ASBA

ASBA SPOTLIGHT

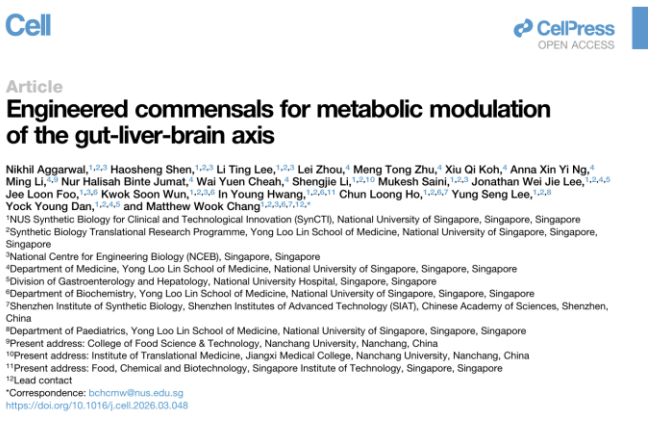
Monthly news from
the Asian Synthetic Biology Association

Edition 2, April 2026 Curated by Xiaofang Huang & Xinyi Chen

Engineered commensals for metabolic modulation of the gut-liver-brain axis

EDITORIAL PICK Report by Xinyi Chen

Complex metabolic disorders often arise not from single molecular defects but from dysregulated networks spanning multiple organs. Hepatic encephalopathy (HE) exemplifies this challenge: impaired liver function leads to systemic hyperammonemia, depletion of branched-chain amino acids (BCAAs), abnormal glutamine cycling, and downstream neurological dysfunction. Existing therapies largely target individual nodes within this network. In this study, a research team at the National University of Singapore (NUS), led by Dr. Nikhil Aggarwal and Professor Matthew Chang, applied synthetic biology to engineer commensal bacteria as programmable, multi-metabolite control systems operating directly in the gut.


Cell

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Article

Engineered commensals for metabolic modulation of the gut-liver-brain axis

Nikhil Aggarwal,[1,2,3] Haosheng Shen,[1,2,3] Li Ting Lee,[1,2,3] Lei Zhou,[4] Meng Tong Zhu,[5] Xiu Qi Koh,[4] Anna Xin Yi Ng,[4] Ming Li,[4,8] Nur Halisah Binte Jumat,[4] Wai Yuen Cheah,[4] Shengjie Li,[1,2,10] Mukesh Saini,[1,2,3] Jonathan Wei Jie Lee,[1,2,4,5] Jee Loon Foo,[1,2,6] Kwok Soon Wun,[1,2,3,6] In Young Hwang,[1,2,6,11] Chun Loong Ho,[1,2,6,7] Yung Seng Lee,[1,2,6] Yock Young Dan,[1,2,4,5] and Matthew Wook Chang[1,2,3,6,7,12,*]

[1]NUS Synthetic Biology for Clinical and Technological Innovation (SynCTI), National University of Singapore, Singapore, Singapore
[2]Synthetic Biology Translational Research Programme, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore
[3]National Centre for Engineering Biology (NCEB), Singapore, Singapore
[4]Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore
[5]Division of Gastroenterology and Hepatology, National University Hospital, Singapore, Singapore
[6]Department of Biochemistry, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore
[7]Shenzhen Institute of Synthetic Biology, Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Sciences, Shenzhen, China
[8]Department of Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore
[9]Present address: College of Food Science & Technology, Nanchang University, Nanchang, China
[10]Present address: Institute of Translational Medicine, Jiangxi Medical College, Nanchang University, Nanchang, China
[11]Present address: Food, Chemical and Biotechnology, Singapore Institute of Technology, Singapore, Singapore
[12]Lead contact
*Correspondence: bchcmw@nus.edu.sg
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Using *Lactobacillus plantarum* WCFS1, a native gut commensal, as the chassis, the team engineered two complementary strains. The first strain (Lp-NH3) has a rewired central metabolism that enables assimilation of free ammonia while synthesizing L-valine, a BCAA. This was achieved by integrating heterologous enzymes, eliminating competing pathways, and tuning expression of the *ilv* operon to couple nitrogen clearance with anabolic output.

