

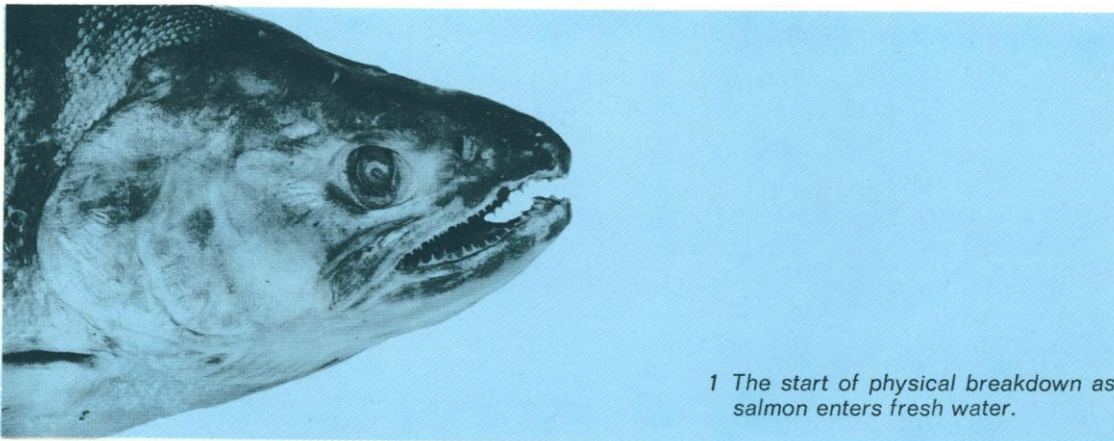
# SCIENCE

7 August 1970

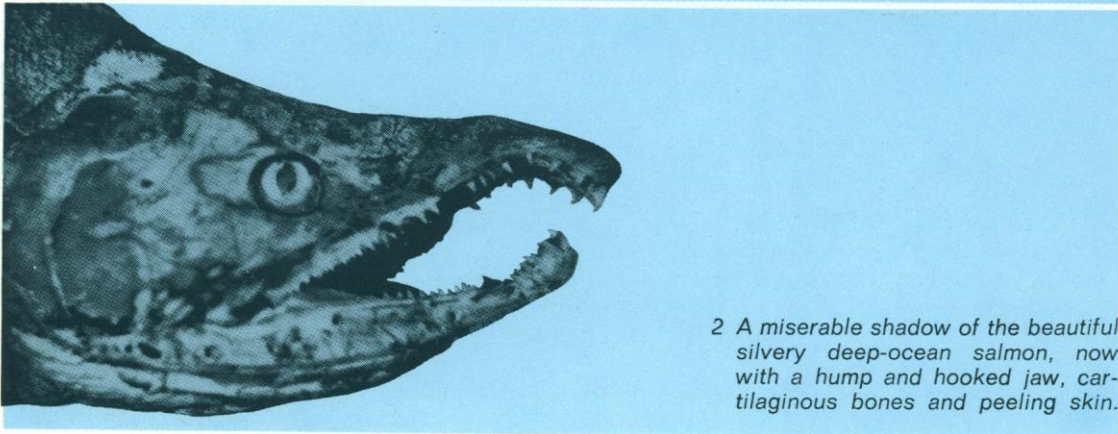
Vol. 169, No. 3945

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





1 The start of physical breakdown as salmon enters fresh water.



2 A miserable shadow of the beautiful silvery deep-ocean salmon, now with a hump and hooked jaw, cartilaginous bones and peeling skin.

Kind permission of Oceans Magazine



## The Ultratome at Sea

LKB have taken part in another "first", this time at sea, aboard the "Alpha Helix".

The "Alpha Helix" investigations concerned the rapid aging of salmon, illustrated in the photos above, which occurs when the salmon enter fresh waters on their spawning run.

During the autumn of 1968 the first electron-micrograph made aboard a ship, was produced on this physiological research vessel belonging to the University of California, San Diego's Scripps Institution of Oceanography. A standard LKB Ultratome cut the sections.

Excellent results were achieved, even when the ship was under way, in the open sea. There could hardly be a more convincing demonstration of the versatility of the LKB Ultratome.

Some of the answers found by the research team could have a direct application to man, and ultimately help to reduce the physical and mental deterioration associated with human aging.



IN THE SERVICE OF SCIENCE

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## Time to order a Mettler

When an employee grits his teeth, clinches his fists and generally loses his "cool" over milligrams, don't replace him. Replace the lazy, unreliable and sluggish balance he is using. Order a Mettler.

If you buy him a new Mettler H20T analytical balance, he will find it a pleasure to weigh milligrams again. A Mettler is fast, reliable, hard-working, and accommodating. It saves time and eliminates jangled nerves.

The ring weights, arranged in a

concentric pattern, are rapidly and smoothly removed from the hanger without any "hang ups". The Mettler air damping system annuls the time required for the optical scale to come to rest. Weighing-in is fast and accurate with the filling guide. The net weight is read directly without any erroneous arithmetical calculations, thanks to rapid taring throughout the full weighing range and the separate tare weight indicator. The weighing result is registered in a compact row

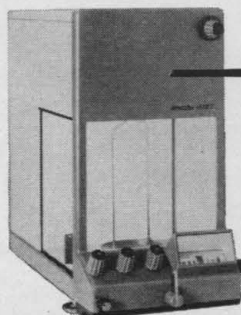
of figures.

The nicest thing about the H20T, however, is its "schizophrenia". It is actually two analytical balances in one: a semi-micro balance with a macro capacity (0.01-mg readability and 160-g weighing range).

So when you see an employee coming "unglued" over his balance, why not order a Mettler for him... the balance that gets along with people.

If he gets upset with a Mettler, it's time to give him a vacation!

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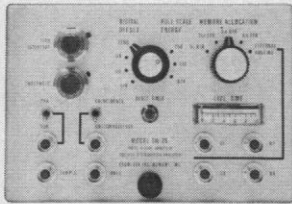
## COVER

Rock painting in red at the Cuevas de la Arána, northwest of Bicorp, Valencia. Figure is gathering wild honey. Disturbed bees are buzzing around the intruder, and are represented on a much larger scale than that of the human figure. See page 544. [After original copy made by W.K. (1921); *Fossil Man in Spain* by Hugo Obermaier; Hispanic Society of America; Yale University Press]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

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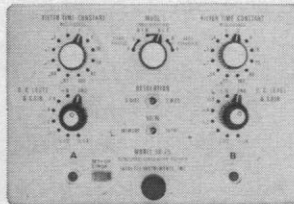


## PULSE HEIGHT AND VOLTAGE DISTRIBUTION ANALYZER

Used for applications such as nuclear spectroscopy, particle size distributions, cell size distributions, and vibration analysis the Model SW-75 plug-in digitizes analog signals or signals which occur as amplitude modulated pulses.

The digitized information is stored and displayed as a histogram or distribution function showing the number of times each particular amplitude occurred.

The SW-75 digitizer has a resolution of one part in 1024. Coincidence capabilities are included so that an input signal is analyzed only when a second (coincidence) signal is present at the same time.

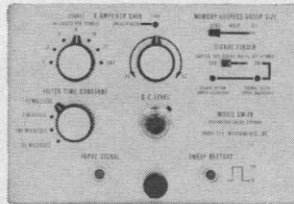


## CORRELATION FUNCTION ANALYZER

Typical correlation technique applications include the fields of medicine, seismology, and vibration analysis.

Time-series correlation provides a means for statistically describing random data in the time domain as opposed to either the frequency or amplitude domain. Autocorrelation describes the similarity between a waveform and a time-shifted version of this same waveform. Crosscorrelation describes the similarity between two different waveforms.

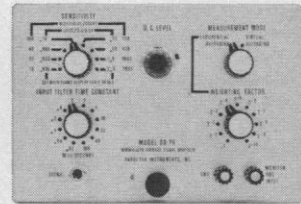
The SD-75 when used with the Fabri-Tek Fast Fourier System provides power spectral density computations.



## PARAMETRIC SWEEP CONTROL

This plug-in was designed for those traditionally difficult applications where the independent variable changes at an unknown or nonlinear rate. It permits the measurement of the relationship between two variables represented by analog input voltages. The SW-79 plug-in programs the 1070 averager's address advance in accordance with amplitude changes in the independent (X-axis) variable, rather than on a time basis.

Typical applications include averaging temperature as a function of pressure, voltage as a function of current, or absorbed energy as a function of magnetic field intensity.

