'Venture fever' grips Asian economies

David Swinbanks

The economic crisis in Asia has awakened governments to the need to cultivate venture businesses to help pull their countries out of recession and compete with the West. Job opportunities in start-up ventures are likely to expand over the years ahead, first in the more nimble and dynamic economies of Taiwan and Singapore, but later in China, Korea and Japan as well.

Asian scientists trained in the West will be central in the development of these start-ups. A dynamic interaction is developing between Asia and the West, in particular with Silicon Valley in the United States, in which entrepreneurial Asian scientists are using venture capital from both local and Western sources to establish start-ups in Asia and the United States.

Last month, the Singapore government announced the creation of a US$1 billion fund to stimulate what it calls "technopreneurship" (*Nature* **398,** 553; 1999). "Singapore is really getting to grips with the key issues surrounding the growth of high-technology businesses," says Hugh Purser of Cambridge Corporate Consultants in Britain, who formerly worked as an adviser to the National Science and Technology Board in Singapore.

"There is a good understanding of what needs to be done, and a commitment of resources from the very top," says Purser. "Some will say that, for entrepreneurial activity to flourish, the best thing is for governments to get out of the way. But in Singapore's case it is essential for government to take the lead, until a critical mass is achieved."

Triangular collaboration: Chen (left) and colleagues at Tsinghua University in China have formed a pharmaceuticals business with US scientific input and finance from Hong Kong (see box on page 178).

Japan is also beginning to realize that it has been left behind in the development of new industries, particularly in biotechnology, genomics, bioinformatics and computing. Japan's Ministry of International Trade and Industry plans to invest ¥50 billion ($400 million) in a supplementary budget this year to support venture businesses as a first step in an ambitious plan to create 1,000 biotechnology-related companies and 70,000–80,000 jobs within the next decade (*Nature Biotechnology* **17,** 320–321; 1999). But the academic community in Japan is generally averse to getting involved in business, and the country will probably continue to lag in this area for many years.

South Korea has been gripped with 'venture fever' since the country plunged into recession in late 1997. The government has introduced laws to allow university professors to set up and head venture companies and use university facilities to make products, and there are already a few success stories. But, as in Japan, many cultural and regulatory hurdles remain.

Singapore aims to become a hot spot for life sciences

Singapore is primed for the launch of start-up companies in the life sciences. Last month, the deputy prime minister Tony Tan Keng Yam announced a US$1 billion "technopreneurship" fund, signalling the island state's commitment to cultivating venture businesses and venture funds.

This follows other recent initiatives, such as the $20 million Life Science Investment fund established last November by the National Science and Technology Board and the Economic Development Board to commercialize home-grown and overseas technology in the life sciences. This was followed in December by the new Centre for Drug Evaluation to evaluate new drugs according to international standards.

Singapore is targeting the development of drugs, medical and food products and agrobiotechnology. It has been building strengths in these areas over the past decade. For example, the Institute of Molecular and Cell Biology, established in the late 1980s, has won wide respect. In 1993, it entered into a joint venture with the British pharmaceutical giant GlaxoWellcome to use molecular and cell technology to screen natural products for drugs. And in 1995 the institute spun-off Singapore's first life-science venture, GeneSing, which is developing health care products for the Asia-Pacific market.

More recently, the Institute of Molecular Agrobiology, established in 1995, has set up a joint venture with Monsanto of the United States to commercialize the use in China of cotton that has been genetically modified to fight bollworm pest (see *Nature* 383, 14; 1996). And a new BioInformatics Center at Singapore National University has created a successful spin-off holding company, Bioinformatrix, and a US-based venture, KRIS Technology, which sells bioinformatics software.

Western investors are sitting up and taking note. One group that has invested in the early stages of life-science ventures in the United States and Europe has been investigating opportunities in the Far East for the past three years. It has concluded that Singapore is where it is "most comfortable", and is soon due to announce a significant investment. "In addition to the frequently cited attributes of Singapore (transparent legal and accounting practices, English language and education), we are particularly impressed with Singapore's commitment to supporting techno-entrepreneurship, and the city state's outstanding Institute of Molecular and Cell Biology," says one investor of this group.

The Singapore government is well aware that it has to develop a whole spectrum of talent, including not only researchers and entrepreneurs, but also investment bankers, analysts, venture capitalists, and patent and corporate lawyers. It is adopting an open-door policy to draw in talent from around the world, and jobs in these areas will abound in the years ahead. D.S.

Cheng: forced to look outside China's borders for financial backing for his biochip venture business.

Taiwan is a pioneer in the region in the development of venture businesses. It has made a great success of its Hsinchu science park south of Taipei, which over the past decade and a half has drawn thousands of Taiwanese scientists and engineers back from the West. Dozens of successful start-ups in information technology have been established in the park, many of them linked to Silicon Valley in the United States, where more than one-third of the engineers and researchers are said to be of Taiwanese origin. A push into biotechnology that began at Hsinchu several years ago is also beginning to show some signs of success, which should be helped by substantial new government investments in research on agrobiotechnology, medical genomics and biopharmaceuticals (see box opposite).

