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Isaacs' wave pump during tests off La Jolla, California. In very low waves, water is ejected continuously some 4 meters high. The pump is simple in design, slack tethered, and responds to waves from all directions. See page 265. [Steven Suess, Scripps Institution of Oceanography, La Jolla, Calif.]

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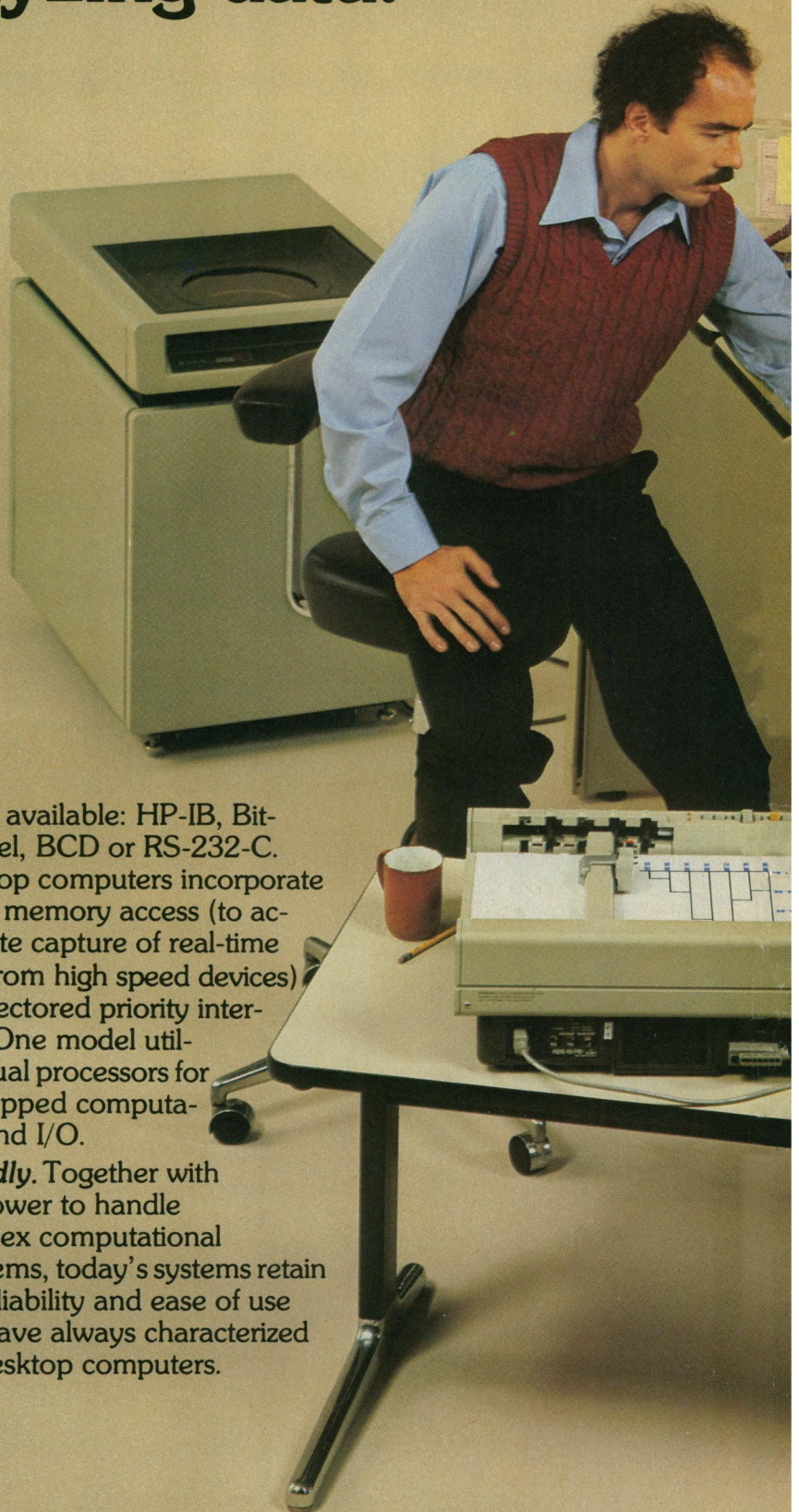
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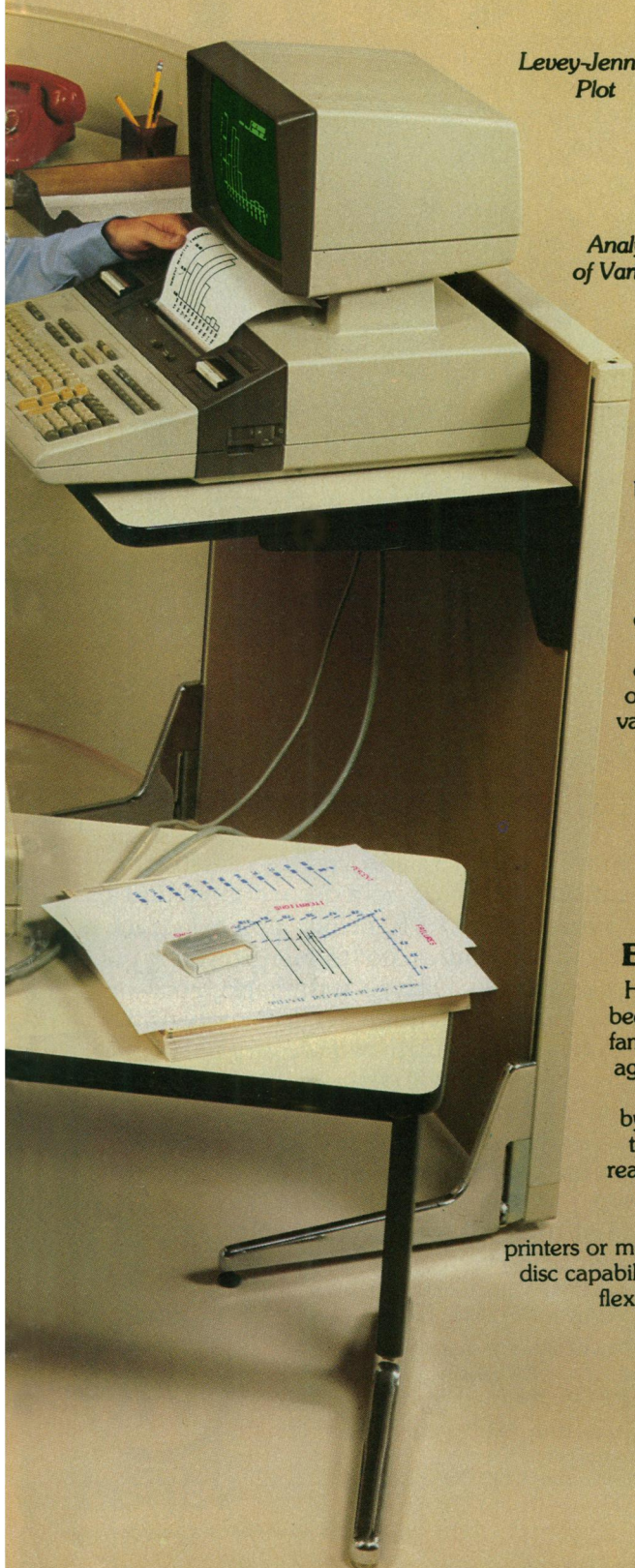
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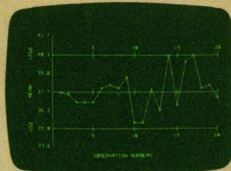
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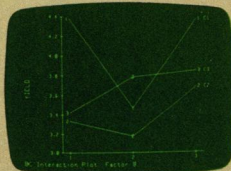
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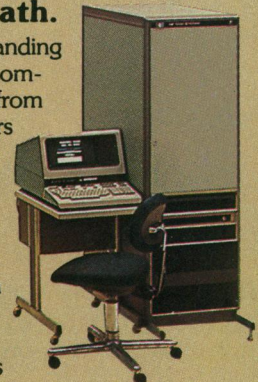
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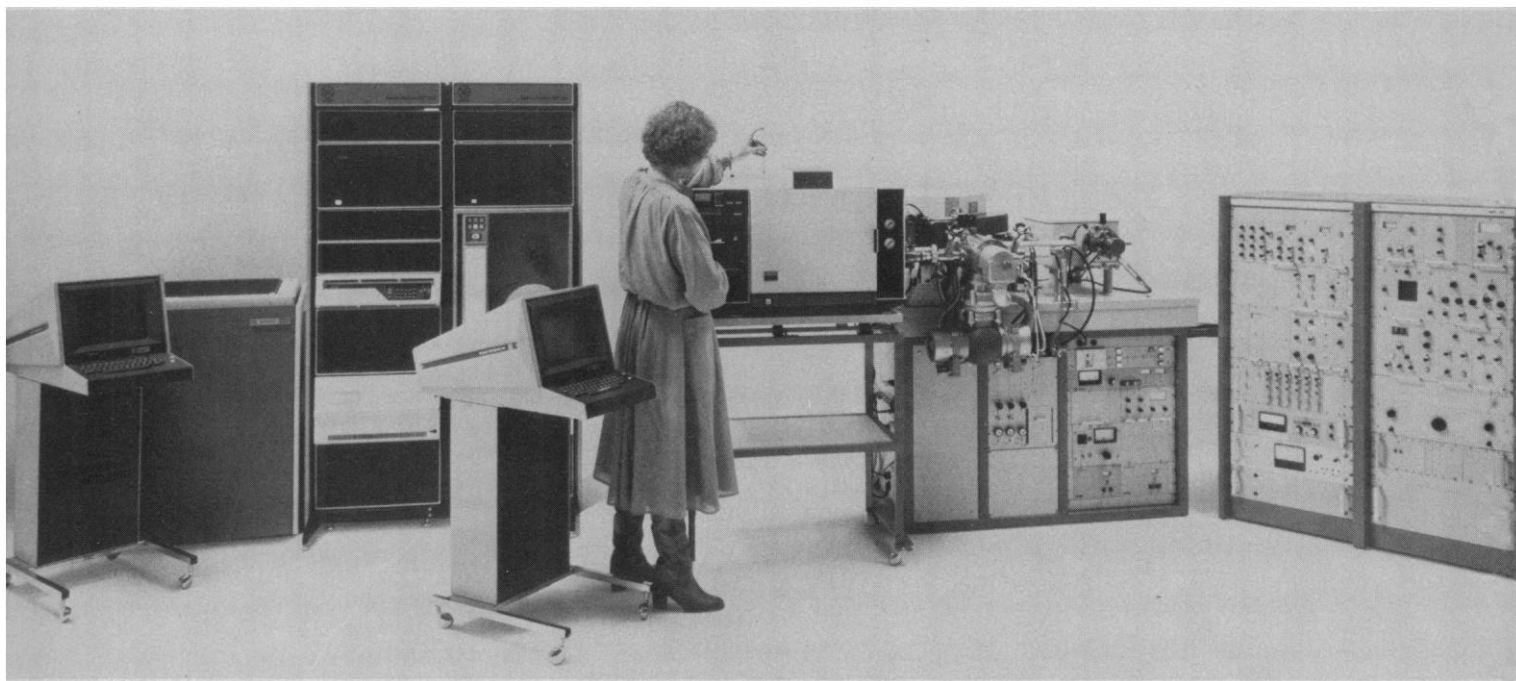
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MAb H-Chain Isotype	Y2a	Y2b	Y2b	Y2a	Y2a	Y2a	Y1	Y2b
Clone Designation	11-4*	11-3*	11-5*	53-7†	53-6†	10-4*	11-6*	30-H12†
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Cytotoxic	Yes	Yes	Yes	Yes ⁺	Yes ⁺	Yes	Yes ⁺	Yes

