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DNA translocation through protein and synthetic nano pores[1]

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DNA translocation through narrow protein channels is recognized as an important process in biology. Recently it has attracted lot of attention in the biophysical community following several experiments on DNA translocation through protein nano-pores, and more recently, through synthetic silicon nano-pores. A fundamental understanding is needed for various biological processes, *e.g.*, entry and exit of a DNA in and out of a cell, efficient separation methods for macromolecules, and, possibly fast DNA sequencing. In this talk I will be presenting results for the DNA translocation using a coarse-grained model for an idealized DNA as well as the pore. I will consider several scenarios for the DNA translocation. First, I will show scaling of translocation time of a homopolymer as it escapes from the *trans* side to the *cis* side of an idealized thin membrane[2] Then I will consider DNA dynamics subject to a driving force inside the pore. Next, I will consider heteropolymer threading through a nano-pore. Specifically we will consider both highly ordered and completely random sequences of the chain and relate specific sequences to the distribution of the translocation time and the residence time inside the pore. These studies also will include effects due to different environment on either side of the pore, specific DNA-pore interactions located at selective sites, *etc.*. I will discuss relevance of these simulation results to recent experiments and theoretical models.

[1]Work done in collaboration with Kurt Binder, Andrey Milchev, Kaifu Luo, See-Chen Ying, and Tapio Ala-Nissila.

[2]A. Milchev, K. Binder, and Aniket Bhattacharya, J. Chem. Phys. **121**, 6042 (2004).