Since moves to develop a market economy in China began in the 1980s, hundreds of start-up companies have been established by institutes of the Chinese Academy of Sciences and universities (*Nature* **378,** 540–542; 1995). Most have been failures, but a significant few have been successful and have pumped much needed funds into their mother institutions.

One example is Beida Weiming Biotech Corporation, set up by Zhang-liang Chen, vice-president of Peking University, when he was a department chairman in 1992. The corporation's joint venture company, Kerxing Biopharmaceutical, established with a US company in 1994, now controls 60% of the market for interferon in China, and the corporation will shortly be listed on the Shanghai stock exchange, according to Chen.

But Chen sees many barriers to the successful establishment of start-up companies in China. There is a lack of creativity and originality in China's nascent biotechnology industry, and a tendency just to copy the West's products. There is a need for greater protection of intellectual property rights, and venture capital is seriously lacking, particularly the long-term type required for biotech start-ups, says Chen.

Government regulations need to be eased, for example, to allow companies to donate money to universities and academic institutions free of tax. And the attitude of the academic community in China, which tends to look down on business activities, needs to change. Last but not least, Chen points to the dearth in China of scientists with entrepreneurial and Western business management skills.

But there is a growing realization in Chinese government circles and the research community that radical reforms are required for venture businesses to thrive. Tsinghua University in Beijing, one of the country's leading universities, at one time had 140 start-up companies, but this has now been slashed to about a dozen successful ones.

Similarly, the 123 institutes of the Chinese Academy of Sciences have more than 500 companies but, according to Yi Xun Yan, one of the four vice-presidents of the academy, only about a third are successful (many would say much less). The rest are a "big problem" for institute directors, says Yan, because it is difficult to close such companies, owing to social obligations to look after the employees.

Nevertheless, the academy has learnt "many important lessons" over the past decade, says Yan, and he is optimistic. He says the government is studying the need to create venture funds, and thinks there is growing awareness of the need to protect intellectual property rights.

But Yan, who established a successful thin-film optics joint venture linked to the acade-

China's scientists tap offshore funds

Two entrepreneurial scientists at Tsinghua University in Beijing who have recently returned to China from the West provide examples of how venture businesses can be established in Asia even when the climate is far from ideal.

George Guo-Qiang Chen carried out microbiological research in Austria, Britain and Canada before returning to China in 1994. In collaboration with Daniel Shao, a financier in Hong Kong, and Thomas Wagner and other scientists at Ohio University in the United States, he has established Huagen Pharmaceutical, which plans to manufacture biopharmaceuticals based on recombinant peptides produced by transgenic *Escherichia coli*. Chen could not find investors in China because of legal hurdles and a "huge gap" in culture with the West, which is why he and his collaborators at Ohio turned to Shao.

Under a triangular arrangement, three people in Hong Kong will raise finance for the venture, four researchers at Ohio are developing recombinant organisms, an area pioneered by Wagner, while researchers at Tsinghua with experience in engineering will set up pilot production facilities. One Tsinghua scientist goes to Ohio each year to interact with the US collaborators.

Similarly, Jing Cheng (above), who has just returned to China to head a new biochip research and development centre at the university, is setting up a biochip venture business. Finance is expected to come from the United States, Taiwan, Hong Kong, and possibly mainland China itself.

Cheng started his career as an electrical engineer in a Chinese locomotive factory in 1983. He then went to Strathclyde University in Scotland to do his PhD and developed and patented a rapid DNA extractor in the department of pure and applied chemistry, before going to Aberdeen University's department of molecular and cell biology to develop capillary electrophoresis-based methods for mutation detection. He moved to the University of Pennsylvania School of Medicine to develop biochips under the sponsorship of PE Applied Biosystems, and then went to the US company Nanogen where he developed a portable bioelectronic chip for field use (see *Nature Biotechnology* 16, 541–546; 1998).

Cheng was attracted to Tsinghua by the opportunity to do interdisciplinary research spanning science and engineering, and he hopes Tsinghua will become the first university in China to enter high-tech ventures overseas and actively "borrow" foreign experience. **D.S.**

my's Shanghai Institute of Technical Physics, is well aware of the difficulties of bringing ideas from the lab to the market. Like Chen, he sees a great need for Chinese scientists trained in Western management skills to return to help China to develop start-ups.

Tsinghua University has recently recruited Jing Cheng from Nanogen, a biochip venture in the United States, to head its new Biochip R&D Centre. Cheng's group will receive over US$1 million research and development funds from the university, and Cheng is also setting up a biochip start-up company using offshore capital (see box opposite). This approach of seeking venture capital offshore has been adopted by entrepreneurial scientists elsewhere in the region, and it may become a widespread phenomenon as governments struggle to change the regulatory, financial and cultural environment that inhibits venture business.

