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Preconvention Issue

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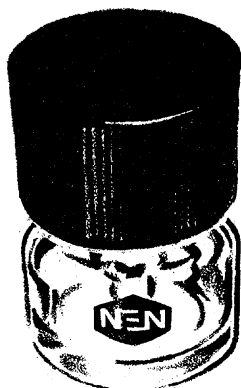
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1. J.A. Eisman, et. al., The Lancet, December 22/29, 1335-1336 (1979)

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COVER

City Hall complex, Toronto, Canada.
See page 763. AAAS Annual Meeting,
3–8 January 1981. [Courtesy of the City
of Toronto]

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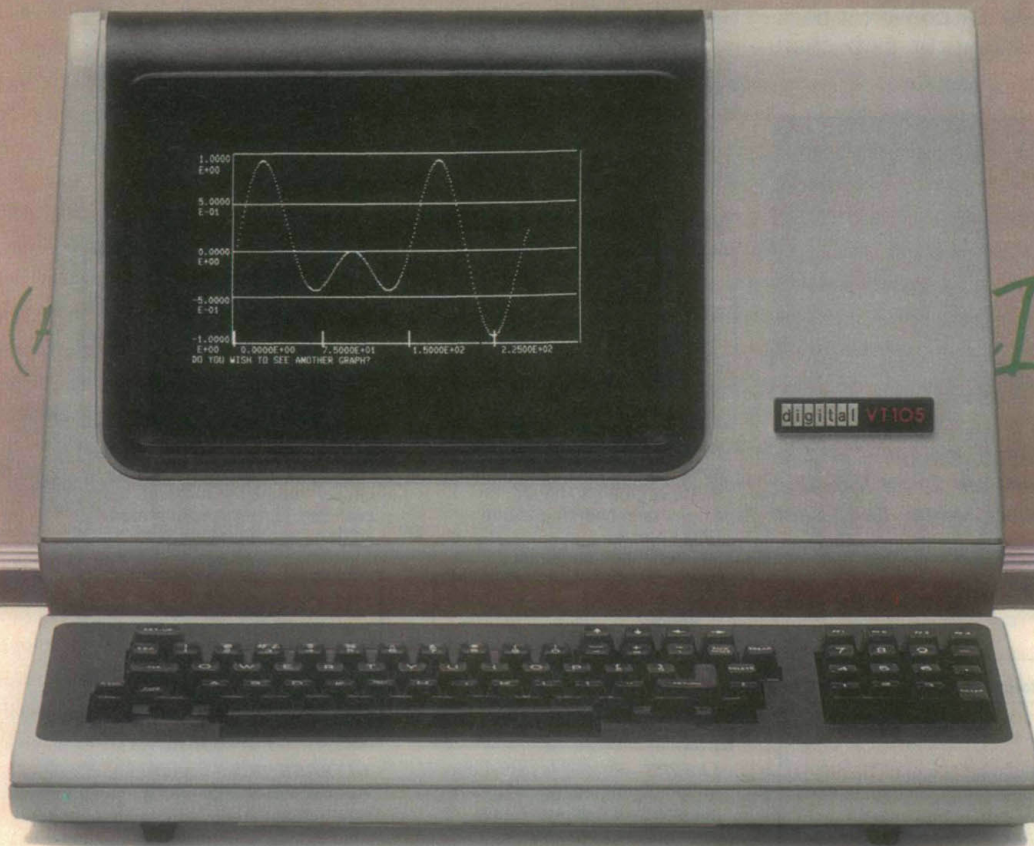
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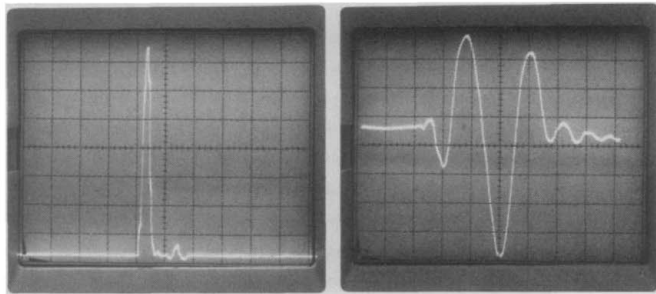
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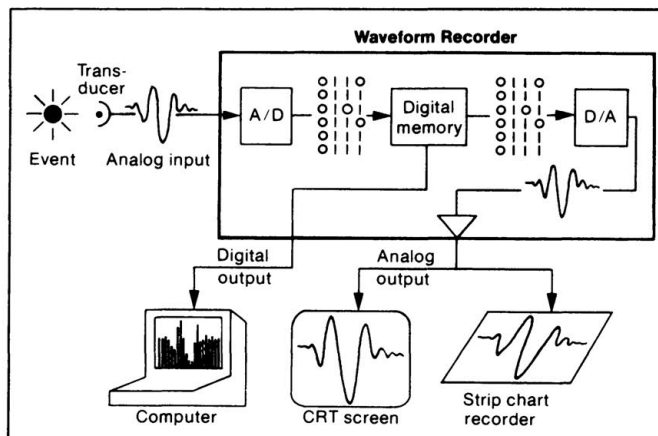
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At left, the 12-ns pulse and leading edge information were captured with a Biomation Model 6500, sampling at 2-ns intervals. Each scope division represents 20 ns. Signal at right was captured by the precision Model 1010. Each division is 20 μ s wide.

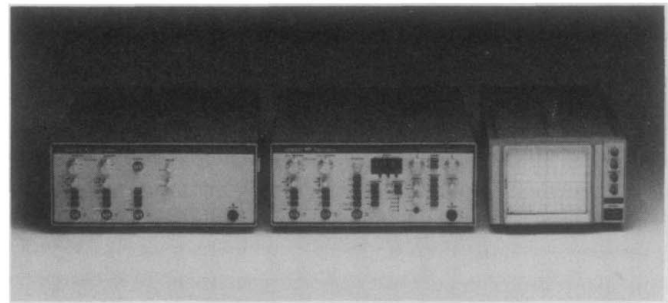
Here's how the waveform recorder fits into your data acquisition system:



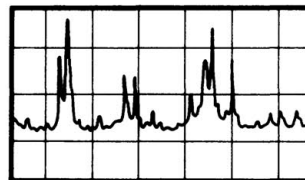
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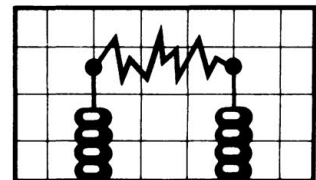
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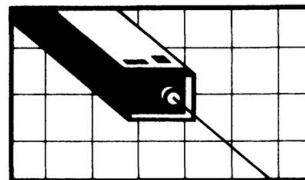
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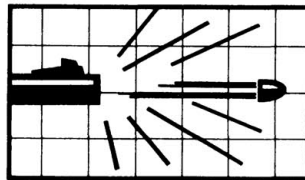
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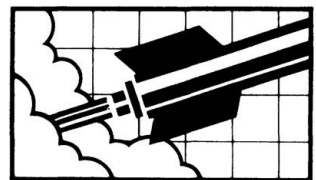
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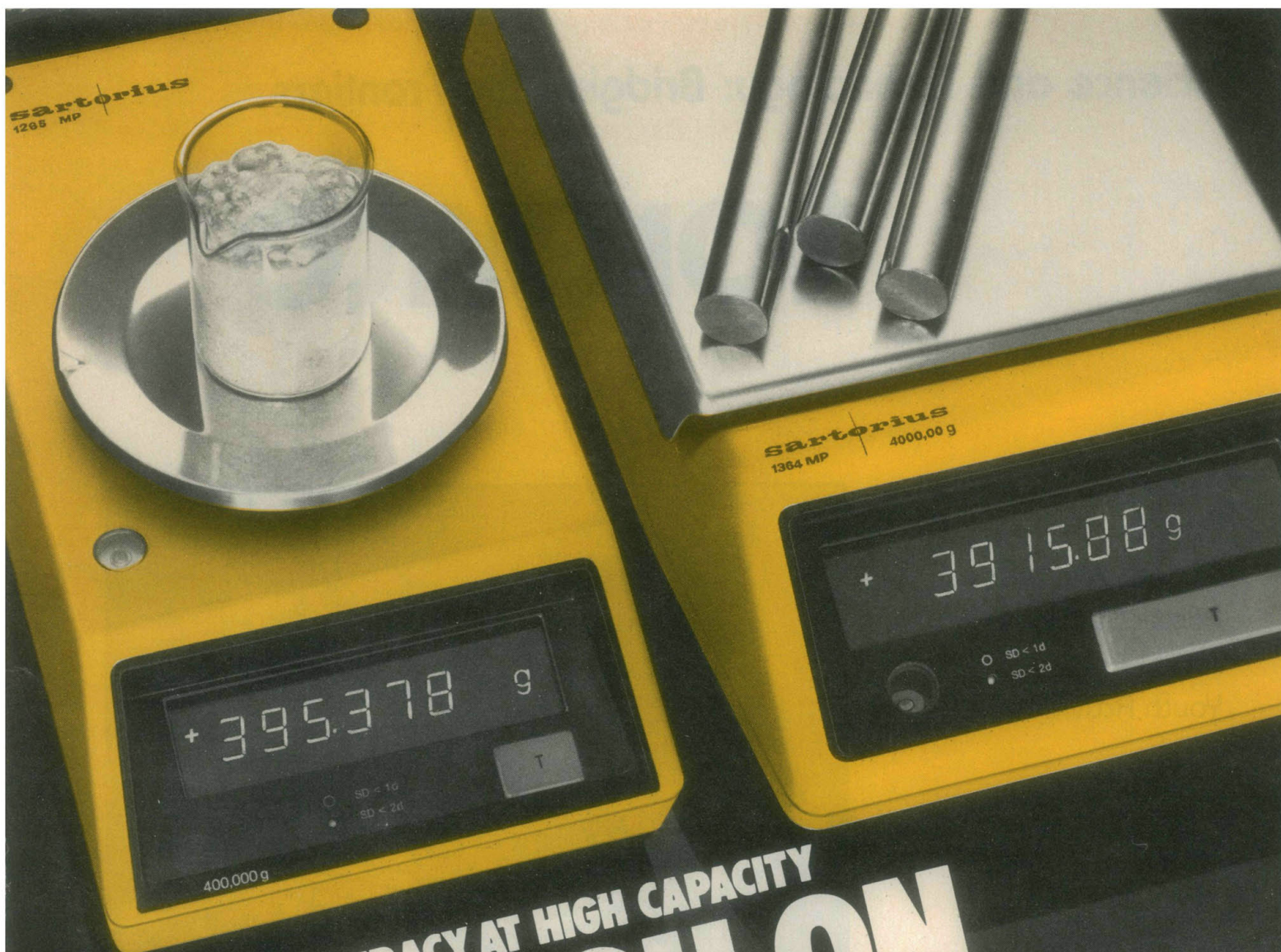


