SCIENCE

14 April 1972

Vol. 176, No. 4031

MINIRAC

Saves time and money

You can save time and money by using the MiniRac for all the less-complicated fraction collecting in your laboratory. It does these jobs just as well as more sophisticated and costly instruments. Up to 60 fractions can be collected, automatically, in one run and dispensing time per fraction can be set for 1 to 40 minutes. An event-marking outlet is incorporated, making the MiniRac suitable for inclusion in a complete system of columns, pumps, monitors and recorders. Above all, it is easy to operate. A run can be set up in minutes.

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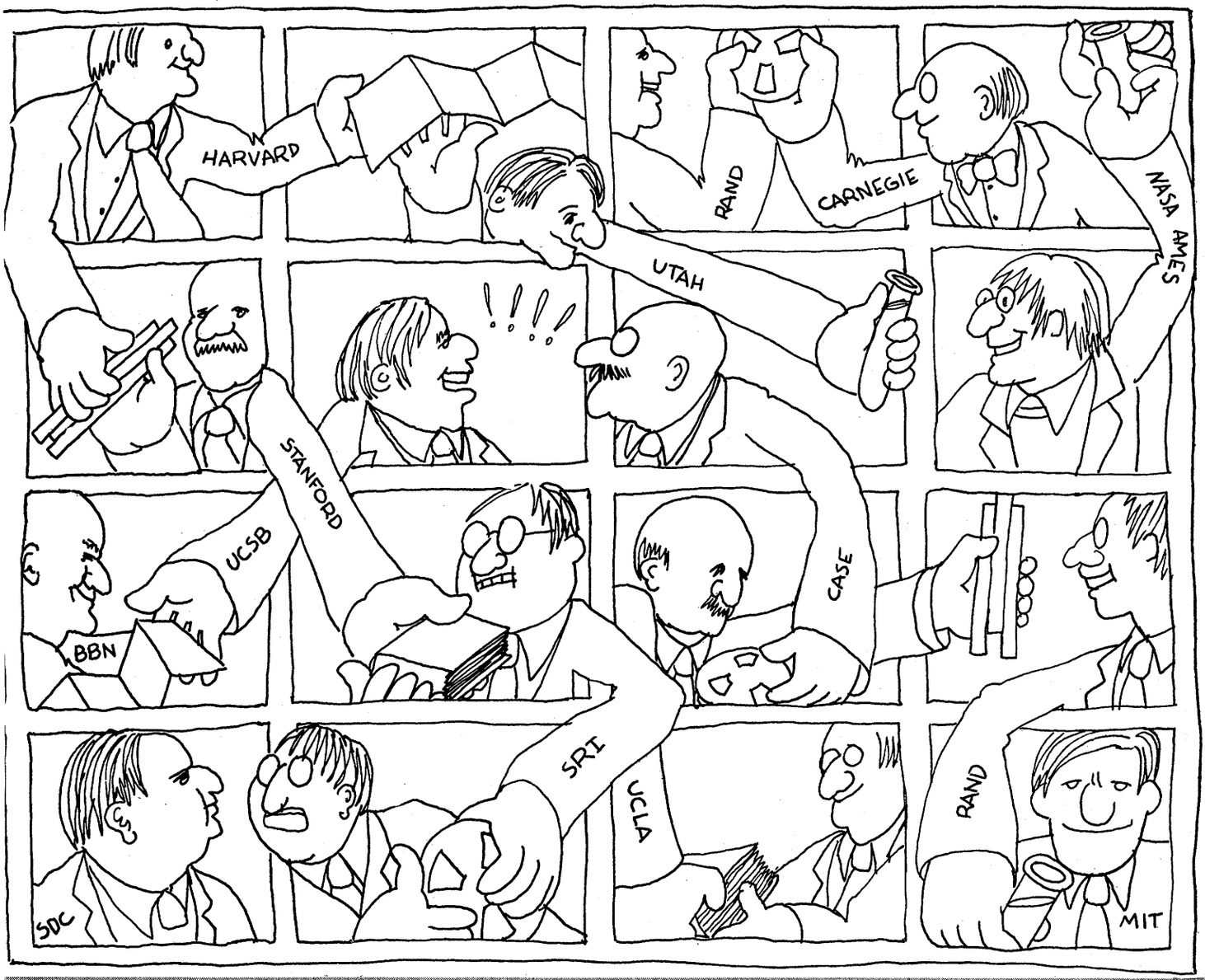

ARPA has a network of Supercomputers.

There are two dozen huge computer systems in the Advanced Research Projects Agency network.

Over half of them are DECsystem-10s. Our Supercomputer. MIT has two. So does Utah. Then there's Harvard, BBN, Carnegie, Case, SRI, Stanford and Rand.

Which should give you some idea of how popular our DECsystem-10 really is.

In the ARPA network, DECsystem-10's are doing state-of-the-art research into weather forecasting, econometric studies, resource management, computer sciences, and much more. Everyone shares their computer and expertise with everyone else. Everyone comes out ahead.

Additional DECsystem-10's will be a part of ARPA's mammoth ILLIAC IV number crunching complex now being installed at NASA-Ames Research Center in California. They'll handle all communications while at the same time managing up to a trillion bits of file storage. Once ILLIAC IV is in gear, ARPA members will be able to do in hours jobs so big that they wouldn't even attempt to do them now.

ARPA is one of the biggest brain trusts ever assembled. If half of its members have a DECsystem-10, you really ought to know about it.

Write for the literature that explains why 62 of the leading universities and research institutions in the country have selected DECsystem-10's. (Hint: It does computation *and* timesharing at half the cost of other systems — without sacrificing throughput.)

DECsystem-10 Scientific Group. Digital Equipment Corporation, 146 Main St., Maynard, Mass. 01754. (617) 897-5111.

digital

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ATTENTION: Members of the Digital Equipment Users Society: SPRING SYMPOSIUM MAY 11-13, Parker House — Boston, Mass.

14 April 1972
Vol. 176, No. 4031

SCIENCE

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COVER

The 22° halo and the upper tangential arc. The photograph, which covers the entire sky, was obtained by photographing the reflection in the convex surface of a reflecting sphere. The entire horizon, camera, tripod, and author are visible. See page 128. [R. G. Greenler, University of Wisconsin, Milwaukee]


5932A DATA SYSTEM

the problem solver

A fully integrated GC/Mass Spectrometer/Computer System designed specifically to solve analytical problems routinely

Traditionally a research instrument, the mass spectrometer has always been the exclusive domain of the skilled spectroscopist. But not the new Hewlett-Packard GC/Mass Spectrometer/Computer System. Designed specifically as a general-purpose analytical tool, it is easily operated by scientists who have no special knowledge of mass spectroscopy or computers and whose primary interest is to solve analytical problems.

In the HP System, the spectrometer may be operated manually or by the computer. When in computer mode, the data system controls the mass scan and accumulates the spectral data *while* it calculates masses and relative abundances in real time, automatically. It does a complete mass scan in two seconds, fast enough to provide spectral identification of GC peaks in real time. It can do repetitive scans and store all the data for as many as 1,000 scans on a single tape cassette. Later, any time you decide to examine a scan in detail, it will search the cassette, find the scan you are interested in and type out a list of every peak by mass number and relative abundance.

The HP mass spectrometer proper is an entirely new design that lets you spend your time getting analytical data rather than caring for the instrument. Its magnetically constrained ion source means you get complete mass spectra from as little as 10 nanograms of sample injected on the GC column. Source and analyzer are bakeable for easy cleaning. It has a low-cost mass marker that identifies the mass of any peak to ±0.2 amu. The spectrometer operates in the total ion mode whenever you want to record the chromatogram on its built-in strip chart recorder. It needs neither water nor liquid nitrogen and is easily moved from lab to lab.

The gas chromatograph can be any model made by HP or, if you prefer, almost any other make. In either case, installation requires no more than a simple tubing connection.

As your final assurance that it will remain a Problem Solver for years after you buy it, HP manufactures the entire system—mass spectrometer and computer as well as GC—and services it world-wide, without buck-passing. The price of an operating mass spectrometer starts as low as $26,600. Complete gc/ms/computer systems begin at $69,500. Call your nearest HP sales office for complete information or write for literature. Hewlett-Packard, 1601 California Avenue, Palo Alto, California 94303. In Europe: 1217 Meyrin-Geneva, Switzerland.

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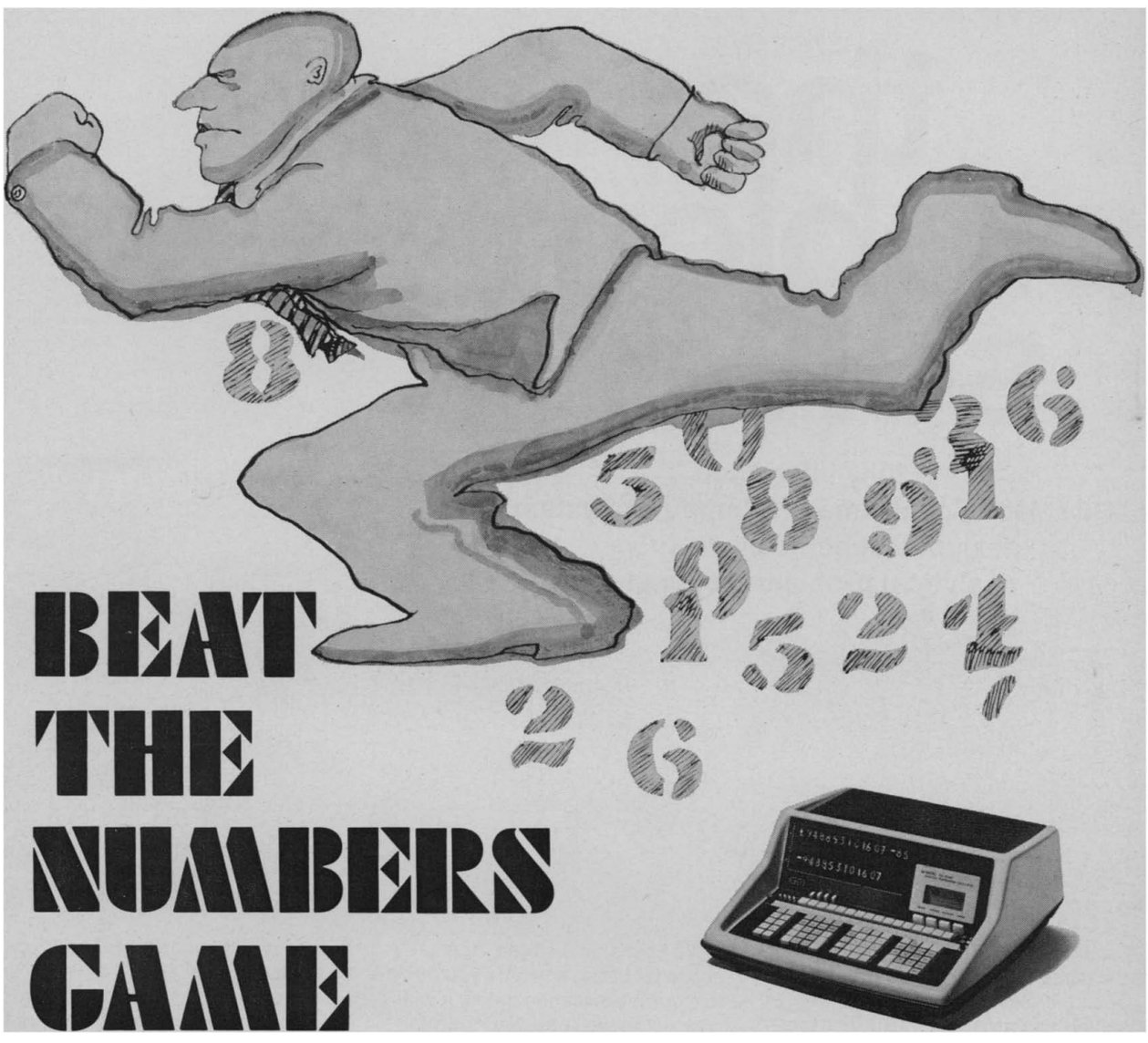
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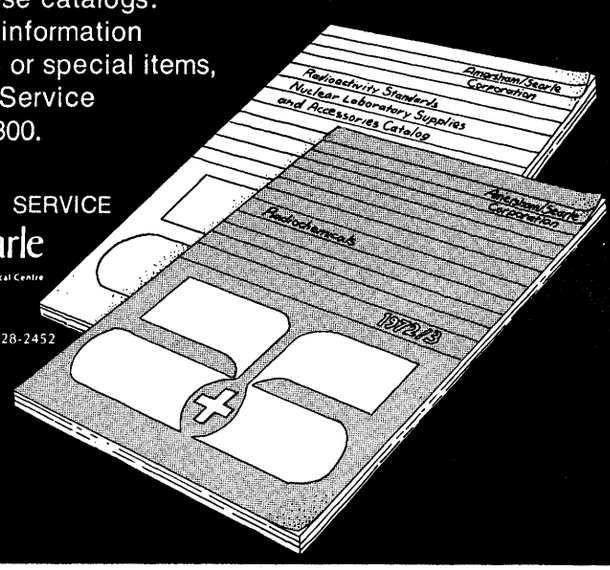

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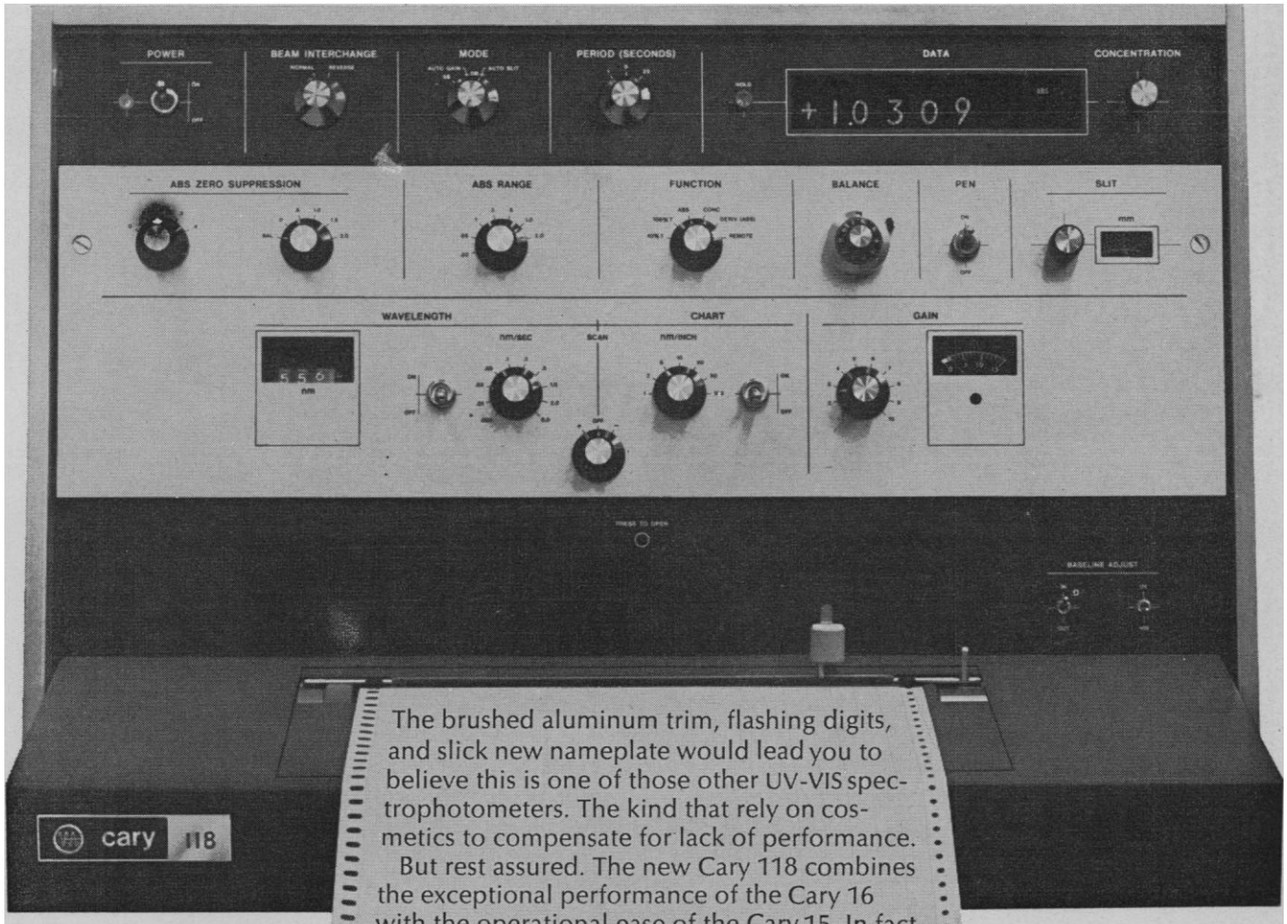
Until the new Cary 118 you could always judge a spectrophotometer by its cover.



