats were dozing. Sounds which did or, more important, did *not* cause ear-twitching were noted. None of the three cats ever twitched to the following sounds: (i) wife shouting in kitchen, (ii) champagne cork popping, (iii) people falling into swimming pool, and (iv) approaching police sirens.

I have been unable to persuade my co-authors that we were walking in the footsteps of Pavlov.

H. W. PITTENGER
Planning Research Corporation,
Los Angeles, California 90024



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12 May 1967, Volume 156, Number 3776

SCIENCE

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Excessive Educational Pressures

Emotional shock waves following the launching of Sputnik in 1957 have been dissipated. Nevertheless, sequelae linger—notably in American education. During the late 1950's strenuous efforts were directed at improving all aspects of instruction and especially the teaching of science in the secondary schools. To achieve this a number of steps were taken. Summer institutes for science teachers were fostered. Efforts such as the Physics Secondary School Curriculum Project were launched. Campaigns to induce more students to enroll in science courses were conducted. Higher standards of performance were established. An increasing amount of homework was required. At the time, these steps generally met with enthusiastic response. However, today questions are being raised concerning the overall results of the efforts.

The most recent statistics show that campaigns to increase interest in science and engineering have not been very successful. From 1960 to 1965, the number of college juniors majoring in physics dropped by about 15 percent, while overall college enrollment was up over 50 percent. During the same period undergraduate enrollment in engineering increased only slightly. In 1965 more baccalaureate degrees were granted to English majors than to all students in the branches of engineering. Nearly five times as many baccalaureate degrees were granted in the social sciences as in the physical sciences.

To what extent is the current student unrest chargeable to the more stringent secondary school curricula? We do not know. However, there is growing concern that too much is being asked of the young. A recent poll conducted by *School Management* showed that 88 percent of the respondents believed that, in their own school districts, pressure on college-bound students had increased during the last 5 years. A substantial majority felt that pressure had become too intense.

In a speech reported in *Chemical and Engineering News* (20 February 1967), L. Carroll King, a professor of chemistry at Northwestern University, is critical of present-day education. He feels that secondary school students are being asked to do "too much, too fast, too soon." He suggests that some students are enduring 17 hours a day of activity in high school. King charges that "we have committed a crime against a generation." These are strong words, but soundings in various areas of this nation have elicited similar sentiments.

King's concern was aroused by observations on chemistry majors entering his university. He found that too many very good high-school students fail outright or do poorly in college. King believes that the poor performance is a sequel to excessive work in high school. The students quit rather than face seemingly endless years of 17-hour days.

Responsibility for excessive pressure on secondary school students is shared by many. College admission offices, parents, new curricula, teachers, and the students themselves are involved. Results of the excessive pressure seem to be especially evident in the physical sciences and engineering.

In the decade since Sputnik, scientists and others have participated in notable experiments in education. Some of the results are unexpected. Evaluation, looking toward prompt changes, is in order.

—PHILIP H. ABELSON

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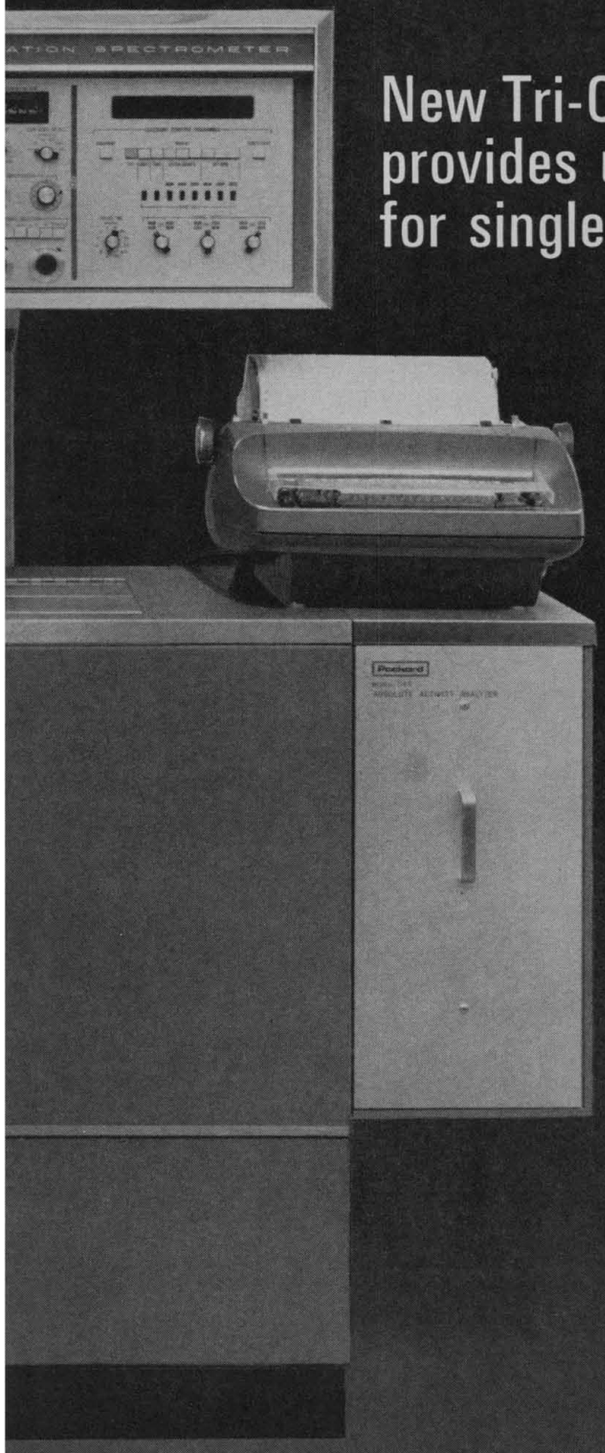