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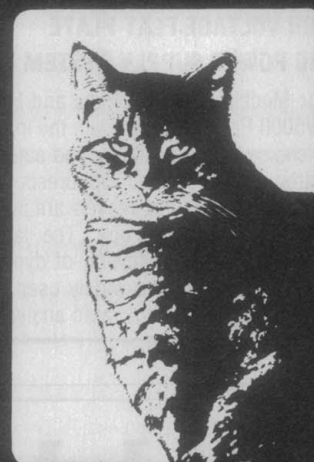
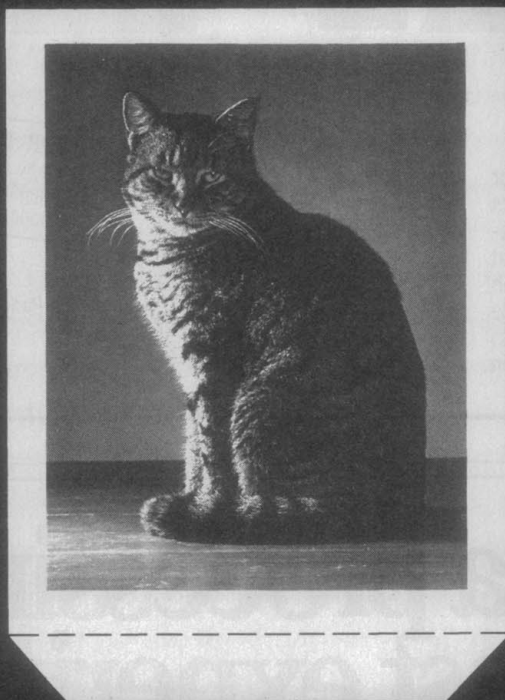
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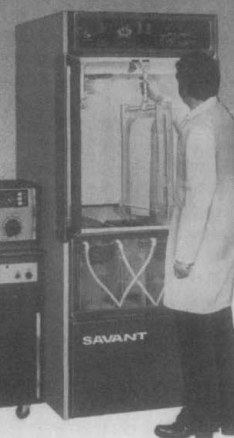
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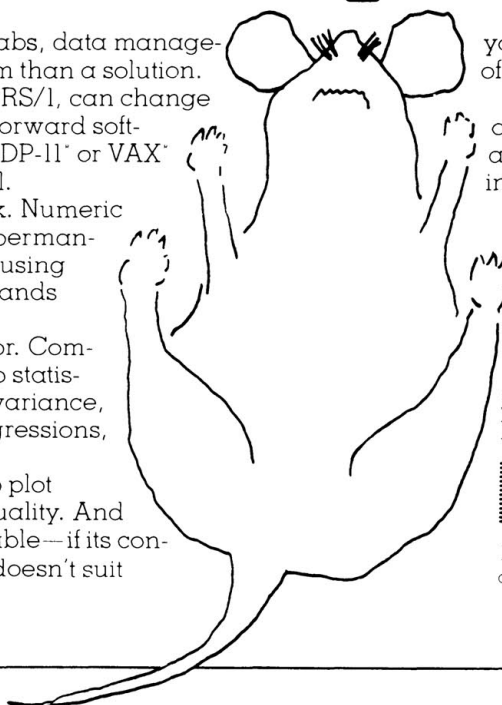
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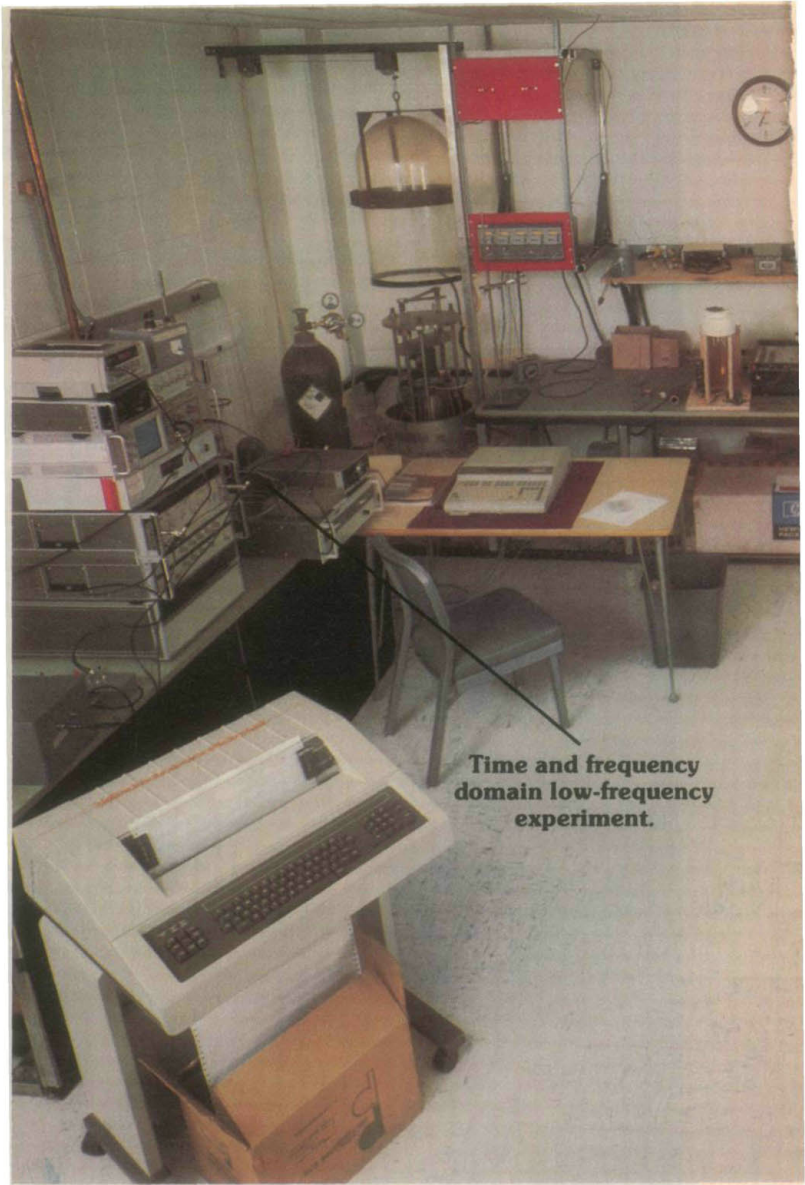
An HP-IB system helped generate— in three months. . .

For Colorado State University's Department of Electrical Engineering, contracts and grants are a hectic game. The competition is stiff, funds must be utilized to the maximum, and contracts unfailingly completed on time.

Professor Joel DuBow, head of the Department's Energy and Materials Group, recommended the use of an HP-IB system for experimental programs involving fossil fuels, because "we have enough problems understanding the measurements without having to worry about interfacing. By using HP-IB compatible instruments and computers, we were able to get right to the data analysis, without first having to do research on research."

Processing the unseen.

The in situ oil shale processing, now considered the most promising oil extraction technique, utilizes underground processing. Since the material cannot be seen, it is critical that the process be monitored and diagnosed accurately. CSU's HP-IB system has permitted Professor DuBow and his colleagues to devise — and test — conceptual schemes for accomplishing this. For example, when oil shale is heated, it goes through three structural changes: from an "as is" state to a transition zone, to a retorting zone, and, finally, to a combustion zone. By using the HP-IB system to monitor temperature coefficients



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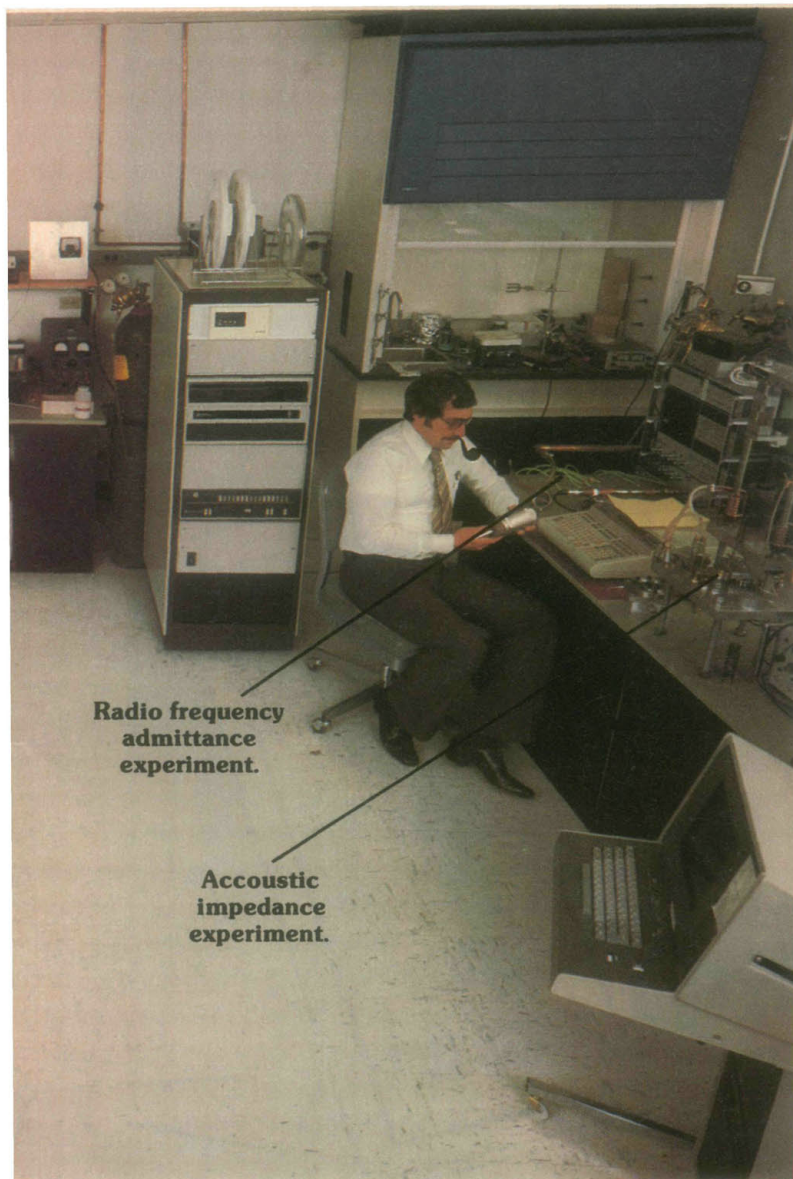
of the shale properties, Prof. DuBow has been able to delineate the location of these zone boundaries. Process engineers can then use this data to detect the position and velocity of these reaction zones, and to determine the shape of each zone. In turn, this tells them whether or not the desired process is being followed. If not, corrective action can be immediately taken.

