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The Effect of a Translocating Cylindrical Particle on the Ionic Current through a Nanopore HUI LIU, University of Pennsylvania, SHIZHI QIAN, University of Nevada-Las Vegas, HAIM BAU, University of Pennsylvania — The effect of a translocating particle on the ionic current through a pore has been used for particle counting, biosensing, and DNA sequencing. Using a continuum model consisting of Nernst-Planck, Poisson, and Navier-Stokes equations, we compute the ionic current and the particle's velocity as functions of the particle's and pore's dimensions, surface charges, electric field intensity, electrolyte concentration, and particle's location. When the electrolyte concnetration is high and the particle's surface charge low, the particle's presence reduces the ionic current. When the electrolyte concentration is low, the particle's presence enhances the ionic current. In some cases, the ionic current is enhanced during part of the particle's trajectory and suppressed during another part. Our theoretical predictions qualitatively agree with experimental data and predictions obtained with Molecular Dynamics simulations pertaining to the translocation of DNA molecules in nanopores.

Haim Bau
University of Pennsylvania

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