Annex A: **About the A*STAR SIFBI-NUS Synthetic Biology Joint Lab**

Unlike conventional research labs that focus mainly on discovery or manufacturing, the joint lab is designed to connect both ends of the process. The joint lab will help companies move from identifying promising biological routes to testing whether these can work at pilot scale. Its work will focus on three areas:

1. **Faster design: AI-guided enzyme and pathway engineering**
   The lab brings together machine learning and biological data, allowing scientists to identify the most promising design to test and prioritise. By reducing the need for lengthy trial-and-error, it significantly shortens development timelines from months to weeks or minutes[1,2], enabling companies to move faster from concept to validated candidates and reducing the time and cost to bring new products to market

2. **Scalable production: Industrially deployable fungal host systems**
   The lab enables the development of engineered fungal "cell factories" that can produce complex molecules efficiently from simple nutrients. Designed to be scalable, the platform can be readily adopted across applications from ingredients to consumer care and advanced materials, allowing companies to integrate it directly into product development without costly redevelopment.

3. **New molecules: Access to novel bio-based compounds**
   The lab engineers fungal systems to generate novel molecules, compounds found in many clinically important drugs and functional ingredients, opening access to a new class of ingredients and bioactives that were previously too complex or costly to produce commercially.

The lab will be led by Professor Jay Keasling as Lead Principal Investigator. He is a professor at the University of California, Berkeley, and is widely credited with pioneering the use of yeast to produce complex molecules. His lab continues to advance technologies that convert renewable resources into biofuels, bioproducts, and next-generation bioactives.

[1] Singh, N., Lane, S., Yu, T. *et al.* A generalized platform for artificial intelligence-powered autonomous enzyme engineering. *Nat Commun* **16**, 5648 (2025).
[2] Rapp, J.T., Bremer, B.J. & Romero, P.A. Self-driving laboratories to autonomously navigate the protein fitness landscape. *Nat Chem Eng* **1**, 97–107 (2024).