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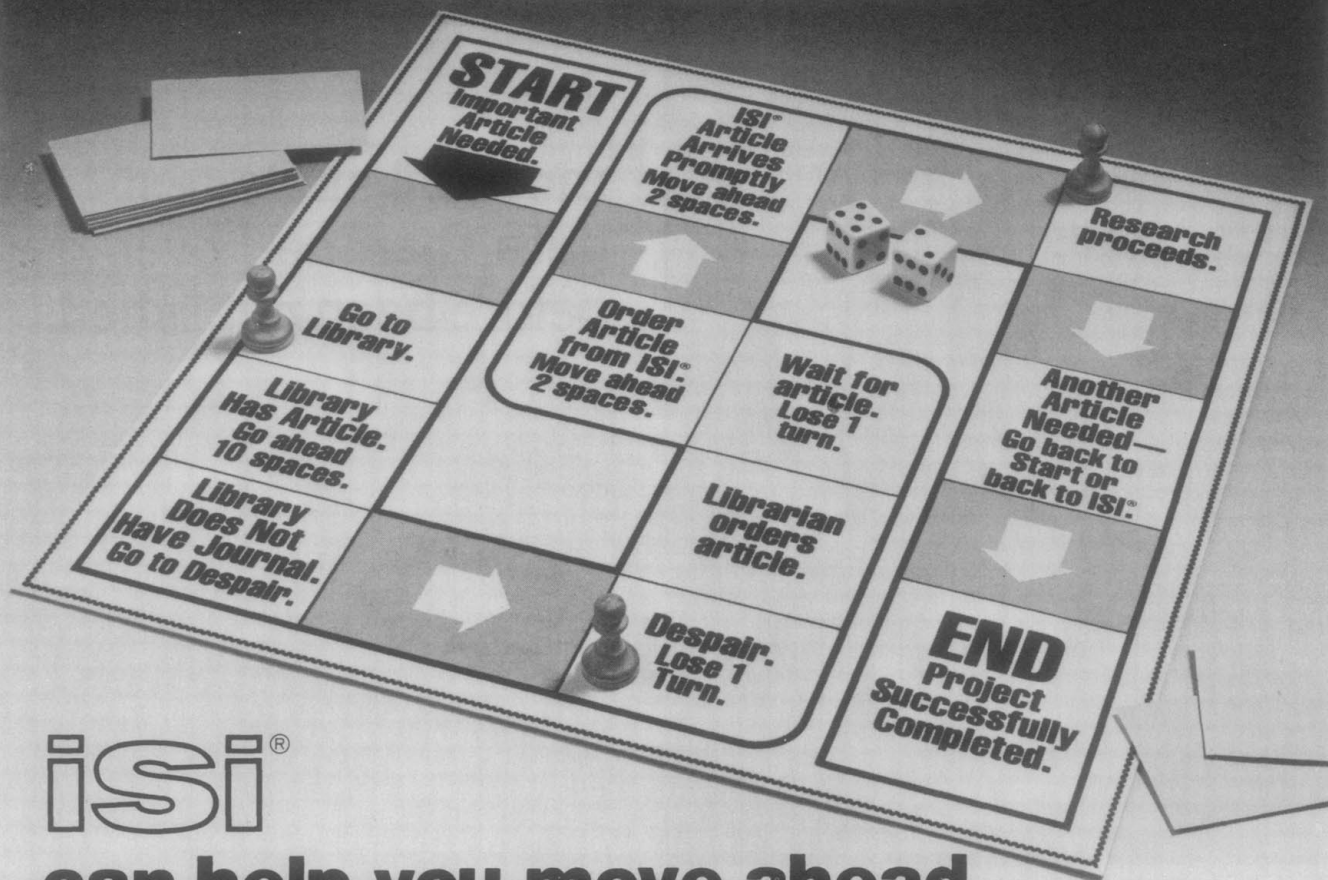
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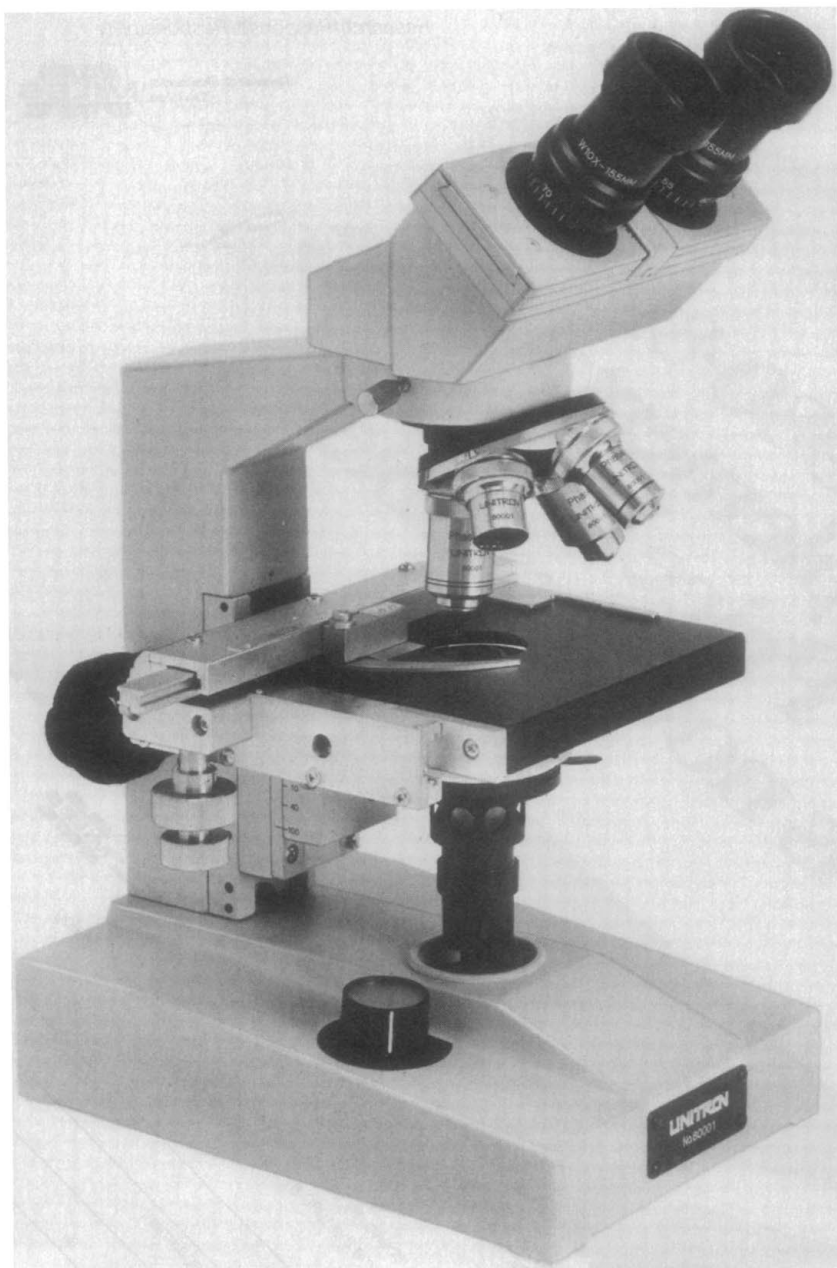
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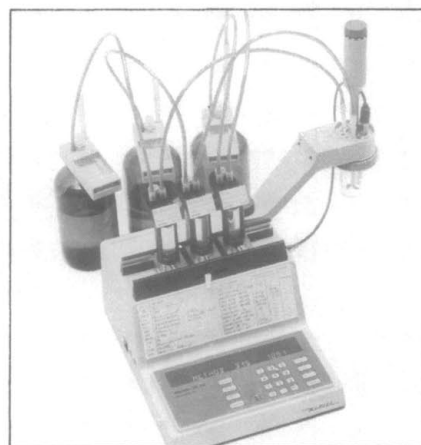
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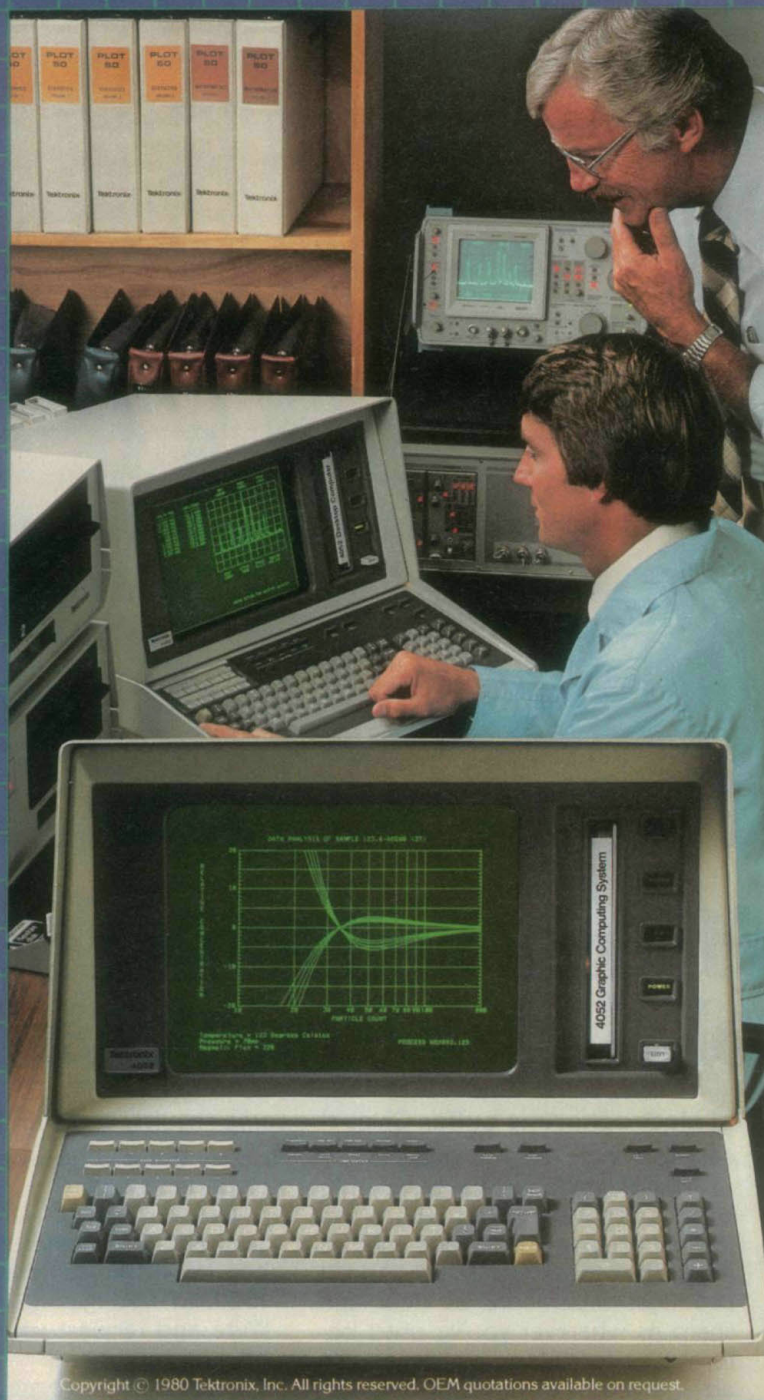
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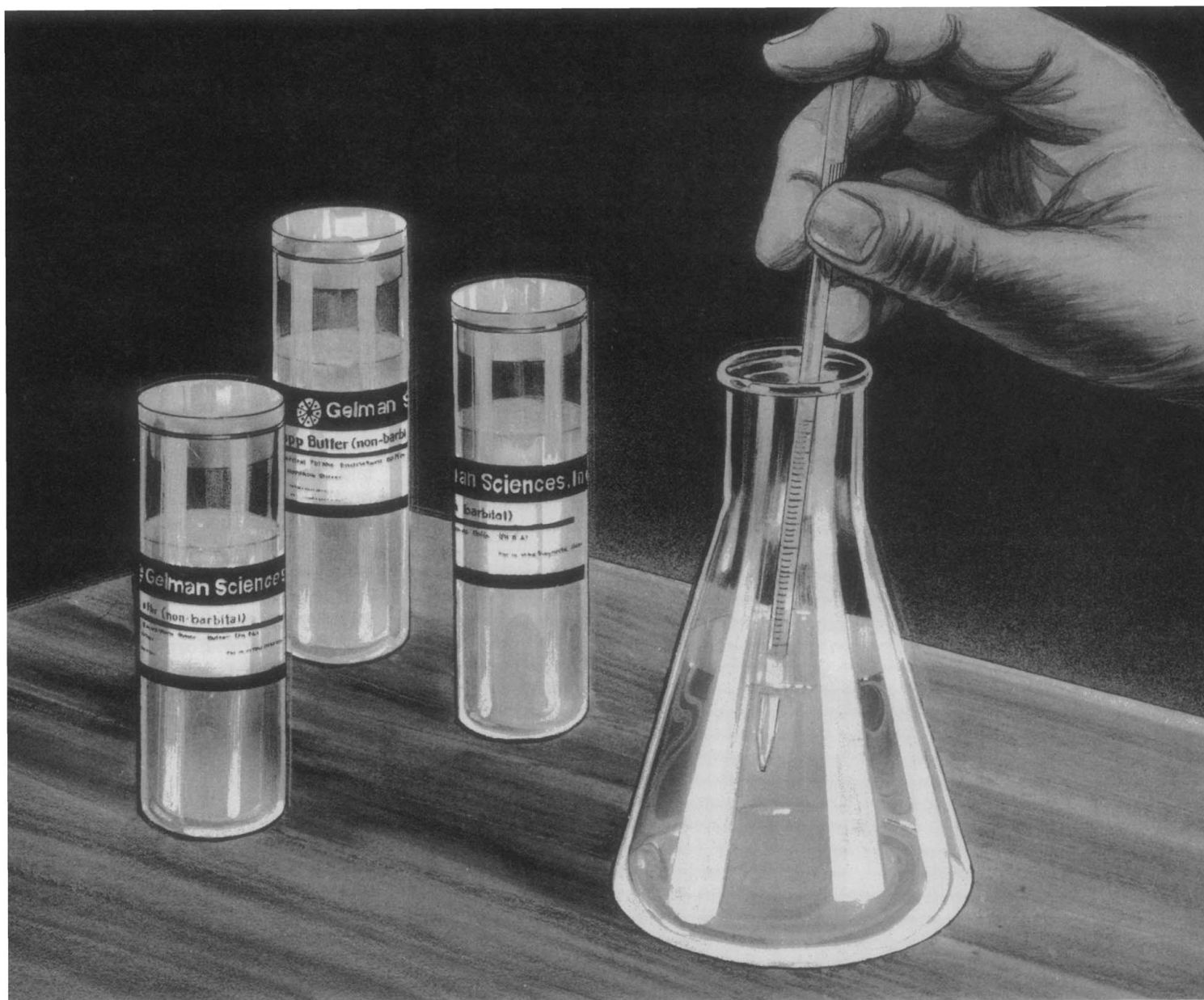
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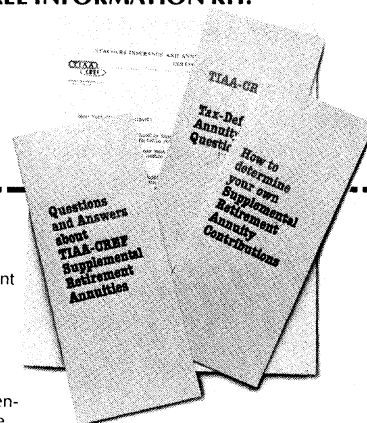
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LETTERS

Effects of Air Ions

The article by Marjorie Sun (News and Comment, 3 Oct., p. 31) reflects confusion about air ions in electrostatic precipitators (used worldwide for dust collection over the past 60 years) and ions discharged into the indoor environment for mood and dust control. The former use is well-documented in the scientific and engineering literature, but the manner in which the latter performs its alleged effects is a deep mystery.

In electrostatic precipitators, unipolar air ions are produced around a charged wire by a potential that exceeds the electrical resistivity of the air. Large numbers of these ions attach themselves to particles contained in the air passing close to the charged zone. After the particles become charged, they are attracted to charged collecting plates of opposite sign and removed from the flowing air stream. Unipolar air ions of negative or positive sign function equally well in electrostatic precipitators and both modes are in use.

Claims for the beneficial effects of negative ions released into occupied spaces go back at least to the 1930's and have ranged from mood improvement to peeling accumulated dirt from unwashed walls. Regrettably, there is no confirmation of these beneficial effects by unbiased evaluators (although those who fail to find merit in negative ions are invariably accused of stubborn bias by negative ion promoters). Most negative ion generators also emit copious quantities of ozone, formerly thought pleasant but now regarded as highly toxic. Ozone is the probable agent in the Russian observation that high concentrations of negative ions slow the growth of bacteria. In fact, machine vendors used to advertise that ozone deodorized and sterilized air. Manufacturers of some of the new models eschew bare ionizing electrodes and ultraviolet lamps and claim thereby to avoid ozone production, but negative ion production is likewise suppressed.

