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Active elastic dimers: self-propulsion and current reversal on a featureless track VIJAY KUMAR KRISHNA MURTHY, SRIRAM RAMASWAMY[1], CCMT, Dept. of Physics, Indian Institute of Science, Bangalore 560012., MADAN RAO[2], Raman Research Institute, Bangalore 560080. — Directed motion without an imposed external gradient is seen not only in living systems but also in agitated granular matter. The essential ingredients are an external energy input and an inherent asymmetry. Unlike traditional "Brownian ratchet models", the asymmetry of interest in the above systems is *internal* to the motile objects, and does not lie in an external periodic potential. In this work, we present a Brownian inchworm model of a self-propelled elastic dimer in the absence of an external potential. Nonequilibrium noise together with a stretch-dependent damping form the propulsion mechanism. Our model connects three key nonequilibrium features – position-velocity correlations, a nonzero mean internal force, and a drift velocity. Our analytical results, including striking current reversals, compare very well with numerical simulations. The model unifies the propulsion mechanisms of DNA helicases, polar rods on a vibrated surface, crawling keratocytes and Myosin VI. We suggest experimental realizations and tests of the model.

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