

Functional metagenomic mining and comprehensive pathway optimization using synthetic selections

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By solving complex metabolic engineering challenges, Biosyntia, a Copenhagen-based biotech company, delivers biological manufacturing of ingredients and high value chemicals. In this talk, co-founder and CSO, Hans Genee, explains how the company with co-workers deploy synthetic selection systems to enable high-throughput mining and functional validation of biological functions. We present a synthetic selection system for thiamine, a vitamin of crucial interest for industrial biotechnology and human health. Using this system we mined soil and gut metagenomes for thiamine transporters and identified several members of a novel transporter class. Additionally, to probe the sequence-function landscape of the complex and tightly regulated thiamine biosynthesis pathway of *Escherichia coli*, and to speed up the engineering of optimized strains, we applied the synthetic selection to interrogate 16,384

refactored pathway variants that sample the synthetic design space. This approach enabled rapid identification of new and non-intuitive pathway configurations leading to high thiamine production levels. Combined, our results demonstrate how synthetic biology approaches can effectively be deployed to functionally mine metagenomes and elucidate sequence-function relationships of complex transport and biosynthesis systems in bacteria

Speaker Biography

Hans J Genee is the founder of Biosyntia ApS. He founded the biotech academy camp, and his activities in synthetic biology has led to peer reviewed publications, the McKinsey Award for exceptional achievements, the SBR-DTU prize for most innovative project, and the Novo Scholarship. He is a Ph.Dc in Biotechnology at the NNF Center for Biosustainability and holds an M.Sc.Eng. degree with honors in systems biology from the Technical University of Denmark, Delft University of Technology, and Harvard University.

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