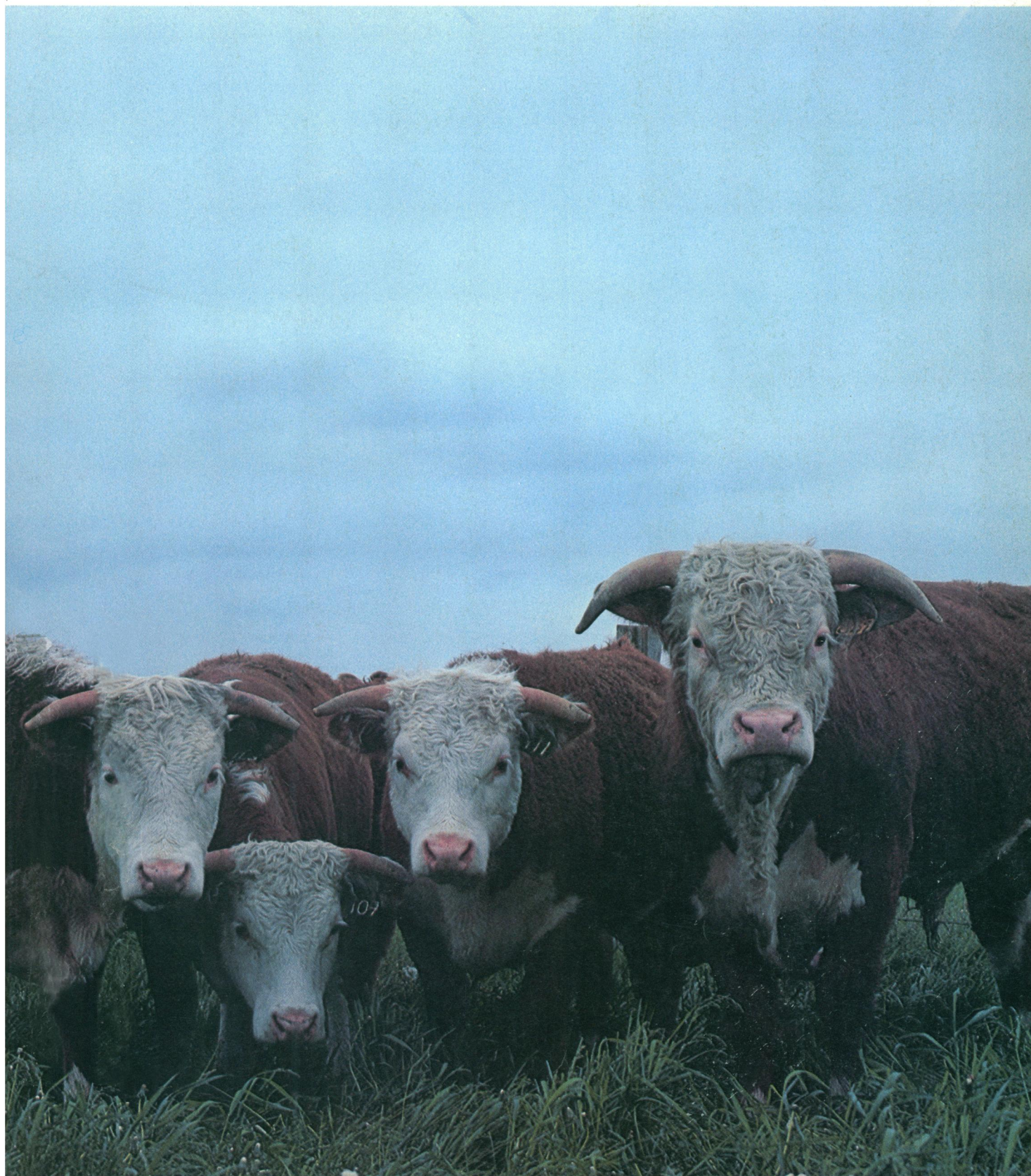


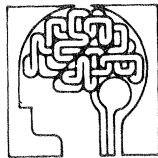
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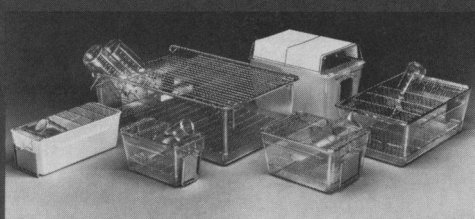
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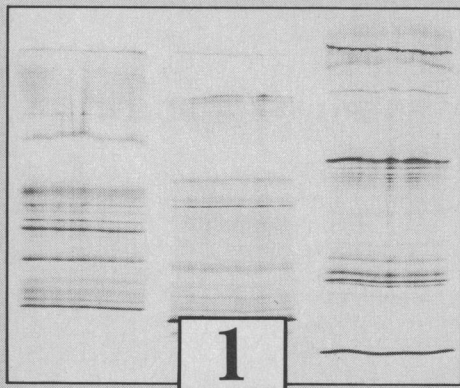
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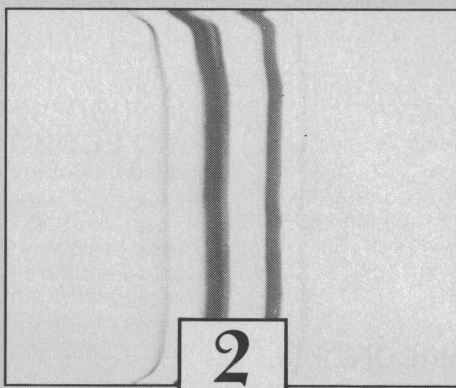
