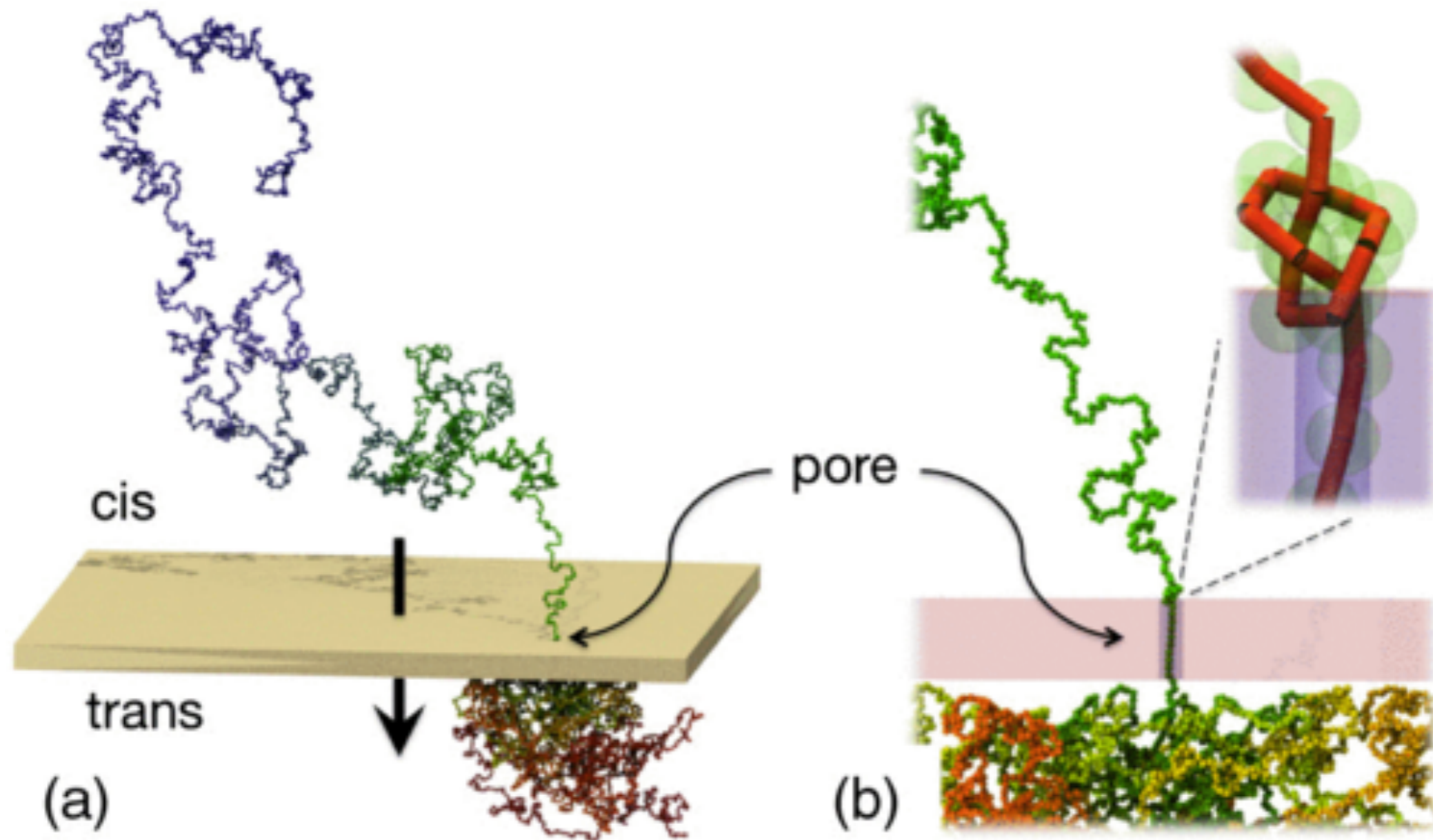


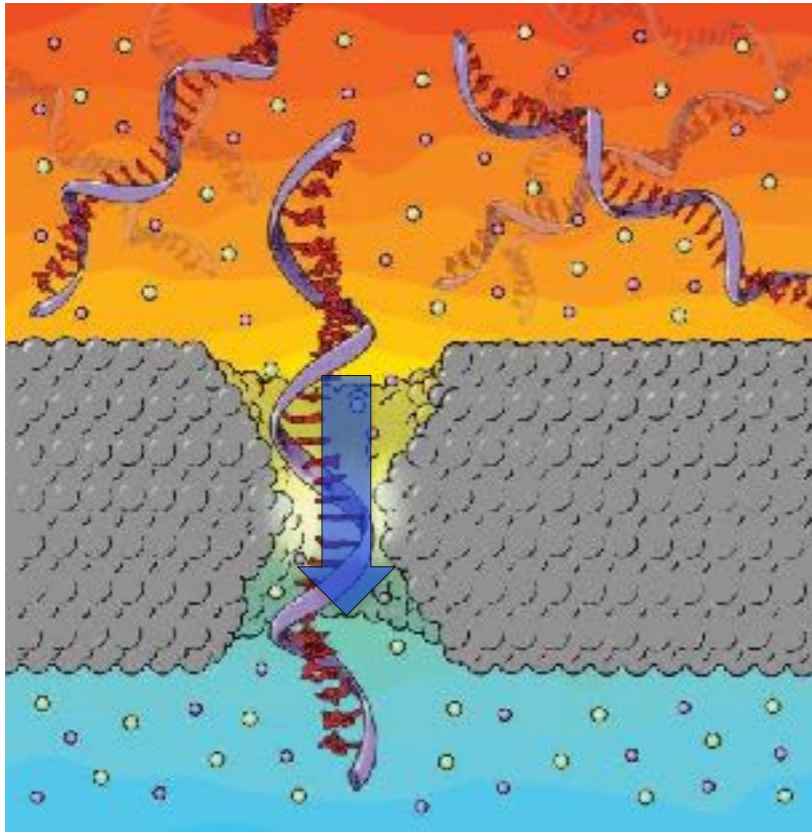
Pore translocation of knotted chains

A. Suma, and C. Micheletti

