

Stepping out from the semiconductor shadow

Success has left Taiwan's Industrial Technology Research Institute (ITRI) with a problem — what to do next. Having helped to revolutionize the country's semiconductor industry, the institute now needs a fresh focus.

Taiwan's premier industrial research institute, ITRI was established in 1973. It is a non-profit organization that helps to promote Taiwanese industry. It has 6,000 researchers, and its 11 laboratories account for more than 500 patents per year.

In the past four years, ITRI has spawned 100 incubators to develop new technology, ten of which have 'graduated' as companies to the Hsinchu Science-based Industrial Park. The institute's Opto-Electronics and Systems laboratories (OES) has helped give Taiwan a 70% market share in the global CD-ROM and DVD-ROM market. ITRI has also established offices overseas in the United States, western Europe, Moscow and Tokyo.

Which way now?

But despite this success, many researchers feel that ITRI needs to redefine its goals. "ITRI was helpful in optoelectronics because industry started late. In other areas — materials, electronics, semiconductors — industry has moved ahead. ITRI needs a structural change," says Yuen-ron Shen at the physics department at the University of California at Berkeley.

Li-chung Lee of ITRI's Silicon Valley office, agrees. "ITRI aims to help small and medium companies that don't have the critical R&D mass to compete with an IBM, but companies are doing more and more R&D themselves. Lately ITRI is doing too much development work," he says.

"ITRI declared victory in [semiconductor manufacture] and then moved on," says Morris Chang, president of ITRI from 1985 until 1987, when he left to form the Taiwan Semiconductor Manufacturing Company. But

where will it go from here?

Geographically, it is stretching out to the new Tainan Science-based Industrial Park in the south. Its overseas offices coordinate joint research efforts with laboratories in their respective regions. "International collaboration and technology transfer will allow ITRI to move away from development to frontier research," says Lee.

ITRI has also been courted by US states that want to develop R&D ties with Taiwan, Lee says, referring specifically to overtures from the office of New York governor George Pataki.

Cashing in on chips

One key organizational change is a concentrated push into biotechnology, with the creation of the Biomedical Engineering Center (BMEC). Started in July 1999, the BMEC now has 230 researchers, most of whom were plucked from various areas within ITRI. Between them, they cover a broad spectrum of disciplines, including molecular biology, medicine, chemistry and optoelectronics.

With these multidisciplinary strengths, director Johnsee Lee believes the BMEC is uniquely qualified to pursue biochips, an



Facing change: Chintay Shih, president of ITRI.



New challenges: Taiwan's Industrial Technology Research Institute.

emerging field of biotechnology that requires materials know-how and knowledge of molecular biology. The BMEC's microfluidic biochips are different from the microarrays used in research on gene expression, Lee says. "Our chips will be for clinical application." For example, they will be used to screen for infectious diseases such as hepatitis C.

"Other institutes in Taiwan working in biotech simply do not have the expertise in miniaturization or the material sciences," says Lee. The roughly 40 biochip researchers have already produced 20 patent applications on microfluidics, probe design, surface chemistry and detection technology.

Sequential systems

Johnsee Lee also hopes to develop new algorithms to deal with the explosion of genome data. "Such high level algorithms will be helpful also as a 'fingerprint for raw materials' in sorting out the complexities of Chinese herbal medicine," he says. "We are aiming to develop one of the best sequence analysing systems in the world."

The BMEC is still a comparatively small operation by ITRI standards, accounting for only about 5% of the institute's budget of US\$540 million, and less than 5% of its researchers. Given this, and a somewhat late start, some critics think it cannot compete in DNA chips. They suggest instead that the BMEC should stick to one of its other core areas, such as medical devices and instruments and biomaterials, which can build more directly on ITRI's proven engineering and manufacturing skills.

Johnsee Lee disagrees: "While the discovery stage for DNA chips might be past, engineering, development and commercialization are still in early stages, and these are our strengths at ITRI." He plans to put together a patent portfolio and use strategic partnerships to emerge as a key niche player in the field. Other initiatives in nanomaterials and high-frequency broad-band wireless telecommunications also mark new directions as ITRI tries to redefine itself. **D.C.**

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