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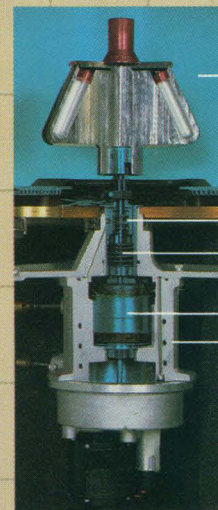
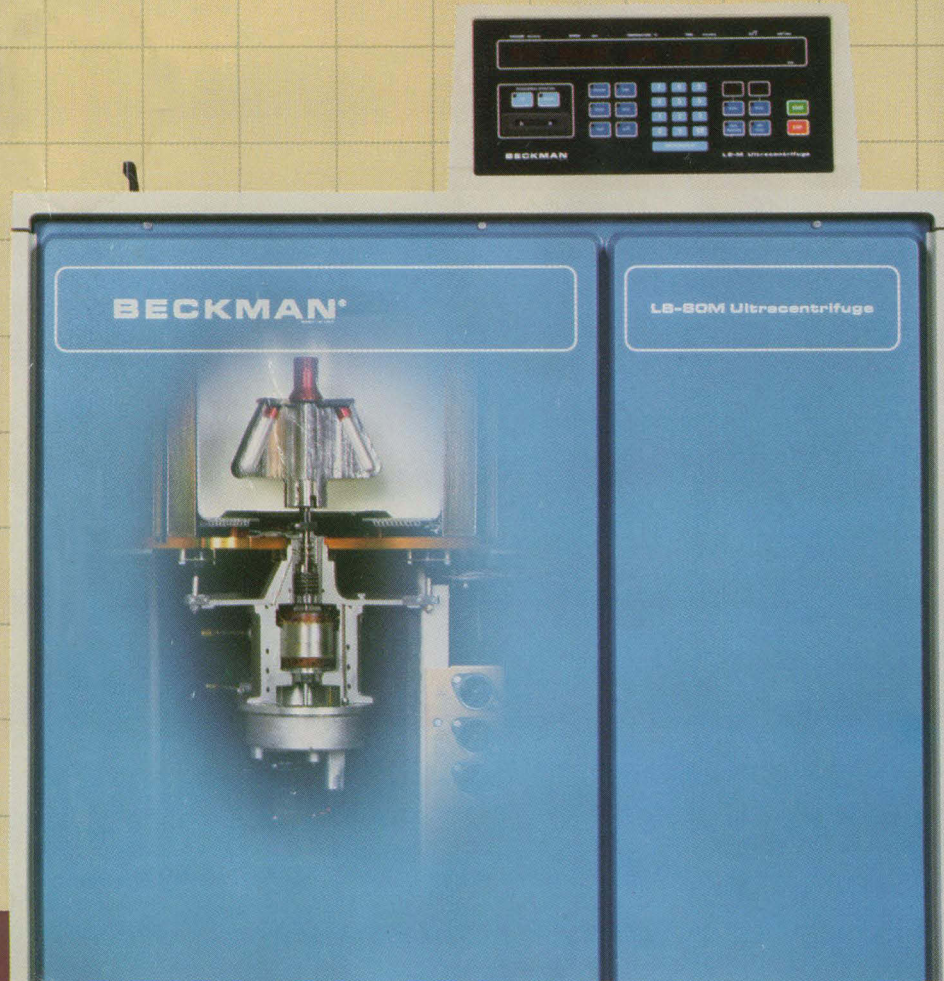
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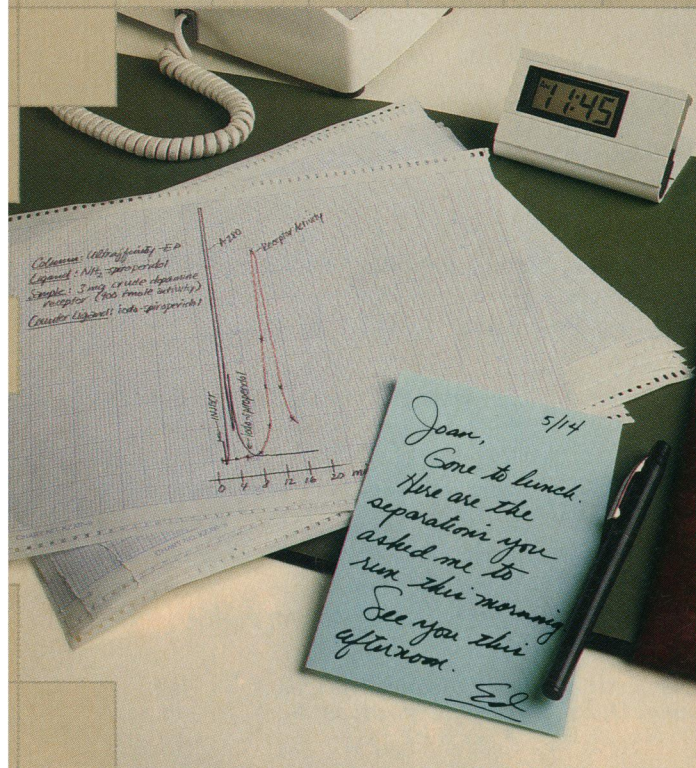
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COVER

Dorsal surface of gymnosome pteropod (*Clione limacina*) photographed during slow forward locomotion. Forward locomotion results from flapping movements of the wing-like parapodia. See page 402. [M. LaBarbera, Department of Anatomy, University of Chicago]

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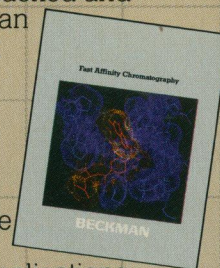
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Evidence for prehistoric earthquakes

Excavation and analysis of natural formations at two sites near Charleston, South Carolina, where a major earthquake occurred in 1886, indicate that there had been other earthquakes in that area in the past (page 379). Talwani and Cox studied local craters and sandblows (mounds of sand forcefully ejected when sand was liquified during the earthquake) as well as embedded organic materials such as roots. The distribution and characteristics of sand—its color, composition, and particle size—and carbon dating of the roots allowed them to reconstruct when and how events that produced the unusual composite structures occurred. Two earthquakes apparently took place between 1270 and 3740 years ago. Surface evidence (such as faults) of local seismic activity has not yet been found.

Drought periodicity and range

Tree-ring data do not directly link devastating droughts that occur every 20 years or so in the U.S. Corn Belt to periodic phases of the sun or moon; solar cycles may, however, influence the size of the region affected (page 381). Meko *et al.* subjected tree-ring data, a measure of annual precipitation, to computer analyses to determine whether data for the 301 years from 1680 through 1980 fit solar (22 year) or lunar (18.6 year) cycles. Droughts in the western Corn Belt recurred with a frequency close to lunar cycles, but high-resolution analyses did not support a simple association. Droughts in the eastern Corn Belt did not show regular periodicity. Periodicity may depend on complex interactions of solar, lunar, and other factors.

