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Polymer Translocation in Crowded Environments[1] AJAY GOPINATHAN, School of Natural Sciences, University of California, Merced, YONG WOON KIM, Department of Physics, University of California, Santa Barbara — Polymer translocation is an important biological process that involves the transport of biopolymers across a membrane, through a pore, into a different environment. However the influence of the crowded nature of the cellular cytoplasm on translocation dynamics has received little attention. We systematically treat the entropic penalty due to the crowded environment by modeling the crowding effect as arising from the excluded volume due to hard spherical obstacles that could be static or free to diffuse. Using a Fokker-Planck description of the translocation dynamics we find novel exponents describing the scaling of the translocation time with polymer length. We also explicitly consider situations where both sides of the membrane are crowded and where the translocation is driven by a chemical potential gradient. In both cases we observe new and qualitatively different translocation regimes as a function of crowding, transmembrane chemical potential asymmetry and polymer length.

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