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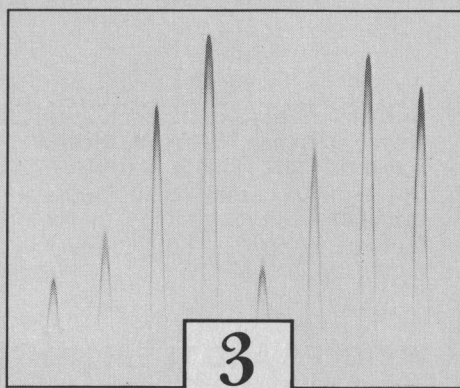
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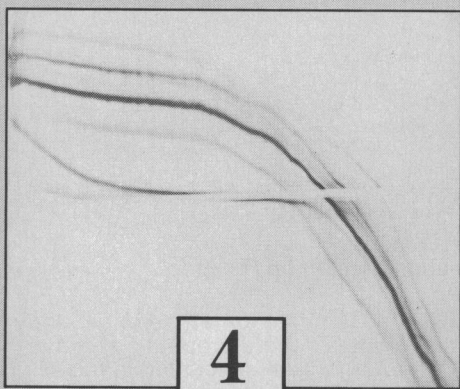
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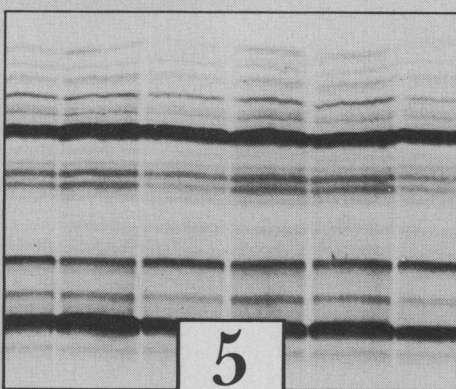
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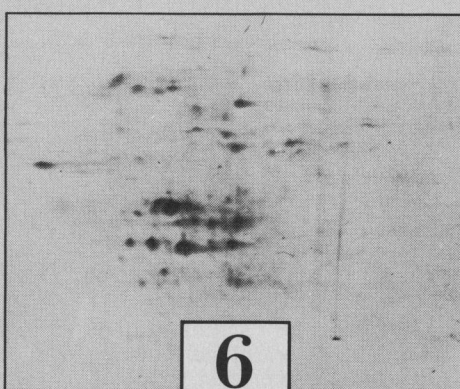