The brushed aluminum trim, flashing digits, and slick new nameplate would lead you to believe this is one of those other UV-VIS spectrophotometers. The kind that rely on cosmetics to compensate for lack of performance.

But rest assured. The new Cary 118 combines the exceptional performance of the Cary 16 with the operational ease of the Cary 15. In fact, the features include a double monochromator, a digitally coupled wavelength scan and chart drive, and a photometric accuracy of 0.001 at 1 absorbance.

It also offers a pay-as-you-progress feature. Sort of modular, but not the add-a-box approach. Start with the basic manual spectrophotometer at $9,950. Later slip in a recorder. Then, later yet, a scanning mechanism. Or you can have the complete recording/scanning version all at once for $14,450. Either way, you end up with the identical instrument.

The recorder itself is a brand new design. For example, the pen drive has no cables or gears, so there's no backlash. And no detectable pen dead zone.

Service accessibility is another thing we kept in mind. All the solid-state electronics are in a roll-out drawer, and everything can be reached from the front.

Even the brochure describing the Cary 118 is a handsome new design. Write for one. Cary Instruments, a Varian subsidiary, 2724 South Peck Road, Monrovia, California 91016. Ask for data file E202-22.

cary instruments

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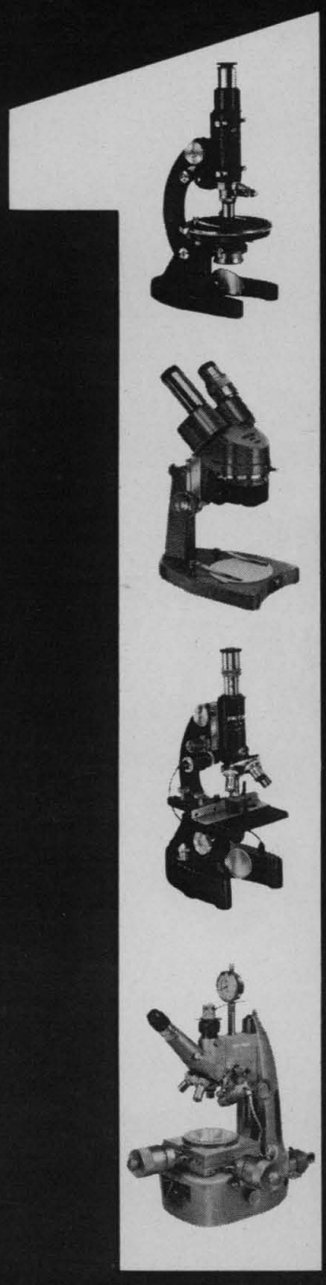

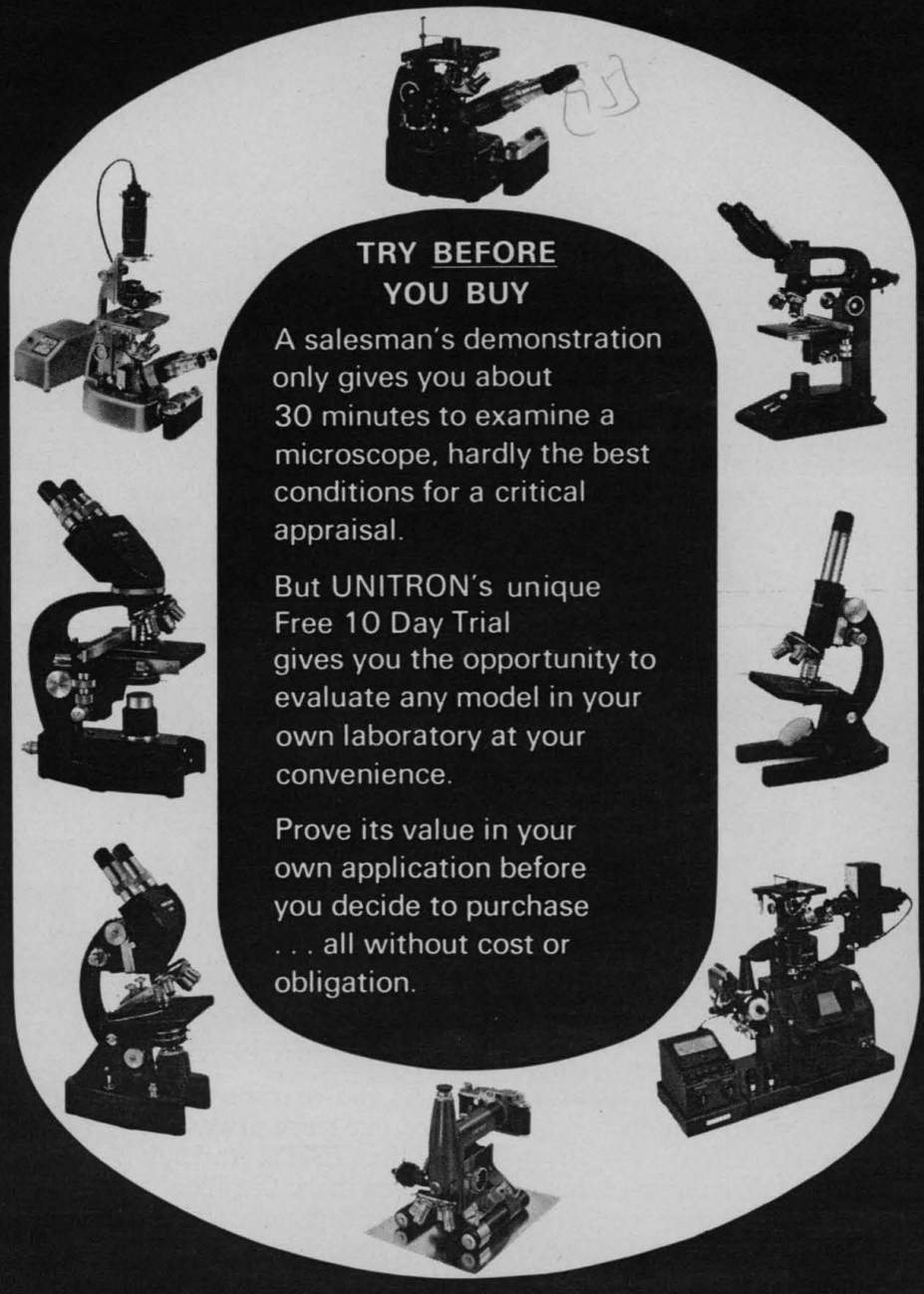

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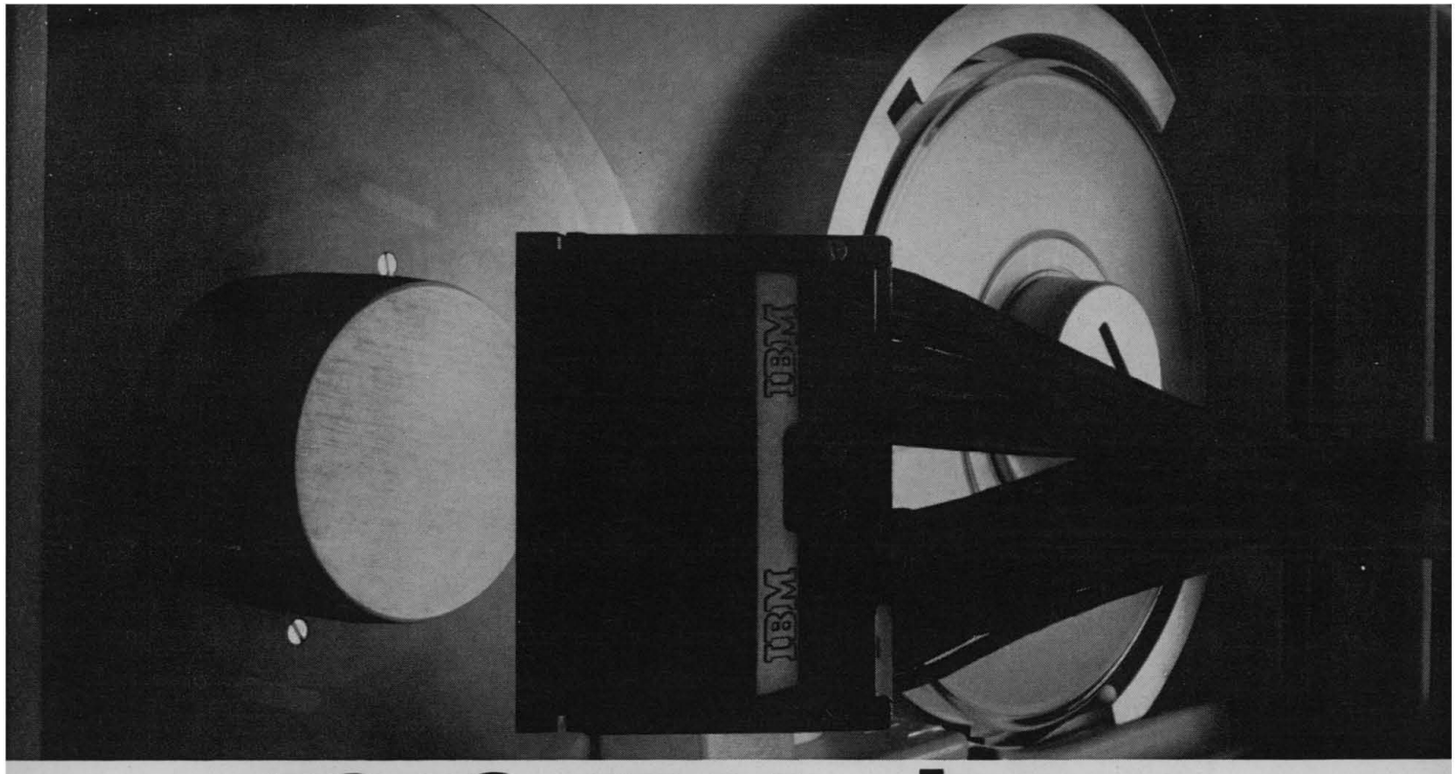

1962. IBM plugs CalComp into IBM.

1972. A new plug.

It happened at the Seattle World's Fair. IBM displayed an early CalComp drum plotter. Driven by their 1620 computer.

They knew a good combination even then.

What's happened since is history. A lot of people have been plugging CalComp disk drives and plotters into just about every computer IBM makes.

And because we've been in and around the computer room for a long time, you would expect us to provide you with a superior tape drive system, as well.

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Our new plug. The 1040 Tape System.

As you've come to expect, our lease prices are lower than IBM's. And our terms are more flexible.

The equipment, itself—like our disk drives and plotters—is IBM compatible, designed to grow with your needs, and fully-serviced. Everywhere.

For information about the new 1040 tape system, write California Computer Products, Inc., Dept. SM-M4-72 , 2411 West La Palma Avenue, Anaheim, California 92801. Or call (714) 821-2011.

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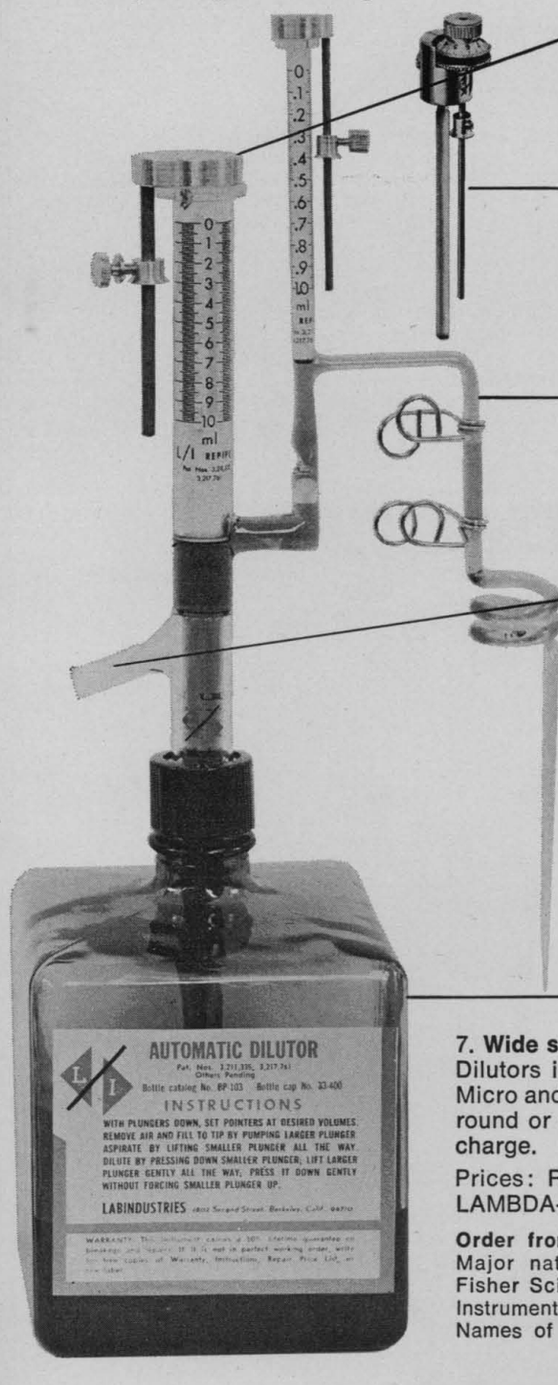
L/I Automatic Dilutor for aspirating and diluting



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ECONO-CAGE QUICK SELECTOR GUIDE

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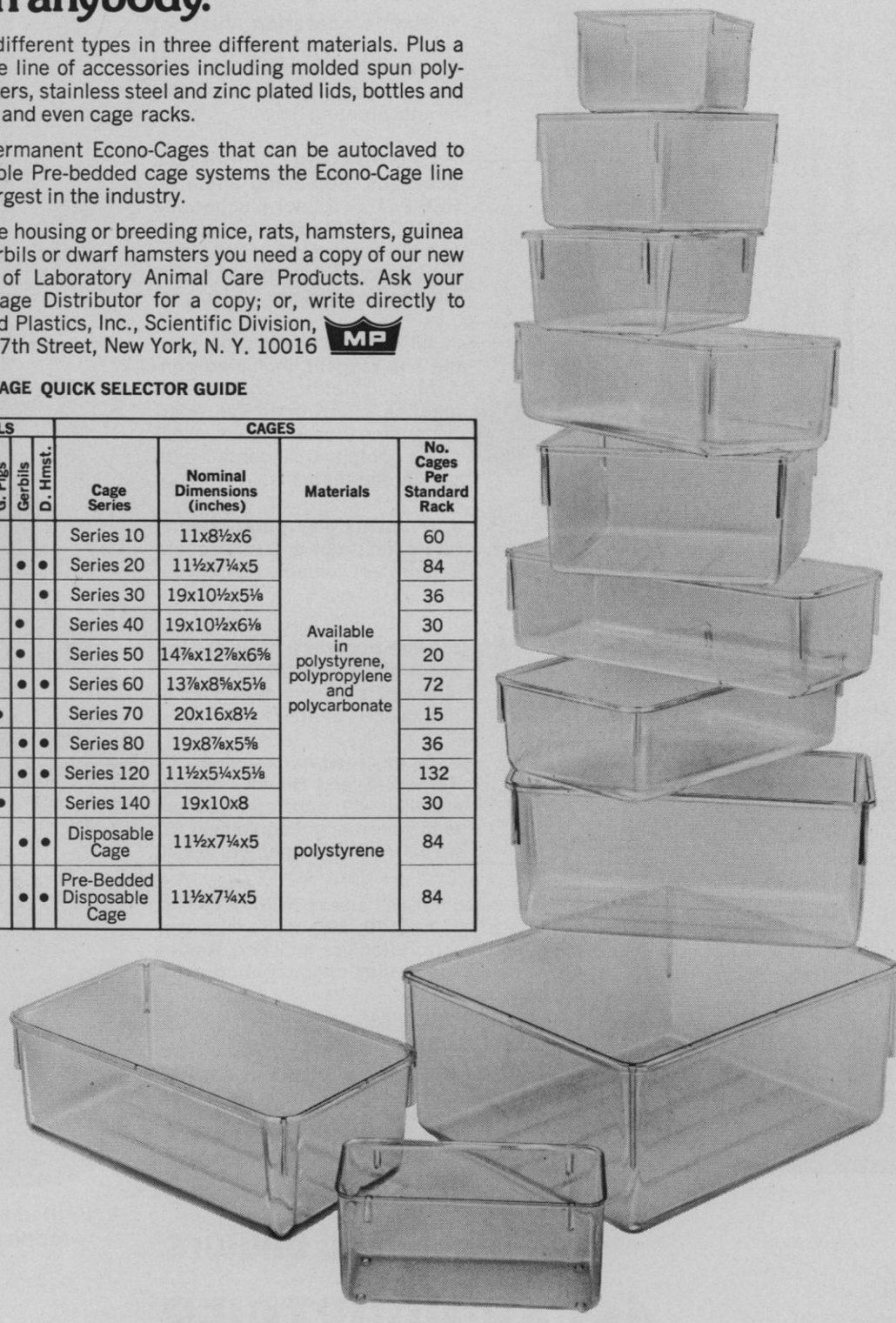
Mice	Rats	Hmstrs.	G. Pigs	Gerbils	D. Hmst.	Cage Series	Nominal Dimensions (inches)	Materials	No. Cages Per Standard Rack
	•	•				Series 10	11x8½x6	Available in polystyrene, polypropylene and polycarbonate	60
•		•		•	•	Series 20	11½x7¼x5		84
•					•	Series 30	19x10½x5⅛		36
	•	•		•		Series 40	19x10½x6⅛		30
	•	•		•		Series 50	14⅞x12⅞x6⅝		20
•				•	•	Series 60	13⅞x8⅝x5⅛		72
	•	•	•			Series 70	20x16x8½		15
•				•	•	Series 80	19x8⅞x5⅝		36
•				•	•	Series 120	11½x5¼x5⅛		132
	•	•	•			Series 140	19x10x8		30
•				•	•	Disposable Cage	11½x7¼x5	polystyrene	84
•				•	•	Pre-Bedded Disposable Cage	11½x7¼x5		84