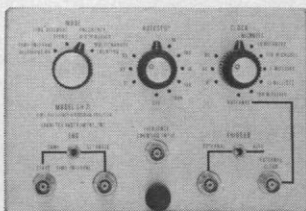


## WEIGHTED AVERAGE SIGNAL DIGITIZER

This plug-in offers the option of signal averaging by either the weighted average or normalized average methods.

The weighted average method emphasizes changes in the input signal as they occur. This emphasis is the result of gradually "forgetting" the older accumulated data. Eleven weighting factors are switch selectable.

The normalized averaging method is especially convenient to use, particularly in set-up procedures. Another advantage is that when the numerical display option is used the displayed numbers represent the average number of microvolts per ordinate point.



## TIME AND FREQUENCY HISTOGRAM ANALYZER

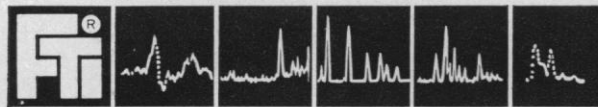
Statistical analysis is a frequently applied technique for describing random data waveforms. Typical examples of these waveforms are the electrical potential of nerve cells, measurements from a quality control application, or the output of a transducer.

The SH-71 plug-in operating modes include time interval distributions between level crossings of voltage waveforms, a plot of successive measurements of time intervals, the distribution of level crossing per unit time, and trend measurements made by plotting the number of events per unit time.

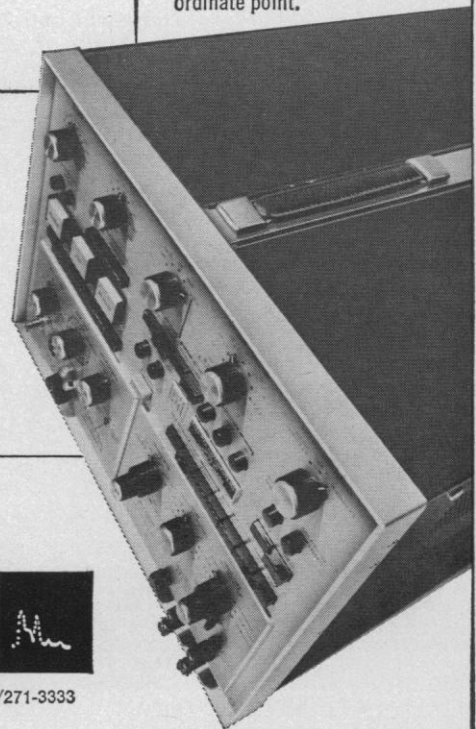
## OTHER PLUG-INS...

A total of 19 different plug-ins are currently available and include capabilities for high resolution (12 bit), or 1, 2 or 4 input medium resolution (9 bit), or high speed (1 microsecond/address) signal averaging; NMR spectrometer control or signal delay averaging. Call or write to discuss your specific application. For full details request our new 44-page brochure.

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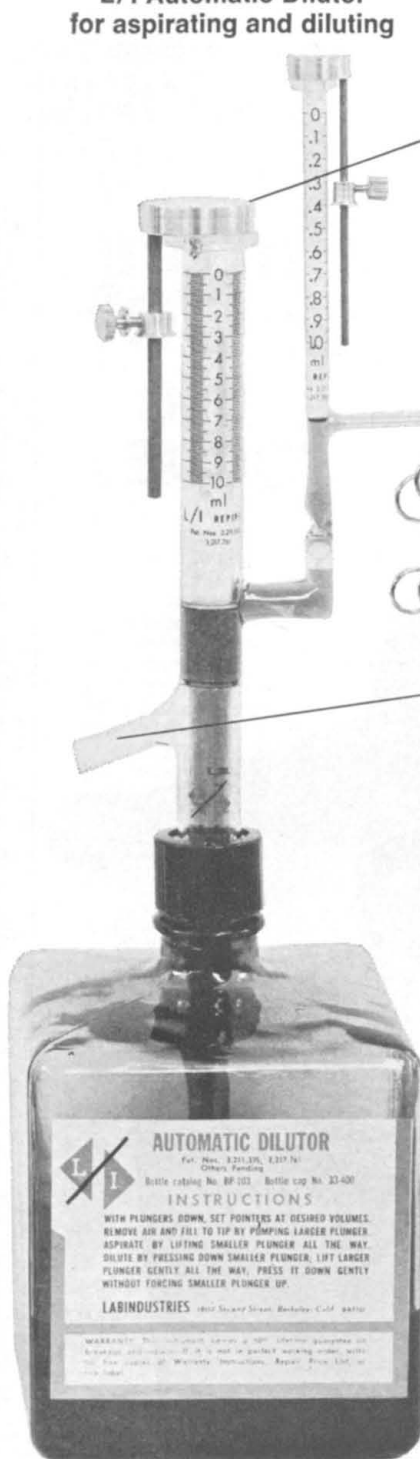
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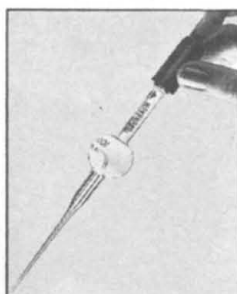
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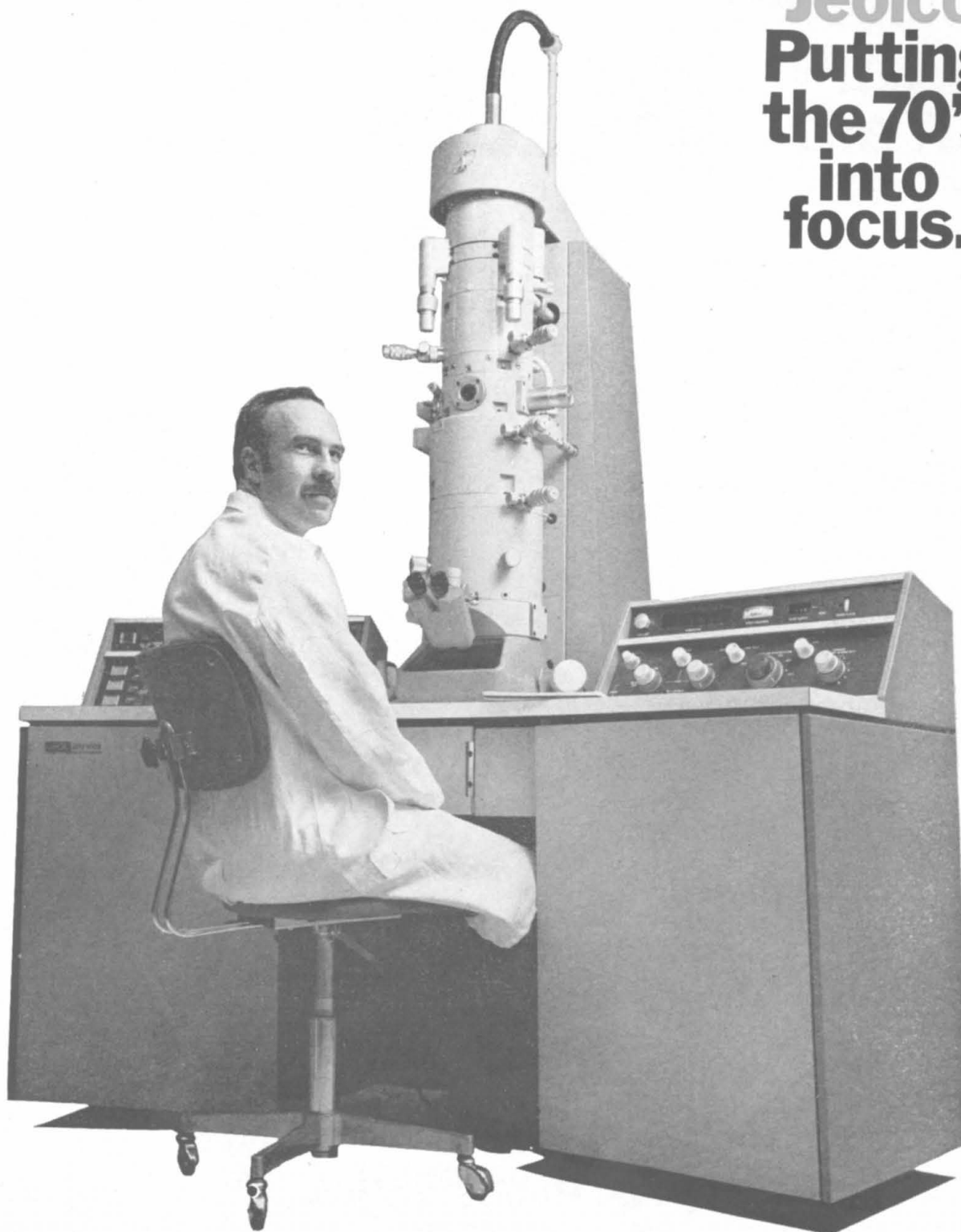


