News & Comment

Investors' Yen for U.S. Technology

From California to Massachusetts, Japanese companies are on a buying spree, snapping up U.S. high tech firms, paying huge prices for electronics and biotechnology ventures

SHELDON WEINIG'S MULTIMILLION dollar company, a major supplier of super pure silicon and other key substances to the nation's semiconductor industry, was in critical need of cash 2 years ago. Weinig went looking for help, but the best offer he could find—one that a growing number of high tech companies are accepting—meant surrendering control to foreign owners.

Though Materials Research Corporation, or MRC, as it is known, was racking up $150 million in annual sales, it badly needed an infusion of money. The publicly held company was $40 million in the red, and Weinig was desperate to expand manufacturing operations and the company's R&D to keep the company "au courant," he says.

So Weinig, a former professor of metallurgy at Columbia University and MRC's founder and chief executive officer, began hunting for potential U.S. investors. He scoured the big banks. They were "a dead end." He went to Wall Street. It "yawned" at him. Semiconductor-related companies are considered too much of a gamble, he was told. Then Weinig went to MRC's own customers—including IBM, Texas Instruments, and Motorola. He proposed they set up a special fund to keep MRC and other struggling supply companies afloat. "They told me, 'It's not part of our corporate strategy,' " Weinig recalls.

Who came to the rescue? "Even though I didn't want to," Weinig says, he agreed in August to sell MRC to Sony. And Sony pounced at the opportunity. The deal was sealed with astonishing speed—in 2½ days. Weinig says Sony paid $63 million for the company stock and also assumed the company's $40 million debt. Some say the sale was a steal.

The buyout is just one example of a new—and some say alarming—trend: While Wall Street naps, Japanese companies are on a shopping spree for U.S. high technology. Indeed, in the past year or so, the Japanese have pumped hundreds of millions of dollars into young American start-up firms, and mature companies as well—firms that conduct leading electronics research, supply critical materials to the U.S. semiconductor industry, make chip-testing and production equipment and computer hardware.

And that's not all. The Japanese are starting to plow more money into the U.S. biotechnology industry (see box). They have also made buyout offers to most of the key U.S. start-up firms in superconductivity, says Greg Eyring of the Office of Technology Assessment. Most of these U.S. companies have not sold though, he says.

Japanese investment in the U.S. high tech industry has received relatively little public attention compared to the commotion over the sale of what many consider two national treasures—Columbia Pictures, which was wholly acquired by Sony, and Rockefeller Center, in which Mitsubishi now has a 51% stake. But to some top leaders and analysts in the scientific and business community, the cumulative effect of Japanese investments in high technology amounts to a raid on U.S. innovation and production capability that weakens U.S. economic and military security.

The fear is that the new owners will convert these properties to subsidiaries of "Japan, Inc.," not sharing innovative products with domestic U.S. firms but capturing them for parent organizations back home. Japanese investors are bailing out U.S. companies, says Charles Ferguson, a research associate at the Massachusetts Institute of Technology and a business consultant, but "this is not a charitable endeavor." Given Japan's track record in other areas, including color televisions, VCRs, and compact disc players, where it has overtaken the United States, he says, "there's every reason to believe that Japanese companies will move important R&D to Japan. They'll rotate their scientists through labs here and then go back," he says.

Materials Research Corporation

Brushed off *by U.S. investors, Sheldon Weinig sold to Sony.*

Already, the U.S. semiconductor industry has been battered by what it calls "predatory competition" (see p. 1240), and its leaders see more trouble looming. The latest bets are that Perkin-Elmer, the only major remaining U.S. manufacturer of key silicon chip production machinery, may sell this equipment division to a Japanese company, probably Nikon. Once ranked behind Perkin-Elmer, Nikon has now become the world leader in chip equipment sales.

Perkin-Elmer spokesman Ed Bloch said on 30 November that a deal would be completed by "around the end of the year," but declined to identify the buyer. Nikon spokesman Yoya Ikeda in Tokyo declined comment.

Perkin-Elmer's tale is much like MRC's. Since last spring, the company has been searching for U.S. investors, apparently to no avail. Robert Noyce, head of the U.S. government-backed Sematech research center, says he tried early on to encourage a group of U.S. companies, whom he declined to specify, to pool money and buy the division. The sale of the division to a foreign buyer would be "a major blow" to the U.S. semiconductor industry, Ian Ross, president of AT&T Bell Laboratories, told *Science*. But neither Noyce nor Ross—nor media attention—has galvanized a potential U.S. buyer or the federal government.