EC-P-4

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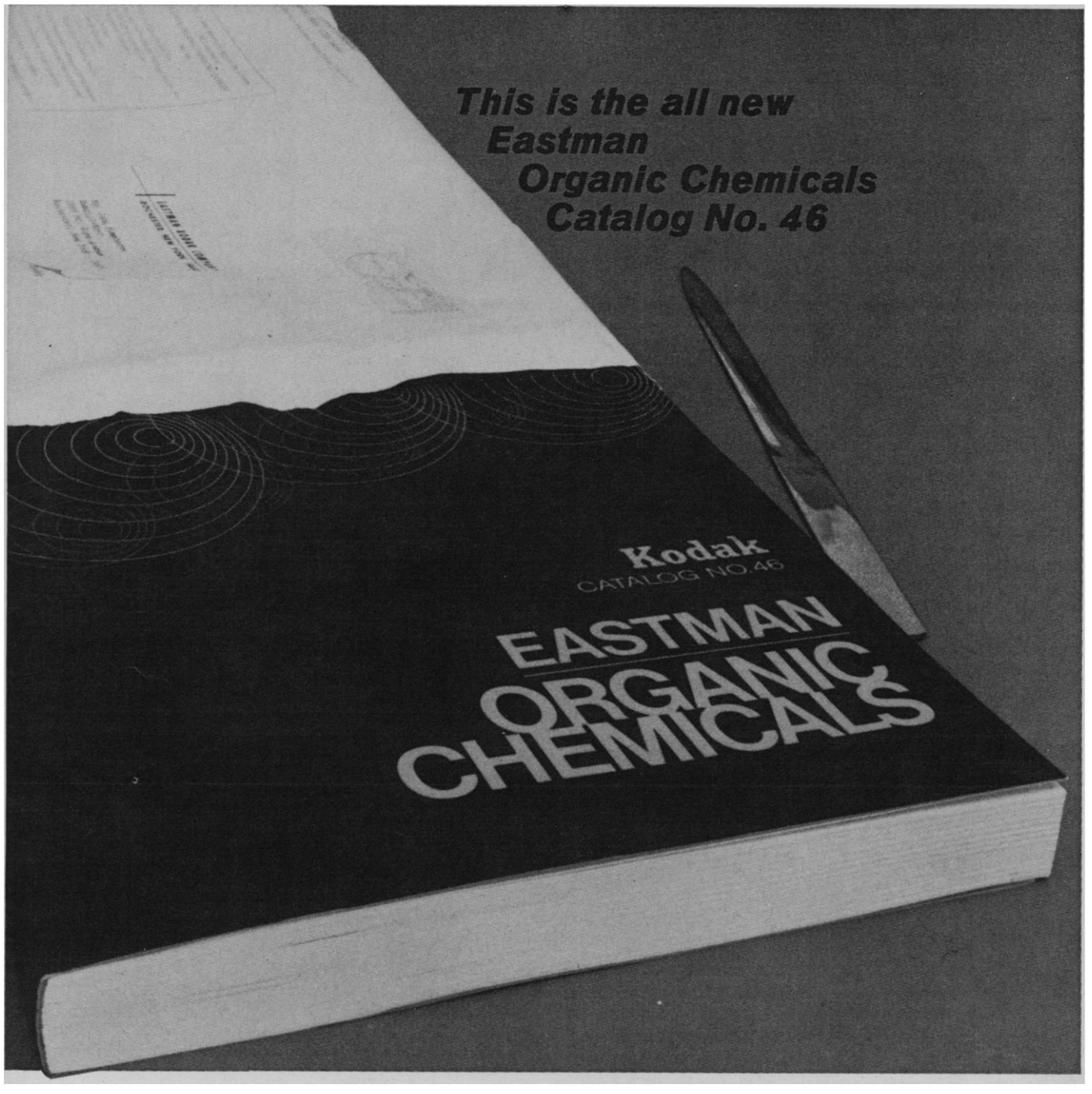

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- ☐ An Empirical Formula Index
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- ☐ A Special Products section with subsections on:
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  - Biochemistry
  - Organic Chemistry
  - Physics and Physical Chemistry

It was designed to help you:

- ☐ Synthesize chemicals
- ☐ Analyze chemicals
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- ☐ Order chemicals

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4-65

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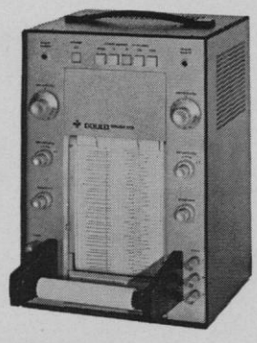
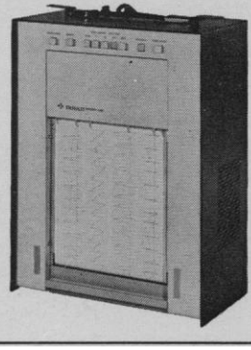


BRUSH 220 2-channel

A versatile, rugged, accurate recorder. Easy to operate, able to withstand inexperienced operator abuse. It weighs only 25 lbs. Comes with built-in preamps with a measurement range from 1mV per division to 500V full scale. 4 pushbutton selected chart speeds from 1 to 125mm/sec. 2-40mm channels, 2 event markers. Frequency response is 40Hz f.s.

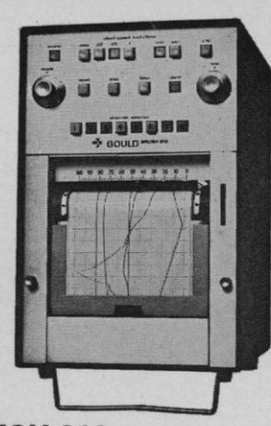
BRUSH 440 4-channel

Maximum versatility at low cost per channel. Exceptional reliability in laboratory or field application. 4-40mm channels and 2 event markers. Frequency response 40Hz, f.s. Sensitivity ±2.5V f.s. Pushbutton selected 8 chart speeds from 1mm/min. to 125mm/sec. Portable, or mobile console. Also available with 2-40mm and 1-80mm channels.



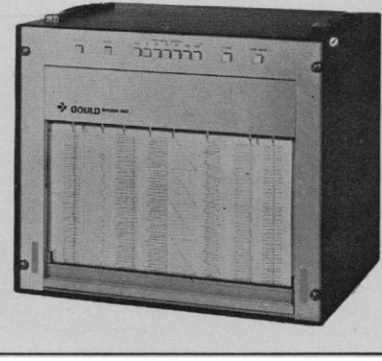
BRUSH 260
6-channel

This rugged recorder handles the bulk of recording tasks with high precision and maximum operator convenience. Built-in preamps provide a measurement range from 1mV per division to 500V full scale, 6-40mm channels and 4 event markers. Frequency response 40Hz f.s. 8 pushbutton selected chart speeds from 1mm/min. to 125mm/sec. Portable, rack or mobile cart mounted.



BRUSH 816
8-channel
hi-speed multipoint

This recorder scans and displays up to 8 channels of data adjustable from 2 seconds per point to 16 points per second. Ideal for measuring temperature, pressure and other slow changing variables. Sensitivity ±2.5V f.s. Frequency response: to 1Hz f.s., flat to 35Hz at useable amplitudes. 3 modes of operation. Multipoint, intensified, continuous. Felt tip capillary writing. 12 pushbutton selected chart speeds from 0.02 in/min. to 1 in/sec. Portable and rack mounted models.



BRUSH 480 8-channel

A general purpose recorder suited for a wide range of applications. 8-40mm channels and 2 event markers. Frequency response 40Hz f.s. Sensitivity ±2.5V f.s. 12 pushbutton chart speeds from 0.05 to 200mm/sec. Portable or rack mounted.

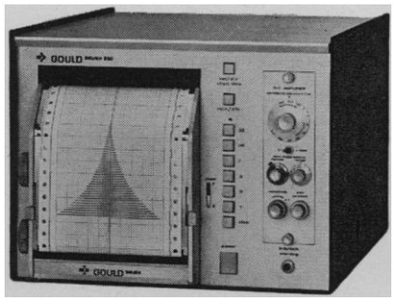
The Brush Recorder: performance that's made its mark.

Whether it's all-purpose or high-performance recorders, Brush has an answer for you. Ten different recorders. A choice of 1, 2, 3, 4, 6, or 8 analog channels.

And all the Brush recorders feature a pressurized-ink writing system. (Standard on all but the 816 Recorder.) The pressurized ink system sees to it that the ink goes into the paper. Not onto it. So traces are always clear, crisp, smudgeproof and uniform. And you never have to worry about clogging, skipping, or priming.

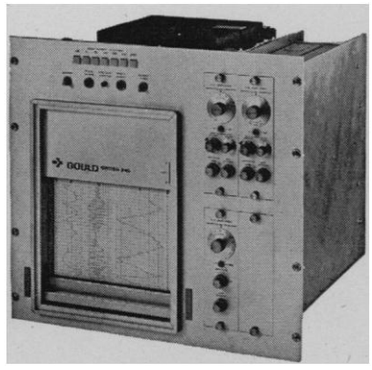
Another plus for the Brush Recorders is our Metrisite® non-contact servo-loop feedback device. A system so accurate it enforces pen positioning at better than 99½% linearity.

And the Metrisite system also takes care



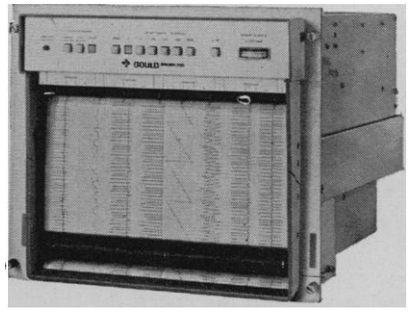
BRUSH 250 single channel

Fast, versatile strip-chart recorder. Frequency response is flat ±2% f.s. from d-c to 10Hz on a full 4½" span. Useable response to 100Hz. Accepts all Brush plug-in preamps. Sensitivity ±2.5V f.s. Detachable chart paper magazine, 12 pushbutton selectable chart speeds from 5 in/sec. to 1/10 of an inch/min. (or 8 days of continuous recording.) Portable or rack mounted.



BRUSH 240 4-channel

Designed for versatility, maximum resolution, and precision. Modular design permits use of interchangeable preamps. Rack, cabinet or cart mounted. Frequency response to 55Hz on 40mm and 35Hz on 80mm channels. 2 event markers. 12 pushbutton chart speeds from 0.05 to 200mm/sec. Sensitivity ±2.5V.



BRUSH 200 8-channel

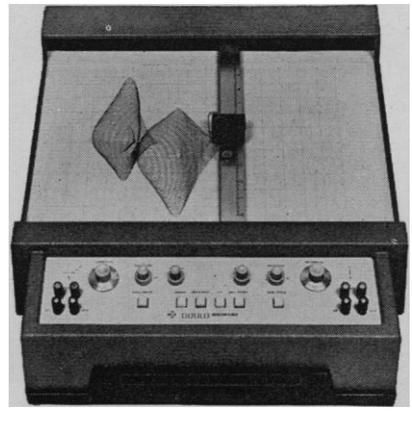
The world's standard for high performance direct writing recorders. The Brush 200 can be tailored to your specific requirements through a broad range of modular sub-systems. Choose rack or roll-around cabinets. Vertical or horizontal oscillographs and a wide range of penmotor and 80 and 40mm channel width combinations. 2 event markers. Frequency response 55Hz f.s. Useable response to 200Hz. 12 pushbutton chart speeds from 0.05 to 200mm/sec.

BRUSH 280 2-channel

Lets you analyze precise recorded data with accuracy and resolution never before possible in medium-frequency recorders. Double width 80mm channels and 2 event markers. 35Hz response f.s. Built-in preamps provide a measurement range from 0.5mV/div. to 500V f.s. 12 pushbutton selectable chart speeds from 0.05 to 200mm/sec. Portable or cart mounted.

BRUSH 500 X-Y Recorder

A rugged, low-priced recorder, 99.85% linearity. Pressurized ink writing plus electrostatic holddown. Built-in preamps with a sensitivity range from 100μV/div. to 1.0V/div. 40 inches-per-second writing speed. Portable or rack-mounted.



BRUSH INSTRUMENTS GOULD

of bothersome maintenance problems. Like dirty pots, wear, cleaning. The Metrisite also eliminates slide wires and all the maintenance problems they cause.

Electronics are all solid-state. And most models come in either portable or rack-mounted versions. And all of them are compatible with our range of signal conditioners. A range wide enough to let you select the conditioning best suited for your measurements.

The Brush Recorders. If you'd like to know more about them, let us know. Contact your nearest Brush Sales Engineer or Representative. Or write for detailed performance information and specifications. Gould Inc., Instrument Systems Division, 3631 Perkins Avenue, Cleveland, Ohio 44114.

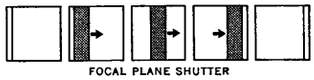
Circle No. 19 on Readers' Service Card

The 1957 Hasselblad.
It's enjoying a revival. But not by Hasselblad.

A curious thing is happening in the camera business. Other people are just beginning to build what we discarded in 1957. A 2¼" camera with a focal plane shutter.

At the root of the problem is the sudden recognition of the 2¼" picture size as one that couples large format quality with miniature camera versatility (something that Victor Hasselblad recognized 23 years ago). The trouble is, with everyone rushing in to make 2¼" cameras, quality isn't always a big consideration.

Which is why you should know—before you buy any 2¼" camera—why Hasselblad changed from a focal plane to a leaf shutter back in 1957.



FOCAL PLANE SHUTTER

The focal plane shutter has to move across the entire film area, exposing the negative piece by piece, through a travelling slit. When the subject is moving parallel to the film plane, like a moving car, the position of the subject has changed by the time the last slit is exposed. This time lag can create distortion—an elongated or compressed car.

The same thing happens when taking pictures from a moving car or plane. The landscape tends to appear elongated.

In 35mm photography, focal plane shutter distortion is minimized by the short distance the shutter has to travel. But with 2¼" cameras, where the shutter has to travel farther, the distortion becomes more noticeable.

LEAF SHUTTER

The leaf shutter, on the other hand (which we call a Synchro-Compur shutter in the Hasselblad) exposes the entire negative area all at once. Which makes it a much more accurate and desirable shutter.

The focal plane shutter has another considerable disadvantage. It can only be synchronized with electronic flash at very low shutter speeds. Which makes it all but useless with strobe for action and sports photography. (At higher shutter speeds, only a strip of the film would get exposed. At slower speeds you end up with ghost images.)

