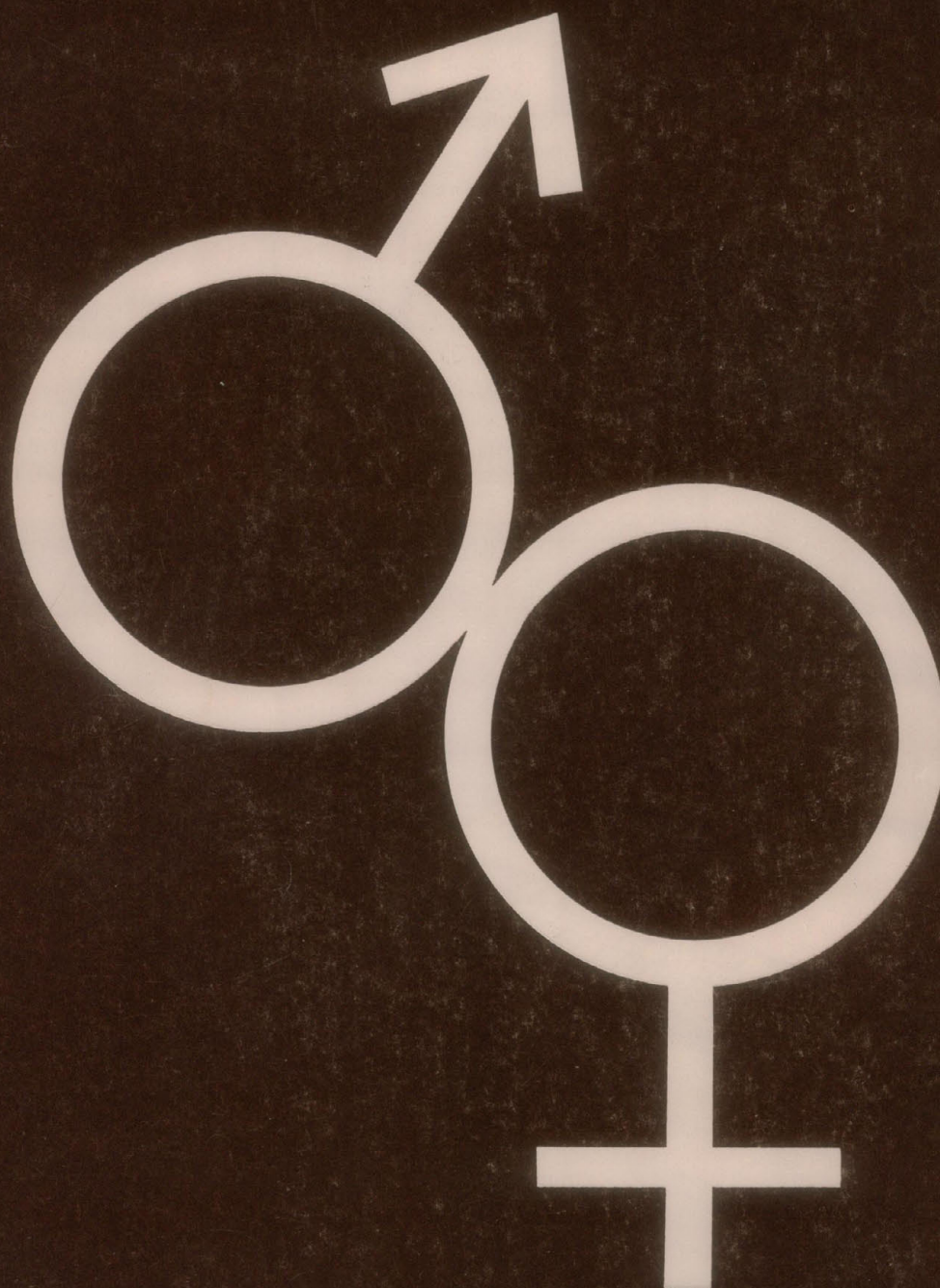


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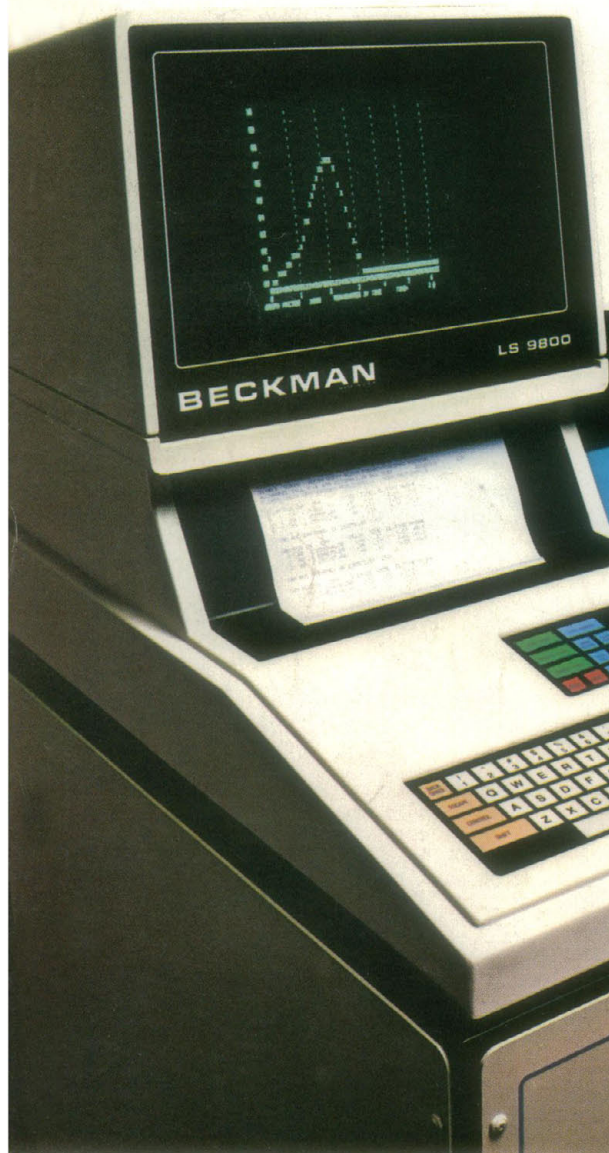