*International School for Advanced Studies, Trieste, Italy

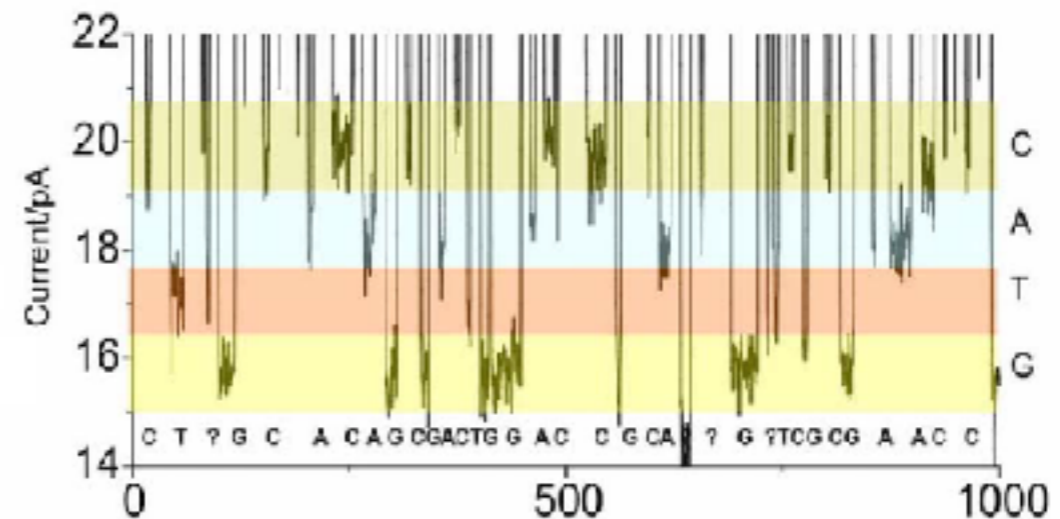


Sequencing of DNA through nanopore



