EXODUS TO ASIA:

RESEARCH OPPORTUNITIES ABOUND

Asia is enjoying enormous investment in science and technology, and is proving a major attraction in the scientific jobs market. By Julie Clayton

cience and technology is booming in Asia, and acting as a magnet for Asian scientists wishing to return home after training in the West—especially to China—attracted to full- or part-time positions in both academia and industry. Promoting the eastward migration is a strong government push—particularly in China, Singapore, Korea, and Japan—to become global players in science and technology, and massive investment from the pharmaceutical industry. The result is a heady mix of new R&D opportunities.

Yet the "returnees" are only one side of the story. Also finding new opportunities are Western scientists wishing to work in Asia—including academics taking up professorships at Chinese universities. At the same time, scientific institutions in the West are keen to seize the new opportunities for research collaboration in Asia.

All of this means that Asia is now enjoying a significant brain-gain.

The Road to China

Several major international pharmaceutical companies are expanding their research and development in China. The city of Shanghai, which has become a mecca for science generally, is now home to both a growing local pharmaceutical industry as well as international companies like Roche, Novartis, Novo Nordisk, GlaxoSmithKline, and AstraZeneca. Consequently, research opportunities go beyond the R&D pipeline to include drug manufacturing, clinical research, quality assessment, and quality control.

Roche was the first multinational pharmaceutical company to arrive at the Zhangjiang Hi-Tech Park in 1994. It opened a new research center in 2004 followed by a development center in 2007, and aims to bridge the gap between basic research and China's "huge resource in clinical research." The goal is to identify new disease diagnostic markers and develop new therapies, according to the company's head of R&D in China, Andreas Tschirky, and chief scientific officer Li Chen.

Chen, who returned to China after training in the United States, notes, "For many years there was a brain drain to the United States and Europe, but now there is a reversal because of the attractiveness of the job market for highly qualified people."

According to Tschirky, scientific enterprise in China is being actively welcomed by the Chinese government and local authorities, who are showing "strong leadership" and are "more proactive" than in the United States or Europe in listening to the views of scientists on the need for scientific innovation. To capture this momentum, Roche aims to provide a platform for local innovation to be transformed into marketable products.

Besides actively recruiting, the company is striving to team up more with Chinese academics, clinicians, and local biotech as well as providing basic research grants—no strings attached—to promote understanding of disease processes.

Novartis also has an existing research facility at the Zhangjiang Hi-Tech Park in Shanghai with approximately 100 scientists. This will be superceded by a new, larger facility on which construction begins this spring, with a capacity for around 400 scientists.

"Shanghai is clearly emerging as a new epicenter of global science, continued >>



66 Shanghai is clearly emerging as a new epicenter of global science, and is a magnet for top research scientists.



Upper: A*Star's diverse community Lower: En Li, vice president and head of the new Novartis facility in Shanghai

UPCOMING FEATURES

Vaccine Research—March 28

Translational Research (online only)—April 18

Diversity 2: Affinity Groups (online only)—May 9

Focus on Asia

"In the last few years, our small institute [now with 17 principal investigators] is publishing at least one-third of all high-profile papers in the biological sciences from China."

—Mu-ming Poo



and is a magnet for top research scientists," says **En Li**, vice president and head of the new facility, which provides "a significant opportunity for Novartis to develop life-saving treatments," with particular regard to cancers that are endemic to the region.

Denmark-based Novo Nordisk, which focuses on diagnosis and treatment of diabetes and other conditions, is actively expanding its R&D base in Beijing. "China is a grossly underestimated scientific force," says chief scientific officer **Mads Krogsgaard**, pointing to China's current world ranking as fourth in publications output (according to National Science Foundation Science and Engineering Indicators 2008).

The company is recruiting graduates from local universities into scientific posts at its R&D center, while looking mainly to Chinese expatriates from Europe and the United States to fill managerial positions. The latter have the advantage of "an international mindset but are still culturally Chinese," says Krogsgaard, highlighting, in particular, analytical skills and the ability to collaborate with people of different backgrounds as particular strengths of Western trained scientists.

The Novo Nordisk R&D center was first established in 2002 to optimize recombinant protein production, but is now moving on to do "real project work and be more innovative," including developing new drug targets. To complement the R&D expansion, the company is also creating a new research foundation, in partnership with the Chinese Academy of Sciences (CAS), to fund new research projects, scholarships, and exchanges for scientists working in protein science, particularly diabetes—a condition affecting around 40 million Chinese.

In contrast, China's biotech industry is in a fairly fledgling stage, according to Zailin Yu, a Chinese biologist who has returned to China from California. He took up a position as an adjunct professor at Peking University College of Life Sciences, and set up two companies. Despite owning the patent to a new technology for the production of recombinant protein-based drugs, he has not found it easy to attract private investment within China, and has had to turn to Chinese government grants and venture capital from the US, to fund his startups.

"In China it's hard to find [a venture capitalist] who is patient enough to wait for animal testing, clinical trials, and then a product." But he expects this to change in future as the market for new drugs is rapidly growing.