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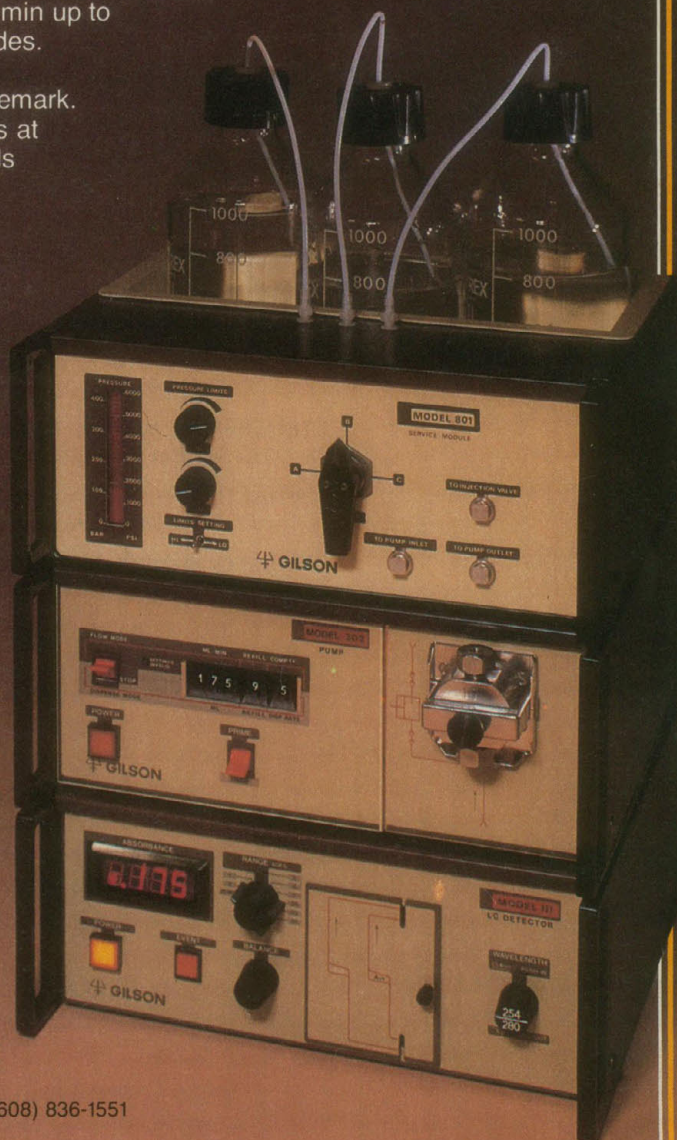
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SCIENCE