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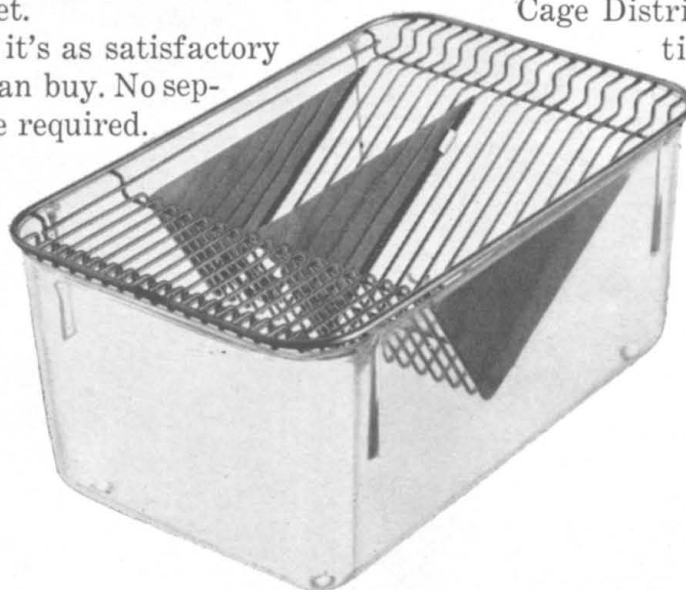
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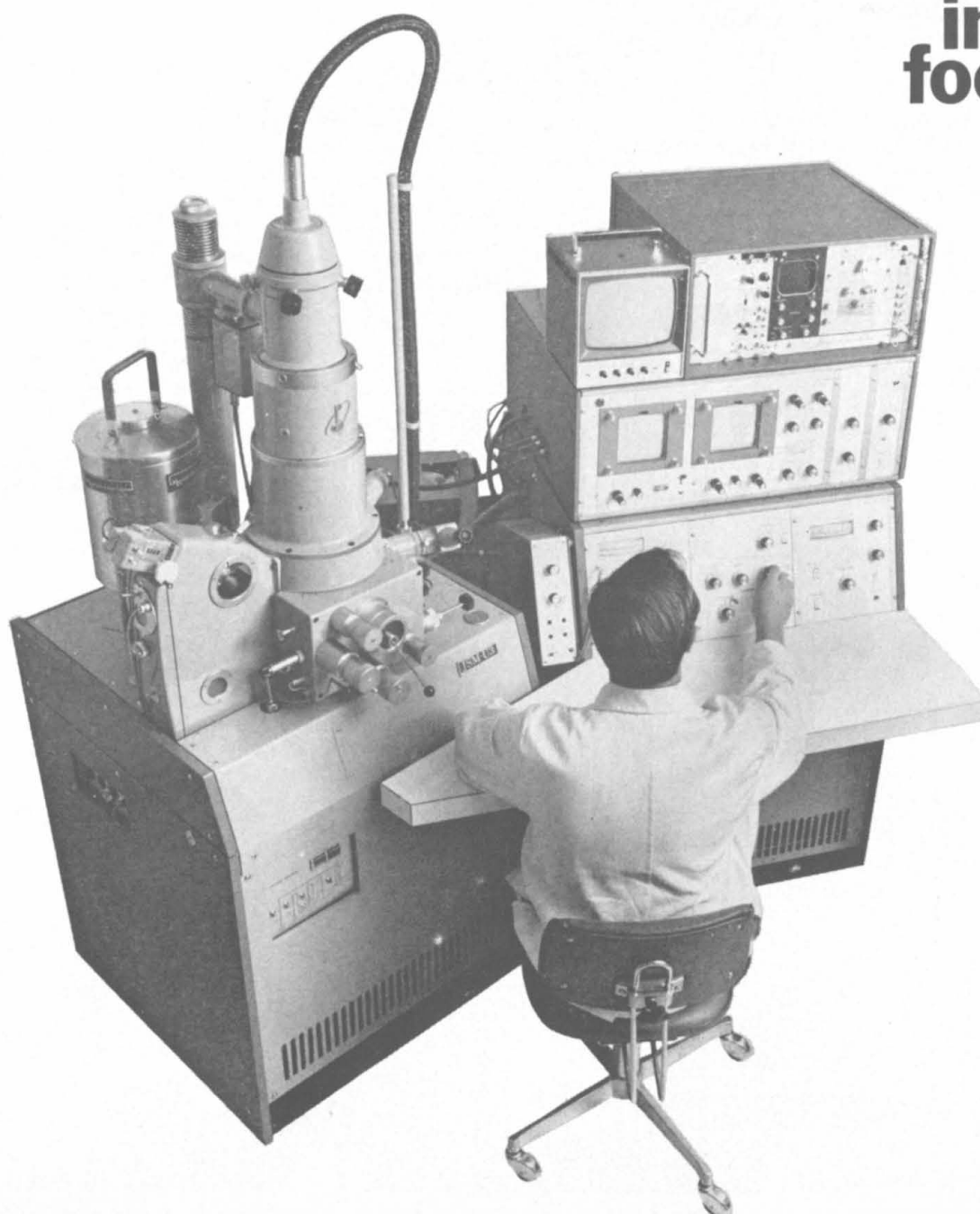


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# 10<sup>-8</sup> torr

## and what it means to the performance of our scanning electron microscope

It takes a titanium sublimation pump—originally developed for space simulation projects—to bring the Ultrascan™ SEM column down to 10<sup>-8</sup> torr. That's two to three orders of magnitude better than any other SEM vacuum system can produce. But what have you got when you get there?

**Cleanliness:** ordinary oil diffusion systems produce vapors which are "cracked" by the electron beam, depositing carbon on the specimen, field stops, apertures, and throughout the column. Not so with Ultrascan's electro-ion pump.

**Flexibility:** the hotstage, cold stage, and cathodoluminescence mode now take on real meaning, since for the first time the specimen will not interact with the vacuum environment.

**Longer filament life:** we routinely get five or six times the usual number of hours from our gun filament, compared with other instruments; less down time for maintenance.

### Auger and a new gun

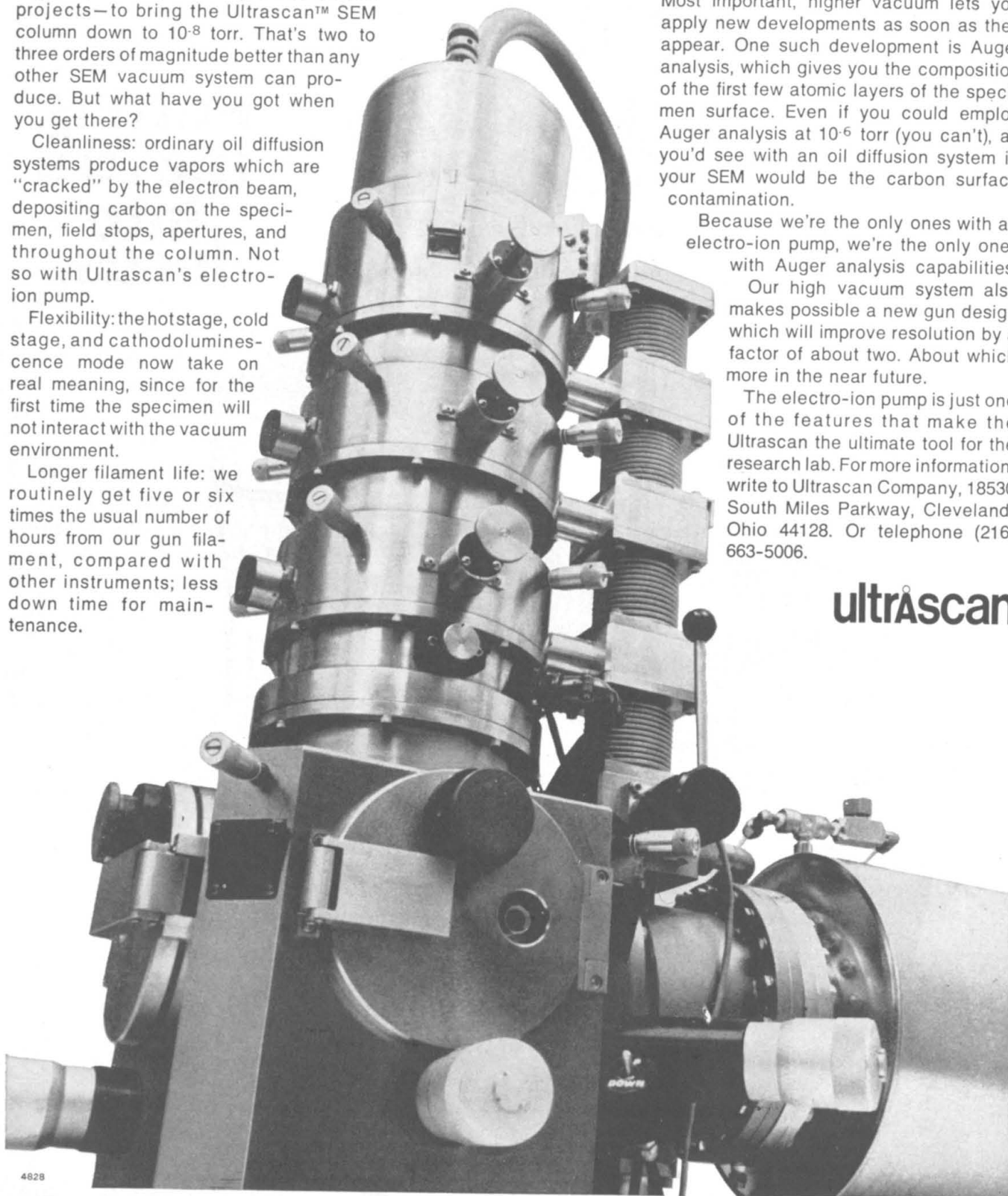
Most important, higher vacuum lets you apply new developments as soon as they appear. One such development is Auger analysis, which gives you the composition of the first few atomic layers of the specimen surface. Even if you could employ Auger analysis at 10<sup>-6</sup> torr (you can't), all you'd see with an oil diffusion system in your SEM would be the carbon surface contamination.