Several factors are fueling the Japanese shopping binge. One is that the cost of raising capital in Japan is, by some estimates, half as expensive as it is in the United States. This structural economic difference gives Japanese companies a great advantage that would be difficult to match even if the U.S. government were making an all-out effort to boost competitiveness. The cheaper rate is based in part on the fact that interest rates are far lower in Japan—about 3% compared with 9% in the United States.

With the advantage of cheap capital, Japanese companies have outbid U.S. investors for control of domestic companies. For ex-

ample, TDK, the magnetic tape firm, recently paid $200 million in cash to buy Silicon Systems Inc.—nearly a 100% premium for the company based on the price of its stock shortly before the deal's announcement, says Joseph Furlong, head of mergers and acquisitions for Robertson, Stephens & Company in San Francisco, which advised Silicon Systems. The electronics company, which makes computer components known as ASICs (application-specific integrated circuits), wasn't even looking for a buyer, he says, but found the offer too good to pass up.

Furlong notes that TDK approached the investment firm "looking for an acquisition with very specific criteria." This is a common pattern. "Japanese are going into deals with strategic purposes in mind, targeting important technologies as a way to build market share in the future," says David Angel, vice president and director of worldwide research in semiconductors at the market consulting firm Dataquest. Unlike their U.S. counterparts, the Japanese are not preoccupied with profit in the short term. Japanese companies, particularly those in smokestack industries, are trying to diversify by buying equity in high technology companies, says MIT's Ferguson. "They're zeroing in on high value–added products," Ferguson observes. Steven Weiner of the San Jose Development Agency, which promotes trade with Japan, says that a Japanese executive put it to him this way: "Japan is moving from the Iron Age to the Silicon Age."

Kubota, Inc., a major Japanese manufacturer of tractors, is a prime example. In recent years, the company has been snapping up equity in U.S. high tech firms left and right. Kubota spent $50 million for a 44% equity share in Ardent, Inc. (which recently merged with Stellar, Inc., another minisupercomputer company; Kubota now has 22% equity in the new company); $21 million for a 20% stake in MIPS Computer Systems, the first American company to develop chips called reduced instruction set computing; $22 million for Akashic Memories, makers of thin-film magnetic computer disks; $17 million for a 25% equity in Maxoptix Corporation, gaining access to the company's magneto-optical technology; and an undisclosed amount for a minority interest in Rasna Corporation, a small software company.

Analysts say that the Japanese are ready to move faster and spend more money to clinch a deal than a few years ago. Until recently, they made small acquisitions and were typically slow and deliberate in decisionmaking.

But now they're doing their homework well in advance, sharpening their savvy as buyers, Angel and others say. Japanese companies, large and small, have scouts in the United States searching for cutting edge technology. Kobe Steel, Inc., has a development office in San Jose. Almost all Tokyo's major trading houses have branches in the

RECENT INVESTMENTS BY JAPANESE FIRMS

Investor	Company	Millions of Dollars	Equity
TDK	SILICON SYSTEMS, INC. chips for disk drives	$200	100%
SONY	MATERIALS RESEARCH CORP. silicon for chip-making	103	100
KYOCERA	AVX electronic capacitors	100	100
KUBOTA	ARDENT mini supercomputer maker	50	44
	MIPS microprocessors	21	20
	AKASHIC MEMORIES thin-film magnetic computer disks	22	100
	MAXOPTIX magneto-optical technology	17	25
CANON	NeXT, INC work stations	100	17
CHUGAI PHARMACEUTICAL	GEN-PROBE, INC diagnostic probes	100	100

DATA: *Business Week, SCIENCE*

Next Stop: U.S. Biotechnology, a 'Targeted Industry'

While Japanese investors have been attracted to U.S. high tech electronics like bees to honey, they're also beginning to show interest in biotechnology.

"Biotechnology is a targeted area by the Japanese government," says Jerry Caulder, president of Mycogen, Inc., and president of the Industrial Biotechnology Association. He says the Japanese are increasing their U.S. investments and "they're coming for the technology." Peter Drake, an industry analyst at Vector Securities, agrees, citing recent moves by Japanese chemical and pharmaceutical companies.

The biggest acquisition so far is the $100-million buyout of Gen-Probe, Inc., by Chugai Pharmaceutical Co., Ltd. Gen-Probe is a leader in the development of genetic probes as diagnostic tools.