These problems are overcome by the leaf shutter which can be synchronized with all kinds of flash at all speeds and apertures (giving complete control over depth of field and background brightness). Making the leaf shutter far more versatile and useful to virtually every photographer.

So in 1957, Hasselblad carefully weighed the pros and cons of both shutter systems and decided to change over from the focal plane to the leaf shutter. We had to increase the camera price to do so, because the leaf shutter is a more complex, sophisticated mechanism. But the objective was to build the best camera possible, without being forced to compromise through economic necessity.

We then developed a full line of ten interchangeable lenses, each with its own leaf shutter mounted between the lens elements next to the diaphragm, in the most optically ideal position.

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Many features of the 1957 Hasselblad were well worth copying. In fact we've copied many of them ourselves. But we also knew what not to copy. With the result that most 2¼" cameras now employ the shutter system we abandoned 14 years ago.

Of course, if price is a consideration, you'll have to select a camera with a less costly focal plane shutter. But before you buy a new imitation of the old 1957 Hasselblad, look into the used camera ads. You can probably pick up the real thing for less.

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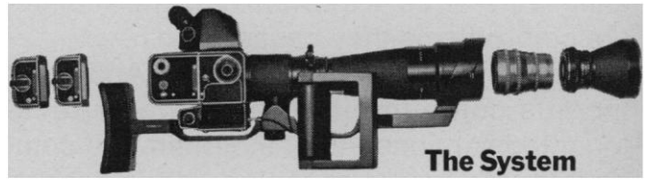

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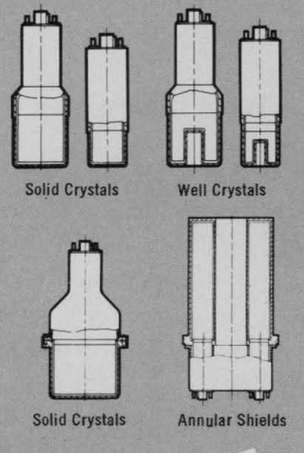

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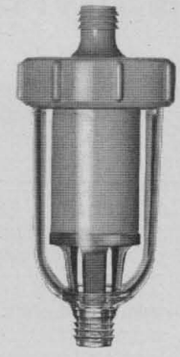

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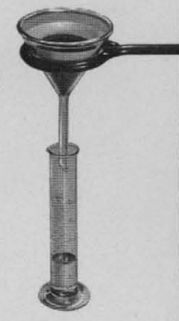

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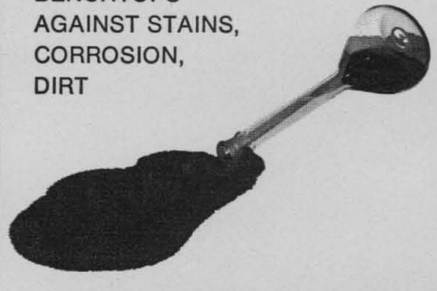

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the project at M.I.T. and is not a report on the output of the project. The book was an unsponsored personal effort. The project sponsored by the Club of Rome and the Volkswagen Foundation has been for the purpose of extending the model, modifying and documenting the assumptions, and discussing the inputs as well as the consequences by working with scientific research groups in other institutions who have relevant information and opinions. The published results of the project will begin to appear soon.

JAY W. FORRESTER

Alfred P. Sloan School of Management, Massachusetts Institute of Technology, Cambridge 02139

Unlike many of my colleagues who are extremely skeptical about large-scale simulation, data banks, and the organized use of politico-socioeconomic models, I believe (and am on record as believing) that an effort of the magnitude of the United States space program should be mounted to do this work. Where Forrester and I differ is that, although we may both see the limitations of econometrics and the importance of model building in areas where measures are hard to obtain, we have different views of what is feasible and useful. In my reading of his *Industrial Dynamics* and *World Dynamics* and glancing at *Urban Dynamics*, I have not seen anything to suggest that the models presented are other than extremely simplistic, given the current state of knowledge in the social sciences. I fear that if Forrester, with his drive, energy, and intelligence, were to obtain large funding for his work at the national level, he might easily be the source of a fad for producing grossly oversimplified models, which after a few years would bring about a reaction that would seriously set back progress in simulation, data bank creation, and large-scale social-scientific investigation. . . .

In reply to the specific points in Gabor's letter, I should say first that it appears to me the burden of proof of the relative worth of Forrester's work lies somewhat with its proponents. I have not seen this proof forthcoming. No evidence is given in Forrester's books that his results are insensible to the details of the assumptions. Furthermore, contrary to Gabor's assumption, such insensibility is not always a merit. Those who have worked with industrial, economic, social, or psychological simulations (Orcutt, Simon, Coleman, Abelson, Adelman, Crecine, Clarkson, to name a few) are well aware of the difficulties of obtaining a good first-approximation model. If it is too insensitive to parametric sensitivity analysis, the model is probably concentrating on the wrong variables. If it is highly sensitive, then data sufficiently accurate for the purposes at hand are probably impossible to obtain.

The application of careful dimensional analysis and the specification of good measures in the right dimensions are all difficult and critical. For instance, what is a measure of "welfare"? Even given a measure, what is its operational significance? Answers to questions such as these call for an intimate knowledge of subjects such as economics, sociology, psychology, and political science. Why are so few social scientists referred to by Forrester? Are there none whose knowledge is worth considering when building models of social, political, economic processes? In fact, there are many who have both deep substantive knowledge and the ability to use computers and who are convinced that the computer and computer models are critical for good social scientific exploration. Consider, for example, the Brookings SSRC model, Tinbergen's work on planning, Orcutt's simulation, or Klein's econometric models. Forrester in his writings does not tell us why such other workers' applications, their sensitivity analysis methods and model building, are not as good as his.

I believe that a proper scientific evaluation of the work on planning and forecasting models in the social sciences is of great importance. This, of course, should include Forrester's work. I propose to Gabor, to the Club of Rome, to the AAAS, to NSF, and others that a project be sponsored or at least a conference be held to initiate such an evaluation. It may turn out that Forrester's work is better than, as good as, or worse than that of Balderston and Hoggatt, Clarkson, Kalman Cohen, Coleman, Crecine, Cyert and March, Gordon, Klein, Leontief, Manne, Markowitz, Meyer, Naylor, or Orcutt, to name a few. An examination of Forrester's contribution to this large body of work in such a context could be of benefit to all. It might provide him with the opportunity to join with members of the growing body of social scientists working on social systems. I should be happy to supply him with a list of eminently qualified judges of work of this nature, in the fields of artificial intelligence, computer science, communications, eco-

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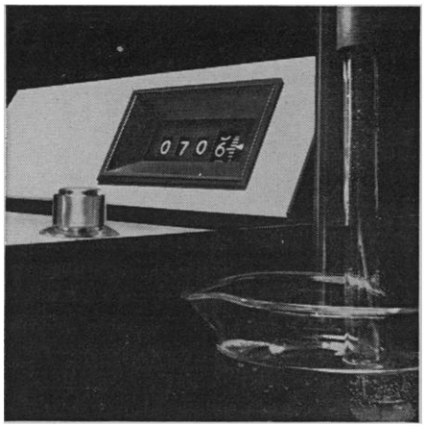

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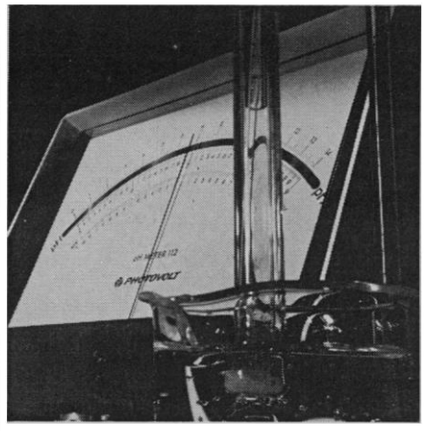

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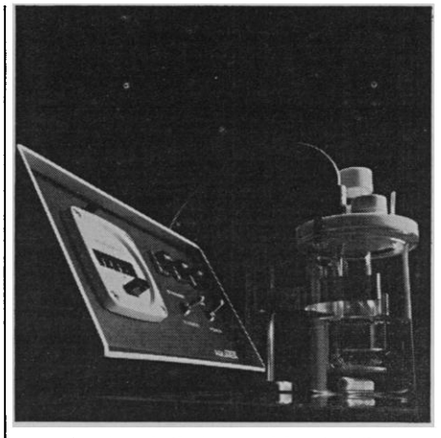

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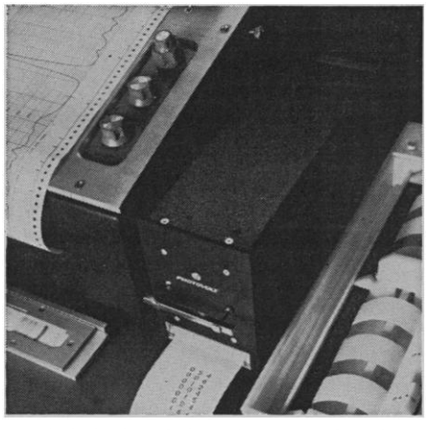

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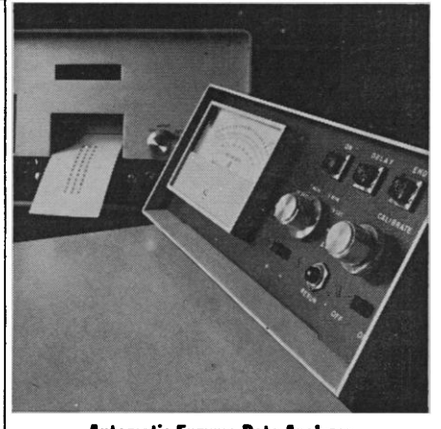

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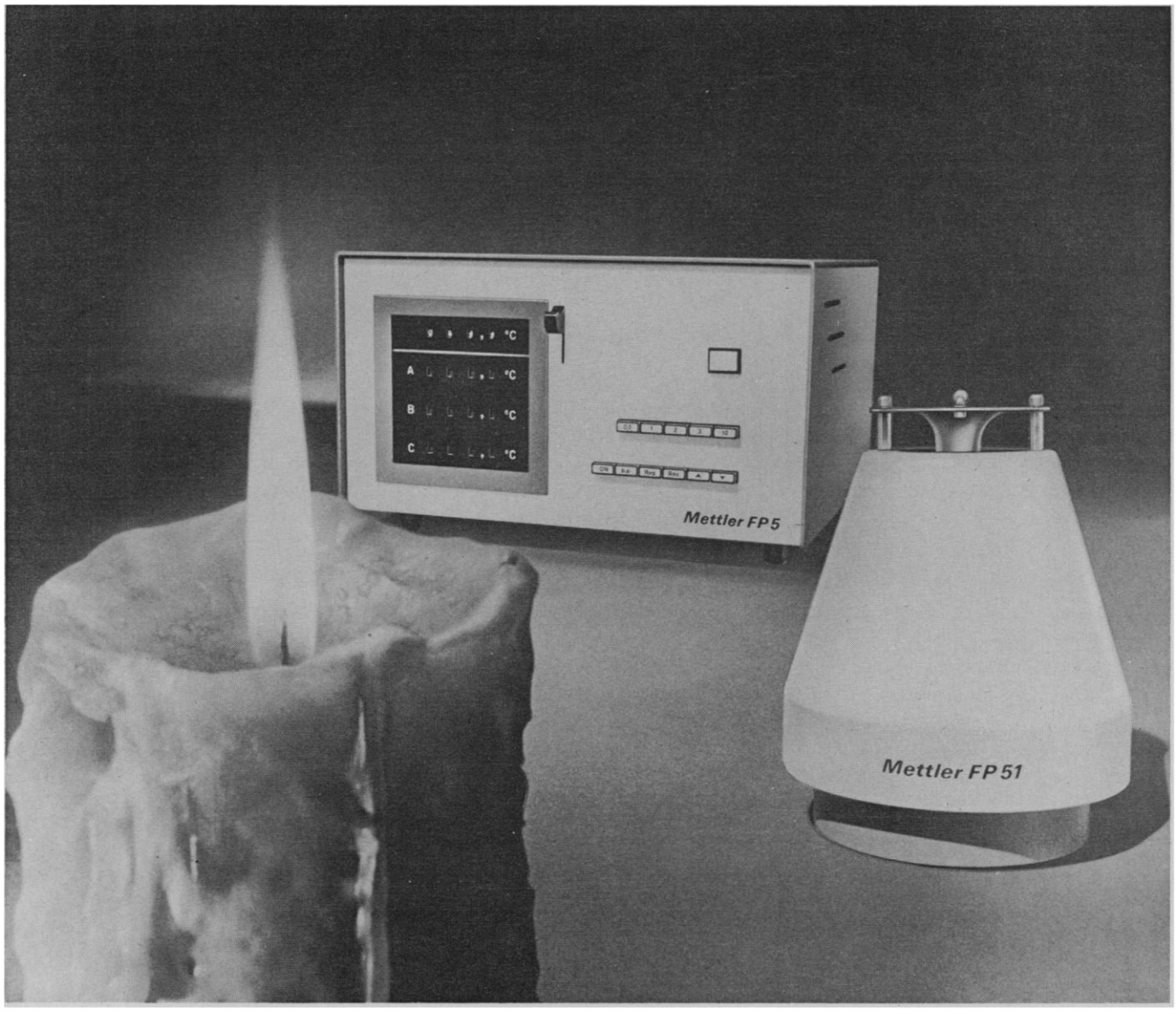

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Test Bias

The letter (24 Dec. 1971, p. 1278) by Kenneth Clark and Lawrence Plotkin was meant to correct what they describe as "three egregious misstatements" in Stanley's article "Predicting college success of the educationally disadvantaged" (19 Feb. 1971, p. 640) where he discussed, among many other studies, one by Cleary (*1*). Clark and Plotkin took out of context a single sentence in the 7½-page article: "Cleary tried to replicate the findings of Clark and Plotkin [*2*] with a better controlled design, but failed." This conclusion referred to Stanley's prior quotation from the Clark and Plotkin study: ". . . Clark and Plotkin . . . had reported results of a study based on 'alumni' classes of the National Scholarship Service and Fund for Negro Students in which they concluded that:

> . . . scholastic aptitude test scores are not clearly associated with college grades. It is suggested that college admissions officers weigh test scores less, since they do not predict the college success of Negro students in the same way they do for whites. This study indicates that motivational factors are probably more important than test scores in the demonstrated superiority of Negro students in completing college."

Stanley was not questioning their conclusion that an able, highly motivated group of black students persisted well to graduation in a variety of interracial colleges during the 1950's. (For example, see note 19 in Stanley's article.) He did, however, cite much evidence—including Cleary's study—that Scholastic Aptitude Test scores and high school records tend to predict the college grades of blacks at least as well as they do those of nonblacks. In their letter Clark and Plotkin disregard this other evidence and thereby imply that Stanley's whole case rests on the Cleary study alone, which they seem to perceive as part of an Educational Testing Service plot against them ("Accustomed as we have become for our study to be the launching pad for ETS papers. . ."). Although one need not defend the professional integrity of researchers at ETS (*3*), we note that neither Stanley's article nor most of the reports he cites were done at ETS. Some of the strongest evidence came from investigations by black non-ETS researchers such as S. O. Roberts, Joseph P. McKelpin, and Charles Leo Thomas and from studies in Illinois, Maryland, Georgia, and the Seven Sisters colleges. Even a glance at the bibliography in the Stanley article would indicate the broad data on which he based his conclusions. (Indeed, only three lines of his paper were devoted to the Cleary article.)

Since Clark and Plotkin have chosen to criticize the Cleary article, let us consider the points they make. Clark and Plotkin say that their data were better than Cleary's because they "had data on over 1200 Negro subjects (with questionnaire response from over 500) drawn from all sections of the country and distributed in hundreds of diverse colleges." The quality of data is, of course, always relative to the purpose they are to serve. For the conclusion of Clark and Plotkin that an admissions officer (who necessarily works within a single institution) should weigh test scores less, distribution of the sample among "hundreds of diverse colleges" is a disadvantage rather than an advantage. For the admissions officer, Cleary's within-college analysis is clearly more relevant. Since Cleary was able to analyze data in only three colleges, she limited her conclusions: "The schools used in this study do not represent the full spectrum of colleges in the United States, so general conclusions cannot be reached." But there are many studies other than Cleary's in which the within-college analysis has been performed, and most of these were reviewed in the Stanley article. With each new analysis, the Clark and Plotkin conclusion becomes less credible.

