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A Nanopore with an Internal Cavity to Selectively Translocate Polymers of a Specific Length[1] HENDRICK W. DE HAAN, MARTIN MAGILL, University of Ontario Institute of Technology — In the majority of experimental and simulation studies of polymer translocation through a nanopore, the scaling of the translocation time, τ, with polymer length, N, is well described by a single exponent: $\tau \sim N^{\alpha}$. Hence, an increase in N always yields an increase in τ. I will present a nanopore geometry in which there is a large central cavity between narrow nanopores at both the *cis* entrance and the *trans* exit. Results from simulations of this system reveal a complex dependence of τ on N. Most notably, the translocation time is now non-monotonic in polymer length such that τ is a minimum for polymers of an intermediate length with both longer and shorter polymers taking a longer time to cross across the membrane. A simple yet effective model for predicting this critical length as a function of the size of the cavity and the magnitude of the external field will be presented. The pore thus can be designed to be optimized for particular lengths with some dynamic tuning being possible by varying the strength of the external field. These results suggest new applications for nanopore-based devices such as the ability to select DNA strands of a specific length from a sample containing both shorter and longer strands.

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