The second strain (Lp-Q) was engineered with enhanced L-glutamine utilization through overexpression of native glutamine-metabolizing enzymes. Together, these strains provide orthogonal but interacting metabolic functions aligned with host nitrogen handling.

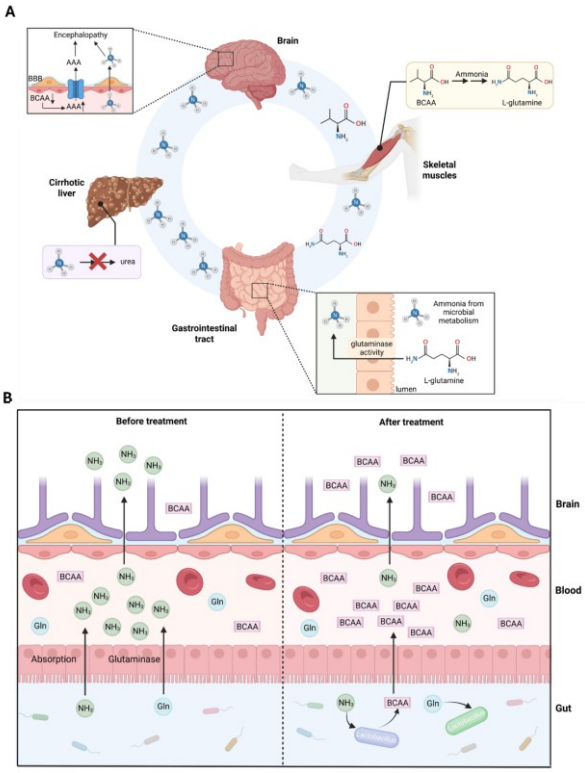


Figure 1: (A) Schematic showing the ammonia cycle and the utilization or synthesis of different metabolites in various organs, resulting in encephalopathy. (B) Schematic showing the intended changes in key HE metabolites before and after treatment with engineered commensals.

In two mouse models—a diet-induced hyperammonemia model and a bile duct ligation model that recapitulates key features of HE—oral administration of the engineered strains resulted in robust, system-level metabolic normalization. Serum and brain ammonia levels were reduced by up to ~10-fold, while BCAA and glutamine imbalances were corrected in a context-dependent manner. These changes were accompanied by improvements in anxiety-like and cognitive behaviors.

Notably, a combined formulation of both strains consistently outperformed rifaximin, a clinically used antibiotic for HE, while preserving gut microbiota diversity rather than inducing dysbiosis.

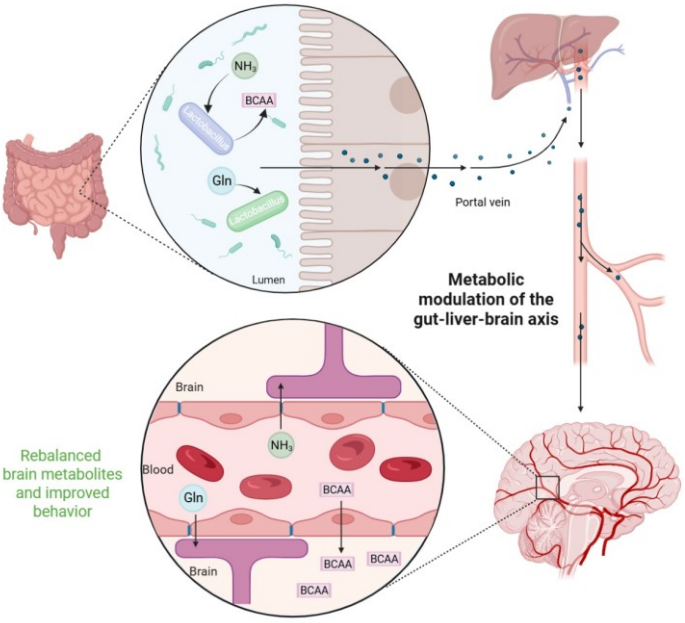


Figure 2: Schematic showing the modulation of the gut-liver-brain axis using engineered commensals.

