DEPARTMENT OF MOLECULAR SCIENCE AND NANOSYSTEMS

Seminars of the PhD Programme in Chemistry

Knots in Biomolecules and self-assembling systems

Dr. Cristian Micheletti

Scuola Internazionale Superiore di Studi Avanzati – SISSA, Trieste

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ABSTRACT.
Knots are part of our everyday life. In some cases they can serve useful purposes, think for instance of climbing or sailing. In other cases they can be a nuisance, as we know from the laborious procedures of disentangling extension cables or headphone wires. Like extension cables, long and densely-packed biopolymers such as DNA can be knotted too, with detrimental effects for their in vivo functionality.
I will present some results, motivated by recent breakthrough experiments [1], about the detection of DNA knots using solid-state nanopores [2], and the prediction of self-assembling constructs with complex target topologies [3] that has been recently realized experimentally[4].

References:
[1] C. Plesa et al "Direct observation of DNA knots using a solid-state nanopore", Nature Nanotech (2016).
[2] A. Suma and C. Micheletti "Pore translocation of knotted DNA", Proc. Natl. Acad. Sci. USA, (2017)
[3] G. Polles et al. "Self-assembling knots of controlled topology by designing the geometry of patchy templates", Nature Communications, 2015
video demo at: https://www.youtube.com/watch?v=XKsuMlp2PLc&feature=youtu.be
[4] J. Danon et al. "Braiding a molecular knot with eight crossings." Science (2017)

L'organizzatore
prof. Achille Giacometti

l Vice-Coordinatore del Dottorato in Chimica
prof. Maurizio Selva

Università Ca'Foscari Venezia

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