Sexual Dimorphism

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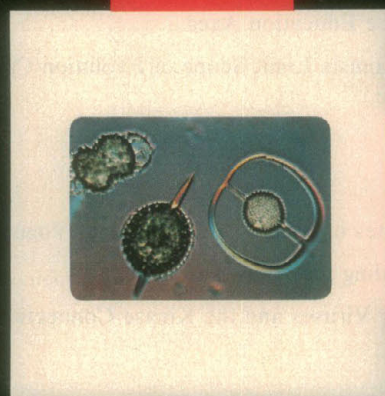
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COVER

Symbols used to designate male and female. These symbols are found in the writings of astrologers and astronomers in the Middle Ages as shorthand for the planets Mars and Venus. Their origin has not been definitively established, and discussion of their history is laced with speculation and fantasy. [Drawing by Stephen Shepherd, Gaithersburg, Maryland]

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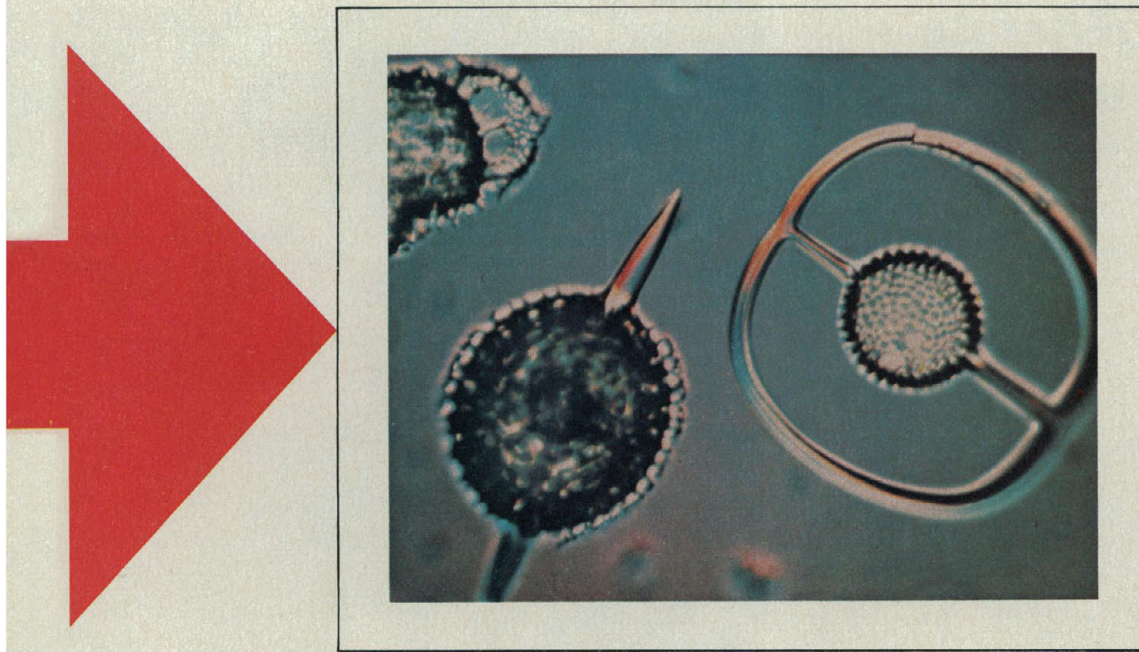