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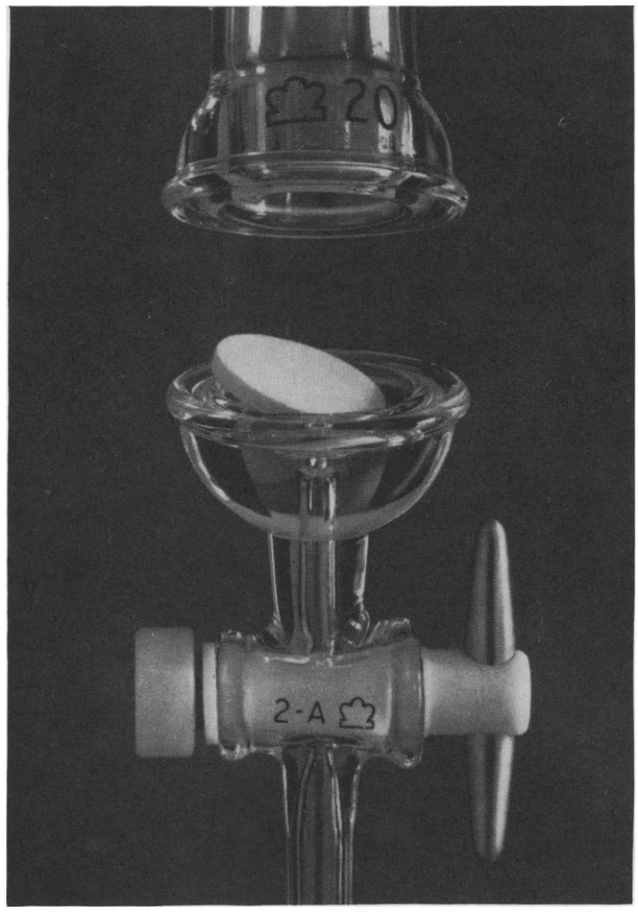

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isotope production has been operating at Orsay since April 1965.

J. Kooi of Euratom discussed their production program centered on Am irradiated in the BR-2 reactor at Mol. After gross processing at Karlsruhe, the transcurium elements will be purified in laboratories placed at Euratom's disposal in the Institute for Nuclear Physics Research at Amsterdam. Studies in nuclear physics and inorganic chemistry include decay scheme studies, extraction chromatographic separation procedures, and electrochemical studies of actinides in molten salts.

C. H. Ice of the Savannah River Laboratory reported on research aimed toward large-scale production of transplutonium elements. Using chemical technology developed in the transplutonium program and a newly-developed high flux mode of production reactor operation, the production of 4.5 kg of ^{244}Cm was undertaken in 1963. This program should also yield 9.2 kg of ^{242}Pu and 3.0 kg of ^{243}Am. If additional ^{244}Cm is produced by irradiating the ^{242}Pu and ^{243}Am intermediates, 5 to 10 mg of ^{252}Cf per kilogram of ^{244}Cm would be produced as a by-product. In the high-flux mode, one of the large reactors at SRL was operated at fluxes up to 6×10^{15} neutrons/cm^2. During the program, 520 grams of ^{242}Pu was irradiated to produce about 2 mg of ^{252}Cf and the associated transplutonium elements. SRL experiments are designed to measure cross sections of ^{252}Cf precursors. Calculations indicate that the production of ^{252}Cf in a resonance reactor may be increased 100-fold over that in a highly thermalized flux. From this, one can project the possibility of producing hundreds of grams of ^{252}Cf per year at a cost that would make a variety of applications attractive. The pioneering work in Mössbauer spectroscopy of the actinides has been carried out at SRL with the first observations of the effect in ^{237}Np and ^{231}Pa.

D. Cohen discussed the transplutonium chemistry program at Argonne National Laboratory, mentioning reduction of actinide oxides in fused chlorides to the metals; Mössbauer studies on neptunium compounds; absorption spectroscopy; extraction chromatography with a quaternary amine of Am-Cm and Es-Cf; electrical resistivity and Hall effect studies on neptunium and americium metal; and the curium-oxygen system.

A. M. Friedman reported the following topics under study in nuclear physics at Argonne National Laboratory: fission kinetics in the ^{240}Pu (α,α' fission) and ^{239}Pu (d,p fission) reactions, alpha-particle spectra of ^{254}Es and ^{255}Es, production of ^{253}Md and ^{243}Cf in (^{3}He,xn) reactions, extensive studies of states in odd-A nuclei between ^{229}Th and ^{249}Cm as observed in (d,p) and (d,t) reactions.

