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Building a Relationship University-industry links like the kind that helped create Silicon Valley are vital to LI's economy and Stony Brook's place as a world-class institution Series: HOW SUNY STACKS UP. Eighth in a series
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SEE SIDEBAR: Growing Along With Biotechnology Industry `About 15 or 20 years ago...universities didn't feel they needed to talk to industry.' Yacov Shamash, New engineering dean

BY THE TIME he emerged from briefing Pentagon officials on the latest technological trends, Jerome Swartz knew that one idea intrigued them: a new bar code that would carry far more data than the familiar zebra-striped version.

The Department of Defense had asked for briefings from Swartz, chairman of Symbol Technologies of Bohemia, because his company was the leader in bar code scanning, a technology the Pentagon was already using. "The two-dimensional bar code bounced back as probably the most exciting to the people who were in the room at the time," said Rich Bravman, Symbol's marketing vice president.

Under existing technology, a scanner reads the bar code's stripes and turns them into numbers, which a computer deciphers by matching them with a data base. What Swartz and Bravman wanted was a technology that would pack enough data into the bar code so that a scanner could read the information directly, without the help of a data base.

To turn the idea into reality, Swartz sought the help of Theo Pavlidis, a pattern recognition expert at the State University of New York at Stony Brook. Pavlidis assigned the project to one of his graduate students, Ynjiun Wang. The goal was to cram 250 characters into a bar code an inch square. Wang did even better, figuring out a way to encode 500 characters. Using 200 of them to make the code "robust" enough to remain readable under adverse conditions, he left room for 300 characters of data. "You can damage your label up to 50 percent and you can still decode the label," Wang said. "That's really the big feature to make this invention practical."

Before the year is out, Bravman said, Symbol should be shipping the first generation of scanners to read the new bar code - four years after Swartz looked to Stony Brook's computer science department for help. The project is a perfect example of the kind of university-industry interaction that leads to economic development. So is the cartographic research Pavlidis conducts with Grumman Data Systems. "Theo is the best there is in the image-processing area," said Herb Tesser, assistant director at Grumman Data Systems.

These relationships, however, are not typical. For a variety of historical reasons, Stony Brook has not yet developed the broad, intense interaction with high-technology industries that some world-class research institutions have pioneered. The two most obvious paradigms for this kind of relationship are Stanford University, which spawned Silicon Valley's computer and electronics industry, and the tandem of Harvard University and the Massachusetts Institute of Technology, the driving forces behind the growth of the Route 128 high-technology region near Boston.

As Long Island's economy moves away from reliance on the defense industry and develops a greater need for civilian high technology, the university-industry axis becomes more crucial. There have been signs of improvement recently, but the region still has a long way to go before Stony Brook and industry function smoothly together, with help from the College of Technology at Farmingdale, to create a dynamic environment of idea-driven economic growth on an island that has 2,000 high-technology businesses - about a third of the state total.

"From my point of view, Stony Brook has done nothing imaginative by way of promoting relationships between Stony Brook and Long Island industry," said David Gelernter, a Yale University computer scientist who designed an influential new computer language called Linda while he was earning his doctorate at Stony Brook. "It seems to me that what is going on is zero, compared to what potentially could be happening . . . Long Island is as good as almost any region in the country, in terms of the concentration of industries where technology matters. Stony Brook has just been perverse in making so little of that."

In the early years of the campus, one barrier to interaction with industry was Stony Brook's youth: It simply didn't have much to offer.

"The first generation was devoted to looking inward . . . to build an institution that was worth having a relationship with," said Ann-Marie Scheidt, special assistant to the provost for regional development. There were also attitudes on both sides that chilled the relationship.

For its part, the university did little to reach out.

"The Stony Brook administration had the totally mistaken impression that the way to become a world-class university is to totally ignore, to rise above, their local surroundings," said Michael Schwartz, director of the 3-year-old Institute for Social Analysis, which was opened partly to develop links between the university and the community. "That was a very mistaken notion, if your ambition is to become world historical in magnitude."

The Stony Brook researchers themselves, like others around the country, labored under two negative impressions about working with industry. One was that this collaboration would taint "the disinterested search for truth," Scheidt said. The other was that industry only wanted them for pedestrian work that wouldn't lead to good science or scholarly publication.

"It turned out that neither of those things was really true," Scheidt said.

