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Ratcheting charged polymers through nanopores: Designing a low pass molecular filter for DNA

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When nanopores are used to capture and translocate DNA molecules through a wall or membrane, the resulting capture rate is essentially independent of their molecular size, making the process incapable of changing relative concentrations in a mixture. Using Langevin Dynamics simulations, we show that it is possible to use pulsed fields to ratchet captured semiflexible molecules so that only short chains successfully translocate, thus transforming translocation into a low pass molecular filter. Two different modes of operation are investigated. One of these modes allow for the ratchet to be run with many pores in parallel, which increases its potential usefulness.

Authors: SLATER, Gary W. (University of Ottawa); QIAO, Le (University of Ottawa)

Presenter: SLATER, Gary W. (University of Ottawa)

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