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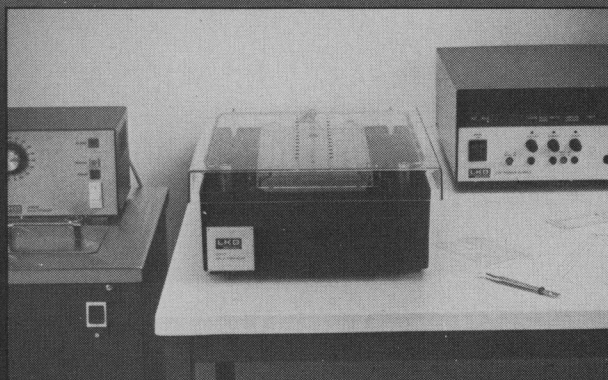
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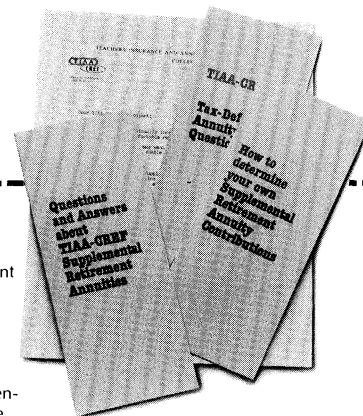
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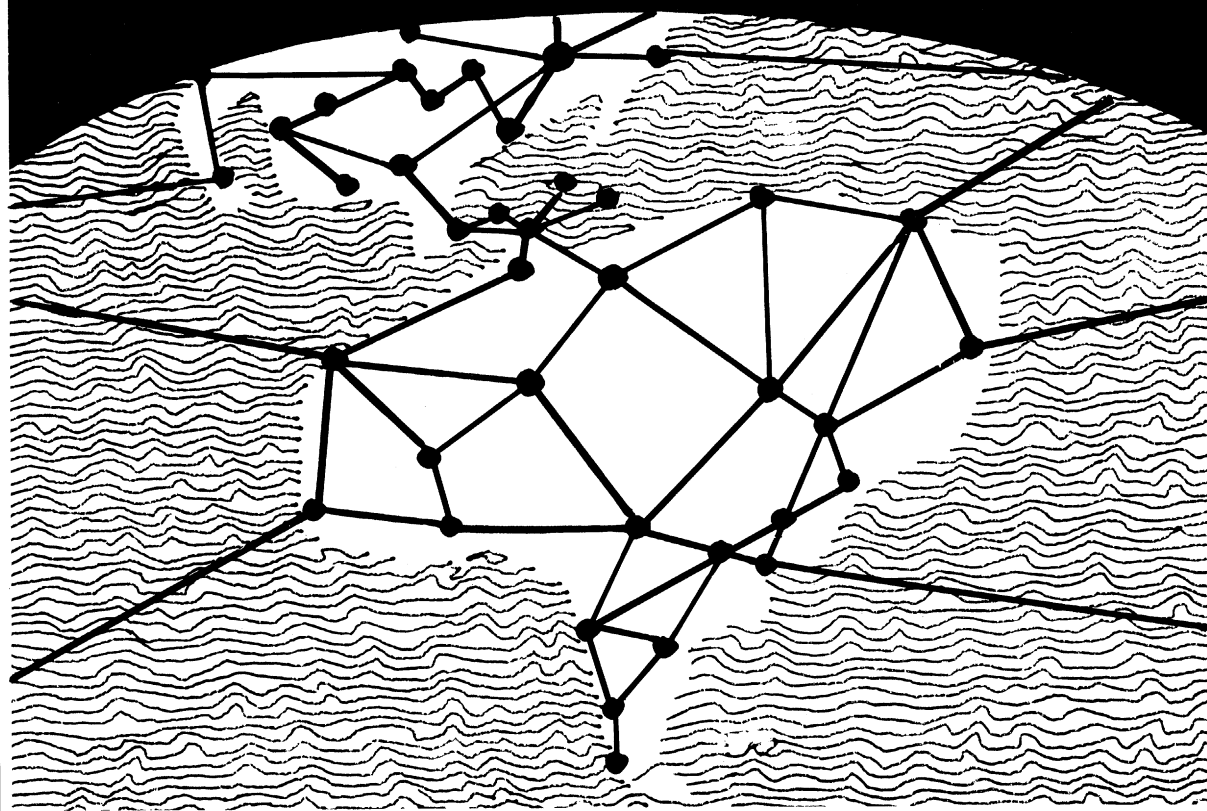
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Digital Precision and the Analog Animal

