Society for Biological Engineering
An AIChE Technological Community

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Advancing Biotechnology in Asia

Asia is in the midst of rapid economic growth and now offers exciting possibilities in research, particularly in the area of biotechnology. Just two decades ago, advanced biotechnology research was centered primarily in the U.S. and Europe, and many researchers and students from Asia went there to pursue postgraduate studies.

With the booming Asian economy and increasingly vibrant research climate, many of those researchers have now returned and brought their expertise with them. They have gone on to establish biotech forces in both academia and industry, as well as form a large network of connections between researchers in Asia and around the world.

The field of biotechnology is extremely broad and multidisciplinary, with applications ranging from energy and materials production to pharmaceuticals and molecular and tissue engineering. Many chemical engineers apply their knowledge and skills to biological processes and applications.

Leading the growth in biotechnology in Asia are China, Japan, South Korea, and Singapore. Although each country has pursued unique research directions, interest has centered on three key areas:

- biomanufacturing of chemicals and biomaterials for various industries, including health, food, energy, and agriculture
- diagnostics and biomedical technologies
- synthetic biology.

National Univ. of Singapore's Matthew Chang shares his views about the rise of this field in Asia. The growth in any new technology requires a synergy between industry and academia, each having different expertise to offer. Biotech is no exception. The industry defines and puts forth the needs of society, and academia works to develop new technologies to meet those demands. "The growth of biotechnology used to be predominantly driven by the industry, as many companies have their own research infrastructure. In recent years, there is increasing collaboration between industry and academia, with industry seeking novel technologies from academia for translation and advising the academics on the needs of the world, and the academics offering solutions to meet the needs of the industry," he says. For instance, in Singapore, various research laboratories have been formed by industry and academia, which indicates the growing alignment of industry and academia. One example is the newly formed Wilmar-NUS Corporate Laboratory (Wil@NUS), which Chang directs.

Government support also plays an important role in driving the direction of biotechnology research. For example, synthetic biology in Singapore, China, South Korea, and Japan has much support at the national level, including the establishment of state-sponsored programs and national institutes and the development of core research capabilities.

In China, government-sponsored programs offer large incentives to create biotech infrastructure, develop biotech and life-science parks, and recruit overseas talent. Legislation is continuously being developed to encourage innovation in China. Biotechnology is named as a Strategic Emerging Industry, and plans such as Made in China 2025 and the 13th Five-Year Plan prioritize its development. More partnerships are happening between academic institutes and biotech companies within and outside of China.

What's most exciting is the range of possibilities for what's yet to come from this vibrant field. This area has great untapped potential to address pressing global challenges, such as climate change and sustainable growth and development. Bio-based production of chemicals and materials in a sustainable way has been attracting much attention, and some traditional petrochemical companies have started to commercialize bio-based chemicals production.

Chueh Loo Poh, of the Dept. of Biomedical Engineering at the National Univ. of Singapore, believes that synthetic biology has an important role in achieving a circular bioeconomy for a more sustainable future. "Even at these early days of engineering biology, we have started to see many new companies being formed and private investment increasing significantly over the past few years. While the U.S. is leading in the startup scene, new startups are also being formed in Asia. Industry plays a very important role in translating the technology," he says. Another cutting-edge research area is the integration of big data and artificial intelligence with biotechnology. Opening up medical data accumulated over many years can enable further advancements.

Today, there continues to be much collaboration between researchers in Asia and those in the U.S. and Europe. The dramatic rise in the quality of research in Asia, coupled with increasing research opportunities spurred by rapid economic growth, draw a growing number of international researchers into Asia. The current healthy infrastructure supporting biotech development in Asia is also enabling many native young people to stay and work in biotech companies in Asia.

In order to support and strengthen these collaborations, AIChE holds some of its major biotech conferences in Asia. Join international researchers Jan. 7–9 in Singapore for the 10th International Conference on Biomolecular Engineering (ICBE Asia 2020) to advance the understanding and application of molecular biology, biophysical chemistry, metabolic engineering, cellular and tissue engineering, biomaterials, and synthetic biology. More information is available at www.aiche.org/ICBEAsia.

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