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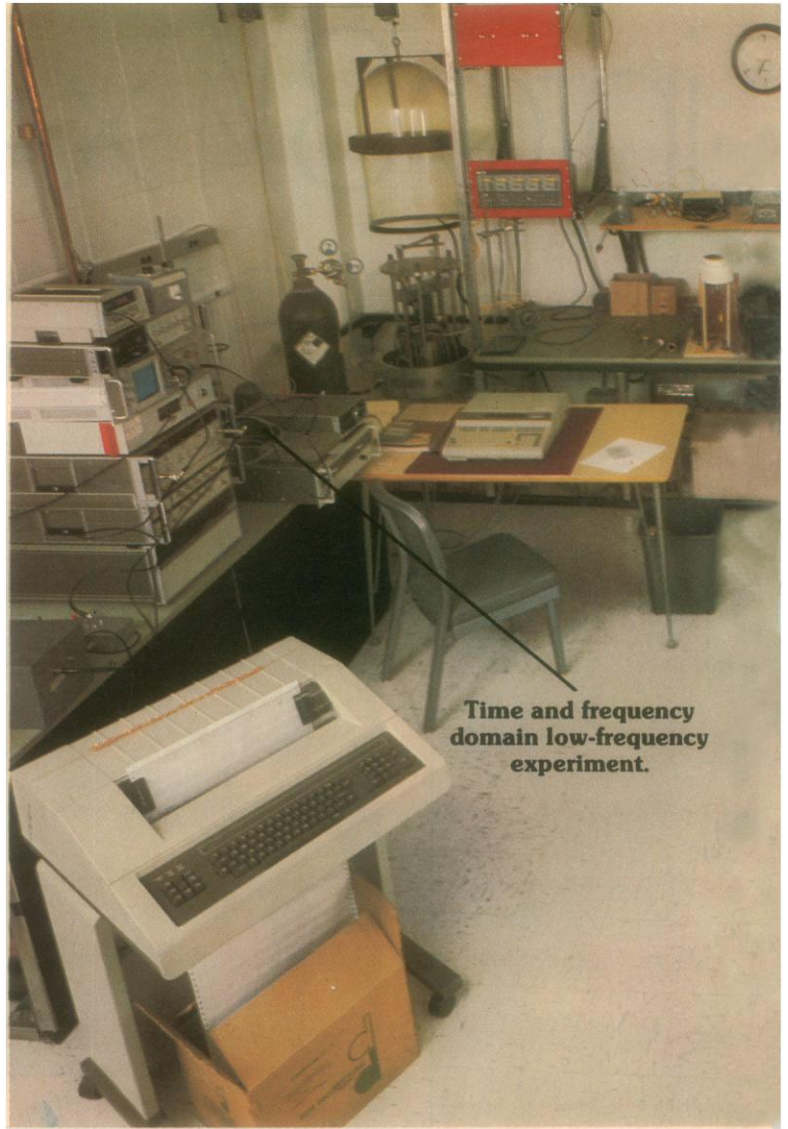
An HP-IB system helped generate— in three months. . .

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

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

Processing the unseen.

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



Time and frequency domain low-frequency experiment.

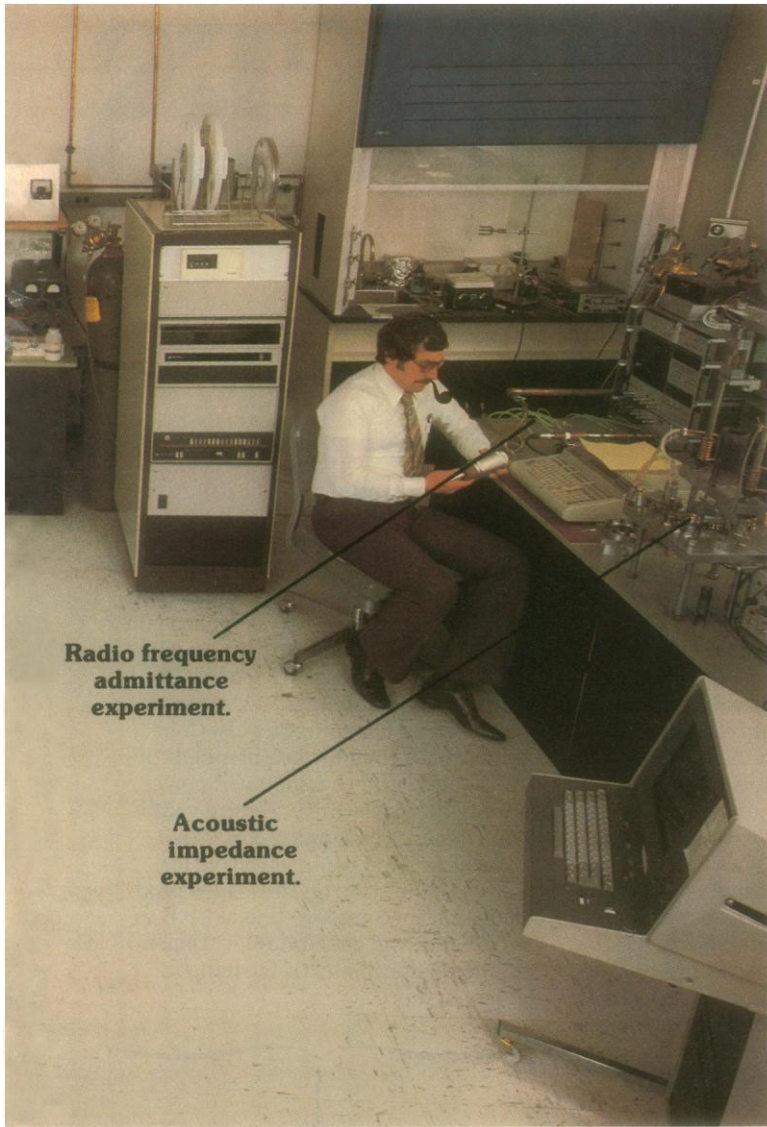
of the shale properties, Prof. DuBow has been able to delineate the location of these zone boundaries. Process engineers can then use this data to detect the position and velocity of these reaction zones, and to determine the shape of each zone. In turn, this tells them whether or not the desired process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