Competition for soil resources

Plants growing near each other compete for limited nutrients in the soil just as they compete for light and space above ground (page 384). Caldwell *et al.* studied the belowground competition between sagebrush and two related species of bunchgrass (*Agropyron spicatum* and *A. desertorum*). The plants were arranged in a regular pattern: each sagebrush plant was boxed in by four grass plants, two of each species. Radioactive phosphorous was then injected into the soil midway between the sagebrush and grasses. Phosphorus uptake, which is mediated by fine root hairs of the plants or by fungi that live in association with the roots, could occur only within a few millimeters of the injection site, since phosphorus is rapidly fixed and does not diffuse. Of the total phosphorus absorbed by sagebrush plants, 86 percent came through roots in the soil shared with *A. spicatum* and only 14 percent came from soil shared with *A. desertorum*. Shoots of *A. desertorum* contained four times as much radioactive phosphorus as those of *A. spicatum*, showing the superiority of this bunchgrass species to compete successfully for soil phosphorus.

Atriopeptides in feedback control

A feedback cycle between atriopeptides (AP's) from the heart and the pituitary hormone arginine-vasopressin (AVP) regulates the fluid and electrolyte balance of blood and urine (pages 395 and 397). Manning *et al.* found that when AVP is injected into rats, AP's are released from heart cells; urine volume and excretion are then increased, and smooth muscles of blood vessels relax. AVP has opposite effects and, in fact, is used medicinally as an antidiuretic and vasoconstrictor. Large amounts of two AP's were found in blood by Schwartz *et al.* One, bigger and more potent than the other, may break down into the smaller form as part of the mechanism that regulates diuretic activity.

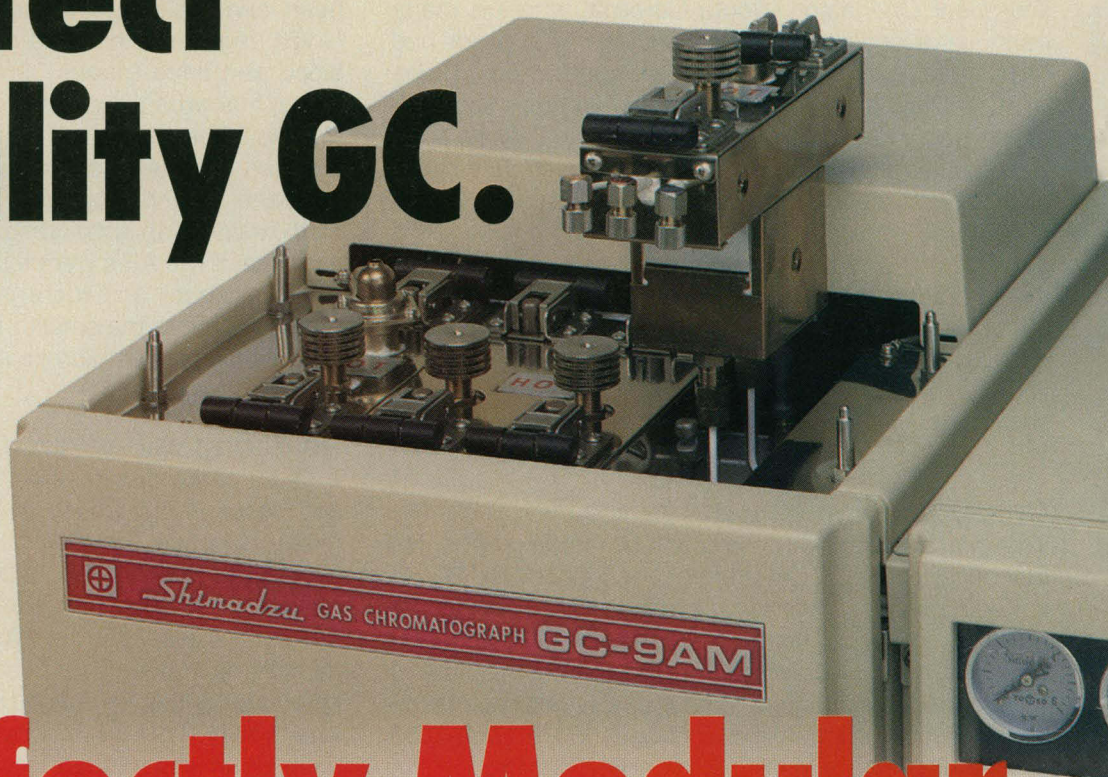
Restoring endangered species

A study of the distribution of genetic variations among and between subgroups of endangered Sonoran topminnows, once the dominant fish in the Gila River system of Arizona, is helping define a strategy for restocking rivers in that area (page 400). Topminnows have become subdivided into small isolated colonies as habitats have been destroyed and predators have been introduced. Diversity (based on analyses of 25 proteins) was greatly reduced in sequestered, endangered communities in comparison with colonies flourishing elsewhere. Vrijenhoek *et al.* recommend restocking with fish of a single subgroup (three subgroups are known) that have been living in the wild, not bred as stocks, to promote diversity while not jeopardizing subgroup distinctions. Because wild fish develop under changing conditions, they would be expected to have the greatest potential for adapting to future environmental changes.

Neuronal control of swimming in mollusks

The hovering swimming movement of the mollusk *Clione limacina*, one of the sea butterflies, is produced by a pair of large, lateral, winglike fins (cover), the perfectly coordinated and simultaneous beating of which is under the control of only four nerve cells (page 402). The upward and downward swings of each wing are regulated by upswing and downswing interneurons, respectively. Fine processes from antagonistic (one up, one down) interneurons interdigitate on each side of the body, and processes from the pair on one side cross to the other side to branch with processes there. Satterlie found that when the two upswing interneurons fired to move the wings upward, the two downswing interneurons were inhibited from firing. The inhibited interneurons rebounded strongly; they then fired and the upswing interneurons were inhibited. The rhythmic pattern of firing may be sustained by calcium and magnesium ions at seawater concentrations. This simple system could be a model for other motor behaviors controlled by neuronal networks.