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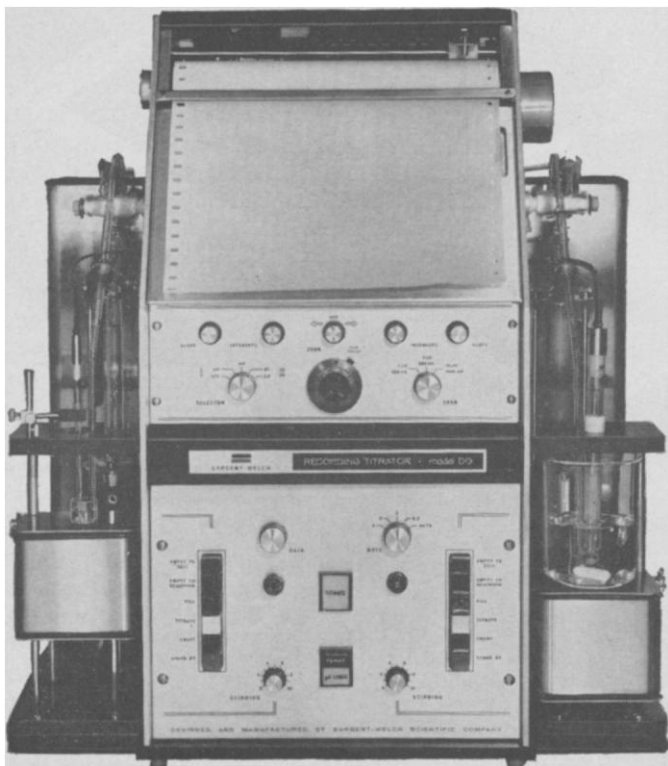
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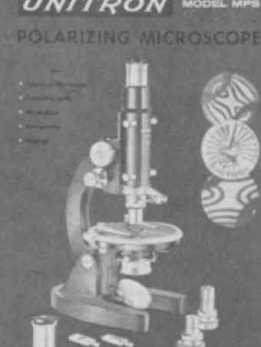
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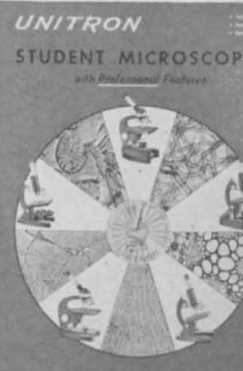
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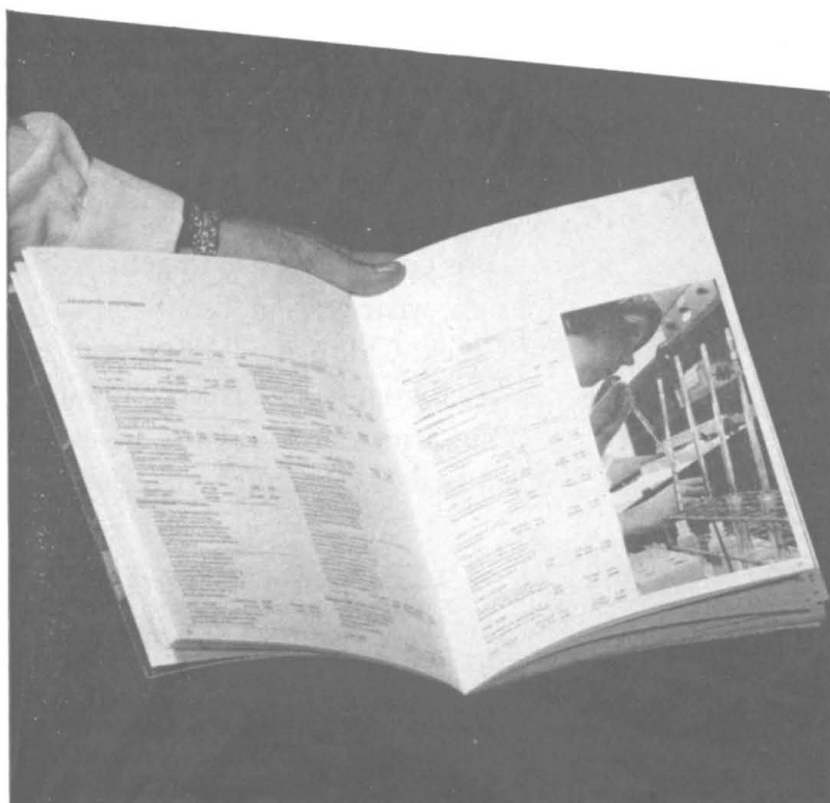
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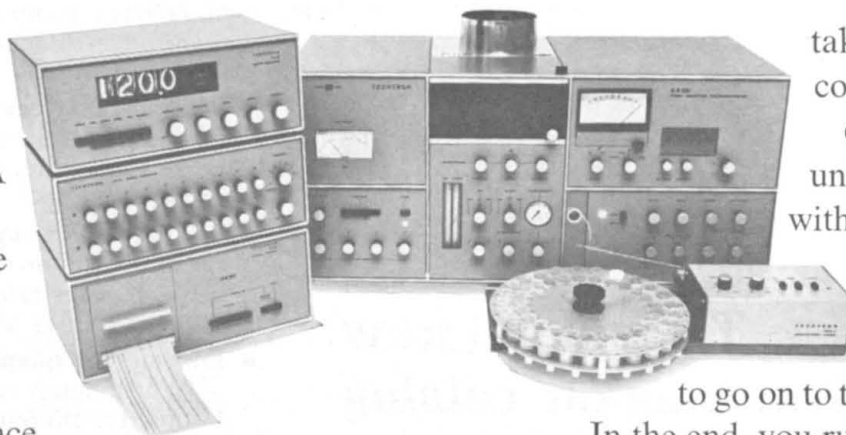
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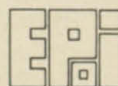


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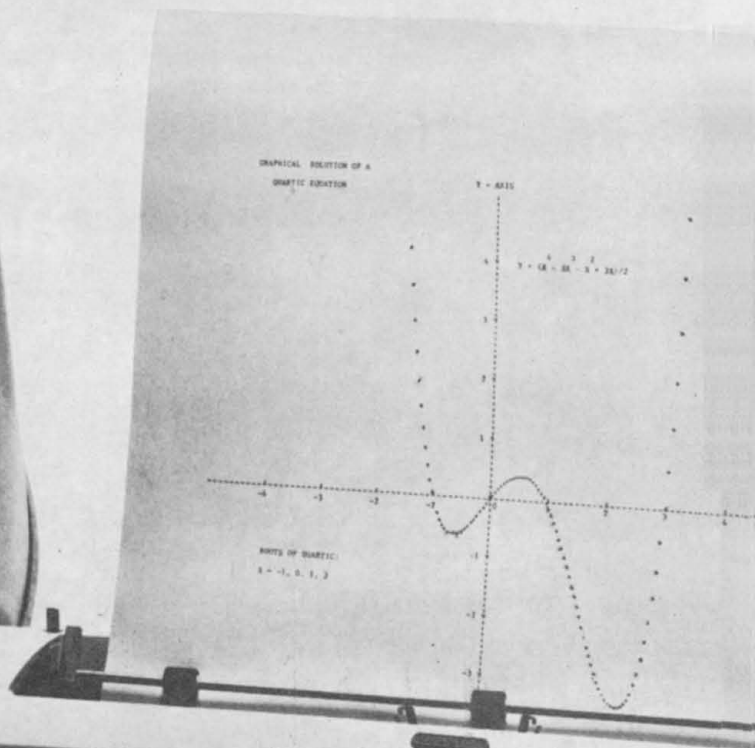