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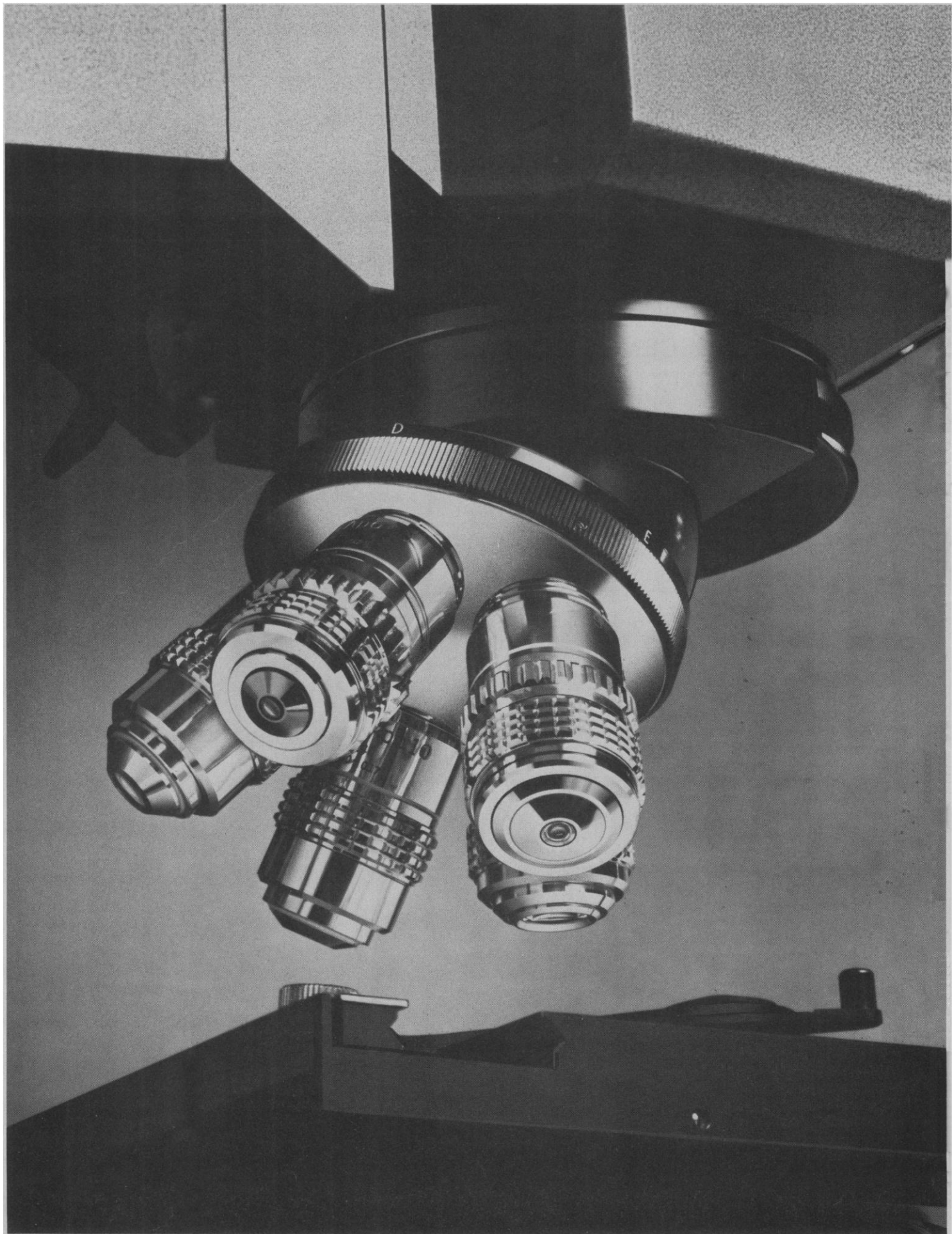
REFERENCES

