PARTNERSHIPS

# Japan Hopes to Cash In On Industry-University Ties

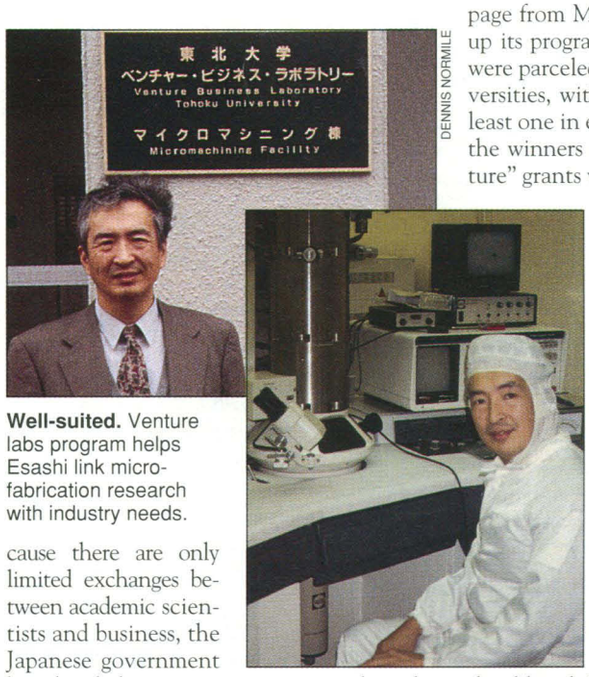
TOKYO—Tohoku University precision engineer Masayoshi Esashi enjoys giving tours of both his laboratories in Sendai, north of Tokyo. First, he takes you through a set of rooms in a 1960s-era building that are packed with a jumble of aging equipment for microfabrication, including working semiconductor fabrication devices that he built as a graduate student 20 years ago. Then, it's out the back door and down an alley to a spanking-new $9 million building, its three stories of lab space filled with $4.5 million of the latest equipment for exploring and developing leading-edge sensors and micromachines.

The two labs offer a stark contrast between the old academic traditions and Japan's new push to get its universities to contribute more directly to economic growth. Esashi's current digs are one of 21 so-called venture business labs funded by the Ministry of Education, Science, Sports, and Culture (Monbusho). The labs are part of a cluster of new programs run by Monbusho and the Ministry of International Trade and Industry (MITI) that are intended to give Japan's universities a larger role in shaping the nation's economy (see sidebar).

After a period of ivory tower aloofness, more and more universities and individual researchers are cozying up to the business world. Although funding for these efforts is modest compared to the country's overall R&D budget, Japanese officials emphasize that the goal of such programs is nothing less than planting and nurturing "the seeds of future industries."

What's driving these changes is worry about the nation's long-term economic health. Although the economy is finally recovering from 5 years of near-zero growth, officials and economists remain concerned that Japan is too dependent on such old, low-growth sectors as automobiles and heavy manufacturing and not sufficiently competitive in such hot areas as biotechnology and computer software. Correctly or not, they attribute U.S. preeminence in these fields in large part to the adroit coupling of university research and entrepreneurial zeal that created California's Silicon Valley and the Route 128 corridor around Boston.

"A decisive difference between American and Japanese universities is that U.S. universities are not just research organizations. They also play the social role of raising and supporting new industries and enterprises," says Seiichi Ohtaki, a professor of economics at Tohoku University who studies industrial policy and small-business growth. Because there are only limited exchanges between academic scientists and business, the Japanese government has decided to use money to stimulate the flow of ideas. "The objective [of the venture business laboratories] is to promote the kind of original research and development that will create the seeds for new industries and venture businesses, and to train young researchers," says Yoshihide Akatsuka, deputy director of Monbusho's university division.




DENNIS NORMILE

**Well-suited.** Venture labs program helps Esashi link microfabrication research with industry needs.

Taken together, the programs break new ground for both ministries. The "Research for the Future" program, funded by Monbusho's Japan Society for the Promotion of Science (JSPS), represents a deepening commitment to fostering university-industry ties. And the Original Industrial Technology R&D Promotion Program, run by the New Energy and Industrial Technology Development Organization (NEDO), an arm of MITI, is the first time MITI money has been channeled directly to university researchers.