Scientists returning to China are also finding attractive positions

Agency for Science and Technology Research (A*STAR) www.a-star.edu.sg/astar

Biomedical Research Council www.a-star.edu.sg

Brain Science Institute of Riken www.brain.riken.jp

Chinese Academy of Sciences www.english.cas.ac.cn

Hong Kong University of Science and Technology www.ust.hk

Institute for Bioengineering and Nanotechnology www.ibn.a-star.edu.sg

Institute of Cell and Molecular Biology www.imcb.a-star.edu.sg/php/ main.php

Institute of Materials Research and Engineering www.imre.a-star.edu.sg

Institute of Neuroscience

www.ion.ac.cn

Japan Society of Promotion of Science www.jsps.go.jp/english

Nanyang Technological University www.ntu.edu.sg/publicportal

National University of Singapore www.nus.edu.sg

Novartis Integrated Biomedical Research Development Center www.novartis.com/research/ research-centers/nibrshanghai.shtml

Novo Nordisk www.novonordisk.com

Peking University www.pku.edu.cn

Roche www.roche.com

Science and Engineering Research Council www.a-star.edu.sg

University of California, Berkeley www.berkeley.edu

Zhangjiang Hi-Tech Park www.zjpark.com/zjpark_en

in academia. **Mu-ming Poo**, director of the Institute of Neuroscience (ION) in Shanghai, part of CAS, is actively recruiting from abroad to the institute. He knows well the experience and skills that such researchers can bring to China, having spent nearly 30 years working in the US when he took up the directorship in 1999.

When Poo was about to accept a professorship at the University of California, Berkeley, in 1998, he was asked by president Lu Yongxiang of CAS to help promote Chinese neuroscience. Poo felt that he would not have the right impact if his task were just to "renovate old institutes." Instead, he proposed a brand new Institute of Neuroscience with a modern infrastructure, "in other words merit-based rather than seniority-based promotion and resource allocation."

Poo, now director of ION, spends one week per month there, while at the same time maintaining his position as Paul Licht Distinguished Professor in Biology in the Department of Molecular and Cell Biology at Berkeley. He is proud that the institute has made its name with a high quality of scientific output. "In the last few years, our small institute [now with 17 principal investigators] is publishing at least one-third of all high profile papers in the biological sciences from China."

Most of the scientists moving to China are returning expatriates, as the culture and bureaucracy means that it is easier continued »

Focus on Asia

"It's the easiest place to work I've ever been. Facilities, resources, and money are amazing. And the drive to accomplish something world class is breathtaking!"

—Victor Nurcombe



for Chinese speakers to gain positions in the country, according to Poo. All documentation regarding work permits, contracts, and grant applications, for example, are in Chinese.

He and others at ION are trying to make it easier for non-Chinese researchers by employing office staff who can speak and write in English, and by conducting seminars and lab meetings in English. "We now have a few non-Chinese students and postdocs. Our plan is that in a few years we are ready to accommodate non-Chinese principal investigators. Our goal is to be an international research institute, with a substantial fraction of non-Chinese Pls, similar to the Brain Science Institute of Riken in Tokyo, which now has 20 percent to 30 percent non-Japanese research staff."

Scientists returning to China are having a strong impact, comments **Nancy Ip**, director of the Biotechnology Research Institute (BRI) at Hong Kong University of Science and Technology (HKUST). "These returnees enhance the innovation capabilities of China as they bring back with them a wealth of overseas experience such as exposure to cutting-edge research, knowledge of international standards, and a broad international network," she says.

In Hong Kong, in contrast, the biopharmaceutical industry is more in its infancy, according to Ip. Most of the cutting-edge research is university based, and is thriving in all areas of life sciences and medicine as well as in the physical sciences, particularly analytical and synthetic chemistry.

Jobs Galore in Singapore

Meanwhile Singapore is attracting considerable attention with the establishment of two flagship R&D centers by the government Agency for Science and Technology Research (A*STAR). The first is Biopolis, opened in 2003 to develop biomedical sciences. The second is Fusionopolis, devoted to creating the next generation of technologies, materials, and devices and due to open later this year.

The two megacenters currently employ around 3,000 researchers across 14 separate research institutes and are overseen by the Biomedical Research Council (BMRC) and the Science and Engineering Research Council (SERC). They are intended to improve the visibility of Singapore's R&D, foster multidisciplinary research, create new commercial spinoffs, and partner with local industries. They are attracting local and returning Singaporeans and scientists from other countries.



Agency for Science and Technology Research (A*STAR), Fusionopolis

"It is a truly international research community, embracing all nationalities, all faiths, and all ethnic groups," says **Andre Wan** of BMRC.

"A lot of things are happening at a very fast pace," says Jackie Ying, who was a professor for 11 years at MIT in Cambridge, Massachusetts, before moving to Singapore in 2003 as executive director of the Institute for Bioengineering and Nanotechnology, "and Singapore has tremendous research opportunities, especially in the biomedical areas."

Around 80 percent of the institute's scientists are either returning Singaporeans or foreign-born—mostly from the United States, Europe, Australia, and Asia—and include chemists, biologists, computer scientists, electrical and mechanical engineers, and medical doctors. "They come over because they are excited about the research," says Ying.