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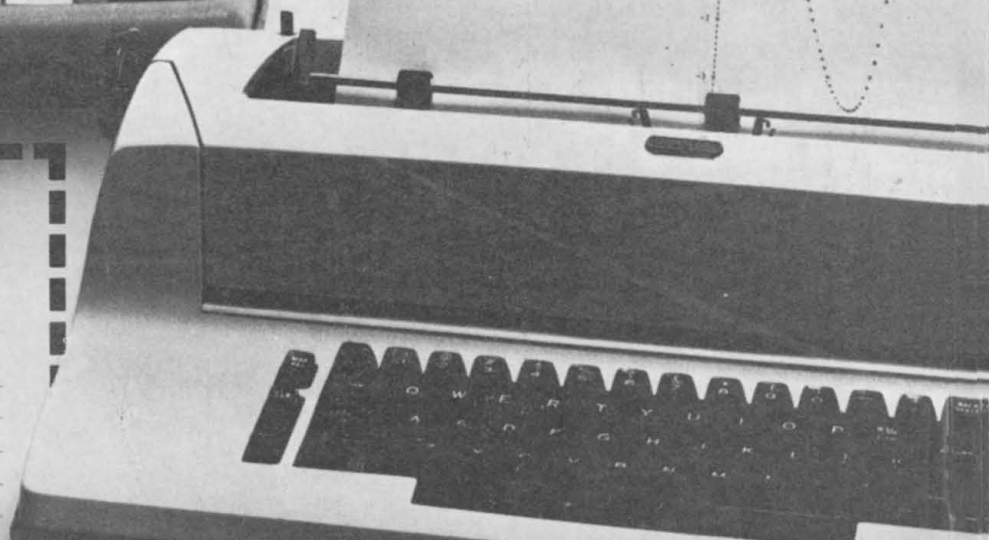


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strengthened since 1965, and the full appropriation of funds authorized some years ago is now making it possible to pursue pollution control at an optimum rate. The President is right when he states that the problem has to be attacked without delay: "It is literally now or never." I don't believe that the public commitment is shallow; the public can and will pay the costs. The additional cost for water and air pollution control, even at the higher level of the next 4 to 5 years, will still be only about half of the cost of garbage collection and disposal. The total national expenditure for all forms of waste control will be substantially less than 1 percent of the gross national product.

It is clear that Etzioni is unhappy about the possibility that pollution control might take attention and funds away from many pressing domestic problems. One reason for the strong support for pollution control may be that the public and the Congress are aware that at last we have all the tools—the laws, the scientific technical know-how, and the resources—to restore the quality of the environment to a much higher level, hopefully to a purity that hasn't been seen in this country for decades. Social problems, as opposed to engineering, are much more complex, and it is not clear that a given amount of funds can be guaranteed to improve schools or save the "57,000 Americans who will lose their lives on the roads in 1970." (Etzioni does not explain how this is to be done.)

Certainly, the elimination of pollution will not settle all other domestic problems. But a clean environment will make it easier to approach many of these social problems, particularly in the cities. It will improve the sanitation and the health of the very people who need help. Without doubt, the poorest people living in the least desirable parts of cities will benefit most from an improvement in environmental quality.

S. FRED SINGER

*Office of the Secretary,  
Department of the Interior,  
Washington, D.C. 20240*

... To state that if Louisiana's brown pelicans "were to disappear, it is still ridiculous to expect that the whole ecology would be thrown so out of equilibrium that our economy or society would collapse" is to view the problem through the wrong end of the telescope. The pelican's problem is of course not confined to Louisiana. A 1968 census along the entire Texas

coast turned up only 13 individuals and the prognosis for the West Coast population is equally dim. In 1969 the nesting season of the brown pelican in California and northwestern Baja California was almost a 100 percent failure.


From the estimated breeding population of 2000 pairs, each of which normally incubate a clutch of three eggs, only 150 young—none of them in California—were produced, a figure which recent field investigations by the San Diego Natural History Museum indicate will be even lower this year. As is now well-known, these nesting problems have been traced directly to DDT through a compelling chain of evidence, including the demonstrated inverse correlation between eggshell thickness and DDT residues in the eggs of several species of pelagic birds and the presence of as much as 2500 parts per million of DDE, the principal metabolite of DDT, in the yolks of the thin-shelled California pelican eggs. The sudden extinction of the brown pelican and other birds such as the bald eagle, the osprey, and the peregrine falcon will probably have little direct ecological impact. But when viewed as a symptom of a widespread and accelerating deterioration of our environment, and in fact of the very food supply upon which the ever growing human population must increasingly depend, the problem assumes its proper magnitude and character. . . .

DURWARD D. SKILES

*Department of Planetary and Space  
Science, University of California,  
Los Angeles 90024*

Etzioni believes that human problems should be handled before problems of the nonhuman environment. Unfortunately even a city slum dweller is affected by the nonhuman environment. A change of climate or only an increase in the CO<sub>2</sub> concentration of the atmosphere (and environmentalists warn about the layer of pollution which the SST would leave behind) could cause a rise in temperature. The melting ice caps of the globe could raise the level of the ocean to make Manhattan uninhabitable.

Poisons that kill laboratory animals are taken seriously, and hazard to man is inferred. But environmental poisons killing vegetation and wildlife are dismissed as unimportant. On the contrary, the death of brown pelicans *does* imply that the spread of insecticide poisons may be a hazard to man, be-



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cause man, like the brown pelican, is at the end of the food chain. The dead pine branches along the roads leading to Boston, and presumably to any city, indicate that pollution is killing trees, and to believe that man is resistant while vegetation is not is probably unwarranted. Environmental problems affect the purity of water supply to city dwellers, the disposal of their garbage, their ability to find swimming beaches or recreation areas.

There is no question that the lot of the disadvantaged should be improved and that education is in a crisis. Education must concern itself not only with the problems of people, but also with the problems of biology as it relates to man, a relationship that Etzioni appears not to see.

HERBERT W. LEVI  
*Museum of Comparative Zoology,  
Harvard University,  
Cambridge, Massachusetts 02138*

Etzioni's editorial is the type of irresponsible article which should not appear in a scientific magazine. He offered no concrete evidence that "newly found environmental dangers are vastly exaggerated," or that a great number of people do not face starvation and plague within the next 10 to 15 years. While Etzioni and his contemporaries quibble about which priorities have priority, the world population continues to grow at an alarming rate (doubling every 35 years). Unless the population growth can be stopped, none of mankind's environmental problems can be solved.

LEON MATTICS  
*Mobile, Alabama*

*The above excerpts from letters commenting on Dr. Etzioni's editorial are representative of more than 35 letters which were received. Lack of space prevented publication of others.—ED.*

In the few months that have passed since my editorial was published, the antipollution fad has already subsided considerably. By fall the ultraactivists should be ready for the new Cause of the Year, while those of us seriously committed to fighting pollution can settle down to the long, arduous, significant project before us.

A major question raised by practically all the letters published here (and in the many others which reached me) concerns the definition of the problem. My editorial dealt with pollution; most of my correspondents see it as an inte-

gral part of the environmental crisis, in which they include overpopulation, hunger, lack of housing, crime, and more generally, the quality of life. Here too, the dangers are often exaggerated; most experts now agree that we are not about to run out of prime resources, or to multiply to the point of global starvation. But, I do see a more immediate and severe threat in any one of these problems than in that posed by pollution, which is one reason I referred to its abatement as the wrong *top* priority.

