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Reversal of motion induced by mechanical coupling in Brownian motors ERIN CRAIG, University of Oregon, MARTIN ZUCKERMANN, Simon Fraser University, HEINER LINKE, University of Oregon — Many studies of Brownian ratchets have dealt with the asymmetric pumping of individual point-like particles. Here, we consider the transport of objects with internal structure in a flashing ratchet potential by investigating the overdamped behavior of a rod-like chain of evenly spaced point particles. In 1D, analytical arguments show that the current can reverse direction multiple times in response to changing the size of the chain or the temperature of the heat bath. However, if the rods are allowed to rotate freely in 3D, or if their length is much less than the spatial period of the ratchet potential, current reversal is no longer observed, and the qualitative behavior of single particle motion is recovered. All analytical predictions are confirmed by Brownian dynamics simulations. These results are relevant to the design of novel particle separation technology, and may provide the basis for simple, coarse-grained models of molecular motor transport that incorporate an object's size and internal degrees of freedom into the mechanism of transport.

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