A hierarchy of machines.

Another reason why Prof. DuBow chose HP-IB is because of the flexibility provided. "We use three HP 9825s, in conjunction with an HP 1000," Prof. DuBow says. "That way, we end up with a hierarchy of machines. The 9825s have the capacity to analyze most of our data, while the HP 1000, with floppy disc drive, is faster for graphics and hard copy output. The HP 1000 also gives us the ability to store data permanently, and to compare new data against data that was generated six months ago. On the other hand, if the 1000 is busy, the 9825s can provide us with a lot of our essential data. And, since software is compatible, if one 9825 is unavailable the other two can keep the lab running."

Flexibility for data quantity and quality.

In short, this HP-IB system made it possible for CSU engineers to assemble a system configuration quickly, so they could begin looking at data months faster than might have been possible had conventional components been used. It also permits them to analyze oil shale samples faster and obtain more data from the tests. In fact, in one three-month period, CSU has generated more oil shale test data than had ever before existed in published form.



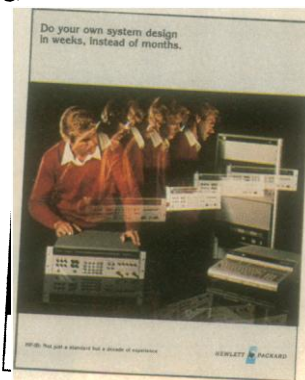
more oil shale test data than had ever before been published.

"Not a new adventure every time."

Professor DuBow's HP-IB system now represents an investment in excess of \$250,000, and includes the computers, a low frequency network analyzer, a differential thermal analyzer, printer, four-pen plotter, five disc drives, tape drive, measurement process controller, terminals, and ten other HP instruments. "With HP," Prof. DuBow reports, "I can modify, upgrade or expand the system as our needs change; I have a system where I can hook up specialized and expensive analytical instruments (such as an HP GCMS) rapidly and not have a new adventure every time. Aid from HP people was crucial at certain times. In fact, if it hadn't been for them, the whole program might have failed. One of their applications engineers was especially helpful not only in the interfacing, but his intimate knowledge of the instrument system helped us design our experiment to get the data we wanted accurately."

Getting to know more.

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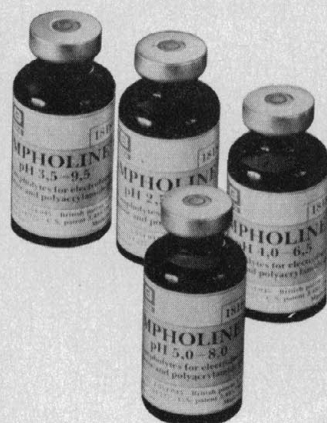
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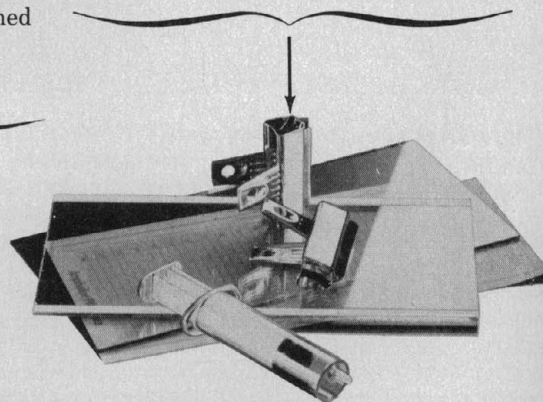


