

Sinergy
Singapore Consortium for
Synthetic Biology

Director's Message

Welcome to the inaugural issue of the SINERGY newsletter, *Vanda*. The Singapore Consortium for Synthetic Biology (SINERGY) was launched by the National Research Foundation (NRF) in September 2018. SINERGY aims to consolidate Singapore's capabilities in synthetic biology and harness synergies across research institutes and industry sectors to create a vibrant and globally connected Bio-Economy.

Synthetic biology is a multi-disciplinary field that applies engineering principles to redesign biological systems and enable new functionalities. At SINERGY our key research capabilities include advanced manufacturing for specialty chemicals, synthetic genomics, protein and enzyme engineering, to name a few. We have 16 industry partners on board, collaborating closely in driving the development and translation of each capability. We also have [Dr. Ning Mao on board as the consortium manager](#), who had scientific training in synthetic biology and will liaise between academia and industry to catalyze more collaborations.

In each issue of the newsletter, we will highlight one of our research teams and an industry partner. In this issue, we are excited to introduce [Dr. Jeng Yeong Chow and his team](#) on their work of

engineering enzymes for better industrial use, and the [collaboration with Singer Instruments](#) to develop an automation platform for synthetic biology research.

In addition to research and technology translation, SINERGY is also committed to promoting technology awareness and manpower training in synthetic biology. We hold regular scientific and industry talks, networking events and educational outreach to serve our local community.

We thank you for your interest and support in the development of synthetic biology in Singapore. We hope the newsletters will serve as a convenient and effective channel to bring the latest developments to you.



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Collaborative Projects



Dr. Matthew Chang
Director of SINERGY



Dr. Ning Mao
Manager of SINERGY



Recent Publication Highlights

Phage-boosted chemotherapy

Aggarwal N, Hwang IY, Chang MW
Nature biomedical engineering
3(9):680-681(2019)

Characterisation of Constitutive Promoters from the Anderson library in *Chromobacterium violaceum* ATCC 12472

Liow LT, Go MDK, & Yew WS
Engineering Biology, 3(3), 57-66 (2019)

Building a global alliance of biofoundries

Hillson N, et al.
Nat Communications.
10(1):2040 (2019)

High capacity DNA data storage with variable-length Oligonucleotides using repeat accumulate code and hybrid mapping

Wang Y, Noor-A-Rahim M, Zhang J, Gunawan E, Guan YL, Poh CL
Journal of Biological Engineering
13 (1), 89 (2019)

Cyclodextrin conjugated ferritin nanocages reduce intracellular cholesterol level in foam cells

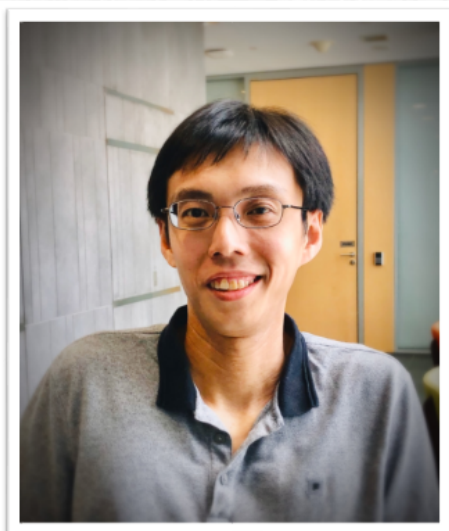
Ravishanker S, Lim S
Nano Research.
12 (12): 2925-2932 (2019)

Phytobacter palmae sp. nov., a novel endophytic, N₂ fixing, plant growth promoting Gammaproteobacterium isolated from oil palm

Madhaiyan M, et al. & Ji L
International Journal of Systematic and Evolutionary Microbiology, ijsem003834.
(2019)

Discovery, biosynthesis and antifungal mechanism of the polyene-polyol mejjiemycin

Low ZJ, et al. & Liang ZX
Chemical Communications (2019)



Spotlight on Researchers

Jeng Yeong Chow: An automated high-throughput screening platform for enzyme engineering