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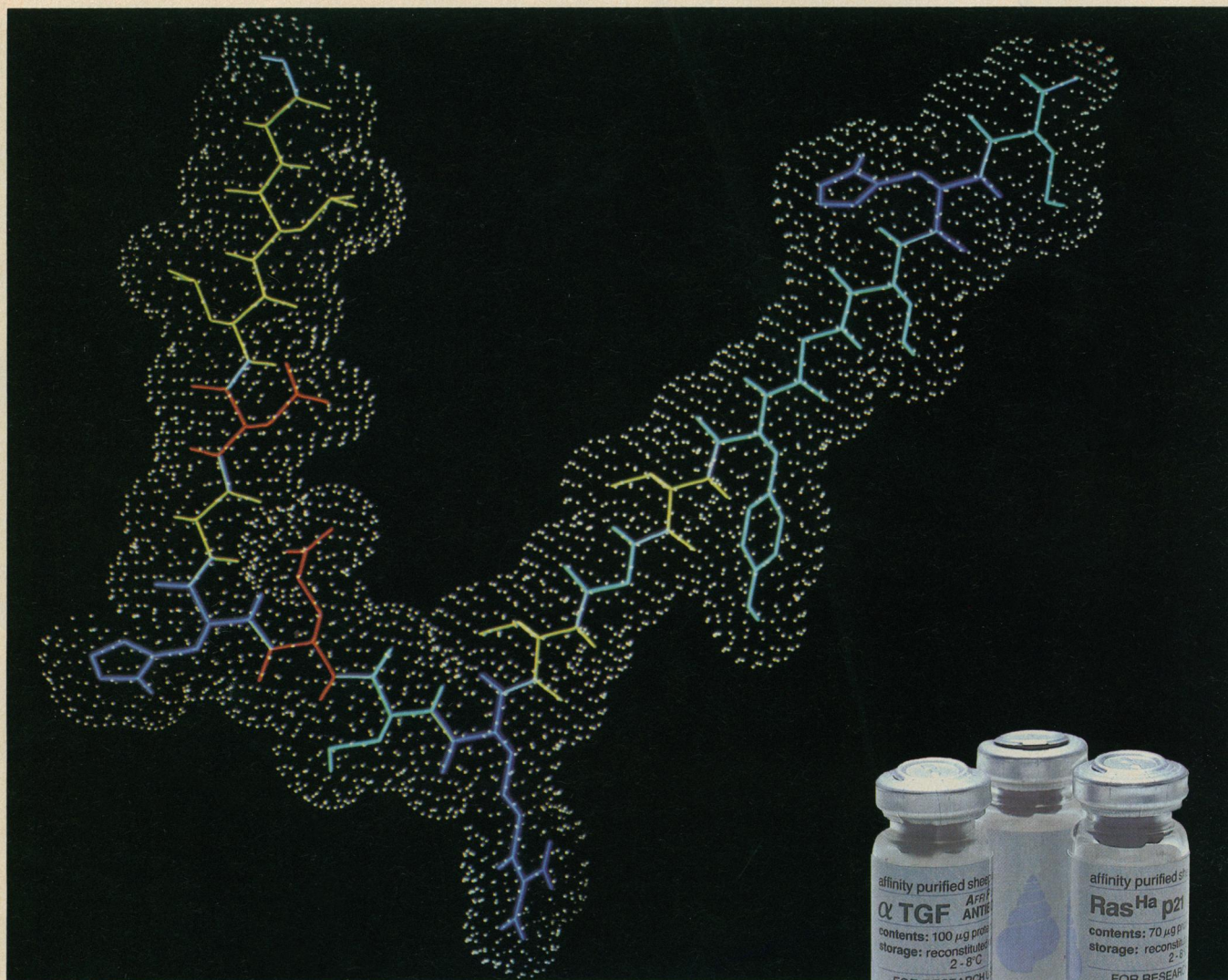
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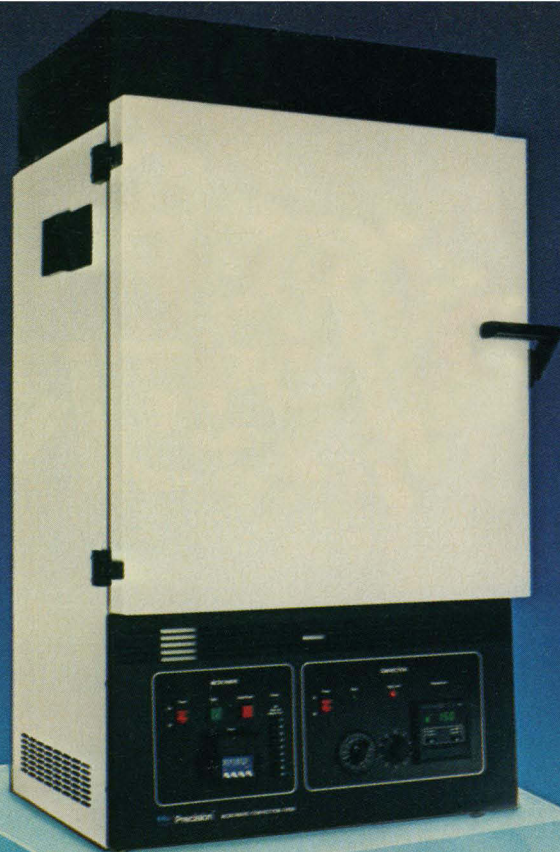
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The Case of the Tax-Perplexed Professor