- * Oi, Jones, Goding, Herzenberg and Herzenberg; *Cur. Topics Microb. and Immun.*, 81:115; 1978.
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⁺ Indirectly cytotoxic using the arsanilate-conjugate with affinity-purified rabbit anti-arsanilate.

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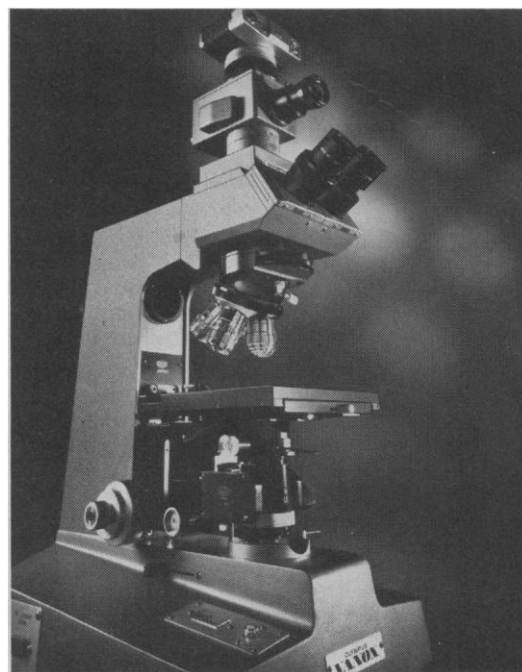
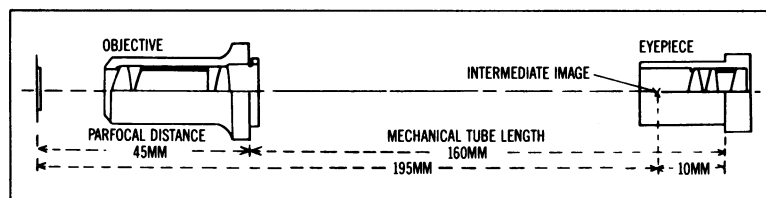
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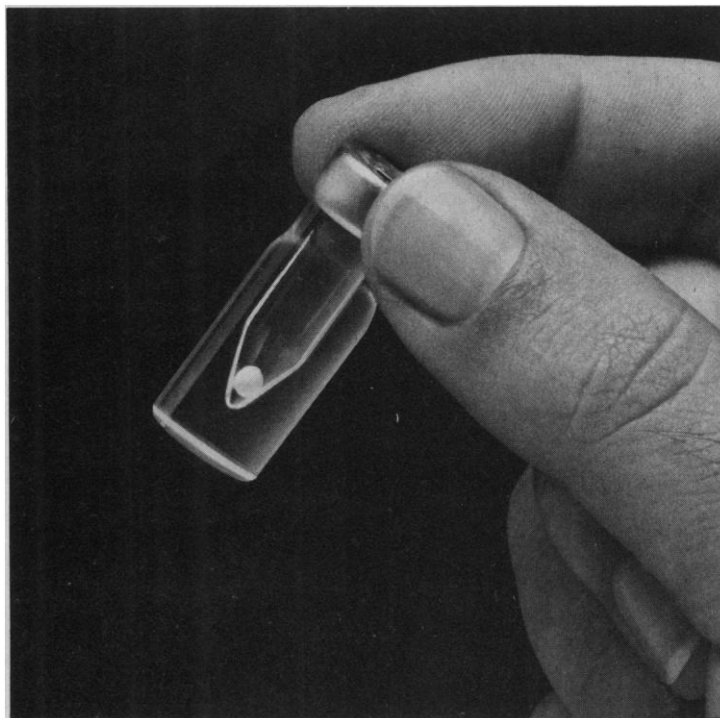
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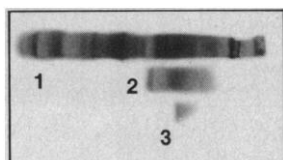
