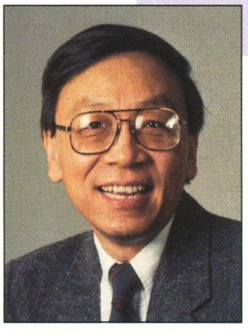
Hong Kong's Pre-1997 Science Boom

Next year's transfer of control to China has already made the British colony a mecca for researchers looking for scientific and economic links to the mainland

HONG KONG—Four years ago, physicist Leroy Chang ended a 29-year career at IBM to come here as dean of sciences at the new Hong Kong University of Science and Technology (HKUST). In March he firmed up that commitment by selling his house in New York. Chang joins a growing band of scientific luminaries who are being lured to this tiny British colony. These world-class recruits include former ITT physicist Charles Kao, now chancellor of the Chinese University of Hong Kong (CUHK), who won this year's Japan Prize for his work in fiber optics; Nobel laureate Chen-Ning Yang, the State University of New York, Stony Brook, physicist who is a visiting scientist at CUHK; and Fields medalist Stephen Smale, who took early retirement from the University of California, Berkeley, in 1994 and now has an appointment at City University in Hong Kong. The main attraction? In a word, China.



On 1 July 1997, the mainland government takes control of Hong Kong. While China will be in charge of the 1200-square-kilometer region, its "One Country, Two Systems" policy will allow local officials to maintain control over internal affairs, including financial matters and the institutions serving its 6 million people. In particular, Hong Kong officials hope to become a bridge connecting China's booming economy with the rest of the world. For researchers, that could mean access to a previously unimagined world of talent and opportunities in science and business. "I would never have come to Hong Kong if it was going to remain just a British colony. We came because of 1997," says Chang.

As recently as 5 years ago, Hong Kong was scarcely a blip on the radar screen of global science and technology. Its two aging, British-style universities were devoted largely to teaching, there was no program to fund competitive research, and the government's laissez-faire philosophy ruled out an organized effort to attract high-technology industries. Today, however, the radar screen is glowing with increased attention to science. In addition to the growing cadre of world-class scientists, there's HKUST, a $460 million, state-of-the-art university that opened in 1991, a $52 million research grants program that is increasing by 10% a year, and a multimillion-dollar campus computer network that offers researchers easy access to colleagues around the world. For California Institute of Technology chemist Sunney Chan, an adviser to CUHK, Chinese rule signals a new era: "It's like the U.S. during the post-Sputnik years."

But soaring into the future won't be easy. While the United States in the 1960s only had to race against the Soviet Union, Hong Kong must compete on a global scale. Even within eastern Asia, the territory faces fierce competition from South Korea, Taiwan, and Singapore. All have sizable head starts in high-tech thanks to aggressive intervention by their governments, something anathema to Hong Kong's spirit of freewheeling capitalism. In addition, local entrepreneurs, accustomed to quick profits on sure bets, may be leery of risky, long-term investments in start-ups. "The Hong Kong government is very proud of the fact that it has no industrial policy," says Chang. "It was finally convinced that some things had to be done. But the investment level may need to be higher than what they're willing to spend. It's not clear to me how enthusiastic government and industry are [to do that]."

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—Leroy Chang

An exciting time

One important stop along Hong Kong's road to scientific success is the creation of homegrown, high-tech industries that can generate jobs to replace those being lost to China's low-cost, low-tech factories. Officials are also eager to attract multinational high-tech firms making consumer goods for the huge Chinese market, and to help turn Chinese discoveries into products for the global market. "There will be a two-way exchange of technologies, and we in Hong Kong will add value to it," declares Kao, an adviser to leaders in both Hong Kong and Beijing.

To achieve this vision, government and business leaders have begun plowing lavish sums into creating a research infrastructure. The government's Industrial Technology Council has begun a campaign to raise public R&D spending from its current level of 0.1% of the gross domestic product to between 1% and 2% by 2000. The most visible result is HKUST, funded in large part by the private Jockey Club Charities Trust with proceeds from gambling on horse races. Hong Kong has also tripled, to six, its number of universities by converting three polytechnics into full universities, and it has raised the standards for research by their faculties. Two competitive grant systems set up in the past few years by the University Grant Council and Industry Department to fund direct costs are growing rapidly. And the new computer networks erase the territory's geographic isolation. "Using e-mail, I can order supplies and get technical support almost for free," says Mary Waye, a molecular biologist at CUHK.

All these efforts are aimed at building a critical mass of scientific talent. Combined with generous salaries—$70,000 for assistant professors, for example—the result has been a flow of topnotch people to Hong Kong's shores. "Things are pretty exciting here," says Smale, age 65. "I felt a decline in math and science in the U.S. But here we have expanding resources."

Indeed, Hong Kong is already beginning to carve out a niche in mathematics, which doesn't require expensive equipment or huge numbers of participants to form a critical mass. The creation of a 40-member department at HKUST brings the total number of mathematicians in Hong Kong to about 100, a sizable community that, in addition to Smale, features other internationally recognized figures such as Roderick Wong and Shiu-Yuen Cheng. "Hong Kong is poised to make a major contribution," says Cheng, who is moving from UCLA to head the math department at HKUST in July.

To capitalize on the local math talent, Harvard University professor Shing-Tung Yau, a Hong Kong native, is looking for private funds to create dual math institutes in Hong Kong and Beijing. The institutes would promote exchanges and revitalize mainland mathematics, which was badly damaged by the Cultural

Revolution and by current economic privations. The idea, he says, is to let Chinese scholars visit for 6 months and earn Hong Kong–scale salaries—making in a few days the equivalent of a year's income in China—as well as to work with colleagues from around the world.