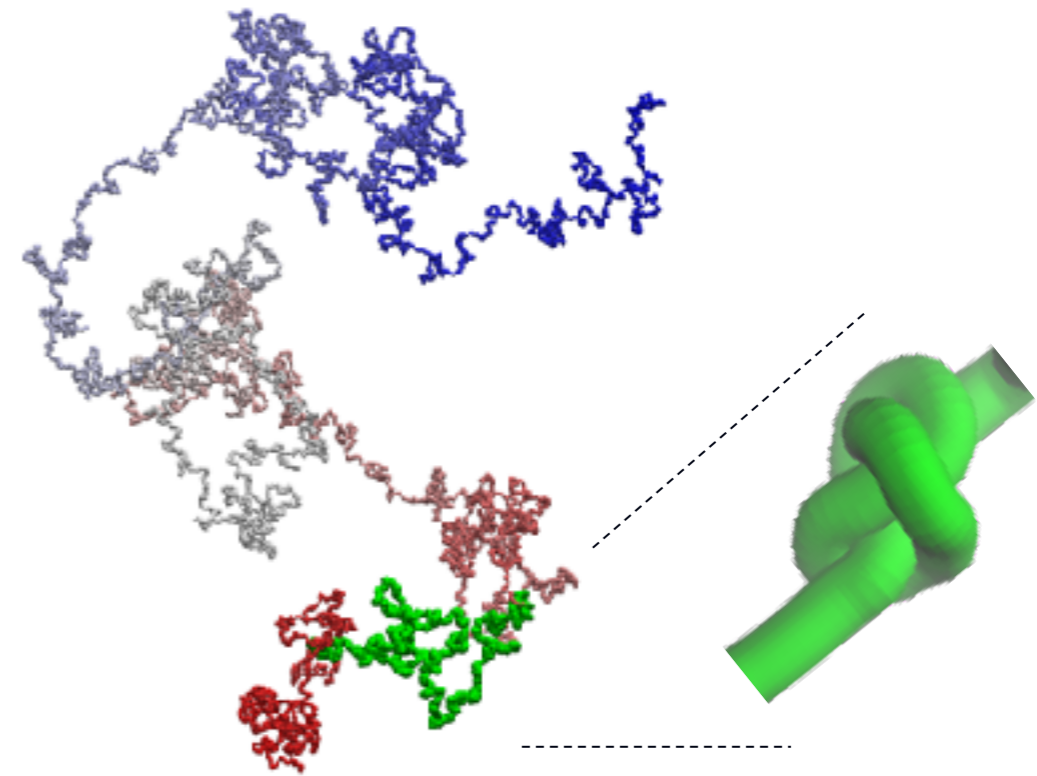
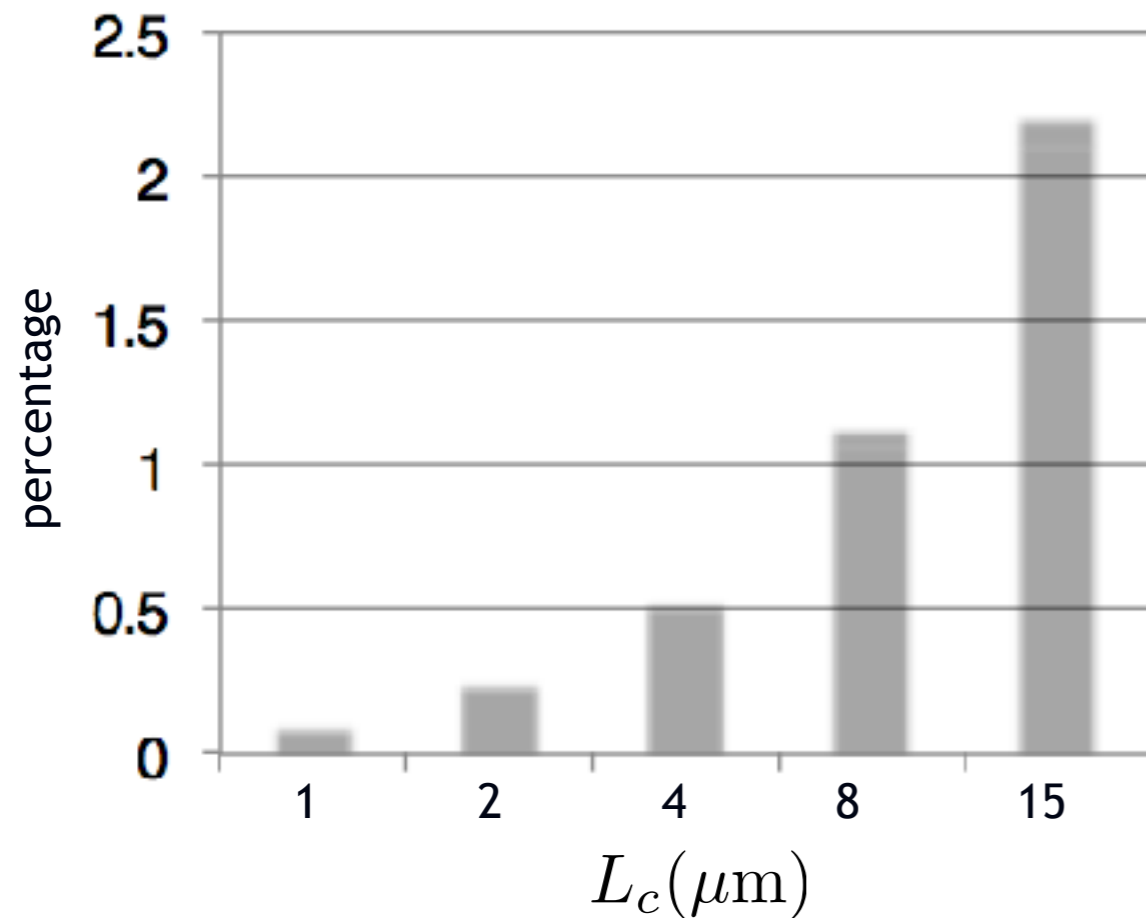
Solid-state nanopore + electric field