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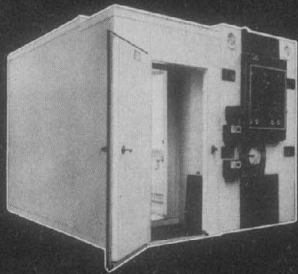
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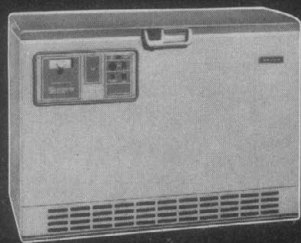
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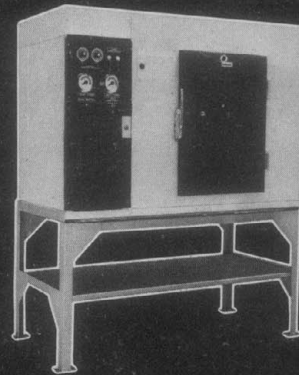
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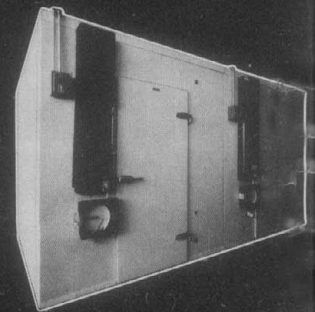
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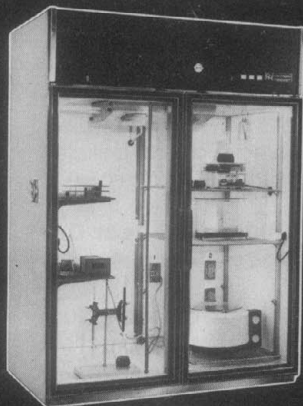
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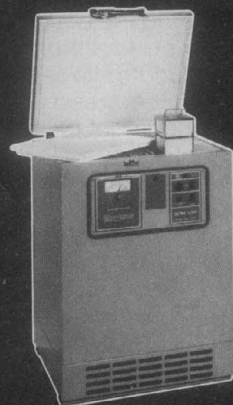
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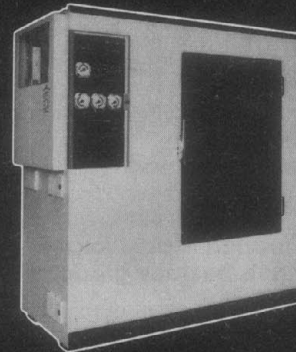
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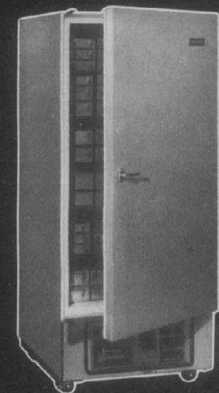
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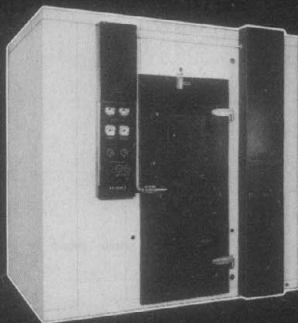
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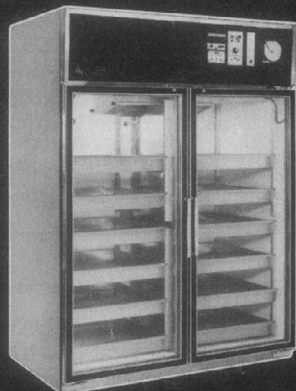
