



Synthetic biology in China, UK and US

China, UK and US are probably three of the countries that heavily invest in synthetic biology. In this special issue, we will show for the first time how these three countries conduct their synthetic biology research.



China started to support synthetic biology research in 2011. So far nine projects have been supported with one related to plant and one to mammalian cells, the rest on microbial technology. Natural products (NPs) have always been an important area for synthetic biology research [4]. reviewed the progresses in discovery of novel biological parts and rational design of synthetic biological pathways, as well as pathway optimization [6]. described the "development of a *Streptomyces* chassis" for fast growth and rapid production of natural products via the exploration of various genetic tools for the chassis named *Streptomyces* sp. FR-008 [6] [1]. demonstrated that synthetic biology could be used to improve economy and diversity of a biodegradable plastic family called polyhydroxyalkanoates (PHA).

Design and construction of synthetic microbial consortia have also been supported by Chinese 973 Synthetic Biology program, which aim to address the fundamental challenges in engineering natural microbial consortia and reconstructing the consortia for industrial demands [8].

Beside microbial synthetic biology, the only one mammalian synthetic biology project in China has been dedicated to devices used to treat bladder cancer [7], including toolkits of DNA, RNA and protein parts to explore various cancer research subjects. On the other hand [5], were able to visualize and precisely design artificial small RNAs for regulating T7 RNA polymerase to enhance recombinant protein folding in *E. coli*, enzyme activity could be increased by 170%.

The UK is perhaps the most active country in synthetic biology. UK government commissioned the production of a national synthetic biology roadmap already in 2011, this was the first national roadmap by any country and any organization [2]. Critical

infrastructural investments have been made to establish an innovation knowledge centre, DNA synthesis foundries, a centre for doctoral training. The UK also published a synthetic biology strategic plan in 2016, increasing focus on the processes of translation and commercialization.

Among various UK synthetic biology centers, SYNBIOCHEM, hosted by the Manchester Institute of Biotechnology at the University of Manchester is delivering innovative technology platforms to facilitate the predictable engineering of microbial bio-factories for fine and speciality chemicals production [3].

The US is a leading nation in synthetic biology research and commercialization [9]. With strategic governmental investments, US has established numerous research centers and programs in synthetic biology, enabling significant advances in foundational tool development and practical applications ranging from bio-energy, biomanufacturing to biomedicine [9].

The above synthetic biology research allow readers to understand the different strategies used by three countries to develop this new discipline. For example, China focuses more on biomanufacturing as China is a large manufacturing country with large fermentation capacity, while UK tends to emphasize on establish centers to develop cluster technology. US has the largest research and commercialization power, it thus expands in all fronts, both on basic research and on products.

The author hopes that this special issue could allow readers to gain a global view on this emerging field.

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