Despite the successes of Stanford and a few others, this standoffish attitude toward industry was hardly unique.

"About 15 or 20 years ago, there was so much money coming in from the federal government that universities didn't feel they

needed to talk to industry," said Yacov Shamash, director of the School of Electrical Engineering and Computer Science at Washington State University, who will become dean of Stony Brook's College of Engineering and Applied Sciences in August. "It really isn't just Stony Brook and Long Island."

In recent years, universities have turned more often toward industry as a source of research dollars, for several reasons. "The immediate cause is the reduction in {federal} funding," said Henry Etzkowitz, a sociologist at the SUNY College at Purchase and an expert on university-industry interaction. "The longer-term cause is the realization that some of the most exciting things that you can work on scientifically also have practical applications, and viceversa."

Stony Brook shares that new attitude. It has signaled its seriousness in several ways, such as the establishment and continued growth of the Center for Biotechnology, whose purpose is to find commercial uses for the discoveries of Stony Brook's life sciences faculty; the establishment of Schwartz' institute; the opening in 1989 of a Small Business Development Center; the creation of Scheidt's job, and, most recently, the ground-breaking for a small business incubator.

The hiring of Shamash, who runs a federal center for industry-university research at Washington State, is another indicator. Shamash said that if he didn't think Stony Brook was committed to developing the industry-university relationship, he wouldn't have agreed to take the job there.

That changed attitude alone, however, is not enough. "Making these connections after a generation of not having tried to do that, clearly there are things that need to be overcome," Scheidt said.

If the university in the past has not gone out of its way to develop the partnership, neither has business.

"I haven't found Long Island industry terribly aggressive in interacting with the university," Pavlidis said. Turning reflexively to the university for help is not part of the culture of Long Island businesses, several researchers said. One reason is that the dominant industry has been defense, in which companies have dealt with a single customer with specific requirements and have displayed little inclination to reach out for research help.

In the post-Cold War era, however, defense contractors will be looking for more help as they develop civilian products to replace lost defense business. "When you start getting into areas of diversification, you have to build a stronger base of generic research and development," said F. Pat Hession, who runs Stony Brook's high-technology incubator. "They're beginning to look outside themselves for resources that can be helpful to them."

Even if industry looks increasingly to Stony Brook for research, the campus doesn't necessarily have strength yet in the narrow areas where industry needs help. Those carefully focused strengths develop when industry and university work together for years and when academic administrators keep industry's needs in mind as they hire faculty. "These connections, where they have been made, involve a growing-together process," Michael Schwartz said. "There's a marriage that is developed."

One of those marriages is the vital but still imperfect match between Stony Brook and the information-technology industry, which many local leaders consider crucial to the region's future. Long Island already has a group of large information-based companies, such as Computer Associates, Symbol Technologies and Reuters. The chairman of Symbol, Jerome Swartz, advocates that local leaders settle on information technology as Long Island's "core competence," its economic centerpiece.

"The largest high-tech business in the United States is the information business, and it's still the fastest-growing," said Philip Lewis, chairman of the Stony Brook computer science department.

Tesser, of Grumman Data Systems, added: "The potential is enormous on Long Island, and it's also ideal for the environment. We're not going to support a manufacturing environment on Long Island for the indefinite future."

To develop the link to information technology, one key element is a strong computer science department. Stony Brook has a solid one, with a strong faculty and a growing expertise in computer graphics. Recently, the New York State Science and Technology Foundation received almost 300 proposals for industry-university grants and awarded 16 statewide. Four went to Stony Brook's computer science department.

"You've got some world-class people in computer science," Swartz said. One of his closest associates at Stony Brook is Pavlidis. In addition to his work with Symbol and Grumman, Pavlidis also has an important contract with the U.S. Postal Service to develop new optical character reading technology that will allow Postal Service scanners to read printed addresses on mail more efficiently.

The department's strength is also evident from the quality of its alumni. "The extent to which Stony Brook has succeeded in infiltrating its graduates into top departments is nothing short of miraculous," said David Gelernter, whose pioneering work on the Linda computer language has made him one of the department's most celebrated alumni.

But another influential alumnus, Stanford computer scientist John Hennessy, looks at Stony Brook and sees a top-20 department that could begin to fall behind. "It's sort of traditionally been the case until recently that there are about five top places," Hennessy said. "The second five in that tier have started to improve dramatically. The danger is that the second-10 tier is going to be left behind in the process."