M. Givon of the Israeli Transuranium group reported a comparison of the spectrophotometric and thermodynamic complex constants for the systems Np, Pu, Am-halide, and nitrate.

The Symposium was sponsored by the Oak Ridge National Laboratory. D. E. Ferguson served as program chairman.

O. L. KELLER, JR.

Chemistry Division,
*Oak Ridge National Laboratory,**
Oak Ridge, Tennessee 37831

Note

* Operated by Union Carbide Corporation for the U.S. Atomic Energy Commission.

Calendar of Events

Courses

Actinomycetes and Mycology. Indiana State Univ., 12–16 June. Oriented towards industrial problems. Limited enrollment. Fee, $125. (F. M. Rothwell, Dept. of Life Sciences, Indiana State Univ., Terre Haute 47809)

Bacteriology and Virology. Indiana State Univ., 5–9 June. Oriented towards industrial problems. Limited enrollment. Fee, $125. (F. M. Rothwell, Dept. of Life Sciences, Indiana State Univ., Terre Haute 47809)

Basic Infrared Spectroscopy. Fisk Univ., 14–19 Aug. Designed to introduce beginners to theory and applications of subject. Enrollment limited to 50 participants. Fee, $150. Partial tuition fellowships available for academic personnel. (Director, Fisk Inst., Box 8, Fisk Univ., Nashville, Tenn. 37203)

Behavior of **Liquid Propellants in Space Vehicles 805.9**. Univ. of California, Los Angeles, 19–30 June. Designed for control system and propulsion system design engineers concerned with design of advanced launch vehicles and missiles. Prerequisite: Bachelor's degree or equivalent in science or engineering. *Deadline: 12 June*. Fee, $300. (Engineering Extension, Room 6266, Boelter Hall, Univ. of California, Los Angeles 90024)

Gas Chromatography. Fisk Univ., 14–18 Aug. Enrollment limited to 50 participants. Fee, $150. Partial tuition fellowships available for academic personnel. (Director, Fisk Inst., Box 8, Fisk Univ., Nashville, Tenn. 37203)

Immuno-serological Methods. Mississippi State Univ., 1–7 June. Orientation towards industrial problems. Enrollment limited to 20 participants. Fee, $125. (J.

B. G. Kwapinski, Mississippi State Univ., State College 39762)

Infrared Spectroscopy, 2nd session. Fisk Univ., 21–25 Aug. Enrollment limited to 50 participants. Fee, $150. Partial tuition fellowships available for academic personnel. (Director, Fisk Inst., Box 8, Fisk Univ., Nashville, Tenn. 37203)

Infrared Spectroscopy. Univ. of California, Los Angeles, 10–21 July. Intended for chemists, biochemists, biologists, and engineers. Fee, $300. (R. E. Garrels, Physical Sciences Extension, Room 6532, Boelter Hall, Univ. of California, Los Angeles 90024)

Interactive Time-sharing Systems: Hardware and Software. Univ. of California, Los Angeles, 19–30 June. Intended for managers of time-sharing installations, systems programmers, and system users. Fee, $300. (R. E. Garrels, Physical Science Extension, Room 6532, Boelter Hall, Univ. of California, Los Angeles 90024)

On-Line Computer Control Systems. Univ. of California, Los Angeles, 10–21 July. Designed for engineers engaged in development and application of on-line computer control systems. *Deadline: 3 July*. (Engineering Extension, Room 6266, Boelter Hall, Univ. of California, Los Angeles 90024)

Practical Astrodynamics. Univ. of California, Los Angeles, 10–21 July. Designed for persons interested in new approaches to astrodynamics including concepts and methods for solving current and future problems. Fee, $300. (R. E. Garrels, Physical Sciences Extension, Room 6532, Boelter Hall, Univ. of California, Los Angeles 90024)

Probability and Statistics. Univ. of California, Los Angeles, 19–30 June. Includes basic concepts of probability, recognition of probabilistic and statistical problems and translation into probabilistic language, hypothesis concerning parameters, and statistics. Fee, $300. (R. E. Garrels, Physical Science Extension, Room 6532, Boelter Hall, Univ. of California, Los Angeles)

Seminar for **Managers** of **Technical Information**. Univ. of Iowa, 4–8 June. Designed for editors or supervisors of technical writers; consultants of information storage, retrieval, processing, and transmission; problem solving experts in information and communication. Fee, $250. (C. A. Andrews, The Seminar, 207 Engineering Bldg., Univ. of Iowa, Iowa City 52240)

Seventh Annual Summer Institute in **Dynamical Astronomy**. Purdue Univ., 19 June–7 July. Intended for science faculty and graduate students. Enrollment limited to 80 participants. (H. Pollard, Div. of Mathematical Sciences, Purdue Univ., Lafayette, Ind. 47907)

Theory and Applications of Modern Optics. Univ. of California, Los Angeles, 17–28 July. Designed for those in research, development, or education related to modern optics. Fee, $300. (R. E. Garrels, Physical Sciences Extension, Room 6532, Boelter Hall, Univ. of California, Los Angeles 90024)

