

# VANDA



## A SINERGY NEWSLETTER

### Director's Message

Dear Colleagues,

Happy 2022 and happy Year of the Tiger! We wish you a fruitful year ahead: one filled with exciting science, meaningful collaborations—and hopefully, more physical interactions.

Our Seed Grant call deadline is fast approaching (**15 March 2022**), and we will do only one Seed Grant call in 2022. So far, we have awarded seven different Seed Grant projects involving PIs from three different institutes. We encourage our colleagues affiliated with our academic and industry members to enquire and apply with their synthetic biology projects.

In this issue, we are pleased to introduce you to **Kumar Selvarajoo**, Senior Principal Investigator at the Agency for Science, Technology and Research's (A\*STAR) Bioinformatics Institute (BII) and adjunct Principal Investigator at NUS Synthetic Biology for Clinical and Technological Innovation (SynCTI). Learn more about Kumar's research in computational and systems biology on P.2. Meanwhile, our featured industry partner is **Sophie's Bionutrients**, a startup that uses microalgae to produce alternative protein food ingredients. Learn more about Sophie's Bionutrients on P.3.



We are also delighted to welcome A\*STAR as our academic partner. With its mission and vision to advance science and develop innovative technology to further economic growth and improve lives, A\*STAR is set to be a key partner in the years to come. We warmly welcome Singapore's lead public sector research agency to the SINERGY family, and we look forward to productive collaborations!

Matthew Chang  
SINERGY Director

#### SINERGY Seed Grant for Collaborative Research in Synthetic Biology



Sinergy provides a **\$50,000** Seed Grant for selected academic - industry collaboration research projects. The application deadline for the next call is on **15 March 2022**.

Find out more details at <https://sinergy.sg/seedgrant/> and submit your application by email to [sinergy.nus.edu.sg](mailto:sinergy.nus.edu.sg)



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### At a Glance

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# Researcher Spotlight



Kumar Selvarajoo is heading the Computational Biology & Omics laboratory at BII and SIFBI, A\*STAR. He is also an adjunct Associate Professor at the Yong Loo Lin School of Medicine, National University of Singapore and the School of Biological Sciences, Nanyang Technological University. Prior, he was an Associate Professor in Systems Biology at the Institute for Advanced Biosciences, Keio University, Japan. His research interests include Computational Biology, Systems Biology, Bioinformatics, Data Analytics,

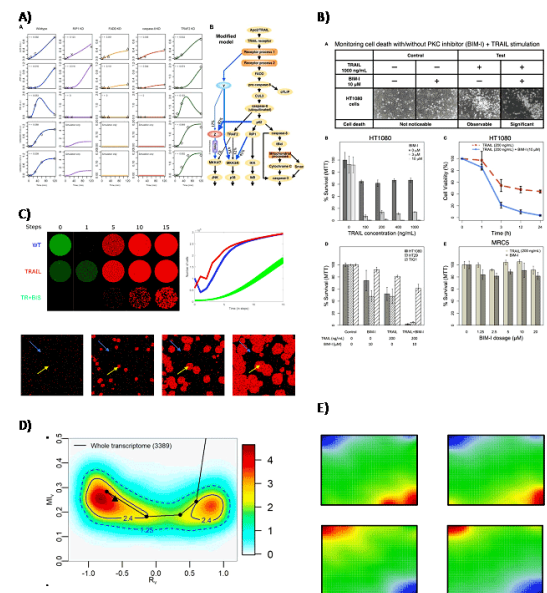
Genomics, Cancer & Immunology, Synthetic Biology.

Living systems are highly complex and appears unpredictable in their response, for example, treating disease cells with drugs. Where much has and continues to be learned from highly reductionist and experimental approaches in understanding the individual processes of living organisms, systems biology field, where Kumar and his team are working, aims to shed light on the highly interconnected gene regulations, signal transductions and metabolic networks by considering them more holistically. Though generally thought to be too convoluted to permit predictability, the modern methods, tools and techniques of systems biology are increasingly allowing better estimations to be made about the inner regulations of life.

Kumar, who is originally trained in Aeronautical Engineering from the Imperial College, London, plunged into studying biological complexities through a PhD scholarship at Nanyang Technological University (NTU), in the area of Computational Biology. *"It was a brand-new initiative at NTU at that time (in year 2000), and my passion is on understanding complexity through theories"*, says Kumar. With partnership with National Cancer Centre and in the lab of Patrick Tan (now the ED of GIS), Kumar developed theories for understanding metabolic pathway aberrations in type 2 diabetes. Subsequently, he moved to Keio University as a faculty member after a short stint in Bioinformatics Institute, A\*STAR.