The psychological and biological effects of air ions have been reviewed by a number of investigators. Typically, these reviews include strong cautionary statements regarding past medical evidence (1). One investigator says, "The studies reporting incidental behavioral effect are far from perfect. Examination of these experimental studies indicates that they were deficient in instrumentation and control of interacting variables, and lacked a rational framework. Consequently,

their results are equivocal and the magnitude and extent of ion effects on man's behavior is not clear" (2). Another says, "the experiments which have demonstrated a specific biological effect due to air ions generally do not remain definitive under critical review by other experimental physiologists" (3).

Yaglou (3) conducted two detailed studies of the effects of air ions on normal human subjects and concluded from the results of both that "On the whole, the results were essentially negative." This conclusion might have been expected in view of the fact that few light ions penetrate into the lungs; most are absorbed in the upper respiratory passages. However, Yaglou (3) reported that similar, negative results were obtained in studies of normal subjects exposed to heavy ions, which can reach the lungs; in experiments on the growth and activity of rats exposed to light ions; and in studies of hypertensive patients who were periodically treated with heavy ions for months or years.

Recent investigations by Kreuger (3) have shown that cilia of animal trachea respond to negatively charged oxygen by increased beat rate and to positively charged carbon dioxide by the opposite effect. These observations have been widely cited as proof that positive ions decrease lung clearance rates and are, therefore, important factors in the detrimental effects of air pollutants. Kreuger is not disposed to accept this interpretation and stated, as reported by Yaglou (3), that his "studies have been limited to so-called basic physiological aspects of the problem, so that it would be presumptuous of us to interpret our results in clinical terms." This appears to be an eminently sensible attitude to adopt with respect to possible biological responses to air ions in the environment.

Concerning the ability of negative ions to clean particles from the air by making "them settle onto electrically grounded surfaces such as walls and ceilings," it should be kept in mind that (i) most air ions carry a charge equivalent to a single electron, and therefore the effect on particle mobility is minimal in a noncharged field; and (ii) although walls and ceilings may be "grounded," they usually have little conductivity and quickly build up a persistent negative charge under negative ion exposure, repelling further acquisition of weak negative charges. It was clear from observing a vendor's demonstration of dust cloud settlement in a bottle placed on an ion generator that the dust-clearing action resulted from dust agglomeration by sonic energy produced by the machine and from rapid

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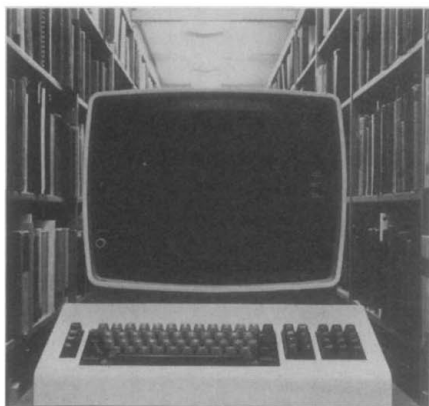
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sedimentation of the large clumps that were formed.

Sun states that "Academic scientists who study the effects of ions confirm that the generators clear the air." I have not in 35 years of practice as an academic scientist specializing in dust collection ever heard of one. Furthermore, I suggest readers contrast Sun's statement that "ions are snatched up by pollutants" with Corn's comment, "Almost all industrial and domestic activities which produce fine particle pollution also produce air ions" (4).

Is it any wonder that the claims quoted in Sun's article raise the hackles of scientists who have been trying for decades to counter the exploitation of mysterious air cleaning devices that are promoted with testimonials by the gullable?

MELVIN W. FIRST

*Harvard Air Cleaning Laboratory,
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References

1. B. J. Steigerwald, in *Air Pollution*, A. Stern, Ed. (Academic Press, New York, 1962), chap. 5.
2. A. H. Frey, *IRE Trans. Bio-med. Electron.* (January 1961), p. 12.
3. C. P. Yaglou, in *The Air We Breathe*, S. M. Farber and R. H. L. Wilson, Eds. (Thomas, Springfield, Ill., 1961), chap. 19; A. P. Kreuger, in *ibid.*, chap. 19, discussion.
4. M. Corn, in *Air Pollution*, A. Stern, Ed. (Academic Press, New York, ed. 3, 1976), vol. 1, chap. 5.

Chemistry Computer Center

As representatives of the community most affected by the decision to scuttle the National Resource for Computation in Chemistry (NRCC) (Research News, 26 Sept., p. 1504), we feel compelled to make our view public regarding this example of public science policy in the making. Our own examination of the issue indicates that the decision of the funding agencies (the Department of Energy and the National Science Foundation) is at odds with the general sense of the chemistry community and, indeed, we find that the decision-making process has essentially ignored community input. In the interest of possible future ventures into "big science" in chemistry, we feel that the scientific public should become aware of the nature of science policy decision-making and how it reflects on performance and politics.

At the Las Vegas meeting of the American Chemical Society (28 August 1980), the NRCC User Association decided to poll its membership (1700 scien-

tists on its mailing list) regarding the report and recommendations issued by the ad hoc committee appointed by the funding agencies to review NRCC performance. It was felt that such a questionnaire was necessary because the report had recommended drastic changes in the nature of the NRCC, and yet the community to be affected had not even been informed of the recommendations.

The first question asked was if enough time had elapsed for a reasonable judgment to be made on the future of the NRCC. The second was whether the NRCC should continue in its present form for a longer time before critical decisions are made regarding its operation. The third question was whether the respondent agreed with each of the five recommendations of the ad hoc review committee.

Of the 200 members who returned their questionnaires within 2 weeks of mailing, 68 percent felt that not enough time had been allotted for proper judgment and 69 percent felt that the NRCC should continue as originally constituted for a period of 2 to 3 more years before review. The strongest disagreements were with the recommendations that suggest substantial changes in the way the NRCC now operates (79 percent were against switching software development away from an in-house scientific staff to an external postdoctoral program; 73 percent were against transferring software distribution to the Quantum Chemistry Program Exchange; and 53 percent were against stopping support of both internal and external computational research).

Shortly after the questionnaires were mailed out, a decision regarding the fate of the NRCC that goes beyond even the review committee's recommendations was reported in the pages of *Science*. However, no official announcement has been made, and no stated rationale for the decision has been made public by the funding agencies. Not only did the disclosure in the *Science* article emphasize to us the necessity of making our findings known as quickly as possible, it highlighted the manner with which this public policy issue has been handled since its beginning.

We have sent the detailed results of our questionnaire to the funding agencies and have urged them to reconsider continued funding for the NRCC. We have also asked them to issue a public report detailing the rationale for any decision that is made regarding NRCC's future.

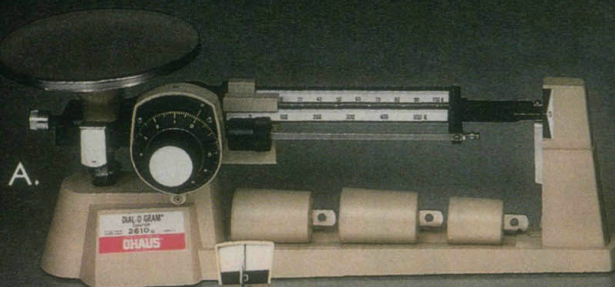
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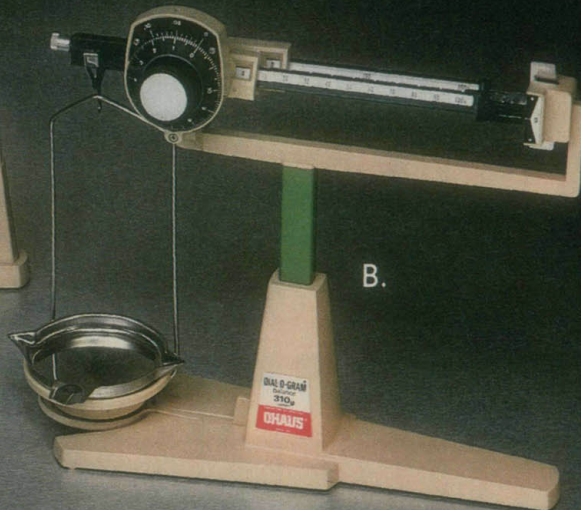
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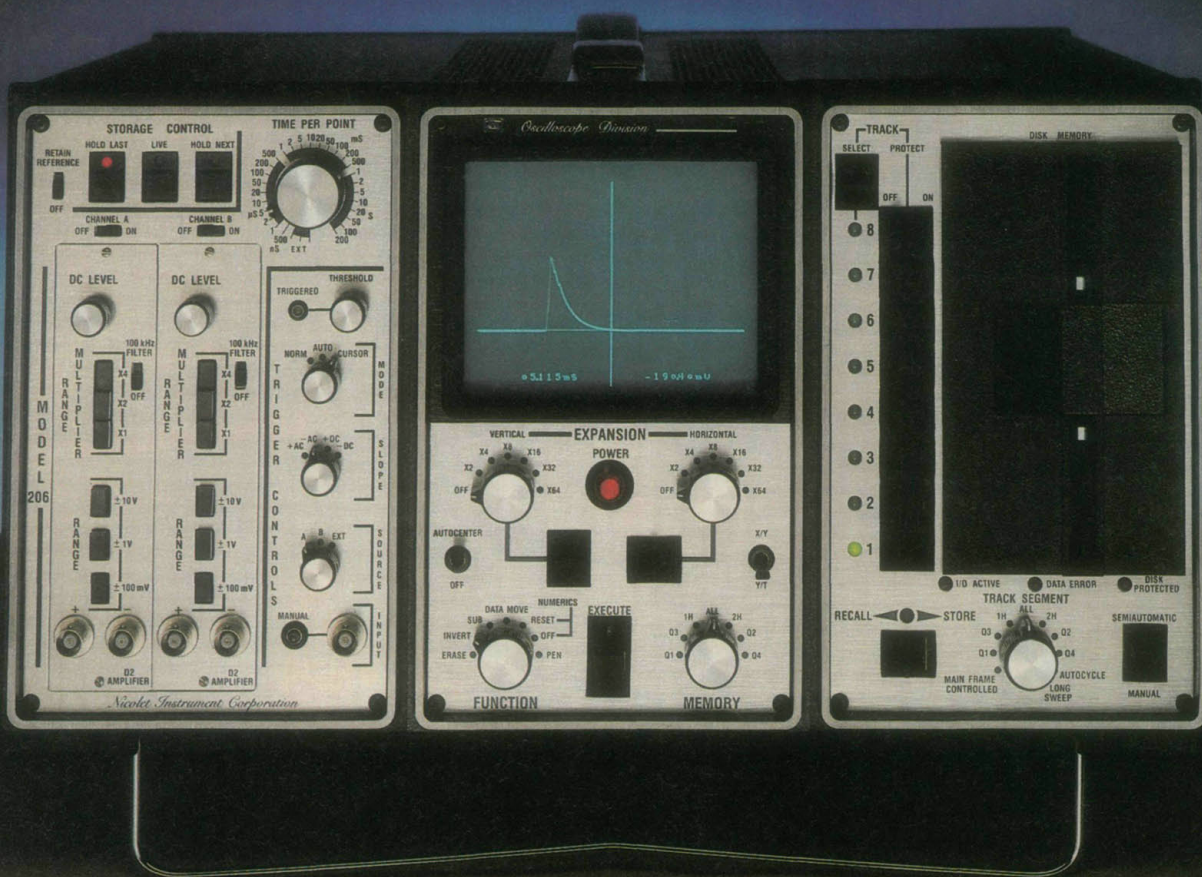
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the community being served. There are unmet needs within the chemical community that will grow without a cogent national policy on computational technology. Beyond the immediate harm of eliminating an organization whose focus was to address some of these needs, the larger danger exists of stigmatizing any future efforts in this area.

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G. SCHATZ, D. SILVER
S. HAGSTROM, G. LOEW

*Office of the Executive Committee,
NRCC User Association,
c/o Department of Biochemistry,
University of Kansas,
Lawrence 66045*

Environmental Assessment

My colleagues and I read with considerable interest the editorial on environmental regulation by Richard C. Atkinson (29 Aug., p. 969) calling for a new national commission to develop a consensus among concerned parties on dealing with environmental problems over the next two decades.

A group with identical concerns has been formed and is known as the Environmental Assessment Council, of which I am chairman. The council has already attracted the participation of respected individuals from the private and public sectors, as well as academia, and includes Laurance S. Rockefeller, George R. Lamb, Abel Wolman, William K. Reilly, Robert G. Dunlop, Lane Kirkland and his representative Thomas Kahn, and Caryl Haskins.