Shionogi Pharmaceutical, Inc., recently paid $31 million, including $10 million up front, to license from Molecular Biosystems a contrast imaging agent used in cardiac ultrasound testing. "That's an unbelievable amount of money" for a company that had $8 million in annual revenues, Drake says.

Sumitomo Chemical Company this year put $10 million into Regeneron Pharmaceuticals, Inc. Regeneron is a biotech company studying ways to treat neurological problems, including spinal cord injuries and Alzheimer's and Parkinson's diseases. Last month, Chiron struck a $20-million deal with Daiichi Pure Chemicals Company, Ltd., to develop diagnostics and license technology for several viral diagnostic tests.

Mycogen, which is developing biopesticides, has two Japanese partners: Japan Tobacco and Kubota, Inc., the tractor firm that has also invested heavily in the U.S. electronics industry. Caulder says Mycogen has gone to great lengths to protect its technology. While many young biotech startups do contract research, Caulder decided against that source of revenue. It also does not license its technology, for that would amount to selling off the company's "seed corn," he says.

Instead, Caulder says, "we do research through joint ventures with a partner so we own the technology. That way, he says, when the Japanese create new technology through the collaboration, "they can't use it separately from the joint venture." Mycogen also gets access to a large marketing distribution system through its Japanese partners.

With Chugai's help, Gen-Probe will be able to accelerate development of the company's technology, says Gen-Probe's president Thomas Bologna. "It's an ideal fit. Together we'll be able to do something we couldn't do alone." ■ **M.S.**

Bay Area. Representatives of Japanese companies always attend a popular conference sponsored by the American Electronics Association where U.S. companies try to drum up potential investors.

The OCL Technology Center in San Jose was set up last year by 300 small to mid-size companies from Osaka prefecture specifically to scope out potential partners in high tech and other sectors. Many of the member firms are from smokestack industries. "Our members are not looking for passive equity," OCL president Diana Yoshikawa told *Science*. They are looking for new products in high technology and other industries, she says. U.S. companies are so desperate for capital that OCL has had to do little scouting of its own to date. Since OCL opened its doors, 400 U.S. firms have found their way in without being solicited, Yoshikawa notes.

Many critics, like Noyce, bemoan the wave of Japanese investment in U.S. high tech as a threat to the nation's economic life. But others respond that the Japanese have saved companies that would have gone out of business, boosted their R&D budgets, and—unlike U.S. investors—taken a long-term view of research.

"Without Kubota's funds, it would have been difficult to build" Ardent, says Gordon Bell, who remained R&D director after the merger with Stellar. Kubota provided manufacturing expertise that Ardent does not have. Bell says, "We're not transferring our know-how about designing computers." He adds that Kubota "wants us to spend even more on R&D."

The same is true for MRC. Weinig says that before Sony came along, MRC was spending "nickels and dimes" on research and development. Sony came in with "dollars," Weinig marvels. "After 25 years of worrying about quarterly reports, I can propose a 3-year project to Sony and they say, 'Okay.' That's a real change."

Chips and Technologies, one of the fastest growing semiconductor companies in Silicon Valley, was turned down by 65 U.S. venture capital firms before it finally found a partner in Ascii, a microcomputer systems firm in Japan, to manufacture its specialized chips, says company spokesman Gavin Bourne. Kobe Steel, Ltd. bought the software subsidiary of Control Data Corporation, Cybernet Systems, after CDC decided to fold its supercomputer operation. The purchase price was not disclosed, but Kobe doubled the firm's capitalization to compete with Cray, NEC, and Fujitsu, according to data from the Japan Economic Institute.

How much U.S. technology is actually flowing to Japan? Some U.S. companies have been able to hold onto their technology while selling significant equity to the Japanese. Canon, Inc., bought a 17% share in Steven Jobs' NeXT computer company for $100 million. For that, Canon only got marketing rights in Asia. OCL's Yoshikawa says that the firm's clients are interested mainly in tailoring or selling new products for the Japanese market rather than licensing the technology.

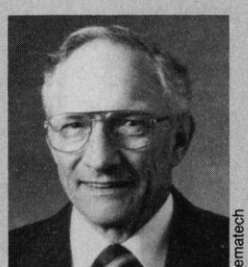
But technology transfer is common when U.S. companies become wholly owned subsidiaries and when they strike partnerships to license or co-develop products with Japanese companies. MIPS signed on NEC to manufacture and market its RISC (reduced instruction set computing) chips. Sun Microsystems is licensing its SPARC chip, a key component from its popular workstation, to Fujitsu. Texas Instruments is developing a 16-megabit DRAM with Hitachi.