Despite its reputation in computer science, Stony Brook's research strengths still do not match up well with Long Island's economic needs because it does not have a powerful electrical engineering department. Faculty and administrators were almost unanimous in saying that Stony Brook must bolster electrical engineering if the university is to play a major role in developing the information technology industry.

"They are exactly right," said Stony Brook President John Marburger. "They are 100 percent correct."

It is not that the department does a poor job of turning out qualified engineers. "Every accreditation visit, the electrical engineering undergraduate program is the most highly ranked undergraduate program we have," said the current dean of the College of Engineering and Applied Sciences, Stewart Harris. The chairman of electrical engineering, Kenneth Short, is the author of an important text on microprocessors, a respected teacher and a major reason for the link between Stony Brook and Symbol Technologies, which employs about 30 Stony Brook alumni. "He turned the class on to the company," said Symbol's Rich Bravman, one of Short's former students."He's really highly regarded academically."

Swartz, Symbol's chairman, agreed: "Ken Short is a phenomenal guy."

The problem, everyone agrees, is that the department is not doing enough cutting-edge research, for a number of reasons. One factor is size. The department has 19 faculty members. Over the years, it has varied from 12 to 22, averaging 16 or 17 over the last few years. "The people I've talked to on the outside who have approximately the same number of students tend to have twice the number of faculty," Short said. "We have tended to run very high ratios of majors to faculty . . . The impact is it reduces the time people have to do research, to go out and create contacts on the outside."

In addition to being small, the faculty is also overloaded with theoretical researchers, rather than experimentalists, whose work brings in larger grants. "You have a structural situation where over 50 percent of that department has been there over 15 years, and they're just mismatched to contemporary needs," Harris said. "They're more scholarly than applied."

The department would like to attract more experimentalists, but it does not have the equipment they would need. In the current budget crunch, it is difficult to offer attractive packages of equipment and salary to recruit high-powered researchers. "The amount of dollars it takes to bring that person in is substantial," Short said. "The bottom line is you have to make the investment. You can't do these things cost-free . . . You can't do it on the cheap."

The arrival of Yacov Shamash this summer as dean of the engineering college is an opportunity for improvement. "We think he has all the right qualities to take engineering to the next stage in its development," said former Stony Brook provost J.R. Schubel, who headed the search committee that hired Shamash. The question is how much funding Stony Brook will give him. The provost, Tilden Edelstein, said that the administration will acquire some new equipment for Shamash and will let him hire faculty in 1993.

Shamash said he was satisfied with Stony Brook's commitment to the engineering college and to industry, and he said he is not concerned about electrical engineering. "I don't think it's a problem; I think it's an opportunity," Shamash said. "I think it's a department that has tremendous potential. There are some tremendous opportunities in the Long Island environment for great university-industry relations."

In addition to Stony Brook's high-technology incubator and its Center for Biotechnology, another facet of its increasing outreach

to industry is the Small Business Development Center established by the Harriman School for Management and Policy in 1989. Before a startup company can enter the Stony Brook incubator, it must work with the SBDC on its business plan and other management aspects of its development, but the center's reach extends well beyond incubator companies.

In the last federal fiscal year, it worked with 395 long-term clients, said its director, Judith McEvoy. That's about half the size of the SBDC at the College at Farmingdale, which started in the mid-1980s, right after Congress passed the enabling legislation. "We got in close to the beginning," said Joseph Schwartz, director of the Farmingdale center.

The help that both centers give is intensely practical. "It's hands-on marketing," McEvoy said. "It's not theoretical marketing . . . We don't do the business plan for them. We do it with them." And the advice is free.

The Harriman School itself remains a relatively small factor in all this. It began more than two decades ago in 1970, when Robert Nathans, a physicist, started a program in urban science and engineering to help members of minority groups learn the quantitative skills needed to work on urban problems. Nathans went all the way to former Gov. W. Averell Harriman in his bold and ultimately successful effort to elevate his program into a full-fledged college.

Until the mid-1980s, the Harriman School focused entirely on graduate-level training to produce government policy analysts. There was no undergraduate major, but there was a business minor. In one survey, said Gerrit Wolf, the former dean of Harriman, "the number one reason why students did not come to Stony Brook was because Stony Brook did not offer a business program."

