

China's Scientific Revolution

By Joseph Jimenez

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The Chinese economy has undergone radical transformation in recent years and is now laying the groundwork for impressive advances in science and technology. In particular, China is setting itself up to be a major player in the fight against disease, and there are many reasons to believe that the country will play a central role in the life-sciences research of the future.

For starters, according to a report in *McKinsey Quarterly*, China spends more than \$200 billion on research annually, a level of investment that is second only to the United States. Chinese President Xi Jinping has positioned science-based innovation near the top of the national agenda, with the government's 13th Five-Year Plan prioritizing complex projects in emerging fields like brain research, gene science, big data, and medical robotics.

China is devoting so much to medical research in part because the country has significant unmet medical needs. By 2050, the Chinese population over age 65 is expected to increase by about 190 million. Meanwhile, chronic illnesses now account for more than 80% of China's disease burden. So it is no surprise that China is already the world's second largest pharmaceutical market, or that its innovation expenditure, according to the *McKinsey Quarterly* report, is expected to reach \$1 trillion by 2020.

Another reason to expect a Chinese research revolution is that China now graduates more university students in the fields of science, technology, engineering, and mathematics than any other country – about 2.5 million students per year, or about five times more than the US. In science and engineering alone, China generates nearly 30,000 PhDs annually.

At the same time, government incentives are luring Chinese scientists who have been working abroad – many with top-tier Western institutions – back home. From its inception in 2008 through mid-2014, this “Thousand Talents” program has attracted more than 4,000 returnees.

These trends clearly indicate that China has a real opportunity to become a major force in global pharmaceuticals research, and that there will soon come a time when breakthrough innovation occurs in China on a regular basis.

Global pharmaceutical companies have taken notice. My own company has been working in research and development in China for ten years. Back in 2006, we opened the first integrated R&D facility in the country, and the largest among international firms. And we recently opened a new R&D center in Shanghai's Zhangjiang Hi-Tech Park.

In Shanghai, premier scientists – many having returned to China from major research centers like Harvard Medical School and MIT – will focus on diseases that are endemic to the Chinese population. These include lung, liver, and gastric cancers, as well as other liver diseases, such as chronic hepatitis B, liver fibrosis, and cirrhosis. These diseases disproportionately affect people in China. For example, the incidence of hepatitis B in China is nearly 30 times higher than in the US; stomach and liver cancer rates are 11-18 times higher than in the US or Europe.

Thanks to advances in recent years, scientists can now identify epigenetic modification enzymes that regulate gene activities. This area of research is especially promising in the search for effective new oncological therapies. And by better understanding how these diseases manifest in Chinese patients, the

industry is honing targeted therapies that can then be introduced in other settings worldwide.

China could very well set the global standard for using epigenetics to gain a better understanding of the underlying causes of diseases. In China, Novartis scientists alone are already running 15 drug discovery projects at different stages, and this pace of development will only accelerate.

I am inspired by China's potential for making landmark scientific discoveries. As the country becomes increasingly important to global R&D, its contributions will be a boon for the fight against disease, both in China and worldwide.

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