*"In Japan, I was more or less isolated...and that allowed me to focus more deeply into systems biology research. I extended my theory to study innate immune and cancer signaling, from both dynamic modeling to high-throughput transcriptomics analyses"*. Kumar acknowledges co-faculty Masa Tsuchiya and Italian collaborator Alessandro Giuliani for close research works on the topics.

Returning to Singapore in 2016, Kumar now works on diverse projects, adding food-related and metabolic engineering/synthetic biology research into his lab's research portfolio. He believes the scope for computational systems biology is currently underestimated, as most biologists think that theories or modeling in biology can only play a supportive role. The journey for convincing is long, but along it, we can make very useful contributions, as is evident by our collaborative works with industries and well as numerous research publications in international cross-disciplinary and biological journals.



A) Dynamic modeling of TRAIL cancer signaling [Piras et al, 2011], B) Experimental regulation of cancer proliferation predicted by model [Hayashi et al, 2015]. C) Space-time simulation of cancer proliferation in untreated and treated condition [Deveaux et al, 2019], D) Transcriptomics attractor landscape for E-coli state transition [Bui & Selvarajoo, 2020], E) Distinct transcriptome signatures for 2 ovarian cancer lines (top=SKOV3, bottom=A2780), and their replicates. All images are reproduced under creative commons license



## KEY PUBLICATIONS

- Giuliani A, Bui TT, Helmy M, Selvarajoo K. Identifying toggle genes from transcriptome-wide scatter: A new perspective for biological regulation. *Genomics*, 114:215-228 (2022).
- Helmy M, Agrawal R, Soudy M, Bui TT, Selvarajoo K. GeneCloudOmics: A Data Analytic Cloud Platform for High-throughput Gene Expression Analysis. *Front Bioinform.*, 1:693836 (2021).
- Helmy M, Selvarajoo K. Systems Biology to Understand and Regulate Human Retroviral Proinflammatory Response. *Front Immunol.*, 12:736349 (2021).
- Selvarajoo K. The Need for Integrated Systems Biology Approaches for Biotechnological Applications. *Biotech-nol. Notes*, 2:39-43 (2021).
- Selvarajoo K. Searching for unifying laws of general adaptation syndrome: Comment on "Dynamic and thermodynamic models of adaptation" by Gorban et al. *Phys Life Rev.*, 37:97-99 (2021).
- Helmy M, Smith D, Selvarajoo K. Systems biology approaches integrated with artificial intelligence for op-timized food-focused metabolic engineering. *Metab Eng Commun.*, 11: e00149 (2020).
- Bui TT, Selvarajoo K. Attractor Concepts to Evaluate the Transcriptome-wide Dynamics Guiding Anaerobic to Aerobic State Transition in *Escherichia coli*. *Sci Rep.*, 10:5878 (2020).
- Deveaux W, Hayashi K, Selvarajoo K. Defining Rules for Cancer Cell Proliferation in TRAIL Stimulation. *NPJ Syst Biol & Appl.*, 5:5 (2019).
- Deveaux W & Selvarajoo K. Searching for Simple Rules in *Pseudomonas aeruginosa* Biofilm Formation. *BMC Res Notes*, 12:763 (2019).
- Selvarajoo K. Complexity of Biochemical and Genetic Responses Reduced Using Simple Theoretical Models. *Methods Mol Biol.*, 1702:171-201 (2018).
- Piras V, Selvarajoo K. The Reduction of Gene Expression Variability from Single Cells to Populations follows Simple Statistical Laws. *Genomics*, 105(3):137-144 (2015).
- Piras V, Tomita M, Selvarajoo K. Transcriptome-wide Variability in Single Embryonic Development Cells. *Sci. Rep.*, 4:7137 (2014).
- Selvarajoo K, Tomita M. Physical Laws Shape Biology. *Science* 339:646 (2013).
- Selvarajoo K. Immuno Systems Biology: A Macroscopic Approach for Immune Cell Signaling. Springer New York, ISBN: 978-1461474593 (2013).
- Selvarajoo K. Discovering Differential Activation Machinery of the Toll-Like Receptor (TLR) 4 Signaling Pathways in MyD88 Knockouts. *FEBS Lett.*, 580:1457-1464 (2006).



# Featured Industry Partners



## Sophies' Bionutrients: alternative food products made of microalgae

Sophie's Bionutrients is on a mission to unleash the limitless possibilities of nature, restore our planet and eliminate food allergies by creating plant-based, protein-rich alternatives to meat and seafood using microalgae, the mother of all food and plant life. Sophie's Bionutrients is a Foodtech 500 startup and winner of the MassChallenge 2020.

The company's story started when Sophie, daughter of the CEO and founder Eugene Wang, suffered an allergic reaction to seafood. Eugene, instead of simply accepting the situation, decided to find a way of providing animal-free protein alternatives. Aquatic microalgae are an excellent protein source, they grow using essentially carbon dioxide and water, and many algae are already in use as food supplements. Thus, Sophie's Bionutrients was born!