In recent years, Harriman has established an undergraduate business major, aimed primarily at turning out managers for the private sector. But the school remains small. The undergraduate program has 80 seniors and 120 juniors. It is not expected to increase beyond 200 graduating seniors a year.

"There is not any enthusiasm to have 25 percent of its {Stony Brook's} students, as would be true nationally, in business," said the current dean, Matthew Sobel. But, with the state's encouragement, Harriman is adding more part-time undergraduates. In the fall, Harriman will install a more ambitious schedule of evening courses for nontraditional students.

Marburger has said that he hopes to build a technical managerial expertise at Harriman, to complement the development of the engineering department.

The Harriman School and the Small Business Development Center can help. As the College at Farmingdale evolves further from its historical role as an agricultural institution into a full four-year technical school, it will also play a major role in the development of a high-technology economy, by turning out engineers and technicians.

But it is Stony Brook's research brainpower that must be the major engine of high-technology growth on Long Island. To amplify those research and technology-transfer skills, Marburger has been pushing for several years to develop a joint research institute with Brookhaven National Laboratory and the Cold Spring Harbor Laboratory, to commercialize the ideas that come out of the three institutions.

"There is a variety of activities that could be consolidated . . . that we feel would really help towards creating a Route 128-Silicon Valley atmosphere on Long Island," said James Simons, chairman of the Stony Brook Foundation. Simons and Walter Kissinger, a Huntington consultant, pushed for a feasibility study of the idea to be conducted by Philip Palmedo of Palmedo Associates, a St. James consulting firm.

"There are efforts being made at all three of these institutions in technology transfer, but even the people involved in that feel they're inadequate," said Palmedo. His report recommended a structure for a research institute, and it resulted in the creation of a working group including the leaders of all three institutions. The group has issued its own reports and moved toward creation of the new research entity, which is expected to coordinate the research efforts of the separate institutions to give them greater cumulative impact.

To Henry Etzkowitz, who has studied the rise of MIT and the Route 128 corridor near Boston, it would be a move in the right direction. Following World War II, Etzkowitz said, the president of MIT, Karl Compton, helped pull together the managerial skills of Harvard Business School, the technical expertise of MIT and the funding ability of New England banks.

"So, what they invented is the venture capital fund," Etzkowitz said. "They did an analysis of the area, they saw what was missing, and they invented a specific organization to make it happen."

It is equally clear that Stony Brook must play a central role in Long Island's economic future. "Not a day passes without some manifestation of the economic impact that that institution has, not only on the county, but the region," said John V. N. Klein, former Suffolk County executive. "I would not like to see Long Island without that institution." **** Library The SUNY New Paltz library is named for Sojourner Truth, a woman born into slavery in Ulster County, who later became a nationally known abolitionist and was received at the White House by President Abraham Lincoln. **** Research A nationwide network to track lightning was developed about 10 years ago by researchers at SUNY Albany. The system, now run by a private Albany firm, uses radiodetection. Ligtning strikes are picked up by 125 radio sensors and beamed to Albany by a communications sattelite.

Illustration

1) Newsday Photo by David L. Pokress- F. Pat Hession, who runs Stony Brook's high-technology incubator, on the site of the program's permanent headquarters, scheduled to open this fall. Newsday Photos by Audrey C. Tiernan- 2) Symbol Technologies president Raymond R. Martino, left, and chairman Jerome Swartz got help from Stony Brook on a new type of bar code. 3) Working with Bohemia-based Symbol Technologies, Stony Brook computer science professor Theo Pavlidis and graduate student Ynjiun Wang helped develop a new type of bar code that carries more information. 4) Newsday Photo by David L. Pokress- Ann-Marie Scheidt's job, provost's special assistant for regional development, is part of Stony Brook's effort to forge links to industry. 5) Photo- Scientist David Gelernter says Stony Brook hasn't done enough to promote ties with LI industry. 6) Newsday Photo by David L. Pokress- SUNY Stony Brook President John Marburger. Charts- 1) Library. 2) Research. 3) Newsday Chart- Funding Goal. Of the initial SUNY goal to appropriate $84.5 million toward a graduate research initiative, only 46.5 percent was granted (see microfilm)

Abstract (Document Summary)

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