The council, which is privately funded in order not to be dependent on established government policies, is dedicated to the mission of identifying our most significant environmental problems and recommending appropriate courses of action to deal with these issues from the standpoint of technical validity and responsible public policy. The council sponsored an initial background study by Resources for the Future to assess the current state of environmental regulation. With the completion of this report we have now embarked on an assessment program that will address national environmental priorities and the development of balanced programs for their management and resolution. We are also gathering data on the problem of acid lakes and some of the actions of our society that may be contributing to this condition. These studies, we believe, will lead to a better understanding of this problem.

This is a time when, as Atkinson points out, we need a more integrated utilization of scientific information and new analytical tools such as risk assessment to make judgments based on an informed consensus about developing rational future environmental programs. The council hopes to assist in resolving the difficult problems that confront us and to channel our best thinking and energies into equitable solutions.

RUTH PATRICK

*Academy of Natural Sciences,
Nineteenth and the Parkway,
Philadelphia, Pennsylvania 19103*

Fruit Fly Breeding

William J. Broad (News and Comment, 10 Oct., p. 168) calls attention to an impending crisis in the field of fruit fly genetics resulting from the rapidly decreasing availability of half-pint milk bottles as laboratory breeding vessels for *Drosophila melanogaster*. And, reflective of a national malaise, Broad notes that, "Yankee ingenuity has produced no answers and the worried parties are looking overseas for a solution."

But what's wrong with half-pint mayonnaise jars or the like? Glass manufacturers in the United States still produce those in quantity, and innovation is as apt a concept for U.S. science as for U.S. industry.

WILLIAM SPINDEL

*Office of Chemistry and Chemical
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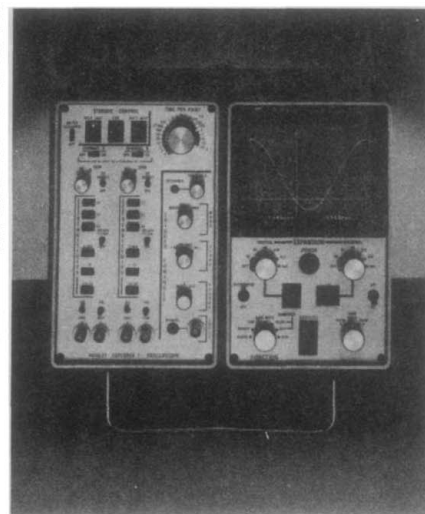
Credit

In the article "Thalassemias: Models of genetic diseases" (Research News, 17 Oct., p. 300), my name is mentioned in connection with data concerning β^+ thalassemia. Most of these data were actually obtained by Lynne Maquat and Alan Kinniburgh, postdoctoral fellows in my laboratory.

JEFFREY ROSS

*Department of Oncology,
McArdle Laboratory for Cancer
Research, University of Wisconsin,
Madison 53706*

Erratum: In the article by Don E. Dumond, "The archeology of Alaska and the peopling of America" (29 Aug., p. 984), the scale bar in Fig. 4 on p. 987 is more than twice as long as it should be to represent 1 centimeter. The artifact in part a, for example, has a maximum width of about 3.5 centimeters.



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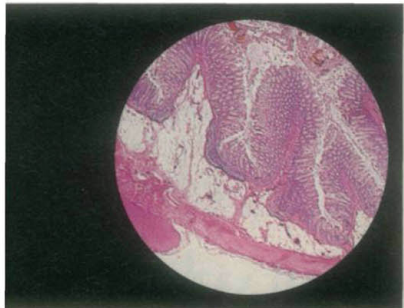
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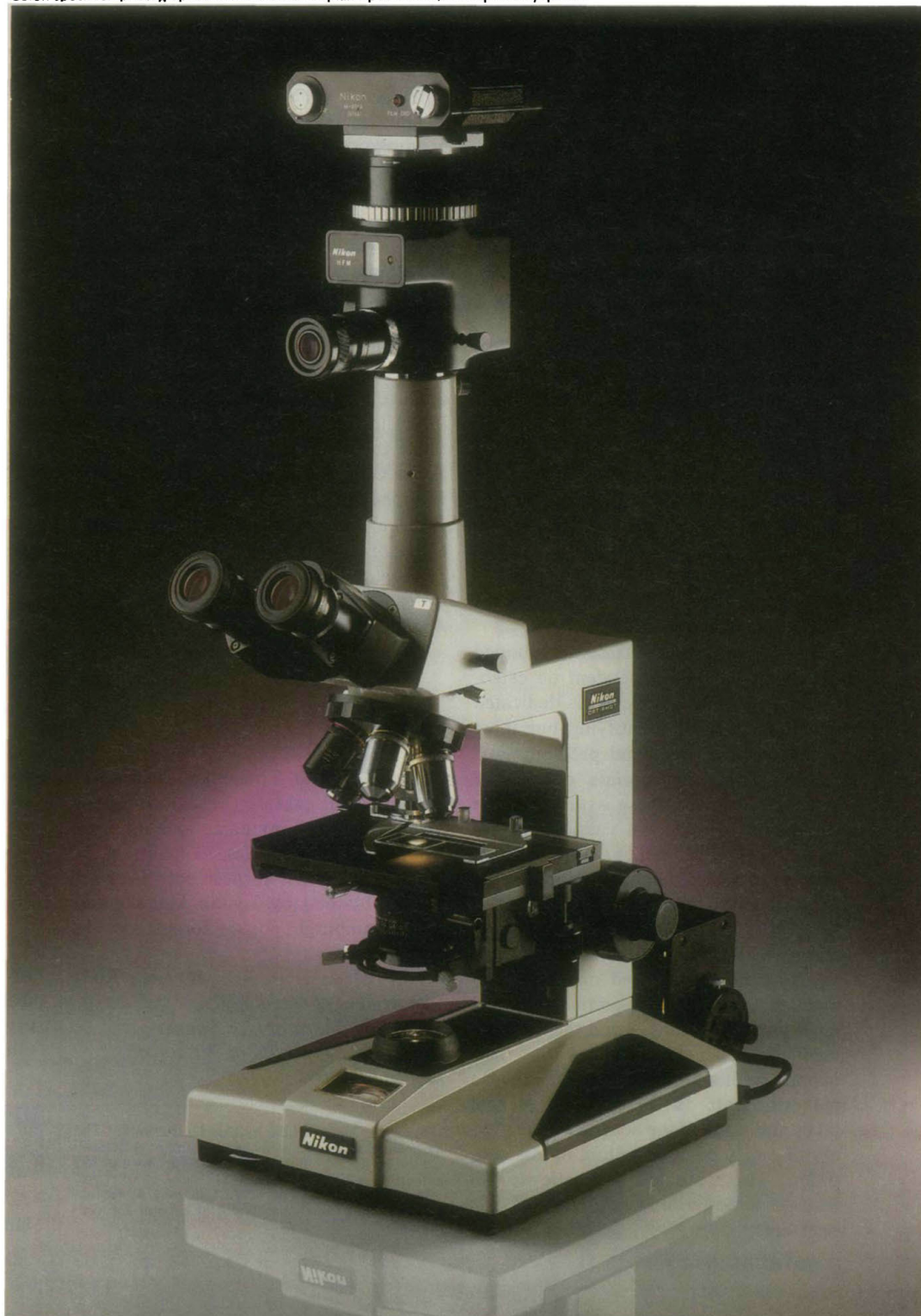
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Proposed Changes in Biomedical Funding

Leaders in the biomedical community are concerned about legislation in Congress that could seriously alter the statutory basis for funding for the National Institutes of Health (NIH). For 35 years NIH has received its appropriations under the authority of Section 301 of the Public Health Service Act. This section provides that "such sums as may be required" may be appropriated for the work of the institutes. Specific ceilings were placed on the appropriations for the National Cancer Institute (NCI) in 1971 and for the National Heart, Lung, and Blood Institute (NHLBI) in 1972, requiring new authorizations for these institutes every 3 years but retaining the Section 301 authorities as backup. The existence of the 301 authority has proved to be important to these two institutes, since on several occasions Congress has been unable to renew the specific authorizing legislation in time for the new fiscal year.

This year each house of Congress passed bills dealing with the authorities and organization of NIH. The House bill (H.R. 7036) has elicited concern because of its provisions related to the annual appropriations for the 11 NIH institutes. Authorization of funds for each of the 11 institutes would be required triennially, with a fourth-year authorization added as insurance against lapse. The Senate version (S. 988) has no similar requirement. On the contrary, it removes existing time and dollar limitations for NCI and NHLBI and makes Section 301 of the Public Health Service Act the sole basis for their appropriations.

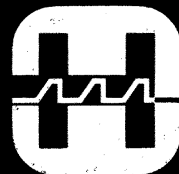
The unlimited authority conferred by Section 301 is an unusual arrangement. It provides the continuity necessary for a commitment to long-term research and ensures that limitations on financial resources will not stand in the way of unexpected opportunities to advance knowledge that will improve human health. This is not to say that the amounts appropriated for the institutes have been made available without careful consideration by Congress, or that no opportunity has been provided for Congress to oversee the activities of NIH. The amounts have been determined each year only after the House and Senate appropriations committees have carefully reviewed the programs and plans of each of the institutes in hearings that have usually extended over several weeks. And the legislative committees have periodically held oversight hearings to review the way in which NIH carries out its functions.

It is difficult to perceive any positive value in the authorizations required by the House bill other than conformity with the practice of other agencies. It has been claimed that the authorizations provide a high target for appropriations committees to aim for, but the experience of NHLBI indicates the converse, that the authorization levels have kept appropriations down. It is said that the authorization process will require regular and careful oversight of the activities of the institutes, but experience to date indicates that this aspect of the reauthorization process has been superficial and perfunctory. An additional area of concern about the reauthorization process is the temptation it offers to target funds for specific diseases on the basis of transitory public appeal. A carefully planned congressional examination of NIH activities free of the pressures of the regular reauthorization deadlines can be far more effective. And the President's Council for the Health Sciences, which would be established by S. 988, would provide a continuing examination of the performance and plans of NIH programs.

An experiment in time and dollar authorizations has been tried with NCI and NHLBI; the experiment has not worked well. The unlimited authorizations of Section 301 have been tested over the years, and under them NIH has been one of the most respected of federal agencies. Why tamper with success?—ROBERT Q. MARSTON, *President, University of Florida, Gainesville 32611*