Motorola is collaborating with Toshiba to co-develop and co-produce 4-megabit DRAMS and RISC microprocessors. But Motorola struck an unusually hard bargain to ensure a fair exchange of technology, says Clyde Prestowitz, former U.S. trade representative to Japan. Before Motorola consented to trade its RISC technology, it made Toshiba come to the table first with its manufacturing know-how.

Noyce, Ferguson, and others fear that the drain of U.S. research to Japan could be even greater than it appears because critical information about many of these transactions is not tracked. Although publicly held companies have to report foreign invest-

The Chip Makers Call, But No Cavalry Rides to the Rescue

"This is death by a thousand cuts," Robert Noyce, chief executive officer of Sematech, the semiconductor research consortium, told *Science*. He was speaking of the many inroads Japan has made into the domestic electronics market, once exclusive U.S. turf. "Not any one cut is fatal," but if it doesn't stop, the U.S. industry will be "dead." Noyce laments: "We're [allowing Japan] to strip away one capability after another."



Sematech

Robert Noyce

The Japanese have stepped up their spending pace at a time when the federal policy in supporting high tech initiatives, including Sematech and R&D for high definition television, is being hotly debated in Washington.

The National Advisory Committee on Semiconductors (NASC), a panel of top industry and government officials appointed by Congress, sounded the alarm in a report released on 20 November. While the U.S. semiconductor industry is still relatively healthy, it is rapidly losing its remaining vigor, NASC said. These findings underscore similar conclusions reached by MIT's Commission on Industrial Productivity in a major report issued last spring, "Made in America: Regaining the Productive Edge."

Why is the U.S. chip industry in trouble? The foremost reason is that the cost of capital in the United States is much greater than in Japan, NASC said. As a result, few, if any, startup firms can raise the funds to build a new chip fabrication plant, which now costs roughly $250 million. The U.S. industry is also highly fragmented, unlike the vertically integrated conglomerates in Japan.

NASC recommends the formation of a multibillion-dollar corporation that could revitalize the U.S. consumer electronics industry, sustaining demand for domestically made chips. The corporation would serve as a source of low-cost capital funds from nonfederal sources, backed by federal loan guarantees. The committee also says Sematech should be expanded to improve the industry's basic manufacturing expertise, especially in developing new chip-making equipment, materials, and processes.

A slightly different rescue approach was suggested by a subcommittee of the MIT commission. It urged a major new initiative to encourage long-term investment, without specifying whether it should be federally backed, and recommended more patience among investors and companies alike. Its report warns that "the conventional economic prescriptions, such as tax credits, guaranteed procurement, import quotas, and industry-wide R&D funding, are unlikely to have much success" and might even prop up the inefficient system that now exists.

Some of these prescriptions don't go far enough, says Richard Lester, the commission's executive director, who stresses that

ment to the Securities and Exchange Commission, privately owned companies do not. "We really don't know who's investing in what," says Davis of the Semiconductor Industry Association.

Davis and Noyce are among those who favor a federal disclosure rule, as proposed in legislation last year by Representative John Bryant (D–TX), requiring reports on foreign equity purchases of 5% or more. But this measure has been vigorously opposed by the Administration. Opponents, including even the National Advisory Committee on Semiconductors (NACS), say that rule would go beyond simple monitoring and ultimately discourage foreign investment.

The key to rehabilitating the domestic semiconductor industry, the NACS says, is to make capital cheaper to buy in the United States and to support a major effort to revive the U.S. consumer electronics industry. NACS recommends, for example, making the R&D tax credit permanent, reinstating the investment tax credit, and reducing capital gains taxes.

But even if a decision were made now, it would take time to bring about such big changes in federal policy, time which the industry may not have. Ross says the U.S. companies have "2 years at most to make corrections before we find ourselves a generation behind" Japan in chip technology."

In the meantime, the Japanese will keep the U.S. chip industry "needs to improve its manufacturing performance as well." In Lester's opinion, a major effort to boost the consumer electronics industry may do little to reduce the industry's fragmentation.