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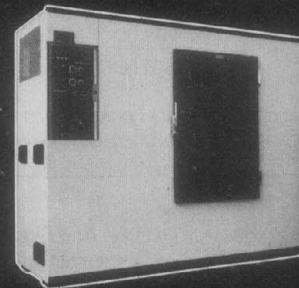
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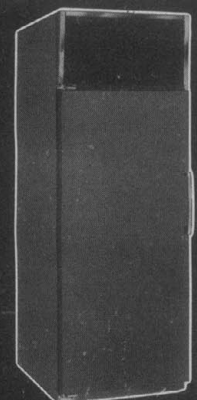
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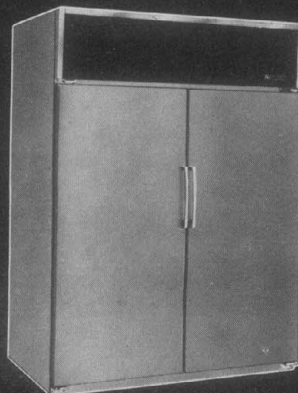
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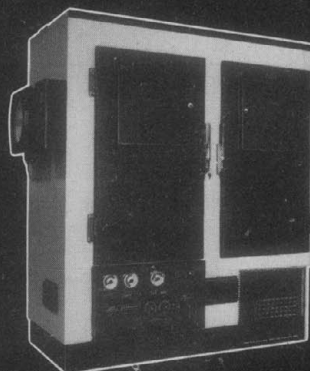
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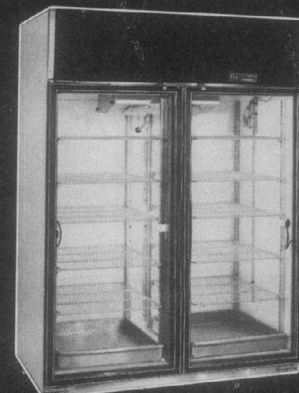
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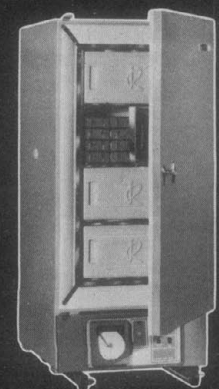
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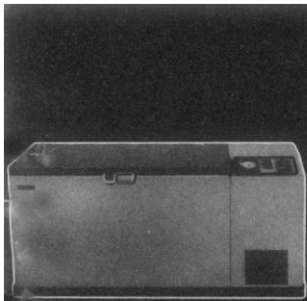
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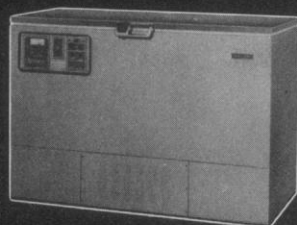
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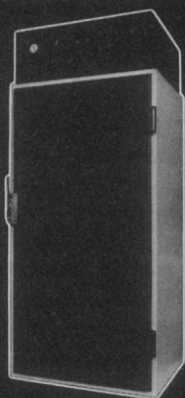
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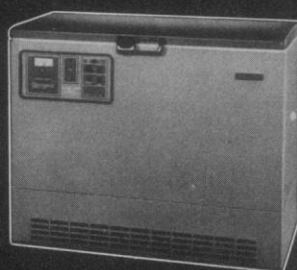
Revco
ULT 1985



