Seminar/Talk

Modulating the flow of entangled DNA with topologically active proteins

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The activity and organisation of DNA in the cell are highly regulated by several proteins, such as topoisomerases and Structural Maintenance of Chromosomes (SMCs), which are involved in topological regulation by resolving crossings between DNA strands or creating loops within chromatin. While we have rich knowledge about the impact of these proteins on the cell's function, the rheological, i.e., flow properties, which affect the capacity of DNA to reorganise and respond to stimuli, are still poorly understood.In this talk, I will investigate the viscous and elastic properties of dense DNA solutions under the effect of SMCs and the formation of gels through DNA ligation. Specifically, I show how SMCs modulate in silico and in vitro the rheological properties both through the extrusion of loops and the creation of transient crosslinks between DNA strands. Additionally, I investigate how DNA can be used to create percolating networks of linked rings. These DNA networks, called "Olympic Gels'', differ from classic transiently linked gels by the presence of permanent topological links. I show that through progressive ligation it is possible to create materials with tuneable viscoelastic properties, which can be controlled by choosing the length of ring and linear DNA strands used in the gel formation. This work contributes to a better understanding of how proteins naturally contained in the cell affect the topology, structure, and rheology of entangled DNA, and will help guide the design of new biomaterials inspired by the properties of DNA.

Wednesday, April 15, 2026 11:00am - 12:00pm
Sunstone Bldg / Ground floor / Big Seminar Room A / 27 seats (I23.EG.102)

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