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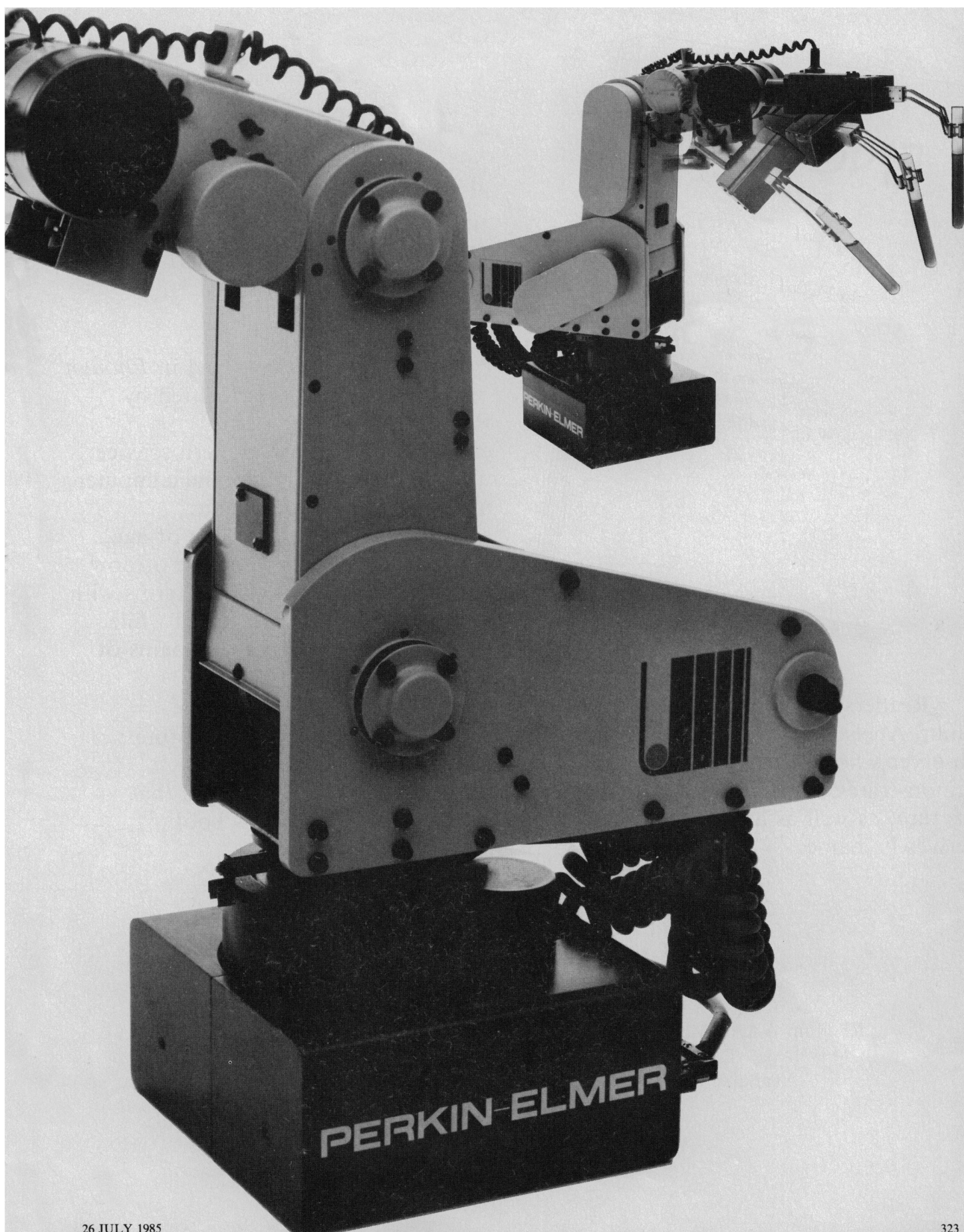
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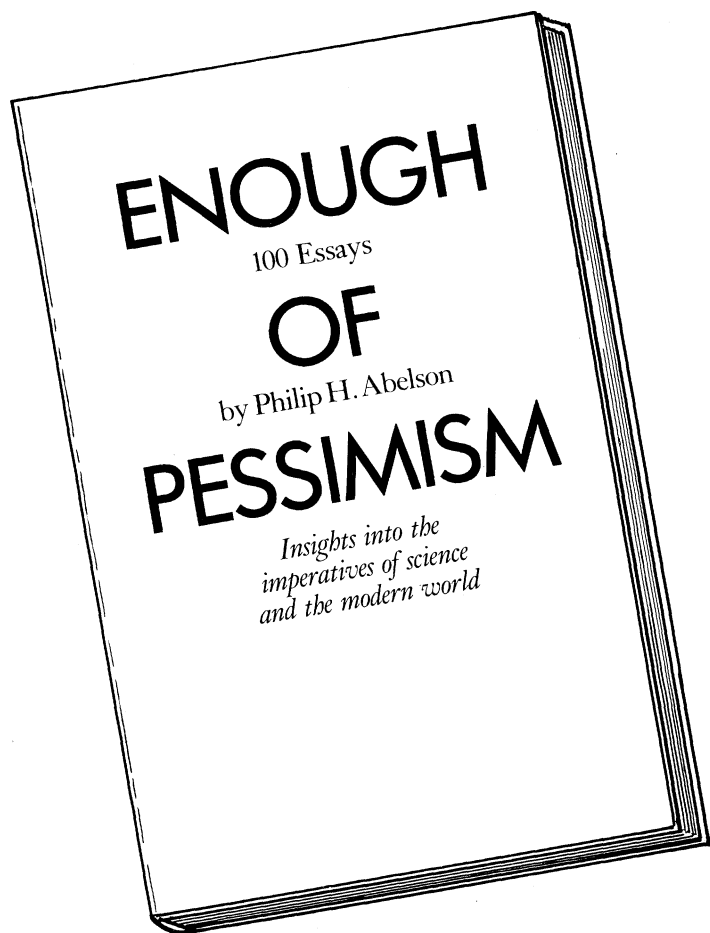
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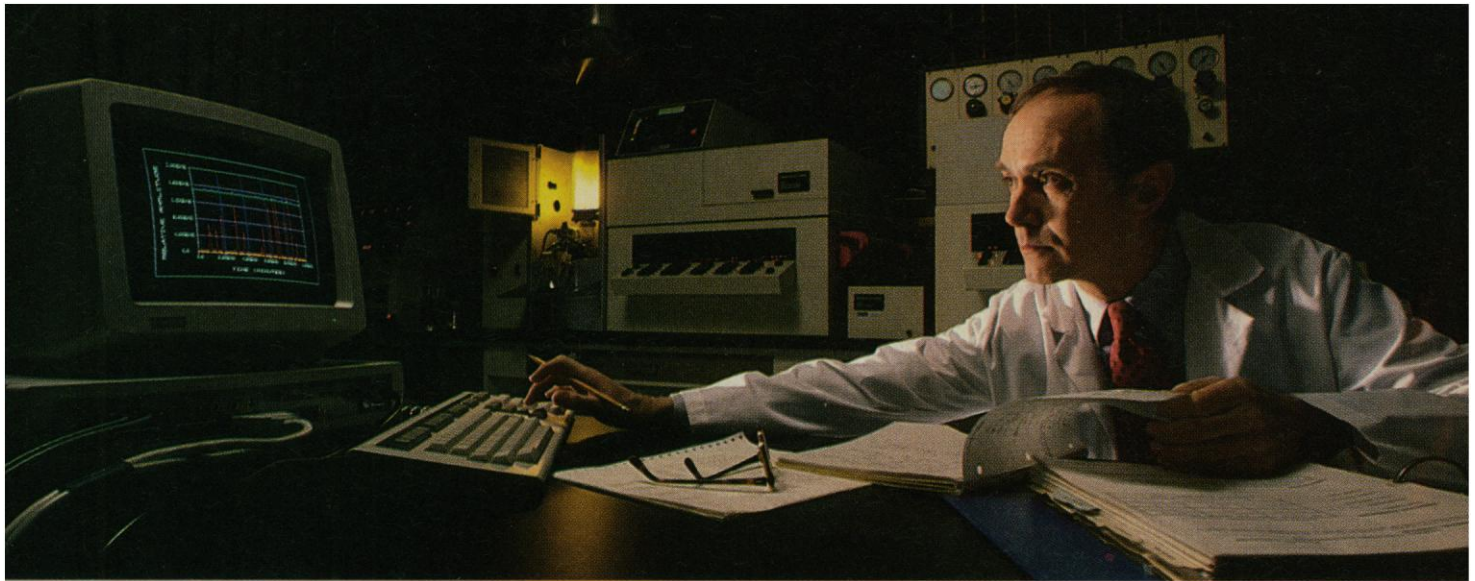
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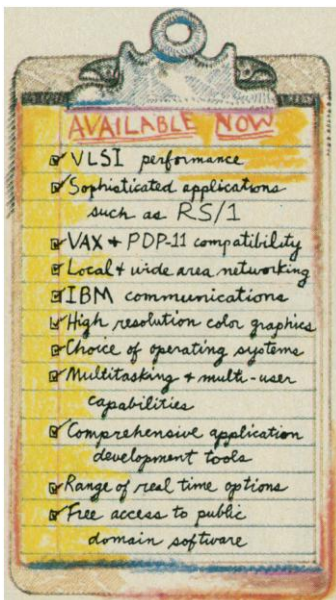