Read lengths: 50 nts in 2010 - Metzker, ten Bosh
1000 nts in 2013 - Oxford nanopore tech.
50000 nts at present: lambda-phage DNA
Oxford nanopore tech.



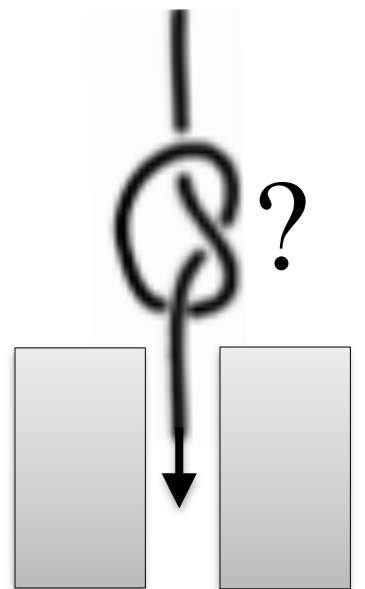
Sources: Zwolak and Di Ventra, *Rev. Mod. Phys.* 2008; Astier et al. *JACS* 2006; Moorthie et al. *HUGO J.* 2011
van Dorp et al., *Nat. Phys.* 2009, Luan et al., *PRE* 2008; Drndic et al. *ACS Nano* 2013,

Knotting probability and chain length



Longer chains have increasing probability of having knots
(unknotting probability decrease exponentially)