For example, Sunyoung Kim at the Institute for Molecular Biology and Genetics of Seoul National University, who in late 1996 established ViroMed, South Korea's first venture business in gene therapy and diagnostics, has sought investment and strategic alliances in the United States and Europe because of the lack of long-term venture capital in Korea. And bioinformatics researchers at Singapore National University have set up a company called KRIS Technology in Menlo, California, to market bioinformatic software products.

It will take time for government initiatives to stimulate venture businesses in the region, particularly in the larger economies of Japan, China and Korea. So, in the immediate future, it is the actions of individuals, such as Cheng and Kim, and their links with venture funds, venture businesses, entrepreneurs and scientists in the West, that are likely to bear the most fruit. □

David Swinbanks is Asia-Pacific editor of Nature.

Taiwan targets biotechnology

Although Taiwan has shown great success in establishing venture businesses in information technology, a push into biotechnology at Hsinchu science park that began in the early 1990s has been slower to develop. However, some new initiatives by the Taiwan government are expected to boost the growth of start-ups in the years ahead.

To date there are only 15 biotech companies in Taiwan's two science parks — Hsinchu near Taipei and Tainan in southern Taiwan — employing a total of fewer than 500 people. About five companies are formed each year, but this figure is expected to double soon, according to Jeff Wang, science adviser at the Ministry of Economic Affairs.

Venture capitalists in Taiwan have been reluctant to invest in biotechnology because of their desire for the quick returns seen in the information technology sector. So, as in Singapore, the Taiwan government has created a large fund of US$600 million to promote biotech start-ups over the next five years, and is taking measures to create the necessary infrastructure, including clinical trials, training, and venture funds.

The government is also making substantial investments in research, which are expected to help cultivate start-ups. Some $NT1,663 million (US$51 million) are being invested in agrobiotechnology research between 1998 and 2004, while medical genetics will receive $NT875 million over the same period. Pharmaceuticals and biotechnology research will be given $NT2,920 million in 1999–2004.

Wang says there are many Taiwanese bioscientists in the West willing to return to Taiwan if and when the environment is right. These programmes, due to employ 430 principal investigators, 630 postdoctoral research fellows and hundreds of PhD students and part-time staff, may mean that now is the time. **D.S.**

End of the brain drain could be in sight

Potter Wickware

Does scientific and engineering talent flow as freely as capital between the world's regions of economic activity and opportunity? Many countries, whether developing ones like Taiwan and Malaysia, or industrialized countries like Germany and Canada, base their economic development policies on the idea that it does, or at least that it could. Hence they channel state resources to start-up companies and offer inducements to scientists and engineers to staff them, particularly their own expatriates who are working in technology ventures in the United States and other developed countries.

These countries look to the high-tech centres of the United States, such as Silicon Valley in northern California and the Route 128 corridor near Boston, as models for the development of their own high-value, knowledge-based industries. The aim is to reduce their dependence on manufacturing, commodity exports, and other more traditional activities.

Indeed, when William Hewlett and David Packard scraped together $538 in 1938 to start their electronics venture in a garage in Palo Alto, the Santa Clara Valley (as Silicon Valley was called then) employed mostly farm workers and was famous for its plums and cherries. Last year Hewlett-Packard had nearly 125,000 employees worldwide and reported revenues of $47 billion.

But is the Silicon Valley model readily transferable to other countries, particularly ones that have thinner traditions of entrepreneurship, or those governed by centralized regimes which have emphasized state planning over individual initiative? Foreign-born scientists and engineers who work in Silicon Valley seem to share the view that an earlier pattern from the nineteenth and early twentieth century still prevails to some extent. That is, move to the United States, become assimilated, and don't look back.

Globe-trotting entrepreneurs

Dinesh Patel exemplifies today's globe-trotting entrepreneurial scientist, who has identified and taken advantage of resources and opportunities as he found them. Born in Zambia, he studied in India, then came to the United States in the 1970s, receiving a PhD in pharmacology at the University of Michigan. In 1985 he co-founded TheraTech, in Salt Lake City, a drug-delivery company which earlier this year

Patel: Silicon Valley lures people back.

was sold to Watson Pharmaceuticals in California for $350 million. Reflecting on the efforts of countries such as Singapore and Japan to produce technology industries like the one he started, by means of state-supported science parks such as Taiwan's Hsinchu centre (see box above), Patel says he is in general not optimistic about their chances. "If they can, the people who go to them tend to come back to the United States. One of the reasons is that, wherever you are, you need the right connections to make things happen, and someone who begins a career in the United States, in Silicon Valley, say, learns a culture and a management style that may not work in the new locale."

Shuo Vincent Liu echoes the idea that for many the trip to Silicon Valley is a one-way voyage. Liu is a software developer at the bioinformatics company Incyte Pharmaceuticals in Palo Alto, California, who graduated from Beijing University, then studied molec-