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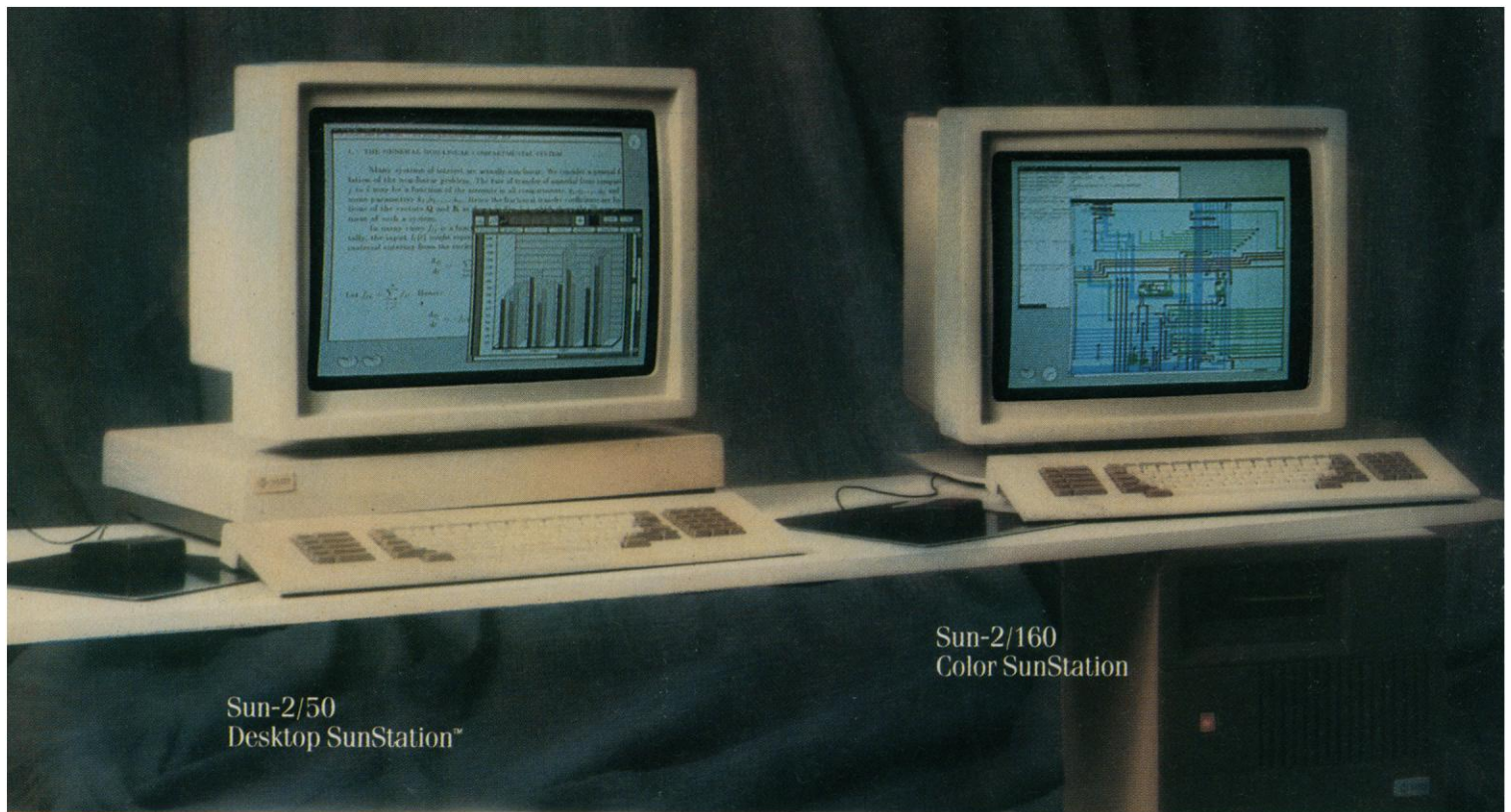
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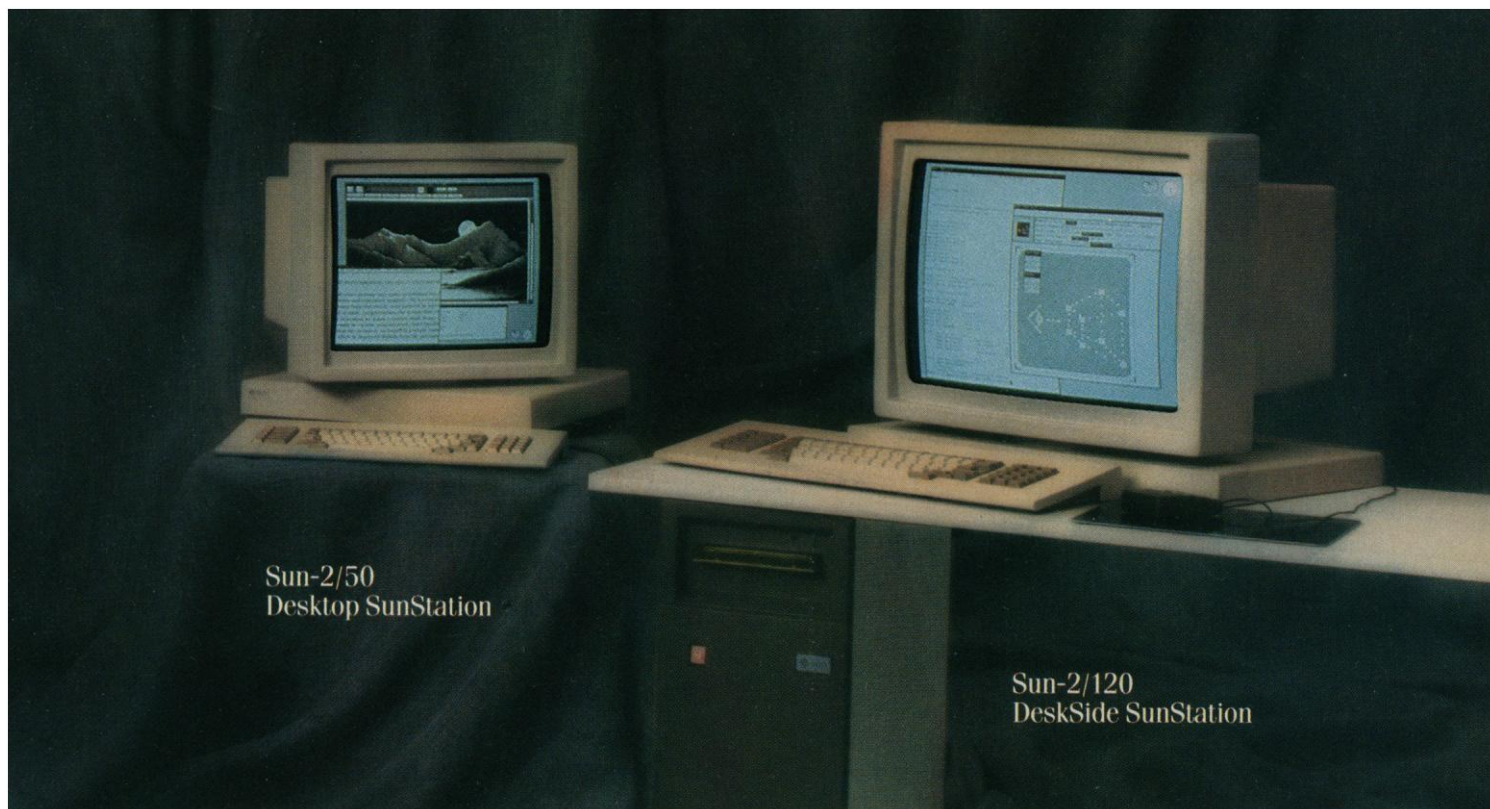
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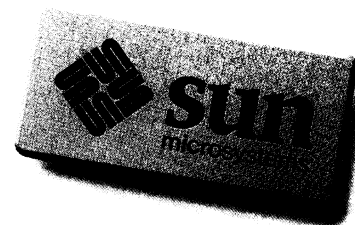
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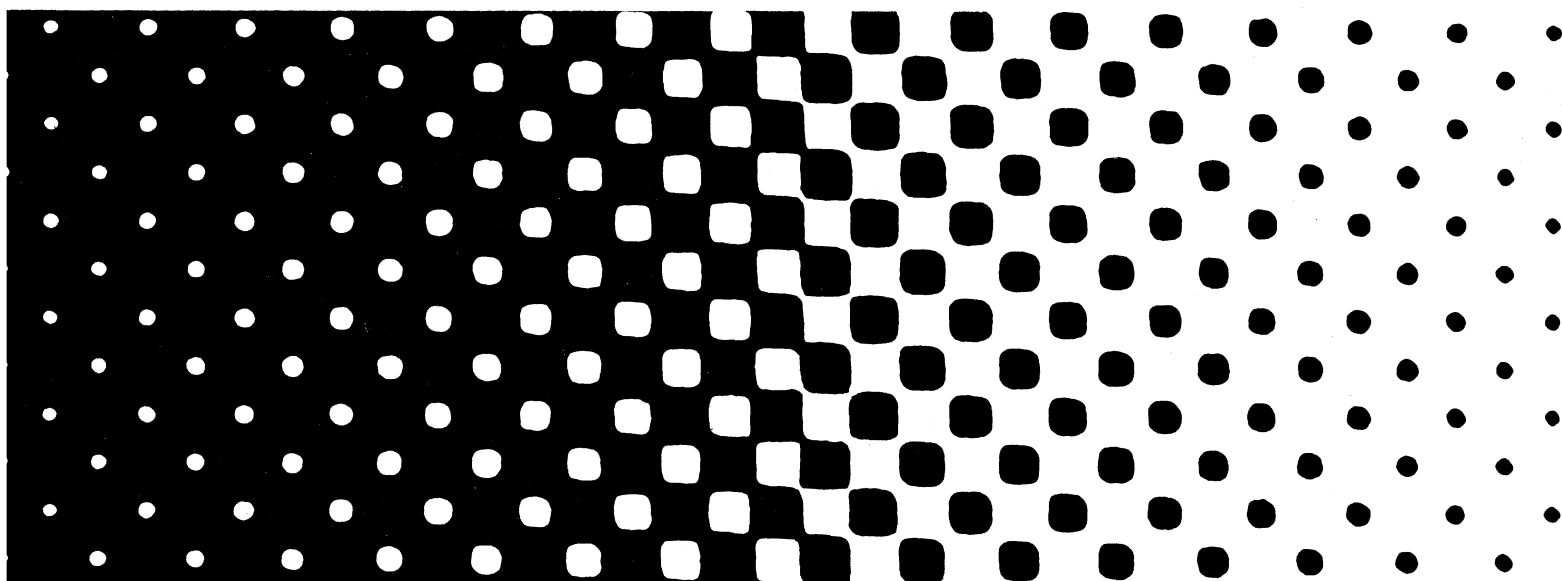