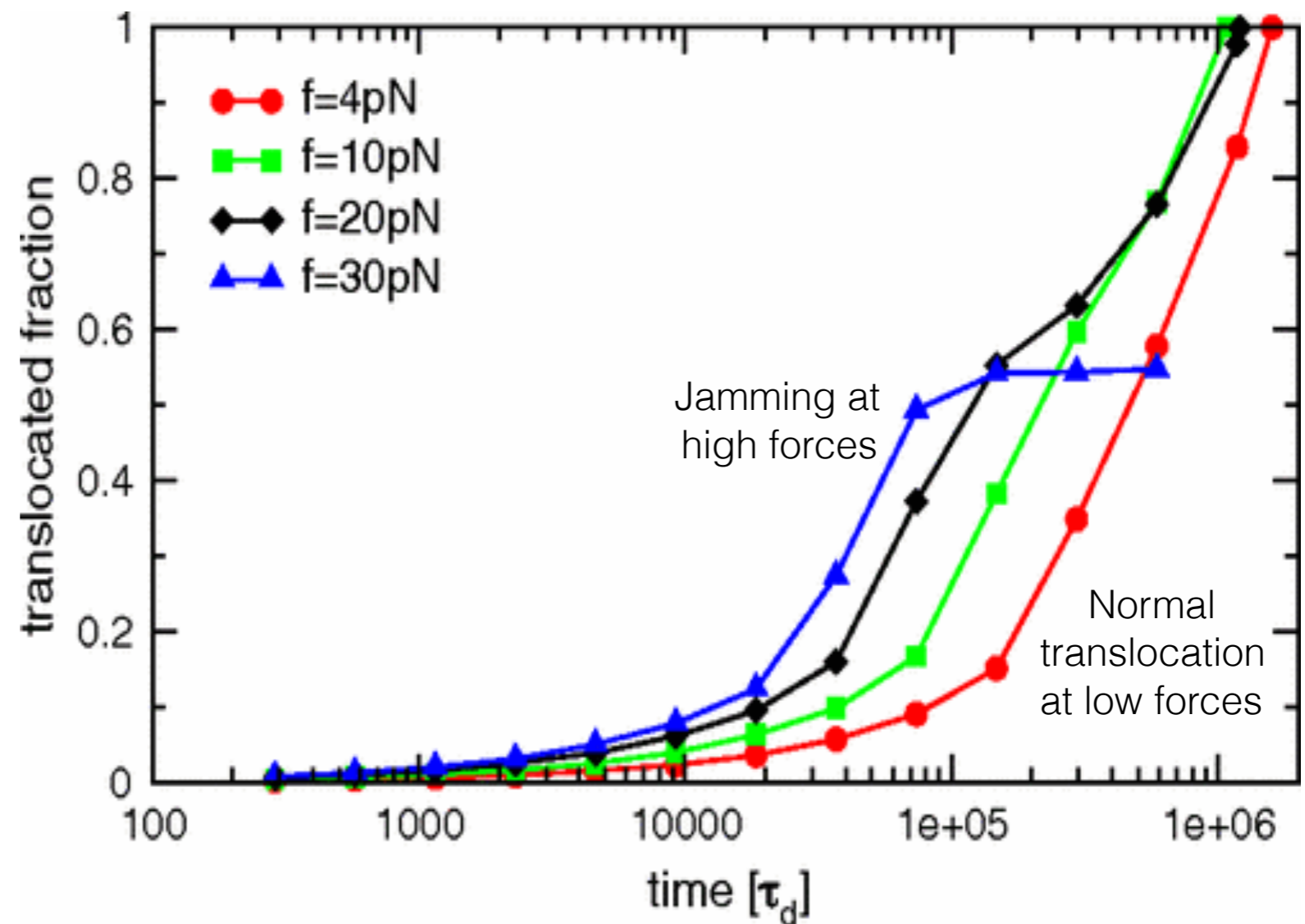
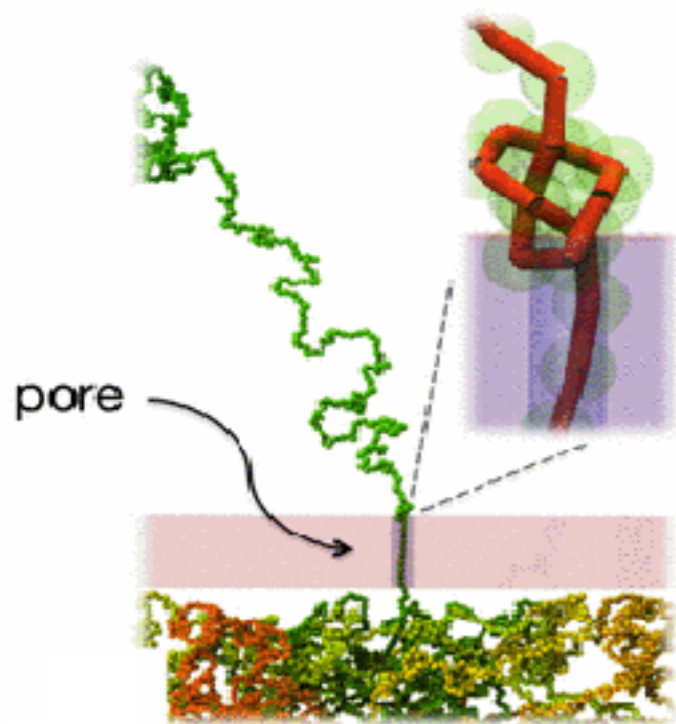
What happens to the translocation with knots?



Translocation dynamics of ssDNA chain with 3_1 knot:

Knot tightens, arrive to the pore, and get stuck with a sufficiently small pore

Impact on translocation process



Rosa et al. Phys Rev. Lett 2012

For protein analogies see P. Szymczak Biochem. Soc. Trans 2013

Topological friction and knot complexity