While it's building up an academic reputation in mathematics, Hong Kong is also well placed to compete in the fiercely competitive global telecommunications market. It has the advantage of a well-established industry located in the world's fastest growing market area and an abundant supply of first-rate researchers available as a result of corporate downsizing in the West. "We've recruited a half-dozen people from IBM and Bell Labs," notes CUHK Vice President Kenneth Young. "They're with us now, developing applications for the Internet," including on-line news services.

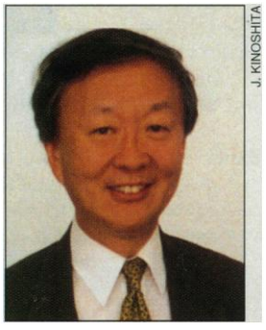
Those factors helped spawn Hong Kong Supernet, a commercial Internet service provider launched by HKUST. It's one of the colony's first and most successful academic spin-offs. "It's growing by 15% to 20% a month and has been profitable since 1994," says Eugene Wong, HKUST's vice president of R&D. Last year the company formed a joint venture with partners in Japan and Singapore to build the first Internet backbone in Asia outside China.

HKUST

Academic anchor. HKUST has helped put Hong Kong on the global science map.

Struggling in biotech

Efforts to move ahead in biotechnology, by contrast, face an uphill struggle. Hong Kong has no track record in basic biology, no R&D facilities, and no pharmaceutical or agricultural industry base. Inexperience has led to some questionable initiatives, notably a 1989 decision by the Jockey Club to invest $22 million in the Hong Kong Institute of Biotechnology. The institute was intended to develop products when there was nothing in the pipeline, using a facility that had not been properly designed to meet international standards for bioengineered drugs. As a result, the institute stands half empty, and its director (the third since its founding) has had to rent space to nonbiotech companies to generate much-needed income.



J. KINOSHITA

Adding value. Kao hopes to boost flow of technology between Hong Kong and China.

But Hong Kong's biotech advocates say things are starting to turn around. "In 1994, there was no biotech here," recalls Wong, a former associate director of the U.S. Office of Science and Technology Policy. "People said there isn't one, there will never be one. Don't waste your time."

But they are wrong, he says. HKUST biochemist Robert Ko, for example, has extracted a compound from an ancient Chinese herbal tonic that was shown in animals to block oxidative damage to cardiac tissue following ischemia. The compound is now being marketed as a health food—in part to show the public the benefits of biotechnology—for people with coronary heart disease, and Ko hopes someday to conduct clinical trials on its efficacy in heart patients.

HKUST administrators are also convinced that joint efforts with leading Chinese institutes will help propel Hong Kong into the forefront of biotechnology. The university recently formed a new Life Science and Biotechnology Joint Laboratory with two research centers in Shanghai that are part of the Chinese Academy of Sciences. Under the agreement, the joint lab, which will be located within HKUST, will pursue up to eight research projects. Initial funding from outside sources is still needed to get these collaborations going, however.

Hong Kong planners also envision tapping into China for something now in short supply—scientists. Mainlanders already fill many university posts, and many more will be needed if Hong Kong succeeds in developing high-tech industries. Indeed, that is part of the thinking behind a recently approved project to build Hong Kong's first-ever science park. "The objective would be for us to enable Hong Kong manufacturers to go for higher technology, higher value-added products by using the vast reservoir of scientific personnel in China," says Brian Chau, Hong Kong's secretary for trade and industry.

The park also hopes to lure companies from the mainland, including some of the dozens of biotech start-ups in Shenzhen, the booming special economic development zone just across the Chinese border. "These companies can't sell their products overseas" because of doubts about the quality of the product, says CUHK biochemist Walter Ho. But having plants in Hong Kong would enable them to meet international standards, he adds, and then "they'll be able to sell all over the world."

The science park is still a long shot, however. The proposed site for the venture now sits under water, awaiting a 10-year reclamation project. And neither the government nor any company has committed funds to the project, which is estimated to cost $300 million.

Outside opportunities

Apart from biotechnology, Hong Kong scientists have also taken on important roles in local and regional problems, such as pollution, environmental monitoring, and infrastructure development. Microbiologist Kai-Keung Mark at CUHK, for example, has isolated a bacterium that breaks down indigo dye, a major pollutant in the waste water produced by Hong Kong's huge denim industry. And HKUST researchers recently completed a working design of a wind-shear detection system for Hong Kong's new airport.

Hong Kong is already looking for a role in tackling environmental problems beyond its borders. CUHK's Center for Environmental Studies, for example, will work with several Chinese research centers to monitor and predict the environmental impact of the massive Three Gorges Dam project on the Yangtze River. "We will focus on technology and software," explains center associate director Po-Keung Wong, "and our Chinese partners will handle data collection."

Next year's transition to Chinese rule is the stimulus for these bold scientific plans. But it's also a source of uncertainty: If the handover of power leads to political or social unrest, or if China uses force to silence the territory's vocal democracy movement, the imported talent it hopes to attract is likely to flee, eviscerating the research community. "There's a lot of nervousness," remarks Smale, "but at the same time the real estate prices keep going up. Most people feel there won't be any immediate bad thing happening."

For Hong Kong's scientific elite, the game is to lay the foundation for what is seen as a major scientific enterprise. For HKUST's Chang, his main challenges are to foster a research culture and to encourage his faculty to do breakthrough work. "When you walk into Harvard or MIT [the Massachusetts Institute of Technology], you feel the atmosphere right away," he explains. "But when you walk into our building, all it feels like is a beautiful building. We really want to contribute to the economies of Hong Kong and China. That's easy to say, but it's much harder to find a way to fulfill our mission."

–June Kinoshita

June Kinoshita is a free-lance writer in Belmont, Massachusetts.