Beyond these physiological effects, brain transcriptomic analysis revealed that treatment with engineered *L. plantarum* partially restored neuronal signaling pathways, including GPCR and monoaminergic signaling, and reduced neuroinflammatory signatures. These findings support a model in which microbial metabolic activity in the gut propagates into functional and molecular changes in the brain, highlighting the gut–liver–brain axis as an engineerable control surface.

Safety and tolerability were evaluated to assess translational relevance. Prolonged daily administration of the combined bacterial formulation in healthy mice did not affect body weight, blood cell counts, or liver and kidney function markers. Although low-level bacterial translocation to mesenteric lymph nodes and liver was observed, this was consistent with physiological immune sampling and was not associated with systemic inflammation or tissue pathology. Importantly, the strains did not persist long-term in the gut and were rapidly cleared following cessation of dosing.

Figure 3: The authors Professor Matthew Chang (Left) and Dr. Nikhil Aggarwal (Right).

From a synthetic biology perspective, this study demonstrates how genome-integrated, stable, non-colonizing engineered microbes can be programmed for multi-objective metabolic regulation in vivo. More broadly, it establishes engineered commensals as modular platforms for tackling disorders driven by distributed metabolic dysregulation, shifting from single-metabolite interventions toward systems-level therapeutic design.

References:

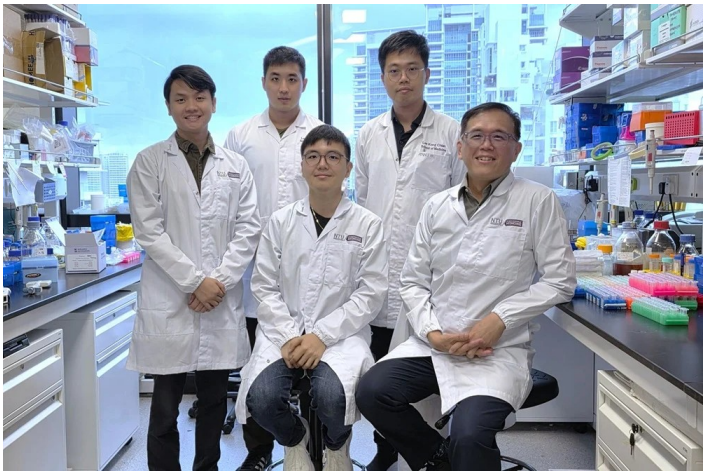
https://www.cell.com/cell/fulltext/S0092-8674(26)00384-3

New Inhalation Therapy Developed to Reduce Long-Term Lung Damage from Severe Infections

EDITORIAL PICK

Report by Xiaofang Huang

The Asian Synthetic Biology Association (ASBA) is pleased to share a groundbreaking advance in respiratory medicine: a new targeted inhalation therapy developed through a global collaborative research effort led by Nanyang Technological University (NTU) Lee Kong Chian School of Medicine (LKCMedicine), in partnership with Southern University of Science and Technology (SUSTech, China) and Lipigon Pharmaceuticals (Sweden).



Viral infections such as pneumonia and COVID-19 often leave patients with persistent lung inflammation, even after the virus has been cleared. This prolonged inflammatory state can cause lasting damage to lung tissue, leading to long-term respiratory complications. To address this challenge, the research team spent ten years on rigorous, patient-focused work to develop a therapy that directly targets the root cause of lingering inflammation.

The therapy works by targeting a specific protein that drives chronic inflammation in the lungs, delivering the treatment directly to the affected tissue via an inhaler—similar to those used by asthma patients.

This approach ensures the drug reaches its intended site efficiently, minimizing systemic side effects while maximizing therapeutic impact. The therapy is designed to help patients recover faster from severe lung infections and reduce the risk of long-term lung damage. A patent for the innovation has already been filed in Singapore, marking an important step toward clinical translation.

This project exemplifies the power of cross-border collaboration: researchers from three institutions across three continents came together to tackle a shared clinical challenge, demonstrating how diverse expertise and sustained investment in fundamental research can lead to practical, life-changing solutions.