Significantly, the new project is also the first time MITI has openly solicited proposals for one of its research projects. In the past, says Kaoru Hattori, deputy director general of NEDO's industrial technology department, the ministry selected a target, say the development of high-efficiency photovoltaic cells, and picked companies and researchers from its own institutes to do the work. But that approach fails to take advantage of the strength of academic research—its ability to stay on the cutting edge of science. "Technology is moving so quickly and emerging fields are changing so rapidly that it is difficult to foresee what is going to be important in 5 years," he says. Adds Tohoku University's Ohtaki, "It's not possible any more for MITI to pick out the targets and steer industries. It has to openly solicit ideas."

In contrast, Monbusho has borrowed a page from MITI's top-down book in setting up its programs. Its 21 venture business labs were parceled out to the largest national universities, with officials taking care to put at least one in every region of the country. And the winners of JSPS's "Research for the Future" grants were identified by committees of academics, which sought out the most qualified groups to attack themes selected by the committees themselves. JSPS officials say this method ensured that the funds would be used by the best scientists.

The hope is that the new programs will renew ties between industry and the universities that were breached during the late 1960s and early 1970s, when those links were seen as an unhappy yoking of academic ideals to profits and pollution. "At one time, university students with very strict notions of what universities should and shouldn't do opposed university-industry cooperation," says Yoichiro Murakami, a science historian at Tokyo's International Christian University. "And so there was a great hesitation [to form ties]." The rift began to heal in the early 1980s, when Monbusho created formal channels for university-industry links through cooperative programs. Now, says Murakami, hostility toward industry has all but disappeared, and "mission-oriented" research is all the rage on campus.

Companies are also keen to work with universities. Take Ricoh Co., which has had a long relationship with Esashi's lab. Shin-Ei Ryu, Ricoh's assistant general manager of research and development, says the company typically dispatches one of its own scientists to work with university researchers for up to 3 years on research projects that could serve as a foundation for commercial technologies. After that, the knowledge is brought back for product development in Ricoh's own labs. One example is character recognition algorithms, which a Ricoh researcher studied with a team doing basic work at Nagoya University. The work led to an optical character recognition software program that holds the leading share of the Japanese market.

The new programs are attempts to duplicate the Ricoh experience on a larger scale. But some question whether the scale is large enough. Murakami, who previously wrestled with such questions when he was head of the

## Trio of Programs Seeks Economic Payoff

TOKYO—Yoshiaki Fukuse is president of a midsize electronics company that wants to develop its own products. Norio Tayama is an engineering professor who hopes to turn his ideas into commercial successes. Last year, the two men took a big joint step toward realizing their dream with a grant from one of three government programs designed to create an entrepreneurial spirit among Japanese academic researchers (see main text).

The marriage broker for Tayama and Fukuse's venture is the New Energy and Industrial Technology Development Organization (NEDO), an arm of the Ministry of International Trade and Industry. It has made 178 awards to university and governmental researchers working on new materials, biotechnology, electronics, and information and medical technologies. Begun in 1995 with $137 million, the program this year added the requirement that proposals must come from joint public-private sector teams.

Tayama hopes to incorporate computed tomography technology—typically used in medical imaging—into an inspection device for examining the internal characteristics of plastic and rubber products. A professor of electrical and electronics engineering at Iwate University in the northeastern arm of Japan's main island of Honshu, Tayama is a partner with three area businesses, including Fukuse's Rapias Electronic Corp. His project is typical of NEDO's grants for small business technologies, which average $250,000 a year for 3 years.

Tayama says the grant, although small, provides an opportunity to make practical a technology he has been working on for several years. "As a research engineer, I've primarily wanted to develop products that benefit people in a practical way," he says. For Fukuse, president of Rapias, the NEDO program offers his 500-employee company a chance to switch from being a contract assembler of other companies' products to one with its own product line.

