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Colloquium

Growing Droplets in Cells and Gels

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Abstract
In order to function effectively, living cells must compartmentalize myriad chemical reactions. In the classic view, distinct functional volumes are separated by thin oily-barriers called membranes. Recently, the spontaneous sorting of cellular components into membraneless liquid-like domains has been appreciated as an alternate route to compartmentalization. I will review the essential physical concepts thought to underlie these biological phenomena, and outline some fundamental questions in soft matter physics that they inspire. In particular, I will focus on the coupling of phase separation to elastic stresses in polymer networks. Using a series of experiments spanning living cells and synthetic materials, I will demonstrate that bulk mechanical stresses dramatically impact every stage in the life of a droplet, from nucleation and growth to ripening and dissolution. Not only does this work address fundamental questions in soft condensed matter physics, but it also has exciting implications for cell physiology and the self-assembly of synthetic materials.

Literature
- Elastic ripening and inhibition of liquid-liquid phase separation (2019 – link)
- Liquid-Liquid Phase Separation in an Elastic Network (2018 – link, scroll down for popular summary)

Bio
Eric Dufresne is the Professor of Soft and Living Materials at the Swiss Federal Institute of Technology in Zurich (ETH). His research focuses on the physics of Soft Matter. Current topics include interfacial properties, mechanics, and self-assembly in biological and synthetic systems. Before moving to ETH, Eric was a graduate student at the University of Chicago, a post-doc at Harvard University, and a professor at Yale University.

30 October, 2019, 15:00-16:15 p.m.

FIT, Georges-Köhler-Allee 105, 79110 Freiburg

Seminar room, ground level

Gefördert durch DFG Deutsche Forschungsgemeinschaft
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