The study of physiological phenomena in laboratory animals has developed into a precise science involving exacting test techniques. Until recently however, the experimentalist has been severely limited by available instrumentation. Whether studying a transient muscle twitch or repetitive heart pulse, the analog oscilloscope and chart recorder have been the standard tools. Recording of data on such instruments is, at best, a rough and

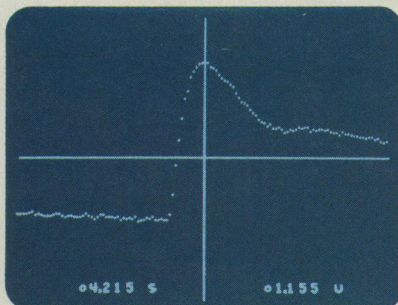


Fig. 2—Expansion of selected area for detailed analysis (up to X 256)

can be viewed live, compared to a reference waveform or stored in both report-ready and computer-compatible formats.

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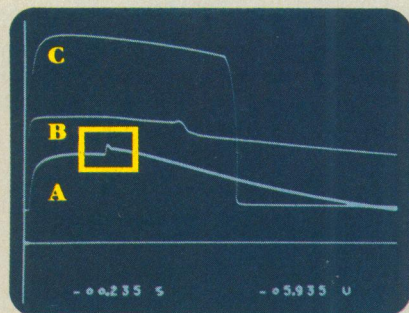


Fig. 1—Tetanic response in avian embryonic muscle after 15 days (A), 17 days (B), and 19 days (C) *in ovo*.

Figure 1 shows tetanic responses from an embryonic chicken muscle after 15, 17 and 19 days *in ovo*. These responses were captured and stored on a Nicolet digital oscilloscope then recombined on the screen for comparison. The high resolution and expansion capabilities allow detailed examination of small changes as shown in Figure 2. Cursor-interactive coordinate display eliminates the need to estimate amplitude or latency values of a waveform feature. Stored waveforms can be displayed or plotted in XY or YT format, transferred to internal disk memory for permanent storage or output to other computing devices via industry standard interfaces.



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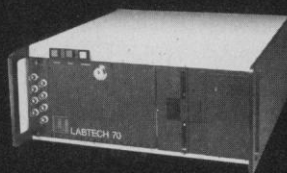
	LABTECH 70	IBM INSTRUMENTS 9000	DEC MINC-23 (RSX-11M)
Analog Data Acquisition Speed (12 bit conversions)	357,000 rps*	30 rps	16,110 rps
Real-Time Multitasking Ability	64K Tasks	7 Tasks	64K Tasks
Standard System Languages	FORTRAN 77	BASIC	BASIC
Floating Point Hardware	Yes (80 bit)	No	Yes (64 bit)
Multi-User Ability	Yes	No	Yes
Menu-Driven Software Included in Basic System	Curve fitting, Non-linear regression, Graphics, Networking	None	None
Networking	Any ASCII compatible computer	ASCII networking promised	DEC computers only
Standard Winchester	Yes	No	No

* Readings per second.

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suggest that 200 $\mu\text{g}/\text{m}^3$ is appropriate and byssinosis symptoms suggest 500 $\mu\text{g}/\text{m}^3$.

Turning to the testimony of one of us (H.W.) at the OSHA hearing in 1977, our research findings, as summarized above, demonstrate a range of dust levels within which a prudent permissible cotton dust exposure limit should be established. This range reflects the scientific uncertainties that frequently must be accepted in public policy decision-making. Indicating that this range is 200 to 500 $\mu\text{g}/\text{m}^3$ does *not* say that the upper value should be used to promulgate the standard, nor that the lower level is inappropriate; we have said neither, then or since. Quite to the contrary, we have supported the standard and have never suggested a more permissive revision, a fact recently reported in an editorial by an investigator (4) whose data and conclusions are heavily supported by Frumin.

The following excerpts from H.W.'s testimony, which Frumin does not quote, conflict with his characterization of this testimony (5):

There is a dose-response relationship between exposure to cotton dust and a biologic effect, measured either with the questionnaire or pulmonary function testing. (page 314)

I strongly favor the prevention of the demonstrated reduction in air flow as measured spirometrically or obtained through the questionnaire responses. Because, ultimately, [by] preventing the bronchial constrictive effect, I think we will probably prevent the chronic disease. (page 317)

Assuming that there is a relationship between the acute and chronic response, and I have no reason to believe there is not, then the detection of such a response or reaction is obviously highly desirable, because it allows an individual to modify his or her exposure in order to effect prevention of further changes. (pages 363-364)

I don't know how to assess the contribution, say, of cigarette smoking in an individual like that and dust exposure, and I think probably, as has been done in other industries, the presumption may have to be made that that exposure may have played a role and, therefore, further exposure is contraindicated. (page 387)

I've said throughout that the dust effect is real and it's there, but in addition to a dust effect there is also an influence exerted by something else which we're not measuring having to do with mill. . . . (page 432)

Neither science or occupational health benefits from misleading descriptions of research findings or publicly stated views on public policy issues.