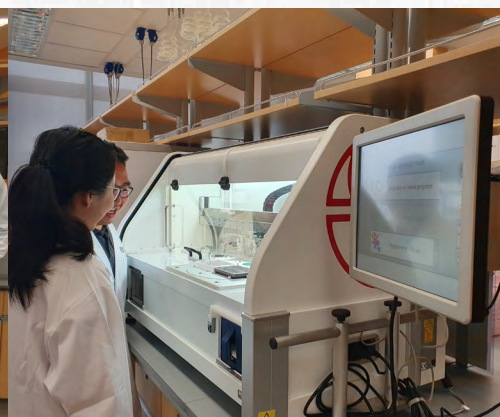
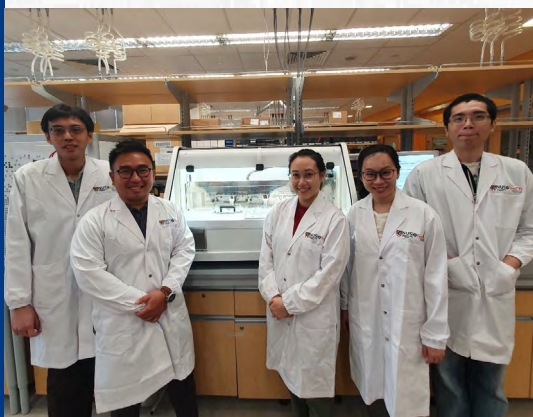
Enzymes, as we know them, catalyze biochemical reactions. They are also commonly used in industrial applications, particularly in the food, detergent and pharmaceutical sectors. However, most of these industrial processes require harsh conditions that often render these enzymes inactive after a short period of time. Our research team seek to engineer variants of such enzymes so that they can tolerate the harsh industrial conditions.

Conventional methods of **screening mutant enzyme libraries** are often tedious and time-consuming. With the recent advances in robotics, we now can conduct high-throughput screening through an automated process. SynCTI has recently partnered with Singer Instruments to develop methodologies that can increase the throughput and efficiency of screening large enzyme libraries. One of the key instruments developed by Singer Instruments is PIXL, a colony-picker that can be used to pick and transfer up to 10,000 colonies per day at a reasonably low cost. The PIXL has now been integrated

into our screening platform for the isolation of improved enzyme mutants for further testing and confirmation, which significantly improved the efficiency of the workflow.

Our team also works very closely with several other industrial collaborators, such as Wilmar and Nestlé, to ensure that our research goals remain up to date and fall in line with the industrial needs. A huge emphasis is placed on the development of **green technologies** with the use of enzymes for various bioprocesses, while ensuring a **low production cost**. One of the long-term goals of the group is to produce engineered enzymes that can replace some of the chemical processes currently used in these companies.

We have maintained a very positive lab environment by promoting openness and effective communication among all lab members. Researchers and students in the lab are very self-driven and are often encouraged to explore new ideas with resources that are available in the lab.



Featured Industry Partner



Singer Instruments: Empowering synthetic biology research through automation

Singer Instruments was established in 1934 and headquartered in the beautiful Exmoor National Park in the South West of England. The company has a long-standing track record developing and manufacturing [mechatronic workstations](#) and [laboratory automation robotics](#). Singer microbial colony pickers, screening robots, and colony counters are widely adopted across public and private research institutions, in multiple facets of biological sciences, including Genetics, Systems Biology, Cancer Biology, Biofuel Engineering, etc.

Our world-leading, specialist products are used to facilitate and accelerate genetic and genomic research around the world. Having worked alongside and added value to laboratory research for over 80 years, Singer Instruments are very proud to have customers within each of the top 50 universities in the world, we are considered [a truly integrated member of the genetics research community](#).

Singer leverages SINERGY's expertise in synthetic biology, to understand its workflows, requirements, and bottlenecks. We started working with SynCTI, which is part of the SINERGY Consortium, and other leading synthetic biology incubators and industrial partners. Through the collaborations, we identified issues with the current colony picking options. Singer listened to researchers' requests, worked together with the researchers, and developed [PIXL - an ultra-reliable, and user-friendly, precision microbial colony picker](#). Since the delivery of the first unit in January 2018, 30 laboratories have adopted the automated platform globally.

In addition to PIXL, Singer Instruments and SINERGY's partnership will spark new developments in technologies that lead to more scientific discoveries and boost research outcomes and efficiency.

"The tag line, 'a responsibility to science' acts as a continual reminder for Singer to do our utmost to support, develop new technology, and add as much value as possible to the science and the scientific community we serve."