ASBA extends its warmest congratulations to Assoc Prof Andrew Tan and the entire team at LKCMedicine, as well as collaborators from SUSTech and Lipigon Pharmaceuticals, on this significant achievement in translational medicine. We are proud to highlight this work as an inspiring example of how synthetic biology and biomedical innovation can drive global health impact.

References:

https://www.ntu.edu.sg/news/detail/new-inhaled-therapy-to-reduce-lung-damage-from-severe-infections

Shanghai Launches "AGI4S Everest Plan" to Accelerate AI-Driven Scientific Discovery Center in Shenzhen

NEWS

Report by Xinyi Chen

Shanghai has unveiled an ambitious initiative aimed at transforming the future of scientific research through artificial intelligence. At the 2026 Pujiang AI Academic Annual Conference, the Shanghai Artificial Intelligence Laboratory officially launched the "AGI4S Everest Plan," a major program designed to integrate AI into the core of scientific discovery.

The initiative focuses on building a comprehensive AI-for-Science (AI4S) infrastructure that combines computing power, large-scale scientific data, and automated experimental systems. By addressing the long-standing fragmentation in research environments, the platform seeks to create a unified system where data, algorithms, and experiments can operate seamlessly together.

At the conference venue. Photo courtesy of Shanghai Jiao Tong University.

A central component of the plan is the development of an "AI-powered scientific operating system." This system is intended to assist researchers in identifying patterns, generating hypotheses, and accelerating experimental cycles. Tasks that traditionally take years could potentially be shortened to months with the support of advanced AI models and integrated workflows.

In addition to technical infrastructure, the program also emphasizes ecosystem development. The initiative aims to bring together universities, research institutes, and industry partners to form a collaborative innovation network. A supporting "Climber Program" will help incubate high-potential scientific projects and nurture interdisciplinary talent.

Experts view the AGI4S Everest Plan as part of a broader national strategy to position China at the forefront of next-generation scientific innovation.

On March 30, the "International Frontier Interdisciplinary Forum on Synthetic Biology" was held as part of the 130th anniversary academic events of Shanghai Jiao Tong University.

By leveraging artificial intelligence as a foundational tool, the initiative seeks to redefine how scientific research is conducted, moving toward a more automated, data-driven, and efficient paradigm.

The launch signals a growing trend in the global scientific community, where AI is increasingly seen not only as a tool, but as a core driver of discovery across fields such as materials science, biomedicine, and energy research.

As the project progresses, its impact may extend beyond academia, influencing industrial applications and shaping the future landscape of innovation.

Academician Deng Zixin delivered a keynote speech at the conference.

References:

https://news.sjtu.edu.cn/mtjj/20260401/221032.html

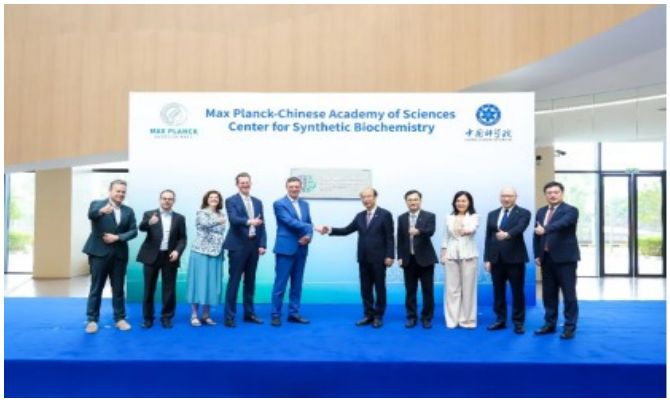
China and Germany Launch Joint Synthetic Biology

NEWS

Report by Xinyi Chen

On April 18, the Max Planck – Chinese Academy of Sciences Joint Center for Synthetic Biochemistry was inaugurated in Shenzhen. The center is jointly established by the Shenzhen Institute of Advanced Technology (SIAT), under the Chinese Academy of Sciences (CAS), and the Max Planck Institute for Terrestrial Microbiology in Germany.