HANS WEILL
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Department of Medicine,
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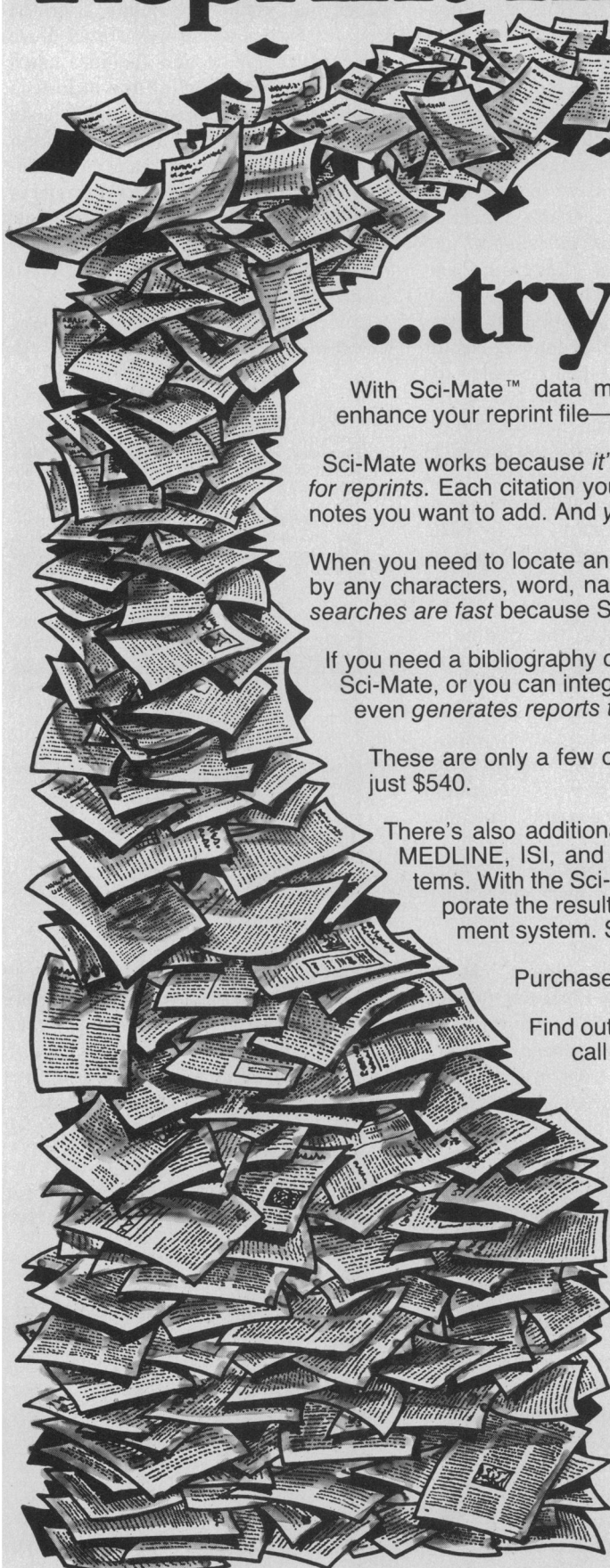
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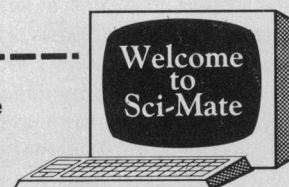
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terrupted operation. In remote locations, you can operate totally from battery power. A "sleep" mode conserves power by putting system components on standby until needed. With HP-IL you can even upgrade to the more powerful HP85 personal computer for tougher data-logging tasks.

