

BDR SEMINAR via Zoom

Shunshi Kohyama

Dept. Cellular and Molecular Biophysics, Max Planck
Institute of Biochemistry

Tuesday, August 1, 2023

12:30-13:30

Meeting URL will be announced on the event day by e-mail.

※This seminar is open only to BDR members.

Building up cell division by design

Summary

Constructing autonomous division machinery within minimal cell models is one of the major goals of bottom-up synthetic biology to decipher the fundamental prerequisite of life, such as the self-organization of cytoskeletal proteins that govern higher-order functions, e.g., division, motility, etc. Here, we present two recent achievements in this regard; 1) *in vitro* reconstitution of a bacterial divisome formation within minimal cell models, in which *E. coli* FtsZA-based contractile ring is positioned into the mid-cell by MinCDE proteins. The success of *in-vesicle* protein synthesis allowed us to observe the entire sequence of self-organization events and the constriction of lipid vesicles by the division ring, making an essential step toward constructing a minimal cell model. 2) machine learning (ML) based generative protein design for *de novo* proteins with a higher-order protein function that organizes the cellular interior. We successfully validated ML-designed proteins by a comprehensive *in silico*, *in vitro*, and *in vivo* screening pipeline (i3-screening) that eventually found the fully functional substitution of a natural gene by an ML-designed gene in *E. coli* cells, giving rise to the next level of synthetic biological applications, where the cell division will be built up by design.



Host: Takuhiro Ito

Laboratory for Translation Structural Biology, BDR
Contact: bdr-mtg@ml.riken.jp

RIKEN Center for Biosystems Dynamics Research (BDR)