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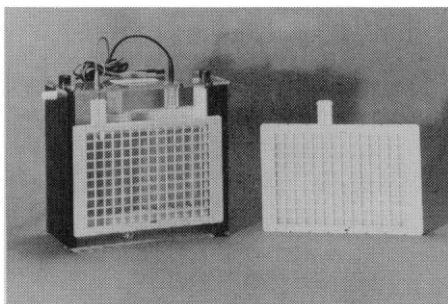
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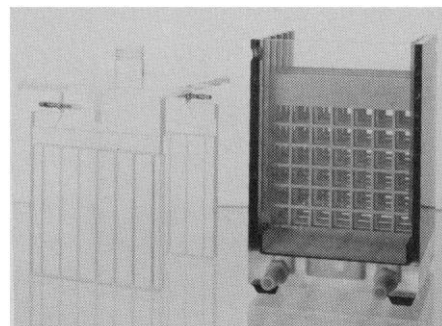
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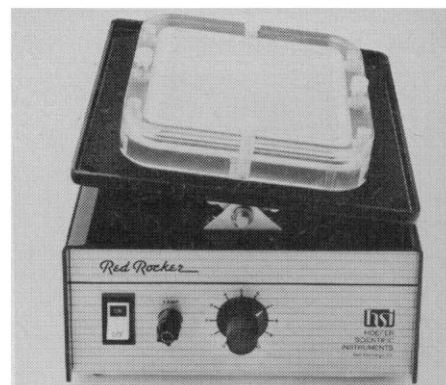
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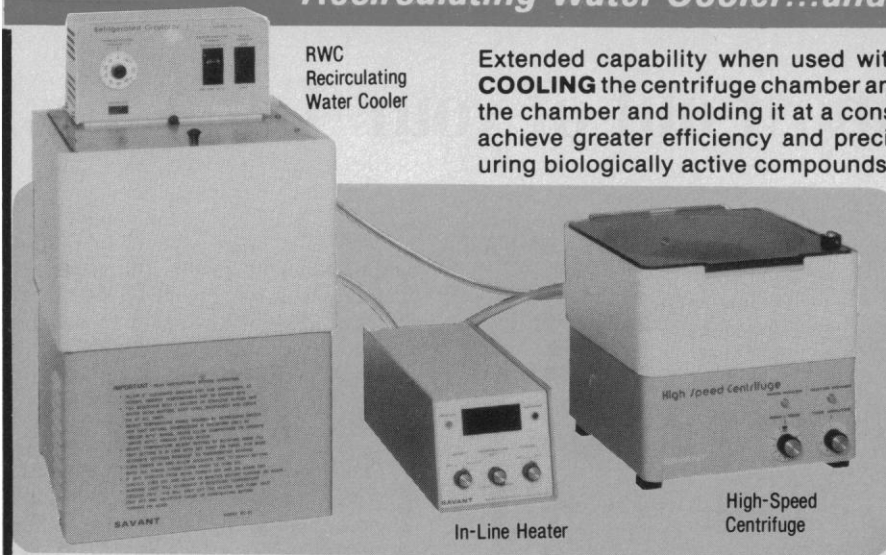
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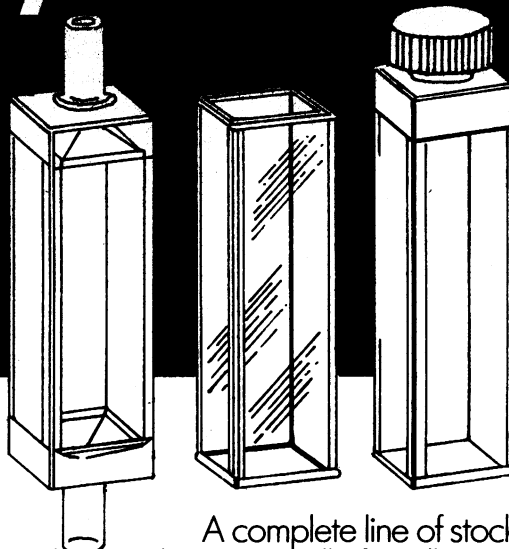
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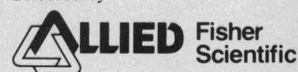
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Chemicals from Waste Dumps