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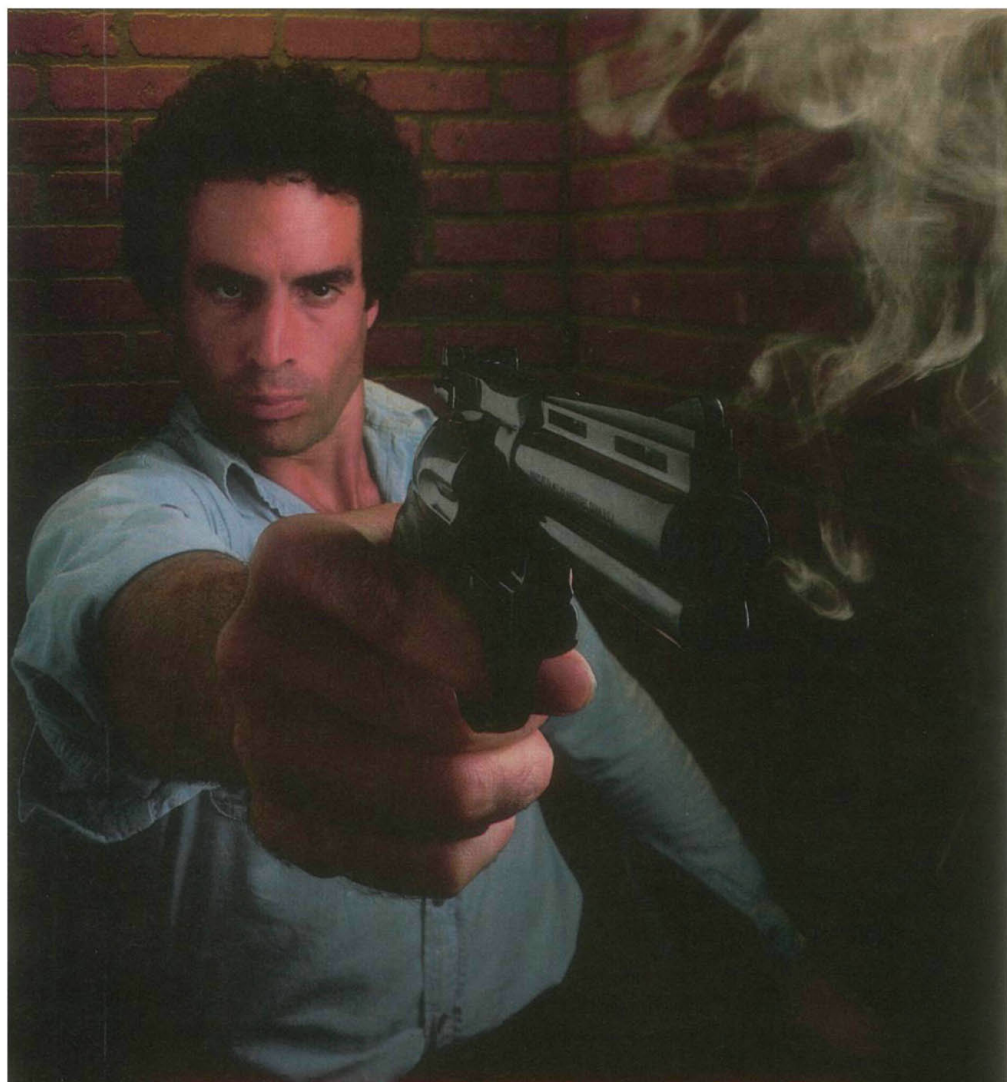
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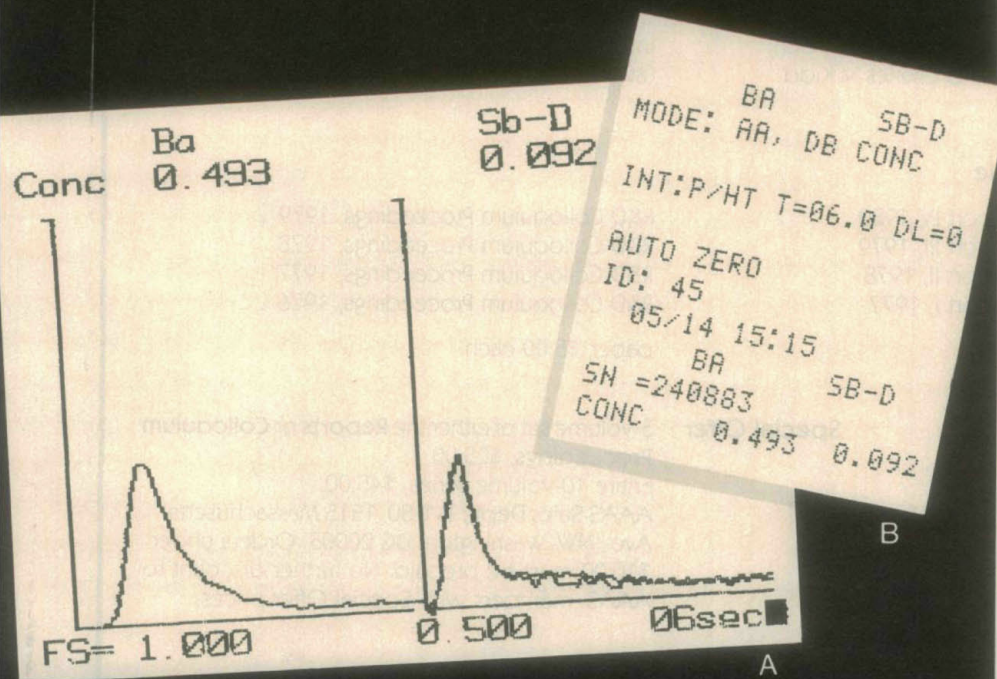
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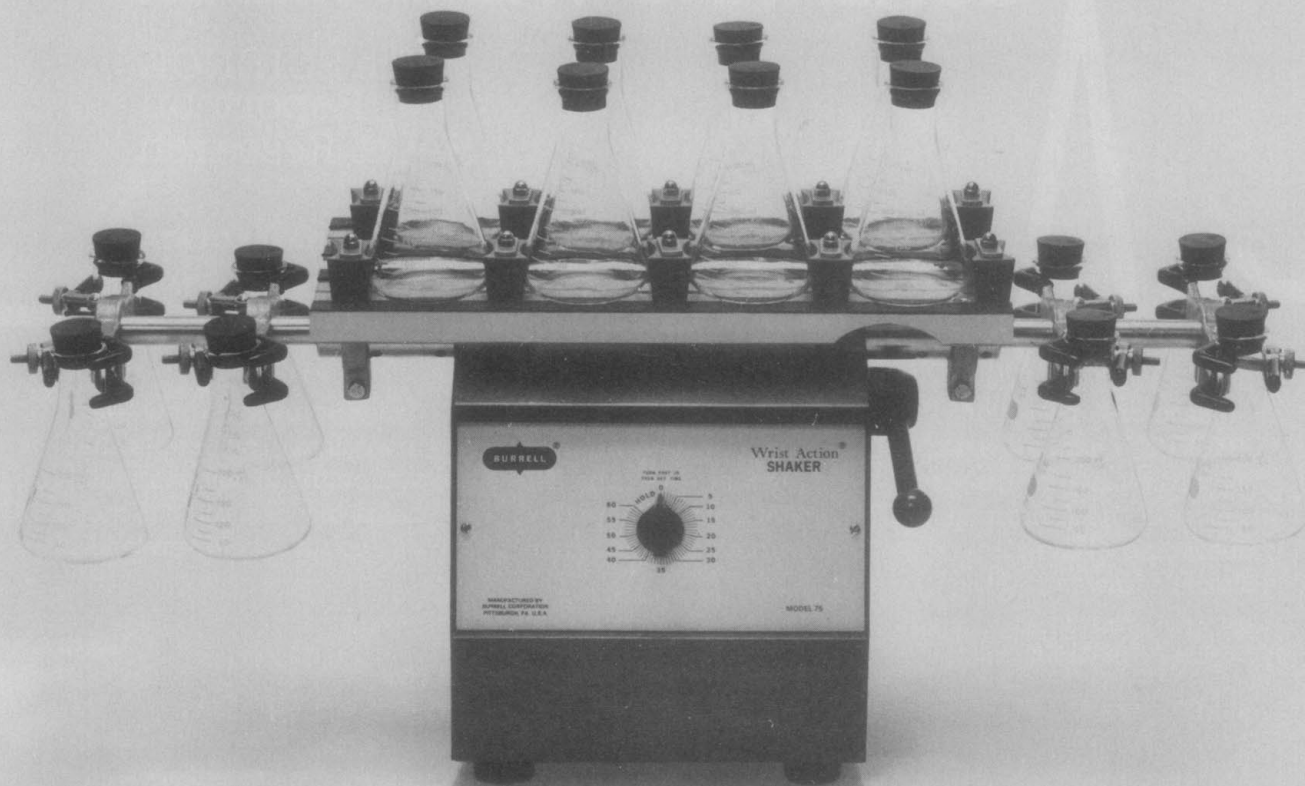
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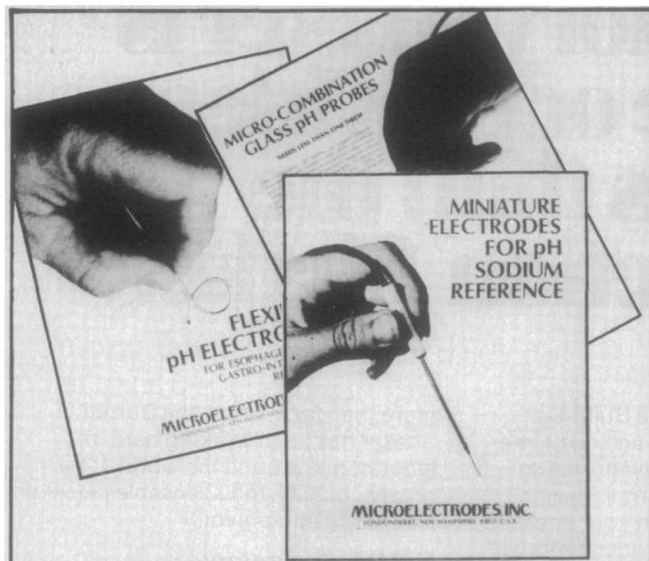
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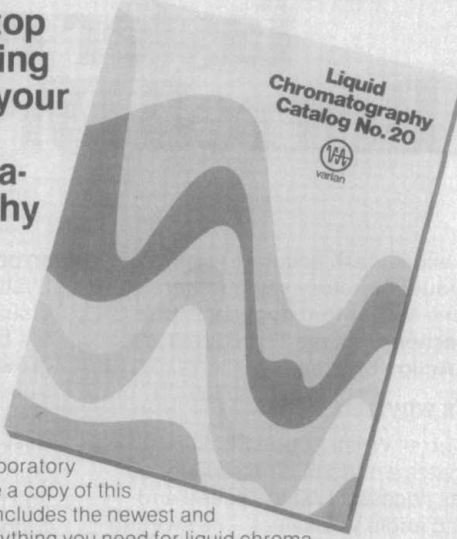
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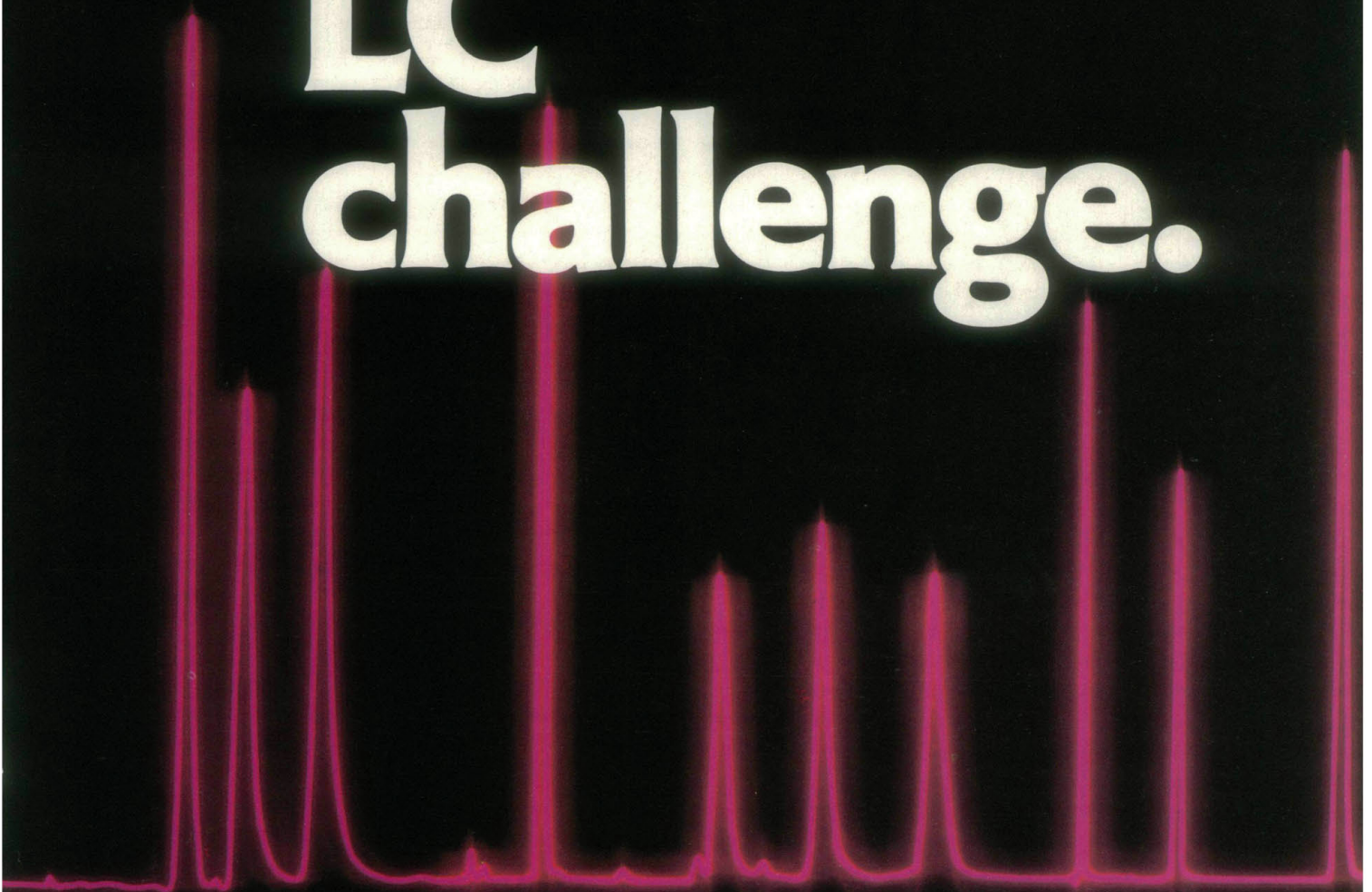
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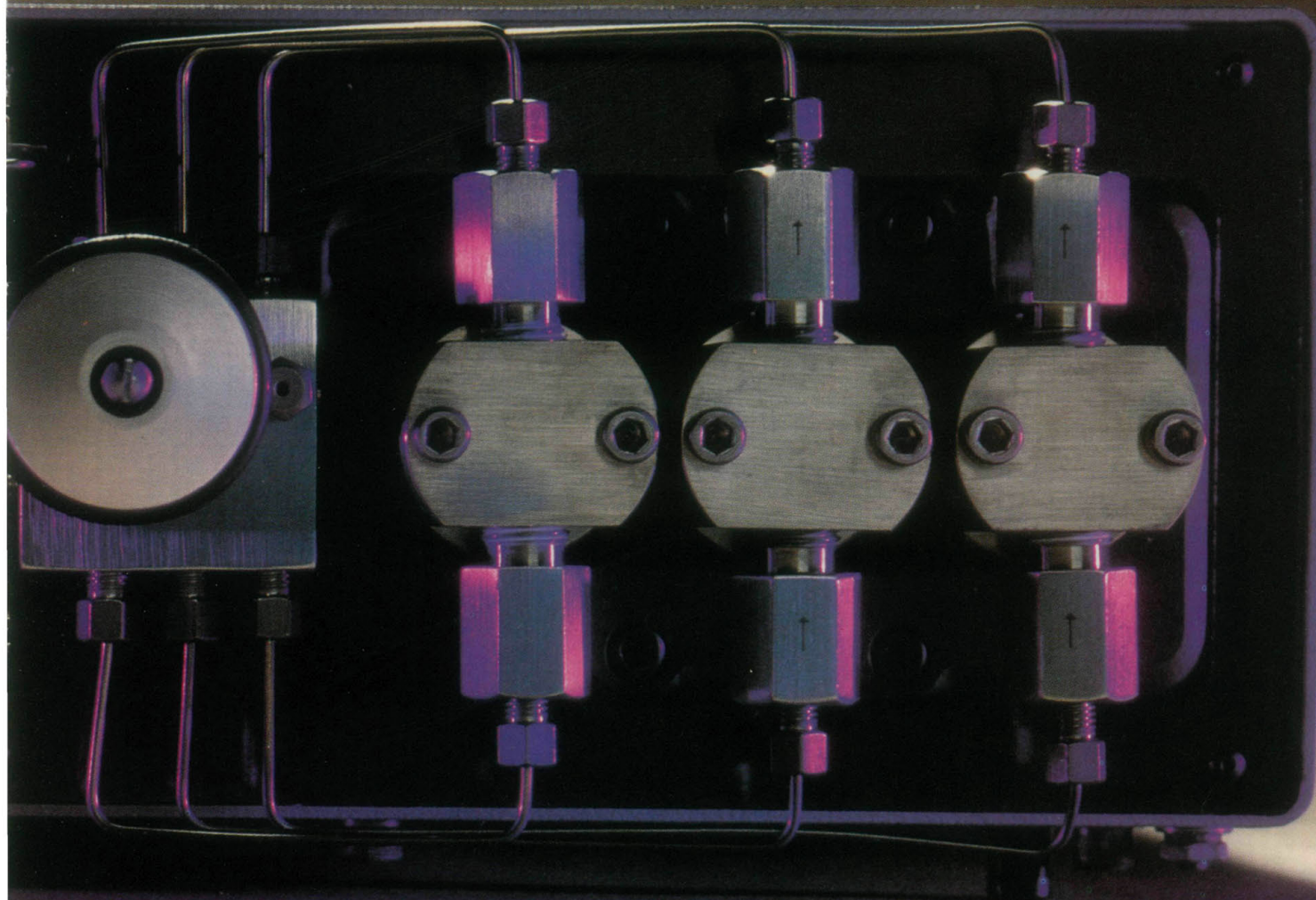
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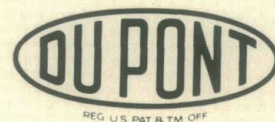
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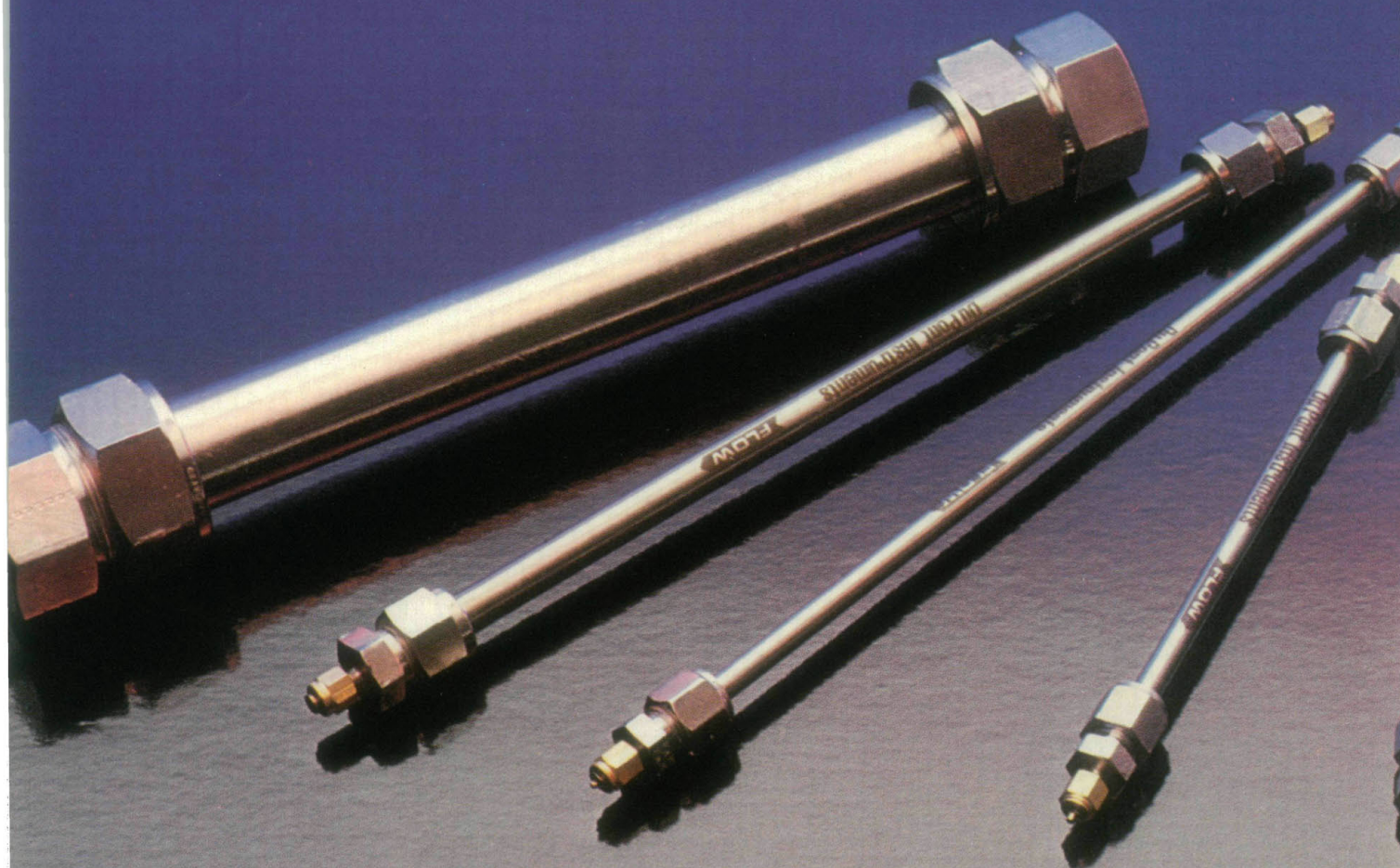