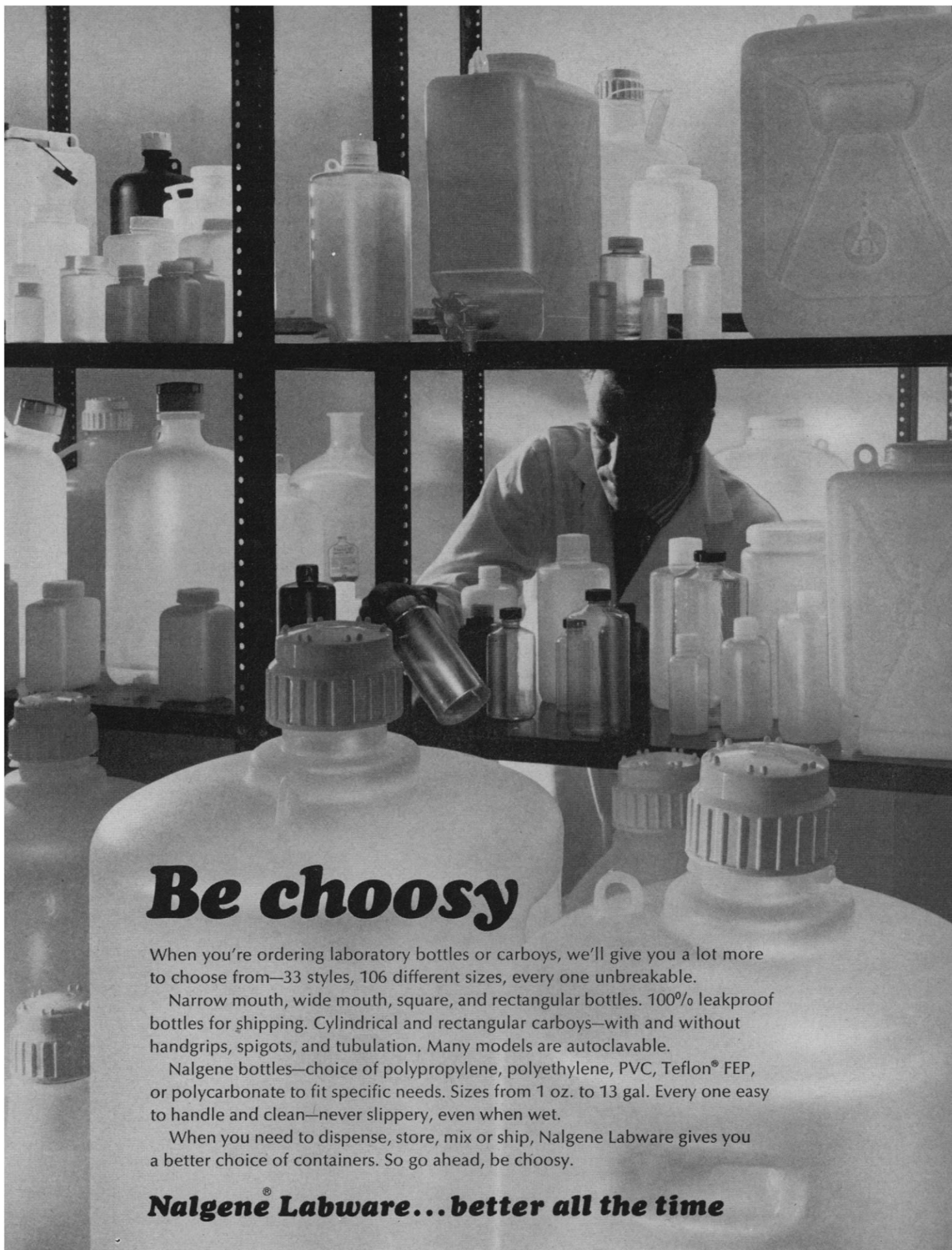
To roll all these problems into one, or to assume that by handling any one we can seriously help solve the others, is a grave mistake. A detailed examination would show that most problems are *not* that closely interrelated and that they differ in their degrees of linkage. For instance, the reduction of pollution alone would have little effect on the other problems listed; effective population control could do relatively much more for pollution control.

But, if lump we must, let me say that improving "man's relations with his environment" benefits little from a wild pell-mell onslaught, but requires the kind of sustained, encompassing, deeply based effort I advocated. And, if there must be one central Archimedean point, I still see it as the shifting of our collective energies away from the production of more consumer goods and wars, toward our impoverished domestic public sector.

As to the traffic fatalities, those could be cut very substantially: (i) by introducing the British road test for detecting drunken drivers (with a greater focus on the hard, rather than the social, drinker); (ii) by implementing the Swedish system of hard labor for all offenders; (iii) by asking our engineers to further develop a radically safer car; and (iv) by requiring the auto makers and importers to sell only these safer cars.

It seems that in expressing our concern we tend toward alarmist generalizations, throwing together everything from plagues to pelicans. However, sustained enlightened citizen participation in mobilization for change requires attention to the differences among the parts, to the linkages among them, to the points of leverage, and to the setting of priorities. A movement pursuing the most recent "fix-it" fad will not go very far, least of all, forward.

AMITAI ETZIONI  
*Department of Sociology,  
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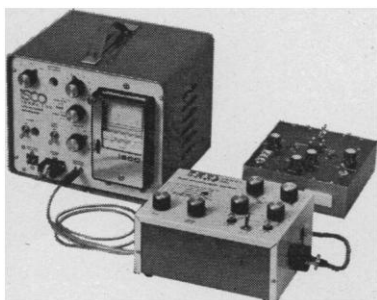
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Seven years ago, in an outpouring of grief, two names of eloquence and beauty were obliterated, both simply yet powerfully evocative of mood, time, and place and both emblematic of our scientific and technological past.

One sounded of wind and sky and sea marsh and of the elusive, temporary, transient world to be found at the end of a long and (originally) slow and noisy trans-Atlantic flight—the other of conquistadors and sand, dawn over the Caribbean, and clangorous, caparisoned, metallic monsters pointing skywards. Idlewild and Cape Canaveral! One saw the development and arrival of the first, regular, land-based trans-Atlantic flights, the transition of the warplane into the civil airliner, the replacement of the piston engine by the turboprop and its replacement by the jet; the other, the initial agonizing experiments and preparation for man's eventual journey to the Moon.

It is now 1970. Man has journeyed to the Moon and Man has landed on the Moon. The hopes and aspirations of the late President Kennedy have been realized. As scientists can't we be persuaded to include in our concern for conservation a concern for language? Without in any way diminishing our respect for the late President, may we ask that these two names be restored and that "Kennedy" be reserved for the Kennedy Space Center?

PATRICK ARTHUR HILL

Department of Geology,  
Carleton University,  
Ottawa 1, Canada

## Water Vapor in the Stratosphere

In Nuessle and Holcomb's article "Will the SST pollute the stratosphere?" (26 June, p. 1562), the results of our study are quoted incorrectly. According to the results from our model of radiative, convective equilibrium of the atmosphere (1), the doubling of the water vapor *everywhere* in the stratosphere may increase the temperature of the earth's surface by about 0.6°C and decrease the temperature of the stratosphere by about 1.5°C provided that the change in the stratospheric water vapor does not affect the cloudiness. Our result does not apply to the situation reported by Machta in which doubling of water vapor occurs only

in a narrow latitudinal belt. It should be noted that the effects of local increase of stratospheric water vapor may not be confined to the local area because of the rapid horizontal mixing of air masses due to large-scale atmospheric circulations.

SYUKURO MANABE

*Geophysical Fluid Dynamics  
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Princeton University, P.O. Box 308,  
Princeton, New Jersey 08540*

### Reference

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## Reply from Argentina

The letter by Geschwind and several distinguished scientists (6 Mar.) in which they express their concern about "the internment without trial of many Argentinian scientists" and their appeal that "free right of contact with them of their family and friends" be permitted has caused us great concern because it describes our situation as bordering on a concentration camp. This grossly exaggerated description may give an erroneous idea of the effort made in Argentina toward scientific progress and may confuse our scientists abroad. It also affects the reputation of our scientific community as a whole and that of many of us who occupy positions in academic institutions.

Although we have had numerous problems, especially in 1966, we consider that the situation is good in relation to what occurs in other parts of this troubled world. Evidently our information is different from that of Geschwind *et al.* since at present we do not know of any scientists interned or denied the right of contact with family and friends.

We are grateful to our American colleagues for the sympathy and goodwill which prompted the writing of their letter. It is comforting to know that we may count on their help when necessary.

CÉSAR VÁSQUEZ

EDUARDO DE ROBERTIS\*

*Faculty of Medicine, University of  
Buenos Aires, Paraguay 2155,  
Buenos Aires, Argentina*

\* This letter was also signed by J. M. Dellacha, V. Deulofeu, V. G. Foglia, P. J. Garrahan, B. A. Houssay, L. F. Leloire, R. E. Mancini, A. C. Paladini, A. Pellegrino de Iraldi, A. F. Rega, J. A. Santomé, A. Solari, A. O. M. Stoppani, E. Strajman, O. Vilar, R. A. Zardini, and L. M. Zieher.