In their criticism of the Cleary article, Clark and Plotkin persist in their emphasis of correlation coefficients to the exclusion of regression lines. It is well known that the size of a correlation coefficient is a function of the variability of the group: when the range of scores is restricted, the correlations are attenuated. For this reason and others, the comparison of regression lines is a more appropriate analysis. Clark and Plotkin computed no correlation coefficients or regression equations, nor did they even work within colleges. Instead, they pooled college grades from 187 different colleges and

universities (*2*, pp. 58–59), thereby treating grades at highly selective institutions as equivalent to grades at unselective ones. (We recognize that they had no choice in this matter; at the time of their study, institutions of higher education were so severely segregated that a useful within-college analysis in integrated colleges was impossible.)

Rather than focus on correlations, Cleary proposed a definition of test bias that was to be examined in her study (*1*, p. 115):

> A test is biased for members of a subgroup of the population if, in the prediction of criterion for which the test was designed, consistent nonzero errors of prediction are made for members of the subgroup. In other words, the test is biased if the criterion score predicted from the common regression line is consistently too high or low for members of the subgroup. With this definition of bias, there may be a connotation of "unfair," particularly if the use of the test produces a prediction that is too low. If the test is used for selection, members of a subgroup may be rejected when they were capable of adequate performance.

She was able to conclude that, in these colleges, the SAT was as appropriate for the prediction of college grades of blacks as of whites (*1*, p. 123):

> In the two eastern schools, there were not significant differences in the regression lines for Negro and white students. In the one college in the southwest, the regression lines for Negro and white students were significantly different: the Negro students' scores were over-predicted by the use of the white or common regression lines. When high school grades or rank-in-class are used in addition to the SAT as predictors, the degree of positive bias for the Negro students increases.

In their letter Clark and Plotkin state that one has to examine Cleary's tables to find the differences in correlations for blacks and whites, because she fails to mention them in her text. In fact, in both the earlier *Research Bulletin* (*4*) which they cite and the journal article (*1*) cited by Stanley, three paragraphs are devoted to correlation coefficients; the differences are pointed out and explanations are proposed.

Clark and Plotkin are correct that there may have been some misidentification of race in the Cleary study: in only one school were records of race available from the college; in the other two colleges identification was made from photographs, with corroboration provided from an NAACP list in one of the colleges. Gross errors in classification would be required, however, to change the results markedly.

Testing and Fair Employment (*5*) is cited by Clark and Plotkin to indicate that differential racial validity is a problem in industrial settings. This is really not relevant to the question of the SAT in educational prediction. Even so, several important points may be noted: (i) the book routinely examines correlation coefficients, rather than regression lines; (ii) all but one of the studies has very small samples of Negroes, usually about 31, and yet large numbers of correlation coefficients are computed and compared; (iii) in the only study with a reasonably large sample (98 Negro and 437 white), differential validities were not found; and (iv) in the one educational study that they say contradicts Cleary's results, the Negro and white students were in different schools, although they took the same criterion tests (State Examinations in Nursing).

In two recently published studies of educational predictions, Temp (*6*) and Davis and Temp (*7*) argue strongly for validity studies in all institutions that are using the SAT (or any other admission tests or predictors) for the selection of students. We agree with this recommendation. The College Board provides, through the Educational Testing Service, free validity studies to any institution that uses the SAT in its admissions process. Users of the SAT are encouraged to study the separate regression lines for Negro and white students (as well as other groups such as males and females) so that they can make reasoned judgments about the utility of the test for groups of students in their institution.

T. ANNE CLEARY
College Entrance Examination Board, 888 Seventh Avenue, New York 10019
JULIAN C. STANLEY
Department of Psychology, Johns Hopkins University, Baltimore, Maryland 21218

References and Notes

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2. K. B. Clark and L. Plotkin, *The Negro Student at Integrated Colleges* (National Scholarship Service and Fund for Negro Students, New York, 1963).
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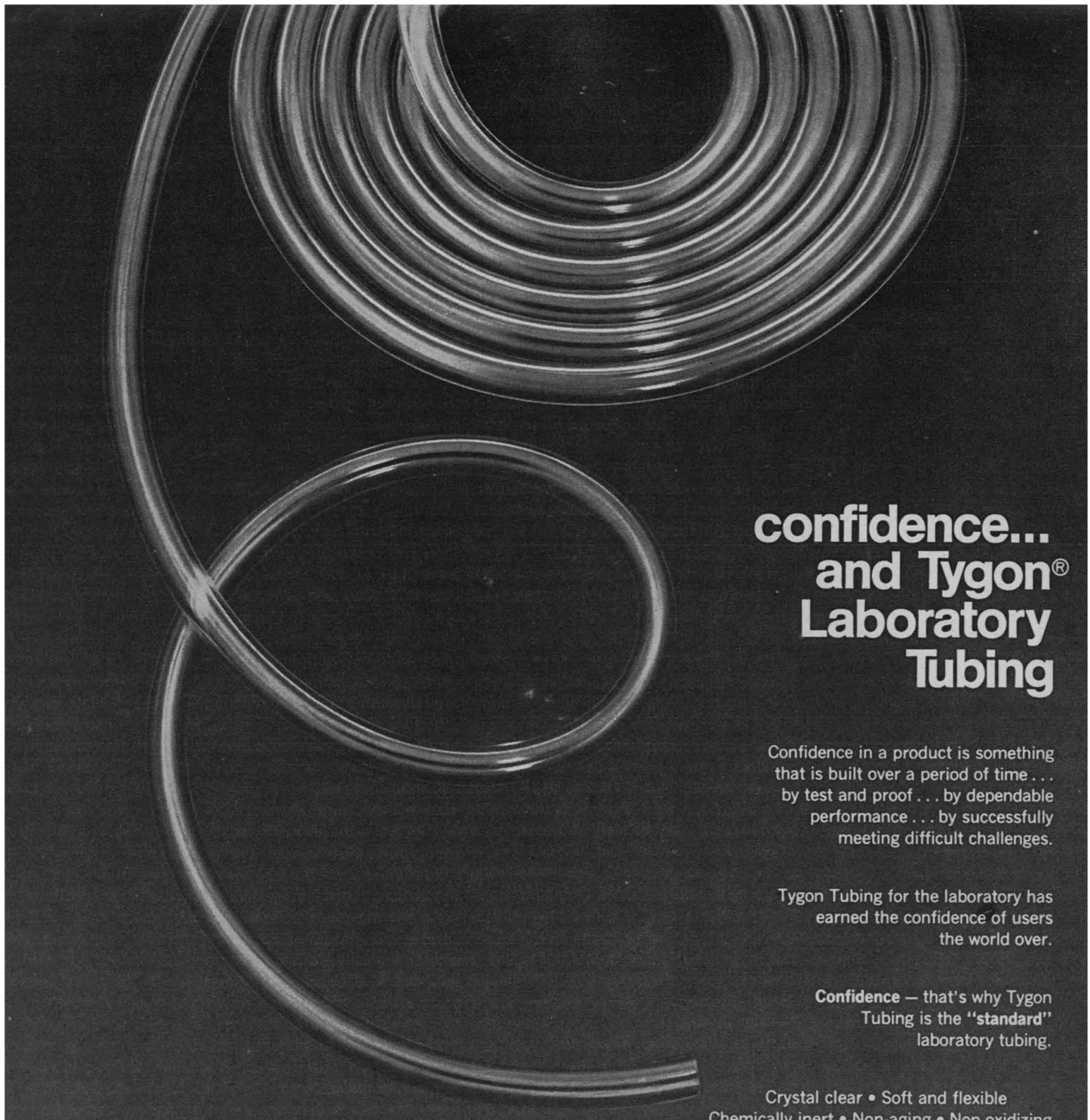

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Psychology and Health Care

John Walsh (News and Comment, 3 Dec. 1971, p. 1003) reports on "Health manpower training: Funding levels at issue" and describes certain inherent problems of fiscal, political, and manpower balance. Both Walsh's comment and the legislation that was enacted omit realistic consideration of a major health profession—psychology.

In terms of hospital beds, patients affected, community services provided, professionals involved, or funds expended—to say nothing of social cost—mental disorders constitute a very major and substantial health problem. Yet the current national-level proposals for health insurance and the broad range of existing prepaid health coverage largely exclude or seriously limit coverage for mental disorder. These proposals and existing coverage commonly exclude the services of psychologists or fail to recognize psychologists as the independent health practitioners that they are—licensed in 44 states and the District of Columbia and represented by a national organization of over 33,000 members, the American Psychological Association.

If there is any doubt that psychology has major substantive relevance and capacity to deliver in this arena, or that mental disorder is not a major health problem, I would recommend a review of the ten reports (published as separate texts by Basic Books, New York) of the Joint Commission on Mental Illness and Health appointed by President Kennedy. Six of these texts were authored, and one coauthored, by psychologists, perhaps evidence both of the preeminent scope of knowledge which my profession has to contribute to this field and its documented willingness to participate in the resolution of health problems at the national level.

HERBERT DÖRKEN
Department of Mental Hygiene, State of California, Human Relations Agency, 744 P Street, Sacramento 95814

Research Management

In the editorial (1 Oct., p. 11) that was excerpted from the 1945–1946 Carnegie Institution yearbook (*1*), Vannevar Bush seems to imply that fundamental research cannot be managed, but only supported, with the management of a program left to the scientist conducting the research. Quite the contrary! Experience in industry has repeatedly shown that the scientist conducting the research is frequently the poorest choice as manager due to his lack of objectivity, or removal from personal involvement. It has been far more successful for the manager to be a separate person from the researcher, although also a scientist.

The "managed" approach has also more successfully kept the final objective in clear focus. The alternative course, as advocated by Bush, frequently results in a diffuse approach, which either never comes to grips with the central problem, or takes a considerably longer time to do so.

The managed approach is not without its disadvantages or risks. But even Bush's "eminent" scientists must make judgments and take the chance of making a wrong choice. The central issue is to make sure that the managers or management groups are properly staffed. If the scientists are anywhere as eminent as Bush contends, they should have no difficulty convincing their managers of the wisdom of their choices. None of us likes to be called to account for our work and forced to justify the direction we have chosen. But in the balance, this is preferable in the case of any national commitments we might choose to make, now or in the future.

F. LOUIS FLOYD
Post Office Box 197
Spring House, Pennsylvania 19477

Reference

1. Report of the President, *Carnegie Inst. Washington Yearb.* **45**, 1–13 (1946).

The College Professor

Because the AAAS has recently made efforts to reform its governance, I decided to read the list (18 Feb., p. 804) of AAAS officers, committees, and representatives. An intriguing pattern began to emerge; of the scores of academic men and women listed, only two are affiliated with an undergraduate college (if we regard Dartmouth, the City College of New York, and Queens College as entities greater in scope and size than a "college"). Of these two, Rhoda Dorsey, who is on the Committee on Minorities in Science, is apparently a representative not only of the majority sex in America but also of a significant minority in academia, the *college* professor. The other, Donald Aitkin, is on the Youth Council.

Why does the AAAS have active

participation from all components of its membership save from those colleges that do not grant doctorates? These institutions represent an important segment of our educational system, and prepare many of our future teachers, doctors, and (hopefully) scientifically aware citizens. I hope that the AAAS officers will recognize that science is not the province only of the university, the corporation, and the government.

CARL STEPHEN PIKE
Department of Biology,
Franklin and Marshall College,
Lancaster, Pennsylvania 17604

Machine Translation

H. Wallace Sinaiko comes to substantially the same conclusion in his letter (17 Dec., p. 1182), "Translation by computer," as that of a National Academy of Sciences–National Research Council committee in 1966. The members of that committee (chairman John R. Pierce, John B. Carroll, Eric P. Hamp, David G. Hays, Charles F. Hockett, Anthony G. Oettinger, Alan Perlis) are gratified at this confirmation.

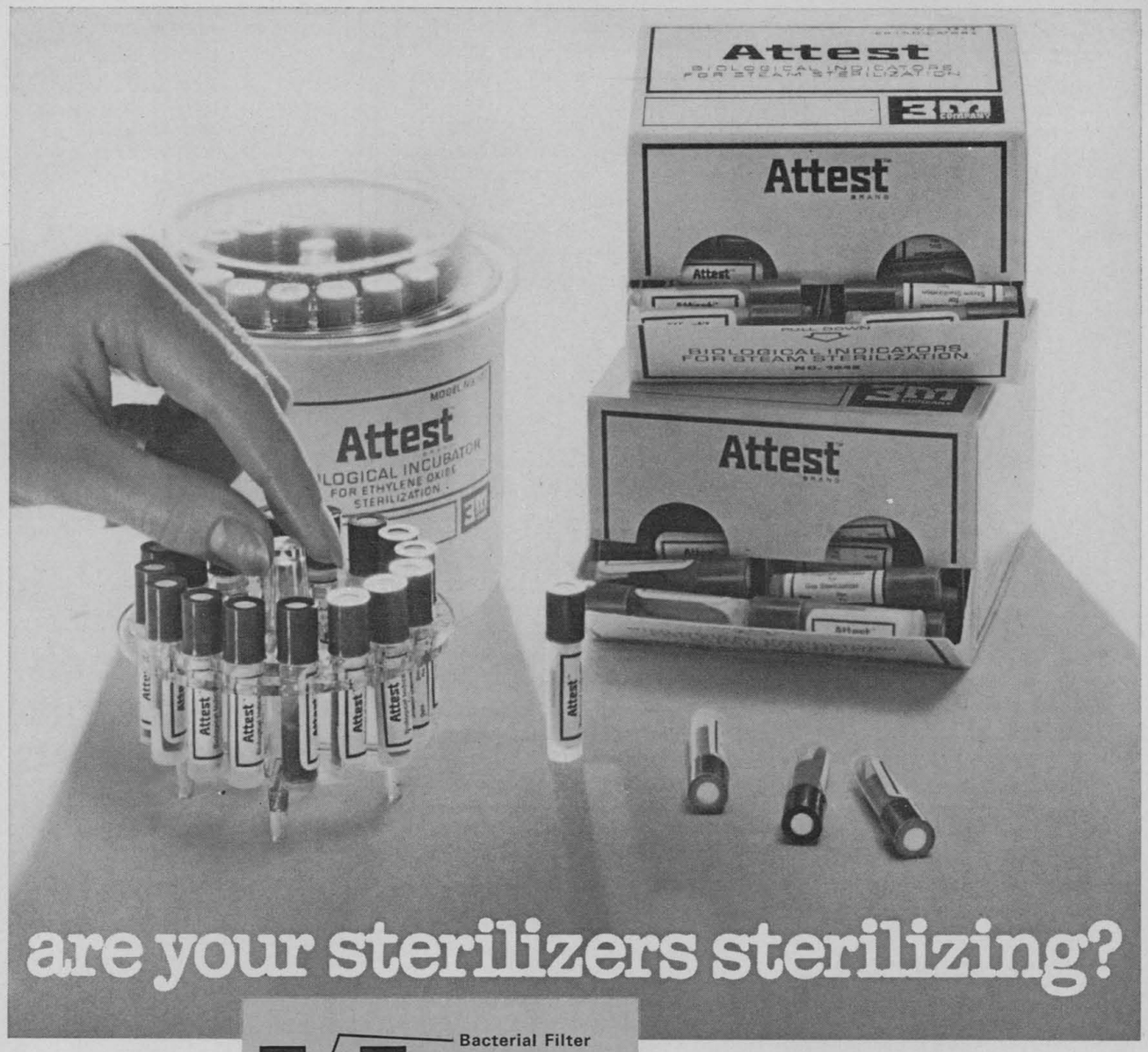
JOHN R. PIERCE
Department of Electrical Engineering,
California Institute of Technology,
Pasadena 91109

Reference

1. *Language and Machines, Computers in Translation and Linguistics*, report of the Automatic Language Processing Advisory Committee (Publ. No. 1416, National Research Council, Washington, D.C., 1966).

Lunar Basalts

We agree with most of Allen L. Hammond's review (Research News, 25 Feb., p. 868) of the history and structure of the moon. However, there is one important point that should be clarified. He says, "Within this period, two major phases of thermal evolution have been identified: (i) widespread melting that apparently occurred about the time of the moon's formation; and (ii) partial melting beginning as early as 4.1 billion years ago to form basalts enriched in potassium, rare earth elements, and phosphorus (KREEP basalts), and somewhat later, flooding of preexisting basins with lava to form the lunar maria between 3.1 and 3.7 billion years ago." He makes other remarks that are not clear about the times at which the basalts were formed.