Ultra-violet–Visible Spectroscopy. Fisk Univ., 21–25 Aug. Enrollment limited to 50 participants. Fee, $150. Partial tuition fellowships available for academic personnel. (Director, Fisk Inst., Box 8, Fisk Univ., Nashville, Tenn. 37203)

Variational Theory and Optimal Control Theory. Univ. of California, Los Angeles, 19–30 June. Designed for engineers, physical scientists, mathematicians, and those interested in optimization. Fee, $300. (R. E. Garrels, Physical Sciences Extension, Room 6532, Boelter Hall, Univ. of California, Los Angeles 90024)

National Meetings

May

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)

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

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)

June

1–2. **Computer Applications in the Earth Sciences**, 2nd colloquium, Lawrence, Kan. (R. F. Treece, University Extension, Univ. of Kansas, Lawrence 66044)

1–2. **Industrial Water and Waste**, 7th conf., Austin, Tex. (J. F. Malina, Jr., 305 Engineering Lab. Bldg., Univ. of Texas, Austin 78712)

1–3. **Applied Diving Physiology**, Univ. of California, San Francisco Extension

Center. (Letters and Science Extension, Univ. of California, Berkeley 94720)

2–3. **Equine Bone and Joint Diseases**, symp., Ithaca, N.Y. (H. F. Schryver, Dept. of Large Animal Medicine, New York State Veterinary College, Cornell Univ., Ithaca 14850)

4–7. **Tissue Culture** Assoc., annual mtg., Philadelphia, Pa. (L. Hayflick, Wistar Inst., 36th and Spruce Sts., Philadelphia 19104)

4–9. American **Water Works** Assoc., annual conf., Atlantic City, N.J. (R. J. Faust, The Association, 2 Park Ave., New York 10017)

4–9. **Underwater Acoustics**, seminar, Pennsylvania State Univ., University Park. (Conf. Center, J. Orvis Keller Bldg., Pennsylvania State Univ., University Park 16802)

4–11. **Lubrication in Nuclear Applications**, symp., American Soc. of Mechanical Engineers, Miami Beach, Fla. (Meetings Manager, The Society, 345 E. 47 St., New York 10017)

5. **Integrated Circuit Manufacturing**, symp., New York, N.Y. (Miss B. S. Hines, Registration Coordinator, 7830 Hasbrook Ave., Philadelphia, Pa. 19111)

5–7. The New **Thrust Seaward**, Marine Technology Soc., annual conf. and exhibit, San Diego, Calif. (Conference Management Organization, Inc., Colonial Bldg., 105 N. Virginia Ave., Falls Church, Va. 22046)

5–7. Recovery and Repair Mechanisms in **Radiobiology**, Brookhaven Natl. Lab., Upton, N.Y. (D. G. Baker, Dept. of Biology, Brookhaven Natl. Lab., Upton 11973)

5–8. Society for **Economic Botany**, 8th annual, Coral Gables, Fla. (Miss J. F. Morton, The Society, Morton Collectanea, Univ. of Miami, Box 8204, Coral Gables)

6–7. **Deposition of Thin Films by Sputtering**, 2nd symp., Rochester, N.Y. (R. D'Aprix, Sputtering Program, CVC, Dept. T, 1775 Mt. Read Blvd., Rochester 14603)

6–9. **Laser Engineering and Applications**, conf., Washington, D.C. (L. Winner, 152 W. 42 St., New York 10036)

8–9. **Post Irradiation Recovery Kinetics**, symp., Bethesda, Md. (M. F. Canning, Information Div., Technical Information and Services Dept., Armed Forces Radiobiology Research Inst., Defense Atomic Support Agency, Bethesda 20014)

8–10. Fourth Pacific Northwest **Plastics** Workshop, Spokane, Wash. (R. Raff, Research Div., College of Engineering, Washington State Univ., Pullman 99163)

11–14. **Apollo and Beyond**, American Astronautical Soc., Huntsville, Ala. (S. S. Hu, Northrop Space Labs., P.O. Box 1484, Huntsville)

11–15. American **Nuclear** Soc., 12th annual, San Diego, Calif. (J. E. Wilkins, Jr., General Atomic, P.O. Box 608, San Diego 92112)

11–15. **Industrial Pharmaceutical Research**, 9th annual natl. conf., Land O' Lakes, Wis. (A. P. Lemberger, Extension Services in Pharmacy, 190 Pharmacy Bldg., Univ. of Wisconsin, Madison 53706)

11–16. **Air Pollution Control** Assoc., 60th annual mtg., Cleveland, Ohio. (Seward Covert & Associates, 1059 Leader Bldg., Cleveland 44114)

11–16. **Medical Library** Assoc., annual mtg., Miami, Fla. (The Association, 919 N. Michigan Ave., Chicago, Ill.)