As the first international synthetic biology center created by the Max Planck Society, the initiative marks a major step in strengthening global scientific collaboration. Cooperation between CAS and the Max Planck Society dates back to 1974, and the two sides have maintained close ties for over 50 years.



Inauguration Ceremony

The center will be co-led by Professor Liu Chenli and Professor Helge Bode, focusing on key challenges in synthetic biology, including natural product discovery and green biomanufacturing.

On-site Visit to Shenzhen's Major Synthetic Biology Research Infrastructure

By combining complementary strengths, the partnership aims to accelerate the translation of basic research into real-world applications. The Max Planck Institute contributes expertise in biosynthesis and metabolic design, while SIAT provides advanced infrastructure and AI-driven engineering platforms. Together, they will implement a "Design – Build – Test – Learn" cycle to improve research efficiency.

At the inauguration ceremony, Max Planck Society President Patrick Cramer highlighted Shenzhen's strong innovation ecosystem and expressed confidence in the center's global impact. CAS official Liu Weidong described the initiative as a new phase of cooperation, emphasizing both fundamental research and industrial application.

Group Photo of Attending Guests and Scholars

Local officials noted that Shenzhen offers a complete innovation chain from basic research to commercialization, making it an ideal hub for international collaboration.

The new center represents a shift from project-based cooperation to long-term institutional collaboration, aiming to advance scientific research, talent development, and sustainable technological innovation.

References:

https://mp.weixin.qq.com/s/87duztwgf2at9qzuH_3jGA

ASBA Workshop:
SynCell Asia 2026 to be held in Kobe, Japan

ANNOUNCEMENT

Following the highly successful workshops in 2024 and 2025, the ASBA Workshop Series: SynCell Asia proudly returns in 2026 at the vibrant city of Kobe, Japan. Held in conjunction with the International Biotechnology Symposium and Open ASBA, this event will take place on the 3rd and 4th of July 2026 at the prestigious RIKEN Kobe Campus.

This exciting gathering will bring together leading researchers, pioneers, and emerging talents in synthetic cell research and synthetic biology from across Asia. Participants will share the latest groundbreaking advances, engage in stimulating discussions, forge powerful new collaborations, and collectively push the frontiers of SynCell science toward transformative discoveries.

Celebrating One of Our Own: Dr. Ling Hua's New Chapter at SIT

ANNOUNCEMENT Report by Ho Chun Loong

We are pleased to share that Dr. Ling Hua has been appointed as Associate Professor at the Singapore Institute of Technology (SIT), within the Food, Chemical and Biotechnology Cluster.

Dr. Ling is among the first cohort of members at ASBA's founding, having been part of our association since 2018.

By way of introduction, Dr. Ling holds training in molecular biology, biochemistry, and synthetic biology from Shanghai Jiao Tong University, Nanyang Technological University, and National University of Singapore. Over the course of his career, he has served as a Principal Investigator at the National University of Singapore for five years. In addition to leading a research group for 19 years in academia, he spent more than three years as Team Leader (Synthetic Biology) at Wilmar International, as well as Co-Lab Director at the WIL@NUS Corporate Laboratory.

Dr. Ling's research focuses on the development of engineered microbes for the bioproduction of value-added chemicals. Regarded as one of Singapore's leading scientists in engineering biology in Singapore, he brings a wealth of both academic and industrial experience to his work. To date, he holds five patents and has authored 77 publications.

On behalf of the ASBA community, we extend our heartfelt congratulations to Dr. Ling on this well-deserved milestone. His unique blend of academic and industrial experience will undoubtedly be a tremendous asset to the Singapore Institute of Technology, and we have no doubt that his expertise and commitment to mentorship will inspire and shape the next generation of scientists in Singapore.