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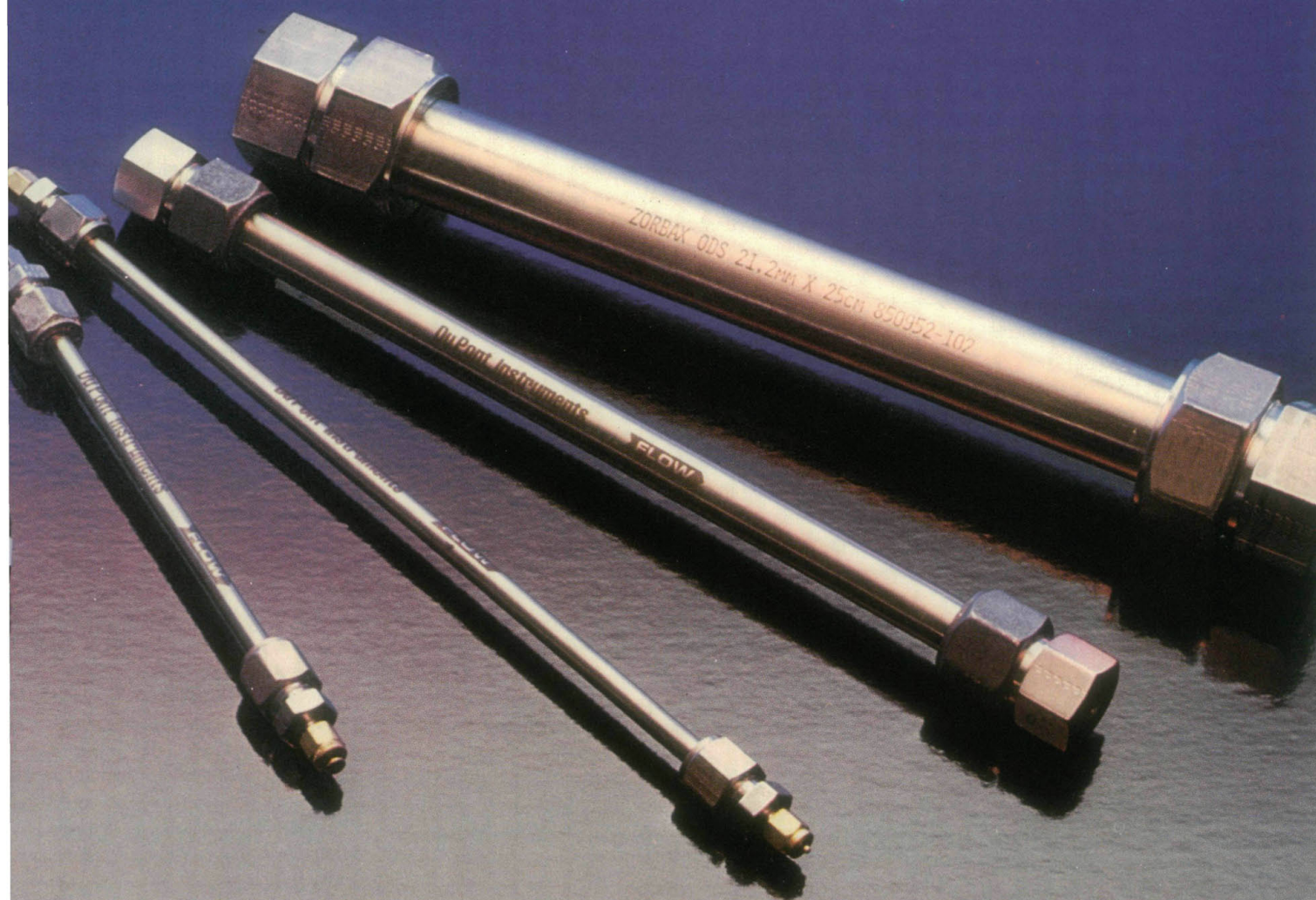
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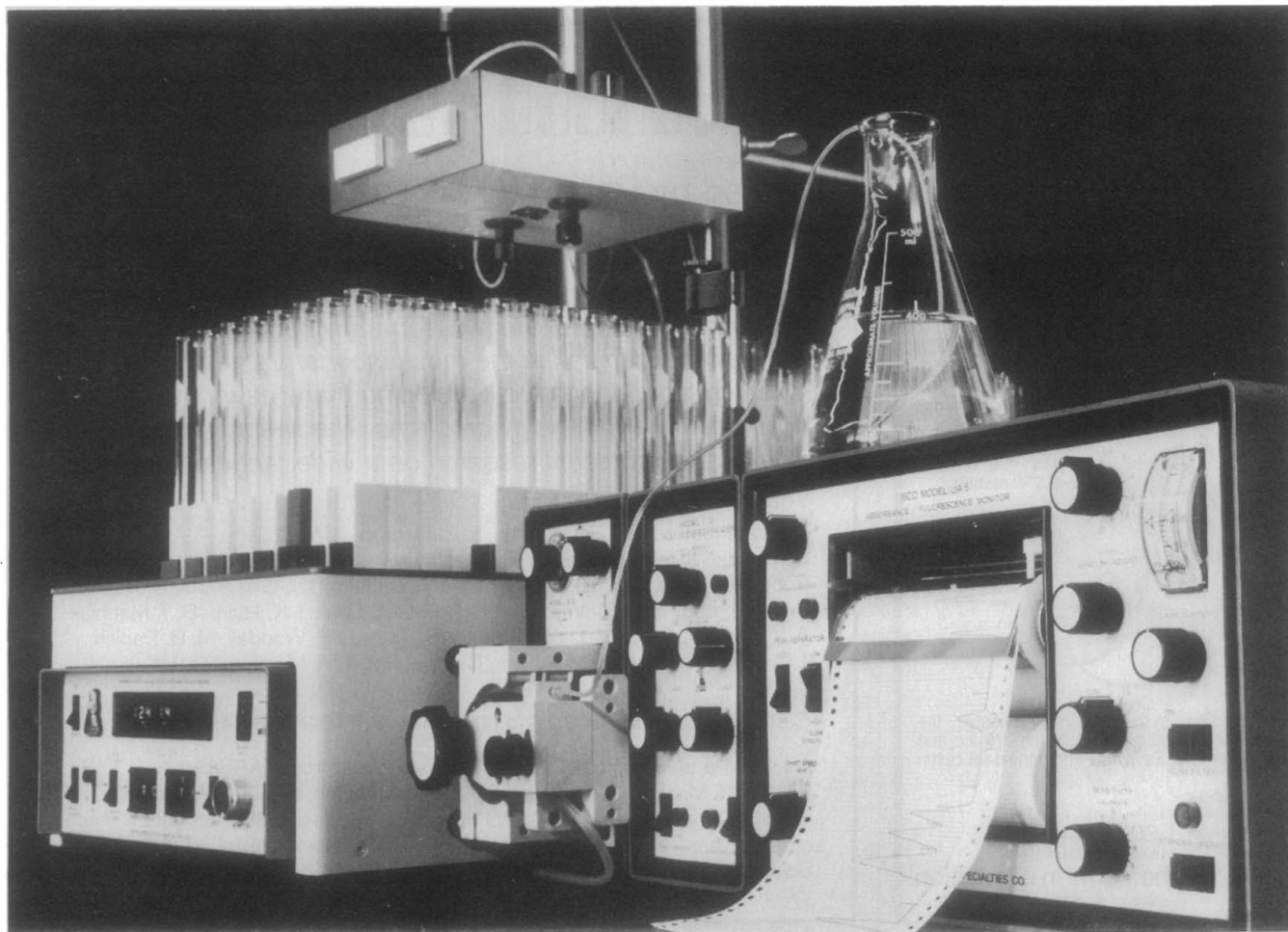
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Edited by Philip H. Abelson and Mary Dorfman

