

Invited talk

# Principles of microbial community design; at the intersection of ecology and engineering

27th november 2024, 10.30 am at LY221 R237



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Professor of Microalgae  
and Microbiome  
Engineering

## Abstract

The presentation, "Principles of Microbial Community Design: At the Intersection of Ecology and Engineering," will address strategies for designing microbial communities attempt to bridge ecological theory and engineering applications. As microbial communities play critical roles in carbon cycling, bioproduction, and environmental resilience, this talk will explore how ecological principles—such as community succession, and environmental filtering—can be harnessed to engineer stable, efficient consortia. Using examples from diatom phycosphere microbiomes I will demonstrate how ecological dynamics, including species priority effects and metabolic exchange, can guide community biodesign and for biotechnology platforms. This talk will lead into a new area of investigation which is to build “designer phycopheres” with programable functional capacities that are derived from Arctic marine taxa relevant to industrial scale CO<sub>2</sub> capture and conversion into marine biomass. This work represents a step forward in leveraging ecological frameworks for microbiome engineering applications, offering promising directions for sustainable energy, climate mitigation, and industrial biotechnology.

## Bio

Dr. Hans C. Bernstein is a Professor of Microalgae and Microbiome Engineering at UiT – The Arctic University of Norway. His interdisciplinary expertise spans molecular microbial ecology, synthetic biology, and bioprocess engineering, with a growing focus on advancing sustainable microbial solutions for carbon capture and utilization. Over his career, he has pioneered studies in microbial interactions and synthetic consortia, leading to major research funding from bodies like the US Department of Energy, the Norwegian Research Council and now The Novo Nordisk Foundation (in collaboration with DTU Bioengineering). He leads the Microalgae & Microbiomes Research group which is a hub for mentoring early-career scientists, fostering an environment of industrial collaboration, and promoting innovative approaches that merge genome-informed engineering with ecological principles. His research not only addresses immediate environmental challenges but also aims to translate ecological theory and observation into engineerable principles for biodesign of microbial interactions.