The Administration thus far has not adopted any policy to deal specifically with the electronics industry. However, the President's science adviser, D. Allan Bromley, said at a Senate subcommittee hearing on 29 November that the federal government should encourage vertical collaboration by revising antitrust law. Better training and education and more cooperation among government, universities, and industry are also needed, he said.

Bromley did commit the Administration on one point: He rejected the NACS proposal to set up a financial entity to revive the electronics industry and ruled out major increases in Sematech's budget. Bromley said these would amount to "interventionist industrial policy." His comments signaled that the Administration will mount no dramatic rescue of the chip industry. ■ **M.S.**

Advanced Micro Devices

Chipping away. *Japan's investments in the U.S. electronics industry are growing.*

buying, and the federal government has shown little inclination to interfere. The late Malcolm Baldridge, Commerce Secretary in the Reagan Administration, curbed a plan by Fujitsu to buy Fairchild Industries, but his aggressiveness was exceptional.

A Treasury Department unit called the Committee on Foreign Investment in the United States is empowered to review the impact of specific deals. But the criteria to block a transaction are so rigorous that the committee has not barred a single one of the 150 deals it has considered to date.

The Treasury Department is the wrong agency to house such a committee anyway, Ferguson says. "It's the most pro-Japan and most heavily dependent on Japan of any of the federal agencies," he claims, because Japan is one of the heaviest investors in U.S. Treasury securities.

Other experts, like Robert Lucky, executive director of AT&T Bell Laboratories' research, communications, and sciences division, don't take such a dire view of Japanese investment, but they express uneasiness. Lucky says Japan's financial investment is "ominous. Japan hasn't flexed its muscle yet, but if they decide to use it, they have it." To him, foreign alliances with U.S. companies should be judged on whether they improve the U.S. standard of living and whether the United States benefits from the net flow of technology.

Ken Katashiba, senior vice president of Fujitsu Microelectronics, Inc., which wholly acquired Amdahl, bought a 30% stake in Pocket, a laptop computer maker, and purchased an undisclosed amount of equity in Via Technologies, a RISC maker, said, "it is a waste of time" to think about these questions. "Rather than talking about these kind of issues, a company should respond to its users and to the market," he says. Naohisa Matsuda, vice president of Kubota Computer, said that apprehension about technology transfer to Japan is misplaced. "The U.S. should be thinking about how to continue to develop high-end technology" to keep attracting Japanese investment, he says.

A recent publication entitled "A Japan That Can Say No," written by popular Japanese politician Shintaro Ishihara and Sony chief executive Akio Morita, hardly allays U.S. apprehension about Japanese investment in the domestic high tech industry. Ishihara writes that criticism by U.S. politicians "has taken on a rather hysterical tone these days," and goes on to charge that racism is at the root of Japan-bashing. Then he threatens, "Japan holds very strong cards in high technology capabilities, which is indispensable to military equipment" in the United States and the Soviet Union. "Yet Japan has never played this card."

But Japan has already withheld key technology from the United States, according to Noyce and Scott Kulicke, head of Kulicke and Soffa Industries, which makes chip assembly machinery. Last week before a Senate subcommittee they testified that Nikon in the past held back its most sophisticated steppers from the U.S. market, while only supplying Japanese companies. Ikeda of Nikon told *Science*, "It is Nikon's policy that we fairly treat all of our customers."

Asked about the impact of Japanese investment in the U.S. high tech industry, Dan Hutcheson, president of consulting firm VLSI Research, responded, "We're selling off the goose that's laying the golden egg. A Japanese executive told me that if you want to tear down a brick wall, you don't try to knock the whole thing down at once. You stand back from the wall and figure out where the loose bricks are. That's what the Japanese have done because of the weaknesses" in the U.S. high tech industry.

The Japanese ought to understand concerns in the United States about the wave of yen pouring into high technology, says Prestowitz. When IBM and Texas Instruments wanted to set up manufacturing plants in Japan, the Japanese would not consent until the U.S. companies agreed to license key technologies to them. "The United States has never responded in kind," he remarks. "The U.S. is the only country that doesn't have a pre-clearance procedure for foreign investment."

Perhaps Weinig best expresses the tensions in the high tech industry. To his frustration, the public realized MRC's value to the domestic semiconductor industry too late. Weinig says MRC "became a national treasure after Sony bought us. Why weren't we considered a national treasure before hand?" ■ **MARJORIE SUN**

Next week: X-ray lithography offers U.S. electronics firms a new chance to compete.