



FLAGSHIP INITIATIVE
ENGINEERING
MOLECULAR SYSTEMS



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COLLOQUIUM ENGINEERING MOLECULAR SYSTEMS

KERSTIN GÖPFRICH will talk about **SYNTHETIC CELLS: DE NOVO ENGINEERING WITH DNA NANOTECHNOLOGY** in the “Engineering Molecular Systems” colloquium at **March 14th 2022** at 5 p.m. (CET) hosted by the Flagship Initiative Engineering Molecular Systems of Heidelberg University.



**Kerstin
Göpfrich**

MPI for Medical Research
Heidelberg

March 14th 2022
5 pm CET
Zoom

ABSTRACT:

Can we construct a cell from non-living matter? In search for answers, bottom-up synthetic biology has successfully encapsulated functional sets of biomolecules inside lipid vesicles, yet a “living” synthetic cell remains unattained. Instead of relying exclusively on biological building blocks, the integration of new tools can be a shortcut towards the assembly of active and eventually fully functional synthetic cells. This is especially apparent when considering recent advances in DNA nanotechnology. DNA nanotechnology allowed us to engineer various functional parts for synthetic



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cells, which, meanwhile have found diverse applications as biophysical probes in cell biology. Recently, we engineered functional DNA-based mimics of a cytoskeleton. These cytoskeletons are capable of stimuli-responsive reversible assembly, cargo transport and can deform giant unilamellar lipid vesicles (GUVs) from within. We further demonstrate the division of GUVs based on phase separation or spontaneous curvature increase and osmosis rather than the biological building blocks of a cell's division machinery. We derive a parameter-free analytical model which makes quantitative predictions that we verify experimentally. The osmolarity increase can be triggered by enzymatic reactions or by light-triggered release of caged compounds. Ultimately, by coupling GUV division to their informational content and their function, we aim for a prototype of a synthetic cell capable of evolution.

BRIEF CV:

I have always been curious about fundamental questions in science and long fascinated by the idea to engineer a cell from scratch. Since 2019, I am leading the Max Planck Research Group Biophysical Engineering. Previously, as a Skłodowska-Curie Fellow in Stuttgart, I worked on bottom-up synthetic biology and microfluidics with Joachim Spatz. In April 2017, I completed my PhD in physics as a Gates Cambridge Fellow at the University of Cambridge, UK, where I built DNA origami nanopores in the group of Ulrich Keyser. See also: <https://goepfrichgroup.de/kerstin-gopfrich>

Please register for the Zoom-Meeting using the following link:

<https://zoom.us/meeting/register/tJUuceqggToqHdHNgTT6Q9InUzq0JUyW2Tlg>