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7th International Meeting on Synthetic Biology (SB7.0)

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Report Highlights:
The 7th International Meeting on Synthetic Biology (SB7.0) was held in Singapore from June 13-16, 2017. The SB7.0's goal was to unite the international synthetic biology communities as they continue to work on challenges and explore collaborations for the collective growth of synthetic biology, its beneficial applications and responsible practices. Recognizing the global importance of the field, the Government of Singapore aims to make the country a hub and platform that link Singapore with the world's synthetic biology leaders and practitioners. This report also includes synthetic biology's applications – especially concerning food and agriculture.

The SB7.0 poster and stage at National University of Singapore (NUS)
(Source: FAS Singapore)

The 7th International Meeting on Synthetic Biology (SB7.0) was held in Singapore June 13-16, 2017. Co-organized by the National University of Singapore's (NUS) Synthetic Biology for Clinical and Technological Innovation (SynCTI), the BioBricks Foundation, and SynBioBeta; the event featured 100 speakers/experts. It was well attended by about 900 participants from 40 countries.

SB7.0 brought together a global community of synthetic biology practitioners to learn, discuss, and share information for the collective growth of synthetic biology, its beneficial applications and responsible practices; and to explore collaborations on building synergizing global partnerships. Established since 2004, the Synthetic Biology Conference series is one of the world's most important meetings in this field. Previous conferences were held in MIT, University of California Berkeley, Stanford University and Imperial College London.

Singapore's role

Guest-of-Honor, Mr. Desmond Lee, Minister, Prime Minister's Office, Second Minister for Home Affairs, and Second Minister for National Development spoke on opening day of the SB 7.0 conference. Mr. Lee said that Singapore "recognizes the potential of synthetic biology as a future economic driver." He added, "Synthetic biology has wide-reaching applications from agriculture to bio-manufacturing, to ground-breaking cancer treatments and medicines, to even information technology and fashion."

Singapore's Mr. Desmond Lee, Second Minister, at SB 7.0
(Source: NUS)

The Government of Singapore (GOS) aims to position the country as a global biological hub for synthetic biology. Under the Research, Innovation and Enterprise 2020 plan, the GOS has committed $ 19 billion to research, innovation and enterprise, key items that are part of the nation's strategy to develop a sustainable, knowledge-based, innovation-driven economy and society.

Singapore has formed its national consortium on synthetic biology (SINERGY – Singapore Consortium for Synthetic Biology) to promote research, commercialization and training in synthetic biology. Established in 2016, SINERGY encourages research, technology translation, training and technology awareness in synthetic biology by promoting research discussions across industry, government agencies and researchers. The consortium is designed to provide a platform to link the country's ecosystem for synthetic biology with the world's scientists, engineers, and clinicians to create impactful technologies. It is part of the $ 23 million investment in synthetic biology related R&D funded under the Biological Design Tools and Applications grant and the National Research Foundation (NFR)'s Competitive Research Program.

What is synthetic biology?

Synthetic biology can be described as the application of engineering principles to the fundamental components of biology. An emerging area of research, synthetic biology is "an interdisciplinary branch of biology and engineering that involves the design and construction of novel artificial biological pathways, organisms or devices, or the redesign of existing natural biological systems" (Source: Biotechin Asia).

According to an article published in Singapore's Straits Times (June 9, 2017), the "advent of synthetic biology is chiefly driven by ambitions to confront some of the world's most pressing challenges, using

biological solutions." Typically, it taps into areas such as biotechnology, microbiology, biochemistry and molecular biology.

Moral/ethical questions

As with other emerging technologies – such as artificial intelligence or stem cell research - the conference organizers have acknowledged that synthetic biology can also potentially spark ethical/moral dilemmas. Possible concerns can include accidental release of organisms into the environment, increased potential of deliberate misuses of biotechnology, and creation of commercial monopolies that have negative effects on trade or social justice (Source: Straits Times).

Recognizing the need for good governance and safe practices, the synthetic biology research community brings together individuals with policy, legal, ethical businesses and social science expertise to help identify areas of concerns and develop a rational and balanced evaluation of the risks and benefits (Source: Straits Times). Thus the featured SB7 speakers are not only the usual suspects of scientists, professors, researchers, engineers, and technical officers; but consisted also of speakers who are social scientists, lawyers, and conservationists. The community understands the importance of advocating governance and public engagement with stakeholders.

Synthetic biology's applications – Food and Agriculture

The SB7.0 featured speakers from various fields talking about synthetic biology and their applications – including also the work/tests their laboratories have been conducting in different areas. Synthetic biology applications are both broad and extensive. They range from life sciences to food/agriculture, and even fashion and conservation as presented at the conference.

Several highlighted presentations include the following:

- Building synthetic cells, with opportunities in medical, biofuels, materials, and food.
- Design based approach to photosynthetic efficiency, with algae as possible solution for climate change.
- Addressing threats to biodiversity (such as deforestation, pollutants, damage to coral reef, commercialization of wild life, animal trafficking, etc.), synthetic biology plays a role in conserving biodiversity: e.g. averting species extinction, preserving species, gene drives (improving environment and agriculture), genome technology for conservation, hybridizing the last of species, etc.
- Plays a role in synthetic aesthetic and fashion: eco-friendly dye (color: indigo) and synthetic spider silk.
- Addressing health matters including engineering T cell for cancer therapy, chromatic engineering for human health, programing biological systems to fight cholera, diabetes control through smartphone, cancer treatment using modified bacteria, etc.
- Writing DNA in constructing synthetic yeast.

Synthetic biology also plays a key role in food and agriculture. Aside from the examples below, the

technologies have allowed farmers/food manufacturers to produce more – both quantity and quality - with less. This has enabled the farmers/food manufacturers to earn more.

- Gene regulation technologies in agriculture to enhance product yield or quality, and disease/pest resistance in plants.
- Gene regulation technologies in agriculture to enhance nutritional content in animal food, crops, fruits and vegetables.
- Gene regulation technologies in aquaculture for desired traits to enhance product yield, nutritional content and disease resistance in seafood and fish.
- Foods and flavorings created through fermentation with engineered yeast.
- Beef production is both expensive and time consuming. Chicken takes a lot less to feed to create a pound of meat (3 pounds/a bit more) than cattle (5.5 - 6.5. lbs); and a cow in general produces only one calf per year. Embryo Transfer (ET) helps to produce more offspring from elite cows and is able to extend the impact of outstanding cattle genetics.
- Maximizing disease resistance in livestock.
- Increasing growth efficiency of livestock and fish.
- Specific examples include the following:

    - Genetically engineered apples that do not turn brown when sliced or bruised.
    - Genetically engineered salmons that grow faster and year round.
    - Genetically engineered potatoes that do not turn brown after cutting.