Health Aspects of the Disposal of Waste Chemicals,* a document prepared by a group of academic scientists representing ten major disciplines of biology, engineering, and medicine, is a wide-ranging introduction to the topic. It is the first comprehensive survey of the literature concerning chemicals in abandoned waste dumps and their health effects. The bibliography contains about 1000 references. The report names the chemicals and the number of sites where they have been found and lists their occurrence in the air, surface water, and ground water near the dumps. The available data on the health effects of these chemicals are also reviewed. These data were derived from studies in industrial situations as well as from assessments by epidemiologic and laboratory methods. Reports of health effects associated with dumps were surveyed and evaluated.

The Environmental Protection Agency has responsibility for designating priorities in the cleanup of abandoned dump sites. In mid-1984, it had designated 546 sites for its National Priority List (NPL). This report lists 229 different items found at one or more of the 546 NPL sites. The most frequently identified component is trichlorethylene, found at 129 sites. Others among the top five were toluene at 95 sites, benzene at 94, lead at 93, and chloroform at 68. Twenty-five components accounted for more than two-thirds of the observed occurrences. These included 11 chlorinated hydrocarbons, 4 hydrocarbons, and 7 heavy metal elements. With the exception of heavy metals, the majority of the material leached from the dumps consisted of chemicals that are liquids at ambient temperatures or that can be readily distilled. The group is also characterized by substantial solubility in water. For example, the solubility of trichlorethylene is 1.11 grams per liter at 25°C; that of benzene is 1.78 grams per liter at 25°C; and that of chloroform, 8.22 grams per liter at 20°C. All the halogenated compounds listed have densities greater than water. Once released in a dump, they would fall by gravity or be carried by leaching water to the bottom of the dump and toward ground water. If the dump is located on a thick bed of clay that contains organic matter, the movement is slow, and chlorinated hydrocarbons may be attacked by anaerobes. However, many dumps have been poorly located.

In compiling the report, the panel of scientists made a determined effort to locate literature concerning pathology associated with waste dumps. They were able to find reports on only 21 sites. The lack of information was explained by the fact that litigation is in progress involving some of the sites. Another factor handicapping the study was a paucity of items in the peer-reviewed literature. A bibliography about Love Canal cited more than 500 documents. Of these, only three that dealt with health effects were to citations in peer-reviewed journals.

On the basis of available evidence, the panel concluded, "To date epidemiological studies have shown very little evidence of a hazard to human health resulting from exposures to chemical disposal sites." However, they point out that delayed effects may yet appear.

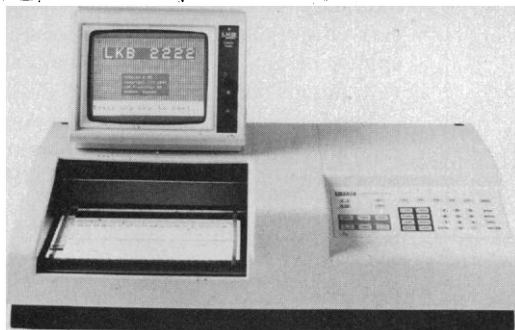
One of the potential sources of problems later could be ground water. As chemicals are leached from dumps, they enter aquifers serving as sources of potable water. Movement of pollutants is often slow, and we probably have not guessed the magnitude of the ultimate difficulties. In addition to solvents from abandoned dumps, there will be solvents from new regulated sites, although disposal of liquids will be phased out in the next year or so. Municipal dumps are also a source of pollution.

Since each dump is different and information about health effects is sketchy and uncertain, this report leaves many questions unanswered. However, it will serve to emphasize the need for better epidemiological information, and it will be a benchmark for reports that come later.

—PHILIP H. ABELSON

**Health Aspects of the Disposal of Waste Chemicals* (Universities Associated for Research and Education in Pathology, Bethesda, Md., 1985).

