

of the office, is a case in point. His post is merely a moonlighting job to his position in the academy's Institute of Biochemistry. It earns him only a paltry salary supplement despite the heavy load in terms of time commitment and responsibility.

To compound the problem, some researchers still object to the sale of their ideas and are willing to give them away. Liang recalls one researcher who off-handedly offered to license his technology for NT\$1, sending Liang scrambling to renegotiate a sum that would at least cover his office and patenting expenses.

Taiwan also lacks potential leaders with multidisciplinary backgrounds combining scientific, legal and business knowledge. Liang prefers to entrust most legal matters to lawyers in the United States. He gets patents written in the United States because, he says, many Taiwanese lawyers will "write very narrow patents, US lawyers know how to make the broadest possible coverage".

**Universities galore**

Ironically, just as the academy tries to move closer to industry the very success of Taiwan's industry and the growth of the Taiwan economy are conspiring to make life difficult for basic research. With the boom of the economy over the past decade (except for a short downturn in the Asian economic crisis), many new universities have been established in Taiwan, most of them upgraded institutes and colleges.

"There are so many universities I am losing count," says Steve Hsieh, vice-chairman of the National Science Council (NSC), Taiwan's government organization that provides competitive research grants to universities, the Academia Sinica and other government research institutions. As a result, the NSC has had to spread its funds over an ever widening base. The average size of grants has actually declined during the 1990s, despite a rapidly rising grant budget for the NSC.

The council is trying to counter this with its new frontier grants, targeted at only the very best researchers in Taiwan. But more still needs to be done to separate the many universities doing relatively mundane research from the few truly outstanding ones.

Some top academic advisors to the government, for example, advocate research assessments similar to those in Britain's university system, which would help target a larger share of block funding at only a small number of top institutions doing outstanding research. Understandably, these ideas are meeting strong resistance from most of Taiwan's 42 national and private universities. But they are welcomed at those institutes, such as the NTU, that are leading the field.

Another consequence of the university boom is that many Taiwanese students now choose to stay in Taiwan rather than go overseas. About 90% of students now stay in Taiwan for graduate studies or to join industry, says Hsieh. And the make-up of those going

overseas has changed markedly, with a growing number favouring business studies over science and engineering.

Cheng-ching Li, director general of the bureau of international and cultural relations at the Ministry of Education, is concerned about this shift. Taiwan has benefited greatly from the return of former overseas students who have gained broad experience in the West and have fluent English language skills. The ministry is now offering scholarships to encourage the best students to go overseas. But it can support only a few hundred students.

The domestically trained students have a very different attitude to those who have spent time overseas. "Most do not want to do PhDs," says Kopin Liu of Academia Sinica's Institute of Atomic and Molecular Sciences, which is located on the NTU's campus. "Most stop at the Masters level and go to industry."

Even those who take up postdoctoral positions often leave for industry after only one year of research, says Liu. This causes discontinuity in the research programmes at the institute. "On one occasion we lost five post-docs overnight to an IT start-up in Hsinchu, or 10% of our whole compliment of 50 post-docs." Recruiting replacements is not easy.

Most of those who leave for industry do not move to research positions but go into areas such as marketing and sales. "The salary in industry is not much better. It is the stock options and bonuses that attract them," says Liu, explaining the departure of one of his postdocs to sell vacuum pumps.

Adding to these local problems, the recent upturn in the US economy has reduced the number of ethnic Chinese prepared to return to Taiwan. Rising political tensions with the Chinese mainland have also deterred potential returnees. The overseas supply is drying

**Nicky Lu — entrepreneur**

**It started with a straightforward offer. "You give me US\$10 million over five years to set up a company and I get to innovate — to make new chips and technology."**

**Under these simple terms, Nicky Lu established Etron Technology, a company that has taken Taiwan to the cutting edge in the design of semiconductor memory chips. His innovations even won Lu the 'Nobel prize' of electrical engineering in 1998 — the Solid-State Circuits Award from the Institute of Electrical and Electronics Engineers.**

**Born in Hong Kong, Lu graduated from the National Taiwan University in 1975 and obtained a PhD in electrical engineering from Stanford University. He made a name for himself at IBM's Thomas J. Watson Research Center in New York by tripling the access speeds of DRAM (dynamic random access memory) chips from 60 nanoseconds to just 20 nanoseconds.**

**This brought Lu to the attention of Taiwan's Industrial Technology Research Institute, which asked him to join**



**its submicron project aimed at developing expertise in DRAM chip technology. It was then that Lu, imbued with an entrepreneurial spirit learned at Stanford, set out the terms for his new business.**

**Etron is now an industry leader in memory products. It is the main supplier of DRAM chips to Intel, maker of the Pentium series processors found in most of today's desktop and laptop computers. Lu continues to position his business interests at the forefront of the electronics industry. He has established offshoot companies in both Taiwan and Silicon Valley, devoted to**

**cutting-edge fields such as wireless communications and semiconductor testing, the latter of which Lu describes as "the real technological bottleneck in semiconductor production".**

**Lu's business success belies his respect for research for its own sake. He recognizes that basic research can lead to technological strength. "Unlike the United States, Taiwan lacks people dedicated to the search for excellence, regardless of money, or fame," Lu says. "Taiwan needs more 'nerds' dedicated to innovation."**

D.C.

Etron <http://www.etrn.com>

The screenshot shows the Etron Technology website with sections for 'PRODUCTS', 'Background', 'Products', 'What's New', 'FAQs', and 'Contact'. A prominent advertisement for 'Ultra Low Power SRAMs' is featured, highlighting 'Play More, Sleep Less with My WAP Phone' and 'with Etron's NEW Ultra Low Power SRAMs'. The ad also mentions 'First 5M SRAMs, 0.18 micron Process, Ultra Low Power operation at 1.5V @ 10R, World's smallest SRAM Cell' and 'Ultra Low Power SRAM'. A small image of a person on a skateboard is part of the ad.