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## The National Goals Research Staff Report

In an increasingly complex society the federal government inevitably expands its jurisdiction over many aspects of human activity. Aside from the usual complaints of red tape, timidity, and bureaucracy, there is a serious danger in this trend. A government run by politicians is preoccupied with the hot crisis of the moment—it is not interested in dealing effectively with important long-range matters. Politicians usually cannot afford to look beyond the next election and are responsive to the public's mood of the moment. The public, in turn, is under the influence of the mass media, particularly television. To maintain interest, the mass media must have a succession of disasters and crises.

The government responds to public clamor with programs specifically designed to apply a soothing poultice to the inflamed portion of the body politic. Possible, far-reaching consequences of legislation are seldom considered, despite the fact that we have repeatedly found that well-intentioned programs often produce undesirable side effects.

In a much needed attempt to improve the national decision-making processes, President Nixon last July established a National Goals Research Staff. The role assigned to the Staff was to analyze social trends and to make projections about the kind of society that could result, if present trends continue, to forecast future developments, and to pose alternatives for the future domestic life of the nation.

The National Goals Research Staff addressed itself to population growth and distribution, the environment, education, basic natural science, technology assessment, and consumerism; its report\* has just been released. For such an ambitious undertaking, the full-time staff was small, and the breadth of its expertise or that of its consultants inadequate. Chapters on population growth and distribution, education, and basic natural science are good. Those on technology assessment and consumerism are only fair. The discussion of the environment is poor. No goals are set forth. The report shows signs of being thrown together hurriedly.

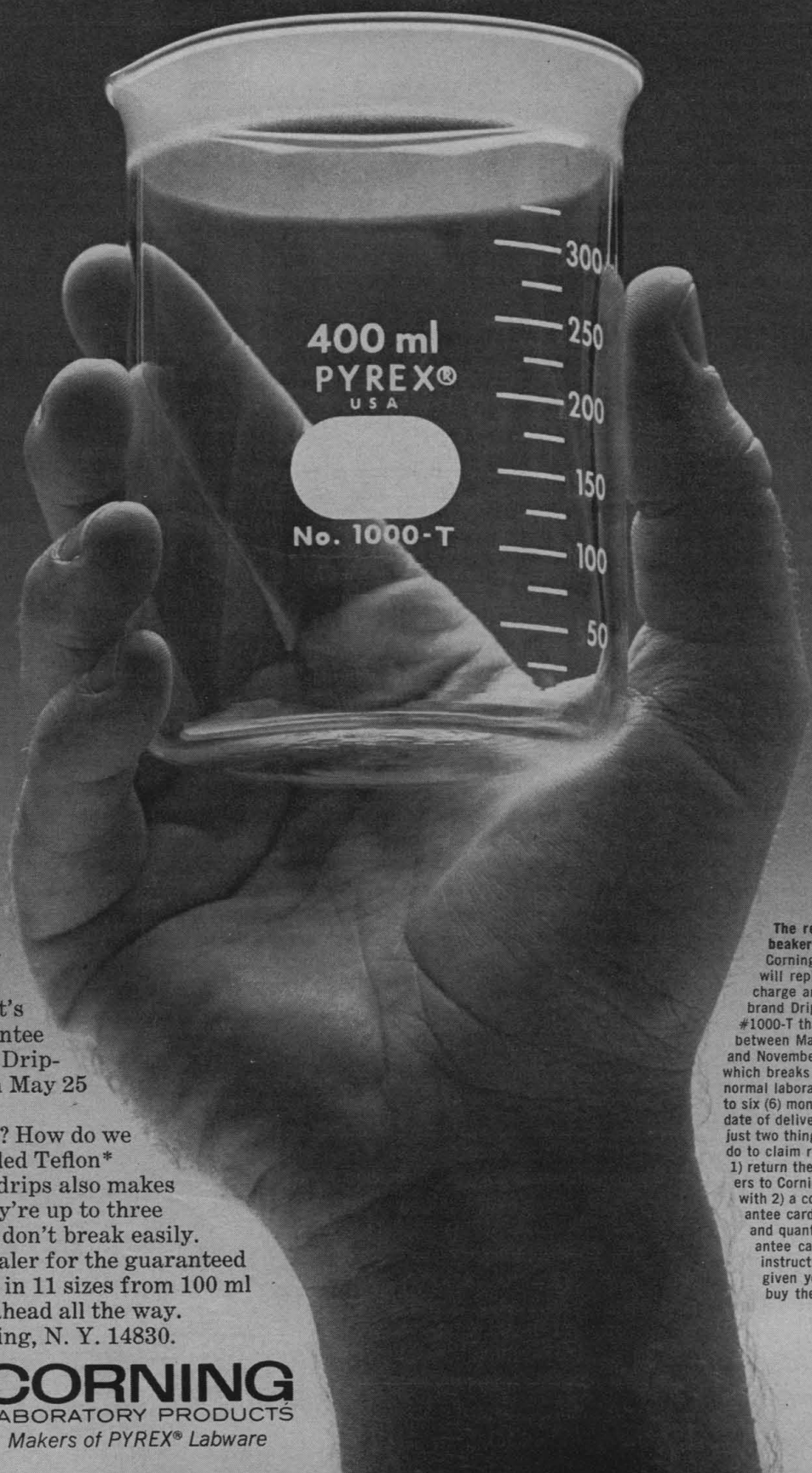
A saving feature is an unusually gracefully written introduction by Daniel P. Moynihan. His essay demonstrates a keen grasp of the need for better analysis and long-range planning if government is to function well. Apparently, it was Moynihan who prevailed on President Nixon to establish the National Goals Research Staff and to issue a statement, which appears in the report, outlining the grand objectives of the venture. However, something in Moynihan's experiences of the past year has caused him to turn cautious. He writes, "The difficulty with national goals is that they too quickly become standards by which to judge not the future but the present. In a sense, they institutionalize the creation of discontent. The setting of future goals, no matter how distant, drains legitimacy from present conditions. Once it is established and agreed upon that the future will have to be very different from the present, it becomes absurd to be content with the present. The past is annihilated. The most extraordinary progress counts for little if it has brought society only to a middling point in an uncompleted journey."

It appears that the experimental attempt that began a year ago to bring more planning into government is being abandoned. In a press conference devoted to the report, Moynihan revealed that the Staff is now being dispersed. However, the need for long-range analysis and planning has not been met, nor will it disappear. The President has a responsibility in the matter which, if unfulfilled, is likely to become the province of Congress.—PHILIP H. ABELSON

\* "Toward Balanced Growth: Quantity with Quality," report of the National Goals Research Staff (U.S. Government Printing Office, Washington, D.C., 4 July 1970).



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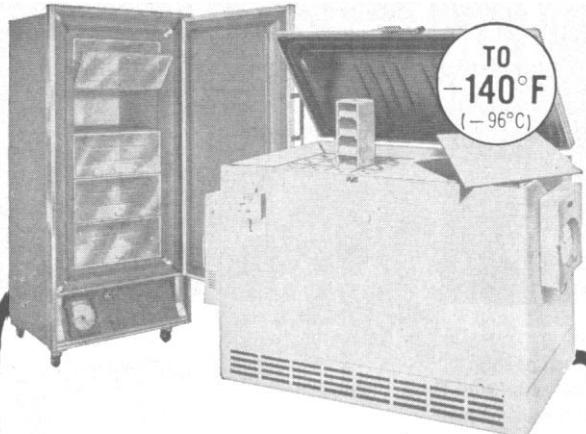
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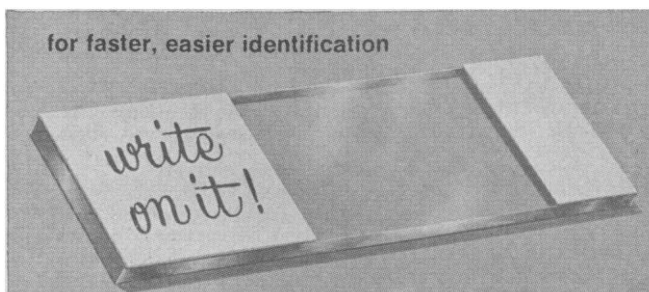
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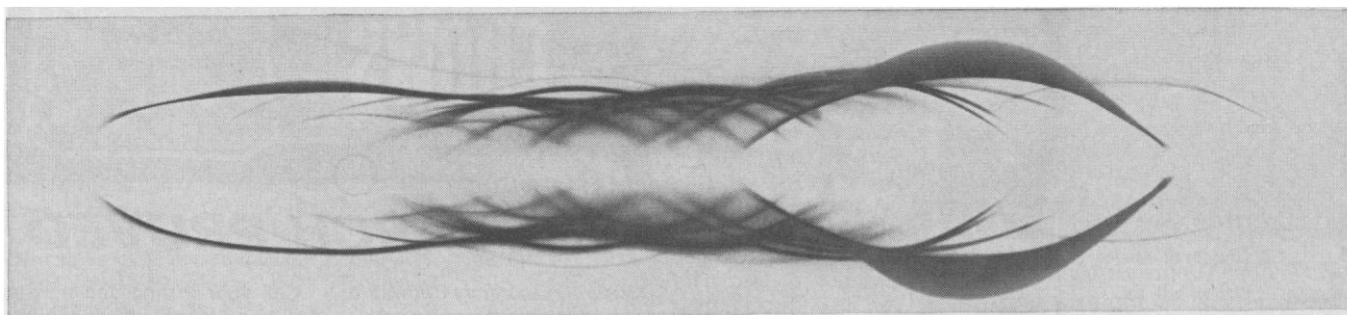
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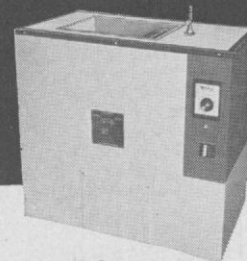
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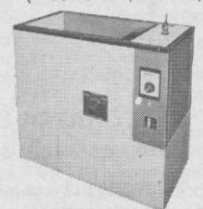