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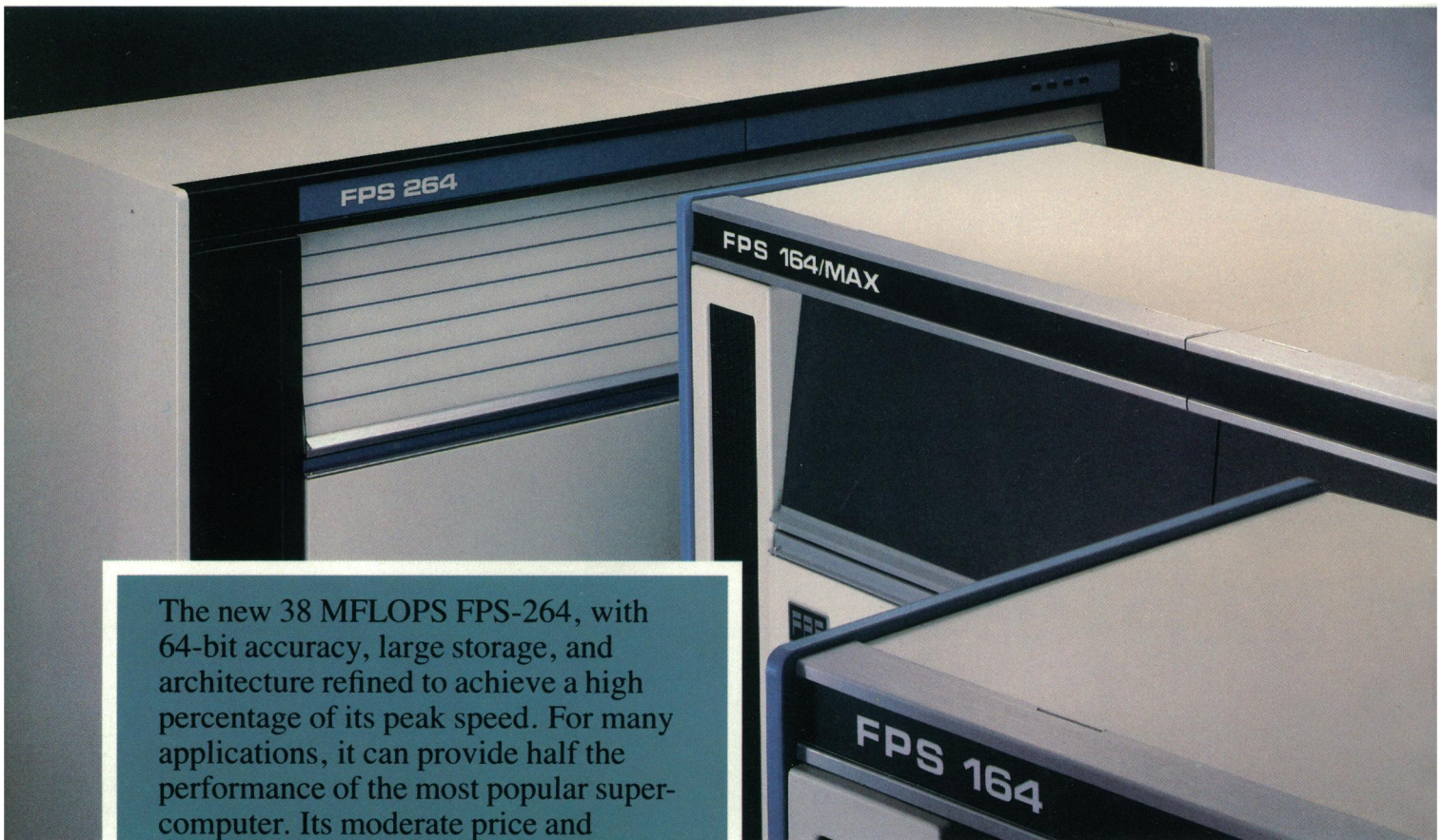
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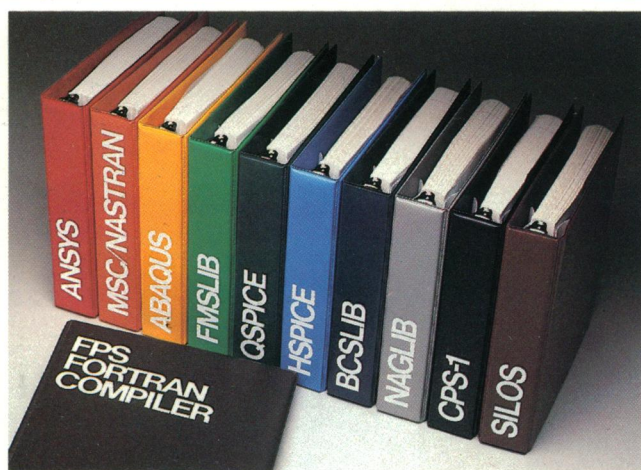
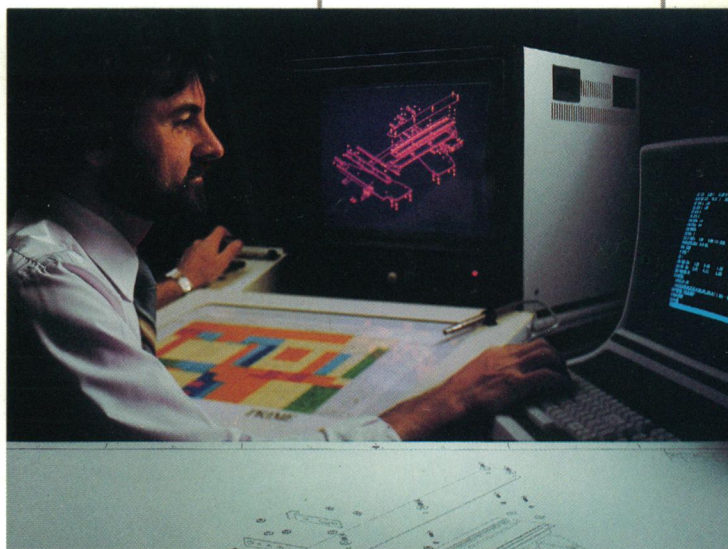
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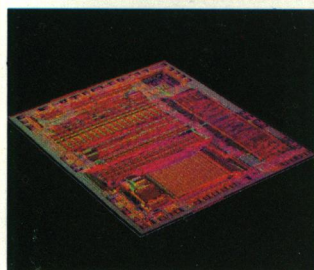
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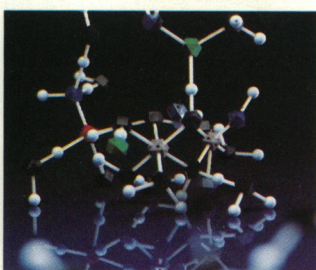
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