The Ministry of Education, Science, Sports, and Culture (Monbusho) got into the industrial development business last year with a $234 million investment in venture business laboratories at 21 national universities. It looked for departments leading their respective fields, such as Tohoku University's sensors and micromachines research and the advanced materials lab at the University of Tsukuba. Although one aim is to encourage technology transfer to businesses, graduating students are not expected to set up their own companies right away. "In the U.S., students can see start-up businesses around them, but there just aren't any such examples in Japan," says Masayoshi Esashi, the engineering professor heading Tohoku University's venture business lab.

Instead, Esashi thinks that the lab's facilities might allow an engineer fleeing a downsizing corporation to develop an idea into a new process, semiconductor design, or microdevice. One or two companies started this way would blaze a trail for others, he says. Meanwhile, collaborations with visiting researchers from established companies on microscale sensors, machines, electronics, and optics will benefit from the cutting-edge facilities.

The third government effort aimed at linking academic and industrial research—Monbusho's $100 million a year "Research for the Future" program—now supports 117 research projects for 5 years. Project leaders are encouraged, although not required, to collaborate with industry where appropriate. Kimio Muramatsu, director of research promotion at the Japan Society for the Promotion of Science, which runs the program, says the plan is to select another 100 projects each year for 4 years. Project leaders were hand-picked by committees that sought the most active researchers in 17 fields considered important for economic and social development. "This money is considered an investment," Muramatsu says, "and an eventual return is expected."

How soon that dividend will be paid, however, is open to discussion. Shigeo Ohno, a professor of molecular biology at Yokohama City University School of Medicine, received a grant to study the regulation of protein kinases in cell signaling. His 5-year grant allows him to expand his program and perhaps even hire a few postdocs. "I'm very grateful," he says, "but I don't think this was chosen with the hope of promoting industrial development in 5 or 10 years." –D.N.

**ACADEMIC-INDUSTRY PARTNERSHIP PROGRAMS**

| Program | Research for Future | Venture Business Labs | Industry R&D Promotion |
|---|---|---|---|
| Sponsoring agency | JSPS (Monbusho) | Monbusho | NEDO (MITI) |
| Year begun | 1996 | 1995 | 1995 |
| Initial budget | $100 million | $234 million | $137 million |
| No. of awards/ duration | 117 projects, 5-year grants | 21 labs, open-ended | 178 awards 2 to 3 years |
| Program description | 17 research areas covering physical and life sciences, engineering, as well as integrating related disciplines | Leading departments in material sciences, micromachining, virtual-reality hardware and software, and nanotechnology | Focuses on new materials, biotechnology, electronics, and information and medical technologies |

SOURCE: MONBUSHO/MITI

University of Tokyo's Research Center for Advanced Science and Technology, says that what universities—or indeed, any government program—can do for Japan's industrial titans is dwarfed by what they can do on their own. The $26 million being spent by NEDO this year among 69 university-industry teams pales next to NEC Corp.'s annual R&D budget of $3 billion. "What the big companies want to do they can really do entirely on their own," Murakami says.

But even a little government money would be a major boost for budding scientific entrepreneurs, for whom the biggest obstacle is not a lack of ideas but access to funding. A venture capital industry never developed in Japan because of the Ministry of Finance's tight regulation of financial markets, says Scott Callon, a former fellow at Stanford University's Asia/Pacific Research Center and author of a recent study, *Divided Sun*, that examines MITI's high-tech research projects. "Having more university-industry interactions is positive, but the first key is [access to] financial markets," says Callon, who adds that deregulatory measures adopted 2 years ago are beginning to bear fruit.

NEDO's Hattori acknowledges that his agency's program is just "a contribution to the promotion of venture business activity." And even participants like Esashi don't expect quick results. Moving technologies discovered today into production in 5 years or less would be a significant achievement, he says. "But what would be best," he adds, "would be the creation of new companies" that could venture out from under the protective wing of universities like Tohoku.

–Dennis Normile