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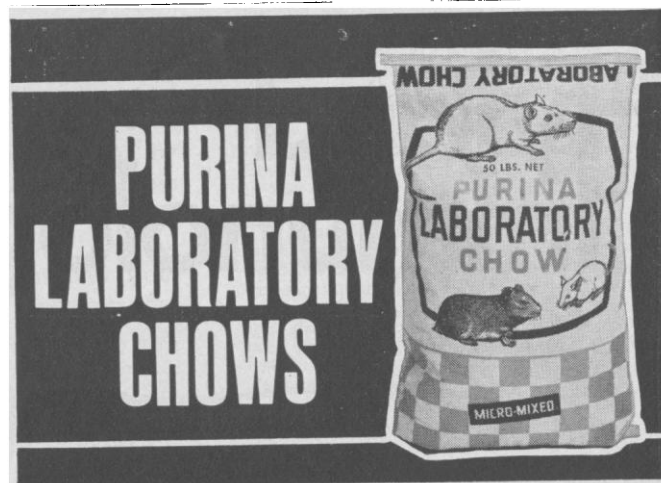
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**General Chemistry.** Linus Pauling. Freeman, San Francisco, ed. 3, 1970. xvi + 962 pp., illus. \$12.50.

**Geometry of Numbers.** C. G. Lekkerkerker. Wolters-Noordhoff, Groningen; North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. x + 510 pp. \$29. *Bibliotheca Mathematica*, vol. 8.

**Handbook of the Birds of India and Pakistan.** Together with those of Nepal, Sikkim, Bhutan and Ceylon. Salim Ali and S. Dillon Ripley. Vol. 3, Stone Curlews to Owls. Synopsis Nos. 435-665. Oxford University Press, New York, 1969. xvi + 328 pp. + plates. \$12.95.

**Handbook of Probability and Statistics with Tables.** Richard Stevens Burington and Donald Curtis May, Jr. Revised by R. S. Burington. McGraw-Hill, New York, ed. 2, 1970. xiv + 466 pp., illus. \$9.95.

**Heterospecific Genome Interaction.** A symposium, Philadelphia, October 1968. Vittorio Defendi and Pamela W. Brown, Eds. Wistar Institute Press, Philadelphia, 1969. viii + 180 pp., illus. Paper, \$7.50. Wistar Institute Symposium Monograph No. 9.

**Holographie.** M. Françon. Masson, Paris, 1969. viii + 128 pp., illus. Paper, 40 F.

**House Officer Training.** A Casual Perspective. Robert H. Moser. Thomas, Springfield, Ill., 1970. xvi + 112 pp. \$5.75. American Lecture Series, No. 768; American Lectures in Medical Writing.

**The Human Adrenal Gland and Its Relation to Breast Cancer.** First Tenovus Workshop, Cardiff, Wales, June 1969. K. Griffiths and E. H. D. Cameron, Eds. Alpha Omega Alpha, Cardiff, 1969. iv + 122 pp., illus. Paper, \$4.

**An Illustrated Guide to Linear Programming.** Saul I. Gass. McGraw-Hill, New York, 1970. xii + 180 pp., illus. \$9.95.

**Imagination and the Growth of Science.** A. M. Taylor. Schocken, New York, 1970. xiv + 110 pp. Paper, \$1.75. Reprint of the 1967 edition.

**Immigration and Nationalism.** Argentina and Chile, 1890-1914. Carl Solberg. Published for the Institute of Latin American Studies by the University of Texas Press, Austin, 1970. xvi + 224 pp., illus. \$6.50. *Latin American Monographs*, No. 18.

**The Impact of Computers on Organizations.** Thomas L. Whisler. Praeger, New York, 1970. xvi + 192 pp. \$11. *New Directions in Management and Economics*.

**Industrial Rheology.** With Particular Reference to Foods, Pharmaceuticals, and Cosmetics. P. Sherman. Academic Press, New York, 1970. xii + 424 pp. + plates. \$19.50.

**Information, Mechanism and Meaning.** Donald M. MacKay. M.I.T. Press, Cambridge, Mass., 1970. x + 198 pp. Cloth, \$8.95; paper, \$2.95.

**Information Storage and Retrieval Systems for Individual Researchers.** Gerald Jahoda. Wiley-Interscience, New York, 1970. xvi + 144 pp., illus. \$8.95.

**Instructor's Manual to Accompany The Behavior of Matter.** Laboratory Experi-

ments in Introductory Chemistry. Sydney S. Biechler. Houghton Mifflin, Boston, 1969. viii + 80 pp. Paper, \$1.65.

**The Intelligent Eye.** R. L. Gregory. McGraw-Hill, New York, 1970. 192 pp., illus. \$7.95.

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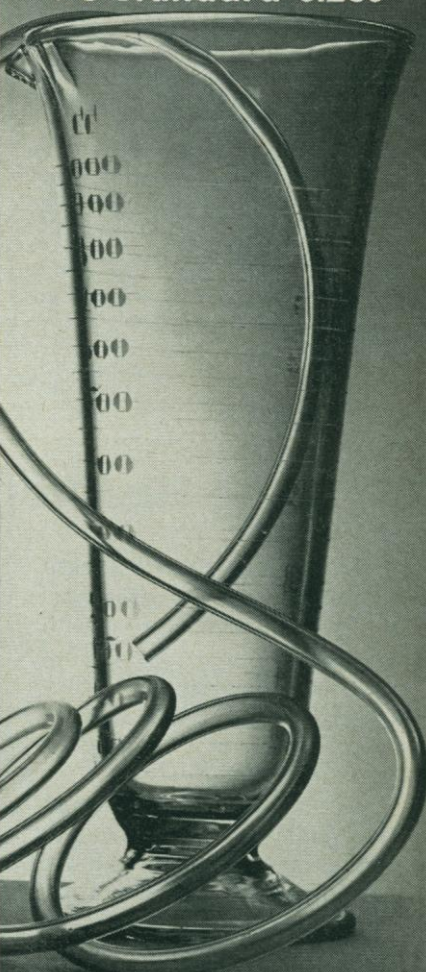
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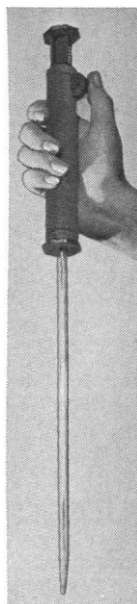


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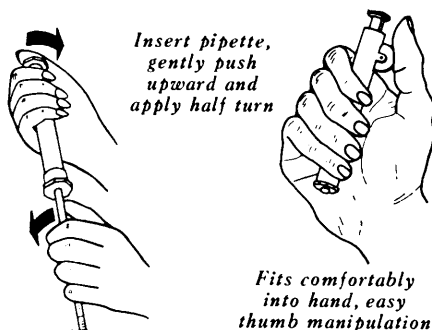
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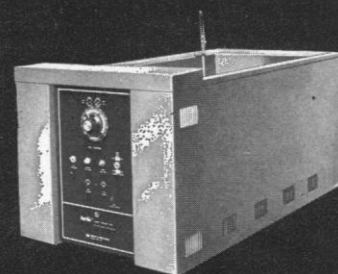
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