

Pore translocation of knotted polymers

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Abstract: Nanopore translocation is increasingly used to probe physico-chemical properties of DNA filaments. In the recent breakthrough study of Plesa et al.[1], this technique was used to detect knots trapped in DNA rings. I will present a recent study where we used a detailed mesoscopic model for DNA to simulate the translocation of knotted DNA filaments and thus expose its unexpectedly rich phenomenology[2].

If time allows I will also report on simulations of self-assembling knotted constructs that have recently allowed for predicting complex target topologies [3], which have been 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>