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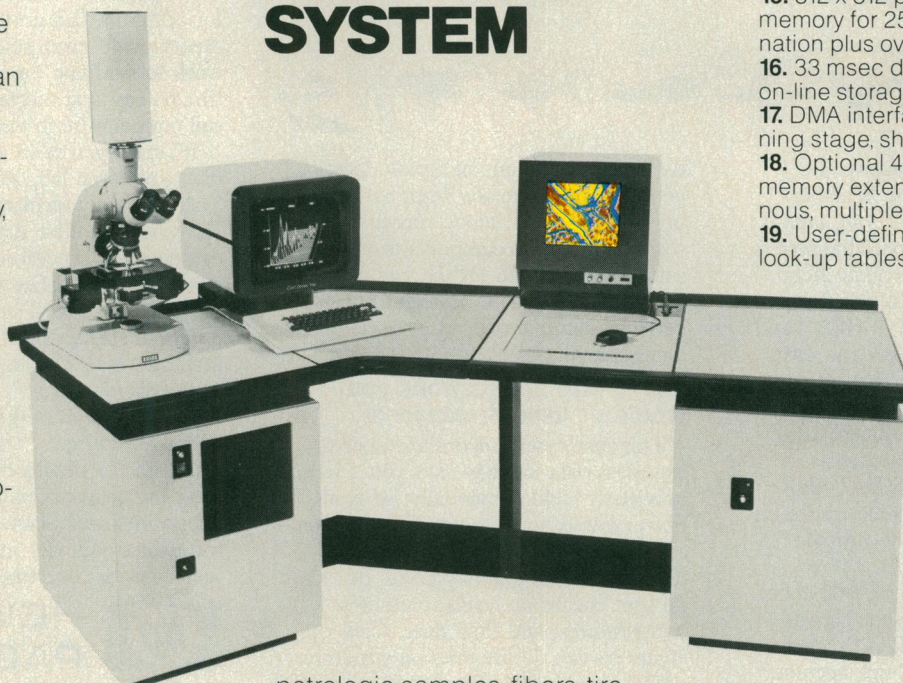
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Whither the Price of Oil?

Virtually all the experts agree that the price of petroleum will drop. But uncertainty prevails about how much it will fall or when. This is a trillion-dollar matter. The world's economy grew vigorously in the decades before the first big rise in the cost of oil in 1973–1974. The world has experienced inflation and recession since the further rise in 1978–1979.

A major lesson of the past decade is that in the short term (a year) demand for petroleum is inelastic. The price increases of 1978–1979 had little immediate effect on consumption. However, since 1979 profound changes have occurred in the availability and use of hydrocarbons. Consumption of oil has dropped while production in countries other than those of the Organization of Petroleum Exporting Countries (OPEC) has increased. As a result, OPEC countries are selling only about half as much oil as they did in 1978, and they have a large idle capacity. The incremental cost of producing additional barrels of oil in many instances is of the order of a dollar or two or less. Countries in or out of OPEC that urgently need money will tend to increase production, shaving the price if necessary, to sell their oil. Since in the short term demand is quite inelastic, the probability is substantial that a chaotic downward price movement will occur. Through strenuous efforts the cartel may be able to slow the move, but this would only lead to a continuing decrease in the use of oil and a longer period of price instability. After 5 to 10 years of lower prices, demand will probably increase substantially, and production capacity for oil will fall due to gradual exhaustion of wells. The stage would then be set for increasing prices.

However, the circumstances that made possible the great increases of the 1970's are not likely to return soon. For example, since 1978 imports of petroleum and its products into the United States have dropped from 8.4 million to about 4.5 million barrels of oil a day. Part of this decrease is due to recession, but most is due to conservation, greater energy efficiency, and substitution of other energy sources for oil. Initial responses to higher fuel prices were followed by more enduring changes. Homes were insulated. The energy efficiency of industry was gradually improved. New automobiles and airplanes require less fuel. Efforts to achieve greater energy efficiency will not be stopped by small changes in the price of oil.

In the United States, and especially in Western Europe, substantial quantities of oil were burned merely to make heat. Often, as in the generation of electricity, coal can be employed. Its energy cost is usually far less than that for oil. A decade ago, 2.1 million barrels of oil a day were burned in the United States to make electricity. Now less than 1 million barrels a day are used, and the trend is downward as more coal-fired and nuclear plants come on line. The forest products industry has curtailed its use of oil and instead is burning wood wastes. Home heating oil faces future competition from electrically driven heat pumps. Another factor leading to less consumption of petroleum is that refiners now obtain more gasoline and heating oil from a barrel of crude oil. What was once burned as cheap residual oil is now being converted to premium products.