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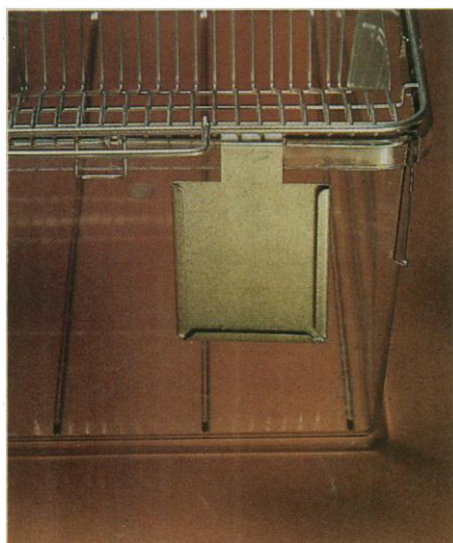
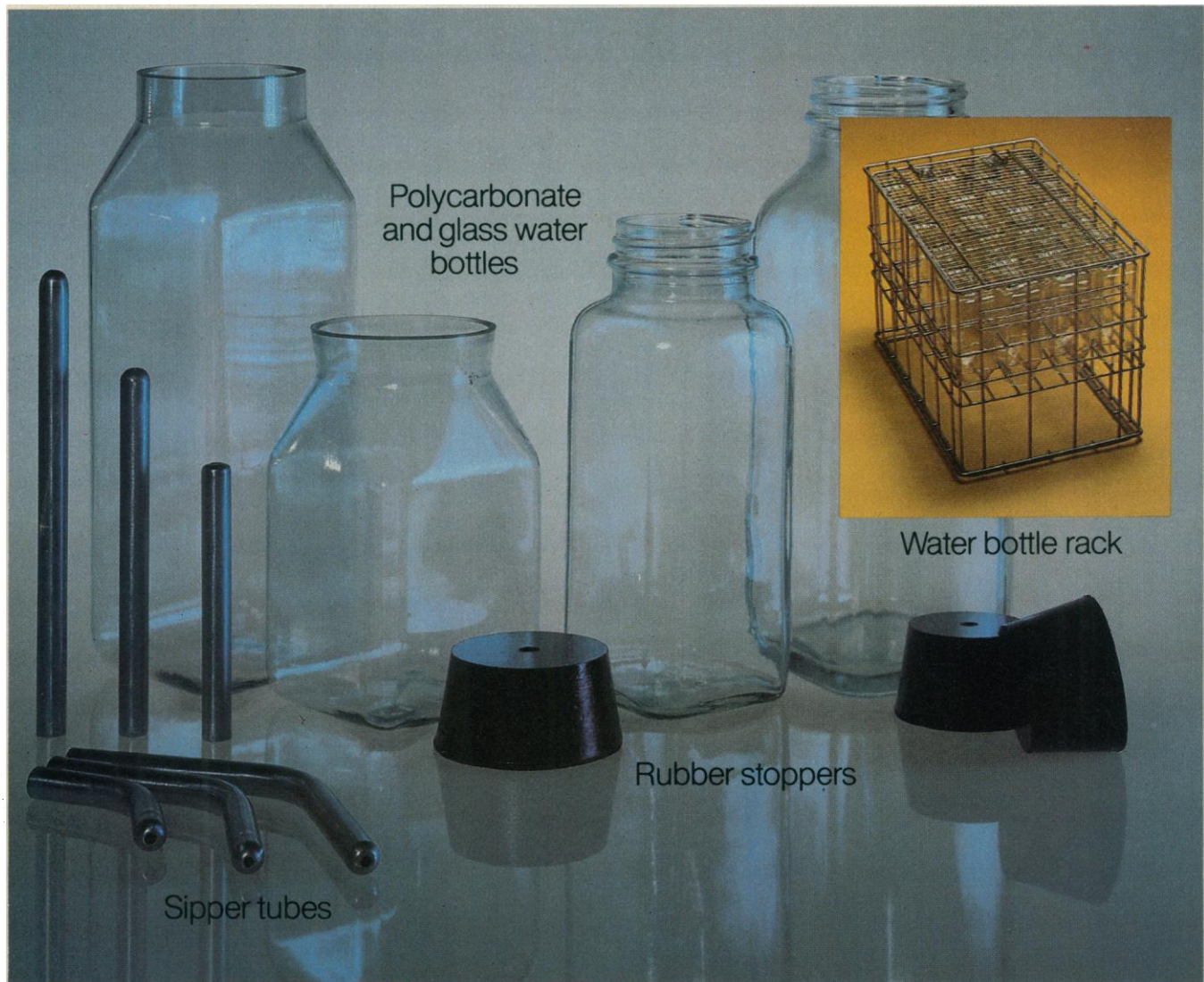
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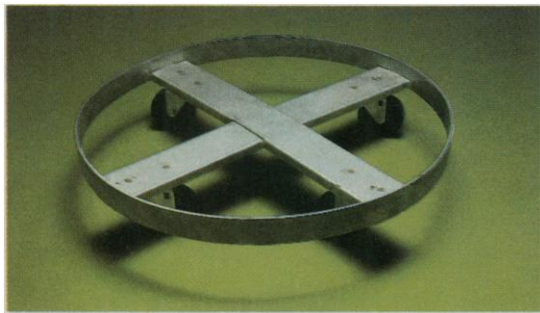
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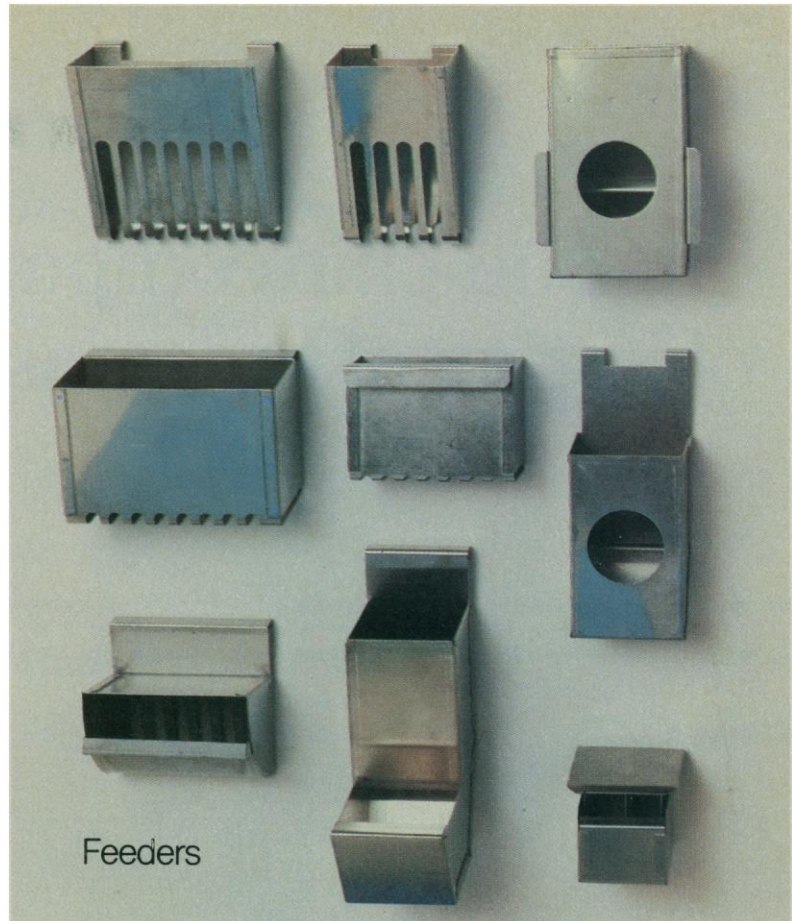
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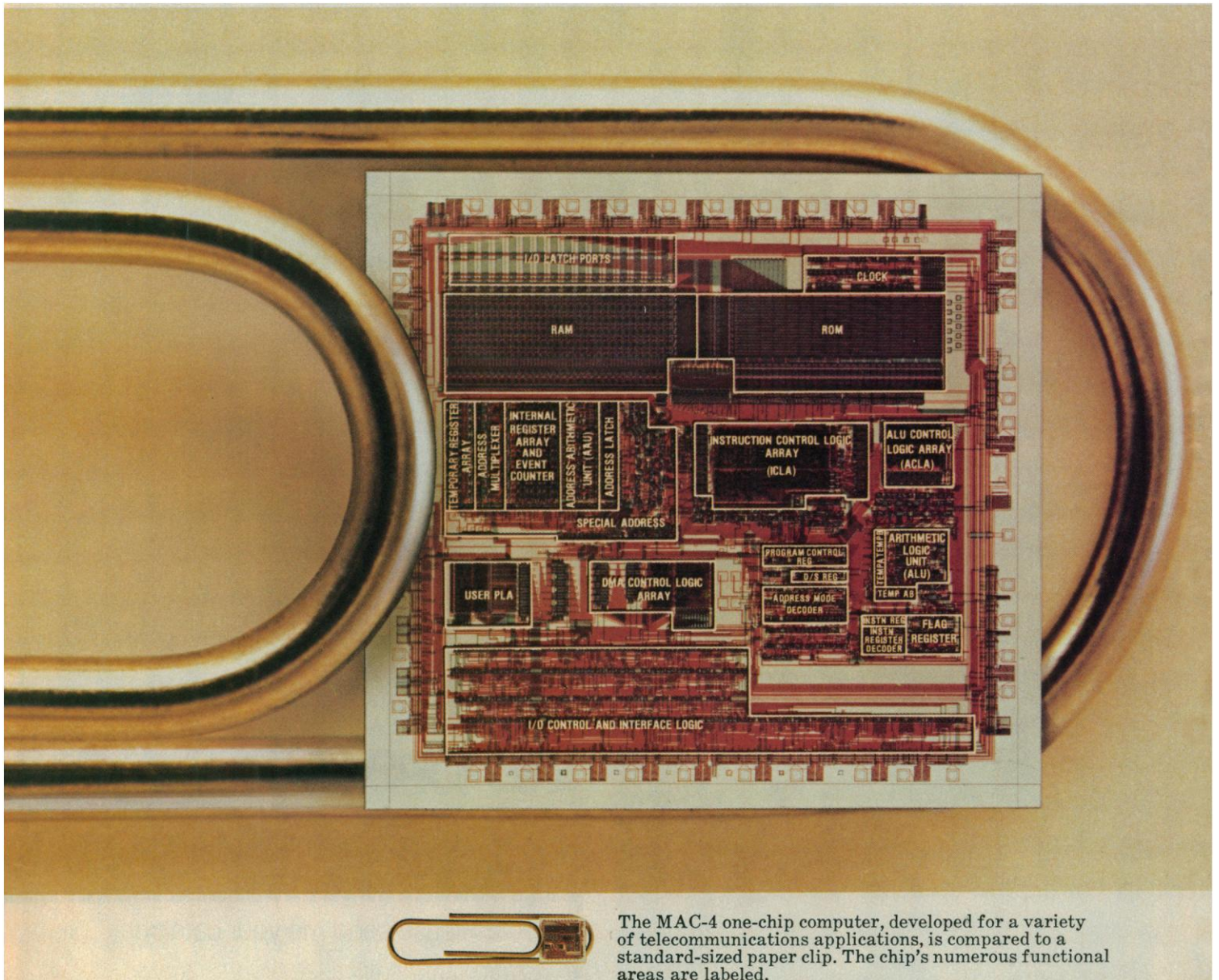
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The one-chip computer: offspring of the transistor