References:

https://www.singaporetech.edu.sg/directory/faculty/hua-ling

Toward Digital Cells and Human

COMMENTARY

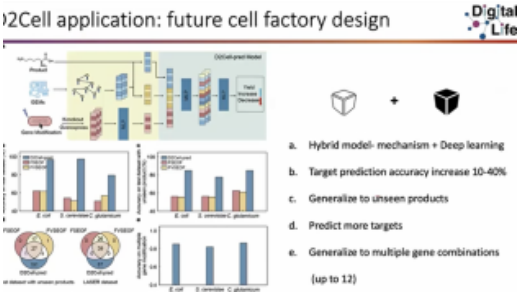
Report by Beiming Cui

On April 9, 2026, ASBA hosted an engaging online seminar featuring Assistant Professor Dr. Feiran Li from Tsinghua University's Shenzhen International Graduate School (SIGS). Her talk highlighted how the integration of digital twins and machine learning is advancing synthetic biology and precision medicine.

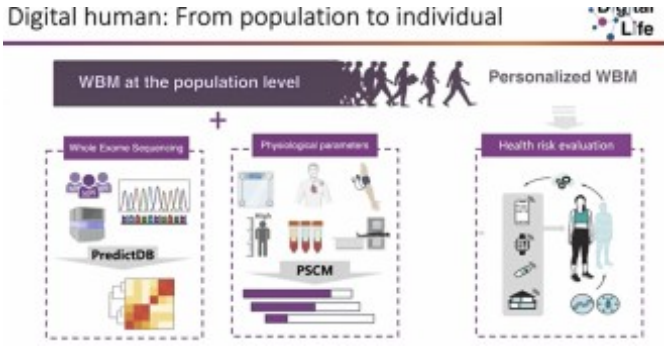
A digital twin is a dynamic virtual model that mirrors a physical system by integrating data from sensors, simulations, and operational history. It enables researchers to simulate, predict, and optimize complex systems across their lifecycle. Extending this concept to biology, Dr. Li described the idea of a digital twin of life, which captures the structure, internal processes, and environmental interactions of living organisms in a unified digital framework.

One of the key challenges in building such models is the lack of kinetic parameters for enzyme-catalyzed reactions. To address this, Dr. Li developed DLKcat, a tool that predicts missing enzyme kinetics from limited experimental data. Her team also established GotEnzymes2, the largest database of enzyme kinetic parameters, providing an essential resource for data-driven biological modeling.

Dr. Li further demonstrated how digital twin models can be applied in practice. For example, digital twins of yeast cells can predict byproduct formation during fermentation, offering valuable insights for biomanufacturing. However, current digital cell models remain limited in their ability to guide the design of synthetic biological circuits.



To overcome this limitation, Dr. Li introduced D2Cell, a large language model tailored for synthetic biology. Trained on over 4,000 open-access research papers, D2Cell can predict the production of user-specified compounds as well as previously unseen products. It can also generate novel gene combinations, opening new possibilities for biosynthetic design.



In addition, Dr. Li presented her work on human whole-body modeling. She developed GEM-Human2, a genome-scale metabolic model that advances our understanding of human metabolism. While most existing models focus on the organ level, her research aims to integrate spatial transcriptomics data with organ-level reconstructions. This approach enables the incorporation of cellular-level information into whole-body models. Looking ahead, she aims to develop personalized models by integrating individual-specific metabolic parameters, supporting future applications in precision medicine.

Dr. Li's work vividly demonstrates how the rapid convergence of AI and biology is accelerating innovation across disciplines. From intelligent yeast cell factories to AI-driven synthetic biology design, her research is transforming how we engineer life and manufacture biological products. At the same time, advances in human metabolic modeling are paving the way toward a comprehensive human biological atlas.

ASBA looks forward to continued engagement with Dr. Li and anticipates her future contributions to this rapidly evolving field.

If anyone is keen for collaboration, Dr Li is contactable via email at feiranli@sz.tsinghua.edu.cn.

