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Detailed Computational Study of Translocation Dynamics: Revealing the Physical Mechanisms of Viscosity Dependent Scaling Laws<sup>1</sup> HENDRICK W. DE HAAN, GARY W. SLATER, University of Ottawa — Noting the limitations of current methods of characterizing the unbiased translocation of a polymer through a nanopore, we demonstrate a measurement which more completely maps out the process in time. Applying this approach to Langevin Dynamics simulations of translocation at different viscosities for a relatively tight nanopore yields interesting results for the scaling of the translocation time with polymer length:  $\tau \sim N^{\alpha}$ . At low viscosities, super-diffusive results are obtained. At high viscosities, while translocation is found to obey simple scaling with  $\alpha = 2.2$  near the beginning of the process, length dependent deviations from simple scaling near the end result in an overall  $\alpha$  exponent which is viscosity dependent. The memory and entropic effects giving rise to this behaviour will be discussed.

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