12–14. American **Neurological** Assoc., 92nd annual mtg., Atlantic City, N.J. (M. D. Yahr, The Association, 710 W. 168 St., New York 10032)

12–15. Society for **Industrial and Applied Mathematics**, Washington, D.C. (W. J. Jameson, Jr., Collins Radio Co., 120-09, Cedar Rapids, Iowa 52406)

13–14. **Electroexplosive Devices**, 5th symp., Philadelphia, Pa. (G. Cohn, Senior Staff Engineer, Franklin Inst. Research Lab., Philadelphia 19103)

13–15. American **Astronomical** Soc., Yerkes Observatory, Williams Bay, Wis. (G. C. McVittie, Univ. of Illinois Observatory, Urbana 61803)

13–16. **Conjugate Point** Symp., Boulder, Colo. (Aeronomy Lab. 540.03, Environmental Science Services Administration, Inst. for Telecommunication Sciences and Aeronomy, Boulder 80302)

13–16. **Vacuum Metallurgical** Conf., 10th annual, New York, N.Y. (E. L. Foster, Materials Engineering Dept., Battelle Memorial Inst., 505 King Ave., Columbus, Ohio)

14–16. **Densitometry**, seminar, Chicago, Ill. (B. Kettinger, News Service Office, P.O. Box 3404, Rochester Inst. of Technology, Rochester, N.Y. 14614)

14–17. Modern **Computer Analysis of Complex Social Science Data Bases**, Council of Social Science Data Archives, annual mtg., Los Angeles, Calif. (W. A. Glaser, Bureau of Applied Social Research, 605 W. 115 St., New York 10025)

14–17. **Speech-Analyzing Aids for the Deaf**, conf., Washington, D.C. (J. M. Pickett, Hearing and Speech Center, Gallaudet College, Washington, D.C.)

15–16. American **Rheumatism** Assoc., New York, N.Y. (Miss M. Walsh, The Association, 1212 Ave. of the Americas, New York)

15–16. **Soil, Water and Suburbia**, Dept. of Agriculture and Dept. of Housing and Urban Development, Washington, D.C. (S. Kasper, Room 1201, Dept. of Housing and Urban Development, 1430 K St., NW, Washington, D.C.)

15–17. American Assoc. of **Physics Teachers**, summer mtg., Canton, N.Y. (A. B. Arons, Physics Dept., Amherst College, Amherst, Mass.)

15–17. Symposium on **High Energy Radiation Therapy Dosimetry**, American Assoc. of Physicists in Medicine, New York, N.Y. (L. H. Lanzl, Dept. of Radiology, Univ. of Chicago, 950 E. 59 St., Chicago, Ill. 60637)

17–18. Academy of **Psychosomatic Medicine**, 4th symp. on anxiety and depression, Atlantic City, N.J. (E. Dunlop, 150 Emory St., Attleboro, Mass. 02703)

17–18. American **Diabetes** Assoc., Atlantic City, N.J. (J. R. Connelly, The Associaton, 18 E. 48 St., New York 10017)

18–21. **Botanical** Soc. of America, Northeastern Section, summer field mtg., Tuxedo, N.Y. (R. K. Zuck, Dept. of Botany, Drew Univ., Madsion, N.J.)

18–22. American **Medical** Assoc., 116th annual conv., Atlantic City, N.J. (The Association, 535 N. Dearborn St., Chicago, Ill. 60610)

18–22. **Health Physics** Soc., 12th annual mtg., Washington, D.C. (J. C. Villforth, Radiological Health Lab., 1901 Chapman Blvd., Rockville, Md.)

18–22. Society for **Investigative Derma-**

tology, Atlantic City, N.J. (G. W. Hambrick, Jr., The Society, Johns Hopkins Hospital, 601 N. Broadway, Baltimore, Md. 21205)

18–23. American Soc. of **Ichthyologists and Herpetologists**, annual mtg., San Francisco, Calif. (W. I. Follett, California Acad. of Sciences, Golden Gate Park, San Francisco 94118)

19. **Scombroid Phylogeny**: Ideas and Approaches, symp. of American Soc. of Ichthyologists and Herpetologists, San Francisco, Calif. (B. J. Rothschild, Tuna Ecology Program, Bureau of Commercial Fisheries, P.O. Box 3830, Honolulu, Hawaii 96812)

19–21. Automatic **Data Processing Systems in Local Government**, 3rd annual conf., New York, N.Y. (H. Sellin, School of Continuing Education, New York Univ., New York 10003)

19–21. **Colloid**, 41st natl. symp., Buffalo, N.Y. (P. Becher, Chemical Research Dept., Atlas Chemical Industries, Wilmington, Del. 19899)

19–21. **Heat Transfer** and **Fluid Mechanics** Inst., La Jolla, Calif. (D. B. Olfe, Dept. of Aerospace and Mechanical Engineering Sciences, Univ. of California at San Diego, La Jolla)

19–21. **Microelectronics**, symp., St. Louis, Mo. (R. Pellin, Inorganic Chemicals Div., Monsanto Co., 800 N. Lindbergh Blvd., St. Louis 63166)

19–22. American Soc. for **Engineering Education**, 75th annual mtg., East Lansing, Mich. (L. Winner, 152 W. 42 St., New York 10036)

21–23. **Modern Titrimetry**, 20th annual summer symp. on analytical chemistry, Claremont, Calif. (A. L. Beilby, The Symposium, Dept. of Chemistry, Pomona College, Claremont 91713)

21–25. Society of **Women Engineers**, 17th annual conv., Washington, D.C. (Mrs. J. R. Fisher, 12501 Connecticut Ave., Silver Spring, Md. 20906)

21–30. **Combustion-Generated Air Pollution**, mtg., Berkeley, Calif. (Engineering Extension, 2223 Fulton St., Berkeley 94720)

22–23. **Animal Reproduction**, 8th symp., Urbana, Ill. (Short Courses and Conferences, 116 Illini Hall, Champaign, Ill. 61820)

22–24. American Soc. of **Enologists**, annual mtg., Santa Barbara, Calif. (The Society, Box 411, Davis, Calif.)