Date of seminar : 9th April 2026

SpotifyLink :

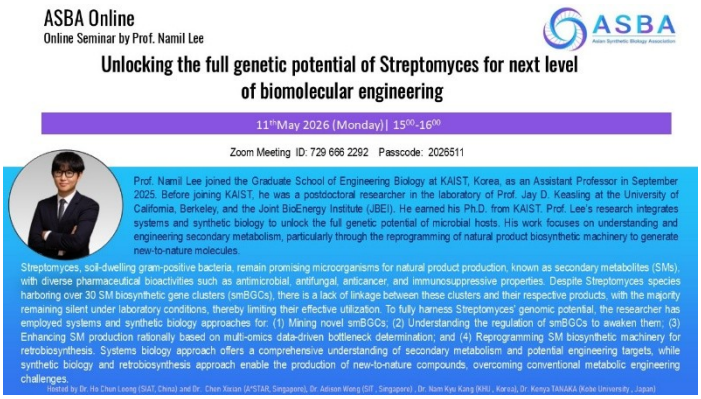
https://open.spotify.com/show/2FNc4RVJjV6OoXpM0rbIRo?si=J_T_Ah_GTHS3MjR_H7Coew

UPCOMING EVENTS

Report by Xiaofang Huang

ASBA Online announcement

Unlocking the full genetic potential of Streptomyces for next level of biomolecular engineering



An upcoming ASBA Online Seminar will be held, featuring cutting-edge insights into synthetic biology and microbial engineering. We invite all ASBA members, researchers, students, and industry partners with an interest in synthetic biology to join this engaging online session, where you can connect with peers and gain valuable knowledge shared by academic experts.

Seminar Details

Event: ASBA Online Seminar

Time: 3:00 PM (GMT+8), May 11th

Format: Online (Zoom Meeting)

Zoom Meeting ID: 729 666 2292

Zoom Passcode: 2026511

Zoom Link:
https://us06web.zoom.us/j/7296662292?pwd=Y39hpGZDRnM1ifpXJH2CidDUaoGMIQ.1&omn=82057955893

Theme: Unlocking the full genetic potential of Streptomyces for next level of biomolecular engineering

In this seminar, Professor Namil Lee will present systems and synthetic biology approaches to unlock Streptomyces' full genomic potential, including mining novel biosynthetic gene clusters, awakening silent pathways, enhancing secondary metabolite production, and reprogramming machinery for new-to-nature molecule synthesis. The presentation will be followed by an interactive Q&A session to facilitate in-depth discussions and knowledge exchange.

This seminar is open to all ASBA members, researchers, students, and industry partners interested in synthetic biology, microbial engineering, natural product biosynthesis, and related fields.

Further updates will be shared via official ASBA channels soon. Please stay tuned for more information.

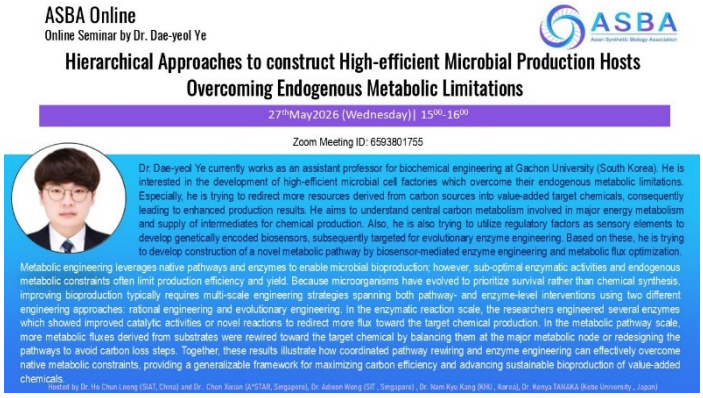
We sincerely look forward to your active participation in this upcoming ASBA Online Seminar!

UPCOMING EVENTS

Report by Xiaofang Huang

ASBA Online announcement

Hierarchical Approaches to construct High-efficient Microbial Production Hosts overcoming Endogenous Metabolic Limitations



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Seminar Details

Event: ASBA Online Seminar

Time: 3:00 PM (GMT+8), May 27th

Format: Online (Zoom Meeting)

Zoom Meeting ID: 6593801755

Zoom Link:
https://singaporetech.zoom.us/my/adisonwong

Theme: Hierarchical Approaches to construct High-efficient Microbial Production Hosts: Overcoming Endogenous Metabolic Limitations

In this seminar, Dr. Dae-yeol Ye will present strategies to overcome native metabolic constraints in microbial cell factories, including pathway rewiring, enzyme engineering, and biosensor-mediated optimization for sustainable bioproduction of value-added chemicals. The presentation will be followed by an interactive Q&A session to facilitate in-depth discussions and knowledge exchange.

