

Online Seminar



Prof.

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TUESDAY, April 12th 2022, 15:00 s.t.

Modelling cell membrane reshaping across evolution

The molecular machinery of life is largely created via self-organisation of individual molecules into functional larger-scaled structures. Such processes are multi-scale in nature and constantly driven far from thermodynamic equilibrium. Our group develops minimal coarse-grained computer models for non-equilibrium organisation of macromolecules into functional nanomachines, which can produce mechanical work needed for cell sculpting.

Today I will discuss our recent research on physical modelling of composite active elastic ESCRT-III filaments that dynamically shift their geometries and mechanical properties to reshape and cut cell membranes. I will first present our model in the context of eukaryotic cell trafficking, supported by experimental data [1-2]. Then I will discuss the evolutionary origins of this physical mechanism and its role in cell division in the archaeal branch of the tree of life [3]. I will show quantitative comparison between live cell imaging of dividing archaeal cells and our simulations of the whole cell division process [4]. I will finish with our recent efforts in artificially evolving assemblies that efficiently cross cell membranes.

- [1] L. Harker-Kirshneck et al., BMC Biology 17, 1-8 (2019).
- [2] A. K. Pfitzner et al., Cell 182, 1140 (2020)
- [3] G. T. Risa et al., Science 369, 6504 (2020).
- [4] L. Harker-Kirshneck et al., PNAS 119, e2107763119 (2022).
- [5] J. C. Forster et al., Phys Rev Lett 125 (22), 228101 (2020).

Andela received her PhD from Columbia University in New York in 2013, after which she moved onto a post-doctoral fellowship at the University of Cambridge, where she was also a Research Fellow of Emmanuel College. She is currently a Group Leader in the Department of Physics & Astronomy at University College London, UK and the Institute of Science and Technology Austria (ISTA). She can be found on Twitter @SaricLab.

All interested colleagues are welcome to this Online-Seminar on **TUESDAY, April 12th 2022, 15:00 s.t.**
(45 min. presentation followed by discussion)



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