22–25. American Assoc. of **Bioanalysts**, mtg., Detroit, Mich. (D. Birenbaum, The Association, 805 Ambassador Bldg., St. Louis, Mo. 63101)

25–28. American **Dairy Science** Assoc., Ithaca, N.Y. (C. Cruse, The Association, 903 Fairview Ave., Urbana, Ill. 61801)

25–28. American **Leather Chemists** Assoc., Lake Placid, N.Y. (W. T. Roddy, Executive Secretary, The Association, Univ. of Cincinnati, Cincinnati, Ohio 45221)

25–30. American Soc. for **Testing and Materials**, 70th annual mtg., Boston, Mass. (H. H. Hamilton, Public Relations, The Society, 1916 Race St., Philadelphia, Pa. 19103)

26–27. American Soc. of **Pharmacognosy**, annual mtg., Ann Arbor, Mich. (A. G. Paul, College of Pharmacy, Univ. of Michigan, Ann Arbor)

26–30. Workshop on Graduate Training

in **Scientific Writing**, Rockefeller Univ., New York, N.Y. (F. P. Woodford, Rockefeller Univ., New York 10021)

26–8. **Immunology**, summer course. Lake Forest, Ill. (S. Dray, Univ. of Illinois at Medical Center, P.O. Box 6998, Chicago 60680)

28–30. American Scientific **Glassblowers** Soc., 12th annual symp., Atlanta, Ga. (R. W. Poole, 100 Cedar Lane, Oak Ridge, Tenn. 37832)

28–30. Joint **Automatic Control** Conf., 8th annual mtg., Philadelphia, Pa. (L. Winner, 152 W. 42 St., New York 10036)

28–30. Society of **Protozoologists**, Toronto, Ont., Canada. (R. W. Hull, Dept. of Biological Sciences, Florida State Univ., Tallahassee, 32306)

29–1. **Navigation** in the Last Third of the 20th Century: Where Do We Stand; What Needs to be Done, Inst. of Navigation, 23rd annual mtg., Washington, D.C. (The Institute, 711 14th St., NW, Suite 912, Washington 20005)

International and Foreign Meetings

June

2–4. **Plasticity**, intern. mtg., Palermo, Italy. (Instituto di Scienze delle Construzioni, Univ. of Palermo, Via Maqueda, Palermo)

4–7. **Chemical Inst. of Canada**, 50th natl. conf., Toronto, Ont., Canada. (General Manager, The Institute, 151 Slater St., Ottawa, Ont.)

5–9. International Commission of **Sugar Technology**, 13th general assembly, Falsterbo, Sweden. (J. Henry, 1, rue Aendoren, Tirlemont, Belguim)

5–10. Northwest Atlantic **Fisheries**, intern. commission mtg., Boston, Mass. (L. R. Day, Bedford Inst. of Oceanography, P.O. Box 638, Dartmouth, Nova Scotia, Canada)

6–8. **Building Materials**, intern. conf., Warsaw, Poland. (Secretary, The Conference, Ministry of Building Construction and Materials, Warsaw, Wspolna 2)

7–9. **Industrial Physics**—The Contribution of Government Sponsored Laboratories, Harrogate, England. (Meetings Officer, Inst. of Physics and Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

7–10. **Transplantation** Soc., 1st intern. congr., Paris, France. (J. Dausset, Hopital Saint Louis, Place du Dr. Fournier, Paris 10°)

9–10. Transfer of **Genetic Information** in Protein Synthesis, intern. symp., New York, N.Y. (D. J. Quinn, Public Relations, Miles Laboratories, Elkhart, Ind.)

11–16. **Eutrophication**, intern. symp., Madison, Wis. (G. A. Rohlich, Univ. of Wisconsin, 602 State St., Madison 53706)

11–14. **Smoking and Health**, 1st intern. congr., New York, N.Y. (J. W. Muckell, Congr. Manager, 54 W. 40 St., New York 10018)

11–14. Society of Professional **Well Log Analysts**, 8th intern. symp., Denver, Colo. (Executive Secretary, The Society, 13507 Tosca, Houston, Tex. 77024)

12–14. **Communications**, intern. conf., Minneapolis, Minn. (R. J. Collins, Dept. of Electrical Engineering, Univ. of Minnesota, Minneapolis 55455)

12–14. **Drug Research**, 1st intern. symp.,

Montreal, Canada. (Chemical Inst. of Canada, 151 Slater St., Ottawa 4, Ont.)