This seminar is open to all ASBA members, researchers, students, and industry partners interested in synthetic biology, metabolic engineering, and related fields.

Further updates will be shared via official ASBA channels soon. Please stay tuned for more information.

We sincerely look forward to your active participation in this upcoming ASBA Online Seminar!

If you would like to share your work in the next ASBA Online or feature your latest work in our future ASBA Spotlight edition, please contact us at asba.center@siat.ac.cn or reach us at our social media platforms *(Linkedin, Facebook, Instagram, X and Rednote)*

RECRUITMENT

Report by Xiaofang Huang

Postdoctoral Position: Synthetic Biology-Driven Rare Earth Bioleaching at SIAT, CAS

The Asian Synthetic Biology Association (ASBA) is pleased to share 3 – 5 postdoctoral openings at the Shenzhen Institute of Advanced Technology (SIAT), Chinese Academy of Sciences, focusing on synthetic biology-driven rare earth bioleaching.

Against the backdrop of the "dual carbon" strategy and global demand for sustainable manufacturing, this project addresses critical bottlenecks in traditional rare earth processing—including low efficiency, insufficient purity, and poor adaptability to complex ores—by leveraging synthetic biology, materials science, and AI to build a new generation of green separation technologies.

You will join a multi-PI collaborative team at SIAT's State Key Laboratory of Quantitative Synthetic Biology, working on three core directions: developing rare earth-selective protein recognition elements, engineering and evolving microbial chassis, and designing scalable bioleaching processes. This work sits at the cutting edge of interdisciplinary research, with clear pathways to real-world industrial impact.

Location: Shenzhen, Guangming District, China

Qualifications: PhD obtained within the last 3 years, with a background in synthetic biology, AI protein design, bioleaching, computational biology, microbiology, or related fields; a track record of peer-reviewed SCI publications and good English communication skills

Benefits: Competitive annual salary (300,000–450,000 RMB including subsidies), housing or talent apartment support, full social insurance, research funding, and opportunities to apply for postdoctoral grants and national programs. High performers may be eligible for direct promotion to project-level research fellow positions.

To Apply: Please submit your CV and relevant materials to gaoxiang@siat.ac.cn with the subject line: "Rare Earth Bioleaching Project + Your Name + Postdoc Application"

ASBA encourages early-career researchers to explore this opportunity to contribute to a transformative project that bridges fundamental synthetic biology and industrial sustainability.

RECRUITMENT

Report by Xiaofang Huang

PhD Studentship Opportunity at Sunway University (Prof. Teck Yew Low's Research Group)

The Asian Synthetic Biology Association (ASBA) is pleased to share fully funded PhD studentships at Sunway University, Malaysia, led by Professor Teck Yew Low. These positions invite motivated early-career researchers to pursue doctoral studies in synthetic biology, biotechnology, and related life science fields.

Professor Teck Yew Low's group offers a fully funded pathway to cutting-edge research at a globally ranked, research-intensive institution, with access to advanced facilities, industry-engaged centres, and expert mentorship. The studentship includes full tuition coverage and a competitive stipend, supporting students to focus entirely on impactful, socially relevant research.

We welcome applications from candidates with strong backgrounds in synthetic biology, molecular biology, biochemistry, microbiology, or related disciplines, who are passionate about collaborative, innovative research.

For full details on projects, eligibility, and application procedures, please contact Professor Teck Yew Low directly at: teckyewl@sunway.edu.my

Additional information is available on Sunway University's official pages:

Doctoral Scholarships:
https://www.sunwayuniversity.edu.my/research/postgraduate-research/doctoral-scholarships

PhD in Biology Programme:
https://www.easyuni.com/international/sunway-university-250/doctor-of-philosophy-phd-in-biology-279728/

This opportunity is open to all ASBA members, students, and early-career researchers. We encourage interested candidates to reach out to discuss their research interests and potential fit.

Related Tags: ASBA Opportunities, PhD Studentship, Sunway University, Synthetic Biology, Life Sciences, Fully Funded PhD