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Diffusion and binding of finite-size particles through tubes MARK HENLE, AJAY GOPINATHAN, UC Santa Barbara, CHRISTIAN SANTANGELO, University of Pennsylvania — The classical treatment of the diffusion of particles through their environment ignores all of the interactions between these particles. The diffusion of biological particles, however, often occurs in crowded environments (e.g. the cellular matrix), where steric interactions between particles are important. In this talk, we investigate the effects of steric interactions on diffusion by considering the diffusion of finite-size particles within a tube whose diameter is comparable to the size of the particles. When the particles diffuse freely through the tube, steric interactions have only a trivial effect on their diffusion; however, steric interactions dramatically alter the diffusion when the particles can reversibly bind to the walls of the tube. Using a simple lattice model of this process, we calculate the steady-state current and density of particles in the tube. We also perform simulations of this system, and find excellent agreement with our analytical results.

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