The momentum of efforts to reduce consumption of oil in the United States is considerable. It will not be stopped quickly. A drop in price to \$20 a barrel would have little effect on the competition of oil with coal. However, it would affect the market for natural gas. Some gas might be replaced by oil. Research and development related to alternative energy sources would be further curtailed and exploration for gas and oil would be slowed, leading to later shortages. But for the shorter term, a drop in price to \$10 or less a barrel would be required to make a substantial change in U.S. consumption of oil. In other countries, circumstances differ. For example, in Western Europe, coal is relatively more expensive than it is here. Oil would compete successfully at about \$20 a barrel. But on a worldwide basis, a short-lived drop in the price of oil to \$15 a barrel or less is a lively possibility.—PHILIP H. ABELSON

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1. General Motors Proving Grounds Headquarters. Friday, 27 May, 8:00 a.m.–12:30 p.m. (Limit: 42 persons)

The GM Proving Grounds incorporate the most modern and complete facilities available for vehicle testing, covering more than 4,000 acres with a road network of more than 128 miles. Test roads include Belgian block, concrete block, engineered pothole, and other special surfaces; water and mud baths; vehicle handling test roads; hill test sections of up to 21 percent grade; and a 4.5 mile perfect circle for high-speed testing.

2. General Motors Technical Center. Friday, 27 May, 8:30 a.m.–12:30 p.m. (Limit: 42 persons)

The Tech Center is where GM brings its scientific and technical resources together. Areas of interest include the Semiconductor Clean Room, Metal Physics Laboratory, Engine Test Cells, robotics testing and development facilities, and the first full-scale automotive aerodynamics wind tunnel in the Western Hemisphere.

3. Warner-Lambert, Inc. Pharmaceutical Research Division. Friday, 27 May, 8:00 a.m.–2:00 p.m. (Limit: 42 persons)

This tour will visit pharmacology and chemistry laboratories, and follow the course of a new drug candidate through these and other departments. Company representatives will be available at a "Q&A" session. The scientific and administrative support required to market a new drug will be explained, and the effects of drug regulations will be discussed.

4. Detroit Arsenal Tank Plant (USATACOM). Friday, 27 May, 12:30–3:30 p.m. (Limit: 42 persons)

The M1 tank is built in this plant. Visitors will see the interior of the M1 and its predecessor, the M60 tank, and the M1 manufacturing process. The M1 design incorporates a digital computer ballistics system, neodymium laser range finder, a special armor capability, and a number of electronic control components.

Restricted tour; some foreign nationals may not participate.

5. Ford Motor Company. Friday, 27 May, 1:00–4:00 p.m. (Limit: 42 persons)

Ford's two newest research and development facilities: the Diversified Products Operations Technical Center, which concentrates on automotive electronic research and development, and the Robotics Center, designed to assist Ford facilities throughout the world in identifying the most sophisticated robotics and automation equipment for computer-aided manufacturing.

6. Stroh Brewery, Inc. Friday, 27 May, 6:00–9:00 p.m. (Limit: 120 persons)

Dinner at the famous Strohaus, followed by a tour of the brew house and packaging area. The featured speaker of the evening will be Dr. Morten Meilgaard, Vice President for Research and Development, who will talk about the chemistry of beer flavor. More than 240 separate flavor elements, each one linked to specific chemistry, contribute to the distinctive flavor of different beers. *This tour is of particular interest to biologists.*

7. Greenfield Village/Henry Ford Museum. Saturday, 28 May. Buses depart hourly, 8:30 a.m.–3:30 p.m.

Greenfield Village is a living history book, with 19 historic homes and shops, such as Thomas Edison's Menlo Park laboratory and Orville and Wilbur Wright's Cycle Shop, that have been removed from their original sites and carefully reconstructed at the Village. Walk through the Village at your own speed, following a map provided, or take advantage of the trains and horse-drawn carriages.

The Henry Ford Museum features 12 acres of historical collections, including carriages, bicycles, motorcycles, automobiles, trains, and aircraft. Artisans frequently give demonstrations of 19th-century machinery.

Separate tickets are required for the Village and the Museum (see order form).

8. University of Michigan. Saturday, 28 May, 9:00 a.m.–2:30 p.m. (Limit: 42 persons)

This guided tour of the University's Ann Arbor campus will include visits to the Highway Safety Research Institute, the Gerald R. Ford Presidential Library, biological science laboratories, and SCRIPT, a computer-aided subject information data bank. There will be a hosted luncheon at the Michigan Student Union restaurant.

9. Wayne State University Campus. Saturday, 28 May, 8:30 a.m.–1:00 p.m. (Limit: 42 persons)

This tour will include the Walter Reuther Library; the Van de Graaff accelerator/positron experiments; non-linear optics and photoacoustics experiments; laser facilities used for art verification, analytical tools, and laser chemistry; the Radiation Oncology Laboratory and x-ray crystallography work; electron microscopy; and the University's safety automatic sled crash tester. A buffet luncheon will be served.

