Virtual BSC RS/Life Sessions: "Non-equilibrium molecular assembly: from NON-LIVING to LIVING and back"

Objectives

You can watch the seminar in this **link**.

Abstract: Identifying the principles that govern the emergence of organisation in non-equilibrium systems remains a central challenge of modern soft matter and physical chemistry. In a living cell, non-equilibrium conditions are necessary for functionality and are maintained by chemical gradients and mechanical forces. These conditions drive the reversible assembly of molecules into large-scaled functional structures that produce work needed for cellular trafficking, motility, division, and healing. When molecular assembly occurs without energy input, irreversibly, severe pathologies can occur.

Today I will present our research on computational modelling of molecular self-assembly processes, in healthy and diseased states. I will discuss the example of active elastic filaments (ESCRT-III) that dynamically change their geometries to reshape and cut cell membranes. I will present comparisons of our simulation results to cell reshaping processes across evolution — from cellular trafficking in eukaryotes to cell division in archaea. I will then discuss our work on modelling pathological amyloid aggregation involved in neurodegenerative disorders, which occurs via passive nucleation and self-replication processes. I will finish with our recent efforts in computationally evolving assemblies to perform a desired function.

Short BIO: Andela leads an

Cell Biology at University College London. Her group works in the area of computational biological physics, developing models to study protein assembly and cell remodelling in health and disease. Andela obtained her PhD from Columbia University, followed by a HFSP postdoctoral fellowship at the University of Cambridge. She is a recipient of the Royal Society University Research Fellowship, ERC Starting Grant, and EMBO Young Investigator Prize.

Speakers

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