12–16. **Macromolecular Chemistry**, intern. symp., Brussels, Belgium. (Secretariat, The Symposium, 49, Sq. Marie-Louise, Brussels)

12–17. Problem of **Identification in Automatic Control Systems**, symp., Prague, Czechoslovakia. (V. Strejc, Ustav Teorie Informace a Automatizace, Ceskoslovenska Akademie Ved, Vysehradska 49, Prague 2)

14–15. **Light and Vision**, intern. symp., Columbus, Ohio. (G. A. Fry, Ohio State Univ., Columbus 43210)

14–16. **Catalysis**, 2nd symp., Hamilton, Ont., Canada. (R. B. Anderson, Dept. of Chemical Engineering, McMaster Univ., Hamilton)

14–16. **Systematic Biology**, intern. conf., Ann Arbor, Mich. (A. G. Kluge, The Conference, Dept. of Zoology, Univ. of Michigan, Ann Arbor 48104)

14–17. Mechanized **Information Storage, Retrieval and Dissemination**, conf., Rome, Italy. (British Computer Soc., 23, Dorset Sq., London, N.W.1, England)

18–24. **Oral Education of the Deaf**, intern. conf., Northampton, Mass. and New York, N.Y. (G. T. Pratt, Clark School for Deaf, Northampton 01060)

18–30. **Algae, Man and the Environment**, intern. symp., Syracuse, N.Y. (D. F. Jackson, Dept. of Civil Engineering, Syracuse Univ., Syracuse 13210)

19–23. **Electronics**, 14th intern. scientific congr., Rome, Italy. (Rassegna Internazionale Elettronica Nucleare e Teleradiocinematografica, Via Crescenzio 9, Rome)

19–23. **Spectroscopy**, 13th intern. colloquium, Ottawa, Ont., Canada. (Secretary, The Colloquium, Natl. Research Council, Ottawa 7)

19–28. International Commission on **Illumination**, Washington, D.C. (L. E. Barbrow, Secretary, USNC, c/o National Bureau of Standards, Washington, D.C.)

20–23. International **Data Processing**, conf. and business exhibition, Boston, Mass. (Data Processing Management Assoc., 524 Busse Hgwy., Park Ridge, Ill. 60068)

21–29. **ACHEMA** 1967, 15th chemical engineering congr. and exhibition, Frankfurt-am-Main, West Germany. (Deutsche Gesellschaft fur chemisches Apparatewesen, Postfach 7746, 6000 Frankfurt (Main), 7)

21–1. International **Plastics** Exhibition and Convention, London, England. (British Plastics, Interplas 67, Dorset House, Stamford St., London, S.E.1)

25–2. **Chemotherapy**, 5th intern. congr., Vienna, Austria. (Sekretariat, Wiener Medizinische Akademie, Alser Strasse 4, 1090 Wienn, Austria)

26–30. **Carbonium Ions**, 1st intern. symp. on physical organic chemistry, Athens, Greece. (The Symposium, Dept. of Chemistry, Michigan State Univ., East Lansing 48823; or G. Gregoriou, Nuclear Research Center "Democritos," Aghia Paraskevi, Athens, Greece)

27–4. **Protein Foods and Concentrates**, intern. symp., Mysore, India. (B. L. Amla or T. N. R. Rao, The Symposium, Central Food Technological Research Inst., Mysore 2)

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The Chemistry of the Carbonyl Group, S. Patai, Ed. 7 Oct. 1966, 142

The Chemistry of the Non-Metals, W. L. Jolly, 31 Mar. 1967, 1659

The Chlorophylls, L. P. Vernon and G. R. Seely, Eds. 9 Dec. 1966, 1318

Chromosome Manipulations and Plant Genetics, R. Riley and K. R. Lewis, Eds., 13 Jan. 1967, 184

Chromosomes, Giant Molecules, and Evolution, B. Wallace, 22 Apr. 1966, 495

Chromosomes Today, C. D. Darlington and K. R. Lewis, Eds., 13 Jan. 1967, 184

Chronologies in Old World Archaeology, R. W. Ehrich, Ed., 11 Nov. 1966, 757

The Circular Functions, C. W. Dodge, 24 June 1966, 1732

Clinical Roentgenology of Collagen Diseases, C. M. Nice, Jr., 24 June 1966, 1735

Climates of the U.S.S.R., A. A. Borisov, 22 Apr. 1966, 498

The Cnidaria and Their Evolution, W. J. Rees, Ed., 30 Dec. 1966, 1638

The Collected Papers of Enrico Fermi, Vol. 2, E. Amaldi, H. L. Anderson, E. Persico, E. Segrè, A. Wattenberg, Eds., 13 May 1966, 950

A Collection of Problems in Atomic and Nuclear Physics, I. Ye. Irodov, 17 Mar. 1967, 1396

College Dropout and the Utilization of Talent, L. A. Pervin, L. E. Reik, W. Dalrymple, Eds., 24 Mar. 1967, 1526

