

Indeed, as they gathered the US\$16 million to start AbGenomics, Lin and Wu turned down about half the capital put up by investors.

Taiwan also lacks lawyers with training in biotechnology issues, and venture businesses have to seek the help of US lawyers. So it is not surprising that many investors in Taiwan look to the United States to place their funds, and this is where the network of Chinese scientists in the United States comes into play.

The China connection

The biggest current investment made by John Yu's department is US\$2 million in the start-up company Aviva Biosciences. Based on the west coast of the United States, the company is developing biochips designed by Jing Cheng of Tsinghua University in mainland China (see "Bridging the gap", right).

The bank is also planning to invest in several 'incubators' to develop new technology in mainland Chinese cities under the umbrella name Chinalab. The first is in Beijing and covers software development, a second will soon open in Shanghai. In all, ten incubators in ten cities are planned with each incubator matched to the high-tech strength of the city. The bank has also invested in Yung-chi Cheng's company, PhytoCeutica.

Yu's belief is that a network of ethnic Chinese scientists linking the United States, the Chinese mainland and Taiwan could be very powerful in the development, manufacture and marketing of biotechnology products.

Yuan-tseh Lee is also active in trying to develop links with the Chinese mainland. There are about 50 mainland Chinese scientists currently at the Academia Sinica. But under the strict regulations imposed by the mainland government, the visitors can only stay a maximum of one year. Also, because Taiwan is considered to be a renegade province by the mainland, the researchers are not granted a passport, preventing them from travelling to scientific meetings outside of Taiwan. This severely hampers their ability to have an impact during their short stays.

Two years ago, Zhu Lilan, China's minister of science and technology, became the first ever minister from the mainland to visit Taiwan. This trip was taken as a sign that thawing relations between Taiwan and the mainland might lead to greater scientific exchange.

But the election of pro-independence president Chen Shui-bian in Taiwan, who received crucial election backing from Lee (see *Nature* 404, 917; 2000), has brought a new chill to relations across the Taiwan Straits. Thus, direct exchange and interaction in science and technology between Taiwan and the mainland seems likely to remain limited for the foreseeable future.

For much of the post-war period, Taiwan focused on building its industry, improving education and defending itself from possible

Bridging the gap

Political tensions might be high between Taiwan and mainland China, but that has not stopped some enterprising scientists from bridging the divide. One such entrepreneur is Jing Cheng, director of the new biochip research and development centre at Tsinghua University in Beijing.

Cheng is developing 'active' electromagnetic biochips that can be used in bioassays. They are much faster and more sensitive than the 'passive' chips such as glass microarrays, he claims. In addition, Cheng says his biochips can use traditional salt buffers, giving them an advantage over their electronic counterparts

which need special low-salt buffers.

Cheng was working at Nanogen, a US biochip venture company in San Diego, when he was lured back to Tsinghua to set up and head the biochip centre with more than US\$4 million in support from the university and grants. But even as he moved back to China, Cheng was raising funds to set up a venture business on the west coast of the United States to develop his biochips (see *Nature* 399, 178; 1999).

The biggest investor in Aviva Biosciences, Cheng's new San Diego-based start-up, is the China Development Industrial Bank in Taiwan. The bank

has contributed US\$2 million of the \$5 million raised to launch the company and is represented on its board.

To get his chips on the market, Cheng has forged an alliance between mainland China, Taiwan and the United States. Under the plan, Cheng's group at Tsinghua will progress discovery research, Aviva will develop the chips for market, and the chips will be made in Taiwan. The chips might also be manufactured on the Chinese mainland "at a later stage", says Cheng. Tsinghua University will retain the rights for the licensed patents in the mainland, while Aviva will hold all the rights elsewhere.

Aviva president Julian Yuan, who comes from Taiwan, expects the first chips to be ready for market in about three years. Cheng says they are already doing their homework to find a suitable pharmaceutical or diagnostic company to form a partnership with when the chips are ready. **D.S.**

► <http://www.tsinghua.edu.cn>



Working together: Tsinghua University is at the heart of a joint venture between China, Taiwan and the United States.

attack by the Chinese mainland. Now it is reaping the rewards from its strategy. The gains made in electronics have put Taiwan firmly on the world map, but its ambitions in biotechnology are still quite some way from being realized.

There are many fundamental weaknesses and deficiencies in Taiwan's infrastructure that must be addressed before there can be any hope of a significant biotechnology industry. The number of life scientists in the whole of Taiwan is about the same as in one western pharmaceutical company. The obvious solution is to get more but, until that is possible, Taiwan will have to be very selective about which projects it takes on.

Taiwan also lacks the powerful pharmaceutical companies of the West, so it will have to work with them while building its own infrastructure. The leaders trying to push biotechnology forward are well aware of

these problems, and as the age of genomics dawns, the capacity of Taiwan to rise to the challenge and find a niche in this new market should not be underestimated. ■

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Web links

ITRI ► <http://www.itri.org.tw/eng/index.html>

Science-based Industrial Parks ► <http://www.sipa.gov.tw>

Academia Sinica ► <http://www.sinica.edu.tw/index.shtml>

NHRI ► <http://www.nhri.org.tw>

DCB ► http://www.dcb.org.tw/e_index1.html

National Science Council ► <http://www.nsc.gov.tw>

China Development Industrial Bank ► <http://www.iaib.org/china.htm>

National Taiwan University ► <http://www.ntu.edu.tw/English>

National Tsinghua University ►

<http://www.edu.tw/bicer/english/tsinghua.htm>

Science and Technology Information Center ►

http://www.stic.gov.tw/eng_home.htm