The MAC-4 one-chip computer, developed for a variety of telecommunications applications, is compared to a standard-sized paper clip. The chip's numerous functional areas are labeled.

One of the transistor's latest descendants is the Bell System's 30,000-element MAC-4 "computer-on-a-chip." It's another in a long line of microelectronic developments that have come from Bell Laboratories.

The MAC-4 is so efficient that a program written on it takes 25 percent less storage space than that required by most other microcomputers. Its assembler language, C, also developed at Bell Labs, has features that make MAC-4 easier to program, debug and maintain. And the MAC-4 can handle anything from nibbles to bytes to words with its 4-, 8-, 12-, and 16-bit operations capacity.

Like other one-chip computers, the MAC-4 has sufficient memory to support its varied tasks—3000 nibbles of read-only memory and 200 nibbles of random access memory coupled to 34 input/output ports.

Fabricated with the latest CMOS technology, the MAC-4 needs little power. Thus it is well matched to a variety of telecommunications applications.

It started with the transistor

MAC-4 is just one current example of the many microelectronic devices to come from Bell Labs since we started the

solid-state revolution with the invention of the transistor in 1947.

Over the past three decades, our advances in materials, processing, and devices have been vital to solid-state technology. These include:

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- Charge-Coupled Device
- Semiconductor Heterostructure
- Laser Used in Lightwave Communications
- Electron-Beam Exposure System

Today and tomorrow

Today, we continue to make important contributions to solid-state technology. For example, we've developed a rugged 65,536-bit RAM that can tolerate processing faults. Corrections can be made on the chip itself, so we can get more usable chips out of each manufacturing batch—and thus lower unit costs.

In materials processing, we've

developed a technique for precisely controlling the growth of successive atomic layers of single crystal materials. This "molecular beam epitaxy" process is finding increasing use within Bell Labs and elsewhere in the electronics industry. We've used it to fabricate a device that permits us to double the speed of electrons by channeling them into crystal layers where they meet less resistance.

Other advances, in X-ray lithography and new resist materials, for example, promise to help place more elements on microelectronic devices and thus enhance their ability to perform important tasks.

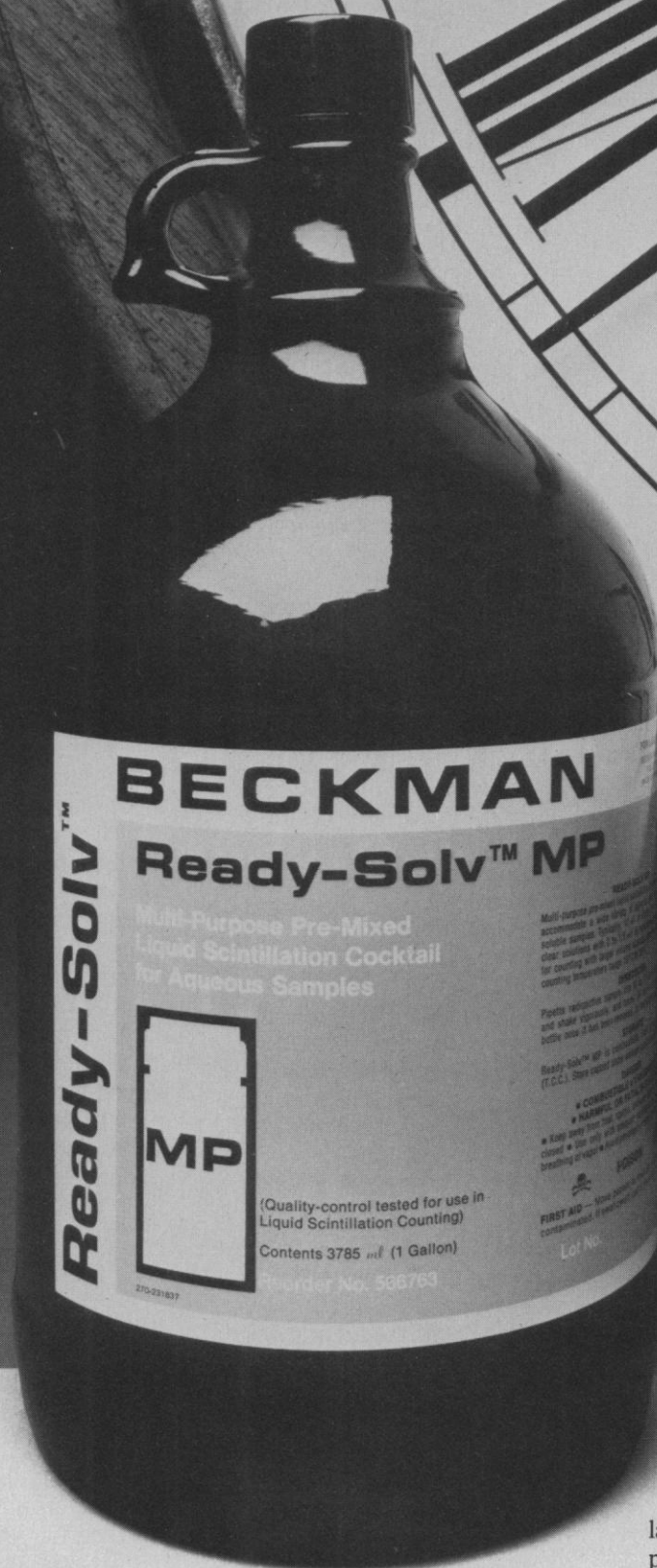
As the solid-state revolution continues, these and other developments from Bell Labs will play an important part in it. What's important to us is the promise these advances offer for new telecommunications products and services. Like the transistor, MAC-4 and its solid-state relatives will find more and more applications in the nationwide telecommunications network.