In comparison to when she was in the US, Ying feels she has more funding options and more flexibility about research directions in Singapore. However, she still maintains an adjunct position at MIT.

Singapore's legacy as a former British colony means that English is the official working language, making the recruitment of scientists, for example, from North America, Europe, and Australia relatively easy compared to elsewhere in Asia.

Focus on Asia

"Don't flock with your own kind too much. Although you may be tempted to work preferentially with fellow countrymen, especially if you feel yourself in a strange land, it will inevitably limit your horizons."

—Jonathan Hobley



And the drive to accomplish something world class is breathtaking!" he enthuses. "To be relieved of all the burdensome administration, to be just left alone to do the best science, not constrained by endless grant writing or budgets—what's not to like?"

Certainly, if the investment is anything to go by, then Singapore is well on the way to its aim of becoming a major scientific hub in Asia. A*STAR gets a five-year budget of US\$3.6 billion, and this for a population of only 4 million people.

The multiethnic makeup of Singapore (particularly Chinese, Indian, and Malay communities) together with good health care infrastructure is attracting pharmaceutical companies wishing to do clinical trials—for example GlaxoSmithKline, Novartis, Eli Lilly and Company, Pfizer, Merck, and Schering-Plough.

Elsewhere in Singapore existing links with the West are already strong, and getting stronger. For example at the Nanyang Technological University (NTU), recruitment of international faculty is occurring across a wide range of subject areas, including engineering and science, with special emphasis on its Nanyang Assistant Professorship scheme, awarding 10 to 12 distinguished young faculty each year with a competitive salary and up to \$1 million startup funds over the first three years. And at the postdoctoral level, NTU is working through the SINGA Scheme with A*STAR to recruit candidates from Eastern Europe, Russia and Ukraine, and the Middle East as well as to bring in Singaporean students.

Similarly, the National University of Singapore (NUS) is thriving in many areas. "We recruit both locally and overseas, and particularly like to 'attract back' overseas Singaporeans who have distinguished themselves in research," says **Barry Halliwell**, deputy president (research and technology). NUS also has links with leading overseas partners and international education alliances.

East Meets West

Meanwhile, scientific institutions in Europe and North America are forging international partnerships spanning East and West. The German Research Foundation (DFG) is encouraging links between its scientists and collaborators in China, Korea, and Japan. This is most advanced in China, where the Sino-German Center for Research Promotion in Beijing, funded jointly with the National Natural Science Foundation of China, supports cooperation between Chinese and German scientists doing basic research in the natural, life, engineering, and management sciences.

"We would warmly encourage scientists to [come to China], because China's science system is becoming increasingly interesting

and offers a growing number of opportunities," says the center's German director **Armin Krawisch**.

At a more preliminary stage, but also promising, is the promotion of new ties between DFG and the Japan Society for the Promotion of Science (JSPS), illustrated by a joint symposium in Hamburg in January 2008 for young researchers on global climate change science.

Along similar lines, the umbrella organization for the UK's research councils—RCUK—opened an office in Beijing in October 2007, with a view to enabling the research councils to offer UK-China funding opportunities (ideally in conjunction with Chinese funding agencies) and make it easier for individual researchers to develop contacts with key partners in other countries, according to the office director, Chris Godwin.

Current plans include several small schemes for facilitating research and travel, while four major projects are also under way involving different UK academic institutions, to promote research into urban sustainability.

Other links between Europe and Asia include plans by the European Science Foundation and the Korea Research Foundation to create new exchange and research initiatives. The Korean government has invested heavily in R&D, for example, in both the private and academic sectors, having increased spending between 2000 and 2004 from 2.4 percent to 2.9 percent, and is looking to forge links with other countries. But Korea has yet to see the influx of trained scientists that China is enjoying, and increasing numbers of students are opting to study abroad, particularly in the US, and may not return to Korea.

Tips for Travelers

So what tips are there for all the foreign scientists in the West who are considering packing their bags for Asia?

Scientists heading for China should "be willing to adapt to, or at least accept, the different conditions in work life, habits, salaries, structures and hierarchies, decision making, equipment, and so on," says Krawisch. He adds that "cultural training on Chinese characteristics and—for those who stay longer—some Chinese language skills are highly recommended."

In Singapore, Nurcombe advises, "Use the opportunities given to you as best you can. The island is developing its research foci and its research style so, because it's very compact, you can have a major effect on how things happen."

British researcher Jonathan Hobley at the Institute of Materials Research and Engineering recommends that foreign scientists begin networking as soon as they arrive—taking advantage of the high density of labs. "It is valuable and pays rapid dividends if you let people know what you are doing and where you can work with them." But, he warns, "Don't flock with your own kind too much. Although you may be tempted to work preferentially with fellow countrymen, especially if you feel yourself in a strange land, it will inevitably limit your horizons."

Julie Clayton, a freelance science writer and journalist, works out of Bristol, UK.

DOI: 10.1126/science.opms.r0800050