10. Greenfield Village/Henry Ford Museum. Sunday, 29 May. Buses depart hourly, 8:30 a.m.–3:30 p.m.

For details, see Tour No. 7.

11. Detroit Medical Center/Wayne State Univ. Medical School. Sunday, 29 May, 1:30–4:30 p.m. (Limit: 42 persons)

The Detroit Medical Center is one of the largest and most widely-recognized institutions of its kind in the nation. Included in this tour will be the Wayne State University School of Medicine; the emergency medicine department of Detroit

Receiving Hospital; the Radiation Oncology Center; the Comprehensive Cancer Center of Metropolitan Detroit; the Wayne State University Comprehensive Sickle Cell Center; and the Kresge Eye Institute.

12. Enrico Fermi 2 Nuclear Power Plant. Monday, 30 May, 12:30–5:00 p.m. (Limit: 42 persons)

Scheduled for completion in 1983, the Fermi 2 nuclear power plant is now under construction near the historic Fermi 1 development fast breeder reactor. Conventional electric generating processes and equipment are combined with a boiling water reactor to generate up to 1,100,000 kw—enough electricity for a city of 1 million people. *Due to safety regulations, no one under the age of 14 will be permitted on this tour.*

Restricted tour; some foreign nationals may not participate.

13. Michigan State University. Monday, 30 May, 1:00–9:00 p.m. (Limit: 42 persons)

Some 16,000 plantings—7,800 species and varieties of trees and shrubs—make the MSU campus a botanical showplace,

especially in the month of May. This tour will include Beal Botanical Gardens, the oldest continually operated teaching facility of its kind in the nation, with 6 acres of more than 5,000 plant species; the Horticultural Gardens; and the new Wharton Center for the Performing Arts. In addition, there are optional tours of the National Superconducting Cyclotron Laboratory, the Mass Spectrometry Facility, the Energy Plant Research Laboratory, and the experimental farms. An authentic midwestern barbecue will be served (outdoors, weather permitting) at the end of the tour. .

14. General Motors Assembly Plant. Tuesday, 31 May, 8:30 a.m.–1:00 p.m. (Limit: 42 persons)

A firsthand view of the state-of-the-art technology and processes used to assemble Buick Skylarks and Oldsmobile Omegas, and the people who make it all work. Visitors will see the complex conveyor system that carries car chassis, bodies, and components to the appropriate point in the assembly process; the parts inventory and storage systems that keep assembly operation running without delays; and the complete automotive assembly process in operation.

Tour Tickets Order Form

Name _____

Institution or Company _____

Street Address _____

City _____ State _____ Zip Code _____

Foreign Nationals, please list: Place of Birth _____ Date of Birth _____

Indicate any special requirements due to a handicap: _____

Tour No.	Ticket Price	No. of Tickets	Tour No.	Ticket Price	No. of Tickets
1. GM Proving Grounds Headquarters (27 May)	\$ 9.00	_____	9. Wayne State University Campus (28 May)	\$ 9.00	_____
2. GM Technical Center (27 May)	9.00	_____	10. Greenfield Village or Henry Ford Museum (29 May)	10.00	_____
3. Warner Lambert, Inc. (27 May)	9.00	_____	Additional ticket to Village or Museum)	6.50	_____
4. Detroit Arsenal Tank Plant (27 May)	9.00	_____	*Specify departure time: _____		
5. Ford Motor Company (27 May)	9.00	_____	11. Detroit Medical Center (29 May)	9.00	_____
6. Stroh Brewery, Inc. (27 May)	13.75	_____	12. Enrico Fermi 2 Nuclear Power Plant (30 May)	9.00	_____
7. Greenfield Village or Henry Ford Museum (28 May)	10.00	_____	13. Michigan State University (30 May)	14.00	_____
Additional ticket to Village or Museum)	6.50	_____	14. GM Assembly Plant (31 May)	9.00	_____
*Specify departure time: _____					
8. University of Michigan (28 May)	9.00	_____			

*Buses depart hourly, from 8:30 a.m. to 3:30 p.m., for tours 7 and 10.

Charge to my ☐ VISA or ☐ MASTERCARD. Enclosed is my check ☐ Total amount enclosed or charged: \$ _____

Total No. of tickets ordered: _____

Account No. _____ Cardholder's Name _____

Expiration Date _____ Signature _____

MAIL TO: Tours, AAAS—Dept. R, 1515 Massachusetts Ave., N.W. Washington, D.C. 20005