SINERGY Membership

As a SINERGY member, an industry partner is entitled to apply for NRF grants, access select lab facilities at members' rate, and has other benefits such as marketing and licensing opportunities, advice and consultancy from top-notch scientists, among others.

For inquiries, please contact Ning Mao at nmao@nus.edu.sg

Twist Bioscience offers a special **Buy-One-Get-One-FREE** Promotion to SINERGY researchers for clonal genes and gene fragment POs by 31st March.

Contact Ryan Tan at rtan@twistbioscience.com



Happenings

Synthetic Biology Companies Fighting the Coronavirus*

Illumina:

Characterizing the virus genome with NGS technology, developing test protocols and training local disease control personnel

Mammoth Biosciences / Sherlock Biosciences:

Developing CRISPR-based rapid diagnostic tests

Inovio &

Twist Bioscience:

Developing vaccines targeting coronavirus DNA sequence

Moderna:

Developing mRNA vaccines

Abcellera:

Identifying antibodies that can neutralize the virus



Upcoming SINERGY Members' Event

May 2020

Dinner and Discussions

"Enabling technologies: how can academia industry collaborations effectively advance the development"

*Adapted from Forbes.com (J. Cumbers, 5 Feb, 2020)



Seminar Highlights in 2019

EFI@Illinois: Discovery of Novel
Enzymes and Metabolic Pathways
John A. Gerlt
University of Illinois

Design, Construction, and Analysis
of a Synthetic Minimal Bacterial Cell
John Glass
J. Craig Venter Institute

Programming Cells at Scale
Jason Kelly
Ginkgo Bioworks

Functional Metagenomics: Gene
Function Discovery in Uncultivated
Bacteria
Trevor C. Charles
University of Waterloo

In vitro Synthetic Biology – Using
Cell Free Systems to Rapidly Access
to Xenobiotics in a Test-Tube
Paul Freemont
Imperial College London

Synthetic Small Intestines For
Treating And Studying Intestinal
Disease
John March
Cornell University

Genome-wide Target Specificity of
CRISPR RNA-guided Base Editors
Jin-Soo Kim
Seoul National University



Dr. Jason Kelly of Ginkgo Bioworks giving a seminar at NUS Synthetic Biology for Clinical and Technological Innovation (SynCTI)



28 Medical Drive
Singapore 117456
+65 6601 2449

For any inquiries or issues, please contact
Hana Sulaiman via suhana.s@nus.edu.sg

Event Highlights

Xperiment 2019

X-Periment! is a science fair jointly organized by A*STAR and the Singapore Science Centre to engage the public in the latest development of science. In 2019, the event was held at Fusionopolis One on 13-14 September, with the theme “Sustainability”.



SINERGY researchers showcased two synthetic biology projects to the visitors – one was about how engineered microbes could process electronic wastes that came from discarded mobile phones to generate precious metals like “GOLD”; the other demonstrated how cellular behaviors could be controlled by light through genetic engineering. The audience, especially young ones, were intrigued by the demonstrations and asked many interesting questions to the scientists.



SWITCH 2019

Singapore Week of Innovation & Technology (SWITCH) is a platform established by Enterprise Singapore, NRF and IPI, to transform scientific discoveries into disruptive technology applications. In 2019, SINERGY held a booth at SWITCH in Singapore EXPO during 11-13 November. Our researchers and staff showcased our research capabilities and consortium membership benefits to the attendees, who included entrepreneurs, investors, and

industry professionals from diverse backgrounds. Many showed great interest in the SINERGY membership, and our researchers also learned about the practical needs of the industry from the conversations at the event.

Conference and Workshop Highlights

- May 2019 - Biosystems Design 5.0 Symposium - Exploration @ Matrix Level 4, Biopolis, Singapore
- May 2019 - The Merlion Workshop - CeLS Auditorium, Centre for Life Sciences, NUS
- October 2019 - Future Trends in Synthetic Biology : Asian Perspectives Workshop - Equarius Hotel, Resorts World Sentosa

Upcoming Events

- May 2020 - Biosystems Design 6.0 Symposium - Exploration @ Matrix Level 4, Biopolis, Singapore
- Jun 2020 - Synthetic Biology Women in Science Workshop - Singapore