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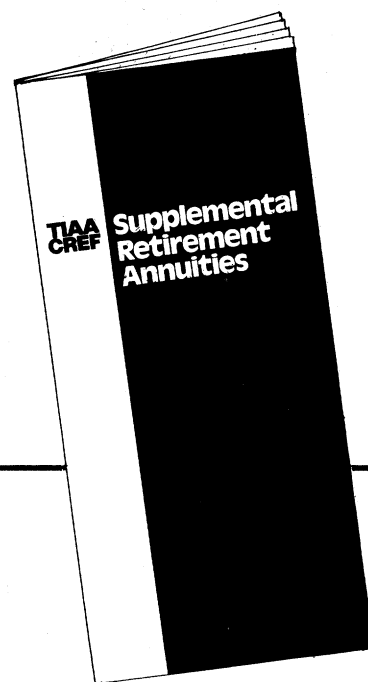
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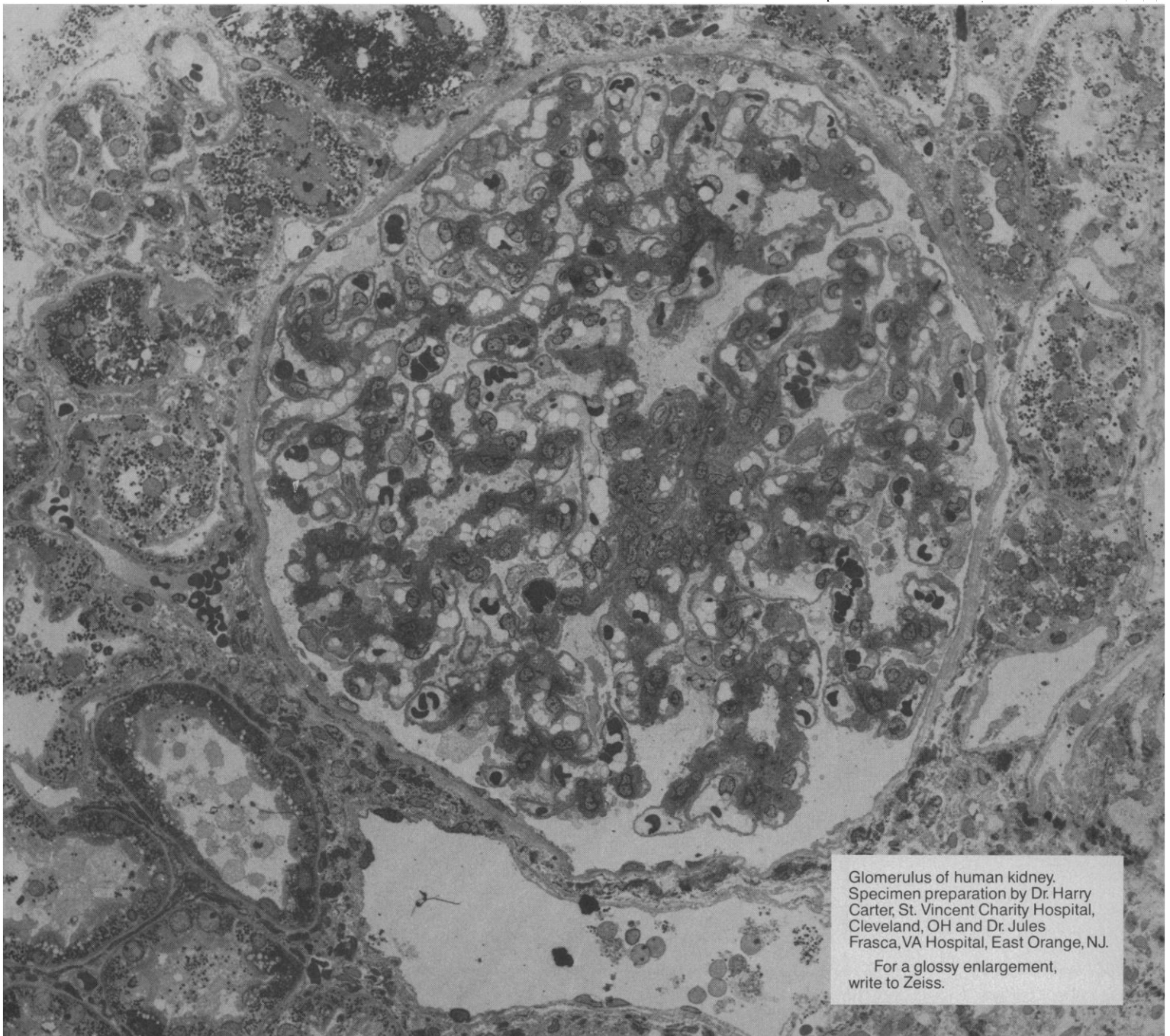
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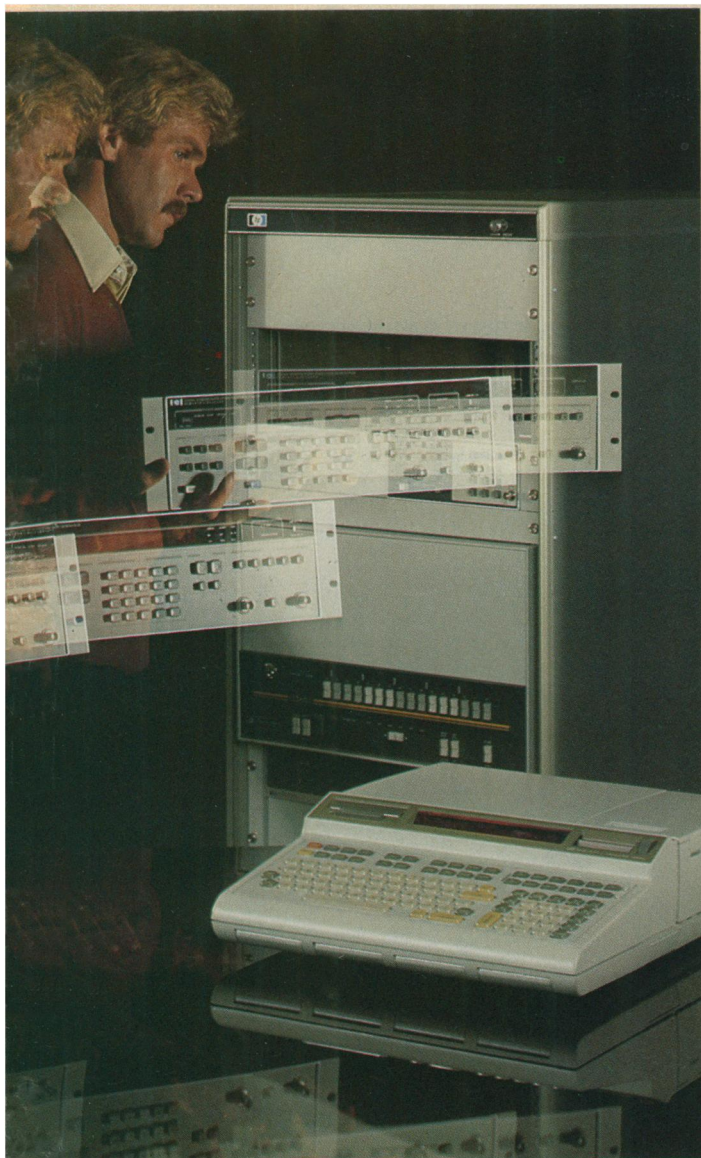
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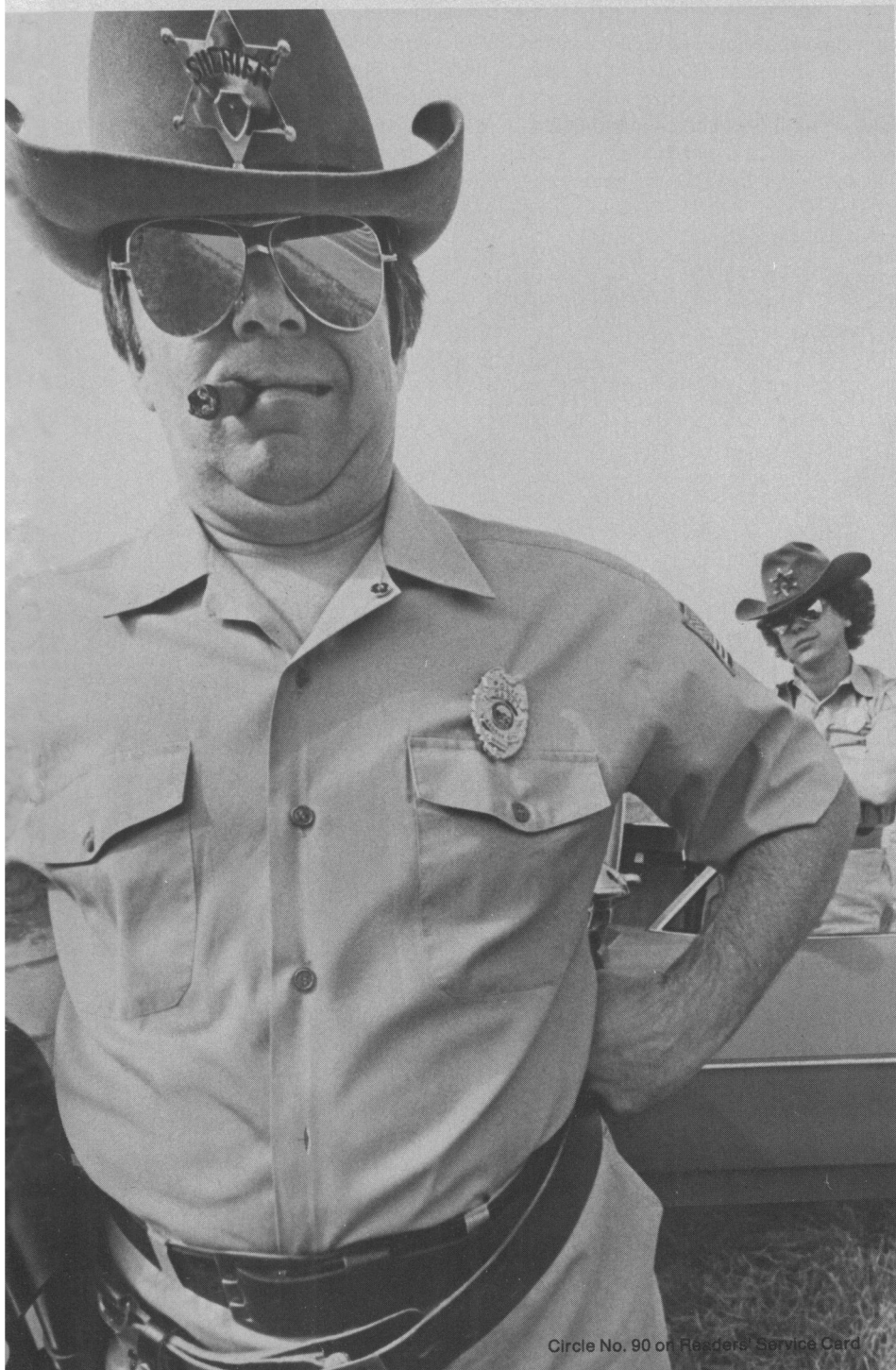
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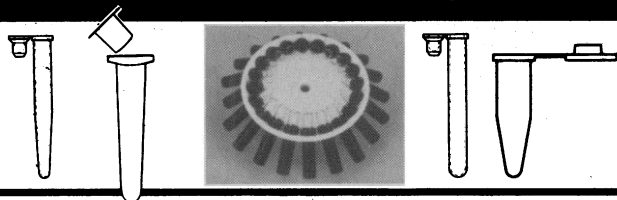
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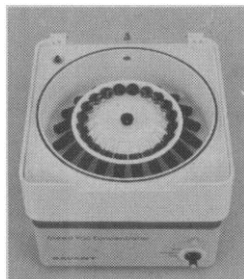
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Federal regulatory agencies, on the other hand, have long been concerned about both direct and incidental additives that increase cancer risks. Scientific studies and regulatory actions in recent decades have given substance to people's fears that our agricultural and food manufacturing industries sometimes add unnecessary hazards—carcinogenic and otherwise—to the food supply. To cite a few recent examples:

- Diethylstilbestrol (DES), a carcinogenic chemical used to promote the growth of livestock, was banned by the Food and Drug Administration (FDA) on 1 November 1979. For many years, residues of DES were detected in some samples of beef liver.

- Saccharin is recognized as a carcinogen by the FDA, which has proposed that the artificial sweetener be banned from food, as well as by the Office of Technology Assessment and the National Academy of Sciences.

- Sodium nitrite, a preservative, coloring, and flavoring, leads to the formation of cancer-causing nitrosopyrrolidine in bacon and several other varieties of cured meat. Some research has suggested that nitrite itself might be carcinogenic (3).

- Butylated hydroxytoluene (BHT), a widely used antioxidant in food, appears to increase the risk of lung (and possible lacrimal gland) tumors in mice (4). The effects of BHT on behavior are also being investigated (5).

- Red No. 40, the most widely used food dye, may be a weak carcinogen (6). The adverse effects of this and other food dyes on child behavior are being examined (7).

- Caffeine, an additive in soft drinks and naturally occurring constituent of several foods, is teratogenic (8). It also affects the central nervous system.

- Antibiotics, added to animal feed to promote growth, increase the likelihood that human pathogens will develop resistance to antibiotics. The FDA has proposed that antibiotics not be permitted as routine ingredients of animal feed.

- Residues of PCB's PBB's, Kepone, and other toxic industrial chemicals and pesticides have been found in numerous foodstuffs (9).

As more chemicals are subjected to thorough tests, it is likely that other direct and indirect additives will be discovered to cause cancer, birth defects, infertility, behavioral problems, and other health problems.

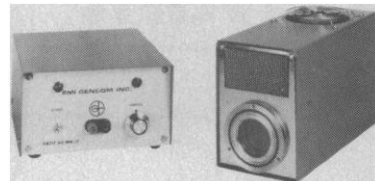
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makers though it may be, tumors do not bear tags identifying their cause or causes. However, in an attempt to quantify a risk, the National Academy of Sciences' report on saccharin cites a *maximum* figure of 3640 cases of cancer per year due to that chemical (10). Estimates have not been made for other food additives. Considering the various known and suspected carcinogens in our food supply, I think my figure of "a maximum of 10,000 to 20,000" deaths per year (approximately 1/2 to 1 percent of all deaths) was reasonable and, in the context, highlighted that (i) food additives cause a certain amount of illness and death, but a small amount compared to dietary fat, alcohol, and smoking; and (ii) deaths due to food additives are largely unnecessary because harmful additives are usually easily controlled.