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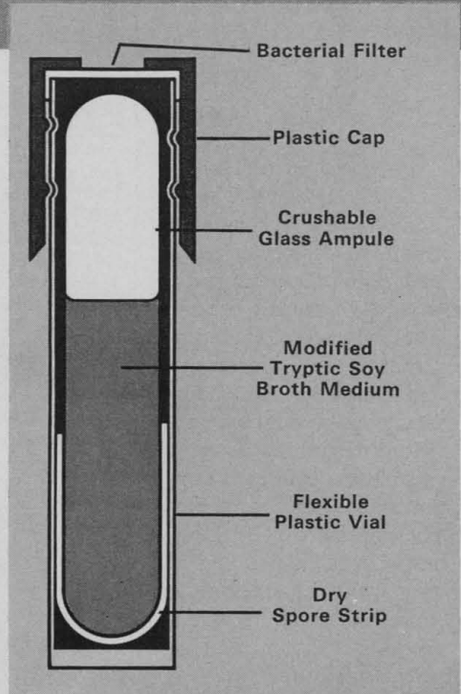

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We conclude that the maria basalts acquired their gross composition 4.5 to 4.7 billion years ago, and that this composition was only slightly modified in the second melting about 3.1 to 4.0 billion years ago. This point was discussed at the Second Lunar Science Conference by Urey *et al.* (*1*), and it has been clearly established by Wasserburg *et al.* (*2*) with an isochrone plot of ^{87}Rb against ^{87}Sr in the average soils of Apollos 11, 12, 14, 15, and Luna 16. We must conclude that these basalts were formed about 4.6 billion years ago, and that a closed-system melting process occurred later. Our explanation for the closed-system melting is as follows: When melting (of undifferentiated terrestrial material) occurs in a strong gravitational field, for example, that of the earth, the liquid separates and forms an extensive pool which, after considerable accumulation, bursts through to the surface. This liquid has the composition of basalt, and the unmelted material below has another composition. The rubidium-strontium composition differs in the two fractions. Because the moon has a weak gravitational field, liquid and solid separate less completely or not at all; when a previously formed basalt melts, solid and liquid flow out together, and the mixture has the same composition as that of the original pack of basaltic rock. The relative distribution of rubidium and strontium in different minerals was changed in the remelting process, although the overall ratio of Rb to Sr was not changed; hence, two isochrones are secured, one when the data from individual crystals of mare basalts are plotted, and the second when the gross compositions of the different mare basalts are plotted. This is the observation of Wasserburg *et al.* (*1*). Our arguments are somewhat different and involve the uranium and thorium-lead dates as well, but we arrive at the same conclusion. We also give a suggestion about the thermal history of the moon, but what we wish to emphasize is that the basaltic composition of the lunar-ash flows must have been acquired 4.5 to 4.7 billion years ago, in the primitive melting and crystallization process, and remained approximately unchanged in the second melting process.

H. C. UREY
KURT MARTI

Department of Chemistry,
University of California, San Diego,
La Jolla 92037

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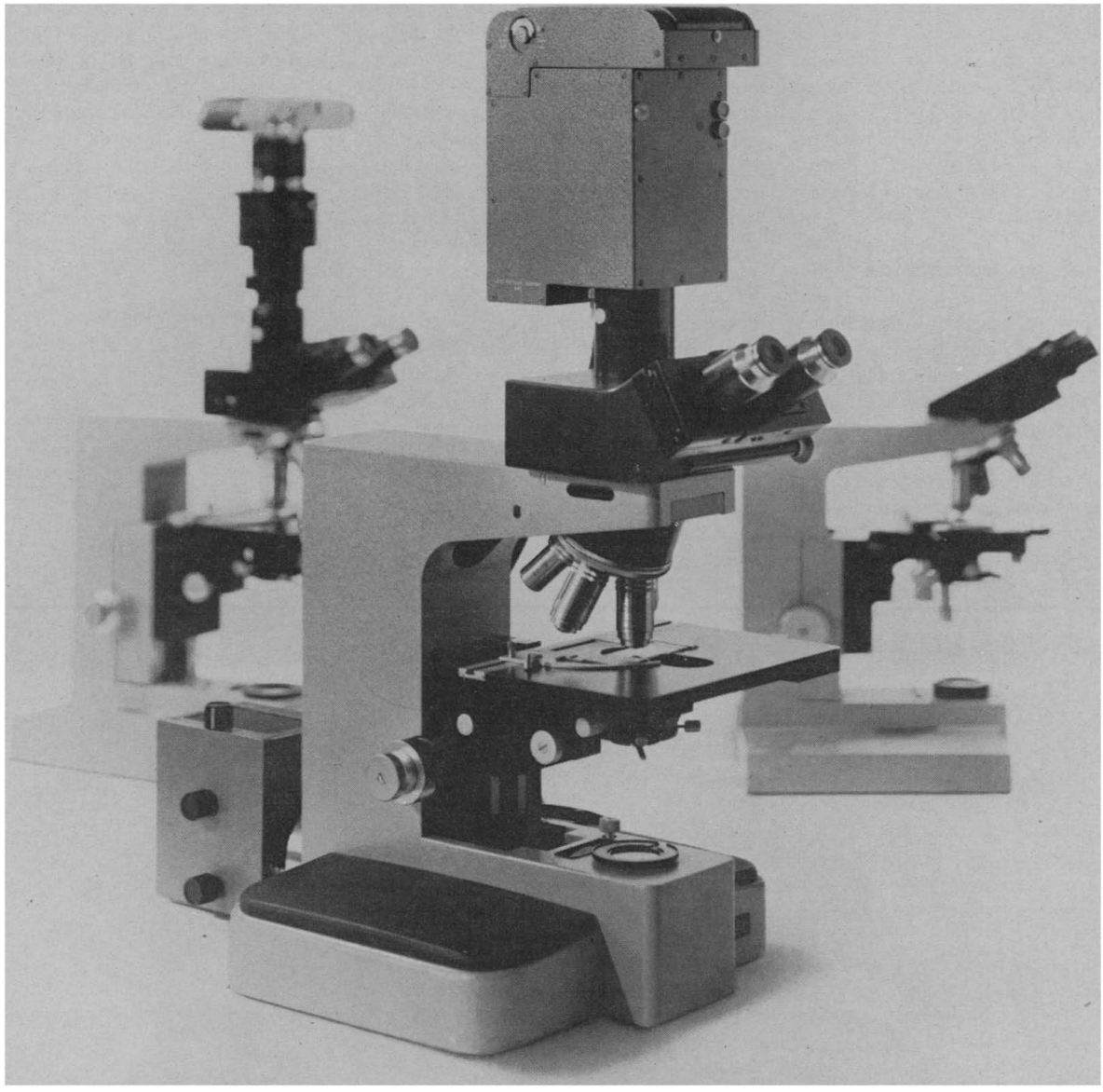

14 April 1972, Volume 176, Number 4031

SCIENCE

Who Should Ultimately Own the Data?

I have just been informed that, in the next meeting of a National Institute of Mental Health review committee on which I serve, 31 research proposals will be assessed. If the committee has a good weekend, we shall allot $1 million or more of public funds. Scores of other such committees, within federal, state, and city agencies, will award much larger amounts. A good part of the tax monies involved will end up paying for the collection or production of data. The question is what happens to this data, and what ought to happen to it, once the original researchers lose interest.

Often the data rots, disintegrates, or is otherwise lost or inaccessible. Decks, tapes, and records are stored in attics or basements at home or on the campus. In some cases, the bewildered widow of the deceased researcher asks his colleagues to "clear away the junk"; in others, it is thrown away with yellowing blue books, early drafts of manuscripts, and books that came apart when the professors moved, as they frequently do.

Data stored on the campus often fares little better. Data decks warp and get moldy; tapes may erase. Most important, code books are not kept with the material or are not updated as the decks and tapes are changed, making the data unusable. Records, unprotected, turn into dust.

More than the original investment is lost. Often the data cannot be duplicated (for example, public opinion polls of views people held in the 1940's). Continuity is undermined, since one researcher cannot build on the efforts of earlier researchers. Also, as the published portions of the studies often do not contain sufficient data to allow for replication, the mutual check by colleagues on the validity and quality of the research findings suffers.

I therefore suggest that government agencies and foundations which finance mass collection or preparation of quantitative data should require that the data generated will eventually be made available to other researchers, by depositing a copy of the data (tape, decks, and so on) in a data bank or library. It would be up to the recipients of the funds to decide when they no longer need to keep the data exclusively for their use (that is, when they have published all they hope to get out of it or their interest has moved elsewhere) and which data bank or library will benefit from their copies. It will also be up to each researcher to decide if his data is sensitive (for example, highly personal or political), in which case some omissions may be called for (for example, no personal identification of the subjects should be provided in medical data about venereal disease).

The data should be deposited in a way that renders it usable by others—by including code books, for example. Appropriate and specific budgetary provisions for preparing such copies (which are not costly) should be made on all grants and contracts.

If such measures are taken, perhaps initially only for those studies in which the investment in the data is $100,000 or higher, it must be expected that the public's investment in research will yield fruit that can be shared more widely, enjoyed for longer periods, and, not least, be of better quality.—AMITAI ETZIONI, *professor of sociology, Columbia University, Director, Center for Policy Research, 475 Riverside Drive, New York 10027*

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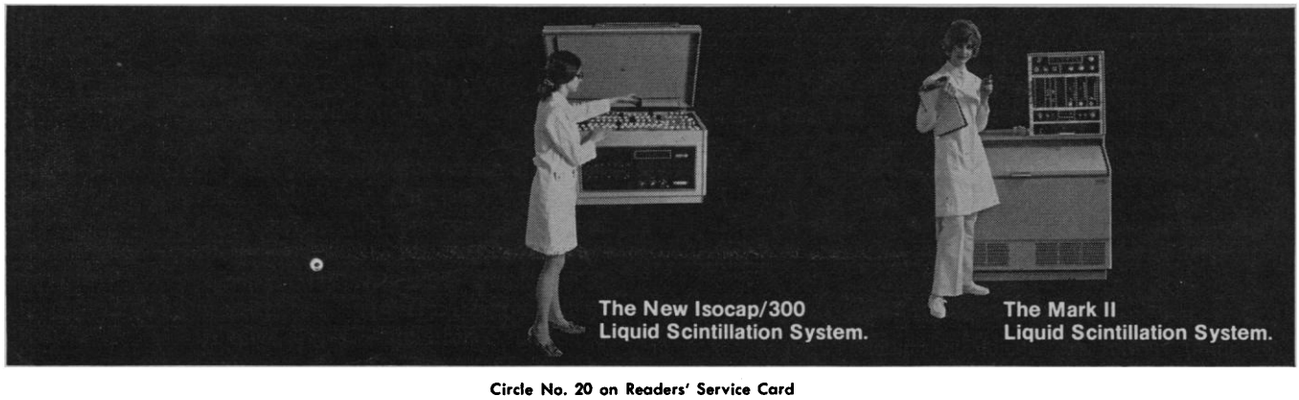

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priorities and with the development of mechanisms for public policy decision-making. J. V. Neel (University of Michigan Medical School), after sketching a number of present and potential genetic developments, presented four possible criteria for setting priorities: reduction of the proportion of persons with genetic disease, improvement of the expression of existing genotypes, creation of genetically superior individuals, and protection of the present gene pool by a world population policy. His conclusion is that we are not yet scientifically, ethically, or socially in a solid enough position to make wise choices among the possible priorities.

The conditions for achieving the necessary kind of consensus for deciding on priorities and for public policy-making were analyzed by D. A. Kindig and V. W. Sidel (Montefiore Hospital; Einstein College of Medicine) and by H. P. Green (George Washington University Law School). The former paper pressed for a more complete relating of genetic problems to other social issues and priorities in society. The need for better social and political processes to carry this out is evident, they said. Kindig and Sidel agreed with Green that decisions in this area must be made by an informed public and not by elite groups. This point was underscored by D. Eaton (All Soul's Unitarian Church, Washington, D.C.), who noted that genetic disease is a much greater preoccupation with whites than with blacks. In addition, Green contended that, if the public is to have genuine options and to become fully informed, there must be public debate and a resort to the adversary system. This method does not always guarantee truth or wisdom, but it does facilitate open discussion, a minimum necessity for wise public decision-making. K. Ludmerer (Johns Hopkins Medical School) stressed, in this context, the importance of public education for an understanding of the capabilities as well as limitations of science.

Where is the future likely to take us in genetics? This question, which kept surfacing throughout the conference, was directly confronted by R. L. Sinsheimer (California Institute of Technology), who asked whether future scientific developments are an "ambush or opportunity"? His clear answer was "opportunity," even if laced with dangers. Higher states are possible for the human species, intellectual, emotional, and moral; the price of not pursuing them would be "to stagnate in fear and doubt." J. V. Neel responded from the floor that he did not agree with Sinsheimer's thesis. Others agreed in part and objected in part. That typified the entire conference.

D. CALLAHAN
Institute of Society, Ethics and the Life Sciences, Hastings-on-Hudson, New York 10706

Forthcoming Events

April

20–21. **Cooperative Education**, 1st natl. conf., Newton, Mass. (M. B. Zerwick, Commco PR Inc., 310 Madison Ave., New York 10017)

21–22. New Mexico **Acad. of Science**, Socorro. (Miss L. M. Shields, New Mexico Highlands Univ., Las Vegas 87001)

24–27. American **Physical** Soc., Washington, D.C. (W. W. Havens, Jr., APS, 335 E. 45 St., New York 10017)

24–28. Inter-American Congr. of **Cardiology**, San Francisco, Calif. (A. M. Bennett, American Heart Assoc., 44 E. 23 St., New York 10019)

24–28. **Structural Engineering**—An Overview for the Seventies, American Soc. of Civil Engineers, Cleveland, Ohio. (H. Hands, ASCE, 345 E. 47 St., New York 10017)

24–29. American Acad. of **Neurology**, Palm Beach, Fla. (S. A. Nelson, AAN, 4005 W. 65 St., Minneapolis, Minn. 55435)

24–6. **Psychotherapy** Week, 22nd, Assoc. for Psychotherapeutic Training, Lindau, Germany. (H. Stolze, Lindauer Psychotherapiewochen, Adalbert-Stifterstrasse 31, D-8 Munchen 81, Germany)

25–26. **Scanning Electron Microscope** Symp., 5th annual, Chicago, Ill. (O. Johari, IIT Research Inst., 10 W. 35 St., Chicago 60616)

25–28. Significance of **Insect and Mite Nutrition**, Lexington, Ky. (J. G. Rodriguez, Dept. of Entomology, College of Agriculture, Univ. of Kentucky, Lexington 40506)

26–28. **Biometric** Soc., Eastern North American regional, Ames, Iowa. (F. B. Cady, Jr., Biometric Unit, 337 Warren Hall, Cornell Unv., Ithaca, N.Y. 14850)

26–28. **Operations Research** Soc. of America, New Orleans, La. (R. M. Oliver, Operations Research Center, Univ. of California, Berkeley 94720)

27–29. Eastern **Psychological** Assoc., Boston, Mass. (W. W. Cumming, 353 Schermerhorn Hall, Columbia Univ., New York 10027)

27–29. **Red Cell Metabolism and Function**, 2nd intern. conf., Ann Arbor, Mich. (G. F. Brewer, Dept of Human Genetics, Univ. of Michigan, Ann Arbor 48104)

27–30. Association of **Clinical Scientists**, Elkhart, Ind. (F. W. Sunderman, Jr., Drawer B, Newington, Conn. 06111)

28. Georgia **Acad. of Science**, Athens. (E. A. Stanley, Dept. of Geology, Univ. of Georgia, Athens 30601)

28–29. Indiana **Acad. of Science**, Notre

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Dame. (J. D. Webster, Hanover College, Hanover, Ind. 47243)

28–29. Society for **Investigative Dermatology**, Atlantic City, N.J. (J. S. Strauss, Boston Univ. Medical Center, 80 E. Concord St., Boston, Mass. 02118)

28–29. Nebraska **Acad. of Sciences**, Lincoln. (C. B. Shultz, 101 Morrill Hall, Univ. of Nebraska, Lincoln 69508)

28–29. South Dakota **Acad. of Science**, Aberdeen. (W. L. Hoffman, Dept. of Physics, Univ. of South Dakota, Vermillion 57069)

28–29. Illinois State **Acad. of Science**, Macomb. (N. R. Brewer, ISAS, 5757 Drexel Ave., Chicago, Ill. 60637)

28–29. **Pests and Pesticides**, Missouri Acad. of Science, Cape Girardeau. (H. D. Rutledge, Dept. of Physics, Southeast Missouri State College, Cape Girardeau 63701)

28–30. Wisconsin **Acad. of Sciences, Arts and Letters**, Stevens Point. (J. P. Batt, 5001 University Ave., Madison, Wis. 53705)

28–30. American Acad. of **Psychoanalysis**, Dallas, Tex. (Mrs. C. Bruskin, 40 Gramercy Park North, New York 10010)

29. American College of **Psychiatrists**, Dallas, Tex. (P. A. Martin, 857 Fisher Bldg., Detroit, Mich. 48202)

29. **Synthetic Fibers**, 9th annual symp., American Inst. of Chemical Engineers, Tidewater-Virginia Section, Williamsburg, Va. (C. E. Armengol, E. I. du Pont de Nemours & Co., Inc., P.O. Box 27001, Richmond, Va. 23261)

30–1. American Soc. for **Clinical Investigation**, Atlantic City, N.J. (P. Calabresi, Roger Williams General Hospital, Providence, R.I. 02908)

30–4. **Environmental Progress in Science and Education**, Inst. of Environmental Sciences, New York, N.Y. (Technical Program Committee, IES, 940 E. Northwest Highway, Mount Prospect, Ill. 60056.

