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Translocation dynamics of pre-packaged polymers through a pore[1] CHANDRA BERGMANN, UC Merced, Physics Department, AJAY GOPINATHAN, UC Merced, GOPINATHAN LAB TEAM — Many biological systems contain polymers that translocate through pores in a membrane only after being packaged by transport factors, which serve to condense the polymer by some packaging fraction as well as to provide some affinity for the inside of the pore. Here, we use a Fokker-Planck formalism to model how the properties of these transport factors interact with the pore size to affect the time of translocation, assuming the removal of these transport factors is accomplished by some other energy-consuming enzymatic action. At sufficiently high affinity, translocation time is the least when there is always exactly one transport factor inside the pore at any given time during translocation; however, at lower affinities, the increased ratcheting effect proves more important than the edge effects, and translocation time decreases as pore size increases. If we take into account that the diffusion constant of the polymer is reduced both by decreasing the packaging fraction and decreasing affinity, we are able to identify optimal and sub-optimal regimes of the parameter space, for pores of varying sizes, where small deviations from the optimal regime can increase the time of polymer translocation drastically.

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