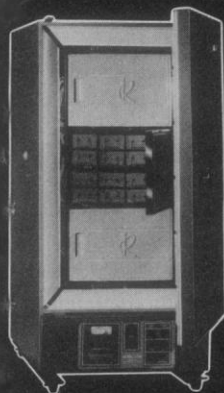
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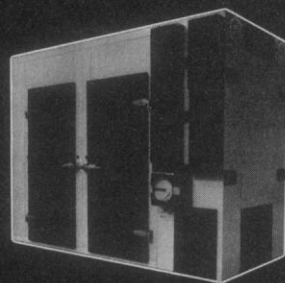
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CEC 25 Incubator



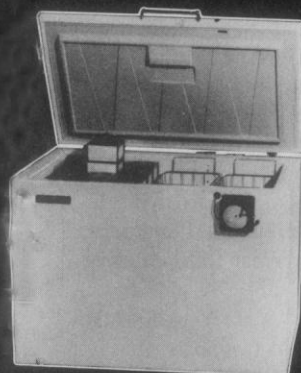
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ULT 900 Series



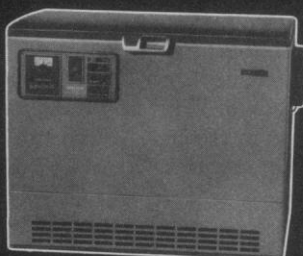
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Anti-human Lyt 3*	biotin labeled	Sheep anti-mouse Ig,
Anti-human Ia	Anti-mouse Thy 1.2,	alkaline phosphatase
	fluorescein labeled	labeled
VIRAL	Anti-mouse Thy 1.1	Anti-mouse Lyb 2.3
Anti-murine	Anti-mouse Lyt 1.2	Anti-mouse TL
leukemia virus gp70	Anti-mouse Lyt 1.1	
Anti-murine	Anti-mouse Lyt 2.1	
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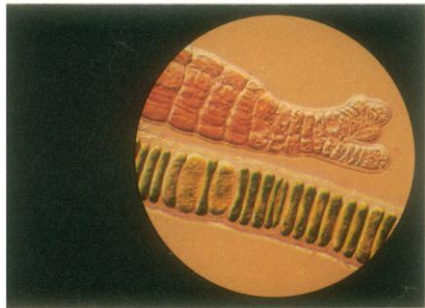


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Pruning the Federal Science Budget

Appropriations for research fall within the "controllable" category of the federal budget, hence seem especially vulnerable when budget cutting is the order of the day. Certainly, managers of the federal budget, seeking to reduce total expenditures by tens of billions of dollars, cannot be expected to treat science as a sacred cow. As it turned out, the nature, more than the magnitude, of the proposed reductions proved to be disturbing. Instead of pro rata overall reductions, with the affected agencies given opportunity then to declare their priorities, they were directed, in successive prunings, markedly to reduce allocations to specific programs.

The scientific community will be grateful that the Office of Management and Budget (OMB) carefully preserved the central core of research and graduate education in the natural sciences, making only relatively nominal downward adjustments across government. Apart from eliminating such major new starts as the research instruments program, however, the programs selected for most other large reductions seem dictated not so much by financial constraints as by social philosophy. Thus, social science has been all but removed from the budgets of the National Science Foundation (NSF) and the National Institute of Mental Health (NIMH); the NSF education programs were virtually eliminated; the international programs of NSF were painfully shrunk; programs involving university-industry collaboration were eliminated; the institutional support component of National Institutes of Health training grants was deleted. Each warrants fair debate before the new Administration begins to implement its policies.

The NSF program for "upgrading" laboratories by providing state-of-the-art instruments is long overdue; the obsolescence of our instruments limits the pace of the national scientific endeavor and, hence, limits the national future. The international programs of NSF support a small amount of bilateral cooperative research, exchange programs with China and the East European nations, dues to the International Institute for Applied Systems Analysis and the International Scientific Unions, inter alia. Surely this country is capable of sustaining a \$14-million commitment to international partnership in the pursuit of knowledge and its beneficial applications. Severe, abrupt reductions in this program could have political repercussions out of all proportion to the sums involved.

The NSF educational programs are designed to improve education in science in every school system, not as support to routine operations. Particularly troublesome is the drastic reduction proposed for federal funding of research in social science. Patently, our knowledge of the natural world and our technology have outrun our wisdom in their use—witness the need for the very effort in which OMB is currently engaged. Agreed, the economists and sociologists have not enabled us to avoid our current national straits, but if the best of them are not assisted in their attempts to learn, we are doomed to cycles of well-intentioned policies resting on flawed theoretical bases. If there is to be adequate funding for the social sciences, natural scientists and engineers must so urge.

As this is written, nothing has been heard from agency heads; they are silent, as they should be. One can hope, however, that appropriately placed outsiders—the National Science Board and the Advisory Council of NIMH, for example—will make representations through channels and that scientists will later press their cases before congressional committees, the opportunity for the scientific community to be heard.

One cannot know whether the presence of a Science Adviser in the White House might have affected the nature—not the magnitude—of these cuts. But there would have been greater assurance of understanding of what is at stake. Inevitably, major decisions involving science and technology will again present themselves in the White House. The President's need for a highly qualified Science Adviser will surely be at least as great as in the past. Announcement of such an appointment would be reassuring.—PHILIP HANDLER, *President, National Academy of Sciences, Washington, D.C.*
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