30–4. **Experimental NMR** Conf., 13th, Pacific Grove (Monterey), Calif. (B. L. Shapiro, Dept. of Chemistry, Texas A&M Univ., College Station 77843)

May

1. Society for **Applied Anthropology**, Montreal, P.Q., Canada. (T. Weaver, Dept. of Anthropology, Univ. of Arizona, Tucson 85721)

1–3. Rocky Mountain **Bioengineering** Symp., 9th, and **Biomedical Sciences Instrumentation** Symp., 10th, Instrument Soc. of America, Omaha, Neb. (Rocky Mountain Bioengineering Symp., Inc., P.O. Box 59, U.S. Air Force Acad., Colorado Springs, Colo. 80840)

1–3. Conference on **Chemical and Molecular Lasers**, St. Louis, Mo. (W. Q. Jeffers, McDonnell Douglas Research Labs., Dept. 223, Bldg. 34, St. Louis 63166)

1–3. **Offshore Technology** Conf., 4th annual, American Inst. of Mining, Metallurgical, and Petroleum Engineers, Houston, Tex. (A. R. Scott, AIMMPE, 345 E. 47 St., New York 10017)

1–4. **Environmental Progress in Science and Education**, Inst. of Environmental Sciences, New York, N.Y. (K. Dambach, IES, 940 E. Northwest Hwy., Mount Prospect, Ill. 60056)

1–5. American **Psychiatric** Assoc., Dallas, Tex. (W. E. Barton, 1700 18th St., NW, Washington, D.C. 20009)

2–5. Virginia **Acad. of Science**, Lexington. (B. M. Bruner, P.O. Box 8454, Richmond, Va. 23226)

2–5. **Titanium**, 2nd intern. conf., American Soc. for Metals, Metallurgical Soc., and Inst. of Metals (London) (jointly), Cambridge, Mass. (H. M. Burte, Air Force Materials Lab. (LL), Wright-Patterson Air Force Base, Fairborn, Ohio 45433)

n Assoc. of **University Pro-**
rleans, La. (B. H. Davis,
Massachusetts Ave., NW,
C. 20036)

n Assoc. for **Cancer Re-**
nual, Boston, Mass. (H. J.
r Cancer Research, 7701
Philadelphia, Pa. 19111)

ern **Psychological** Assoc.,
(Miss W. F. Hill, Dept. of
thwestern Univ., Evanston,

al Medicine, 2nd intern.
e, Switzerland. (2e Symp.
le médecine biologique,
ne 11, CH-1004 Lausanne)

4–7. **Symbiosis in the Sea**, Georgetown, S.C. (W. B. Vernberg, Belle W. Baruch Research Inst., Univ. of South Carolina, Columbia 29208)

5. **Future Patterns in Health Care Delivery**, Professional Group on Engineering in Medicine and Biology, Philadelphia, Pa. (Miss H. Yoman, IEEE Office, Univ. of Pennsylvania, Philadelphia 19104)

5–6. Minnesota **Acad. of Science**, Marshall. (M. I. Harrigan, MAS, 3100 38th Ave., S., Minneapolis 55406)

5–6. North Dakota **Acad. of Science**, Dickinson. (B. G. Gustafson, Div. of Continuing Education, Univ. of North Dakota, Grand Forks 58201)

5–6. **Trace Elements in Our Environment**, Wisconsin Acad. of Sciences, Arts & Letters, Stevens Point. (J. R. Batt, 5001 University Ave., Madison, Wis. 53705)

6. American Soc. for **Clinical Nutrition**, Atlantic City, N.J. (C. E. Butterworth, Jr., Univ. of Alabama School of Medicine, Birmingham 35233)

6–11. American **Ceramic** Society, Inc., 74th annual, Washington, D.C. (F. P. Reid, ACS, 4055 N. High St., Columbus, Ohio 43214)

7–12. **Electronics** Div., Electrochemical Soc., Houston, Tex. (H. Huff, Texas Instruments Inc., P.O. Box 5936, M/S 144, Dallas 75222)

7–12. Society of **Photographic Scientists and Engineers**, 25th annual (includes repeat of seminar on Novel Audio-Visual Imaging Systems), San Francisco, Calif. (R. H. Wood, SPSE, 1330 Massachusetts Ave., NW, Washington, D.C. 20005)

8–10. American Soc. for **Quality Control**, Washington, D.C. (R. W. Shearman, ASQC, 161 W. Wisconsin Ave., Milwaukee, Wis. 53203)

8–11. **Quantum Electronics** Conf., American Inst. of Physics and Inst. of Electrical and Electronics Engineers, Montreal, P.Q., Canada. (Miss D. Edgar, Courtesy Associates, Suite 700, 1629 K St., NW, Washington, D.C. 20006)

8–12. Instrument Soc. of America, 13th natl. **chemical and petroleum instrumenta-**

tion symp., Philadelphia, Pa. (W. A. Bajek, UOP Process Div., 30 Algonquin Rd., Des Plains, Ill. 60016)

9. **Mycotoxins and Mycotoxicoses**, Symp., Univ. of Missouri, Columbia. (Office of Conferences and Short Courses, 103 Whitten Hall, Univ. of Missouri, Columbia 65201)

9–12. International Symp. on **Modeling Techniques in Water Resources**, Ottawa, Ont. Canada (A. B. Biswas, Water and Renewable Resources Sector, Dept. of Fisheries and Forestry, Ottawa)

10–12. **Federal Grants, Contracts, and Other Funding for Colleges, Universities, Hospitals, Nonprofit, and Other Institutions**, Washington, D.C. (Fifth Inst., Natl. Graduate Univ., 1630 Kalmia Rd., NW. Washington, D.C. 20012)

10–13. German **Röntgen** Soc., 53rd congr., Stuttgart. (F. Heuck, Zentral-Röntgeninstituts des Katharinenhospitals der Stadt Stuttgart, 7000 Stuttgart 1, Kriegsbergstr. 60)

10–13. Society of **Technical Writers and Publishers**, Boston, Mass. (C. T. Youngblood, Suite 421, 1010 Vermont Ave., NW, Washington, D.C. 20005)

11–13. **Radionuclide Carcinogenesis**, 12th symp., Richland, Wash. (Mrs. J. A. Harrison, Biology Dept., Battelle, Pacific Northwest Lab., Richland 99352)

11–13. Symposium on **X- and Gamma-ray Astronomy** (joint IAW/COSPAR), Madrid, Spain. (R. Giacconi, American Science and Engineering, Inc., 955 Massachusetts Ave., Cambridge, Mass. 02139)

14–18. **Radiation Research** Soc., 20th annual, Portland, Ore. (R. J. Burke, Jr., RRS, 4211 39th St., NW, Washington, D.C.

14–19. American **Radium** Soc., Boca Raton, Fla. (J. M. Vaeth, ARS, 1600 Divisadero St., San Francisco, Calif. 94115)

15–17. American Inst. of **Chemists**, Niagara Falls, N.Y. (P. B. Slawter, Jr., AIC, 79 Madison Ave., New York 10016)

15–18. Symposium on **Biochemistry of Gene Expression in Higher Organisms**, Intern. Union of Biochemistry, Sydney, Australia. (J. W. Lee, Australian Biochemical Soc., CSIRO Wheat Research Unit, Private Bag, P.O. North Ryde, New South Wales 2113)

15–19. American **Industrial Hygiene** Assoc., San Francisco, Calif. (E. L. Schall, AIHA, 210 Haddon Ave., Westmont, N.J. 08108)

15–19. Society of **Plastics Engineers**, Chicago, Ill. (C. C. Campbell, SPE, 656 W. Putnam Ave., Greenwich, Conn. 06830)

16–18. **Biting Flies and the Environment**, Edmonton, Alta., Canada. (S. McIver, Dept. of Parasitology, School of Hygiene, Univ. of Toronto, Toronto 181, Ont., Canada)

16–18. **Carbon and the Biosphere**, Brookhaven Symp. in Biology No. 24, Upton, N.Y. (G. M. Woodwell, Dept. of Biology, Brookhaven Natl. Lab., Upton 11973)

16–18. **Computer** Conf., American Federation of Information Processing Societies, Inc., Atlantic City, N.J. (T. C. White, AFIPS, 210 Summit Ave., Montvale, N.J. 07645)

17–19. **Drug Information** Assoc., New York, N.Y. (J. J. Harris, Galloping Hills Rd., Kenilworth, N.J. 07033)

18. Memorial Symp. on **Human Development and Reproductive Biology**, Washington, D.C. (L. V. Leak, Dept. of Anatomy, College of Medicine, Howard Univ., 540 W St., NW, Washington, D.C. 20001)

18–19. Southern **Textile Research** Conf., American Assoc. of Textile Chemists and Colorists, Hilton Head Island, S.C. (A. Giamara, 59 Route 10, East Hanover, N.J. 07936)

21–24. **Underground Transmission** Conf., 1st, Pittsburgh, Pa. (Inst. of Electrical and Electronics Engineers, Inc., 345 E. 47 St., New York 10017)

21–25. Institute of **Food Technologists**, Minneapolis, Minn. (C. L. Willey, IFT, 221 N. LaSalle St., Chicago, Ill. 60601)

22–24. **International Microwave** Symp., Inst. of Electrical and Electronics Engineers, Inc., Chicago, Ill. (P. P. Toulios, IIT Research Inst., 10 W. 35 St., Chicago 60616)

23–26. Society for **Experimental Stress Analysis**, Cleveland, Ohio. (B. E. Rossi, 21 Bridge Sq., Westport, Conn. 06880)

25–26. **Storage Polyglucosides**, New York Acad. of Sciences, New York, N.Y. (J. F. Frederick, Research Labs., Dodge Chemical Co., Bronx, N.Y. 10469)

25–27. **Mechanisms and Regulation of Craniofacial Morphogenesis**, Nymegen, The Netherlands. (F. Van der Linden, Dept. of Orthodontics, Univ. of Nymegen, "Heyendael," Philips van Leydenlaan 25, Nymegen)

28–2. National Conf. on **Social Welfare**, 99th, Chicago, Ill. (J. R. Hoffer, 22 W. Gay St., Columbus, Ohio 43215)

28–3. International College of **Surgeons**, 18th intern. biennial congr., Rome, Italy. (P. Stefanini, 1516 Lake Shore Dr., Chicago, Ill. 60610)

30–2. International Federation of Associations of **Textile Chemists and Colorists**, 9th congr., Munich, Germany. (Secretariat, 9th FATCC Congr., Rohrbacker Str. 76, D-6900 Heidelberg-1, Germany)

30–4. **Space Simulation**, Inst. of Environmental Sciences, New York, N.Y. (IES, 940 E. Northwest Highway, Mount Prospect, Ill. (60056)

31–2. **Endotoxin** Conf., Warrenton, Va. (EC, Channing Lab., Boston City Hospital, Boston, Mass. 02118)

31–2. American Inst. of **Industrial Engineers**, Anaheim, Calif. (J. F. Jericho, AIIE, 345 E. 47 St., New York 10017)

June

1–2. **Environmental and Water Resources Engineering** Conf., Nashville, Tenn. (E. L. Thackston, Dept. of Environmental and Water Resource Engineering, Vanderbilt Univ., Nashville 37203)

1–2. **Laboratory Animal Considerations in Toxicology and Related Disciplines**, East Brunswick, N.J. (W. H. Mitchell, P.O. Box 130, New Britain, Pa. 18901)

1–3. **Cancer Chemotherapy**, natl. conf., American Cancer Soc. and Natl. Cancer Inst., New York, N.Y. (S. L. Arje, ACS, 219 E. 42 St., New York 10017)

2. **Endotoxin** Conf., Warrenton, Va. (EC, Channing Lab., Boston City Hospital, Boston, Mass. 02118)

4–8. **Special Libraries** Assoc., Boston, Mass. (F. E. McKenna, SLA, 235 Park Ave. S., New York 10003)

4–8. **Tissue Culture** Assoc., Los Angeles, Calif. (R. H. Kahn, Dept. of Anatomy, Univ. of Michigan, Ann Arbor 48104)

4–9. **Mass Spectroscopy and Allied Topics**, American Soc. for Mass Spectrometry, Dallas, Tex. (F. E. Saalfeld, Naval Research Laboratory, Code 6110, Washington, D.C. 20390)

5–7. Natural **Gas Research and Technology**, 2nd conf., American Gas Assoc., Atlanta, Ga. (L. A. Sarkes, AGA, 1515 Wilson Blvd., Arlington, Va. 22209)

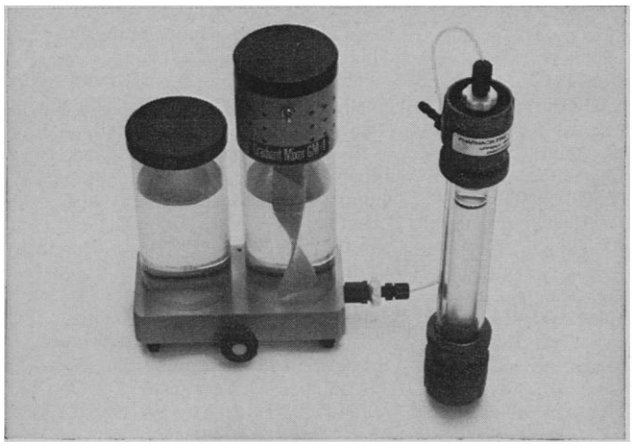
5–7. **Intestinal Microflora**, 2nd intern. symp., Columbia, Mo. (Conference Section, Continuing Medical Education, M-175 Medical Center, Columbia 65201)

5–7. American **Physical** Soc., Albuquerque, N.M. (W. W. Havens, Jr., APS, 335 E. 45 St., New York 10017)

5–8. **Coastal Mapping** Symp., American Soc. of Photogrammetry, Washington, D.C. (ASP, 105 N. Virginia Ave., Falls Church, Va. 22046)

5–8. United Nations Conf. on the **Human Environment**, Stockholm, Sweden. United Nations Headquarters, New York 10017)

5–9. **Pleasure, Reward, Preference**: Their Nature, Determinants, and Role in Behaviour, NATO-sponsored symp., Elsinore, Denmark. (D. E. Berlyne, Dept.