Eugene Wang  
CEO, Co-founder  
20+ Years in Food Manufacturing  
MBA Degree,  
Columbia Business School



Kirin Tsuei  
CTO, Co-founder  
20+ Years in Global  
Supplement Companies  
MS in Nutrition Science,  
UC Davis Licensed Dietician



Willem Sodderland  
Scale-up Director  
25+ years in bringing disruptive  
innovations to market  
Launched seaweed pioneer,  
Seamore 2015  
Master of Law, Leiden University

Sophie's Bionutrients is the first food-tech company using fermentation technologies to grow microalgae for alternative protein. This process can be precisely controlled to produce protein in a matter of days. The company plans to use local food waste, and limited amounts of water to produce micro-algae protein within metropolitan areas in many parts of the globe. In addition, they can generate whole-algae ingredients in a variety of food applications in plant-based meat and functional food. One of the company's recent successes is the development of the world's first [microalgae milk alternative](#).

When asked whether alternative protein will replace animal-grown meat in the future, Eugene commented that *"it will not be a zero-sum game. Alternative protein will NOT replace traditional protein in the foreseeable future. And that's not the purpose of developing alternative protein either. The goal is to complement the conventional protein so that we have more and sustainable supply when the demands of protein surge more in the future"*.

Sophie's Bionutrients is developing its technology and grows its R&D capacity in Singapore. However, the company aspires to enter and establish into the European markets in the next few years. *"Singapore has set itself up very nicely as the perfect location for any startups who want to be in the alternative-protein business in Asia. Especially, SFA's approval on cell-based meat technologies last year perfectly illustrated the desire of Singapore government and people to make this country an alternative protein friendly nation"*, Eugene said. *"However, on synthetic biology, I think Singapore (or maybe should I say the whole Asian market) still has a long way to catch up with Europe."*

### COMPANY MILESTONES



# Recruitment & Announcements

## Career Opportunity at the Strain Engineering Team, Singapore Institute of Food and Biotechnology Innovation (SIFBI), A\*STAR

- 1) **Scientist** (Sg Map)
- 2) **Scientist** (Protein Engineering)
- 3) **Scientist** (Fungal Engineering)
- 4) **Scientist** (Modified nucleotides) Please inquire Yifeng Wei ([weiyf@sifbi.astar.edu.sg](mailto:weiyf@sifbi.astar.edu.sg)).



Please send your cover letter, curriculum vitae, and contacts of three referees to Ee Lui Ang ([ang\\_ee\\_lui@sifbi.a-star.edu.sg](mailto:ang_ee_lui@sifbi.a-star.edu.sg)), or apply online.

## GenScript Sets Up State-Of-Art Manufacturing Facility in Singapore to Strengthen Manufacturing Capability



GenScript Biotech Corporation, the world's leading life science research tools and services provider, announced the opening of more than 30,000-square-foot facility for highly automated protein and gene preparation services. The state-of-the-art site marks a significant expansion of the company's advanced protein and gene platforms, and is designed to provide high quality, fast-turnaround on products required for new vaccines and therapeutics development and innovations in life sciences.

Read the whole store [here](#).

## Updates



### SINERGY Seed Grant Calling for Submissions

SINERGY provides a \$50,000 seed grant for selected academic-industry collaboration research projects. The grant call is open throughout the year with submission deadlines on 15 March 2022 respectively. Interested PIs and companies can find details at <https://sinergy.sg/seedgrant/> and submit to [sinergy@nus.edu.sg](mailto:sinergy@nus.edu.sg).



### 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 topnotch scientists, among others.

For inquiries, please contact [sinergy@nus.edu.sg](mailto:sinergy@nus.edu.sg).

## Upcoming Events

### Sinergy Seminars

Reprogramming the genetic code and how to use it.

Thursday, 26 April 2022, 2pm SGT

Register at : <https://qrs.ly/4wdhrwh>



Dr. Julius Fredens  
Department of Biochemistry,  
National University of Singapore

### THE RESURGENCE OF ALGAL BIOTECHNOLOGY

ONLINE EVENT

15 March 2022, 10:00am–11:00am (Singapore Time / UTC +8)

Presented By:



Sinergy  
Singapore Consortium for  
Synthetic Biology



## Twist Bioscience Synthetic Biology Grant Call 2022 Singapore

Submit your research project proposal to  
**win Synthetic DNA from Twist Bioscience !**

**Proposal submission deadline**

31 March 2022

To learn more about this program, register using this link

<https://pages.twistbioscience.com/synbio-grant-call-SG.html>  
or **scan the QR code**

