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| **Research Theme: Enzyme engineering & Synthetic biology** |
| **PhD Research Project Title: Reprogramming nature’s biosynthetic machinery** |
| **Scholarship category (Please indicate the source of funding for this project):**  **SBS Research Student Scholarship (for SBS faculty only)** |
| **Principal Investigator/Supervisor: Liang Zhao-Xun** |
| **Co-supervisor/ Collaborator(s) (if any): NA** |
| **Project Description**   1. **Background: Biosynthesis of natural products.**   Are you intrigued by the evolving landscape of drug development and eager to be part of innovative research? Consider joining our lab, where we're engaged in pioneering work to reimagine nature's capabilities and its impact on pharmaceuticals.  In our well-established laboratory, we're harnessing the potential of microbial biosynthetic pathways. Nature has long provided the foundation for essential drugs through its bioactive compounds. But we're taking a step beyond traditional approaches. Recent advancements in DNA synthesis and genome editing have opened doors to innovative biochemical research. Our lab focuses on rewiring and reprogramming these biosynthetic pathways, seeking to unlock new possibilities. As a Ph.D. candidate in our program, you'll have the opportunity to:   1. Redesign Nature: Explore the modification of microbial biosynthetic pathways, creating unique chemical scaffolds that are not naturally occurring. These novel compounds may hold potential for future pharmaceuticals. 2. Master Genetic Techniques: Dive into genome editing and genetic engineering, learning how to manipulate biological systems to produce compounds with therapeutic potential. 3. Translational Impact: Your research won't end in the lab. We're dedicated to translating discoveries into practical solutions for patients.   Our lab is the place where students and research staff with biology and chemistry background work together to create biosynthetic pathways that do not exist in nature. We offer an environment where creativity blends with advanced technology and where your contributions can drive scientific progress.  **b) Proposed work:**   1. Microbial Genomics: Sequencing and analyzing the genomes of unique microbial strains to identify cryptic biosynthetic gene clusters (BGCs). 2. Bioinformatics: Using computational tools and methods to predict and analyze the presence of cryptic biosynthetic pathways in microbial genomes. 3. Enzyme engineering: Applying computational protein design and directed evolution methods to generate enzymes with desired properties. 4. Functional Characterization: Employing biochemical techniques to understand the functions and activities of these newly discovered enzymes. 5. Genetic Manipulation: Using genetic tools to manipulate microbial strains, potentially activating and expressing the cryptic biosynthetic pathways. 6. Synthetic Biology: Applying synthetic biology techniques to engineer and modify these pathways for the production of novel specialized metabolites.   The students may be involved in tasks related to any of these aspects of the research, depending on their level of expertise and the specific objectives of the laboratory work.  **c) Preferred skills: basic understanding of biochemistry and molecular cloning.** |
| **Supervisor contact:**  **If you have questions regarding this project, please email the Principal Investigator:** |
| **SBS contact and how to apply:**  Associate Chair-Biological Sciences (Graduate Studies) : [AC-SBS-GS@ntu.edu.sg](mailto:AC-SBS-GS@ntu.edu.sg)  Please apply at the following:  **Application portal:** <https://venus.wis.ntu.edu.sg/GOAL/OnlineApplicationModule/frmOnlineApplication.ASPX> |