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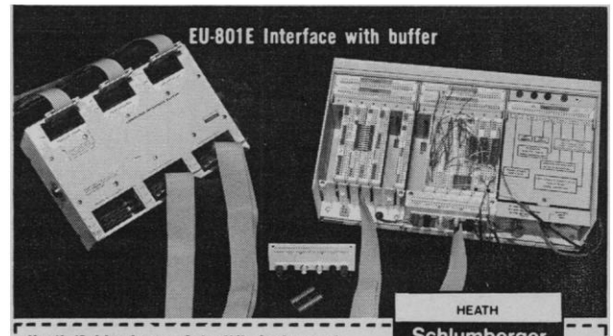

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of Psychology, Univ. of Toronto, Toronto 181, Ont., Canada)

5–9. **Stratigraphy, Structure, and Evolution of the Northern Piedmont**, Geological Soc. of America, Frederick, Md. (E. B. Eckel, GSA, P.O. Box 1719, Colorado Bldg., Boulder, Colo. 80302)

5–9. **Thermionic Electrical Power Generation**, 3rd intern. conf., jointly by European Nuclear Energy Agency and Intern. Atomic Energy Agency, Jülich, Germany. (P. von Handel, Kernforschungsanlage Jülich GmbH, D-5170 Jülich, Postfach 365, Germany)

6–10. **Animal Reproduction**, 7th intern. congr., Munich, Germany. (H. H. Messerschmidt, Arbeitsgemeinschaft, Deutscher Rinderzuchter, e V, Adenaurallee 176, 53 Bonn/Rh, Germany)

7–9. **Development Aspects of Vision**, 7th symp., Center for Visual Science, Rochester, N.Y. (J. L. Brown, CVS, University of Rochester, River Campus Sta., Rochester 14627)

7–10. American **Rheumatism** Assoc., Dallas, Tex. (Miss L. Bonfiglio, ARA, 1212 Avenue of the Americas, New York 10036)

8–9. **Cellular Modification and Genetic Transformation by Exogenous Nucleic Acids**, 6th Miles intern. symp., Baltimore, Md. (C. J. O'Donovan, Miles Labs., Inc., Elkhart, Ind. 46514)

8–10. International Assoc. for **Cereal Chemistry**, Vienna, Austria. (IACC, A-2320 Schwechat, Schmidgasse 3-7, Austria)

9–11. American Assoc. of **Neuropathologists**, Chicago, Ill. (E. P. Richardson, Jr., Neuropathology Lab., Massachusetts General Hospital, Boston 02114)

10–11. **Animal and Human Conditioning: Techniques and Theories in Drug Abuse Research**, Portland, Ore. (P. E. Blachly, Univ. of Oregon Medical School, Portland 97201)

11–15. **Medical Library** Assoc., Inc., San Diego–Coronado, Calif. (Mrs. H. B. Schmidt, MLA, 919 N. Michigan Ave., Chicago, Ill. 60611)

11–16. American Soc. of **Medical Technologists**, Minneapolis, Minn. (S. B. Friedheim, ASMT, Suite 1600, Hermann Professional Bldg., Houston, Tex. 77025)

12–14. **Computers in the Undergraduate Curricula**, Atlanta, Ga. (Southern Regional Education Board, 130 Sixth St., NW, Atlanta, Ga. 30313)

12–14. **Improvement of the Capabilities of Small Research and Development Firms in a Declining R&D Environment**, National Science Foundation/Small Business Administration Conf., Washington, D.C. (J. D. Johnson, Center for the Study of Private Enterprise, American Univ., Washington, D.C. 20016)

12–14. Society for **Industrial and Applied Mathematics**, 20th, Philadelphia, Pa. (H. B. Hair, SIAM, 33 S. 17 St., Philadelphia 19103)

12–14. American **Neurological** Assoc., 97th annual, Chicago, Ill. (S. A. Trufant, Cincinnati General Hospital, Cincinnati, Ohio 45229)

12–15. American Assoc. for the **Advancement of Science**, Pacific Div., Eugene, Ore. (R. C. Miller, California Acad. of Sciences, Golden Gate Park, San Francisco 94118)

12–15. **Immunology**, 3rd intern. conf., Buffalo, N.Y. (N. R. Rose, Center for Immunology, Room 203, Sherman Hall, State Univ. of New York School of Medicine, Buffalo 14214)

12–16. Western Inst. of **Drug Problems**, Portland, Ore. (P. H. Blachly, Univ. of Oregon Medical School, Portland 97201)

12–16. **Life Stress and Illness**, NATO-sponsored symp., Beito, Norway. (E. K. E. Gunderson, Operational Psychiatry Div., Dept. of the Navy, Navy Medical Neuropsychiatric Research Unit, San Diego, Calif. 92152)

12–17. International Federation of **Automatic Control**, 5th congr., Paris, France. (Meetings Officer, Inst. of Electrical and Electronics Engineers, Inc., 345 E. 47 St., New York 10017)

12–17. **Health Physics** Soc., 17th annual, Las Vegas, Nev. (J. S. Coogan, Environmental Protection Agency, Western Environmental Research Lab., P.O. Box 15027, Las Vegas 89114)

12–17. **Pollution: Engineering and Scientific Solutions**, 1st intern. conf., Soc. of Engineering Science (cosponsored by Environmental Protection Agency, National Oceanic Atmospheric Administration, and Washington Univ.) Tel-Aviv, Israel. (E. Y. Rodin, Dept. of Applied Mathematics, Washington Univ., St. Louis, Mo. 63130)

13–16. Canadian Federation of **Biological** Societies jointly with Canadian Soc. of **Microbiologists**, Quebec, P.Q., Canada. (D. T. Armstrong, Dept. of Physiology, Univ. of Western Ontario, London 72, Ont., Canada)

13–16. **Simulation** Conf., San Diego, Calif. (M. K. Horn, Cities Service Oil Co., P.O. Box 50408, Tulsa, Okla. 74150)

14–16. International Symp. on **Metabolism and Membrane Permeability of Erythrocytes, Thrombocytes, and Leucocytes**, Vienna, Austria. (K. Moser, Wiener Medizinische Akademie, Alserstrasse 4, 1090 Vienna)

14–17. American **Medical Women's** Assoc., Seattle, Wash. (Mrs. G. F. Conroy, AMWA, 1740 Broadway, New York 10019)

14–18. American Assoc. of **Bioanalysts** and California Assoc. of Bioanalysts (joint), Scottsdale, Ariz. (D. Birenbaum, AAB, 411 N. 7 St., St. Louis, Mo. 63101)

18–19. Soc. of **Wood Science and Technology**, Dallas, Tex. (E. L. Schoffer, SWST, P.O. Box 5062, Madison, Wis. 53705)

18–21. American **Dairy Science** Assoc., Blacksburg, Va. (C. Cruse, ADSA, 113 N. Neil St., Champaign, Ill. 61820)

18–22. International Congr. on **Lipids**, Göteborg, Sweden. (R. Marcuse, Intern. Soc. for Fat Research, Lipidforum, c/o SIK, FACK, S-400 21 Göteborg 16)

18–22. Association of **Food and Drug Officials**, 76th annual, Monticello, N.Y. (K. A. Silver, Room 700, 850 Third Ave., Brooklyn, N.Y. 11232)

18–22. American **Medical** Assoc., San Francisco, Calif. (L. W. Prang, Records Section, AMA, 535 N. Dearborn St., Chicago, Ill. 60610)

18–22. American **Nuclear** Soc., Las Vegas, Nev. (H. Coffer, CER Geonuclear Corp., P.O. Box 15090, Las Vegas 89114)

18–23. **Clinical Chemistry**, 8th intern. congr., Copenhagen, Denmark. (Secretariat, 8th Intern. Congr. of Clinical Chemistry, Rigshospitalet, Blegdamsvej 9, DK-2100, Copenhagen 8)

18–23. International Congr. of **Endocrinology**, 4th, Intern. Soc. of Endocrinology, Washington, D.C. (G. D. Aurbach, Section on Mineral Metabolism, Natl. Inst. of Health, Bethesda, Md. 20014)

18–24. **Water Pollution** Research, 6th intern. conf., Jerusalem, Israel. (Organizing Committee, 6th Intern. Conf. on Water Pollution Research, P.O. Box 16271, Tel Aviv, Israel)

19–21. **Colloid** Symp., 46th natl., Div. of Colloid and Surface Chemistry, American Chemical Soc., Amherst, Mass. (R. L. Rowell, Dept. of Chemistry, Univ. of Massachusetts, Amherst 01002)

19–21. American College of **Preventive Medicine**, San Francisco, Calif. (W. Bentley, 801 Old Lancaster Rd., Bryn Mawr, Pa. 19010)

19–21. **Surface Properties and Surface States of Electronic Materials**, Rolla, Mo. (W. J. James, Graduate Center for Materials Research, Space Sciences Research Center, Univ. of Missouri, Rolla 65401)

19–21. **Watersheds in Transition**, American Water Resources Assoc., Fort Collins, Colo. (T. G. McLaughlin, Water Resources Div., U.S. Geological Survey, Denver, Colo.)

19–22. **Air Pollution Control** Assoc., 65th annual, Miami Beach, Fla. (Public Relations Dept., APCA, 4400 Fifth Ave., Pittsburgh, Pa. 15213)

19–22. American Soc. for **Engineering Education**, Lubbock, Tex. (L. B. Williams, ASEE, Suite 400, 1 Dupont Circle, Washington, D.C. 20036)

19–22. American **Vacuum** Soc., Pittsburgh, Pa. (AVS, 335 E. 45 St., New York 10017)

19–23. **Influence of Culture on Ergonomics**, Oosterbeck, The Netherlands. (A. Chapanis, Dept. of Psychology, Johns Hopkins Univ., Baltimore, Md. 21218)

21–23. **Experimental Medicine and Surgery in Primates**, 3rd conf., Lyon, France. (J. Moor-Jankowski, LEMSIP, New York Univ. Medical Center, 500 First Ave., New York 10016)

21–23. **Plastics in Packaging**, Pullman, Wash. (R. A. V. Raff, Research Div., College of Engineering, Washington State Univ., Pullman 99163)

21–23. **Role and Value of Measurement** (jointly sponsored by American Soc. for Quality Control, Inst. for Electrical and Electronics Engineers, Instrument Soc. of America, Natl. Bureau of Standards, Natl. Conf. of Standards Labs., and Precision Measurements Assoc.), Boulder, Colo. (G. Goulette, 130 Academy Bldg., Univ. of Colorado, Boulder 80302)

22–23. **Legal Aspects of Computerized Information Systems**, intern. symp., Federal Council of Science and Technology, Washington, D.C. (J. H. Farmakides, Office of Science Information Services, COSATI, National Science Foundation, Washington, D.C. 20550)

22–24. American Assoc. of **Physics Teachers**, Albany, N.Y. (W. F. Johnson, AAPT, 1785 Massachusetts Ave., NW, Washington, D.C. 20036)

22–25. **Optical Manufacturers** Assoc., St. Louis, Mo. (Albert A. Kohler Co., Inc., 15 Wilmot Lane, Riverside, Conn. 06878)

22–28. **Coordination Chemistry**, 14th intern. conf. (sponsored by National Research Council of Canada and Chemical Inst. of Canada), Toronto, Ont., Canada. (C. J. L. Lock, Inst. for Materials Research, McMaster Univ., Hamilton, Ont.)

24–25. American **Diabetes** Assoc., Washington, D.C. (J. R. Connelly, ADA, 18 E. 48 St., New York 10017)

25–30. National **Education** Assoc., Atlantic City, N.J. (S. M. Lambert, NEA, 1201 16th St., Washington, D.C. 20036)

25–30. American Soc. for **Testing Materials**, 75th annual, Los Angeles, Calif. (H. H. Hamilton, ASTM, 1916 Race St., Philadelphia, Pa. 19103)

25–1. American **Library** Assoc., Chicago, Ill. (C. J. Hoy, ALA, 50 E. Huron St., Chicago, Ill.)

26–28. Institute of **Navigation**, West Point, N.Y. (R. E. Freeman, IN, Suite 832, 815 15th St., NW, Washington, D.C. 20005)

26–29. **Law of the Sea: Needs and Interests of Developing Countries**, 7th annual conf., Kingston, R.I. (Law of the Sea Inst., Univ. of Rhode Island, Kingston 02881)

26–29. American Assoc. of **Physicists in Medicine**, Philadelphia, Pa. (B. M. Galkin, Stein Research Center, 920 Chancellor St., Philadelphia 19107)

26–29. Society for the **Study of Reproduction**, 5th annual, East Lansing, Mich. (J. M. Yochim, Dept. of Physiology and Cell Biology, Univ. of Kansas, Lawrence 66044)

26–29. **Weather Modification**, 3rd conf., American Meteorological Soc., Rapid City, S.D. (R. A. Schleusener, Inst. of Atmospheric Sciences, South Dakota School of Mines and Technology, Rapid City 57701)

26–2. **Radiation** Commission, Intern. Assoc. of Meteorology and Atmospheric Physics, intern. symp., Sendai, Japan. (J. London, Univ. of Colorado, Boulder 80302)

27–30. Cheiron: The International Soc. for the **Behavioral and Social Sciences**, Calgary, Alta., Canada. (R. G. Weyant, Dept. of Psychology, Univ. of Calgary, Calgary 44)

27–30. International Study Group for **Research in Cardiac Metabolism**, 5th annual, Winnipeg, Man., Canada. (N. S. Dhalla, Dept. of Physiology, Faculty of Medicine, Univ. of Manitoba, Winnipeg 3)

July

2–7. **Environment**, 36th annual conf., Natl. Environmental Health Assoc., New York, N.Y. (N. Pohlit, NEHA, 1600 Pennsylvania Ave., Denver, Colo. 80203)

5–8. **Shock Tube** Symp., 8th intern., London, England. (Symp. Secretary, Dept. of Aeronautics, Imperial College, Prince Consort Rd., London, S.W. 7)

6–8. **RF Plasma Heating**, American Physical Soc., Lubbock Tex. (M. O. Hagler, Dept. of Electrical Engineering, Texas Tech Univ., Lubbock 79409)

9–12. **Molecular Beams**, 4th intern. symp., Cannes, France. (F. M. Devienne, Laboratoire de Physique Moléculaire des Hautes Energies, B.P.2 (06), Peymeinade, France)

9–14. American **Malacological** Union, Galveston, Tex. (A. S. Merrill, Biological Lab., Natl. Marine Fisheries Service, Oxford, Md. 21654)

9–14. **Power Engineering** Soc., San Francisco, Calif. (Meetings Officer, Inst. of Electrical and Electronics Engineers, Inc., 345 E. 47 St., New York 10017)

10–12. **DNA Synthesis in vitro**, 2nd annual Steenbock symp., Madison, Wis. (Mrs. M. Parker, Dept. of Biochemistry, 420 Henry Mall, Univ. of Wisconsin, Madison 53706)

10–14. **Interaction of Radioactive Contaminants with the Constitutents of the Marine Envronment**, Seattle, Wash. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

10–14. **Rarefied Gas Dynamics**, 8th intern. symp., Stanford, Calif. (K. Karamcheti, Dept. of Aeronautics and Astronautics, Stanford Univ., Stanford 94305)

11–15. National Soc. of **Professional Engineers**, Denver, Colo. (P. H. Robbins, NSPE, 2029 K St., NW, Washington, D.C. 20006)

16–20. American **Veterinary Medical** Assoc., New Orleans, La. (M. R. Clarkson, AVMZ, 600 S. Michigan Ave., Chicago, Ill. 60605)

16–28. **Technology and the People**, Inst. on Man and Science, Rensselaerville, N.Y. (G. A. Enk, IMS, Rensselaerville 12147)

17–21. **Electron Probe Analysis** Soc. of America, 7th natl. conf., San Francisco, Calif. (C. G. Cleaver, General Electric Co., Vallecitos Nuclear Center, Bldg. 105, Pleasanton, Calif. 94566)

18–21. **Cyclotron** Conf., 6th intern., Vancouver, B.C., Canada. (N. Brearley, Univ. of British Columbia, Vancouver 8)

18–21. **Hormones, the Brain, and Behavior**, 3rd intern. symp., Intern. Soc. of Psychoneuroendocrinology, London, England. (R. P. Michael, Inst. of Psychiatry, De Crespigny Park, Denmark Hill, London SE5 8AF)

19–21. **Defects in Semiconductors**, intern. conf., Reading, England. (Meetings Officer, Inst. of Physics, 47 Belgrave Sq., London S.W.1, England)

19–22. **Calorimetry** Conf., 27th, Park City, Utah. (J. M. Sturtevant, Dept. of Chemistry, Yale Univ., New Haven, Conn. 06520)

23–28. **Illuminating Engineering** Soc., Tulsa, Okla. (P. C. Ringgold, IES, 345 E. 47 St., New York 10017)

24–30. **Angiology**, 8th intern. congr., Rio de Janeiro, Brazil. (D. F. M. Bunce, Dept. of Physiology, College of Osteopathic Medicine and Surgery, Sixth at Center, Des Moines, Iowa 50309)

26–31. Inter-American Meeting of **Neuroradiology**, Rio de Janeiro, Brazil. (A. Tomax Rezende, Caixa Postal 9031, ZC-02, Rio de Janeiro, Gb)

27–29. **Intracranial Pressure**, 1st intern. symp., Hannover, Germany. (M. Brock, Neurochirurgische Klinik, Medizinische Hochschule Hannover, 3 Hannover-Kleefeld, Roderbruchstrasse 101, Germany)