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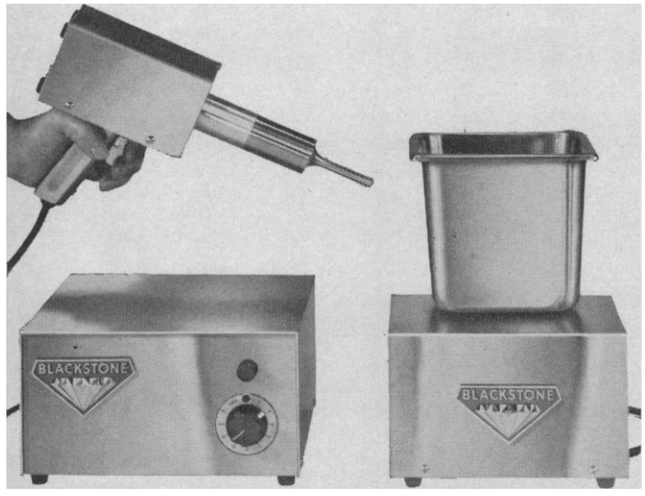

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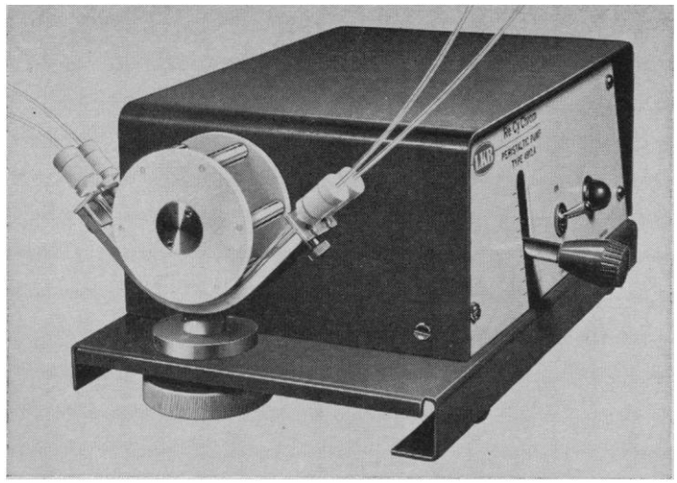

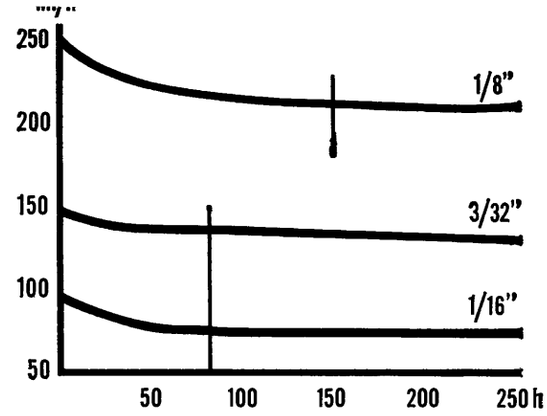

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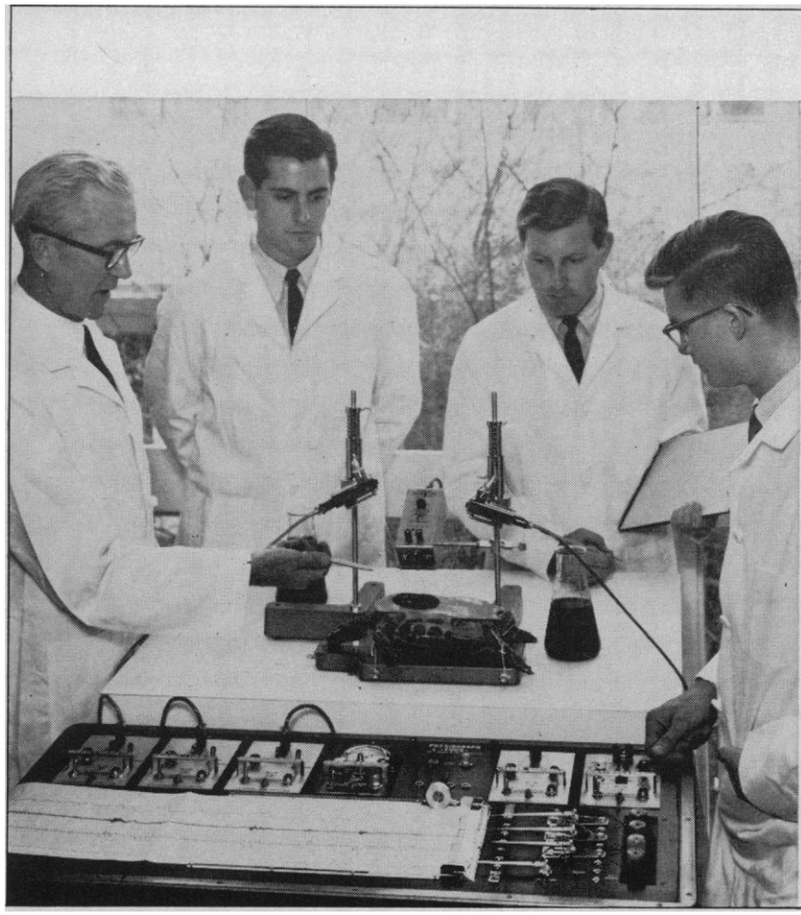

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