Reports in the media that a chemical causes cancer often do lead to public concern. It is indeed unfortunate that people have to be troubled about chemicals that pose only a slight risk to a given individual. In fact, regulatory agencies were set up, in part, to save people the trouble of worrying about each and every little hazard. The agencies have a legal responsibility to restrict the use of chemicals that pose miniscule hazards to individuals, but significant dangers to the population as a whole. It is unfortunate that massive public pressure has been the only effective mechanism for overcoming bureaucratic lethargy and industrial opposition to controlling environmental hazards (11).

MICHAEL F. JACOBSON

Center for Science in the Public
Interest, Washington, D.C. 20009

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9. *Environmental Contaminants in Food* (Office of Technology Assessment, Washington, D.C., 1979).
10. *Saccharin and Its Impurities* (Panel I) (National Academy of Sciences, Washington, D.C., 1978).
11. S. Epstein, *The Politics of Cancer* (Doubleday, New York, 1979).

Erratum: In the article "Park is sought to save Indian tribe in Brazil" (News and Comment, 7 Dec. 1979, p. 1160), the University of Pennsylvania is given as the affiliation of Napoleon Chagnon. This is not correct. Chagnon is a member of the faculty of Pennsylvania State University.

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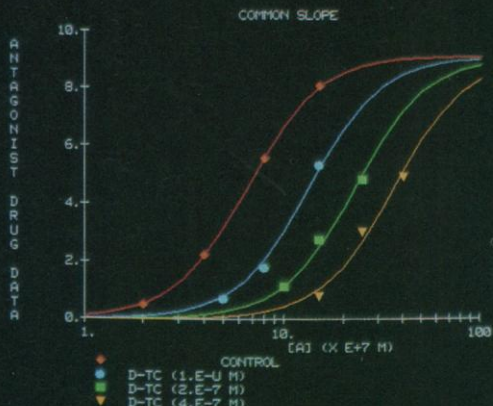
	1 BACT. STRAIN	2 DOSE	3 DATE STARTED	4 DATE READ	5 COLONY COUNT
5.	P104 ALPHA	7.	6/10/79	6/13/79	93.
6.	P105 ALPHA	8.	6/11/79	6/13/79	100.
13.	P113 ALPHA	7.	6/10/79	6/13/79	91.
14.	P114 ALPHA	8.	6/11/79	6/13/79	101.
21.	P121 ALPHA	7.	6/11/79	6/13/79	93.
22.	P122 ALPHA	8.	6/11/79	6/13/79	101.
29.	P129 ALPHA	7.	6/11/79	6/13/79	91.
30.	P130 ALPHA	8.	6/10/79	6/13/79	102.
37.	P137 BETA	7.	6/10/79	6/14/79	92.
38.	P138 BETA	8.	6/10/79	6/14/79	100.
45.	P145 BETA	7.	6/11/79	6/13/79	93.
46.	P146 BETA	8.	6/11/79	6/13/79	104.
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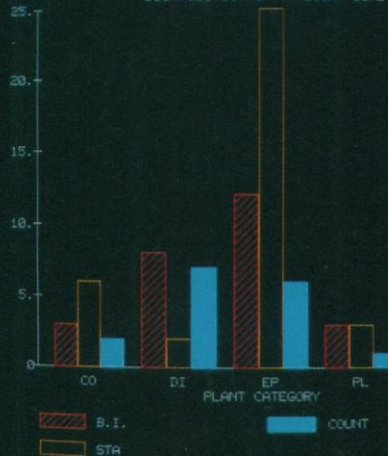
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  FOUND=0;
  DO I=1 TO LAST ROW OF DT;
    IF CLASS=DTI,I,0;
    THEN FOUND=I;
  END;
  IF FOUND=0
  THEN DO;
    /* A new class; create new row in class table. */
    FOUND=I;
    DO C=NC TO 1 BY -1;
      DTIFOUND,C=0;
    END;
    DTIFOUND,0=CLASS;
  END;
END;

```

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A Modest Basis for Energy Optimism

Given the sobering nature of today's headlines and somber continuing prospects, it is tempting to press the panic button. However, one should remember that the United States has tremendous resources of people and things and a capacity to unite and function well when the going is rough.

A major source of vulnerability is, of course, excessive dependence on foreign oil, and here at least amid the gloom is a modest basis for optimism. We have stopped increasing our imports and instead begun to lessen dependence on foreign oil. Imports of oil and its products have been reduced about 6 percent. This is only a small fraction of what needs to be done, but there are signs of more substantial reductions ahead in the major items of consumption—gasoline and fuel oils.

It is unpleasant to see gasoline prices increase as they have, but this has been affecting both the short-term and longer-term outlook for gasoline use. During the past 4 months consumption of gasoline relative to that a year ago has decreased about 8 percent. Sales of the heavier automobiles are slow while fuel-efficient models are in strong demand. Further substantial increases in the price of imported oil are inevitable. This will cut consumption of gasoline further and hasten the disappearance of old gas guzzlers. Replacement of the present fleet of cars by fuel-efficient ones would go far toward minimizing our oil import problems.

Consumption of distillate plus residual oil has been lower than a year ago. The full extent of the reduction is not known. However, the American Gas Association has reported that industrial and utility consumption of nearly 0.5 million barrels of oil a day has been replaced by natural gas. Residential consumers are responding to higher prices; there has been some conservation and some switching to wood and to natural gas.

Much of the fuel oil used by the utilities and industry could be replaced by a combination of coal and nuclear power, but only slowly. By far the quickest replacement for fuel oils is natural gas. Until about a year ago, prospects for this change were dismal. But decontrol has increased the availability of natural gas and substantial discoveries are being made in the western overthrust belt, the eastern overthrust belt, the Appalachian basin, and the Atlantic outer continental shelf, as well as by deep drilling in Oklahoma and the Gulf Coast.

Two principal factors have contributed to increased and successful drilling—higher prices for natural gas and improved geophysical methods. Higher prices have made it feasible to drill deeper, to examine volumes of sediments hitherto unexplored. Improved geophysical methods permit discovery of stratigraphic traps in complexly deformed terrains. Higher prices have been particularly effective in stimulating drilling in the deep basins of the middle South and also in the shallower sediments of the Appalachian basin. In the latter region, many thousands of holes have recently been drilled. Production per hole is small, but costs are low and the success rate is very high.

The two most exciting potentials are the overthrust belts, where improved geophysical methods have been especially helpful. The western feature extends from the vicinity of Provo, Utah, northward to the Canadian border, and possibly south to the Mexican border, with a width of the order of 50 miles. Estimates of probable reserves have been as high as 100 trillion to 200 trillion cubic feet. The higher figure would represent a doubling of U.S. reserves. The potential of the eastern overthrust belt is unknown, but substantial discoveries have been made. In consequence, major oil companies have recently leased some 10 million acres in Alabama, Tennessee, Virginia, West Virginia, and Pennsylvania.

Ultimately, this country must adapt to the use of renewable resources, but first we must manage to live with the realities of the 1980's. A combination of conservation and substitution for oil is the approach we will find it expedient to follow.—PHILIP H. ABELSON



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