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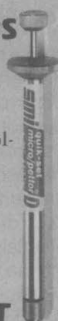
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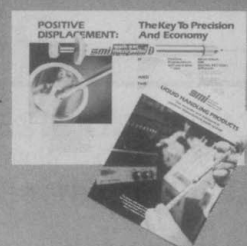
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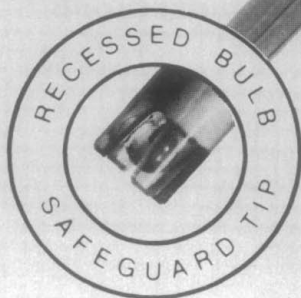
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Annual Meeting
Toronto
3-8 January 1981

ADVANCE REGISTRATION FORM
(E)

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NAME OF SPOUSE REGISTRANT: _____
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REGISTRANT'S MAILING ADDRESS: _____
[For receipt of program(s), badges(s),
and *Science* (for new applicants)]
(Street)
(City/State or Province) (Zip Code)

ADDITIONAL REGISTRANTS: _____
(With same mailing address. Use new
form if address differs.)

REGISTRANT'S
INSTITUTION OR COMPANY: _____

(City) (State or Province) (Zip Code)

CONVENTION ADDRESS: _____
(Where you can be reached) (Hotel or Street Address, and/or Phone No.)
Check days attending: Sat Sun Mon Tue Wed Thu

☐ Please check here if you need special services due to handicap. We will contact you prior to the meeting.

- Please check appropriate boxes, complete remainder of form (type or print), and enclose payment.
- Preconvention Program, badge, and voucher for full Program and Abstracts will be mailed to registrants in early December.
- Full Program and Abstract Volume can be picked up at *Advance Registrants' Desks* at the Sheraton Centre or the Royal York.
- Registrations received after 12 December will be held at the AAAS Information Booth at the Sheraton Centre.
- Refund requests for registration fees must be made by letter or telegram prior to 26 December 1980 and will be honored after the Annual Meeting. No refunds are made on cancellation notices received after this date.
- Special one-day attendance registration will be available at on-site Registration Desks only.

Registration Category	Regular				Student† or Retired			
	Single		Double		Single		Double	
<input type="checkbox"/> AAAS Member	\$US 30	\$CAN 35	\$US 45	\$CAN 52	\$US 15	\$CAN 17	\$US 23	\$CAN 26
<input type="checkbox"/> Non-Member:								
<input type="checkbox"/> Meeting registration only	38	44	53	61	19	22	27	31
<input type="checkbox"/> Register and join: Single membership*	68	95#	83	112#	42	64#	50	73#
<input type="checkbox"/> Registration and join: Double membership**			95	125#			62	86#

†Fulltime undergraduate or graduate students only.

*Specify name of new member _____

**Registrant and spouse double membership includes single subscription to *Science* (51 issues per year).

#Canadian dollar rates are for Canadian membership, including additional postage.

NOTE: 1980 Membership Dues: Regular Member \$US 38; \$CAN 60#. Student or Emeritus, \$US 27; \$CAN 47#. Spouse or Emeritus without *Science*, \$US 12; \$CAN 13#. For other countries, please inquire.

Mail to: American Association for the Advancement of Science, Dept. R,
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SURVEY OF ATTENDANTS

Annual Meeting, Toronto, 3-8 January 1981

Your answers to the following questions will help us to plan future Annual Meetings. Please complete the form and either return it with your registration form or send in separately (to the same address) if you wish to respond anonymously (the two forms will be processed separately).

Principal Professional Interest	Principal Professional Activity	Institutional Affiliation Type
11 <input type="checkbox"/> Physical, mathematical	21 <input type="checkbox"/> Teaching, education	31 <input type="checkbox"/> University, 4-year college
12 <input type="checkbox"/> Biological, medical	22 <input type="checkbox"/> Health practice	32 <input type="checkbox"/> Other educational
13 <input type="checkbox"/> Engineering	23 <input type="checkbox"/> Other practice, consulting	33 <input type="checkbox"/> Industrial, commercial
14 <input type="checkbox"/> Social, behavioral	24 <input type="checkbox"/> Research, development	34 <input type="checkbox"/> Other Private
15 <input type="checkbox"/> Science policy	25 <input type="checkbox"/> Administration	35 <input type="checkbox"/> Government
16 <input type="checkbox"/> (other)	26 <input type="checkbox"/> (other)	36 <input type="checkbox"/> (other)
Highest Educational Level	Age	Number of Past AAAS Meetings Attended
41 <input type="checkbox"/> Doctoral Degree	51 <input type="checkbox"/> Under 26 years	61 <input type="checkbox"/> None
42 <input type="checkbox"/> Master's Degree	52 <input type="checkbox"/> 26 to 35 years	62 <input type="checkbox"/> One
43 <input type="checkbox"/> Other professional	53 <input type="checkbox"/> 36 to 45 years	63 <input type="checkbox"/> Two
44 <input type="checkbox"/> Bachelor's Degree	54 <input type="checkbox"/> 46 to 55 years	64 <input type="checkbox"/> Three
45 <input type="checkbox"/> (other)	55 <input type="checkbox"/> 56 to 65 years	65 <input type="checkbox"/> Four
	56 <input type="checkbox"/> Over 65 years	66 <input type="checkbox"/> Five or more
		Distance Traveled to Meeting
		71 <input type="checkbox"/> Under 51 miles
		72 <input type="checkbox"/> 51 to 150 miles
		73 <input type="checkbox"/> 151 to 400 miles
		74 <input type="checkbox"/> 401 to 1000 miles
		75 <input type="checkbox"/> 1001 to 3000 miles
		76 <input type="checkbox"/> Over 3000 miles

HOTEL RESERVATIONS

Annual Meeting

Toronto

3-8 January 1981



Conference Air Services (CAS) has been selected as the official travel coordinator for the AAAS Annual Meeting in Toronto. CAS will handle all housing and travel arrangements. Please take note of the housing information below and the travel information on the back of this page.

- All housing reservations must be submitted to CAS in writing (use housing form below).
- Reservations must be received by *Conference Air Services* not later than **12 December 1980**; reservations received after that date are conditional upon space availability at the hotels.
- Rooms are assigned on a first come, first served basis. If room rate requested is no longer available, the next available higher rate will be assigned.
- Confirmation will come directly from *Conference Air Services (CAS)*. All changes and cancellations must be made in writing through CAS.

ROOM RATES IN CANADIAN DOLLARS*

Hotels	Single	Double & Twin	Parlor + 1 Bedrm.	Parlor + 2 Bedrms.	Parking (rates subject to change)
SHERATON CENTRE 123 Queen Street West (No. of rooms: 1000)	\$52 56 64	\$66 70 78	\$128 and up	\$192 and up	\$5.50 per 24 hours; no in-and-out privileges. Inquire for hourly rates.
ROYAL YORK HOTEL 100 Front Street West (No. of rooms: 800)	\$53 58 63	\$67 72 77	\$125 and up	\$203 and up	\$5.25 per 24 hours with in-and-out privileges.
HOTEL TORONTO 145 Richmond Street West (No. of rooms: 100)	\$58	\$68	\$150 and up	\$210 and up	\$5.00 per 24 hours with in-and-out privileges.

*\$ (Can) 1.00 = \$ (US) 0.86, with slight daily fluctuations; there is no room tax.

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OTHER OCCUPANTS OF ROOM:

Name _____ Name _____

Name _____ Name _____

CHOICE OF HOTEL: First _____ Second _____ Third _____

ROOM: ☐ Single ☐ Double ☐ Twin SUITE: ☐ 1 Bedroom ☐ 2 Bedrooms PREFERRED RATE: \$ _____

PLEASE INDICATE SPECIAL HOUSING NEEDS DUE TO A HANDICAP:

Wheelchair accessible room ☐ Other: _____

ARRIVAL DATE: _____ TIME: _____ ☐ a.m. ☐ p.m.

DEPARTURE DATE: _____ TIME: _____ ☐ a.m. ☐ p.m.

Be sure to list definite arrival and departure date and time. Hotel reservations will be held only until 6 p.m. unless otherwise specified.

Mail to: AAAS Housing Bureau
c/o CONFERENCE AIR SERVICES
1911 N Ft. Myer Drive
Arlington, Virginia 22209



Annual Meeting

Toronto

3-8 January 1981

AIR TRAVEL RESERVATIONS

Because of the constant increase in air fares, the AAAS is attempting to provide the attendants of its 1981 Annual Meeting in Toronto with the lowest air fares available. Thus, the Association has selected *Conference Air Services (CAS)* as the official travel coordinator for the Toronto Meeting. CAS will endeavor to arrange groups from among those traveling to Toronto from other cities on the same day, thereby offering these travelers group fare savings. CAS guarantees booking of airline space at the best rates available, consistent with travelers' requirements, using group and super saver fares whenever possible.

Please take note of the travel information below and the housing information on the preceding page. We urge you to purchase your tickets through CAS, and to do so early, since air fares are increasing constantly. Volume ticket purchases will enable CAS to form groups at key departure points, thus providing the lowest air fares possible.

SAMPLE ROUNDTRIP AIR FARES TO TORONTO*

City	Coach Fare	Special Group Fare	City	Coach Fare	Special Group Fare
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Boston	180.00	126.00	Miami	349.00	299.00
Chicago	174.00	121.00	New York	160.00	112.00
Cleveland	116.00	98.00	New Orleans	355.00	251.00
Dallas	349.00	255.00	St. Louis	241.00	168.00
Denver	345.00	243.00	San Francisco	547.00	387.00
Detroit	121.00	96.00	Seattle	517.00	358.00
Houston	387.00	274.00	Washington, D.C.	180.00	143.00

*Note: These fares were in effect in July 1980 and are most definitely **subject to change**. Only sample cities have been listed above. Please call CAS for applicable airfares and possible group departure schedules from your home area. Persons for whom group flights cannot be arranged will be booked on the best air fare available.

For assistance with travel reservations call toll-free
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If you are interested in a post convention skiing weekend or vacation in the Laurentian Mountains or at Blue Mountain, Ontario call CAS at the above toll-free number.

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AAAS AIR TRAVEL RESERVATION FORM

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SEND TICKET(S) TO:

Name _____ Street _____
City _____ State _____ Zip Code _____ Phone No. _____

ADDITIONAL PASSENGERS:

Name _____ Name _____

Please make the following flight reservations to Toronto:

Departing from _____ on _____
(Airport) (Date)

Returning from Toronto on _____, based on: ☐ 1st Class ☐ Coach ☐ Group Fare*
(Date)

I prefer the following specific flights, times, stopovers: _____

I will pay for my airfare by: ☐ Check based on invoice from CAS ☐ Credit Card**

Name of Card _____ Number _____ Expiration Date _____

Authorization (Signature of Cardholder): _____

*Persons for whom group flights cannot be arranged will be booked on the best air fare available.

**Persons providing credit card information will be fare-protected at the time of booking.

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