

"generic technologies that support both our economic competitiveness and our national security." Until this point, it was acceptable to spend federal funds to develop military hardware, but not on technologies that lacked a national security link of some kind. But now the rigid prohibition of the 1980s is giving way to a more tolerant approach in the 1990s, as revealed in a blue booklet (labeled "U.S. Technology Policy") issued last fall by the White House (*Science*, 9 November 1990, p. 747). In it, Bromley wrote that one of the federal government's responsibilities is "to participate with the private sector in precompetitive research on generic, enabling technologies that have the potential to contribute to a broad range of government and commercial applications."

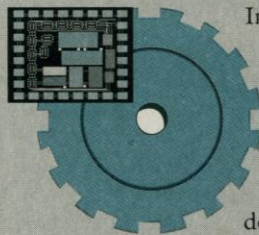
To many, the book still seemed thin on substance, but, to some, it had set a precedent. This, at any rate, is what Lewis Branscomb argues. Branscomb, now at the John F. Kennedy School of Government at Harvard University, has served on many White House advisory panels dealing with technology and was vice president and chief scientist at IBM from 1972 to 1986. He observed Bromley's negotiations with other, more skeptical White House officials and insists that getting the blue book published was a case of "masterful diplomacy." Because it has been endorsed by the White House, says Branscomb, "every agency that wants to fund industrial technology can quote this document as the justification for doing so."

To the doubters, cash carried more weight than a thin publication. The Great Lakes Center and four sister agencies in New York, South Carolina, Kansas, and Michigan have been allocated \$11 million this year—though on a base of local business support and state funding that was required to get the federal funds. The cash isn't an endless stream, though: After 6 years the agencies must become self-supporting.

The White House science office deserves credit for pushing a few other technology-boosting efforts through the mill this year. These include Bromley's inauguration of a multiagency drive to improve the speed and quality of U.S. computer technology, an effort that has been accorded a 30% budget increase (*Science*, 15 February, p. 737). In the future, Bromley intends to promote materials research and biotechnology.

In April, at the urging of Congress, OSTP is expected to unveil a list of 26 critical technologies for civilian and military purposes that it judges to be the most important to target for special attention. Then, in June, OSTP will announce the membership of a new Critical Technologies Institute, a quasi-governmental agency advocated by Senator Jeff Bingaman (D-NM) and created

## Sematech: Techno-Policy in Action



In the mid-1980s, leaders of the U.S. semiconductor industry were getting nervous. The computer industry was stalled in recession and U.S. companies had virtually abandoned the market for big-selling memory chips called DRAMs. Semiconductor industry leaders were quick to blame their problems on "predatory" trade practices by Japanese companies, and they loudly warned that the Japanese next planned to "target" dominant U.S. companies making more specialized chips. Their best hope for salvation, they said, was a helping hand from Uncle Sam.

Congress was listening. By mid-1987, legislators were drawing up plans for what has since become one of the more ambitious examples of direct federal support for civilian technology: Sematech, an Austin, Texas-based consortium of 14 major U.S. semiconductor manufacturers. With \$100 million a year from the Defense Advanced Research Projects Agency (DARPA) (member companies more than match the federal contribution, giving the entire program an annual budget of about \$225 million), Sematech is charged with leading a veritable revolution in chip manufacturing technology and industry relations.

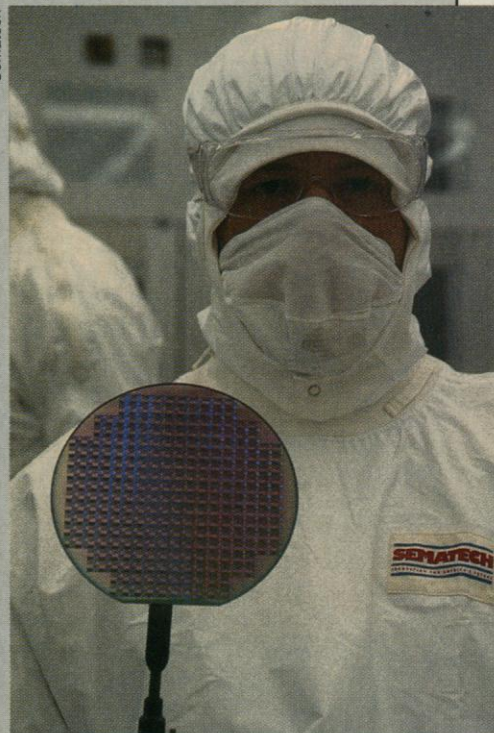
Sematech is focused on the process of manufacturing, not its end result. Consequently, it has devoted much of its effort to beefing up the 130 or so American companies that supply most of the tools for processes such as photolithography, chemical etching, and molecular epitaxy. Sematech not only helps these generally small companies fund the development and testing of new equipment, it's also engaged in a wholesale attempt to alter cutthroat business practices by preaching the virtues of "partnerships" between suppliers and their customers.

Sematech has also been busy developing new manufacturing techniques itself. At a state-of-the-art fabrication line, which utilizes only equipment from U.S.-based suppliers, Sematech engineers and "assignees" from member companies work side-by-side to iron the glitches out of processing steps. Last fall, it turned out its first batch of chips with a resolution of 0.5 microns—an achievement Sematech officials say brings them even with their Japanese competitors.

The gains from such activities are difficult to quantify. No Sematech members contacted by *Science* were willing to claim they'd increased their market share as a result of Sematech advances. But spokespersons for IBM, Digital Equipment, and Motorola practically radiate with enthusiasm over Sematech's progress. "There is a tremendous sense that Sematech is doing the right things," says Paul Bergevin, an IBM spokesman.

With federal funding scheduled to end in 1993, Sematech officials are busily drawing up plans to keep the DARPA money flowing. Federal participation has been essential to keeping the consortium together, they say. "I doubt very seriously...if the industry would ever have formed Sematech on its own," says Turner Hasty, Sematech's chief operating officer.

But there is a darker cloud on Sematech's horizon: the vulnerability of small suppliers to foreign takeover. Despite anguished cries from Sematech officials, a federal judge last week refused to block the sale of Semi-Gas, a \$23-million Sematech-affiliated gas equipment manufacturer, to Nippon Sanso of Tokyo. Sematech CEO Bill Spencer says the case shows that "foreign firms are able to purchase U.S. technology at a bargain price." Unless the federal government acts to block such sales, however, more are probably inevitable—a prospect likely to make Sematech's most ardent admirers pale. ■ DAVID P. HAMILTON



**Cutting edge.** Sematech's \$100-million-a-year federal subsidy is paying off.